A

absorption- Movement of ions and water into as organism as a result of metabolic processes, frequently against an electrochemical potential gradient (active) or as a result of diffusion along an activity gradient (passive).

acetogenic bacterium- Prokaryotic organism that uses carbonate as a terminal electron acceptor and produces acetic acid as a waste product.

acetylene-block method- Estimates denitrification by determining release of nitrous oxide (N_2O) from acetylene-treated soil.

acetylene-reduction assay- Estimates nitrogenase activity by measuring the rate of acetylene reduced to ethylene.

N-Acetylglucosamine and *N*-Acetylmuramic acid- Sugar derivatives in the peptidoglycan layer of bacterial cell walls.

acidophile- Organism that grows best under acid conditions (down to a pH of 1).

acid soil- Soil with a pH value < 6.6.

actinomycete- Nontaxonomic term applied to a group of high G + C base composition, Gram-positive bacteria that have a superficial resemblance to fungi. Includes many but not all organisms belonging to the order Actinomycetales.

activation energy- Amount of energy required to bring all molecules in one mole of a substance to their reactive state at a given temperature.

active site- Region of an enzyme where substrates bind.

adenosine triphosphate (ATP)- Common energy-donating molecule in biochemical reactions. Also an important compound in transfer of phosphate groups.

adsorption- Process by which atoms, molecules, or ions are taken up and retained on the surfaces of solids by chemical or physical binding.

aerenchyma- Plant tissue incorporating large, gas-filled spaces.

aerobic- (i) Having molecular oxygen as a part of the environment. (ii) Growing only in the presence of molecular oxygen, as in aerobic organisms. (iii) Occurring only in the presence of molecular oxygen, as in certain chemical or biochemical processes such as aerobic respiration.

aerotolerant anaerobes- Microbes that grow under both aerobic and anaerobic conditions, but do not shift from one mode of metabolism to another as conditions change. They obtain energy exclusively by fermentation.

aestivation- State of dormancy during the summer.

agar- Complex polysaccharide derived from certain marine algae that is a gelling agent for solid or semisolid microbiological media. Agar consists of about 70% agarose and 30% agaropectin. Agar can be melted at temperature above 100ºC; gelling temperature is 40-50ºC.

agarose- Nonsulfated linear polymer consisting of alternating residues of D-galactose and 3,6-anhydro-L-galactose. Agarose is extracted from seaweed, and agarose gels are often used as the resolving medium in electrophoresis.

aggregate- See soil aggregate

akinete- Thick-walled resting cell of cyanobacteria and algae.

alga (plural, algae)- Phototrophic eukaryotic microorganism. Algae could be unicellular or multicellular. Blue-green algae are not true algae; they belong to a group of bacteria called cyanobacteria.

aliphatic- Organic compound in which the main carbon structure is a straight chain.

alkaline soil- Soil having a pH value >7.3.

alkalophile- Organism that grows best under alkaline conditions (up to a pH of 10.5).

alkane- Straight chain or branched organic structure that lacks double bonds.

alkene- Straight chain or branched organic structure that contains at least one double bond.

allochthonous flora- Organisms that are not indigenous to the soil but that enter soil by precipitation, diseased tissues, manure, and sewage. They may persist for some time but do not contribute in a significant way to ecologically significant transformations or interactions.

allosteric site- Site on the enzyme other than the active site to which a nonsubstrate compound binds. Binding may result in a conformational change at the active site so that the normal substrate cannot bind to it.

amensalism (antagonism)- Interaction between organisms where one organism is adversely affected and the other organism is unaffected, like antibiosis and allelopathy.

amino group- An --NH_2 group attached to a carbon skeleton as in the amines and amino acids.

ammonification- Liberation of ammonium (ammonia) from organic nitrogenous compounds by the action of microorganisms.

amoeba (plural, amoebae)- Protozoa that can alter their cell shape, usually by the extrusion of one or more pseudopodia.

anabolism- Metabolic processes involved in the synthesis of cell constituents from simpler molecules. An anabolic process usually requires energy.

anaerobic- (i) Absence of molecular oxygen. (ii) Growing in the absence of molecular oxygen, such as anaerobic bacteria. (iii) Occurring in the absence of molecular oxygen, as a biochemical process.

anaerobic respiration- Metabolic process whereby electrons are transferred from an organic, or in some cases, inorganic compounds to an inorganic acceptor molecule other than oxygen. The most common acceptors are nitrate, sulfate, and carbonate.

anamorph- Asexual stage of fungal reproduction in which cells are formed by the process of mitosis.

anhydrobiosis- Life history strategy to tolerate desiccation in which organisms lose water, initiating lower physiological activity; upon rehydration the organism becomes active again.

anion exchange capacity- Sum total of exchangeable anions that a soil can adsorb. Expressed as centimoles of negative charge per kilogram of soil.

Annelid- Phylum of segmented aquatic and terrestrial worms. Each segment has its own excretory and sensory elements, with specialized functions (e.g. reproduction) associated with specific segments.

anoxic- An environment without oxygen.

anoxygenic photosynthesis- Type of photosynthesis in green and purple bacteria in which oxygen is not produced.

antagonist- Biological agent that reduces the number or disease-producing activities of a pathogen.

antheridium- Male gametangium found in the phylum Oomycota (Kingdom Stramenopila) and phylum Ascomycota (Kingdom Fungi).

anthropogenic- Derived from human activities.

antibiosis- Inhibition or lysis of an organism mediated by metabolic products of the antagonist; these products include lytic agents, enzymes, volatile compounds, and other toxic substances.

antibiotic- Organic substance produced by one species of organism that in low concentrations will kill or inhibit growth of certain other organisms.

antibody- Protein that is produced by animals in response to the presence of an antigen and that can combine specifically with that antigen.

antigen- Substance that can incite the production of a specific antibody and that can combine with that antibody.

antiseptic- Agent that kills or inhibits microbial growth but is not harmful to human tissue.

apothecium- Open ascoma of fungi in the phylum Ascomycota.

arbuscular mycorrhiza (AM)- Mycorrhizal type that forms highly branched arbuscules within root cortical cells.

arbuscule- Special "tree-shaped" structure formed within root cortical cells by arbuscular mycorrhizal fungi.

Archaea- Evolutionarily distinct group (domain) of prokaryotes consisting of the methanogens, most extreme halophiles and hyperthermophiles, and *Thermoplasma*.

archaebacteria- Older term for the Archaea.

aromatic- Organic compounds which contain a benzene ring, or a ring with similar chemical characteristics.

arthropod- Invertebrate with jointed body and limbs (includes insects, arachnids, and crustaceans).

ascoma (plural, ascomata)- Fungal fruiting body that contains ascospores; also termed an ascocarp.

ascospore- Spores resulting from karyogamy and meiosis that are formed within an ascus. Sexual spore of the Ascomycota.

ascus (plural, asci)- Saclike cell of the sexual state formed by fungi in the phylum Ascomycota containing ascospores.

aseptic technique- Manipulating sterile instruments or culture media in such a way as to maintain sterility.

assimilatory nitrate reduction- Conversion of nitrate to reduced forms of nitrogen, generally ammonium, for the synthesis of amino acids and proteins.

associative dinitrogen fixation- Close interaction between a free-living diazotrophic organism and a higher plant that results in an enhanced rate of dinitrogen fixation.

associative symbiosis- Close but relatively casual interaction between two dissimilar organisms or biological systems. The association may be mutually beneficial but is not required for accomplishment of a particular function.

autochthonous organism- see oligotrophs.

autolysis- Spontaneous lysis.

autoradiography- Detecting radioactivity in a sample, such as a cell or gel, by placing it in contact with a photographic film.

autotroph- Organism which uses carbon dioxide as the sole carbon source.

autotrophic nitrification- Oxidation of ammonium to nitrate through the combined action of two chemoautotrophic organisms, one forming nitrite from ammonium and the other oxidizing nitrite to nitrate.

axenic- Literally "without strangers." A system in which all biological populations are defined, such as a pure culture.

B

bacillus- Bacterium with an elongated, rod shape.

Bacteria- All prokaryotes that are not members of the domain Archaea.

bacteriochlorophyll- Light-absorbing pigment found in green sulfur and purple sulfur bacteria.

bacteriocin- Agent produced by certain bacteria that inhibits or kills closely related isolates and species.

bacteriophage- Virus that infects bacteria, often with destruction or lysis of the host cell.

bacteriovorous- Feeding on bacteria.

bacteroid- Altered form of cells of certain bacteria. Refers particularly to the swollen, irregular vacuolated cells of rhizobia in nodules of legumes.

base composition- Proportion of the total bases consisting of guanine plus cytosine or thymine plus adenine base pairs. Usually expressed as a guanine + cytosine (G + C) value, e.g. 60% G+C.

basidioma (plural, basidiomata)- Fruiting body that produces basidia; also termed a basidiocarp.

basidiospore- Spore resulting from karyogamy and meiosis that is formed on a basidium. Sexual spore of the Basidiomycota.

basidium (plural, basidia)- Clublike cell of the sexual state formed by fungi in the phylum Basidiomycota.

binary fission- Division of one cell into two cells by the formation of a septum. It is the most common form of cell division in bacteria.

binomial nomenclature- System of having two names, genus and specific epithet, for each organism.

bioaccumulation-Accumulation of a chemical substance in living tissue.

biochemical oxygen demand (BOD)- Amount of dissolved oxygen consumed in five days by biological processes breaking down organic matter.

biodegradable- Substance capable of being decomposed by biological processes.

biofilm- Microbial cells encased in an adhesive, usually a polysaccharide material, and attached to a surface.

biogeochemistry- Study of microbially mediated chemical transformations of geochemical interest, such as nitrogen or sulfur cycling.

biomagnification- Increase in the concentration of a chemical substance as it is progresses to higher trophic levels of a food chain.

bioremediation- Use of microorganisms to remove or detoxify toxic or unwanted chemicals from an environment.

biosolid- The residues of wastewater treatment. Formerly called sewage sludge.

biosphere- Zone incorporating all forms of life on earth. The biosphere extends from deep in sediment below the ocean to several thousand meters elevation in high mountains.

biotrophic- Nutritional relationship between two organisms in which one or both must associate with the other to obtain nutrients and grow.

biosynthesis- Production of needed cellular constituents from other, usually simpler, molecules.

biotechnology- Use of living organisms to carry out defined physiochemical processes having industrial or other practical application.

blue-green alga-See cyanobacterium.

brown rot fungus- Fungus that attacks cellulose and hemicellulose in wood, leaving dark-colored lignin and phenolic materials behind.

budding- Asexual reproduction (usually for yeast) beginning as a protuberance from the parent cell that grows and detaches to form a smaller, daughter cell.

bulk density- Mass of dry soil per unit bulk volume (combined volume of soil solids and pore space).

by-pass flow- See preferential flow.

C

Calvin cycle- Biochemical route of carbon dioxide fixation in many autotrophic organisms.

capsid- Protein coat of a virus.

capsule- Compact layer of polysaccharide exterior to the cell wall in some bacteria.

carbon cycle- Sequence where carbon dioxide is converted to organic forms by photosynthesis or chemosynthesis, recycled through the biosphere, with partial incorporation into sediments, and ultimately returned to its original state through respiration or combustion.

carbon fixation- Conversion of carbon dioxide or other single-carbon compounds to organic forms such as carbohydrates.

carbon-nitrogen (C/N) ratio- Ratio of the mass of organic carbon to the mass of nitrogen in soil or organic material.

carboxyl group- A --COOH group attached to a carbon skeleton as in the carboxylic acids and fatty acids.

carcinogen- Substance which causes the initiation of tumor formation. Frequently a mutagen.

catabolism- Biochemical processes involved in the breakdown of organic compounds, usually leading to the production of energy.

catabolite repression- Transcription-level inhibition of a variety of inducible enzymes by glucose or other readily used carbon source.

catalyst- Substance that promotes a chemical reaction by lowering the activation energy without itself being changed in the end. Enzymes are a type of catalyst.

cation exchange capacity (CEC)- Sum of exchangeable cations that a soil can adsorb at a specific pH. Expressed as centimoles of positive charge per kilogram of soil (cmolc kg^{-1}).

cell- Fundamental unit of living matter.

cell membrane- See cytoplasmic membrane.

cell wall- Layer or structure that lies outside the cytoplasmic membrane; it supports and protects the membrane and gives the cell shape.

cellulose- Glucose polysaccharide (with beta-1,4-linkage) that is the main component of plant cell walls. Most abundant polysaccharide on earth.

chelate (chelator)- Organic chemical that forms ring compound in which a metal is held between two or more atoms strongly enough to diminish the rate at which it becomes fixed by soil, thereby making it more available for plant and microbial uptake.

chemoautotroph- Organism that obtains energy from the oxidation of reduced inorganic compounds or elements and obtains carbon from carbon dioxide.

chemolithotroph- Organism that obtains energy from the oxidation of inorganic compounds and uses inorganic compounds as electron donors.

chemoheterotroph- Organism that obtains energy and carbon from the oxidation of organic compounds.

chemoorganotroph- Organism that obtains energy and electrons (reducing power) from the oxidation of organic compounds.

chemostat- Continuous culture device usually controlled by the concentration of limiting nutrient and dilution rate.

chemotaxis- Oriented movement of a motile organism with reference to a chemical agent. May be positive (toward) or negative (away) with respect to the chemical gradient.

chlamydospore- Thick-walled resting structure that forms from the cell wall of a fungal hypha; usually formed under conditions where the hypha is no longer able to function optimally.

chlorophyll- Green pigment required for photosynthesis.

chloroplast- Chlorophyll-containing organelle of photosynthetic eukaryotes.

chromatography- Any technique used to separate different species of molecules (or ions) by subjecting them to two different carrier phases: mobile and stationary phases.

chromosome- Genetic element carrying information essential to cellular metabolism. Prokaryotes have a single chromosome, consisting of a circular DNA molecule. Eukaryotes contain more than one chromosome, each containing a linear DNA molecule complexed with specific proteins.

chytrid- Fungal organism in the phylum Chytridiomycota that consists of a spherical cell from which short thin filamentous branches (rhizoids) grow that resemble fine roots.

ciliate- Protozoan that moves by means of cilia on the surface of the cell.

cilium (plural, cilia)- Short, threadlike appendages that extend from the surface of some protozoa and beat rhythmically to propel them.

citric acid cycle- See tricarboxylic acid cycle.

clamp connection- Small branch of a fungal hypha that connects two compartments separated by a septum and helps to maintain a dikaryon in each hyphal compartment; characteristic of fungi in the phylum Basidiomycota.

classification- (i) Arrangement of organisms into groups based on mutual similarity or evolutionary relatedness. (ii) Systematic arrangement of soils into groups or categories on the basis of their characteristics.

clay- Soil particle < 0.002 mm in diameter.

cleistothecium- Closed ascocarp of fungi in the phylum Ascomycota.

climax- Most advanced successional community of plants capable of development under, and in dynamic equilibrium with, the prevailing environment.

clone- (i) Population of cells all descended from a single cell. (ii) Number of copies of a DNA fragment to be replicated by a phage or plasmid.

cloning vector- DNA molecule that is able to bring about the replication of foreign DNA fragments.

coccus- Spherical bacterial cells.

codon- A sequence of three nucleotides in mRNA that directs the incorporation of an amino acid during protein synthesis or signals the start or stop of translation.

coenocytic- Fungal hypha without crosswalls (septa), so that the nuclei present in the cytoplasm are free-floating and mobile.

coenzyme- Low-molecular-weight chemical which participates in an enzymatic reaction by accepting and donating electrons or functional groups.

cohesion- Force holding a solid or liquid together, owing to attraction between like molecules.

coliform- Gram-negative, nonspore-forming facultative rod that ferments lactose with gas formation with 48 hours at 35ºC. Often an indicator organism for fecal contamination of water supplies. *Escherichia coli* and *Enterobacter* are important members.

colloid fraction- Organic and inorganic matter with very small particle size and a correspondingly large surface area per unit of mass.

colonization- Establishment of a community of microorganisms at a specific site or ecosystem.

colony- Clone of bacterial cells on a solid medium that is visible to the naked eye.

cometabolism- Transformation of a substrate by a microorganism without deriving energy, carbon, or nutrients from the substrate. The organism can transform the substrate into intermediate degradation products but fails to multiply at its expense.

commensalism- Interaction between organisms where one organism benefits from the association while the second organism remains unaffected.

comminution- Reduction in the size of organic materials as a result of feeding by soil organisms; shredding is one form of comminution.

community- All organisms that occupy a common habitat and interact with one another.

compensatory growth- Accelerated population growth in response to grazing or predation.

competent- In a genetic sense, the ability to take up DNA.

complementary- In reference to base pairing, the ability of two polynucleotide sequences to form a double-stranded helix by hydrogen bonding between bases in the two sequences.

complex medium- Medium whose precise chemical composition is unknown. Also called undefined medium.

competition- Rivalry between two or more species for a limiting factor in the environment that usually results in reduced growth of participating organisms.

compost- Organic residues which have been mixed, piled, and moistened, with or without addition of fertilizer and lime, and generally allowed to undergo thermophilic decomposition until the original organic materials are substantially altered or decomposed.

condensation- The joining of two organic compounds.

conidiophore- Aerial hypha bearing conidia.

conidium (plural, conidia)- Nonmotile, asexual spore resulting from mitotic nuclear division and formed from the ends or sides of a hypha; produced in abundant numbers by the asexual phase of soil fungi in the phyla Ascomycota and Basidiomycota.

conjugation- In prokaryotes, transfer of genetic information from a donor cell to a recipient cell by cell-to-cell contact.

conjugative plasmid- Self-transmissible plasmid; a plasmid that encodes all the functions needed for its own intercellular transmission by conjugation.

consortium- Two or more members of a natural assemblage in which each organism benefits from the other. The group may collectively carryout some process that no single member can accomplish on its own.

constitutive enzyme- Enzyme always synthesized by the cell regardless of environmental conditions.

covalent- Nonionic chemical bond formed by a sharing of electrons between two atoms.

cross-feeding- (i) Specific type of syntrophy where two populations cooperate to metabolize a compound. (ii) One organism consuming products excreted by another organism.

culture- Population of microorganisms cultivated in an artificial growth medium. A pure culture is grown from a single cell; a mixed culture consists of two or more microbial species or strains growing together.

cyanobacterium- Prokaryotic, oxygenic phototrophic bacterium containing chlorophyll *a* and phycobilins, formerly the "blue-green algae."

cyanophage- Virus that infects cyanobacteria.

cyanophycin- Non-protein nitrogen storage polymer in cyanobacteria.

cyclic photophosphorylation- Formation of ATP when light energy is used to move electrons cyclically through an electron transport chain during photosynthesis.

cyst- Resting stage formed by some bacteria, nematodes, and protozoa in which the whole cell is surrounded by a protective layer; not the same as endospore.

cytochrome- Iron-containing porphyrin ring (e.g., heme) complexed with proteins which act as electron carriers in an electron-transport chain.

cytoplasm- Cellular contents inside the cell membrane, excluding the nucleus.

cytoplasmic membrane- Selectively permeable membrane surrounding the cell's cytoplasm.

cytosome. Cell opening through which protozoa ingest food (mouth) or secrete wastes (anus).

D

decomposer- Heterotrophic organism that breaks down organic compounds.

decomposition- Chemical breakdown of a compound into simpler compounds, often accomplished by microbial metabolism.

defined medium- Medium whose exact chemical composition is quantitatively known.

degradation- Process whereby a compound is usually transformed into simpler compounds.

dehalorespiration- The utilization of haloorganic compounds by anaerobes as terminal electron acceptors.

denaturation- Process where double-stranded DNA unwinds and dissociates into two single strands. The reverse of DNA-DNA hybridization.

denitrification- Reduction of nitrate or nitrite to molecular nitrogen or nitrogen oxides by microbial activity (dissimilatory nitrate reduction) or by chemical reactions involving nitrite (chemical denitrification).

deoxyribonucleic acid (DNA) - Polymer of nucleotides connected via a phosphate-deoxyribose sugar backbone; the genetic material of the cell.

derepressible enzyme- Enzyme that is produced in the absence of a specific inhibitory compound acting at the transcriptional level.

diatom- Alga with siliceous cell walls that persist as a skeleton after death. Any of the microscopic unicellular or colonial alga constituting the class Bacillariophyceae.

diatomaceous earth-Geologic deposit of fine, grayish siliceous material composed chiefly or wholly of the remains of diatoms. It may occur as a powder or as a porous, rigid material.

diazotroph- Organism that can use dinitrogen as its sole nitrogen source, i.e. capable of N_2 fixation.

differential medium- Cultural medium with an indicator, such as a dye, which allows various chemical reactions or microbial genera to be distinguished during growth.

diffusion (nutrient)- Movement of nutrients in soil that results from a concentration gradient.

dikaryon- Two nuclei present in the same hyphal compartment; they constitute a homokaryon when both nuclei are genetically the same or a heterokaryon when each nucleus is genetically different from the other.

dilution plate count method- Method for estimating the viable numbers of microorganisms in a sample. The sample is diluted serially and then transferred to agar plates to permit growth and quantification of colony-forming units.

dinitrogen fixation- Conversion of molecular dinitrogen (N_2) to ammonia and subsequently to organic combinations or to forms useful in biological processes.

diploid- In eukaryotes, an organism or cell with two chromosome complements, one derived from each haploid gamete.

direct count- Method of estimating the total number of microorganisms in a given mass of soil by direct microscopic examination.

disinfectant- Agent that kills microorganisms.

dissimilatory nitrate reduction- see denitrification.

dissimilatory nitrate reduction to ammonium (DNRA)-Use of nitrate by organisms as an alternate electron acceptor in the absence of oxygen resulting in the reduction of nitrate to ammonium.

DNA fingerprinting- Molecular genetic techniques to assess possible differences among DNA in a samples.

DNA library- Collection of cloned DNA fragments which in total contain genes from the entire genome of an organism; also called a gene library.

dolipore septum- Specialized crosswall separating compartments of a hypha of fungi in the phylum Basidiomycota; consisting of a central pore covered with perforated membranes on both sides (called a parenthosome).

domain- Highest level of biological classification, superseding kingdoms. The three domains of biological organisms are the Bacteria, the Archaea, and the Eukarya.

doubling time- Time needed for a population to double in number or biomass.

E

earthworm- Soil-dwelling worm with a segmented body structure. Through their activities, earthworms can stimulate microbial activity, mix soils and aide in the formation of soil structure, and translocate plant material from the surface to lower soil strata.

ecology- Science which studies the interrelations among organisms and between organisms and their environment.

ecosystem- Community of organisms and the environment in which they live.

Ectomycorrhiza (EM)- Mycorrhizal type in which the fungal mycelia extend inward, between root cortical cells, to form a network (Hartig net) and outward into the surrounding soil. Usually the fungal hyphae also form a mantle on the surface of the root.

edaphic- (i) Of or pertaining to the soil. (ii) Resulting from or influenced by factors inherent in the soil or other substrate, rather than by climatic factors.

E_h- Potential generated between an oxidation or reduction half-reaction and the H electrode in the standard state.

electron acceptor- Substance that accepts electrons during an oxidation-reduction reaction. An electron acceptor is an oxidant.

electron donor- Substance that donates electrons in an oxidation-reduction reaction. An electron donor is a reductant.

electron-transport chain- Final sequence of reactions in biological oxidations composed of a series of oxidizing agents arranged in order of increasing strength and terminating in oxygen.

electron-transport chain phosphorylation- See oxidative phosphorylation.

electrophilic compounds- Chemicals that attack or are drawn to regions in other chemicals in which electrons are readily available; oxidizing agents act as electrophilic compounds.

electrophoresis- Separation of charged molecules, such as nucleic acids, in an electrical field.

eluviation- Removal of soil material from a layer of soil as a suspension .

Embden-Meyerhof-Parnas pathway (Embden-Meyerhof pathway; EMP pathway; glycolytic pathway)- A biochemical pathway that degrades glucose to pyruvate; the six-carbon stage converts glucose to fructose-1,6-bisphosphate, and the three-carbon stage produces ATP while changing glyceraldehyde-3-phosphate to pyruvate.

endergonic reaction- Chemical reaction that proceeds with the consumption of energy.

endomycorrhiza- Mycorrhizal association with intracellular penetration of the host root cortical cells by the fungus as well as outward extension into the surrounding soil.

endoenzyme- Enzyme that operates along the internal portions of a polymer.

endolithic- Rock dwelling.

endonuclease- Endoenzyme that cleaves phosphodiester bonds within a nucleic acid molecule.

endophyte- Organism growing within a plant. The association may be symbiotic or parasitic.

endospore- Differentiated cell formed within the cells of certain Gram-positive bacteria and extremely resistant to heat and other harmful agents.

endosymbiont- An organism that lives within the body of another organism in a symbiotic association.

enrichment culture- Technique in which environmental (including nutritional) conditions are controlled to favor the development of a specific organism or group of organisms.

enteric bacteria- General term for a group of bacteria that inhabit the intestinal tract of humans and other animals. Among this group are pathogenic bacteria such as *Salmonella* and *Shigella*.

enterovirus- Small virus that infects the gastrointestinal tract and can spread to other areas, especially the nervous system. Examples include coxsackie, hepatitis A, and polio.

enzyme- Protein within or derived from a living organism that functions as a catalyst to promote specific reactions.

enzyme-linked immunosorbent assay (ELISA)- Immunoassay that uses specific antibodies to detect antigens or antibodies. The antibody-containing complexes are visualized through an enzyme coupled to the antibody. Addition of substrate to the enzyme-antibody-antigen complex results in a colored product.

episome- Plasmid that replicates by inserting itself into the bacterial chromosome.

epitope- The region of an antigen to which the variable region of an antibody binds.

ericoid mycorrhiza- Type of mycorrhiza found on plants in the Ericales. The hyphae in the root are able to penetrate cortical cells (endomycorrhizal habit); however, no arbuscules are formed. Major forms are ericoid, arbutoid, and monotropoid.

Eubacteria-Old term for the Bacteria.

Eukarya- Phylogenetic domain containing all eukaryotic organisms.

eukaryote- Organism having a unit membrane-bound nucleus and usually other organelles.

eutrophic- Having high concentrations of nutrients optimal, or nearly so, for plant or animal growth. Can be applied to nutrient or soil solutions and bodies of water.

eutrophication- Enrichment of natural waters with excess nutrients that leads to algae blooms and subsequent oxygen deficiency when the algae die and bacteria degrade them.

exergonic reaction- Chemical reaction that proceeds with the liberation of energy.

exponential growth- Period of sustained growth of a microorganism in which the cell number constantly doubles within a fixed time period.

exponential phase- Period during the growth cycle of a population in which growth increases at an exponential rate. As referred to as logarithmic phase.

exobiology- Branch of biology concerned with the effects of extraterrestrial environments on living organisms.

exoenzyme- Enzyme that acts at the end of a polymer cleaving off monomers and dimers and sometimes larger chain fragments

extracellular- Outside the cell.

exudate- Low molecular weight metabolites that leak from plant roots into soil.

F

facultative organism- Organism that can carry out both options of a mutually exclusive process (e.g., aerobic and anaerobic metabolism).

feedback inhibition- Inhibition by an end product of the biosynthetic pathway involved in its synthesis.

fermentation- Metabolic process in which organic compounds serve as both electron donors and electron acceptors.

fertilizer- Any organic or inorganic material of natural or synthetic origin (other than liming materials) added to a soil to supply one or more elements essential to plant growth.

field capacity- Content of water, on a mass or volume basis, remaining in a soil after being saturated with water and after free drainage is negligible.

filamentous- In the form of very long rods, many times longer than wide (for bacteria), in the form of long branching strands (for fungi).

fimbria (plural, fimbriae)- Short filamentous structure on a bacterial cell; although flagella-like in structure, generally present in many copies and not involved in motility. Plays a role in adherence to surfaces and in the formation of pellicles.

fission- See binary fission.

flagellate- Protozoan that moves by means of one to several flagella.

flagellum (plural, flagella)- Whiplike tubular structure attached to a microbial cell responsible for motility.

fluorescent- Able to emit light of a certain wavelength when activated by light of a shorter wavelength.

fluorescent antibody- Antiserum conjugated with a fluorescent dye, such as fluorescein or rhodamine.

fluxes- Rate of emission, sorption, or deposition of a material from one pool to another. For example, the exchange of methane between the land and the atmosphere is a flux, while the production of methane within the soil is not.

food chain- Movement of nutrients from one life form to another as a result of the different feeding habits and dietary requirements of organisms in an ecosystem.

food web- Diagram of the interconnections of nutrient flow through a food chain.

free energy- Intrinsic energy contained in a given substance that is available to do work, particularly with respect to chemical transformations; designated □ G.

fruiting body- Macroscopic reproductive structure produced by some fungi, such as mushrooms, and some bacteria, including myxobacteria.

Fruiting bodies are distinctive in size, shape, and coloration for each species.

frustule- Siliceous wall and protoplast of a diatom.

fulvic acid- Yellow organic material that remains in solution after removal of humic acid by acidification.

fungistasis- Suppression of germination of fungal spores or other resting structures in natural soils as a result of competition for available nutrients, presence of inhibitory compounds, or both.

fungivorous- See mycophagous.

fungus (plural, fungi)- Nonphototrophic, eukaryotic microorganisms that contain rigid cell walls.

fusiform- Spindle-shaped; tapered at both ends.

G

gametangium- Fungal structure that contains one or more gametes.

gamete- In eukaryotes, the haploid cell analogous to sperm and egg, which results from meiosis.

gas chromatography- Chromatographic technique in which the stationary phase is a solid or an immobile liquid and the mobile phase is gaseous. The gaseous samples are separated based on their differential adsorption to the stationary phase.

gel- Inert polymer, usually made of agarose or polyacrylamide, that separates macromolecules such as nucleic acids or proteins during electrophoresis.

gene- Unit of heredity; a segment of DNA specifying a particular protein or polypeptide chain, a tRNA or an mRNA.

gene cloning- Isolation of a desired gene from one organism and its incorporation into a suitable vector for the production of large amounts of the gene.

gene probe- A strand of nucleic acid which can be labeled and hybridized to a complementary molecule from a mixture of other nucleic acids.

genetic code- Information for the synthesis of proteins contained in the nucleotide sequence of a DNA molecule (or in certain viruses, of an RNA molecule).

generation time- Time needed for a population to double in number or biomass.

genetic engineering- *In vitro* techniques for the isolation, manipulation, recombination, and expression of DNA.

genome- Complete set of genes present in an organism.

genomics- The study of the molecular organization of genomes, their information content, and the gene products they encode.

genotype- Precise genetic constitution of an organism.

genus (plural, genera)- The first name of the scientific name (binomial); the taxon between family and species.

germination shield, A distinct germinal wall formed by *Scutellopora* spp.

Gibb's free energy- See free energy.

glomalin- An extracellular glycoprotein produced by arbuscular mycorrhizal fungi.

glycolysis- Reactions of the Embden-Meyerhof (glycolytic) pathway in which glucose is oxidized to pyruvate.

glycosidase- Enzyme that hydrolyzes a glucosidic linkage between two sugar molecules.

grazing- See predation.

Gram stain- Differential stain that divides bacteria into two groups, Gram-positive and Gram-negative, based on the ability to retain crystal violet when decolorized with an organic solvent such as ethanol. The cell wall of Gram-positive bacteria consists chiefly of peptidoglycan and lacks the outer membrane of Gram-negative cells.

gravitational water- Portion of total soil water potential due to differences in elevation.

groundwater- Portion of the water below the surface of the ground at a pressure equal to or greater than atmospheric.

growth- In microbiology, an increase in both cell number and cellular constituents.

growth factor- Organic compound necessary for growth because it is an essential cell component or precursor of such components and cannot be synthesized by the organism itself. Usually required in trace amounts.

growth rate- The rate at which growth occurs, usually expressed as the generation time.

growth rate constant- Slope of the log of the number of cells per unit volume plotted against time.

growth yield coefficient-Quantity of biomass carbon formed per unit of substrate carbon consumed.

H

habitat- Place where an organism lives.

halogen- Any of the five elements F, Cl, Br, I, and At that form part of group VII A of the periodic table.

halophile- Organism requiring or tolerating a saline environment

haploid- In eukaryotes, an organism or cell containing one chromosome complement and the same number of chromosomes as the gametes.

heavy metals- Those metals which have densities > 5.0 Mg m^{-3}. These include the metallic elements Cu, Fe, Mn, Mo, Co, Zn, Cd, Hg, Ni, and Pb. Al and Se have densities < 5 but are also considered heavy metals.

hermaphroditic- Containing both male and female sex organs.

heterocyst- Differentiated cyanobacterial cell that carries out dinitrogen fixation.

heterokaryon- Hypha that contains at least two genetically dissimilar nuclei.

heteropolysaccharide- The class name for polysaccharides composed of two or more different kinds of monomeric units.

heterothallic- Hyphae that are incompatible with each other each requiring contact with another hypha of compatible mating type which, upon fusion, forms a dikaryon or a diploid.

heterotroph- Organism capable of deriving carbon and energy for growth and cell synthesis from organic compounds; generally also obtain energy and reducing power equivalents from organic compounds.

heterotrophic nitrification- Biochemical oxidation of ammonium to nitrite and nitrate by heterotrophic microorganisms.

holomorph- Whole fungus consisting of all sexual and asexual stages in its life cycle.

homokaryon- Fungal hypha in which all nuclei are genetically identical.

homothallic- Hyphae that are self-compatible in that sexual reproduction occurs in the same organism by meiosis and genetic recombination; fusion of hypha results in a dikaryon or diploid.

horizon- See soil horizon.

hormogonia- Small motile fragments produced by fragmentation of filamentous cyanobacteria; used for asexual reproduction and dispersal.

host- Organism capable of supporting the growth of a virus or other parasite.

humic acid- Dark-colored organic material extracted from soil by various reagents (e.g., dilute alkali) and that is precipitated by acid (pH 1 to 2).

humic substances- Series of relatively high-molecular-weight, brown-to-black substances formed by secondary synthesis reactions. The term is generic in a sense that it describes the colored material or its fractions obtained on the basis of solubility characteristics, such as humic acid or fulvic acid.

humification- Process whereby the carbon of organic residues is transformed and converted to humic substances through biochemical and chemical processes.

humus- Total of the organic compounds in soil exclusive of undecayed plant and animal tissues, their "partial decomposition" products, and the soil biomass. The term is often used synonymously with soil organic matter.

hybridization- Natural formation or artificial construction of a duplex nucleic acid molecule by complementary base pairing between two nucleic acid strands derived from different sources.

hygroscopic water- Water adsorbed by a dry soil from an atmosphere of high relative humidity.

hydrogen bond- Chemical bond between a hydrogen atom of one molecule and two unshared electrons of another molecule.

hydrogen-oxidizing bacterium-Facultative lithotrophs that, in the absence of an oxidizable organic source, oxidize H_2 for energy and synthesize carbohydrates with carbon dioxide as their source of carbon.

hyperthermophile- An organism that has its growth optimum above 80°C.

hypha (plural, hyphae)-Long and often branched tubular filament that constitutes the vegetative body of many fungi and funguslike organisms. Bacteria of the order Actinomycetes also produce branched hyphae.

hymenium-Layer of hyphae which are fertile in producing asci (fungi in the phylum Ascomycota) or basidia (fungi in the phylum Basidiomycota) from the process of meiosis.

hyperparasite-Parasite that feeds on another parasite.

hypoxic- Insufficient availability of oxygen in an environment to support aerobic respiration.

I

illuviation- Deposition of soil material removed from one horizon to another in the soil.

immobilization- Conversion of an element from the inorganic to the organic form in microbial or plant biomass.

immunity- The ability of a human or animal body to resist infection by microorganisms or their harmful products such as toxins.

immunoblot (western blot)-Detection of proteins immobilized on a filter by complementary reaction with specific antibody.

immunoglobulin -Antibody.

immunogen- Substance which is capable of eliciting immune response. An immunogen usually has a fairly high molecular weight (usually greater than 10,000), thus, a variety of macromolecules such as proteins, lipoprotein, polysaccharides, and some nucleic acids can act as immunogens.

immunofluorescence- Technique to visualize specific antibodies and any attached homologous antigens by means of conjugating the antibodies to a fluorescent dye

induced systemic resistance (ISR)- The process of active resistance dependent on the host's physical or chemical barriers, activated by biotic or abiotic inducing agents.

inducible enzyme- Enzyme synthesized (induced) in response to the presence of an external substance (the inducer).

infection- Growth of an organism within another living organism.

infection thread- Cellulosic tube in a root hair through which rhizobia can travel to reach and infect root cells.

infrared (IR)- The portion of the electromagnetic spectrum with wavelengths from about 0.75 µm to 1 mm.

inhibition- Prevention of growth or function.

inoculate- To treat with microorganisms for the purpose of creating a favorable response. For example, treatment of legume seeds with rhizobia to stimulate N_2 fixation.

inoculum- Material used to introduce a microorganism into a suitable situation for growth.

insertion- Genetic mutation in which one or more nucleotides are added to DNA.

insertion sequence (IS element)- Simplest type of transposable element. Has only genes involved in transposition.

integration- Process by which a DNA molecule becomes incorporated into another genome.

intracellular- Inside the cell.

in vitro- Literally "in glass"; it describes whatever happens in a test tube or other receptacle, as opposed to *in vivo*. When a study or an experiment is done outside the living organism, in test tube, it is done *in vitro*.

in vivo- In the body, in a living organism, as opposed to *in vitro*; when a study or an experiment is done in the living organism, it is done *in vivo.*

ions- Atoms, groups of atoms, or compounds, that are electrically charged as a result of the loss of electrons (cations) or the gain of electrons (anions).

irrigation- Intentional watering of the soil.

isoenzyme (isozyme)- When two different enzymes catalyze the same reaction(s), they are isoenzymes of each other. Isoenzymes could differ from each other in their primary structure or electrophoretic mobility.

isolation- Any procedure in which an organism present in a particular sample or environment, is obtained in pure culture.

isomorphous substitution- Substitution in a crystalline clay sheet of one atom by a similarly sized atom of lower valence.

isotope- Different form of the same element containing the same number of protons and electrons, but differing in the number of neutrons.

isozyme- See isoenzyme.

J-M

K-strategy- Ecological strategy where organisms rely on physiological adaptations to environmental resources for continued survival with the

community. K strategists are usually stable and permanent members of the community.

karyogamy- Fusion in a cell of haploid (N) nuclei to form a diploid (2N).

Koch's Postulates-Set of laws formulated by Robert Koch to prove that an organism is the causal agent of disease.

Krebs cycle- See tricarboxylic acid cycle.

lag phase-Period after inoculation of fresh growth medium during which population numbers do not increase.

lamella (plural, lamellae)- (i) A thin layer, platelike arrangement or membrane. (ii) Layers of protoplasmic membranes within the chloroplast that contain the photosynthetic pigments.

latin binomial- See binomial nomenclature.

leaching- (i) Removal of valuable metals from ores by microbial action. (ii) The removal of materials in solution from the soil.

lectins- Plant proteins with a high affinity for specific sugar residues.

leghemoglobin- Iron-containing, red pigment(s) produced in root nodules during the symbiotic association between rhizobia and leguminous plants. The pigment is similar but not identical to mammalian hemoglobin.

lichen- Fungus and an alga or a cyanobacterium living in symbiotic association.

ligand- Molecule, ion, or group bound to the central atom in a chelate or a coordination compound.

lime, agricultural-Soil amendment containing calcium carbonate, magnesium carbonate or other materials to neutralize soil acidity and furnish calcium or magnesium or both for plant growth.

lipophilic- Having an affinity for fat.

lipopolysaccharide (LPS)-Complex lipid structure containing unusual sugars and fatty acids found in many Gram-negative bacteria.

lithotroph- Organism that uses an inorganic substrate such as ammonia or hydrogen as an electron donor in energy metabolism. There are two types of lithotrophs: chemolithotroph and photolithotroph.

litter- Surface layer of the forest floor consisting of freshly fallen leaves, needles, twigs, stems, bark, and fruits.

lophotrichous- Having a tuft of polar flagella.

luminescence- Production of light.

luxury uptake- The absorption by plants of nutrients in excess of their need for growth. Luxury contents accumulated during early growth may be used for later growth.

lysis- Rupture of a cell, resulting in loss of cell contents.

lysogeny- An association where a prokaryote contains a prophage and the virus genome is replicated in synchrony with the host chromosome.

lysosome- Cell organelle containing digestive enzymes.

macrofauna- Soil animals that are > 1000 micrometers in length (e.g., vertebrates, earthworms, and large arthropods).

macromolecule- Large molecule formed from the connection of a number of small molecules.

macronutrient- A substance required in large amounts for growth, usually attaining a concentration of > 500 mg kg^{-1} in mature plants. Usually refers to N, P, K, Ca, Mg, and S.

macropore- Larger soil pores, generally having a minimum diameter between 30 and 100 micrometers, from which water drains readily by gravity.

manure- Excreta of animals, with or without an admixture of bedding or litter, fresh or at various stages of decomposition or composting. In some countries the term may denote any fertilizer material.

mass flow (nutrient)- Movement of solutes associated with net movement of water.

matric potential- Portion of the total soil water potential due to the attractive forces between water and soil solids as represented through adsorption and capillarity.

medium (plural, media)- Any liquid or solid material prepared for the growth, maintenance, or storage of microorganisms.

meiosis- In eukaryotes, reduction division, the process by which the change from diploid to haploid occurs.

mesofauna- Soil animals between 200 to1000 micrometers in length, including nematodes, oligochaete worms, smaller insect larvae, and small arthropods.

mesophile- Organism whose optimum temperature for growth falls in an intermediate range of approximately 15 to 40ºC.

mesopore- Soil pores ranging in diameter from 0.2 to 50 μm.

messenger RNA (mRNA)- RNA molecule transcribed from DNA, which contains the information to direct the synthesis of a particular protein.

metabolism- All biochemical reactions in a cell, both anabolic and catabolic.

methanogenic bacterium (methanogen)- Methane-producing prokaryote; member of the Archaea.

methanogenesis- Biological production of methane.

methanotroph- Organism capable of oxidizing methane.

microaerophile- Organism that require or prefer a low concentration of oxygen for growth. Sometimes indicates an organism that will carry out its metabolic activities under aerobic conditions but will grow much better under anaerobic conditions.

microaggregate- Clustering of clay packets stabilized by organic matter and precipitated inorganic materials.

microarthropod- Invertebrate with jointed legs and exoskeleton; includes insects and arachnids. They form part of the soil mesofauna.

microbial biomass- Total mass of microorganism alive in a given volume or mass of soil.

microbial mat- A firm structure of layered microorganisms with complementary physiological activities.

microbial population- Total number of living microorganisms in a given volume or mass of soil.

microbiology- Study of microorganisms.

microbivorous- Feeding on microorganisms, including bacteria and fungi.

microcosm- A community or other unit that is representative of a larger unity.

microenvironment- Immediate physical and chemical surroundings of a microorganism.

microfauna-Protozoa, nematodes and arthropods generally < 200 micrometers long.

microflora- Bacteria (including actinomycetes), fungi, algae, and viruses.

microhabitat- Clusters of microaggregates with associated water within which microbes function. May be composed of several microsites (e.g., aerobic and anaerobic).

micrometer- One-millionth of a meter, or 10^{-6} meter, the unit usually used for measuring microorganisms.

micronutrient- Chemical element necessary for growth found in small amounts, usually < 100 mg kg^{-1} in a plant. These elements consist of B, Cl, Cu, Fe, Mn, Mo, and Zn.

microorganism (microbe)- Living organism too small to be seen with the naked eye (< 0.1 mm); includes bacteria, fungi, protozoans, microscopic algae, and viruses.

micropore- Relatively small soil pore, generally found within structural aggregates and having a diameter < 30 micrometers.

microsite- Small volume of soil where biological or chemical processes differ from those of the soil as a whole, such as an anaerobic microsite of a soil aggregate or the surface of decaying organic residues.

mineralization- Conversion of an element from an organic form to an inorganic state as a result of microbial decomposition.

minor elements- See micronutrients.

mitochondrion (plural, mitochondria)- Eukaryotic organelle responsible for processes of respiration and oxidative phosphorylation.

mitosis- Highly ordered process by which the nucleus divides in eukaryotes.

mixotroph- Organism able to assimilate organic compounds as carbon sources while using inorganic compounds as electron donors. Compare with autotroph and heterotroph.

Moisture-characteristic curve- See water-retention curve.

moisture content- See water content.

moisture-release curve- See water-retention curve.

mold- A filamentous fungus.

molecule- Result of two or more atoms combining by chemical bonding.

monoclonal antibody- Antibody produced from a single clone of cells. This antibody has uniform structure and specificity.

monokaryon- Fungal hypha in which compartments contain one nucleus.

most probable number (MPN)- Method for estimating microbial numbers in soil based on extinction dilutions.

motility- Movement of a cell under its own power.

mucigel- Gelatinous material at the surface of roots grown in normal nonsterile soil. It includes natural and modified plant mucilages, bacterial cells, and their metabolic products (e.g., capsules and slimes), and colloidal mineral and organic matter from the soil.

mucilage- Gelatinous secretions and exudates produced by plant roots and many microorganisms..

mulch- (i) Any material such as straw, sawdust, leaves, plastic film, and loose soil, that is spread upon the surface of the soil to protect the soil and plant roots from the effects of raindrops, soil crusting, freezing, or evaporation. (ii) To apply mulch to the soil surface.

municipal solid waste- Combined consumer and commercial waste generated within a defined geographic area

murein- See peptidoglycan.

mushroom- Large, sometimes edible, fruiting body produced by some fungi.

mutagen -Substance that causes the mutation of genes.

mutant- Organism, population, gene, or chromosome that differs from the corresponding wild type by one or more base pairs.

mutation- Heritable change in the base sequence of the DNA of an organism.

mutualism- Interaction between organisms where both organisms benefit from the association.

mycelium (plural, mycelia)- Mass of hyphae that form the vegetative body of many fungal organisms.

mycophage- see mycovirus.

mycophagous- Organisms that consume fungi, such as mycophagous nematodes.

mycoplasma-Group of bacteria without a cell walls that do not revert to walled forms. Phylogenetically related to clostridia.

mycorrhiza-Literally "fungus root." The symbiotic association between specific fungi with the fine roots of higher plants.

mycorrhizosphere-Unique microbial community that forms around a mycorrhiza.

mycovirus- Virus that infects fungi.

N-Q

nanopore- Soil pore having dimensions measured in nanometers. Materials encased in nanopores are beyond the reach of microorganisms and enzymes.

necrosis- Damage of living tissues because of infection or injury.

necrotrophic- Nutritional mechanism by which an organism produces a battery of hydrolytic enzymes to kill and break down host cells and then absorb nutritional compounds from the dead organic matter.

nematode- Multicellular eukaryote defined as an unsegmented, usually microscopic roundworm. Various species feed on plants, animals, fungi, and bacteria.

neutralism- Lack of interaction between two organisms in the same habitat.

niche- Functional role of a given organism within its habitat.

nicotinamide adenine dinucleotide (NAD^+)- Important coenzyme, functioning as a hydrogen and electron carrier in a wide range of redox reactions; the oxidized form of the coenzyme is written NAD^+, the reduced form as NADH.

nicotinamide adenine dinucleotide phosphate ($NADP^+$)- Important coenzyme, functioning as a hydrogen and electron carrier in a wide range of redox reactions; the oxidized form of the coenzyme is written $NADP^+$, the reduced form as NADPH.

nitrate reduction (biological)- Process whereby nitrate is reduced by plants and microorganisms to ammonium for cell synthesis (nitrate assimilation, assimilatory nitrate reduction) or to various lower oxidation states (N_2, N_2O, NO,) by bacteria using nitrate as the terminal electron acceptor in anaerobic respiration.

nitrification- Biological oxidation of ammonium to nitrite and nitrate, or a biologically induced increase in the oxidation state of nitrogen.

nitrifying bacteria- Chemolithotrophs capable of carrying out the transformations from NH_3 to NO_2^- or NO_2^- to NO_3^-.

nitrogen cycle- Sequence of biochemical changes wherein nitrogen is used by a living organism, transformed upon the death and decomposition of the organism, and converted ultimately to its original state of oxidation.

nitrogen fixation- See dinitrogen fixation.

nitrogenase- Specific enzyme system required for biological N_2 fixation.

N.N.C.- Natural Nutrient Chelator

nodule bacteria-see rhizobia.

nodule- See root nodule.

nodulins- Unique proteins produced in root hairs or nodules in response to rhizobial infection.

nomenclature- System of naming organisms.

nonpolar- Possessing hydrophobic (water repelling) characteristics and not easily dissolved in water.

nontarget effect- Impacting organisms other than that intended by a treatment.

northern blot- Hybridization of single-stranded nucleic acid (DNA or RNA) to RNA fragments immobilized on a filter.

nucleic acid- Polymer of nucleotides.

nucleoid- Aggregated mass of DNA that makes up the chromosome of prokaryotic cells.

nucleophilic compound- Chemical that attracks or is drawn to electron-deficient regions in other chemicals; reducing agents act as nucleophilic compounds.

nucleoside- Nucleotide without the phosphate group.

nucleotide- Monomeric unit of nucleic acid, consisting of a sugar (pentose), a phosphate, and a nitrogenous base.

nucleus- Membrane-enclosed structure containing the genetic material (DNA) organized in chromosomes.

nutrient- Substance taken by a cell from its environment and used in catabolic or anabolic reactions.

obligate- (i) Adjective referring to an environmental factor (for example, oxygen) that is always required for growth. (ii) Organism that can grow and reproduce only by obtaining carbon and other nutrients from a living host, such as obligate symbiont.

Oligochaete- A particular class of segmented worms, including the earthworms, which have few (*oligo*) body bristles (*chaeta*).

oligonucleotide- Short nucleic acid chain, either obtained from an organism or synthesized chemically.

oligotroph- Microorganism specifically adapted to grow under low nutrient supply. Thought to subsist on the more resistant soil organic matter and be little affected by the addition of fresh organic materials. Sometimes a synonym for autochthonous.

omnivorous- Feeding on a variety of foods, such as plants, fungi, bacteria, animals and organic detritus.

oogonium- Specialized sexual structure formed as a female gametangium by funguslike organisms in the phylum Oomycota.

oospore- Thick-walled spore formed within an oogonium by fungus-like organisms in the phylum Oomycota.

operon- Cluster of genes whose expression is controlled by a single operator; typical in prokaryotic cells.

organelle- Membrane-enclosed body specialized for carrying out certain functions; found only in eukaryotic cells.

organic soil- Soil that contains a high percentage (>200 g kg^{-1}, or >120-180 g kg^{-1} if saturated with water) of organic carbon.

organotroph- Organism that obtains reducing equivalents (stored electrons) and carbon from organic substrates.

osmosis- Diffusion of water through a membrane from a region of low solute concentration to one of higher concentration.

osmotic potential- Portion of total soil water potential due to the presence of solutes in soil water.

osmotolerent- Organisms that grow over a wide range of salt concentration.

oven-dry soil-Soil that has been dried at 105ºC until it reaches constant mass.

oxic-An environment with oxygen.

oxidation- Process by which a compound gives up electrons, acting as an electron donor, and becomes oxidized.

oxidation-reduction (redox) reaction- Coupled pair of reactions, in which one compound becomes oxidized, while another becomes reduced and takes up the electrons released in the oxidation reaction.

oxidation state- Number of electrons to be added (or subtracted) from an atom in a combined state to convert it to the elemental form.

oxidative phosphorylation- Synthesis of ATP involving a membrane-associated electron-transport chain and the creation of a proton-motive force. Also called electron-transport chain phosphorylation.

oxygenic photosynthesis- Use of light energy to synthesize ATP and NADPH by noncyclic photophosphorylation with the production of oxygen from water during carbon dioxide fixation.

parasitism- Feeding by one organism on the cells of a second organism, which is usually larger than the first. The parasite is, to some extent, dependent on the host at whose expense it is maintained.

parasexual cycle- Nuclear cycle in which genes of haploid nuclei recombine without meiosis.

particle density- Density of the soil particles, the dry mass of the particles being divided by the solid (not bulk) volume of the particles, in contrast with bulk density.

particle size- Effective diameter of a particle measured by sedimentation, sieving or micrometric methods.

pasteurization- Process using mild heat to reduce microbial numbers in heat-sensitive materials.

pathogen- Organism able to inflict damage on a host it infects.

pathogenicity- Ability of a parasite to inflict damage on the host.

pathogen-suppressive soil- Soil where a pathogen does not establish or persist, a pathogen establishes but causes little or no damage, or a pathogen causes disease for a while, but the disease becomes less important even though the pathogen persists in soil.

peat- Unconsolidated soil material consisting largely of undecomposed, or only slightly decomposed, organic matter accumulated under conditions of excessive moisture.

pectin- Important component of the plant cell walls containing chains of galacturonic acid that is often esterified with a methyl group.

ped- A unit of soil structure such as a block, column, granule, plate, or prism, formed by natural processes.

pellicle- Relatively rigid layer of proteinaceous elements just beneath the cell membrane in many protozoa and algae.

peptidoglycan-Rigid layer of cell walls of bacteria, a thin sheet composed of N-acetylglucosamine, N-acetylmuramic acid, and a few amino acids. Also called murein.

peribacteroid membrane- Plant-derived membrane surrounding one to several rhizobia within host cells of legume nodules

periplasmic space- Area between the cell membrane and the cell wall in Gram-negative bacteria, containing certain enzymes involved in nutrition.

perithecium- Flask-shaped ascocarp open at the tip; containing asci of fungi in the phylum Ascomycota.

peritrichous flagellation- Having flagella attached to many places on the cell surface.

permanent wilting point- Greatest water content of a soil at which indicator plants, growing in that soil wilt and fail to recover when placed in a humid chamber. Often estimated by the water content at -1.5-MPa soil matric potential.

pH- Negative logarithm of the hydrogen ion activity. The degree of acidity (or alkalinity) of a soil as determined by means of a glass or other suitable electrode or indicator at a specified moisture content or soil-water ratio, and expressed in terms of the pH scale.

phage- See bacteriophage.

phagotrophic- Form of feeding where animals, such as protozoans, engulf particulate nutrients, such as bacterial cells or detritus.

phenotype- Observable properties of an organism.

phosphobacterium- Bacterium that is especially good at solubilizing the insoluble inorganic phosphate in soil.

phosphodiester bond- Type of covalent bond linking nucleotides together in a polynucleotide.

phospholipid- Lipids containing a substituted phosphate group and two fatty acid chains on a glycerol backbone.

phosphorus cycle- sequence of transformations undergone by phosphorus where it is transformed between soluble and insoluble, and organic and inorganic forms.

photic zone- Uppermost layer of a body of water or soil that receives enough sunlight to permit the occurrence of photosynthesis.

photoautotroph- Organism able to use light as its sole source of energy and carbon dioxide as sole carbon source.

photoheterotroph- Organism able to use light as a source of energy and organic materials as carbon source.

photophosphorylation- Synthesis of high-energy phosphate bonds, as ATP, using light energy.

photosynthesis- Process of using light energy to synthesize carbohydrates from carbon dioxide.

phototaxis- Movement toward light.

phototroph- Organism that uses light as the energy source to drive the electron flow from the electron donors, such as water, hydrogen, or sulfide.

phycobilin- Water-soluble pigment that occurs in cyanobacteria and functions as the light-harvesting pigments for Photosystem II.

phycobiont- The algal or cyanobacterial partner in a lichen.

phylogeny- Ordering of species into higher taxa and the construction of evolutionary trees based on evolutionary (genetic) relationships.

pilus (plural pili)- Fimbria-like structure that is present on fertile cells and is involved in DNA transfer during conjugation. Sometimes called sex pilus.

plaque- Localized area of lysis or cell inhibition caused by virus infection on a lawn of cells.

plant growth-promoting rhizobacteria (PGPR)-Broad group of soil bacteria that exert beneficial effects on plant growth usually as root colonizers. Many are members of the genus *Pseudomonas.*

plasma membrane- See cytoplasmic membrane.

plasmid- Covalently closed, circular piece of DNA which, as an extrachromosomal genetic element, is not essential for growth.

plasmogamy- Fusion of the contents of two cells, including cytoplasm and nuclei.

plastid- Specialized cell organelles containing pigments or protein materials.

plate count- Number of colonies formed on a solid culture medium when uniformly inoculated with a known amount of soil, generally as a dilute soil suspension. The technique estimates the number of certain organisms present in the soil sample.

polar- Possessing hydrophilic characteristics and generally water soluble.

polar flagellation- Condition of having flagella attached at one end or both ends of the cell.

poly-beta-hydroxybutyrate (PHB)- Common storage material of prokaryotic cells consisting of beta-hydroxybutyrate or other beta-alkanoic acids.

polyclonal antiserum- Mixture of antibodies to a variety of antigens or to a variety of determinants on a single antigen.

polymer- Large molecule formed by polymerization of monomeric units.

polymerase chain reaction (PCR)- Method for amplifying DNA *in vitro*, involving the use of oligonucleotide primers complementary to nucleotide sequences in target genes and the copying of the target sequences by the action of DNA polymerase.

polysaccharide- Long chain of monosaccharides (sugars) linked by glycosidic bonds.

polysome- Strings of ribosomes attached by strands of mRNA.

pore space- Portion of soil bulk volume occupied by soil pores.

porin- A protein channel in the lipopolysaccharide layer of Gram-negative bacteria.

porosity- Volume of pores in a soil sample (nonsolid volume) divided by the bulk volume of the sample.

pour plate- Method for performing a plate count of microorganisms. A known amount of a serial dilution is placed in a sterile Petri dish and then a melted agar medium is added and the inoculum mixed well by gently swirling. After growth the number of colony forming units is counted.

predation- Relationship between two organisms whereby one organism (predator) engulfs or captures and digests the second organism (prey).

preferential flow- The process whereby free water and its constituents move by preferred pathways through a porous medium.

primary producer- Organism that adds biomass to the ecosystem by synthesizing organic molecules from carbon dioxide and simple inorganic nutrients.

primer- Molecule (usually a polynucleotide) to which DNA polymerase can attach the first nucleotide during DNA replication.

profile- See soil profile.

prokaryote- Organism lacking a unit membrane-bound nucleus and other organelles, usually having its DNA in a single circular molecule.

promoter- Site on DNA where the RNA polymerase binds and begins transcription.

propagule- Cell unit capable of developing into a complete organism.

prophage- State of the genome of a temperate virus when it is replicating in synchrony with that of the host, typically integrated into the host genome.

prosthetic group- Tightly bound, nonprotein portion of an enzyme.

protocooperation- See synergism.

proton motive force (PMF)- Energized state of a membrane created by expulsion of protons through action of an electron transport chain.

protoplasm- Complete cellular contents, cytoplasmic membrane, cytoplasm, and nucleus; usually considered the living portion of the cell, thus excluding those layers peripheral to the cell membrane.

protoplast-Cell from which the wall has been removed.

Protista-Old taxonomic term referring to algae, fungi, and protozoa (collectively, the eukaryotic protists), and the prokaryotes.

protozoan (plural, protozoa)- Unicellular eukaryotic microorganisms that move by either protoplasmic flow (amoebae), flagella (flagellates) or, cilia (ciliates). Most species feed on bacteria, fungi, or detrital particles

provirus- See prophage.

pseudomonad- Member of the genus *Pseudomonas*, a large group of Gram-negative, obligately respiratory (never fermentative) bacteria.

pseudomurein- A modified peptidoglycan found in methanogenic archaea.

pseudopodium (plural, pseudopodia)- Protrusion of an amoeboid cell formed by the extrusion or streaming of the cytoplasm (but still enclosed in the membrane) for the purpose of movement or feeding.

psychrophile- Organism able to grow at low temperatures and showing a growth temperature optimum < 15ºC.

pure culture-Population of microorganisms composed of a single strain. Such cultures are obtained through selective laboratory procedures and are rarely found in a natural environment.

Q_{10}-Relative increase in a reaction rate with temperature. It is expressed as the increase over a 10ºC interval.

R-S

r-strategy- Ecological strategy where organisms rely on high reproductive rates for continued survival within the community. Populations of r-strategists are subject to extreme fluctuations.

radionuclide- An isotope of artificial or natural origin that exhibits radioactivity.

reannealing- Process where two complementary single strands of DNA automatically hybridize back into a single, double-stranded molecule upon cooling.

recalcitrant- Resistant to microbial attack.

recombinant DNA- DNA molecule containing DNA originating from two or more sources.

recombination- Process by which genetic elements in two separate genomes are brought together in one unit.

redox- See oxidation-reduction reaction.

reducing equivalent (power)- Electrons stored in reduced electron carriers such as NADH, NADPH and $FADH_2$.

reduction- Process by which a compound accepts electrons.

reduction potential- Inherent tendency of a compound to act as an electron donor or an electron acceptor. Measured in millivolts.

reductive dechlorination- Removal of Cl as Cl^- from an organic compound by reducing the carbon atom from C-Cl to C-H.

remediation- See bioremediation.

replication-Conversion of one double-stranded DNA molecule into two identical double-stranded DNA molecules.

repression-Process by which the synthesis of an enzyme is inhibited by the presence of an external substance (the repressor).

reservoir- In the context of human pathogens, a place where disease-causing organisms reside when they are not living in a human host.

respiration- Catabolic reactions producing ATP in which either organic or inorganic compounds are primary electron donors and exogenous compounds are the ultimate electron acceptors.

restriction endonuclease (restriction enzyme)- Enzyme that recognizes and cleaves specific DNA sequence, generating either blunt or single-stranded (sticky) ends.

restriction fragment length polymorphism (RFLP)- Method to identify differences between similar genes from different organisms. Digestion of genes with restriction endonucleases followed by separation of the resulting fragments by gel electrophoresis yields banding patterns that are characteristic of the individual gene.

retrovirus- Virus containing single-stranded RNA as its genetic material and producing a complementary DNA by action of the enzyme reverse transcriptase.

reverse transcription- Process of copying information found in RNA into DNA.

rhizobacteria- Bacteria that aggressively colonize roots.

rhizobia- Bacteria capable of living symbiotically in roots of leguminous plants, from which they receive energy and often fix molecular dinitrogen. Collective common name for *Rhizobium* and closely related genera.

rhizoid- Rootlike structure that helps to hold an organism to a substrate.

rhizomorph- Mass of fungal hyphae organized into long, thick strands usually with a darkly pigmented outer rind and containing specialized tissues for absorption and water transport.

rhizoplane- Plant root surfaces and usually strongly adhering soil particles.

rhizosphere- Zone of soil under the influence of plant roots in which the kinds, numbers, or activities of microorganisms differ from that of the bulk soil.

rhizosphere competence- Ability of an organism to colonize the rhizosphere.

ribonucleic acid (RNA)- Polymer of nucleotides connected via a phosphate-ribose backbone, involved in protein synthesis.

ribosomal RNA (rRNA)- Types of RNA found in the ribosome; some participate actively in the process of protein synthesis.

ribosome- The organelle where protein synthesis occurs; the message encoded in mRNA is translated here.

root nodule- Specialized structure occurring on roots, especially of leguminous plants, in which bacteria fix dinitrogen and make it available for the plant.

saline soil- Soil containing sufficient soluble salt to adversely affect the growth of most crop plants.

sand- Soil particle between 0.05 and 2.0 mm in diameter.

sanitization- Elimination of pathogenic or deleterious organisms, insect larvae, intestinal parasites, and weed seeds.

saprophyte- Nonparasitic nutritional mechanism by which an organism obtains its food exclusively from the degradation of nonliving organic material.

sclerotium- Modified fungal hyphae that form a compact, hard vegetative resting structure with a thick pigmented outer rind.

scytonemin- A pigment produced by cyanobacteria that absorbs UV radiation, and thereby acts as a passive sunscreen.

secondary metabolite- Product of intermediary metabolism released from a cell, such as an antibiotic.

selective medium- Medium that allows the growth of certain types of microorganisms in preference to others. For example, an antibiotic-containing medium allows the growth of only those microorganisms resistant to the antibiotic.

septum (plural, septa)- Crosswall (partition) dividing a parent cell into two daughter cells during binary fission or occurring between adjacent cells in hyphae.

serial dilution- Series of stepwise dilutions (usually in sterile water) performed to reduce the populations of microorganisms in a sample to manageable numbers.

serology- Study of antigen-antibody reactions *in vitro*.

sheath- Tubular structure formed around a chain of cells or around a bundle of filaments.

siderophore-Nonporphyrin metabolite secreted by certain microorganisms that forms a highly stable coordination compound (chelate) with iron; a high-affinity iron-binding compound. There are two major types: catecholates and hydroxamates.

silt- Soil particle with a diameter between 0.002 and0.05 mm.

site- (i) In ecology, area described or defined by its biotic, climatic, and soil conditions as related to its capacity to produce vegetation. (ii) Area sufficiently uniform in biotic, climatic, and soil conditions to produce a particular climax vegetation.

site-directed mutagenesis- Insertion of a different nucleotide at a specific site in a molecule using recombinant DNA methodology.

16S rRNA-Large polynucleotide (about 1,500 bases) that functions as a part of the small subunit of the ribosome of prokaryotes and from whose sequence evolutionary information can be obtained; the eukaryotic counterpart is 18s rRNA.

slime layer- Diffuse layer of polysaccharide exterior to the cell wall in some bacteria..

slime mold- Nonphototrophic eukaryotic microorganism lacking cell walls, which aggregate to form fruiting structures (cellular slime molds) or simply masses of protoplasm (acellular slime molds).

soil-(i) Unconsolidated mineral and organic material on the immediate surface of the earth that serves as a natural medium for the growth of land plants. (ii) Unconsolidated mineral and organic matter on the surface of the earth that has been subjected to and influenced by genetic and environmental factors of: parent material, climate (including water and temperature effects), macroorganisms and microorganisms, and topography, all acting over a period of time and producing a product--soil--that differs from the material from which it is derived in many physical, chemical, biological, and morphological properties, and characteristics.

soil aggregate- Unit of soil structure generally < 10 mm in diameter and formed by natural forces and substances derived from root exudates and microbial products which cement smaller particles into larger units.

soil atmosphere- Gases occupying the pore space in soil. Generally characterized as having a greater percentage of carbon dioxide and a lesser percentage of oxygen than the overlying air.

soil biochemistry-Branch of soil science concerned with enzymes and the reactions, activities, and products of soil microorganisms.

soil classification-See classification.

soil crust- A soil-surface layer that is either denser, structurally different or more cemented than the material immediately beneath it.

soil extract- Solution separated from a soil suspension or from a soil by filtration, centrifugation, suction or pressure.

soil health- See soil quality.

soil horizon- Layer of soil or soil material approximately parallel to the land surface and differing from adjacent genetically related layers in physical, chemical, and biological properties or characteristics such as color, structure, texture, consistency, kinds and number of organisms present, and degree of acidity or alkalinity.

soil microbiology- Branch of soil science concerned with soil-inhabiting microorganisms and their functions and activities.

soil organic matter (SOM)- Organic fraction of the soil exclusive of undecayed plant and animal residues. Often synonymous with humus.

soil population- (i) All the organisms living in the soil, including plants and animals. (ii) Members of the same taxa.

soil pore- That part of the bulk volume of soil not occupied by soil particles. Soil pores have also been referred to as interstices or voids.

soil quality- Continued capacity of soil to function as a vital living system to sustain biological productivity, maintain the quality of the environment, and promote plant, animal, and human health.

soil salinity- Amount of soluble salts in a soil. The conventional measure of soil salinity is the electrical conductivity of a saturation extract.

soil science- Science dealing with soils as a natural resource on the surface of the earth including soil formation, classification and mapping, and physical, chemical, biological, and fertility properties of soils per se; and these properties in relation to their use and management.

soil series- Lowest category of U.S. system of soil taxonomy; a conceptualized class of soil bodies (polypedons) that have limits and ranges more restrictive than all higher taxa. The soil series serve as a major vehicle to transfer soil information and research knowledge from one soil area to another.

soil solution- Aqueous liquid phase of the soil and its solutes.

soil structure- Combination or arrangement of primary soil particles into secondary particles, units, or peds. The secondary units are characterized and classified on the basis of size, shape, and degree of distinctness into classes, types, and grades, respectively.

soil texture- Relative proportions of the various soil separates in a soil. The major textural classes are sand, silt, and clay.

soil water potential-(total)- Amount of work that must be done per unit quantity of pure water in order to transport reversibly and isothermically an infinitesimal quantity of water from a pool of pure water, at a specified elevation and at atmospheric pressure, to the soil water (at the point

under consideration). Informally, the amount of energy that must be expended to extract water from soil. The total potential (of soil water) consists of the following: gravitational potential, matric potential, and osmotic potential.

solarization- Method to control pathogens and weeds where moistened soil in hot climates is covered with transparent polyethylene plastic sheets, thereby trapping incoming radiation.

Southern blot- Hybridization of single-stranded nucleic acid (DNA or RNA) to DNA fragments immobilized on a filter.

spatial variability- Variation in soil properties (i) laterally across the landscape, at a given depth, or with a given horizon, or (ii) vertically downward through the soil.

specific activity- Amount of enzyme activity units per mass of protein. Often expressed as micromoles of product formed per unit time per milligram of protein. Also used in radiochemistry to express the radioactivity per mass of material (radioactive and nonradioactive).

species- In microbiology, a collection of closely related strains sufficiently different from all other strains to be recognized as a distinct unit.

specific epithet- Designation of a particular organism in the binomial nomenclature system. For example, *coli* is the specific epithet of *Escherichia coli*.

spermosphere- Area of increased microbial activity around a germinating seed.

spirillum (plural, spirilli)- (i) Bacterium with a spiral shape which is relatively rigid. (ii) Bacterium in the genus *Spirillum*.

sporangiospore- Spore formed within a sporangium by fungi in the phylum Zygomycota.

sporangium- Fungal structure which converts its cytoplasm into a variable number of sporangiospores; formed by fungi in the phylum Zygomycota.

spores- Specialized reproductive cell. Asexual spores germinate without uniting with other cells, whereas sexual spores of opposite mating types unite to form a zygote before germination occurs.

spread plate- Method for performing a plate count of microorganisms. A known amount of a serial dilution is spread over the surface of an agar plate. After growth the number of colony-forming units is counted.

stationary phase- Period during the growth cycle of a population in which growth rate equals the death rate.

sterilization- Rendering an object or substance free of viable microbes.

stoma- Mouth opening of predacious and bacteriovorous nematodes.

storage polysaccharide- Energy reserve deposited in the cell when there is an excess of carbon available. These are usually deposited as large granules in the cell. The most common example of a storage polysaccharide in plants is starch. Its counterpart in animal cells is glycogen.

strain- Population of cells all descended from a single pure isolate.

structure- See soil structure

structural polysaccharide- Polysaccharide that serves primarily as a structural element in cell walls and coats and intercellular spaces, and connective tissue where they give shape, elasticity, or rigidity to plant or animal tissues and protection and support to unicellular organisms. Cellulose is the predominant structural polysaccharide in plant cell walls and chitin is abundant in fungal cell walls and insect exoskeletons.

stylet- Small, spear-like mouth structure used by some nematodes to pierce cells to feed on protoplasm; usually associated with herbivorous or fungivorous nematodes.

subsidence- Decline in soil volume due to oxidation of organic matter.

substrate- (i) Substance, base, or nutrient on which an organism grows. (ii) Compounds or substances that are acted upon by enzymes or catalysts and changed to other compounds in the chemical reaction.

substrate-level phosphorylation- Synthesis of high-energy phosphate bonds through reaction of inorganic phosphate with an activated (usually) organic substrate.

succession- Gradual process brought about by the change in the number of individuals of each species of a community and by the establishment of new species that gradually replace the original inhabitants.

sulfur cycle- Sequence of transformations undergone by sulfur where it is taken up by living organisms, transformed upon death and decomposition of the organism, and converted ultimately to its original state of oxidation.

surfactant- A substance that lowers the surface tension of a liquid.

surface area- Area of the solid particles in a given quantity of soil or porous medium.

surface soil- Uppermost part of the soil, ordinarily moved in tillage, or its equivalent in uncultivated soils ranging in depth from 7 to 20 cm. Frequently designated as the surface layer, the Ap layer, or the Ap horizon.

symbiosis- Living together in intimate association of two dissimilar organisms. The interactions between the organisms can be commensal or mutualistic.

synergism- Association between organisms that is mutually beneficial. Both populations, however, are capable of surviving in their natural environment on their own.

syntrophy-Interaction of two or more populations that supply each other's nutritional needs.

systemic-Not localized in a particular place of the body; an infection disseminated widely through the body is said to be systemic.

T-Z

taxon (plural, taxa)- A group into which related organisms are classified.

taxonomy- Study of scientific classification and nomenclature.

teichoic acids- All wall, membrane, or capsular polymers containing glycerophosphate or ribitol phosphate residues.

teleomorph- Sexual stage in reproduction in which cells are formed by the process of meiosis and genetic recombination.

temperate virus- Virus which upon infection of a host does not necessarily cause lysis but whose genome may replicate in synchrony with that of the host.

terminal electron acceptor- External oxidant (often oxygen) that accepts the electrons as they exit from the electron transport chain.

testa- Hard external covering or shell.

texture- See soil texture.

thallus- Vegetative body that is not differentiated into tissue systems or organs.

thermophile- Organism whose optimum temperature for growth is between 45 and 85ºC.

Ti plasmid- Conjugative tumor-inducing plasmid present in the bacterium *Agrobacterium tunefaciens* which can transfer genes into plants.

topsoil- (i) Layer of soil moved in cultivation. (ii) The A horizon. (iii) Presumably fertile soil material used to topdress roadbanks, gardens, and lawns.

toxin- Microbial substance able to induce host damage.

trace gas- Gas other than nitrogen and oxygen in the atmosphere, particularly those gases that are active in the chemistry or radiation balance of the atmosphere.

transcription- Synthesis of an RNA molecule complementary to one of the two strands of a DNA double-stranded molecule.

transduction- Transfer of host genetic information via a virus or bacteriophage particle.

transfer RNA (tRNA)- Type of RNA that carries amino acids to the ribosome during translation.

transformation- Transfer of genetic information into living cells as free DNA.

transgenic- Describes genetically modified plants or animals containing foreign genes inserted by means of recombinant DNA techniques.

translation- Synthesis of proteins using the genetic information in mRNA as a template.

transposable element- Genetic element that can move (transpose) from one site on a chromosome to another.

transposition- Movement of a piece of DNA around the chromosome, usually through the function of a transposable element.

transposon- Transposable element of which, in addition to genes involved in transposition, carries other genes; often confers selectable phenotypes such as antibiotic resistance.

transposon mutagenesis- Insertion of a transposon into a gene; this inactivates the host gene leading to a mutant phenotype and also confers the phenotype associated with the transposon gene.

tree of life- A diagrammatic representation of the phylogenetic relationships among organisms.

tricarboxylic acid cycle (TCA cycle, citric acid cycle, Krebs cycle)- Series of metabolic reactions by which pyruvate is oxidized completely to carbon dioxide, also forming NADH, which allows ATP production.

trichome- Row of cells which have remained attached to one another following successive cell divisions. Trichomes are formed by many cyanobacteria and by species of *Beggiatoa*.

trophic level- A group of organisms with the same feeding habit in the food chain, ranging from the primary nutrient-assimilating autotrophs to predatory carnivorous animals.

uronic acid- Class of acidic compounds of the general formula $HOOC(CHOH)_nCHO$ that contain both carboxylic and aldehydic groups, are oxidation products of sugars, and occur in many polysaccharides; especially in the hemicelluloses.

vadose zone- Unsaturated zone of soil above the groundwater, extending from the bottom of the capillary fringe all the way to the soil surface.

vector- (i) Plasmid or virus used in genetic engineering to insert genes into a cell. (ii) Agent, usually an insect or other animal, able to carry pathogens from one host to another.

vegetative cell- Growing or feeding form of a microbial cell, as opposed to a resting form such as a spore.

vesicles-Spherical structures, formed intracellularly, by some arbuscular mycorrhizal fungi.

vesicular-arbuscular mycorrhiza-See arbuscular mycorrhiza.

viable- Alive; able to reproduce.

viable but nonculturable- Organisms that are alive but cannot be cultured on laboratory media.

viable count- Measurement of the number of live cells in a microbial population.

vibrio- (i) Curved, rod-shaped bacterial cell. (ii) Bacterium of the genus *Vibrio*.

virion- Virus particle; the virus nucleic acid surrounded by protein coat and in some cases other material.

virulence- Degree of pathogenicity of a parasite.

virus- Any of a large group of submicroscopic infective agents that typically contain a protein coat surrounding a nucleic acid core and are capable of growth only in a living cell.

water content-Water contained in a material expressed as the mass of water per unit mass of oven-dry material.

water potential- See soil water potential.

water-retention curve- Graph showing soil-water content as a function of increasingly negative soil water potential.

weathering- All physical and chemical changes produced in rock by atmospheric agents.

white rot fungus- Fungus that attacks lignin, along with cellulose, and hemicellulose, leading to a marked lightening of the infected wood.

wild type-Strain of microorganism isolated from nature. The usual or native form of a gene or organism.

wilting point-See permanent wilting point.

Winogradsky column- Glass column with an anaerobic lower zone and an aerobic upper zone, which allows growth of microorganisms under conditions similar to those found in nutrient-rich water and sediment.

Woronin body-Spherical structure associated with the simple pore in the septa separating hyphal compartments of fungi in the phylum Ascomycota.

xenobiotic- Compound foreign to biological systems. Often refers to human-made compounds that are resistant or recalcitrant to biodegradation and decomposition.

xerophile- Organism adapted to grow at low water potential, i.e., very dry habitats.

xenophore- Group or structure built into a chemical that imparts xenobiotic character, which may hinder biodegradation of the chemical.

yeast- Fungus whose thallus consists of single cells that multiply by budding or fission.

zoospore- An asexual spore formed by some fungi that usually can move in an aqueous environment via one or more flagella.

zygospore- Thick-walled resting spore resulting from fusion of two gametangia of fungi in the phylum Zygomycota.

zygote- In eukaryotes, the single diploid cell resulting from the union (fusion) of two haploid gametes.

zymogenous organism- Refers to an often transient or alien microorganism that grows rapidly when high energy-containing nutrients become available. Also called copiotroph.