

**Living Environment
Science Glossary**

Glossary of Prominent Scientists

- Crick, Francis** A 20th-century British scientist who, with James Watson, developed the first workable model of DNA structure and function.
- Darwin, Charles** A 19th-century British naturalist whose theory of organic evolution by natural selection forms the basis for the modern scientific theory of evolution.
- Fox, Sidney** A 20th-century American scientist whose experiments showed that Stanley Millar's simple chemical precursors could be joined to form more complex biochemicals.
- Hardy, G. H.** A 20th-century British mathematician who, with **W. Weinberg**, developed the Hardy-Weinberg principle of gene frequencies.
- Lamarck, Jean** An 18th-century French scientist who devised an early theory of organic evolution based on the concept of use and disuse.
- Linnaeus, Carl** An 18th-century Dutch scientist who developed the first scientific system of classification, based on similarity of structure.
- Mendel, Gregor** A 19th-century Austrian monk and teacher who was the first to describe many of the fundamental concepts of genetic inheritance through his work with garden peas.
- Miller, Stanley** A 20th-century American scientist whose experiments showed that the simple chemical precursors of life could be produced in the laboratory.
- Morgan, Thomas Hunt** A 20th-century American geneticist whose pioneering work with *Drosophila* led to the discovery of several genetic principles, including sex linkage.
- Watson, James** A 20th-century American scientist who, with **Francis Crick**, developed the first workable model of DNA structure and function.
- Weinberg, W.** A 20th-century German physician who, with **G. H. Hardy**, developed the Hardy-Weinberg principle of gene frequencies.
- Weismann, August** A 19th-century German biologist who tested Lamarck's theory of use and disuse and found it to be unsupportable by scientific methods.

Glossary of Biological Terms

A

- abiotic factor** Any of several nonliving, physical conditions that affect the survival of an organism in its environment.
- absorption** The process by which water and dissolved solids, liquids, and gases are taken in by the cell through the cell membrane.
- accessory organ** In human beings, any organ that has a digestive function but is not part of the food tube. (See liver; gallbladder; pancreas.)
- acid** A chemical that releases hydrogen ion (H^+) in solution with water.
- acid precipitation** A phenomenon in which there is thought to be an interaction between atmospheric moisture and the oxides of sulfur and nitrogen that results in rainfall with low pH values.
- active immunity** The immunity that develops when the body's immune system is stimulated by a disease organism or a vaccination.
- active site** The specific area of an enzyme molecule that links to the substrate molecule and catalyzes its metabolism.
- active transport** A process by which materials are absorbed or released by cells against the concentration gradient (from low to high concentration) with the expenditure of cell energy.
- adaptation** Any structural, biochemical, or behavioral characteristic of an organism that helps it to survive potentially harsh environmental conditions.
- addition** A type of chromosome mutation in which a section of a chromosome is transferred to a homologous chromosome.
- adenine** A nitrogenous base found in DNA and RNA molecules.
- adenosine triphosphate (ATP)** An organic compound that stores respiratory energy in the form of chemical-bond energy for transport from one part of the cell to another.
- adrenal cortex** A portion of the adrenal gland that secretes steroid hormones that regulate various aspects of blood composition.
- adrenal gland** An endocrine gland that produces several hormones, including adrenaline. (See adrenal cortex; adrenal medulla.)
- adrenal medulla** A portion of the adrenal gland that secretes the hormone adrenaline, which regulates various aspects of the body's metabolic rate.
- adrenaline** A hormone of the adrenal medulla that regulates general metabolic rate, the rates of heartbeat and breathing, and the conversion of glycogen to glucose.
- aerobic phase of respiration** The reactions of aerobic respiration in which two pyruvic acid molecules are converted to six molecules of water and six molecules of carbon dioxide.
- aerobic respiration** A type of respiration in which energy is released from organic molecules with the aid of oxygen.
- aging** A stage of postnatal development that involves differentiation, maturation, and eventual deterioration of the body's tissues.
- air pollution** The addition, due to technological oversight, of some unwanted factor (for example, chemical oxides, hydrocarbons, particulates) to our air resources.
- albinism** A condition, controlled by a single mutant gene, in which the skin lacks the ability to produce skin pigments.
- alcoholic fermentation** A type of anaerobic respiration in which glucose is converted to ethyl alcohol and carbon dioxide.
- allantois** A membrane that serves as a

- reservoir for wastes and as a respiratory surface for the embryos of many animal species.
- allele** One of a pair of genes that exist at the same location on a pair of homologous chromosomes and exert parallel control over the same genetic trait.
- allergy** A reaction of the body's immune system to the chemical composition of various substances.
- alveolus** One of many air sacs within the lung that function to absorb atmospheric gases and pass them on to the bloodstream.
- amino acid** An organic compound that is the component unit of proteins.
- amino group** A chemical group having the formula —NH_2 that is found as a part of all amino acid molecules.
- ammonia** A type of nitrogenous waste with high solubility and high toxicity.
- amniocentesis** A technique for detecting genetic disorders in unborn human beings in which a small amount of amniotic fluid is removed and the chromosome content of its cells analyzed. (See **karyotyping**.)
- amnion** A membrane that surrounds the embryo in many animal species and contains a fluid to protect the developing embryo from mechanical shock.
- amniotic fluid** The fluid within the amnion membrane that bathes the developing embryo.
- amylase** An enzyme specific for the hydrolysis of starch.
- anaerobic phase of respiration** The reactions of aerobic respiration in which glucose is converted to two pyruvic acid molecules.
- anaerobic respiration** A type of respiration in which energy is released from organic molecules without the aid of oxygen.
- anal pore** The egestive organ of the paramecium.
- anemia** A disorder of the human transport system in which the ability of the blood to carry oxygen is impaired usually because of reduced numbers of red blood cells.
- angina pectoris** A disorder of the human transport system in which chest pain signals potential damage to the heart muscle due to narrowing of the opening of the coronary artery.
- animal** One of the five biological kingdoms; it includes multicellular organisms whose cells are not bounded by cell walls and that are incapable of photosynthesis (for example, human being).
- Annelida** A phylum of the animal kingdom whose members (annelids) include the segmented worms (for example, earthworm).
- antenna** A receptor organ found in many arthropods (for example, grass-hopper), which is specialized for detecting chemical stimuli.
- anther** The portion of the stamen that produces pollen.
- antibody** A chemical substance produced in response to the presence of a specific antigen that neutralizes that antigen in the immune response.
- antigen** A chemical substance, usually a protein, recognized by the immune system as a foreign invader and that is neutralized by a specific antibody.
- anus** The organ of egestion of the digestive tract.
- aorta** The principal artery carrying blood from the heart to the body tissues.
- aortic arches** A specialized part of the earthworm's transport system that serves as a pumping mechanism for the blood fluid.
- apical meristem** A plant growth region located at the tip of the root or tip of the stem.
- appendicitis** A disorder of the human digestive tract in which the appendix becomes inflamed as a result of bacterial infection.
- aquatic biome** An ecological home composed of many different water environments.

artery A thick-walled blood vessel that carries blood away from the heart under pressure.

arthritis A disorder of the human locomotor system in which skeletal joints become inflamed, swollen, and painful.

Arthropoda A phylum of the animal kingdom whose members (arthropods) have bodies with chitinous exoskeletons and jointed appendages (for example, grasshopper).

artificial selection A technique of plant/animal breeding in which individual organisms displaying desirable characteristics are chosen for breeding purposes.

asexual reproduction A type of reproduction in which new organisms are formed from a single parent organism.

asthma A disorder of the human respiratory system in which the respiratory tube becomes constricted by swelling brought on by some irritant.

atrium In human beings, one of the two thin-walled upper chambers of the heart that receive blood,

autonomic nervous system A subdivision of the peripheral nervous system consisting of nerves associated with automatic functions (for example, heartbeat, breathing).

autosome One of several chromosomes present in the cell that carry genes controlling "body" traits not associated with primary and secondary sex characteristics.

autotroph An organism capable of carrying on autotrophic nutrition. Self-feeder.

autotrophic nutrition A type of nutrition in which organisms manufacture their own organic foods from inorganic raw materials.

auxin A biochemical substance, a plant hormone, produced by plants that regulates growth patterns.

axon An elongated portion of a neuron that conducts nerve impulses, usually

away from the cell body of the neuron.

B

base A chemical that releases hydroxyl ion (OH^-) in solution with water.

bicarbonate ion The chemical formed in the blood plasma when carbon dioxide is absorbed from body tissues.

bile In human beings, a secretion of the liver that is stored in the gallbladder and that emulsifies fats.

binary fission A type of cell division in which mitosis is followed by equal cytoplasmic division.

binomial nomenclature A system of naming used in biological classification that consists of the genus and species names (for example, *Homo sapiens*).

biocide use The use of pesticides that eliminate one undesirable organism but that have, due to technological oversight, unanticipated effects on beneficial species as well.

biological controls The use of natural enemies of various agricultural pests for pest control, thereby eliminating the need for biocide use—a positive aspect of human involvement with the environment.

biomass The total mass of living material present at the various trophic levels in a food chain.

biome A major geographical grouping of similar ecosystems, usually named for the climax flora in the region (for example, Northeast Deciduous Forest).

biosphere The portion of the earth in which living things exist, including all land and water environments.

biotic factor Any of several conditions associated with life and living things that affect the survival of living things in the environment.

birth In placental mammals, a stage of embryonic development in which the baby passes through the vaginal canal to outside of the mother's body.

blastula In certain animals, a stage of

embryonic development in which the embryo resembles a hollow ball of undifferentiated cells.

blood The complex fluid tissue that functions to transport nutrients and respiratory gases to all parts of the body.

blood typing An application of the study of immunity in which the blood of a person is characterized by its antigen composition.

bone A tissue that provides mechanical support and protection for bodily organs and levers for the body's locomotive activities.

Bowman's capsule A cup-shaped portion of the nephron responsible for filtering of soluble blood components.

brain An organ of the central nervous system responsible for regulating conscious and much unconscious activity in the body.

breathing A mechanical process by which air is forced into the lung by means of muscular contraction of the diaphragm and rib muscles.

bronchiole One of several subdivisions of the bronchi that penetrate the lung interior and terminate in alveoli.

bronchitis A disorder of the human respiratory system in which the bronchi become inflamed.

bronchus One of the two major subdivisions of the breathing tube; the bronchi are ringed with cartilage and conduct air from the trachea to the lung interior.

Btyophyta A phylum of the plant kingdom that consists of organisms lacking vascular tissues (for example, moss).

budding A type of asexual reproduction in which mitosis is followed by unequal cytoplasmic division.

bulb A type of vegetative propagation in which a plant bulb produces new bulbs that may be established as independent organisms with identical characteristics.

C

cambium The lateral meristem tissue in woody plants responsible for annual growth in stem diameter.

cancer Any of a number of conditions characterized by rapid, abnormal, and uncontrolled division of affected cells.

capillary A very small, thin-walled blood vessel that connects an artery to a vein and through which all absorption into the blood fluid occurs.

carbohydrate An organic compound composed of carbon, hydrogen, and oxygen in a 1:2:1 ratio (for example, $C_6H_{12}O_6$).

carbon-fixation reactions A set of biochemical reactions in photosynthesis in which hydrogen atoms are combined with carbon and oxygen atoms to form PGAL and glucose.

carbon 14 A radioactive isotope of carbon used to trace the movement of carbon in various biochemical reactions, and also used in the carbon dating of fossils.

carbon-hydrogen-oxygen cycle A process by which these three elements are made available for use by other organisms through the chemical reactions of respiration and photosynthesis.

carboxyl group A chemical group having the formula $-COOH$ and found as part of all amino acid and fatty acid molecules.

cardiac muscle A type of muscle tissue in the heart and arteries associated with the rhythmic nature of the pulse and heartbeat.

cardiovascular disease In human beings, any disease of the circulatory organs.

carnivore A heterotrophic organism that consumes animal tissue as its primary source of nutrition. (See secondary consumer)

carrier An individual who, though not expressing a particular recessive trait, carries this gene as part of his/her het-

- erozygous genotype.
- carrier protein** A specialized molecule embedded in the cell membrane that aids the movement of materials across the membrane,
- cartilage** A flexible connective tissue found in many flexible parts of the body (for example, knee); common in the embryonic stages of development.
- catalyst** Any substance that speeds up or slows down the rate of a chemical reaction. (See enzyme.)
- cell plate** A structure that forms during cytoplasmic division in plant cells and serves to separate the cytoplasm into two roughly equal parts,
- cell theory** A scientific theory that states, "All cells arise from previously existing cells" and "Cells are the unit of structure and function of living things."
- cell wall** A cell organelle that surrounds and gives structural support to plant cells; cell walls are composed of cellulose.
- central nervous system** The portion of the vertebrate nervous system that consists of the brain and the spinal cord.
- centriole** A cell organelle found in animal cells that functions in the process of cell division.
- centromere** The area of attachment of two chromatids in a double-stranded chromosome.
- cerebellum** The portion of the human brain responsible for the coordination of muscular activity.
- cerebral hemorrhage** A disorder of the human regulatory system in which a broken blood vessel in the brain may result in severe dysfunction or death.
- cerebral palsy** A disorder of the human regulatory system in which the motor and speech centers of the brain are impaired.
- cerebrum** The portion of the human brain responsible for thought, reasoning, sense interpretation, learning, and other conscious activities.
- cervix** A structure that bounds the lower end of the uterus and through which sperm must pass in order to fertilize the egg.
- chemical digestion** The process by which nutrient molecules are converted by chemical means into a form usable by the cells.
- chemosynthesis** A type of autotrophic nutrition in which certain bacteria use the energy of chemical oxidation to convert inorganic raw materials to organic food molecules.
- chitin** A polysaccharide substance that forms the exoskeleton of the grasshopper and other arthropods.
- chlorophyll** A green pigment in plant cells that absorbs sunlight and makes possible certain aspects of the photosynthetic process.
- chloroplast** A cell organelle found in plant cells that contains chlorophyll and functions in photosynthesis.
- Chordata** A phylum of the animal kingdom whose members (chordates) have internal skeletons made of cartilage and/or bone (for example, human being).
- chorion** A membrane that surrounds all other embryonic membranes in many animal species, protecting them from mechanical damage.
- chromatid** One strand of a double-stranded chromosome.
- chromosome mutation** An alteration in the structure of a chromosome involving many genes, (See nondisjunction; translocation; addition; deletion.)
- cilia** Small, hairlike structures in paramecia and other unicellular organisms that aid in nutrition and locomotion.
- classification** A technique by which scientists sort, group, and name organisms for easier study.
- cleavage** A series of rapid mitotic divisions that increase cell number in a developing embryo without a corresponding increase in cell size.
- climax community** A stable, self-perpet-

- uating community that results from an ecological succession.
- cloning** A technique of genetic investigation in which undifferentiated cells of an organism are used to produce new organisms with the same set of traits as the original cells.
- closed-transport system** A type of circulatory system in which the transport fluid is always enclosed within blood vessels (for example, earthworm, human).
- clot** A structure that forms as a result of enzyme-controlled reactions following the rupturing of a blood vessel and serves as a plug to prevent blood loss.
- codominance** A type of intermediate inheritance that results from the simultaneous expression of two dominant alleles with contrasting effects.
- codon** See **triplet codon**.
- Coelenterata** A phylum of the animal kingdom whose members (coelenterates) have bodies that resemble a sack (for example, hydra, jellyfish).
- coenzyme** A chemical substance or chemical subunit that functions to aid the action of a particular enzyme. (See **vitamin**.)
- cohesion** A force binding water molecules together that aids in the upward conduction of materials in the xylem.
- commensalism** A type of symbiosis in which one organism in the relationship benefits and the other is neither helped nor harmed.
- common ancestry** a concept central to the theory of evolution that postulates that all organisms share a common ancestry whose closeness varies with the degree of shared similarity.
- community** A level of biological organization that includes all of the species populations inhabiting a particular geographic area.
- comparative anatomy** The study of similarities in the anatomic structures of organisms, and their use as an indicator of common ancestry and as evidence of organic evolution.
- comparative biochemistry** The study of similarities in the biochemical make ups of organisms, and their use as an indicator of common ancestry and as evidence of organic evolution.
- comparative cytology** The study of similarities in the cell structures of organisms, and their use as an indicator of common ancestry and as evidence of organic evolution.
- comparative embryology** The study of similarities in the patterns of embryological development of organisms, and their use as an indicator of common ancestry and as evidence of organic evolution.
- competition** A condition that arises when different species in the same habitat attempt to use the same limited resources.
- complete protein** A protein that contains all eight essential amino acids.
- compound** A substance composed of two or more different kinds of atom (for example, water; H₂O).
- compound light microscope** A tool of biological study capable of producing a magnified image of a biological specimen by using a focused beam of light.
- conditioned behavior** A type of response that is learned but that becomes automatic with repetition.
- conservation of resources** The development and application of practices to protect valuable and irreplaceable soil and mineral resources—a positive aspect of human involvement with the environment.
- constipation** A disorder of the human digestive tract in which fecal matter solidifies and becomes difficult to egest.
- consumer** Any heterotrophic animal organism (for example, human being).
- coronary artery** An artery that branches off the aorta to feed the heart muscle.
- coronary thrombosis** A disorder of the human transport system in which the heart muscle becomes damaged as a result of blockage of the coronary artery.
- corpus luteum** A structure resulting from

the hormone-controlled transformation of the ovarian follicle that produces the hormone progesterone.

- corpus luteum stage** A stage of the menstrual cycle in which the cells of the follicle are transformed into the corpus luteum under the influence of luteinizing hormone (LH).
- cotyledon** A portion of the plant embryo that serves as a source of nutrition for the young plant before photosynthesis begins.
- cover cropping** A proper agricultural practice in which a temporary planting (cover crop) is used to limit soil erosion between seasonal plantings of main crops.
- crop** A portion of the digestive tract of certain animals that stores food temporarily before digestion.
- cross-pollination** A type of pollination in which pollen from one flower pollinates flowers of a different plant of the same species.
- crossing-over** A pattern of inheritance in which linked genes may be separated during synapsis in the first meiotic division, when sections of homologous chromosomes may be exchanged.
- cuticle** A waxy coating that covers the upper epidermis of most leaves and acts to help the leaf retain water.
- cutting** A technique of plant propagation in which vegetative parts of the parent plant are cut and rooted to establish new plant organisms with identical characteristics.
- cyclosis** The circulation of the cell fluid (cytoplasm) within the cell interior.
- cyton** The cell body of the neuron, which generates the nerve impulse.
- cytoplasm** The watery fluid that provides a medium for the suspension of organelles within the cell.
- cytoplasmic division** The separation of daughter nuclei into two new daughter cells.
- cytosine** A nitrogenous base found in both DNA and RNA molecules.

D

- daughter cell** A cell that results from mitotic cell division.
- daughter nucleus** One of two nuclei that form as a result of mitosis.
- deamination** A process by which amino acids are broken down into their component parts for conversion into urea.
- death** The irreversible cessation of bodily functions and cellular activities.
- deciduous** A term relating to broad-leaved trees that shed their leaves in the fall.
- decomposer** Any saprophytic organism that derives its energy from the decay of plant and animal tissues (for example, bacteria of decay, fungus); the final stage of a food chain.
- decomposition bacteria** In the nitrogen cycle, bacteria that break down plant and animal protein and produce ammonia as a by-product.
- dehydration synthesis** A chemical process in which two organic molecules may be joined after removing the atoms needed to form a molecule of water as a by-product.
- deletion** A type of chromosome mutation in which a section of a chromosome is separated and lost.
- dendrite** A cytoplasmic extension of a neuron that serves to detect an environmental stimulus and carry an impulse to the cell body of the neuron.
- denitrifying bacteria** In the nitrogen cycle, bacteria that convert excess nitrate salts into gaseous nitrogen.
- deoxygenated blood** Blood that has released its transported oxygen to the body tissues.
- deoxyribonucleic acid (DNA)** A nucleic acid molecule known to be the chemically active agent of the gene; the fundamental hereditary material of living organisms.
- deoxyribose** A five-carbon sugar that is a component part of the nucleotide unit in

DNA only.

desert A terrestrial biome characterized by sparse rainfall, extreme temperature variation, and a climax flora that includes cactus.

diabetes A disorder of the human regulatory system in which insufficient insulin production leads to elevated blood sugar concentrations.

diarrhea A disorder of the human digestive tract in which the large intestine fails to absorb water from the waste matter, resulting in watery feces,

diastole The lower pressure registered during blood pressure testing. (See **systole**.)

differentiation The process by which embryonic cells become specialized to perform the various tasks of particular tissues throughout the body.

diffusion A form of passive transport in which soluble substances are absorbed or released by cells.

digestion The process in which complex foods are broken down by mechanical or chemical means for use by the body.

dipeptide A chemical unit composed of two amino acid units linked by a peptide bond.

diploid chromosome number The number of chromosomes found characteristically in the cells (except gametes) of sexually reproducing species.

disaccharidase Any disaccharide-hydrolyzing enzyme.

disaccharide A type of carbohydrate known also as a double sugar; all disaccharides have the molecular formula $C_{12}H_{22}O_{11}$.

disjunction The separation of homologous chromosome pairs at the end of the first meiotic division.

disposal problems Problems, due to technological oversight, that result when commercial and technological activities produce solid and/or chemical wastes that must be disposed of.

dissecting microscope A tool of biological study that magnifies the image of

a biological specimen up to 20 times normal size for purposes of gross dissection.

dominance A pattern of genetic inheritance in which the effects of a dominant allele mask those of a recessive allele.

dominant allele (gene) An allele (gene) whose effect masks that of its recessive allele.

double-stranded chromosome The two-stranded structure that results from chromosomal replication.

Down's syndrome In human beings, a condition characterized by mental and physical retardation that may be caused by the nondisjunction of chromosome number 21.

Drosophila The common fruit fly, an organism that has served as an object of genetic research in the development of the gene-chromosome theory.

ductless gland See **endocrine gland**.

E

ecology The science that studies the interactions of living things with each other and with the nonliving environment.

ecosystem The basic unit of study in ecology, including the plant and animal community in interaction with the nonliving environment.

ectoderm An embryonic tissue that differentiates into skin and nerve tissue in the adult animal.

effector An organ specialized to produce a response to an environmental stimulus; effectors may be muscles or glands.

egestion The process by which undigested food materials are eliminated from the body.

electron microscope A tool of biological study that uses a focused beam of electrons to produce an image of a biological specimen magnified up to 25,000 times its normal size.

element The simplest form of matter; an

- element is a substance (for example, nitrogen) made up of a single type of atom.
- embryo** An organism in the early stages of development following fertilization.
- embryonic development** A series of complex processes by which animal and plant embryos develop into adult organisms.
- emphysema** A disorder of the human respiratory system in which lung tissue deteriorates, leaving the lung with diminished capacity and efficiency.
- emulsification** A process by which fat globules are surrounded by bile to form fat droplets.
- endocrine (ductless) gland** A gland (for example, thyroid, pituitary) specialized for producing and secreting hormones directly into the bloodstream; such glands lack ducts.
- endoderm** An embryonic tissue that differentiates into the digestive and respiratory tract lining in the adult animal.
- endoqasroic reticulum (ER)** A cell organelle known to function in the transport of cell products from place to place within the cell.
- environmental laws** Federal, state, and local legislation enacted in an attempt to protect environmental resources—a positive aspect of human involvement with the environment.
- enzymatic hydrolysis** An enzyme-controlled reaction by which complex food molecules are broken down chemically into simpler subunits.
- enzyme** An organic catalyst that controls the rate of metabolism of a single type of substrate; enzymes are protein in nature.
- enzyme-substrate complex** A physical association between an enzyme molecule and its substrate within which the substrate is metabolized.
- epicotyl** A portion of the plant embryo that specializes to become the upper stem, leaves, and flowers of the adult plant.
- epidermis** The outermost cell layer in a plant or animal.
- epiglottis** In a human being, a flap of tissue that covers the upper end of the trachea during swallowing and prevents inhalation of food.
- esophagus** A structure in the upper portion of the digestive tract that conducts the food from the pharynx to the midgut.
- essential amino acid** An amino acid that cannot be synthesized by the human body but must be obtained by means of the diet.
- estrogen** A hormone, secreted by the ovary that regulates the production of female secondary sex characteristics.
- evolution** Any process of gradual change through time.
- excretion** The life function by which living things eliminate metabolic wastes from their cells.
- exoskeleton** A chitinous material that covers the outside of the bodies of most arthropods and provides protection for internal organs and anchorage for muscles.
- exploitation of organisms** Systematic removal of animals and plants with commercial value from their environments to sell them—a negative aspect of human involvement with the environment.
- extensor** A skeletal muscle that extends (opens) a joint.
- external development** Embryonic development that occurs outside the body of the female parent (for example, birds).
- external fertilization** Fertilization that occurs outside the body of the female parent (for example, fish).
- extracellular digestion** Digestion that occurs outside the cell.

F

- fallopian tube** See oviduct.
- fatty acid** An organic molecule that is a component of certain lipids.
- fauna** The animal species comprising an ecological community.
- feces** The semisolid material that results from the solidification of undigested foods in the large intestine.

fertilization The fusion of gametic nuclei in the process of sexual reproduction.

filament The portion of the stamen that supports the anther.

flagella Microscopic, whiplike structures found on certain cells that aid in locomotion and circulation.

flexor A skeletal muscle that flexes (closes) a joint.

flora The plant species comprising an ecological community.

flower The portion of a flowering plant specialized for sexual reproduction.

fluid-mosaic model A model of the structure of the cell membrane in which large protein molecules are thought to be embedded in a bilipid layer.

follicle One of many areas within the ovary that serve as sites for the periodic maturation of ova.

follicle stage The stage of the menstrual cycle in which an ovum reaches its final maturity under the influence of the hormone FSH.

follicle-stimulating hormone (FSH) A pituitary hormone that regulates the maturation of and the secretion of estrogen by the ovarian follicle.

food chain A series of nutritional relationships in which food energy is passed from producer to herbivore to carnivore to decomposer; a segment of a food web.

food web A construct showing a series of interrelated food chains and illustrating the complex nutritional interrelationships that exist in an ecosystem.

fossil The preserved direct or indirect remains of an organism that lived in the past, as found in the geologic record.

fraternal twins In human beings, twin offspring that result from the simultaneous fertilization of two ova by two sperm; such twins are not genetically identical.

freshwater biome An aquatic biome made up of many separate freshwater systems that vary in size and stability and may be closely associated with ter-

restrial biomes.

fruit Any plant structure that contains seeds: a mechanism of seed dispersal.

Fungi One of the five biological kingdoms; it includes organisms unable to manufacture their own organic foods (for example, mushroom).

G

gallbladder An accessory organ that stores bile.

gallstones A disorder of the human digestive tract in which deposits of hardened cholesterol lodge in the gallbladder.

gamete A specialized reproductive cell produced by organisms of sexually reproducing species. (See sperm; ovum; pollen; ovule.)

gametogenesis The process of cell division by which gametes are produced. (See meiosis; spermatogenesis; oogenesis.)

ganglion An area of bunched nerve cells that acts as a switching point for nerve impulses traveling from receptors and to effectors.

garden pea The research organism used by Mendel in his early scientific work in genetic inheritance.

gastric cecum A gland in The grasshopper that secretes digestive enzymes.

gastrula A stage of embryonic development in animals in which the embryo assumes a tube-within-a-tube structure and distinct embryonic tissues (ectoderm, mesoderm, endoderm) begin to differentiate.

gastrulation The process by which a blastula becomes progressively more indented, forming a gastrula.

gene A unit of heredity; a discrete portion of a chromosome thought to be responsible for the production of a single type of polypeptide; the factor responsible for the inheritance of a genetic trait.

gene frequency The proportion (per-

- centage) of each allele for a particular trait that is present in the gene pool of a population.
- gene linkage** A pattern of inheritance in which genes located along the same chromosome are prevented from assorting independently but are linked together in their inheritance.
- gene mutation** An alteration of the chemical nature of a gene that changes its ability to control the production of a polypeptide chain.
- gene pool** The sum total of all the inheritable genes for the traits in a given sexually reproducing population.
- gene-chromosome theory** A theory of genetic inheritance that is based on current understanding of the relationships between the biochemical control of traits and the process of cell division.
- genetic counseling** Clinical discussions concerning inheritance patterns that are designed to inform prospective parents of the potential for expression of a genetic disorder in their offspring.
- genetic engineering** The use of various techniques to move genes from one organism to another.
- genetic screening** A technique for the detection of human genetic disorders in which bodily fluids are analyzed for the presence of certain marker chemicals.
- genome** The total genetic makeup (DNA) of an organism.
- genotype** The particular combination of genes in an allele pair.
- genus** A level of biological classification that represents a subdivision of the phylum level; having fewer organisms with great similarity (for example, *Drosophila*, *Paramecium*).
- geographic isolation** The separation of species population by geographic barriers, facilitating the evolutionary process.
- geologic record** A supporting item of evidence of organic evolution, supplied within the earth's rock and other geologic deposits.
- germination** The growth of the pollen tube from a pollen grain; the growth of the embryonic root and stem from a seed.
- gestation** The period of prenatal development of a placental mammal; human gestation requires approximately nine months.
- gizzard** A portion of the digestive tract of certain organisms, including the earthworm and the grasshopper in which food is ground into smaller fragments.
- glomerulus** A capillary network lying within Bowman's capsule of the nephron.
- glucagon** A hormone, secreted by the islets of Langerhans, that regulates the release of blood sugar from stored glycogen.
- glucose** A monosaccharide produced commonly in photosynthesis and used by both plants and animals as a fuel in the process of respiration.
- glycerol** An organic compound that is a component of certain lipids.
- glycogen** A polysaccharide synthesized in animals as a means of storing glucose; glycogen is stored in the liver and in the muscles.
- goiter** A disorder of the human regulatory system in which the thyroid gland enlarges because of a deficiency of dietary iodine.
- Golgi complex** Cell organelles that package cell products and move them to the plasma membrane for secretion.
- gonad** An endocrine gland that produces the hormones responsible for the production of various secondary sex characteristics. (See ovary; testis.)

gout A disorder of the human excretory system in which uric acid accumulates in the joints, causing severe pain.

gradualism A theory of the time frame required for organic evolution that assumes that evolutionary change is slow, gradual, and continuous.

grafting A technique of plant propagation in which the stems of desirable plants are attached (grafted) to rootstocks of related varieties to produce new plants for commercial purposes.

grana The portion of the chloroplast within which chlorophyll molecules are concentrated.

grassland A terrestrial biome characterized by wide variation in temperature and a climax flora that includes grasses.

growth A process by which cells increase in number and size, resulting in an increase in size of the organism.

growth-stimulating hormone (GSH) A pituitary hormone regulating the elongation of the long bones of the body.

guanine A nitrogenous base found in both DNA and RNA molecules.

guard cell One of a pair of cells that surround the leaf stomata and regulate its size.

H

habitat The environment or set of ecological conditions within which an organism lives.

Hardy-Weinberg principle A hypothesis, advanced by G. H. Hardy and W. Weinberg that states that the gene pool of a population should remain stable as long as a set of ideal conditions is met.

heart In human beings, a four-chambered muscular pump that facilitates the movement of blood throughout the body,

helix Literally a spiral; a term used to

describe the twisted ladder shape of the DNA molecule.

hemoglobin A type of protein specialized for the transport of respiratory oxygen in certain organisms, including earthworms and human beings.

herbivore A heterotrophic organism that consumes plant matter as its primary source of nutrition, (See primary consumer.)

hermaphrodite An animal organism that produces both male and female gametes.

heterotroph An organism that typically carries on heterotrophic nutrition,

heterotroph hypothesis A scientific hypothesis devised to explain the probable origin and early evolution of life on earth.

heterotrophic nutrition A type of nutrition in which organisms must obtain their foods from outside sources of organic nutrients.

heterozygous A term used to refer to an allele pair in which the alleles have different, contrasting effects (for example, *Aa*, *RW*).

high blood pressure A disorder of the human transport system in which systolic and diastolic pressures register higher than normal because of narrowing of the artery opening.

histamine A chemical product of the body that causes irritation and swelling of the mucous membranes.

homeostasis The condition of balance and dynamic stability that characterizes living systems under normal conditions.

homologous chromosomes A pair of chromosomes that carry corresponding genes for the same traits.

homologous structures Structures present within different species that can be shown to have had a common origin but that may or may not share a common function.

homozygous A term used to refer to an allele pair in which the alleles are identical in terms of effect (for example,

.AA, aa),
hormone A chemical product of an endocrine gland that has a regulatory effect on the cell's metabolism.
host The organism harmed in a parasitic relationship,
hybrid A term used to describe a heterozygous genotype. (See **heterozygous**.)
hybridization A technique of plant/animal breeding in which two varieties of the same species are crossbred in the hope of producing offspring with the favorable traits of both varieties.
hydrogen bond A weak electrostatic bond that holds together the twisted strands of DNA and RNA molecules.
hydrolysis The chemical process by which a complex food molecule is split into simpler components through the addition of a molecule of water to the bonds holding it together.
hypocotyl A portion of the plant embryo that specializes to become the root and lower stem of the adult plant.
hypothalamus An endocrine gland whose secretions affect the pituitary gland.

identical twins In human beings, twin offspring resulting from the separation of the embryonic cell mass of a single fertilization into two separate masses; such twins are genetically identical.
importation of organisms The introduction of nonactive plants and animals into new areas where they compete strongly with native species—a negative aspect of human involvement with the environment.
in vitro fertilization A laboratory technique in which fertilization is accomplished outside the mother's body using mature ova and sperm extracted from the parents' bodies.
inbreeding A technique of plant/animal breeding in which a purebred variety is

bred only with its own members so as to maintain a set of desired characteristics.

independent assortment A pattern of inheritance in which genes on different, nonhomologous chromosomes are free to be inherited randomly and regardless of the inheritance of the others.
ingestion The mechanism by which an organism takes in food from its environment.
Inorganic compound A chemical compound that lacks the element carbon or hydrogen (for example, table salt: NaCl).
insulin A hormone, secreted by the islets of Langerhans, that regulates the storage of blood sugar as glycogen.
intercellular fluid (IGF) The fluid that bathes cells and fills intercellular spaces.
interferon A substance, important in the fight against human cancer, that may now be produced in large quantities with techniques of genetic engineering.
intermediate inheritance Any pattern of inheritance in which the offspring expresses a phenotype different from the phenotypes of its parents and usually representing a form intermediate between them.
internal development Embryonic development that occurs within the body of the female parent.
internal fertilization Fertilization that occurs inside the body of the female parent.
interneuron A type of neuron, located in the central nervous system, responsible for the interpretation of impulses received from sensory neurons.
intestine A portion of the digestive tract in which chemical digestion and absorption of digestive end products occur.
intracellular digestion A type of chemical digestion carried out within the cell.
iodine A chemical stain used in cell study; an indicator used to detect the

presence of starch. (See **staining**.)

islets of Langerhans An endocrine gland, located within the pancreas, that produces the hormones insulin and glucagon.

K

karyotype An enlarged photograph of the paired homologous chromosomes of an individual cell that is used in the detection of certain genetic disorders involving chromosome mutation.

karyotyping A technique for the detection of human genetic disorders in which a karyotype is analyzed for abnormalities in chromosome structure or number.

kidney The excretory organ responsible for maintaining the chemical composition of the blood, (See **nephron**)

kidney failure A disorder of the human excretory system in which there is a general breakdown of the kidney's ability to filter blood components.

kingdom A level of biological classification that includes a broad grouping of organisms displaying general structural similarity; five kingdoms have been named by scientists.

L

lacteal A small extension of the lymphatic system, found inside the villus, that absorbs fatty acids and glycerol resulting from lipid hydrolysis.

lactic acid fermentation A type of anaerobic respiration in which glucose is converted to two lactic acid molecules.

large intestine A portion of the digestive tract in which undigested foods are solidified by means of water absorption to form feces.

lateral meristem A plant growth region located under the epidermis or bark of a stem. (See **cambium**.)

latin The language used in biological classification for naming organisms by

means of binomial nomenclature.

lenticel A small pore in the stem surface that permits the absorption and release of respiratory gases within stem tissues.

leukemia A disorder of the human transport system in which the bone marrow produces large numbers of abnormal white blood cells. (See **cancer**.)

lichen A symbiosis of alga and fungus that frequently acts as a pioneer species on bare rock.

limiting factor Any abiotic or biotic condition that places limits on the survival of organisms and on the growth of species populations in the environment.

lipase Any lipid-hydrolyzing enzyme.

lipid An organic compound composed of carbon, hydrogen, and oxygen in which hydrogen and oxygen are *not* in a 2:1 ratio (for example, a wax, plant oil); many lipids are constructed of a glycerol and three fatty acids.

liver An accessory organ that stores glycogen, produces bile, destroys old red blood cells, deaminates amino acids, and produces urea.

lock-and-key model A theoretical model of enzyme action that attempts to explain the concept of enzyme specificity.

lung The major organ of respiratory gas exchange.

luteinizing hormone (LH) A pituitary hormone that regulates the conversion of the ovarian follicle into the corpus luteum.

lymph Intercellular fluid (ICF) that has passed into the lymph vessels.

lymph node One of a series of structures in the body that act as reservoirs of lymph and also contain white blood cells as part of the body's immune system.

lymph vessel One of a branching series of tubes that collect ICF from the tissues and redistribute it as lymph.

lymphatic circulation The movement of

lymph throughout the body,
lymphocyte A type of white blood cell that produces antibodies.
lysosome A cell organelle that houses hydrolytic enzymes used by the cell in the process of chemical digestion.

M

- Malpighian tubules** In arthropods (for example, grasshopper), an organ specialized for the removal of metabolic wastes.
- maltase** A specific enzyme that catalyzes the hydrolysis (and dehydration synthesis) of maltose.
- maltose** A type of disaccharide; a maltose molecule is composed of two units of glucose joined together by dehydration synthesis.
- marine biome** An aquatic biome characterized by relatively stable conditions of moisture, salinity, and temperature.
- marsupial mammal** See **nonplacental mammal**.
- mechanical digestion** Any of the processes by which foods are broken apart physically into smaller particles.
- medulla** The portion of the human brain responsible for regulating the automatic processes of the body.
- meiosis** The process by which four monoploid nuclei are formed from a single diploid nucleus.
- meningitis** A disorder of the human regulatory system in which the membranes of the brain or spinal cord become inflamed.
- menstrual cycle** A hormone-controlled process responsible for the monthly release of mature ova.
- menstruation** The stage of the menstrual cycle in which the lining of the uterus; breaks down and is expelled from the body via the vaginal canal.
- meristem** A plant tissue specialized for embryonic development. (See **meristem**; **lateral meristem**; **cambium**/)
- mesoderm** An embryonic tissue that differentiates into muscle, bone, the excretory system, and most of the reproductive system in the adult animal.
- messenger RNA (mRNA)** A type of RNA that carries the genetic code from the nuclear DNA to the ribosome for transcription.
- metabolism** All of the chemical processes of life considered together; the sum total of all the cell's chemical activity.
- methylene blue** A chemical stain used in cell study. (See **staining**.)
- micradissection instruments** Tools of biological study used to remove certain cell organelles from within cells for examination.
- micrometer (μm)** A unit of linear measurement equal in length to 0,001 millimeter (0,000001 meter), used for expressing the dimensions of cells and cell organelles.
- mitochondrion** A cell organelle that contains the enzymes necessary for aerobic respiration.
- mitosis** A precise duplication of the contents of a parent cell nucleus followed by an orderly separation of these contents into two new, identical daughter nuclei.
- mitotic cell division** A type of cell division that results in the production of two daughter cells identical to each other and to the parent cell.
- Monera** One of the five biological kingdoms; it includes simple unicellular forms lacking nuclear membranes (for example, bacteria).
- monohybrid cross** A genetic cross between two organisms both heterozygous for a trait controlled by a single allele pair. The phenotypic ratio resulting is 3:1; the genotypic ratio is 1:2:1.
- monoploid chromosome number** The number of chromosomes commonly found in the gametes of sexually reproducing species.

monosaccharide A type of carbohydrate known also as a simple sugar; all monosaccharides have the molecular formula $C_6H_{12}O_6$.

motor neuron A type of neuron that carries command impulses from the central nervous system to an effector organ.

mucus A protein-rich mixture that bathes and moistens the respiratory surfaces.

multicellular Having a body that consists of large groupings of specialized cells (for example, human being),

multiple alleles A pattern of inheritance in which the existence of more than two alleles is hypothesized, only two of which are present in the genotype of any one individual.

muscle A type of tissue specialized to produce movement of body parts.

mutagenic agent Any environmental condition that initiates or accelerates genetic mutation.

mutation Any alteration of the genetic material, either a chromosome or a gene, in an organism.

mutualism A type of symbiosis beneficial to both organisms in the relationship.

N

nasal cavity A series of channels through which outside air is admitted to the body interior and is warmed and moistened before entering the lung.

natural selection A concept, central to Darwin's theory of evolution, to the effect that the individuals best adapted to their environment tend to survive and to pass their favorable traits on to the next generation

negative feedback A type of endocrine regulation in which the effects of one gland may inhibit its own secretory activity while stimulating the secretory activity of another gland.

nephridium An organ found in certain organisms, including the earthworm, specialized for the removal of meta-

bolic wastes.

nephron The functional unit of the kidney. (See **glomerulus**; **Bowman's capsule**.)

nerve A structure formed from the bundling of neurons carrying sensory or motor impulses.

nerve impulse An electrochemical change in the surface of the nerve cell.

nerve net A network of nerve-like cells in coelenterates such as the hydra.

neuron A cell specialized for the transmission of nerve impulses.

neurotransmitter A chemical substance secreted by a neuron that aids in the transmission of the nerve impulse to an adjacent neuron.

niche The role that an organism plays in its environment.

nitrifying bacteria In the nitrogen cycle, bacteria that absorb ammonia and convert it into nitrate salts,

nitrogen cycle The process by which nitrogen is recycled and made available for use by other organisms.

nitrogen-fixing bacteria A type of bacteria responsible for absorbing atmospheric nitrogen and converting it to nitrate salts in the soil.

nitrogenous base A chemical unit composed of carbon, hydrogen, and nitrogen that is a component part of the nucleotide unit,

nitrogenous waste Any of a number of nitrogen-rich compounds that result from the metabolism of proteins and amino acids in the cell. (See **ammonia**; **urea**; **uric acid**.)

nondisjunction A type of chromosome mutation in which the members of one or more pairs of homologous chromosomes fail to separate during the disjunction phase of the first meiotic division.

nonplacental mammal A type of mammal (marsupial) in which internal development is accomplished without the aid of a placental connection.

nucleic acid An organic compound

composed of repeating units of nucleotide.

nucleolus A cell organelle located within the nucleus that functions in protein synthesis.

nucleotide The repeating unit making up the nucleic acid polymer (for example, DNA, RNA).

nucleus A cell organelle that contains the cell's genetic information in the form of chromosomes.

nutrition The life function by which living things obtain food and process it for their use.

O

omnivore A heterotrophic organism that consumes both plant and animal matter as sources of nutrition.

one gene-one polypeptide A scientific hypothesis concerning the role of the individual gene in protein synthesis.

oogenesis A type of meiotic cell division in which one ovum and three polar bodies are produced from each primary sex cell.

open transport system A type of circulatory system in which the transport fluid is *not* always enclosed within blood vessels (for example, grasshopper).

oral cavity In human beings, the organ used for the ingestion of foods.

oral groove The ingestive organ of the paramecium.

organ transplant An application of the study of immunity in which an organ or tissue of a donor is transplanted into a compatible recipient.

organelle A small, functional part of a cell specialized to perform a specific life function (for example, nucleus, mitochondrion).

organic compound a chemical compound that contains the elements carbon and hydrogen (for example, carbohydrate, protein).

organic evolution The mechanism thought to govern the changes in living

species over geologic time,

osmosis A form of passive transport by which water is absorbed or released by cells.

ovary A female gonad that secretes the hormone estrogen, which regulates female secondary sex characteristics; ovary also produces ova, which are used in reproduction.

overcropping A negative aspect of human involvement with the environment in which soil is overused for the production of crops, leading to exhaustion of soil nutrients.

overgrazing The exposure of soil to erosion due to the loss of stabilizing grasses when it is overused by domestic animals—a negative aspect of human involvement with the environment.

overhunting A negative aspect of human involvement with the environment in which certain species have been greatly reduced or made extinct by uncontrolled hunting practices.

oviduct A tube that serves as a channel for conducting mature ova from the ovary to the uterus; the site of fertilization and the earliest stages of embryonic development.

ovulation The stage of the menstrual cycle in which the mature ovum is released from the follicle into the oviduct.

ovule A structure located within the flower ovary that contains a monoploid egg nucleus and serves as the site of fertilization.

ovum A type of gamete produced as a result of oogenesis in female animals; the egg, the female sex cell.

oxygen 18 A radioactive isotope of oxygen that is used to trace the movement of this element in biochemical reaction sequences.

oxygenated blood Blood that contains a high percentage of oxyhemoglobin.

oxyhemoglobin Hemoglobin that is loosely bound to oxygen for purposes of oxygen transport.

P

- pH** A chemical unit used to express the concentration of hydrogen ion (H^+), or the acidity, of a solution.
- palisade layer** A cell layer found in most leaves that contains high concentrations of chloroplasts.
- pancreas** An accessory organ that produces enzymes that complete the hydrolysis of foods to soluble end products; also the site of insulin and glucagon production.
- parasitism** A type of symbiosis from which one organism in the relationship benefits, while the other (the host) is harmed, but not ordinarily killed.
- parathormone** A hormone of the parathyroid gland that regulates the metabolism of calcium in the body.
- parathyroid gland** An endocrine gland whose secretion, parathormone, regulates the metabolism of calcium in the body.
- passive immunity** A temporary immunity produced as a result of the injection of preformed antibodies.
- passive transport** Any process by which materials are absorbed into the cell interior from an area of high concentration to an area of low concentration without the expenditure of cell energy (for example, osmosis, diffusion).
- penis** A structure that permits internal fertilization through direct implantation of sperm into the female reproductive tract.
- peptide bond** A type of chemical bond that links the nitrogen atom of one amino acid with the terminal carbon atom of a second amino acid in the formation of a dipeptide.
- peripheral nerves** Nerves in the earthworm and grasshopper that branch from the ventral nerve cord to other parts of the body.
- peripheral nervous system** A major subdivision of the nervous system that consists of all the nerves of all types branching through the body. (See **autonomic nervous system**; **somatic nervous system**.)
- peristalsis** A wave of contractions of the smooth muscle lining; the digestive tract that causes ingested food to pass along the food tube.
- petal** An accessory part of the flower that is thought to attract pollinating insects.
- phagocyte** A type of white blood cell that engulfs and destroys bacteria.
- phagocytosis** The process by which an ameba surrounds and ingests large food particles for intracellular digestion.
- pharynx** The upper part of the digestive tube that temporarily stores food before digestion.
- phenotype** The observable trait that results from the action of an allele pair.
- phenylketonuria (PKU)** A genetically related human disorder in which the homozygous combination of a particular mutant gene prevents the normal metabolism of the amino acid phenylalanine.
- ploem** A type of vascular tissue through which water and dissolved sugars are transported in plants from the leaf downward to the roots for storage.
- phosphate group** A chemical group made up of phosphorus and oxygen and that is a component part of the nucleotide unit.
- phosphoglyceraldehyde (PGAL)** An intermediate product formed during photosynthesis that acts as the precursor of glucose formation.
- photochemical reactions** A set of biochemical reactions in photosynthesis in which light is absorbed and water molecules are split, (See **photolysis**.)
- photolysis** The portion of the photochemical reactions in which water molecules are split into hydrogen atoms and made available to the carbon fixation reactions.
- photosynthesis** A type of autotrophic nutrition in which green plants use the energy of sunlight to convert carbon

dioxide and water into glucose,

phylum A level of biological classification that is a major subdivision of the kingdom level, containing fewer organisms with greater similarity (for example, Chordata).

pinocytosis A special type of absorption by which liquids and particles too large to diffuse through the cell membrane may be taken in by vacuoles formed at the cell surface.

pioneer autotrophs The organisms supposed by the heterotroph hypothesis to have been the first to evolve the ability to carry on autotrophic nutrition.

pioneer species In an ecological succession, the first organisms to inhabit a barren environment.

pistil The female sex organ of the flower. (See **stigma**; **style**; **ovary**.)

pituitary gland An endocrine gland that produces hormones regulating the secretions of other endocrine glands; the master gland.

placenta In placental mammals, a structure composed of both embryonic and maternal tissues that permits the diffusion of soluble substances to and from the fetus for nourishment and the elimination of fetal waste.

placental mammal A mammal species in which embryonic development occurs internally with the aid of a placental connection to the female parent's body.

plant One of the five biological kingdoms; it includes multicellular organisms whose cells are bounded by cell walls and that are capable of photosynthesis (for example, maple tree).

plasma The liquid fraction of blood, containing water and dissolved proteins.

plasma membrane A cell organelle that encloses the cytoplasm and other cell organelles and regulates the passage of materials into and out of the cell.

platelet A cell-like component of the blood that is important in clot formation.

polar body One of three nonfunctional cells produced during oogenesis that contain monoploid nuclei and disintegrate soon after completion of the process.

polio A disorder of the human regulatory system in which viral infection of the central nervous system may result in severe paralysis.

pollen The male gamete of the flowering plant.

pollen tube A structure produced by the germinating pollen grain that grows through the style to the ovary and carries the sperm nucleus to the ovule for fertilization.

pollination The transfer of pollen grains from anther to stigma.

pollution control The development of new procedures to reduce the incidence of air, water, and soil pollution—a positive aspect of human involvement with the environment.

polyploidy A type of chromosome mutation in which an entire set of homologous chromosomes fail to separate during the disjunction phase of the first meiotic division.

polysaccharide A type of carbohydrate composed of repeating units of monosaccharides that form a polymeric chain.

polyunsaturated fat A type of fat in which many bonding sites are unavailable for the addition of hydrogen atoms.

population All the members of a particular species in a given geographical location at a given time.

population control The use of various practices to slow the rapid growth in the human population—a positive aspect of human interaction with the environment.

population genetics A science that studies the genetic characteristics of a sexually reproducing species and the factors that affect its gene frequencies.

postnatal development The growth and maturation of an individual from birth,

- through aging, to death.
- prenatal development** The embryonic development that occurs before birth within the uterus. (See gestation.)
- primary consumer** Any herbivorous organism that receives food energy from the producer level (for example, mouse); the second stage of a food chain.
- primary sex cell** The diploid cell that undergoes meiotic cell division to produce monoploid gametes.
- producer** Any autotrophic organism capable of trapping light energy and converting it to the chemical bond energy of food (for example, green plants); the organisms forming the basis of the food chain.
- progesterone** A hormone produced by the corpus luteum and/or placenta that has the effect of maintaining the uterine lining and suppressing ovulation during gestation.
- protease** Any protein-hydrolyzing enzyme.
- protein** A complex organic compound composed of repeating units of amino acid.
- Protista** One of the five biological kingdoms; it includes simple unicellular forms whose nuclei are surrounded by nuclear membranes (for example, ameba, paramecium).
- pseudopod** A temporary, flowing extension of the cytoplasm of an ameba that is used in nutrition and locomotion.
- pulmonary artery** One of two arteries that carry blood from the heart to the lungs for reoxygenation.
- pulmonary circulation** Circulation of blood from the heart through the lungs and back to the heart.
- pulmonary vein** One of four veins that carry oxygenated blood from the lungs to the heart.
- pulse** Rhythmic contractions of the artery walls that help to push the blood fluid through the capillary networks of the body.
- punctuated equilibrium** A theory of the time frame required for evolution that assumes that evolutionary change occurs in bursts with long periods of relative stability intervening.
- pyramid of biomass** a construct used to illustrate the fact that the total biomass available in each stage of a food chain diminishes from producer level to consumer level.
- pyramid of energy** A construct used to illustrate the fact that energy is lost at each trophic level in a food chain and is most abundant at the producer level.
- pyruvic acid** An intermediate product in the aerobic or anaerobic respiration of glucose.
- receptor** An organ specialized to receive a particular type of environmental stimulus.
- recessive allele (gene)** An allele (gene) whose effect is masked by that of its dominant allele.
- recombinant DNA** DNA molecules that have been moved from one cell to another in order to give the recipient cell a genetic characteristic of the donor cell.
- recombination** The process by which the members of segregated allele pairs are randomly recombined in the zygote as a result of fertilization.
- rectum** The portion of the digestive tract in which digestive wastes are stored until they can be released to the environment.
- red blood cell** Small, nonnucleated cells in the blood that contain hemoglobin and carry oxygen to body tissues.
- reduction division** See meiosis.
- reflex** A simple, inborn, involuntary response to an environmental stimulus.
- reflex arc** The complete path involving a series of three neurons (sensory, interneuron, and motor) working together in a reflex action.
- regeneration** A type of asexual reproduction in which new organisms are produced from the severed parts of a single parent organism; the replacement

of loss or damaged tissues.

regulation The life process by which living things respond to changes within and around them, and by which all life processes are coordinated.

replication An exact self-duplication of the chromosome during the early stages of cell division; the exact self-duplication of a molecule of DNA.

reproduction The life process by which new cells arise from preexisting cells by cell division.

reproductive isolation The inability of species varieties to interbreed and produce fertile offspring because of variations in behavior or chromosome structure.

respiration The life function by which living things convert the energy of organic foods into a form more easily used by the cell.

response The reaction of an organism to an environmental stimulus.

rhizoid A rootlike fiber produced by fungi that secrete hydrolytic enzymes and absorb digested nutrients.

ribonucleic acid (RNA) A type of nucleic acid that operates in various ways to facilitate protein synthesis.

ribose A five-carbon sugar found as a component part of the nucleotides of RNA molecules only.

ribosomal RNA (rRNA) The type of RNA that makes up the ribosome.

ribosome A cell organelle that serves as the site of protein synthesis in the cell.

root A plant organ specialized to absorb water and dissolved substances from the soil as well as to anchor the plant to the soil.

root hair A small projection of the growing root that serves to increase the surface area of the root for absorption.

roughage A variety of undigestible carbohydrates that add bulk to the diet and facilitate the movement of foods through the intestine.

runner A type of vegetative propagation in which an above ground stem (runner)

produces roots and leaves and establishes new organisms with identical characteristics.

S

saliva A fluid secreted by salivary glands that contains hydrolytic enzymes specific to the digestion of starches.

salivary gland The gland that secretes saliva, which is important in the chemical digestion of certain foods.

salt A chemical composed of a metal and a nonmetal joined by means of an ionic bond (for example, sodium chloride).

saprophyte A heterotrophic organism that obtains its nutrition from the decomposing remains of dead plant and animal tissues (for example, fungi, bacteria).

saturated fat A type of fat molecule in which all available bonding sites on the hydrocarbon chains are taken up with hydrogen atoms.

scrotum A pouch extending from the wall of the lower abdomen that houses the testes at a temperature optimum for sperm production.

secondary consumer Any carnivorous animal that derives its food energy from the primary consumer level (for example, a snake); the third level of a food chain.

secondary sex characteristics The physical features, different in males and females, that appear with the onset of sexual maturity.

seed A structure that develops from the fertilized ovule of the flower and germinates to produce a new plant.

seed dispersal Any mechanism by which seeds are distributed in the environment so as to widen the range of a plant species. (See **fruit**.)

segregation The random separation of the members of allele pairs that occurs during meiotic cell division.

self-pollination A type of pollination in which the pollen of a flower pollinates

- another flower located on the same plant organism.
- sensory neuron** A type of neuron specialized for receiving environmental stimuli, which are detected by receptor organs.
- sepal** An accessory part of the flower that functions to protect the bud during development.
- sessile** A term that relates to the unmoving state of certain organisms, including the hydra.
- seta** One of several small, chitinous structures (setae) that aid the earthworm in its locomotor function.
- sex chromosomes** A pair of homologous chromosomes carrying genes that determine the sex of an individual; these chromosomes are designated as X and Y.
- sex determination** A pattern of inheritance in which the conditions of male-ness and femaleness are determined by the inheritance of a pair of sex chromosomes (XX = female; XY = male).
- sex linkage** A pattern of inheritance in which certain nonsex genes are located on the X sex chromosome but have no corresponding alleles on the Y sex chromosome.
- sex-linked trait** A genetic trait whose inheritance is controlled by the genetic pattern of sex linkage (for example, color blindness).
- sexual reproduction** A type of reproduction in which new organisms form as a result of the fusion of gametes from two parent organisms.
- shell** An adaptation for embryonic development in many terrestrial, externally developing species that protects the developing embryo from drying and physical damage (for example, birds).
- sickle-cell anemia** A genetically related human disorder in which the homozygous combination of a mutant gene leads to the production of abnormal hemoglobin and crescent-shaped red blood cells.
- skeletal muscle** A type of muscle tissue associated with the voluntary movements of skeletal levers in locomotion.
- small intestine** In human beings, the longest portion of the food tube, in which final digestion and absorption of soluble end products occur.
- smooth muscle** See **visceral muscle**.
- somatic nervous system** A subdivision of the peripheral nervous system that is made up of nerves associated with voluntary actions.
- speciation** The process by which new species are thought to arise from previously existing species.
- species** A biological grouping of organisms so closely related that they are capable of interbreeding and producing fertile offspring (for example, human being).
- species presentation** The establishment of game lands and wildlife refuges that have permitted the recovery of certain endangered species—a positive aspect of human involvement with the environment.
- sperm** A type of gamete produced as a result of spermatogenesis in male animals; the male reproductive cell.
- spermatogenesis** A type of meiotic cell division in which four sperm cells are produced from each primary sex cell.
- spinal cord** The part of the central nervous system responsible for reflex action as well as impulse conduction between the peripheral nervous system and the brain.
- spindle apparatus** A network of fibers that form during cell division and to which centromeres attach during the separation of chromosomes.
- spiracle** One of several small pores in arthropods, including the grasshopper, that serve as points of entry of respiratory gases from the atmosphere to the tracheal tubes.
- spongy layer** A cell layer found in most leaves that is loosely packed and contains many air spaces to aid in

- gas exchange.
- spore** A specialized asexual reproductive cell produced by certain plants.
- sporulation** A type of asexual reproduction in which spores released from special spore cases on the parent plant germinate and grow into new adult organisms of the species.
- staining** A technique of cell study in which chemical stains are used to make cell parts more visible for microscopic study.
- stamen** The male reproductive structure in a flower. (See **anther**; **filament**.)
- starch** A type of polysaccharide produced and stored by plants.
- stem** A plant organ specialized to support the leaves and flowers of a plant as well as to conduct materials between the roots and the leaves.
- stigma** The sticky upper portion of the pistil, which serves to receive pollen.
- stimulus** Any change in the environment to which an organism responds.
- stomach** A muscular organ that acts to liquefy food and that produces gastric protease for the hydrolysis of protein.
- stomate** A small opening that penetrates the lower epidermis of a leaf and through which respiratory and photo-synthetic gases diffuse.
- strata** The layers of sedimentary rock that contain fossils, whose ages may be determined by studying the patterns of sedimentation.
- stroke** A disorder of the human regulatory system in which brain function is impaired because of oxygen starvation of brain centers.
- stroma** An area of the chloroplast within which the carbon-fixation reactions occur; each stroma lies between pairs of grana.
- style** The portion of the pistil that connects the stigma to the ovary.
- substrate** A chemical metabolized by the action of a specific enzyme.
- succession** A situation in which an established ecological community is gradually replaced by another until a climax community is established.
- survival of the fittest** The concept, frequently associated with Darwin's theory of evolution, that in the intraspecies competition among naturally occurring species, the organisms best adapted to the particular environment will survive.
- sweat glands** In human beings, the glands responsible for the production of perspiration.
- symbiosis** A term that refers to a variety of biotic relationships in which organisms of different species live together in close physical association.
- synapse** The gap that separates the terminal branches of one neuron from the dendrites of an adjacent neuron.
- synapsis** The intimate, highly specific pairing of homologous chromosomes that occurs in the first meiotic division, forming tetrads.
- synthesis** The life function by which living things manufacture the complex compounds required to sustain life.
- systemic circulation** The circulation of blood from the heart through the body tissues (except the lungs) and back to the heart.
- systole** The higher pressure registered during blood pressure testing. (See **diastole**.)

T

- taiga** A terrestrial biome characterized by long, severe winters and climax flora that includes coniferous trees.
- Tay-Sachs disease** A genetically related human disorder in which fatty deposits in the cells, particularly of the brain, inhibit proper functioning of the nervous system.
- technological oversight** A term relating to human activities that adversely affect environmental quality due to failure to assess the environmental impact of a technological development adequately.

- teeth** Structures located in the mouth that are specialized to aid in the mechanical digestion of foods.
- temperate deciduous forest** A terrestrial biome characterized by moderate climatic conditions and climax flora that includes deciduous trees.
- template** A pattern or design provided by the DNA molecule for the synthesis of protein molecules.
- tendon** A type of connective tissue that attaches a skeletal muscle to a bone.
- tendonitis** A disorder of the human locomotor system in which the junction between a tendon and a bone becomes irritated and inflamed.
- tentacle** A grasping structure in certain organisms, including the hydra, that contains stinging cells and is used for capturing prey.
- terminal branch** A cytoplasmic extension of the neuron that transmits a nerve impulse to adjacent neurons via the secretion of neuro-transmitters.
- terrestrial biome** A biome that comprises primarily land ecosystems, the characteristics of which are determined by the major climate zone of the earth.
- testcross** A genetic cross to determine the genotype of an organism expressing a dominant phenotype; the unknown is crossed with a homozygous recessive.
- testis** A gonad in human males that secretes the hormone testosterone, which regulates male secondary sex characteristics; the testis also produces sperm cells for reproduction.
- testosterone** A hormone secreted by the testis that regulates the production of male secondary sex characteristics.
- tetrad** A grouping of four chromatids that results from synapsis.
- thymine** A nitrogenous base found only in DNA.
- thyroid gland** An endocrine gland that regulates the body's general rate of metabolism through secretion of the hormone thyroxin.
- thyroid-stimulating hormone (TSH)** A pituitary hormone that regulates the secretions of the thyroid gland.
- thyroxin** A thyroid hormone that regulates the body's general metabolic rate.
- tongue** A structure that aids in the mechanical digestion of foods.
- trachea** A cartilage-ringed tube that conducts air from the mouth to the bronchi.
- tracheal tube** An adaptation in arthropods (for example, grasshopper) that functions to conduct respiratory gases from the environment to the moist internal tissues.
- Tracheophyta** A phylum of the plant kingdom whose members (tracheophytes) contain vascular tissues and true roots, stems, and leaves (for example, geranium; fern, bean, maple tree, corn).
- transfer ANA (tRNA)** A type of RNA that transports specific amino acids from the cytoplasm to the ribosome for protein synthesis.
- translocation** A type of chromosome mutation in which a section of a chromosome is transferred to a non-homologous chromosome.
- transpiration** The evaporation of water from leaf stomates.
- transpiration pull** A force that aids the upward conduction of materials in the xylem by means of the evaporation of water (transpiration) from leaf surfaces.
- transport** The life function by which substances are absorbed, circulated, and released by living things.
- triplet codon** A group of three nitrogenous bases that provide information for the placement of amino acids in the synthesis of proteins.
- tropical forest** A terrestrial biome characterized by a warm, moist climate and a climax flora that includes many species of broad-leaved trees.
- tropism** A plant growth response to an environmental stimulus.
- tuber** A type of vegetative propagation in

which an underground stem (tuber) produces new tubers, each of which is capable of producing new organisms with identical characteristics.

tundra A terrestrial biome characterized by permanently frozen soil and climax flora that includes lichens and mosses.

tympanum A receptor organ in arthropods (for example, grass-hopper) that is specialized to detect vibrational stimuli.

U

ulcer A disorder of the human digestive tract in which a portion of its lining erodes and becomes irritated.

ultracentrifuge A tool of biological study that uses very high speeds of centrifugation to separate cell parts for examination.

umbilical cord In placental mammals, a structure containing blood vessels that connects the placenta to the embryo.

unicellular Having a body that consists of a single cell (for example, paramecium).

uracil A nitrogenous base that is a component part of the nucleotides of RNA molecules only.

urea A type of nitrogenous waste with moderate solubility and moderate toxicity.

ureter In human beings, a tube that conducts urine from the kidney to the urinary bladder.

urethra In human beings, a tube that conducts urine from the urinary bladder to the exterior of the body. The urethra also conducts semen to the outside of the body.

uric acid A type of nitrogenous waste with low solubility and low toxicity.

urinary bladder An organ responsible for the temporary storage of urine.

urine A mixture of water, salts, and urea excreted from the kidney.

use and disuse A term associated with the evolutionary theory of Lamarck, since proved incorrect,

uterus In female placental mammals, the organ within which embryonic development occurs.

V

vaccination An inoculation of dead or weakened disease organisms that stimulates the body's immune system to produce active immunity.

vacuole A cell organelle that contains storage materials (for example, starch, water) housed inside the cell.

vagina In female placental mammals, the portion of the reproductive tract into which sperm are implanted during sexual intercourse and through which the baby passes during birth.

variation A concept, central to Darwin's theory of evolution, that refers to the range of adaptation that can be observed in all species.

vascular tissues Tubelike plant tissues specialized for the conduction of water and dissolved materials within the plant. (See **xylem**; **phloem**.)

vegetative propagation A type of asexual reproduction in which new plant organisms are produced from the vegetative (nonfloral) parts of the parent plant.

vein (human) A relatively thin-walled blood vessel that carries blood from capillary networks back toward the heart.

vein (plant) An area of vascular tissues located in the leaf that aid the upward transport of water and minerals through the leaf and the transport of dissolved sugars to the stem and roots.

vena cava One of two major arteries that return blood to the heart from the body tissues.

ventral nerve cord The main pathway for nerve impulses between the brain and peripheral nerves of the grasshopper and earthworm.

ventricle One of two thick-walled, muscular chambers of the heart that pump

blood out to the lungs and body.

villi Microscopic projections of the lining of the small intestine that absorb the soluble end products of digestion. (See **lacteal**.)

visceral muscle A type of muscle tissue associated with the involuntary movements of internal organs (for example, peristalsis in the small intestine).

vitamin A type of nutrient that acts as a coenzyme in various enzyme-controlled reactions.

W

water cycle The mechanism by which water is made available to living things in the environment through the processes of precipitation, evaporation, runoff, and percolation.

water pollution A type of technological oversight that involves the addition of some unwanted factor (for example, sewage, heavy metals, heat, toxic chemicals) to our water resources.

Watson-Crick model A model of DNA structure devised by J. Watson and F. Crick that hypothesizes a twisted ladder arrangement for the DNA molecule also known as a "double helix."

white blood cell A type of blood cell that functions in disease control. (See **phagocyte**; **lymphocyte**.)

X

xylem A type of vascular tissue through which water and dissolved minerals are transported upward through a plant from the root to the stems and leaves.

Y

yolk A food substance, rich in protein and lipid, found in the eggs of many animal species.

yolk sac The membrane that surrounds the yolk food supply of the embryos of many animal species.

Z

zygote The single diploid cell that results from the fusion of gametes in sexual reproduction; a fertilized egg.