

Glossary

Abortion: Expulsion or removal of a fetus from the womb prematurely.

Acquired characteristics: Physiological or other changes developed during the lifetime of an individual.

Actin: A contractile protein found in many eucaryotic cells, especially muscle cells, forming part of the cytoskeleton.

Action potential (spike): A large reversal of polarization in a nerve cell membrane, resulting in a nerve impulse.

Active transport: Use of energy to transport a substance, often from an area where it is in lower concentration to an area where it is in higher concentration. Active transport is performed by membrane proteins called transporters.

Acute effect: An effect that ceases soon after its cause is removed.

Adaptation: (1) Any trait that increases fitness or increases the ability of a population to persist in a particular environment. (2) A physiological change in response to a stimulus that prepares the body to better withstand or react more vigorously to similar stimuli.

Addiction: A strong psychological and physiological dependence.

Additive effect: A physiological response produced by two drugs given together that is the same as the sum of the effects of each drug given separately.

Age pyramid: A diagram that represents the age distribution of a population by a stack of rectangles, each proportional in size to the percentage of individuals in a particular age group.

Age structure: The distribution of members of a population into different age groups.

Agonist: A drug that stimulates a particular receptor or that has a stated effect.

AIDS (Acquired ImmunoDeficiency Syndrome): Impairment of most parts of the immune system resulting from infection with human immunodeficiency virus, accompanied by opportunistic infections or rare cancers and leading, in most cases, to death.

Adult stem cell: A cell in an adult organism that still retains the capacity to differentiate and form cells of several different kinds.

Algae: Photosynthetic plants not differentiated into tissues and having reproductive cells (gametes) not surrounded by protective nonreproductive cells.

Alkaptonuria: A genetic condition (inborn error of metabolism) in which urine turns dark upon exposure to air because of the body's inability to break down a compound called homogentisic acid.

Allele: One of the alternative DNA sequences of a gene.

Allele frequency: The frequency of an allele in a population, or the fraction of gametes that carry a particular allele.

Allen's rule: In any warm-blooded species, populations living in warmer climates tend to have longer and thinner protruding parts (legs, ears, tails, etc.), while the same parts tend to be shorter and thicker in colder climates.

Allergen: Anything provoking an allergic response by the immune system.

Alloparental behavior: Caring for young individuals to which one is not genetically related.

Altruism: Any act that increases another individual's fitness but lowers or endangers one's own fitness.

Alveoli: Small pouches or cavities, especially the air-filled pouches in which gas exchange occurs in the lungs.

Anaerobic: Conditions when oxygen is not present, or organisms that can live under such conditions.

Analogy: Resemblance resulting from similar evolutionary adaptation, as in wings of similar shape made of different materials.

Anaphase: The stage of cell division in which paired chromosomes or chromatids separate and begin to travel in opposite directions.

Angiogenic growth factors: Cytokines that induce the growth of blood vessels nearby.

Anisogamy: A condition in which the two types of gametes (eggs and sperm) differ in size and other characteristics.

Anorexia nervosa: A psychological eating disorder characterized by self-imposed starvation.

Antagonist: A drug that inhibits another or that inhibits a particular receptor.

Antagonistic interaction: A combined effect in which two drugs together produce less of a physiological response than either drug given separately.

Anthropogenic: Caused by human activity.

Antibodies: Proteins, secreted by lymphocytes during an immune response, that bind specifically to the type of molecule that induced their secretion, thus helping to protect the body from disease.

Anticodon: A three-nucleotide sequence in a transfer RNA molecule that pairs with a messenger RNA codon.

Antigen: Any molecule or part of a cell that is detected by the immune system.

Antigenic drift: Spontaneous single nucleotide mutations that change the shape of antigenic molecules within a species, often reducing the effectiveness of previously acquired immunity within a host.

- Census:** Any enumeration (counting) of the members of a population.
- Central nervous system:** The brain and spinal cord.
- Cerebellum:** Part of the hindbrain that controls muscular coordination and balance.
- Cerebral cortex:** The outer layer of the cerebrum.
- Cerebral hemispheres:** The two halves of the cerebrum.
- Cerebrospinal fluid:** A fluid contained within the cavities of the brain and spinal cord, from which nutrients and oxygen diffuse to the neurons.
- Cerebrum:** The part of the forebrain controlling conscious activity and thought; it is the major part of the brain in humans.
- Channels:** Porelike openings in a membrane, through which ions or other particles can move by passive diffusion.
- Chemical digestion:** The use of enzymes and chemical reactions to break down food into molecules absorbable by cells.
- Chlorofluorocarbons:** Organic compounds derived from hydrocarbons by replacing some hydrogen atoms with chlorine and others with fluorine.
- Chlorophyll:** A green pigment molecule that traps light in the light reactions of photosynthesis.
- Chloroplasts:** Photosynthetic organelles containing chlorophyll.
- Cholesterol:** A lipid with a multiringed structure, found in the cell membranes of most animal cells.
- Chromosomal aberrations:** Sudden changes in chromosome sequences large enough to contain many genes. Examples include chromosomal inversions, translocations, duplications, and deletions.
- Chromosomes:** Elongated structures that contain DNA; in eucaryotic cells, the chromosomes are located in the nucleus and contain protein as well as DNA.
- Chronic effects:** Lasting or life-long effects.
- Cilia:** Hairlike processes on the surface of some eucaryotic cells, each typically containing two protein strands in the center surrounded by nine doublet strands.
- Circadian rhythm:** A biological change whose pattern repeats approximately every 24 hours.
- Circulatory system:** A fluid (such as blood) and a series of vessels or other means by which the fluid can transport materials around the body.
- Clade:** A branch of a family tree formed by a single species and all its descendants.
- Cladistics:** A method of classification in which taxa are made to correspond to clades.
- Class:** A subdivision of a phylum, typically containing several orders.
- Classical conditioning:** A form of learning in which one stimulus (the conditioned stimulus) that repeatedly precedes or accompanies another (the unconditioned stimulus) becomes capable of evoking the response originally elicited only by the unconditioned stimulus.
- Classification:** An arrangement of larger groups of species that are subdivided into smaller groups on the basis of some organizing principle or theory.
- Cline:** A gradual geographic variation of a trait within a species.
- Clone:** The genetically identical cells or organisms derived from a single cell or individual by cell division or asexual reproduction.
- Cloning:** Production of a new individual having the complete genome of another individual.
- Codominant:** Alleles capable of producing different phenotypic effects simultaneously.
- Codon:** A coding unit of three successive nucleotides in a messenger RNA molecule that together determine an amino acid.
- Coenzyme:** A nonprotein substance needed for an enzyme to function.
- Colon:** The large intestine, excluding the cecum.
- Communicability:** The probability that a disease-causing microorganism will be transferred from one individual to another, either directly or indirectly.
- Community:** A group of species that interact in such a way that a change in the population of one species has consequences for the other species in the community.
- Complement:** Blood proteins that, usually in combination with antibody, can destroy some bacteria and viruses.
- Complete protein:** A protein that contains all of the amino acids considered essential for human nutrition.
- Composting:** A managed process that uses microorganisms to help break down wastes (garbage, leaf litter, lawn clippings) into material that can be spread on fields as a fertilizer.
- Concentration gradient:** A situation in which the concentration of a substance is different in different locations or on opposite sides of a membrane.
- Conditioned withdrawal symptom:** Symptoms of drug withdrawal brought about by psychological stimuli or memories of drug-related behavior.
- Condom:** A latex or other barrier to the passage of sperm, worn as a covering over the penis.
- Consumers:** Organisms that obtain their energy from other organisms and use much of this energy in biosynthesis; heterotrophs other than decomposers.
- Contact inhibition:** The inability of a normal cell to divide if it is touching other cells.
- Contagious:** Capable of spreading from one infected individual to another, either directly or indirectly through another species.
- Continuous variation:** Variation in which in-between values are always possible, such as a length of 23.15 cm between the values 23.1 and 23.2.
- Contraceptive:** Any method that prevents conception (fertilization).
- Control group:** In an experiment, a group used for comparison. For example, if animals are experimentally exposed to a drug, then a control group might consist of similar animals not exposed to the drug but treated the same in every other way.
- Convergence:** Independent evolution of similar adaptations in unrelated lineages.
- Corpus luteum:** Progesterone-secreting scar tissue, formed within the ovary by a follicle after its egg has been released.
- Correlation by fossils:** Judging geological formations to be of the same age if they contain fossil assemblages with many of the same or similar species.
- Crossing-over:** The rearrangement of linked genes when homologous chromosomes break and recombine.
- Cytokines:** Chemicals that carry information from one cell to another but have no nutritional value or enzymatic activity of their own.
- Cytoplasm:** The portion of a cell outside the nucleus but within the plasma membrane.
- Cytoskeleton:** A protein network in the cytoplasm of eucaryotic cells that provides support for the cell and allows directed movement of chromosomes, organelles, and the cell itself.

- Cytotoxic (CD8) T cells:** Lymphocyte cells of the immune system that react specifically to a nonself molecule, becoming activated to kill cells bearing that molecule.
- Dark reactions:** Those reactions of photosynthesis that do not require light, including the reactions in which carbon dioxide is incorporated and carbohydrates are produced.
- Data:** Information gathered so as to permit the testing of hypotheses.
- DDT:** Dichloro-diphenyl-trichloroethane, a long-lasting pesticide that is not biodegradable and therefore accumulates in biological systems.
- Dead-end host:** A host in which a pathogen reaches the end of its life cycle and is not transmitted to subsequent hosts.
- Death control:** Any measure that reduces the death rate.
- Death rate (D):** The number of deaths in a given time period divided by the number of individuals in the population at the beginning of that period.
- Declarative learning:** Conscious remembrance of persons, places, things, and concepts, requiring the actions of the hippocampus and the temporal regions of the brain.
- Decomposers:** Organisms that break down organic matter into simpler molecules.
- Deduction:** Logically valid reasoning that guarantees a true conclusion whenever the premises are true.
- Demographic momentum:** A temporary population increase that can be predicted in a population that has more prereproductive members and fewer postreproductive members than a population with a stable age distribution would have.
- Demographic transition:** An orderly series of changes in population structure in which the death rate decreases before a similar decrease occurs in the birth rate, resulting in a population increase during the transition period.
- Demography:** The mathematical study of populations.
- Dendrites:** Nerve cell processes that receive signals and respond by conducting impulses toward the nerve cell body.
- Deontological:** A type of ethics in which the rightness or wrongness of an act is judged without reference to its consequences.
- Deoxyribonucleic acid (DNA):** A nucleic acid containing deoxyribose sugar and usually occurring as two complementary strands arranged in a double helix.
- Dependence:** Inability to carry out normal physiological functions without a particular drug.
- Depolarization:** The disappearance of a separation of unequal electrical charges.
- Depression:** A mental disorder characterized by low levels of serotonin and other neurotransmitters, by lack of motivation, and, in severe cases, by suicidal thoughts and actions.
- Desertification:** The processes whereby habitats are replaced by an advancing desert.
- Determined:** A state of development in which the future identity of a cell's progeny is predictable.
- Determinism (genetic determinism):** The belief that an individual's characteristics are wholly determined by its genes.
- Deuterostome:** Having an embryo in which the mouth forms at the opposite end from the entrance to the gastrula's interior cavity.
- Differentiation:** The process of becoming different; a restriction on the set of future possibilities for a cell's progeny.
- Diffusion:** A process in which molecules move randomly from an area of high concentration to an area of low concentration until they are equally distributed.
- Digestive system:** A system of organs responsible for breaking down food into simpler materials and absorbing those materials.
- Diploid:** Possessing chromosomes and genes in pairs, as in all somatic cells.
- Disease:** Any condition of an organism in which normal biological function is lessened or impaired.
- Discontinuous variation:** 'Either/or' variation in which intermediate conditions usually do not exist, as in the presence or absence of a disease.
- DNA marker:** Any part of DNA whose chromosomal location is known, permitting it to be used to help locate genes.
- DNA probe:** Any DNA fragment that has both (1) a sequence complementary to that of a gene or marker, and (2) some ability to be made visible (e.g., by radioactive labeling). Probes are used to determine the locations of the sequences to which they are complementary.
- DNA polymerase:** An enzyme that builds a new stand of DNA complementary to a preexisting strand used as a template.
- Dominant:** A trait that is expressed in the phenotype of heterozygotes; an allele that expresses its phenotype even when only one copy of the allele is present.
- Dopamine:** A neurotransmitter synthesized from the amino acid tyrosine and terminating in an amino group.
- Dose:** The amount of a drug given at one time.
- Doubling time:** The time required for the number of individual units in a population to double.
- Down syndrome:** A complex syndrome that includes varying degrees of mental retardation, plus eyes with epicanthic folds and in some cases heart malformations, arising usually from trisomy of chromosome number 21, or less often from other chromosome abnormalities.
- Drug:** Any chemical substance that alters the function of a living organism other than by supplying energy or needed nutrients.
- Drug abuse (substance abuse):** Excessive use of a drug, or use which causes harm to the individual or society.
- Economic impact level (EIL):** The smallest population level of a pest species that reduces crop yields by an unacceptable amount.
- Ecosystem:** A biological community interacting with its physical environment.
- Echolocation:** A navigation system used by bats and certain whales in which sounds are emitted and their echoes are used to locate food, obstacles, and other objects.
- Ectoderm:** The outer layer of cells in an embryo, forming such structures as the nervous system and the outer layers of the skin.
- Egg:** The female gamete, nonmotile and larger than the sperm because it contains more cytoplasm.
- Electrical potential:** A form of stored (potential) energy consisting of a separation of electrical charges.
- Electrolyte:** Charged mineral ions in solution.
- Embryonic stem cell:** An embryonic cell having the capacity to differentiate into cells of many different kinds.
- Endangered species:** A species threatened with extinction.
- Endemic:** Persistently found in a specified location, e.g., a disease that maintains a low to moderate prevalence over a long time.
- Endocrine glands:** Glands that secrete their products, called hormones, into the blood stream rather than into a duct.
- Endocytosis:** Bringing a particle into a cell by surrounding it with cell membrane.
- Endoderm:** The innermost layer of cells of an embryo, forming the interior lining of the gut.

- Endogenous opiates:** Pain-killing neurotransmitters that act on neurons and on cells of the immune system.
- Endorphin:** A type of endogenous opiate secreted by the pituitary gland.
- Endosymbiosis:** A theory that explains the origin of eucaryotic cells from large procaryotic cells that engulfed and maintained smaller procaryotic cells inside the larger cells.
- Enkephalins:** Small, peptide molecules secreted by the brain as neurotransmitters; a type of endogenous opiate.
- Enzyme:** A chemical substance (nearly always a protein) that speeds up a chemical reaction without getting used up in the reaction; a biological catalyst.
- Epidemiology:** The study of the frequency and patterns of disease in populations.
- Epidemic:** An outbreak of a disease at much greater prevalence than usual.
- Epilepsy:** A brain disorder characterized by uncontrollable muscle seizures.
- Epiphyte:** A plant that lives upon and derives support, but not nutrition, from another plant.
- Erythrocytes:** Red blood cells containing hemoglobin and capable of transporting oxygen.
- Essential amino acids:** Amino acids essential in nutrition, from which the body can make all other (nonessential) amino acids.
- Estrogen:** A hormone that stimulates development of female sex organs prior to reproductive age and the growth of an ovarian follicle each month during the reproductive years.
- Eucaryotic:** Cells with the following properties: they contain various organelles bounded by membranes, including nuclei surrounded by a nuclear envelope; their chromosomes are usually multiple and contain protein as well as nucleic acids; they have a cytoskeleton that is composed of structural and/or contractile fibers of protein.
- Eugenics:** An attempt to change allele frequencies through selection or changes in fitness. Raising the fitness of desired genotypes is called 'positive' eugenics; lowering the fitness of undesired genotypes is called 'negative' eugenics.
- Euphenics:** Measures designed to alter phenotypes (producing phenocopies) without changing genotypes.
- Euphoria:** A feeling of elation and well-being, especially one unrelated to the true state of affairs.
- Eupsychics:** Social and educational measures that accommodate people with differences.
- Eusocial:** A form of social organization characterized by overlapping generations (parents coexist with offspring), strictly delimited subgroups (castes), and cooperative care of eggs and young larvae.
- Euthenics:** Measures designed to assist people to overcome some of the consequences of their phenotypes. Wheelchairs and eyeglasses are examples.
- Eutrophication:** An ecological succession in which a lake becomes filled with vegetation and eventually disappears.
- Evolution:** The process of permanent change in living systems, especially in genes or in the phenotypes that result from them.
- Excretion:** The production of waste products, especially by the kidney, and their subsequent removal from the body.
- Exocrine glands:** Glands that secrete their products into a duct.
- Exogenous:** Originating outside the body.
- Exon:** the functional part of a messenger RNA sequence that remains after certain internal fragments (introns) are deleted.
- Exoskeleton:** A hard supporting skeleton on the outside the body, as in insects and other arthropods.
- Experiment:** An artificially contrived situation in which hypotheses are tested by comparison with some known condition called the control condition.
- Experimental sciences:** Sciences that rely primarily on hypothesis testing by means of experiments.
- Exponential growth:** A form of geometric growth without any limit, according to the equation $dN/dT = rN$.
- Extinction:** Termination of a lineage without any descendants.
- Extracellular matrix:** Material produced by cells but located outside any cell. Connective tissues have large amounts of extracellular matrix.
- Fairness:** The principle that all individuals in similar circumstances should receive similar treatment.
- False negative:** A negative test result in a sample that actually has the condition being tested for; indicates a lack of sensitivity of the test.
- False positive:** A positive test result in a sample that does not actually have the condition being tested for; indicates a lack of specificity of the test.
- Falsifiable:** Capable of being proved false by experience.
- Family:** A taxonomic subdivision of an order, containing one or more genera.
- Fats:** Lipids that are generally solid at room temperatures.
- Fatty acids:** Long-chain, nonpolar organic acids, released by the digestion of fats or phospholipids.
- Feedback mechanism:** See *Feedback system*.
- Feedback system:** Any process in which a later step modifies or regulates an earlier step in the process.
- Female athlete triad:** The combination of severe weight loss (often anorexia), causing estrogen depletion which results in cessation of menstruation and loss of bone density, occurring in female athletes who overtrain.
- Females:** Individuals who produce large gametes (eggs).
- Fertilization:** The combining of a sperm with an egg to form a zygote.
- Fertilizer:** Any substance artificially furnished to promote the growth of crops.
- Fetal alcohol syndrome:** Permanent brain damage and mental retardation, accompanied by abnormal facial features, caused by fetal exposure to alcohol while in the uterus.
- Fetus:** An embryo after all of its organs have formed.
- Fitness:** The ability of a particular individual or genotype to contribute genes to future generations, as measured by the relative number of viable offspring of that genotype in the next generation.
- Flagellum (flagella):** (1) On certain eucaryotic cells, a locomotor structure with two protein strands in the center surrounded by nine doublet strands and operating by means of a whiplike action. (2) On some procaryotic cells, a much simpler structure capable of rotary motion.
- Forebrain:** The front portion of the brain, containing the paired olfactory bulbs, olfactory lobes, cerebral hemispheres, and several unpaired portions including the hypothalamus.
- Fossils:** The remains or other evidence of life forms of past geological ages.
- Founder effect:** A type of genetic drift in which the allele frequencies of a population result from the restricted variation present among a small number of founders of that population.

- Frameshift mutation:** A mutation caused by the addition or deletion of one or a few base pairs in the DNA, causing many mRNA codons to be changed.
- Free radicals:** Very reactive chemicals containing unpaired electrons.
- G6PD deficiency (favism):** A deficiency of the enzyme glucose-6-phosphate dehydrogenase (G6PD), producing a blood-cell-rupturing (hemolytic) anemia when certain beans, especially fava beans, are eaten.
- Gaia hypothesis:** The hypothesis that life on Earth has helped to make conditions on Earth more suitable for life than it had been originally.
- Gall bladder:** A pouch in which bile accumulates until it is needed.
- Gametes:** Reproductive cells (eggs or sperm), containing one copy of each chromosome.
- Gastrula:** An embryonic stage in all animals except sponges, consisting of an outer layer of cells (ectoderm), an inner layer of cells (endoderm) which line a cavity open to the outside, and in many cases also a third or middle layer of cells (mesoderm) between them.
- Gene:** A portion of DNA that determines a single protein or polypeptide. In earlier use, a hereditary particle.
- Gene expression:** Transcription and translation of a gene to its protein product.
- Gene family:** A group of genes, similar in sequence, believed to have originated by successive mutations from multiple copies of an ancestral gene.
- Gene pool:** The sum total of all alleles contained in a population.
- Gene therapy:** Introduction of genetically engineered material into an individual for the purpose of curing a disease or a genetic defect.
- General adaptation syndrome:** A series of physiological reactions produced by stressors, including the three stages of alarm, resistance, and exhaustion.
- Genetic drift:** Changes in allele frequencies in populations of small to moderate size as the result of random processes.
- Genetic engineering:** Direct and purposeful alteration of a genotype.
- Genetics:** The study of heredity, including genes and hereditary traits.
- Genome:** The total genetic makeup of an individual, including its entire DNA sequence.
- Genomics:** The study of entire genome sequences
- Genotype:** The hereditary makeup of an organism as revealed by studying its offspring.
- Genus (genera):** Taxonomic subdivisions of a family, each containing one or more species.
- Geographic isolation:** Geographic separation of populations by an extrinsic barrier such as a mountain range or an uninhabitable region.
- Global warming:** An increase in the overall or average temperature of a planet, such as is caused by the buildup of carbon dioxide and other gases.
- Gloger's rule:** In any warm-blooded species, populations living in warm, moist climates tend to be darkly colored or black; populations living in warm, arid climates tend to have red, yellow, brown, or tan colors; and populations living in cold, moist climates tend to be pale or white in color.
- Glycogen:** A carbohydrate consisting of many glucose units linked together, used as a storage molecule in animals and certain microorganisms.
- Glycolysis:** The breakdown of carbohydrates to pyruvate.
- Greenhouse effect:** The retention of heat by the atmosphere of a planet, much of the heat being reflect by the atmosphere back to the planetary surface.
- Green manure:** A natural compost made from plant wastes.
- Group selection:** Selection that operates by differences in fitness between social groups.
- Growth factors:** Chemical messengers which signal cells to divide.
- Growth rate (r):** The population increase during a specified time interval (usually a year) divided by the population size at the beginning of that time interval.
- Guard cells:** Enlarged cells on the underside of many leaves, whose swelling opens the breathing pores (stomates).
- Habitat:** The place and environmental conditions in which an organism lives.
- Habituation:** A form of learning in which an organism learns not to react to a stimulus that is repeated without consequence.
- Half-life:** For a drug, the time that it takes for the level of the drug in the body to be reduced by half.
- Haplodiploidy:** A form of sex determination characteristic of the insect order Hymenoptera, in which males have one copy of each chromosome (haploidy) while females have a pair of each type of chromosome (diploidy).
- Haploid:** Containing only unpaired chromosomes, as in gametes or procaryotic organisms.
- Hardy-Weinberg equilibrium:** A genetic equilibrium formed in large, randomly mating populations in which selection, migration, and mutation do not occur or are balanced.
- Hardy-Weinberg principle:** In a large, random-mating population in which selection, migration, and unbalanced mutation do not occur, allele frequencies tend to remain stable from each generation to the next.
- Harm reduction:** An approach to drug use in society that seeks to minimize the harm done rather than to punish the drug user.
- HDLs:** See *High-density lipoproteins*.
- Health:** The ability of an organism to maintain homeostasis or to return to homeostasis after disease or injury.
- Helper (CD4) T cells:** Lymphocyte cells of the immune system that react specifically to a nonself molecule by secreting interleukin-2, a cytokine needed for full activity of either B cells or CD8 T cells.
- Hemoglobin:** The oxygen-carrying protein in red blood cells.
- Herd immunity:** Resistance of a population to a disease by the presence of many individuals who do not transmit it.
- Hereditarian:** The belief that an individual's characteristics are wholly determined by its heredity.
- Heterotroph:** An organism not capable of manufacturing its own energy-rich organic compounds and therefore dependent on eating other organisms or their parts to obtain those compounds.
- Heterozygous:** Possessing two different alleles of the same gene in a genotype.
- High-density lipoproteins (HDLs):** Proteins that carry lipids away from tissues via the bloodstream; often referred to as 'good cholesterol.'
- Higher taxon:** Any taxon at a rank higher than that of species, and thus capable of including more than one species.
- High-risk behaviors:** Behaviors or actions that increase the probability of undesirable outcomes, such as the transmission of a disease.

- High-risk groups:** A subpopulation of people who share some behavioral, geographic, nutritional, or other characteristic and who have a higher frequency of a particular disease than the general population.
- Hindbrain:** The rear portion of the brain, containing the cerebellum and medulla.
- Hippocampus:** A folded structure deep in the interior of the forebrain, important in certain types of memory.
- HIV:** See *Human immunodeficiency virus*.
- Homeostasis:** The ability of a complex system (such as a living organism) to maintain conditions within narrow limits. Also, the resulting state of dynamic equilibrium, in which changes in one direction are offset by other changes that bring the system back to its original state.
- Homologous:** Similar by virtue of common ancestry, as in similar body structures, shared DNA sequences, or chromosomes that carry similar sets of genes and therefore pair with one another during meiosis.
- Homology:** Shared similarity of structure resulting from common ancestry.
- Homozygous:** Possessing two like alleles of the same gene in a genotype.
- Hormone:** A chemical messenger, transported through the blood, that affects the activity of the cells in a target tissue.
- Human immunodeficiency virus (HIV):** The virus that causes AIDS by infecting and inactivating cells of the immune system that bear a molecule called CD4.
- Humus:** A dark-colored, nutrient-rich layer of soil in which organic matter is abundant; also called topsoil.
- Hydroponics:** The practice of growing plants without soil.
- Hypertension:** High blood pressure.
- Hyphae:** Tiny, threadlike filaments constituting the vegetative or feeding stage of a fungus.
- Hypothalamus:** A structure at the base of the forebrain that regulates body temperature and controls the release of various pituitary hormones.
- Hypothesis:** A suggested explanation that can be tested.
- Ileum:** The final third of the small intestine, in which most absorption of digestion products takes place.
- Immortal:** A property of transformed cells that relieves them from having a limit on the number of times they can divide.
- Immunity:** See *Innate immunity* and *Specific immunity*.
- Immunization (vaccination):** Artificial exposure to an antigen that evokes a protective immune response against a potential disease-causing antigen similar in structure to the antigen in the vaccine.
- Immunodeficiency:** A decreased activity of some part of the immune system as the result of genetic, infectious, or environmental factors.
- Immunosuppression:** Decreasing the strength of future immune functions in any manner that is not antigen-specific.
- Implantation:** The attachment of an early embryo to the wall of the uterus, where it later forms a placenta.
- Incidence:** The number or frequency of new cases of a disease or other condition. Compare *Prevalence*.
- Inclusive fitness:** The total fitness of all individuals sharing one's genotype, including fractional amounts of the fitness of individuals sharing fractions of one's genotype.
- Independent assortment, law of:** Genes carried on different chromosomes segregate independently of one another; the separation of alleles for one trait has no influence on the separation of alleles for traits carried on other chromosomes. Also called 'Mendel's second law.'
- Induction:** Reasoning from specific instances to general principles, which can sometimes be unreliable, as in 'these five animals have hearts, so all animals must have hearts.'
- Industrial melanism:** The evolution of protective dark coloration in soot-polluted habitats.
- Infectious:** Capable of being transmitted from one individual to others in the same population.
- Infanticide:** The killing of an infant shortly after birth.
- Infection:** The colonization and growth of a pathogen within a host species.
- Inflammation:** A physiological response to cellular injury that includes capillary dilation, redness, heat, and immunological activity that stimulates healing and repair.
- Informed consent:** A voluntary agreement to submit to certain risks by a person who knows and understands those risks.
- Innate:** Inborn; present from birth.
- Innate immune system:** See *Innate immunity*.
- Innate immunity:** Host defenses that exist prior to that individual's exposure to an antigen and are not antigen-specific.
- Instinct:** Complex behavior that is innate and need not be learned.
- Instrumental value:** The value that something has only as a means to attain something else of value.
- Insulin:** A hormone, produced by the pancreas, important in the metabolism and cellular uptake of carbohydrates.
- Integrated pest management (IPM):** An approach to the management of pest populations that emphasizes biological controls and frequent monitoring of pest populations.
- Interbreeding:** The mating of unrelated individuals or the exchange of genetic information between populations.
- Interferon:** A cytokine secreted by lymphocytes that prevents viral replication.
- Interphase:** The long interval between one mitosis and the next, during which cell metabolism is active but chromosomes are not visible.
- Intrauterine device (IUD):** Anything inserted into the uterus to prevent implantation or pregnancy.
- Intrinsic value:** The value that something has on its own, other than as a means to something else.
- Intron:** A portion of a messenger RNA sequence that is deleted before translation to a protein.
- Invertebrate:** Any animal not possessing a backbone.
- In vitro fertilization:** Fertilization that takes place outside the body in laboratory glassware.
- Isogamy:** A condition in which gametes are all similar in size.
- IUD:** See *Intrauterine device*.
- Karyotype:** The chromosomal makeup of an individual.
- Kilocalorie (kcal):** The amount of energy required to raise the temperature of 1000 grams of water through 1 degree Celsius; equal to 1000 calories.
- Kin selection:** Selection that favors characteristics that decrease individual fitness but that are nevertheless favored because they increase inclusive fitness.
- Kingdoms:** The largest taxonomic groups, such as the animal or plant kingdoms, each containing many phyla.
- Klinefelter syndrome:** A condition arising from the chromosomal arrangement XXY, resulting in a sterile male, often thin, with underdeveloped genitalia and with varying degrees of mental retardation and breast development.
- Koch's postulates:** A set of test results that must be obtained to demonstrate that a particular species of microorganism is the cause of a particular infectious disease.

- Krebs cycle:** A series of biochemical reactions that break apart pyruvate and use the chemical bond energy to make some ATP and NADH from ADP and NAD.
- K-selection:** Natural selection that characterizes populations living at or near the carrying capacity (K) of their environments by favoring adaptations for parental care and efficient exploitation of resources.
- Kwashiorkor:** A type of protein deficiency in which total calorie consumption is adequate but protein intake is not.
- Lactose intolerance:** Inability to digest the sugar lactose.
- Lateral line system:** A sense organ in most fishes, consisting of a series of canals and nerve cells sensitive to the movements of water caused by other fish or by obstacles.
- Laterite:** A nutrient-poor soil type, usually red, found in many tropical areas with high rainfall. The low nutrient content is usually attributed to the constant leaching of minerals by rainwater.
- Law of unintended consequences:** A principle of human ecology, that any desired change results in many other changes, some of which may be undesirable; also expressed as “you can’t change just one thing.”
- Learning:** The modification of behavior or of memory on the basis of experience.
- Left atrium:** A heart chamber that receives oxygen-rich blood from the lungs.
- Left ventricle:** A heart chamber that pumps oxygen-rich blood to the body’s organs.
- Life expectancy:** The average duration of life in a population.
- Light reactions:** Those reactions of photosynthesis that require light, especially those involved in the splitting of water molecules and the release of oxygen.
- Limiting amino acid:** An amino acid present in small amounts that, when used up, prevents the further synthesis of proteins requiring that amino acid.
- Limiting nutrient:** Any nutrient whose amounts constrain the growth of an organism or population; supplying greater amounts of this nutrient therefore allows a population of organisms to increase or grow more vigorously.
- Lineage:** A succession of species in an ancestor-to-descendent sequence.
- Linkage:** An exception to the law of independent assortment in which genes carried on the same pair of chromosomes tend to assort together, with the parental combinations of genes predominating.
- Lipids:** Nonpolar molecules formed primarily of carbon and hydrogen, occurring in cell membranes and also used as energy sources.
- Logistic growth:** Growth that begins exponentially but then levels off to a stable population size (K), according to the equation $dN/dT = rN(K-N)/K$.
- Low-density lipoproteins (LDLs):** Proteins that carry lipids to tissues via the bloodstream; often referred to as ‘bad cholesterol.’
- Lymph:** A fluid containing white blood cells, but no red blood cells.
- Lymphatic circulation:** An open circulatory system in vertebrate animals that gathers intracellular fluid and returns it to the blood along with cells of the immune system.
- Lymphocytes:** White blood cells that have specific receptors for antigens and are therefore capable of forming an antigen-specific immune response.
- Macronutrients:** Carbohydrates, lipids, and proteins, collectively.
- Macrophage:** A large, amoebalike wandering cell that surrounds and destroys cellular debris and bacteria.
- Malaria:** A parasitic infection, transmitted by mosquitoes, in which a protozoan of the genus *Plasmodium* infects blood cells.
- Males:** Individuals who produce small gametes (sperm).
- Malignant:** A tumor that has grown through the extracellular matrix.
- Malnutrition:** Poor or inadequate nutrition.
- Marasmus:** A type of malnutrition in which calorie intake and protein intake are both inadequate.
- Margin of safety:** The ratio between the toxic dose of a drug and its effective dose.
- Mast cells:** Cells whose release of histamine causes inflammation.
- Maternal effect gene:** A gene that is transcribed in an egg prior to fertilization.
- Mating system:** A description of mating behavior in terms of such features as the number of mates chosen (monogamous, polygamous, promiscuous) and the seasonality and permanence of mating units.
- Mean value:** The arithmetical sum of many values divided by the number of values.
- Mechanical digestion:** Breaking food into smaller particles by physical means such as chewing and churning, exposing new surfaces for chemical digestion.
- Medulla oblongata:** See *Medulla*.
- Medulla:** The innermost part of any organ, such as the medulla oblongata, a portion of the hindbrain that controls breathing and other involuntary activities that continue even during sleep.
- Medusa:** A freely floating body form in certain Cnidaria in which the mouth is directed downwards; commonly called a ‘jellyfish.’
- Meiosis:** A form of cell division in which the chromosome number is reduced from the diploid to the haploid number. Compare *Mitosis*.
- Melatonin:** A hormone produced by the pineal body during darkness; its changing levels of concentration entrains the body to follow circadian rhythms.
- Memory:** The ability to recall past learning.
- Memory cells:** Cells of the immune system that retain the ability to respond rapidly to an antigen that the body has encountered before.
- Mesoderm:** The middle layer of tissue in an embryo, giving rise to most of the muscles, skeleton, circulatory system, reproductive system, and significant portions of many other organs.
- Messenger RNA (mRNA):** A strand of RNA that leaves the nucleus after transcription and passes into the cytoplasm, where it functions in protein synthesis.
- Metaphase:** The phase of cell division in which all chromosomes line up on a disk-shaped area (the metaphase plate) before separating.
- Metastasis:** The ability of transformed cells to leave the original tumor, travel through the body, and adhere and form new tumors in other locations.
- Microarray:** Short pieces of complementary DNA attached to a solid such as a glass slide or a piece of nylon membrane, for the purpose of probing the presence or absence of particular genes in a DNA sample. Microarrays typically contain 6400 probes; a high-density version, called a DNA chip, can contain up to 1 million nucleotides per square centimeter.
- Micronutrients:** Collectively, vitamins and minerals, nutrients needed in much smaller quantities than macronutrients.

- Midbrain:** The middle portion of the brain, containing most of the reticular formation.
- Mimicry:** A situation in which one species of organisms derives benefit from its deceptive resemblance to another species.
- Minerals:** Inorganic (non-carbon-containing) atoms or molecules needed to regulate chemical reactions in the body.
- Mitochondria:** Organelles in eucaryotic cells that produce most of the energy-rich ATP that the cells use.
- Mitosis:** The usual form of cell division, in which the number of chromosomes does not change. Compare *Meiosis*.
- Model:** A mathematical, pictorial, or physical representation of how something is presumed to work.
- Monoculture:** Growth of only one species in a particular place, as in a field planted with a single crop.
- Monogamy:** A mating system in which each adult forms a mating pair with only one member of the opposite sex.
- Morals:** Rules governing human conduct.
- Morphological (typological) race concept:** A definition of each race by its physical characteristics, based on the assumption that each characteristic is unvarying and reflects an ideal type or *form* shared by all members of the group.
- Morphological species concept:** A now-discarded concept that defined each species according to its morphological (physical) features.
- Mosaicism:** The existence of cells or patches of cells that differ genetically from one another within an organism because of changes that took place during that organism's development.
- Motor neuron:** A neuron that conducts impulses away from the central nervous system.
- Mouth:** The entrance to the digestive tract or gut.
- mRNA:** See *Messenger RNA*.
- Multiregional model:** A model that views the human species as divided into various regional populations that exchange genes with one another frequently enough so that they all evolve together.
- Mutagen:** An agent that causes mutation in DNA.
- Mutation:** A heritable change in a DNA sequence or gene.
- Mutual aid (mutualism):** An interaction between species in which both species benefit from the interaction.
- Myelin sheath:** A lipid-rich covering that surrounds and insulates many neurons.
- Myosin:** A contractile protein found principally in muscle cells.
- Narcotic:** Any drug capable of inducing sleep or loss of consciousness.
- Natural selection:** A naturally occurring process by which different genotypes consistently differ in fitness, i.e., in the number of copies of themselves that they pass to future generations.
- Naturalistic sciences:** Sciences in which hypotheses are tested by the observation of naturally occurring events under conditions in which nature is manipulated as little as possible.
- Negative eugenics:** Attempting to change the gene pool of a population by discouraging or preventing certain genotypes from surviving or reproducing.
- Negative reinforcement:** The removal of an unpleasant stimulus, which may result in learning whatever behavior preceded the removal.
- Nerve impulse:** An electrical excitation that travels along a nerve cell without decreasing in strength.
- Nerve:** A bundle of axons outside the central nervous system.
- Neuroendocrine system:** The nervous system and the endocrine system considered as an interactive whole.
- Neuroglia:** Cells of the nervous system other than neurons.
- Neurons:** Specialized cells that conduct nerve impulses along their surface.
- Neurotransmitter:** Any chemical that transmits a nerve impulse from one cell to another.
- Niche:** The way of life of a species, or its role in a community.
- Nitrogen cycle:** A cyclical series of chemical reactions occurring in nature in which nitrogen compounds are built up, broken down, and changed from one form into another with the help of living organisms.
- Nitrogen fixation:** A process in which atmospheric nitrogen is incorporated into other molecules.
- Nonpolar:** Having a molecular structure in which electric charges are evenly distributed (or nearly so) across chemical bonds; nonpolar substances are not stable in water because water is a polar solvent.
- Normal distribution:** A mathematical description of random variation about a mean value.
- Normal science:** Science that proceeds step-by-step within a paradigm.
- Notochord:** A stiff but flexible rod of connective tissue that defines the body axis in animals of the phylum Chordata.
- Nuclei:** Plural of *nucleus*.
- Nucleic acids:** DNA and RNA; compounds containing phosphate groups, five-carbon sugars, and nitrogen-containing bases.
- Nucleotide:** Part of a nucleic acid molecule consisting of a phosphate group linked to a five-carbon sugar and then to a nitrogen-containing base.
- Nucleus (nuclei):** (1) The central part of an animal cell, plant cell, or other eucaryotic cell, containing the chromosomes. (2) Also, a clump of nerve cell bodies in the central nervous system.
- Nutrient cycle:** Any cyclical series of chemical reactions occurring in nature in which compounds of a specified element are built up, broken down, and changed from one form into another.
- Obesity:** A condition in which ideal body weight is exceeded by at least 20%.
- Oddity problem:** A task in which the subject is expected to pick out the one item of a set that is dissimilar to the rest.
- Oils:** Lipids that are liquid at room temperature.
- Oncogene:** A mutated growth control gene that leads to the transformation of a cell, which may then lead to cancer.
- Operant conditioning:** A form of conditioning in which a pleasurable stimulus reinforces any behavior (including spontaneous behavior) occurring just before the stimulus, making that behavior more likely to be repeated.
- Opiates:** Drugs derived from the opium poppy (*Papaver somniferum*), or similar chemicals produced by the brain itself.
- Opportunistic infection:** Infection in a host with suppressed immunity, resulting from microorganisms that are normally present in the host's environment but that do not cause disease in a host with a normal immune system.
- Order:** A taxonomic subdivision of a class, containing a family or a group of related families.
- Organ:** A group of tissues working together structurally and functionally.
- Organelles:** Cellular parts consisting of or bounded by membranes.
- Organizer:** An embryonic tissue whose chemical secretions induce the differentiation of other cells.

- Osmosis:** Diffusion of water molecules across a semipermeable membrane in response to a concentration gradient of some other molecule or ion.
- Osteoporosis:** Weakness and brittleness of the bones due to mineral loss.
- Ovary:** An organ that produces eggs in females.
- Over the counter (OTC):** Any drug that may legally be sold without a prescription.
- Ovulation:** The release of an egg from the ovary.
- Oxidation:** Removal of electrons from an atom or a molecule.
- Ozone:** A form of oxygen, O₃, containing three atoms at a time; ozone is highly reactive at the Earth's surface, but is more prevalent at higher layers in the atmosphere.
- Pancreas:** A glandular organ that secretes digestive enzymes and also insulin.
- Pandemic:** A worldwide epidemic.
- Paradigm:** A coherent set of theories, beliefs, values, and vocabulary terms used to organize scientific research.
- Paradigm shift:** The replacement of one paradigm with another.
- Parasite:** A species that lives in or on another species (the host), to which it causes harm.
- Parasympathetic nervous system:** A division of the autonomic nervous system that brings about the relaxation response and secretes acetylcholine as its final neurotransmitter.
- Parental investment:** The energy or resources that a parent invests in the production of offspring and the raising of offspring.
- Passive immunity:** Antigen-specific immunity acquired by one organism and then transferred to another organism in the form of antibodies or specific immune cells.
- Pathogen:** A disease-causing organism.
- PCR:** See *Polymerase chain reaction*.
- Pecking order:** A linear dominance hierarchy in which one individual is dominant to all others, a second individual to all others except the first, and so on.
- Pedigree:** A chart showing inheritance of genetic traits within a family.
- Peptides:** Short strings of amino acids, shorter than proteins.
- Perception:** The interpretation that the brain gives to a particular stimulus.
- Peripheral nerves:** Nerves outside the brain and spinal cord.
- Peripheral nervous system:** The nervous system except for the brain and spinal cord.
- Pesticide:** A chemical used to kill undesired (pest) organisms.
- Phagocytosis:** A process in which one cell surrounds, engulfs, and kills another.
- Pharmacology:** The study of drugs and their effects.
- Phenotype:** The visible or biochemical characteristics or traits of an organism.
- Pheromones:** Chemical signals by which organisms communicate with other members of their species.
- Phloem:** A vascular plant tissue in which photosynthetic products are transported throughout the plant, generally from the leaves downward.
- Phospholipids:** Molecules containing long, nonpolar hydrocarbon chains attached at one end to a polar phosphate group.
- Photosynthesis:** A process by which plants and certain other organisms use energy captured from sunlight to build energy-rich organic compounds, especially carbohydrates.
- Phylogeny:** A family tree or history of a group of organisms, forming a branching pattern of descent in most cases.
- Phylum (phyla):** A major subdivision of a kingdom, containing a group of related classes.
- Pineal body:** A structure on the roof of the diencephalon of vertebrate brains that maintains circadian rhythms.
- Placebo:** A drug formulation lacking the active ingredient being tested.
- Placebo effect:** Physiological response to a placebo that does not result from the chemistry of the placebo but that often produces the response expected by the subject.
- Placenta:** A structure appearing in the development of most mammals, composed of tissue derived from both the embryo and the mother's uterine lining, by means of which the embryo is nourished during its development in the uterus.
- Plasma:** The fluid portion of blood.
- Plasmid:** A bacterial DNA fragment that can separate from the main chromosome and later reattach at the point of separation.
- Platelets:** Cellular fragments capable of releasing blood clotting factors in response to injury.
- Point mutation:** A mutation resulting from a change in a single nucleotide.
- Polar:** Having a molecular structure in which most bonds have electrons shared unevenly, producing one part of the bond that has more negative charge than another part; water is polar, therefore other polar molecules do not spontaneously separate out from water.
- Polarized:** Having opposite ends or surfaces differing from one another in electrical charge.
- Policy decisions:** Decisions that must be made in terms of human preference, especially ethical preference, for one set of consequences over another.
- Pollution:** Contamination of an environment by substances present in undesirable quantities or locations.
- Polyandry:** An uncommon mating system in which each mating unit consists of one female and many males.
- Polygyny:** A mating system in which each mating unit consists of one male and many females.
- Polymerase:** An enzyme that joins smaller units into larger molecules (polymers).
- Polymerase chain reaction (PCR):** An artificial replication process in which many copies are made of specific DNA regions.
- Polymorphism:** The persistence of several alleles in a population at levels too high to be explained by mutation alone.
- Polyp:** A body form in certain Cnidaria in which the mouth is directed upwards; polyps often grow attached to a surface.
- Population:** A group of organisms capable of interbreeding among themselves and often sharing common descent as well; a group of individuals within a species living at a particular time and place.
- Population control:** All measures that limit or reduce the rate of population growth.
- Population ecology:** The study of populations and the forces that control them.
- Population genetics:** The study of genes and allele frequencies in populations.
- Positive checks:** Involuntary measures that limit or reduce population growth, such as famine, war, and epidemic diseases.
- Positive eugenics:** Attempting to change the gene pool of a population by encouraging desired genotypes to reproduce in greater numbers.
- Positive reinforcement:** A pleasant or pleasurable stimulus that results in learning.

- Postsynaptic cell:** A cell that receives a signal across a synapse.
- Potentiality:** The range of possible futures for a cell's progeny.
- Preventive checks:** Voluntary measures that reduce population growth, including voluntary abstinence from sexual activity.
- Presynaptic cell:** A cell that transmits a signal across a synapse.
- Prevalence:** The number or frequency of existing cases of a disease or other condition at any particular time. Compare *Incidence*.
- Primary host:** the host in which a pathogen or parasite spends the majority of its life cycle, usually including the reproductive stages.
- Prion:** A protein capable of producing an infection. Creutzfeldt–Jacob disease in humans and BSE (bovine spongiform encephalopathy or ‘mad cow disease’) are examples of diseases caused by prions.
- Prokaryotic:** Cells containing no cytoskeleton and no internal membrane-bounded organelles, but having a simple nuclear region that is never surrounded by a nuclear envelope, and a single chromosome (usually circular) containing nucleic acid only and no protein.
- Procedural learning:** Learning how to do things, a process that does not require the hippocampus and is not necessarily conscious.
- Producers:** Species that use the sun's energy to produce energy-rich organic materials.
- Progesterone:** A hormone that maintains the uterine lining in its enlarged, blood-rich condition, ready for implantation of a zygote.
- Promiscuity:** A mating system in which no permanent mating units are formed and in which each adult of either sex mates with many individuals of the opposite sex.
- Promoter:** A DNA sequence where RNA polymerase binds and where transcription of a gene therefore begins.
- Prophase:** The first and longest stage of mitosis, in which chromosomes condense and then rearrange before lining up during metaphase.
- Prospective experimental design, prospective study:** An experimental design in which subjects are chosen beforehand and data are subsequently gathered on events as they happen.
- Protease inhibitor:** An antiviral drug that interferes with viral replication by inhibiting the processing of its proteins.
- Proteins:** Molecules built of amino acids linked together in straight chains, which then fold up on themselves to produce complex shapes, functioning most often as enzymes or as structural materials in or around cells or their membranes.
- Proteomics:** The study of protein sequences
- Proton gradient:** A form of potential (stored) energy created by a separation or unequal distribution of protons (hydrogen ions).
- Proto-oncogene:** A normal gene from which an oncogene is derived; it encodes a product that regulates cell division.
- Protostome:** A type of animal embryo in which the mouth forms from the entrance to the cavity of the embryonic gastrula.
- Pseudoextinction:** Extinction of a taxon by its evolution into something else, thus continuing to have descendants.
- Pseudopod:** A temporary extension of cytoplasm that allows a creeping form of locomotion in amoeba-like cells.
- Psychoactive drug:** Any chemical substance that alters consciousness, mood, or perception.
- Psychoneuroimmunology:** A theory that postulates that the mind and the body are a single entity interconnected through interactions of the nervous, endocrine, and immune systems.
- Puberty:** A series of hormonal changes and their consequences associated with the onset of sexual maturity.
- Punctuated equilibrium:** A theory that describes species as remaining the same over long periods of time and then changing suddenly and giving rise to new species.
- Quadrumanal clambering:** A form of locomotion in which the body is suspended from three or four limbs that are pulled under tension.
- Race:** A geographic subdivision of a species distinguished from other subdivisions by the frequencies of a number of genes; a genetically distinct group of populations possessing less genetic variability than the species as a whole. This concept is called the *population genetics race concept* and is distinguished from other, older race concepts by defining race as a characteristic that can only apply to populations, not to individuals. Important older meanings include the following. *Socially constructed race concept:* A definition of an oppressed group and the individuals in that group by their oppressors, using whatever cultural or biological distinctions the oppressors wish to use. *Morphological (typological) race concept:* A definition of each race by its physical characteristics, based on the assumption that each characteristic is unvarying and reflects an ideal type or *form* shared by all members of the group.
- Racism:** A belief that one race is superior to others.
- Rate of concordance:** In studies of twins or other matched individuals, the fraction of individuals with a certain trait whose twin (or matched individual) also has the trait.
- Reception:** Receipt of a stimulus by a sensory cell capable of producing a nerve impulse as a result.
- Receptor:** A protein or other molecule that binds with a specific drug or other chemical substance and responds to the binding by initiating some cellular activity.
- Recessive:** A trait that is not expressed in heterozygotes; an allele that expresses its phenotype only when no dominant allele of the same gene is present.
- Recommended dietary allowance (RDA):** The amount of a vitamin or mineral recommended to be consumed daily to maintain good health in healthy adult humans.
- Rectum:** The straight part of the large intestine following the colon.
- Reducing conditions:** Hydrogen-rich conditions in which no free oxygen is present.
- Relaxation response:** A voluntary, self-induced stimulation of the parasympathetic nervous system in which the stress response is ended, blood pressure and breathing are reduced, the threshold of excitation of nerve cells becomes higher, and digestive activity is stimulated.
- Replication:** A process in which DNA is used as a template to make more DNA.
- Reproductive cloning:** Cloning whose purpose is the production of new individuals.
- Reproductive isolating mechanism:** Any biological mechanism that hinders the interbreeding of populations belonging to different species.
- Reproductive isolation:** The existence of biological barriers to interbreeding.
- Reproductive strategy:** A pattern of behavior and physiology related to reproduction.

- Resting potential:** The difference in electric charge maintained by a nerve cell membrane in the absence of a nerve impulse.
- Restriction enzymes:** Enzymes that selectively split DNA only at those locations where a particular sequence of bases occurs.
- Restriction fragment length polymorphisms (RFLPs):** Variations in the lengths of the DNA fragments created using a particular restriction enzyme.
- Reticular activating system:** A system of neurons, radiating upward from the midbrain, maintaining the body alert and attentive to stimuli.
- Reticular formation:** A center in the midbrain and part of the hindbrain from which the reticular activating system radiates upward.
- Retina:** The light-sensitive membrane coating the rear of the eye.
- Retrospective study:** An experimental design in which data are collected about events that have already happened.
- Retroviruses:** RNA viruses that begin their reproduction by synthesizing DNA from their RNA.
- Reuptake:** Absorption of a neurotransmitter by the cell that secreted it.
- Reverse transcriptase inhibitors:** Anti-AIDS drugs that interfere with the viral enzyme that helps to transcribe viral RNA to DNA.
- Reverse transcription:** Transcription of complementary DNA from a template of RNA.
- Rhythm method:** A birth-control method of timed abstinence in which the couple avoids having sex during the time when ovulation is most likely.
- Ribonucleic acid (RNA):** A nucleic acid containing nucleotides with ribose sugar and usually existing in single-stranded form.
- Ribosome:** An intracellular particle containing RNA and protein, and serving as the site of protein synthesis during translation.
- Right atrium:** A heart chamber that receives oxygen-poor blood from the body.
- Right ventricle:** A heart chamber that pumps oxygen-poor blood to the lungs.
- Rights:** Any privilege to which individuals automatically have a just claim or to which they are entitled out of respect for their dignity and autonomy as individuals.
- Risk behaviors:** Behaviors classified according to the likelihood of disease transmission. See *High-risk behaviors*.
- Risk:** The probability of occurrence of a specified event or outcome.
- RNA polymerase:** An enzyme that builds a strand of messenger RNA during transcription complementary to a DNA strand by using that DNA strand as a template.
- Root nodules:** Enlargements on the roots of certain plants that create anaerobic conditions that attract and maintain nitrogen-fixing microorganisms.
- Route of transmission:** The means by which an infectious disease spreads from one host individual to another.
- r-selection:** Natural selection that characterizes populations living far below the carrying capacity of their environments and favors high rates of reproduction (high *r*) and maximum dispersal ability.
- Rule utilitarianism:** An ethical system that establishes rules of right and wrong behavior based on their consequences and judges individual acts only according to their conformity to these rules.
- Salivary amylase:** A starch-digesting enzyme contained in saliva.
- Saturated fats:** Lipids with no double bonds between their carbon atoms.
- Schizophrenia:** A disorder that results in an inability to distinguish real from imaginary situations or stimuli, and characterized by frequent auditory or other hallucinations.
- Science:** An endeavor in which falsifiable hypotheses are systematically tested.
- Scientific method:** a method of investigation in which hypotheses are subjected to testing by comparison with empirical data.
- Scientific revolution:** The establishment of a new scientific paradigm, including the replacement of earlier paradigms.
- Second messenger:** Molecules within the cytoplasm of a cell that carry information from membrane receptors to other locations in the cell.
- Secondary sexual characteristics:** Features characteristic of one sex but not essential in reproduction; examples include female breasts and male beards in humans, and antlers in male deer.
- Segregation, law of:** When a heterozygous individual produces gametes, the different alleles separate so that some gametes receive one allele and some receive the other, but no gamete receives both.
- Sensation:** Perception of a stimulus.
- Sensitivity:** The smallest amount of some substance that can be detected by a clinical or other test.
- Sensitization:** A form of learning in which an intense and often aversive stimulus increases subsequent responses to other stimuli.
- Sentinel species:** A species that can be monitored as an indicator of the health of an ecosystem.
- Seroconversion:** Development in a person or other host of an antibody specific for some microorganism to which they have been exposed, either through infection or vaccination.
- Severe combined immune deficiency syndrome (SCIDS):** A genetic condition in which the lymphocytes responsible for antigen-specific immunity fail to develop, leaving an individual extremely susceptible to being killed by infections that would be of little or no consequence in most other individuals. One form of this condition is caused by a lack of the enzyme adenosine deaminase.
- Sex chromosome:** One of the chromosomes that differ between the sexes, usually distinguished as X and Y.
- Sex-linked:** Carried on the X chromosome.
- Sexual reproduction:** Reproduction in which recombination of alleles occurs.
- Sexual selection:** A process by which different genotypes leave unequal numbers of progeny to future generations on the basis of their success in attracting a mate and in reproducing.
- Sickle-cell anemia:** A genetic disorder in which hemoglobin A is replaced by hemoglobin S, with resulting sickle-shaped red blood cells having a reduced oxygen-carrying capacity but also a resistance to malaria.
- Side effect:** A drug effect other than the one for which the drug was intended.
- Slash-and-burn agriculture:** A form of agriculture in which forests are first cleared by burning.
- Social behavior:** Any behavior that influences the behavior of other individuals of the same species.

- Social organization:** A set of behaviors that define a social group and the role of individuals within that group.
- Social policy:** A formal or informal set of rules under which people make decisions in individual cases.
- Sociobiology:** The biological study of social groups and social behavior and their evolution.
- Sodium–potassium pump:** A group of membrane proteins that can actively transport sodium ions from the inside to the outside of a cell, such as a nerve cell, while actively transporting potassium ions in the opposite direction.
- Somatic cell:** any cell other than an egg or sperm; a diploid body cell.
- Somatic nervous system:** That part of the nervous system that is under conscious control.
- Somite:** A block of mesoderm in a developing embryo.
- Speciation:** The process by which a new species comes into being, especially by a single species splitting into two new species.
- Species:** Reproductively isolated groups of interbreeding natural populations.
- Specific (acquired) immunity:** An acquired antigen-specific ability to react to a previously encountered antigen.
- Specificity:** The degree to which a test detects only the molecule it is meant to detect and not detect other molecules.
- Sperm:** The male gamete, smaller and more motile than the egg in most species.
- Spores:** The tiny reproductive stages (usually cold-resistant and dryness-resistant) of fungi, certain plants, and certain bacteria.
- Stem cell:** An undifferentiated cell that retains the ability to divide and differentiate.
- Stereotyped:** See *Stereotyped behavior*.
- Stereotyped behavior:** Behavior that is always performed the same from one occasion to the next and from one individual to the next.
- Steroid hormone:** Any hormone chemically related to (and synthesized from) cholesterol.
- Stomates:** Pores on the underside of leaves in most vascular plants, through which gases are exchanged.
- Stratigraphy:** The study of layered sedimentary rocks.
- Stress, stress response:** A physiological response or state of heightened activity brought about by the sympathetic nervous system and maintained for a longer time by the immune and endocrine systems.
- Stressor:** Any stimulus or condition that brings on a stress response.
- Subspecies:** A geographical subdivision of a species, characterized by less genetic variation within the subspecies than in the species as a whole.
- Substance abuse:** Use so excessive as to cause harm to the user or to others.
- Succession:** In ecology, a process by which one community replaces another.
- Susceptibility:** (1) The likelihood that a person who is exposed to a microorganism will become infected with that organism. (2) The probability that a person will get a particular disease.
- Sustainable:** Any practice that could continue indefinitely without depleting any material whose supply is limited.
- Symbiosis:** Any type of interaction between two species living together; mutualism and parasitism are two types of symbiosis.
- Symbiotic:** Living together as two interacting species.
- Sympathetic nervous system:** A division of the autonomic nervous system that brings about the fight-or-flight response and secretes epinephrine as its final neurotransmitter.
- Synapse:** A meeting of cells in which a nerve cell stimulates another cell by secreting a neurotransmitter; the postsynaptic cell must have a receptor to which the neurotransmitter binds.
- Synergistic effect:** A physiological response to two drugs given simultaneously that is greater than the sum of the effects of the same two drugs given separately.
- Synergistic interaction:** A combination of two causes that lead to an effect greater than the sum of the effects that would have been produced by the two causes independently; for example, a combined effect in which two drugs together produce a greater physiological response than the sum of the effects of each drug given separately.
- T lymphocyte (T cell):** A type of white blood cell that helps bring about an antigen-specific immune response without releasing antibodies. See also *Cytotoxic (CD8) T cells* and *Helper (CD4) T cells*.
- Taxon:** A species or any other collective group of organisms.
- Taxonomy:** The study of how taxa are recognized and how classifications are made.
- Tela choroidea:** A thin-walled roof of one the brain cavities, across which nutrients and wastes are exchanged between the blood and the cerebrospinal fluid.
- Telomere:** A structure at the end of a chromosome whose gradual loss during cell division limits the cell's capacity to go on dividing forever.
- Telophase:** The last phase of cell division, during which chromosomes gather at opposite ends of the cell just before cytoplasmic division (cytokinesis) begins.
- Testis (testes):** The male gonads, or sperm-producing organs.
- Testosterone:** A steroid hormone that produces male primary and secondary sex characteristics.
- Thalassemia:** A form of anemia, common in many Mediterranean countries, resulting from shortened forms of the beta chain in hemoglobin molecules, and protecting the bearers from malaria.
- Theory:** A coherent set of well-tested hypotheses that guide scientific research.
- Therapeutic cloning:** Cloning whose purpose is the treatment of illnesses or other medical conditions.
- Threshold:** (1) A minimum level of a drug below which no physiological response can be detected. (2) The minimum level of a stimulus that is capable of producing an action potential.
- Thymus:** A mass of lymphoid tissue where T lymphocytes develop; it develops in the throat but usually migrates to the vicinity of the heart before adulthood.
- Tissue:** A group of similar cells and their extracellular products that are built together (structurally integrated) and that function together (functionally integrated).
- Tissue culture:** A growth of cells and tissues in a laboratory, artificially maintained outside any organism.
- Tolerance:** (1) A condition in which a greater amount of a drug is required to produce the same physiological effect that a smaller amount produced originally. (2) In immunology, acquired unreactivity to a specific antigen after repeated contact with that antigen.
- Trace minerals:** Minerals needed only in minute amounts.

Tract: A bundle of axons in the central nervous system.

Transcription: A process in which DNA is used as a template to guide the synthesis of RNA.

Transformation: (1) The multistage process that a cell undergoes in changing from a normal cell to an unregulated, less-differentiated, immortal cell lacking contact inhibition and anchorage dependence. (2) In bacteria, a hereditary change caused by the incorporation of DNA fragments from outside the cell.

Transgenic: Containing genes from another species.

Translation: A process in which amino acids are assembled into a polypeptide chain (part or all of a protein) in a sequence determined by codons in a messenger RNA molecule.

Transmission: The transfer of microorganisms from one individual to another; does not imply any particular route by which the transfer may occur.

Transpiration: Evaporation of water from the leaves of plants.

Transpiration-pull theory: The theory that sap ascends trees and other tall plants by being pulled from above by the reduced fluid pressure resulting from evaporative transpiration.

Transporter proteins: Membrane proteins that use energy to transport substances across the membrane from a region of low concentration to a region of higher concentration.

Triglycerides: Lipids formed from glycerol and three fatty acid units at a time.

Trisomy: A chromosomal condition in which three copies of a particular chromosome are present.

Trophic pyramid: A diagram summarizing the amount of food energy present at the level of producer organisms, primary consumers that feed on the producers, secondary consumers that feed on the primary consumers, and so on.

True extinction: See *Extinction*.

Tumor: A solid mass of transformed cells that may also contain induced normal cells such as blood vessels.

Tumor initiator: Agents that begin the process of transformation by causing permanent changes in the DNA; mutagens and radiation are tumor initiators.

Tumor promoter: An agent that completes the process of cell transformation after the process is started by a tumor initiator; tumor promoters are not mutagenic by themselves but cause partly transformed cells to go into cell division.

Tumor suppressor genes: Genes which normally suppress the growth of tumors.

Turgor: Fluid pressure that causes swelling and stiffness in plant cells and some other types of cells.

Turner syndrome: A condition arising from a single unpaired X chromosome (XO), resulting (if untreated) in a sterile female with immature genitals, widely spaced breasts that do not develop fully, webbing of skin at the neck, and varying degrees of mental retardation.

Unsaturated fats: Lipids with one or more double bonds between their carbon atoms.

Utilitarian: A system of ethics in which the rightness or wrongness of an act is judged according to its consequences.

Vaccination: See *Immunization*.

Vascular plants: Plants containing tissues that efficiently conduct fluids from one part of the plant to another.

Vector: (1) A virus used to transfer DNA. (2) An insect or other intermediary that transmits a disease organism.

Veins: Blood vessels that carry blood toward the heart.

Ventral tegmental area (VTA): An area in the midbrain that functions as a positive reward center by generating pleasurable sensations in response to certain stimuli.

Vestigial structures: Organs reduced in size and nonfunctional, but often showing resemblance to functional organs in related species.

Villi: Fingerlike processes, such as those lining the inside of the small intestine.

Virulence: The ability of a microorganism to cause a disease.

Virulent: Capable of causing an infectious disease.

Virus: A particle of nucleic acid (RNA or DNA) enclosed in a protein coat that cannot replicate itself but can cause a cell to replicate it.

Vitamin deficiency disease: A disease caused by insufficient amounts of a vitamin, and cured in most cases by adding the vitamin to the diet.

Vitamins: Carbon-containing molecules needed in small amounts to facilitate certain chemical reactions in the body.

White blood cells (leucocytes): The several types of blood cells that perform various protective (immune) functions but do not possess hemoglobin and do not carry oxygen.

Withdrawal: Physiological changes or unpleasant symptoms associated with the cessation of drug taking.

Xylem: A vascular tissue that gives wood its strength and that conducts watery fluids with dissolved minerals from the roots through the stem to the upper parts of the plant.

Zero population growth: A condition in which a population no longer changes size because its birth rate and death rate are equal.

Zygote: The cell that results when a sperm fuses with an egg, doubling the number of chromosomes.