

# **Foundations of Biology**

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Front cover  
American egret, Gainesville, Florida.  
Photograph by Samuel Scheiner

## Glossary

**abiotic** The nonliving parts of the environment.

**allele** Different versions of the same gene.

**anabolism** The synthesis of complex substances from simpler ones; one of the two linked processes that comprise metabolism.

**anaerobic metabolism** Metabolism in the absence of oxygen.

**biological species concept** A group of actually or potentially interbreeding organisms that are reproductively isolated from other such groups.

**biotic** The living parts of the environment.

**catabolism** The breaking down of complex substances into simpler ones; one of the two linked processes that comprise metabolism.

**chloroplasts** Specialized substructures in eukaryotic cells that capture energy from sunlight.

**cilia** Short fibers that extend from the surface of a cell and often used for propulsion.

**codon** Triplets of DNA bases that make up the genetic code.

**community** A group of populations that coexist in space and time and interact with one another directly or indirectly.

**consilience** The idea that the interdependence of scientific theories requires that they be consistent with each other.

**cytoskeleton** A meshwork of fine fibers that extends throughout a cell that gives them shape and coherence.

**degenerate** The characteristic of the genetic code in which a given amino acid is coded for by more than one possible combination of DNA bases.

**diploid** An individual with chromosomes in pairs so that it has two copies of each gene.

**dominant** An allele which is expressed preferentially in heterozygous individuals.

**ecosystem** All of the species in a community including their interactions with each other and the abiotic environment.

**egg** In species which produce two types of gametes, the larger type (see also ovule).

**empiricism** The school of thought in philosophy that understands the world by producing theories that can make useful predictions through logical deduction from basic assumptions combined with data gathered from previous experiments without assuming that the theories necessarily capture any basic truth about the world.

**endoplasmic reticulum (ER)** A membrane containing ribosomes that manufacture proteins.

**enzyme** A protein that directs or speeds up a chemical reaction.

**epistemology** The branch of philosophy that studies ways of knowing.

**essential amino acid** An amino acid which an organism cannot synthesize, and thus must take in via consumption of food.

**evolution** Changes in successive generations of a population of organisms due to changes in their genetic makeu.

**experiment** A test of an hypothesis.

**female** In species which produce two types of gametes, an individual that produces the larger type.

**flagella** Long fibers that extend from the surface of a cell used for propulsion.

**food web** The network of interactions within a community based on which species are eating each other.

**gamete** A reproductive cell.

**gene** The fundamental unit of biological information.

**genetic drift** Changes in gene frequencies due to random sampling effects.

**genotype** The genetic makeup of an individual.

**genotype-environment interactions** Differences in genetic expression as a function of the environment.

**germ line** In animals, the cells that will produce gametes.

**Golgi apparatus** A complex of vesicles and folded membranes within the cytoplasm of most eukaryotic cells, involved in secretion and intracellular transport.

**haploid** An individual with a single copy of each chromosome and each gene.

**heritability** The amount of resemblance among relatives that is due to shared genes.  
**hermaphrodite** In species which produce two types of gametes, an individual that produces both types.

**horizontal gene transfer** The process of moving a gene, a whole gene, or a large number of genes from an individual of one species to an individual of another species, usually in reference to distantly related species.

**hybridization** The process by which individuals of different species mating and produce offspring.

**hypothesis** A proposed explanation for a series of observations.

**learning** Changes in behavior resulting from experience

**lichen** A symbiotic organism consisting of an alga living inside of a fungus

**life history** The series of events in which an organism is born, grows, reproduces and dies.

**lysosome** A structure in eukaryotic cells that contain degradative enzymes.

**macromolecule** A very large molecule.

**male** In species which produce two types of gametes, an individual that produces the smaller type.

**manipulative experiment** A test of an hypothesis based on a deliberate change in the physical world.

**meiosis** The process during which a diploid individual produces haploid gametes.

**meristem cell** In plants, an unspecialized cell at the tip of a stem or root where active growth is occurring.

**metabolism** The set of co-coordinated chemical reactions that provide organisms with energy.

**Metabolism First theory** The idea that life first arose on the Earth as simple organic molecules that could replicate through a series of coupled biochemical reactions.

**methylation** The replacement of a hydrogen atom with a CH<sub>3</sub> group in the cytosine of Eukaryotes or the adenine of Bacteria.

**migration** The movement of organisms or propagules.

**mitochondria** Specialized substructures in eukaryotic cells that process energy.

**mitosis** The process of chromosome duplication and sorting into daughter cells.

**model** An abstraction or simplification that expresses structures or relationships.

**module** A part of a system within which components interact a lot with each other, and much less than with other parts of the system.

**multicausality** A single outcome that can arise as a consequence of a number of different components, or multiple causes act together.

**mutation** A change in information, possibly leading to a change in the characteristics of an organism; a change in the sequence of the DNA molecule.

**natural experiment** A test of an hypothesis based on a change in the physical world caused by some natural occurrence.

**niche** The ecological role and space that an organism fills in an ecosystem.

**nucleotide** A biochemical unit of information storage consisting of a nucleic acid, a sugar molecule, and one or more phosphorus atoms.

**observational experiments** The systematic study of natural variation undertaken to test a hypothesis.

**ontogeny** An individual's biological development.

**ovule** In species which produce two types of gametes, the larger type (see also egg).

**peroxisome** A structure in eukaryotic cells that contains and isolates some enzymes and their breakdown products.

**phenotype** The physical characteristics of an individual.

**photosynthesis** The process by which organisms capture light energy and store it as chemical energy.

**phylogenetic species** A smallest group of organisms that share an ancestor and can be distinguished from other such sets.

**phylogeny** A species' evolutionary history.

**plasmid** A small, circular piece of DNA found in bacteria consisting of just a few genes.

**pollen** In plant species which produce two types of gametes, the smaller type (see also sperm).

**primary research** Gathering information or finding fact not previously known before, and the generation and testing of scientific hypotheses.

**protein** A biochemical compound consisting of chains of amino acids.

**realism** The school of thought in philosophy that holds that theories can tell us truths about the natural world; as more accurate data is gathered about the world, theories are refined and expanded to more accurately reflect how the world works.

**recombination** The bringing together of DNA sequences in new combinations.

**reduction-oxidation reaction** The transfer of electrons from one substance to another.

**Replication First theory** The idea that life first arose on the Earth as self-replicating RNA molecules.

**reproductive rate** The number of offspring per adult organism.

**scientific method** Techniques for investigating and gathering measurable evidence about natural phenomena, using steps of systematic observation, measurement, and experiment, and the formulation, testing, and modification of hypotheses.

**secondary research** Gathering data or confirming facts that are already known, usually undertaken by students or the general public.

**senescence** An increase in the probability of dying with age.

**social constructivism** The school of thought in philosophy that posits that theories are supported by the consensus opinion of the scientific community rather than drawn from facts and data.

**speciation** The process by which one species gives rise to one or more new species.

**sperm** In species which produce two types of gametes, the smaller type (see also pollen).

**spontaneous generation** The idea that life can arise from non-life.

**spore** A diploid reproductive cell.

**stem cell** In animals, an unspecialized cell.

**superorganism** A theory that an ecological community is an analogue of an individual organism.

**symbiosis** An interdependent or mutually beneficial relationship between two or more entities.

**systematics** The science of determining the relationships among organisms.

**The Central Dogma** The idea that information flow in a cell is only in one direction, from DNA to RNA to proteins.

**transcription** The process by which the information contained in a DNA molecule is copied to a RNA molecule.

**translation** The process by which the information in a RNA molecule is used to create a protein.

**vacuole** A vesicle in plant cells that contains fluids and organic molecules.

**vesicle** A membrane sphere that stores and transports materials within eukaryotic cells.

**vitamin** An organic molecule that is essential for normal growth and nutrition and are required in small quantities in the diet.

**zygote** A diploid, unicellular entity that is formed at fertilization, which by mitosis grows into a multicellular embryo.