

GLOSSARY

#

3' UTR

3' untranslated region; region just downstream of the protein-coding region in an RNA molecule that is not translated

5' cap

a methylated guanosine triphosphate (GTP) molecule that is attached to the 5' end of a messenger RNA to protect the end from degradation

5' UTR

5' untranslated region; region just upstream of the protein-coding region in an RNA molecule that is not translated

7-methylguanosine cap

modification added to the 5' end of pre-mRNAs to protect mRNA from degradation and assist translation

A

abduction

when a bone moves away from the midline of the body

abiotic

nonliving components of the environment

aboveground biomass

total mass of aboveground living plants per area

abscisic acid (ABA)

plant hormone that induces dormancy in seeds and other organs

abscission

physiological process that leads to the fall of a plant organ (such as leaf or petal drop)

absorption spectrum

range of wavelengths of electromagnetic radiation absorbed by a given substance

abstract

opening section of a scientific paper that summarizes the research and conclusions

abyssal zone

deepest part of the ocean at depths of 4,000 m or greater

Acanthostega

one of the earliest known tetrapods

accessory fruit

fruit derived from tissues other than the ovary

acclimatization

alteration in a body system in response to environmental change

acellular

lacking cells

acetylcholine

neurotransmitter released by neurons in the central nervous system and peripheral nervous system

acetylcholinesterase (AChE)

enzyme that breaks down ACh into acetic acid and choline

acetyl CoA

combination of an acetyl group derived from pyruvic acid and coenzyme A, which is made from pantothenic acid (a B-group vitamin)

acid

molecule that donates hydrogen ions and increases the concentration of hydrogen ions in a solution

acidophile

organism with an optimal growth pH of 3.0 or below

acid rain

corrosive rain caused by rainwater falling to the ground through sulfur dioxide gas, turning it into weak sulfuric acid; can damage structures and ecosystems

acoelomate

animal without a body cavity

acromegaly

condition caused by overproduction of GH in adults

acrosomal reaction

series of biochemical reactions that the sperm uses to break through the zona pellucida

actin

globular contractile protein that interacts with myosin for muscle contraction

Actinopterygii

ray-finned fishes

action potential

self-propagating momentary change in the electrical potential of a neuron (or muscle) membrane

activation energy

energy necessary for reactions to occur

activator

protein that binds to prokaryotic operators to increase transcription

active immunity

development of immunity due to the activation of an individual's own adaptive immune response

active site

enzyme's specific region to which the substrate binds

active transport

method of transporting material that requires energy

acute disease

disease where the symptoms rise and fall within a short period of time

adaptation

heritable trait or behavior in an organism that aids in its survival and reproduction in its present environment

adaptive evolution

increase in frequency of beneficial alleles and decrease in deleterious alleles due to selection

adaptive immunity

immunity that has memory and occurs after exposure to an antigen either from a pathogen or a vaccination

adaptive radiation

rapid branching through speciation of a phylogenetic tree into many closely related species

Addison's disease

disorder caused by the hyposecretion of corticosteroids

adduction

movement of the limbs inward after abduction

adenyl cyclase

an enzyme that catalyzes the conversion of ATP to cyclic AMP

adhesion

attraction between water molecules and other molecules

adjuvant

a chemical compound added to vaccine formulations that is used to induce an immune response against the vaccine antigen

adrenal cortex

outer portion of adrenal glands that produces corticosteroids

adrenal gland

endocrine glands associated with the kidneys

adrenal medulla

inner portion of adrenal glands that produces epinephrine and norepinephrine

adrenocorticotrophic hormone (ACTH)

hormone released by the anterior pituitary, which stimulates the adrenal cortex to release corticosteroids during the long-term stress response

adventitious

describes an organ that grows in an unusual place, such as roots growing from the side of a stem

adventitious root

aboveground root that arises from a plant part other than the radicle of the plant embryo

aerobic respiration

process in which organisms convert energy in the presence of oxygen

afferent arteriole

arteriole that branches from the cortical radiate artery and enters the glomerulus

affinity

attraction of molecular complementarity between antigen and antibody molecules

aflatoxins

toxic and carcinogenic compounds released by fungi of the genus *Aspergillus*

age structure

proportion of population members at specific age ranges

aggregate fruit

fruit that develops from multiple carpels in the same flower

aggressive display

visual display by a species member to discourage other members of the same species or different species

A horizon

consists of a mixture of organic material with inorganic products of weathering

aldosterone

steroid hormone produced by the adrenal cortex that stimulates the reabsorption of Na^+ from extracellular fluids and secretion of K^+

aleurone

single layer of cells just inside the seed coat that secretes enzymes upon germination

algal bloom

rapid increase of algae in an aquatic system

alimentary canal

tubular digestive system with a mouth and anus

aliphatic hydrocarbon

hydrocarbon consisting of linear chains, branched chains, or nonaromatic rings of carbon atoms

alkaliphile

organism with an optimal growth pH of 9.0 or above

allantois

membrane of the egg that stores nitrogenous wastes produced by the embryo; also facilitates respiration

allele

gene variations that arise by mutation and exist at the same relative locations on homologous chromosomes

allele frequency

rate at which a specific allele appears within a population (also, gene frequency)

allergy

immune reaction that results from immediate hypersensitivities in which an antibody-mediated immune response occurs within minutes of exposure to a harmless antigen

allopatric speciation

speciation that occurs via geographic separation

allopolyploid

polyploidy formed between two related but separate species

allosteric regulation

regulation due to a binding event at a site different from the active site, which induces a conformational change and changes the enzyme's affinity for its substrate (either an increased or decreased affinity)

alpha cell

endocrine cell of the pancreatic islets that produces the hormone glucagon

alpha-helix structure (α -helix)

type of secondary protein structure formed by folding the polypeptide into a helix shape with hydrogen bonds stabilizing the structure

alteration

change of the set point in a homeostatic system

alternation of generations

life-cycle type in which the diploid and haploid stages alternate

alveolar duct

duct that extends from the terminal bronchiole to the alveolar sac

alveolar P_{O_2}

partial pressure of oxygen in the alveoli (usually around 100 mmHg)

alveolar sac

structure consisting of two or more alveoli that share a common opening

alveolar ventilation

how much air is in the alveoli

alveolus

(plural, *alveoli*) terminal region of the lung where gas exchange occurs (also, air sac)

Alzheimer's disease

neurodegenerative disorder characterized by problems with memory and thinking

amino acid

a protein's monomer; has a central carbon or alpha carbon to which an amino group, a carboxyl group, a hydrogen, and an R group or side chain is attached; the R group is different for all 20 common amino acids

amino acid-derived hormone

hormone derived from amino acids

aminoacyl-tRNA

tRNA molecule to which the correct amino acid has been chemically attached

aminoacyl-tRNA synthetase

enzyme that "charges" tRNA molecules by catalyzing a bond between the tRNA and a corresponding amino acid

aminopeptidase

protease that breaks down peptides to single amino acids; secreted by the brush border of small intestine

ammonia

compound made of one nitrogen atom and three hydrogen atoms

ammonification

process by which ammonia is released during the decomposition of nitrogen-containing organic compounds

ammonotelic

describes an animal that excretes ammonia as the primary waste material

amnion

membrane of the egg that protects the embryo from mechanical shock and prevents dehydration

amniote

animal that produces a terrestrially adapted egg protected by amniotic membranes

amoebocyte

sponge cell with multiple functions, including nutrient delivery, egg formation, sperm delivery, and cell differentiation

amphiarthrosis

(plural, *amphiarthroses*) joint that allows slight movement; includes syndesmoses and symphyses

Amphibia

frogs, salamanders, and caecilians

amphibolic

a metabolic process that has both catabolic and anabolic components

amphipathic

a molecule that has both hydrophobic and hydrophilic components

amphiphilic

molecule possessing a polar or charged area and a nonpolar or uncharged area capable of interacting with both hydrophilic and hydrophobic environments

ampulla of Lorenzini

sensory organ that allows sharks to detect electromagnetic fields produced by living things

amygdala

structure within the limbic system that processes fear

amyloplast

plant organelle that stores starch granules and functions as a statolith in gravity-sensing cells

anabolic

pathways that require an energy input to synthesize complex molecules from simpler ones (also, anabolism)

anaerobic (organism)

refers to organisms that grow without oxygen

anaerobic (process)

process that does not use oxygen

anaerobic cellular respiration

process in which organisms convert energy for their use in the absence of oxygen

analogous structures

structures that are similar in structure and function but with different evolutionary origins

analogy

characteristic that is similar between organisms by convergent evolution, not due to the same evolutionary path (also, homoplasy)

analytical model

ecosystem model that is created with mathematical formulas to predict the effects of environmental disturbances on ecosystem structure and dynamics

anaphase

stage of mitosis during which sister chromatids are separated from each other

anapsid

animal having no temporal fenestrae in the cranium

anatomical dead space

region of the lung that lacks proper ventilation/perfusion due to an anatomical block (also, anatomical shunt)

androecium

the group of stamens in a flower

androgen

male sex hormone, such as testosterone

aneuploid

individual with an error in chromosome number; includes chromosome segment deletions and duplications

aneuploidy

condition of a cell having an extra chromosome or missing a chromosome for its species

angina

pain caused by partial blockage of the coronary arteries by the buildup of plaque and lack of oxygen to the heart muscle

angiosperm

flowering plant

angiotensin I

product in the renin-angiotensin-aldosterone pathway

angiotensin II

molecule that affects different organs to increase blood pressure

angiotensin-converting enzyme (ACE)

enzyme that converts angiotensin I to angiotensin II

angular movement

produced when the angle between the bones of a joint changes

anion

negative ion that is formed by an atom gaining one or more electrons

Annelida

phylum of vermiform animals with metamerism

anoxic

without oxygen

antenna protein

pigment molecule that directly absorbs light and transfers the energy absorbed to other pigment molecules

anterior pituitary gland

portion of the pituitary gland that produces six hormones (also, adenohypophysis)

anther

saclike structure at the tip of the stamen in which pollen grains are produced

antheridium

male gametangium

Anthophyta

phylum to which angiosperms belong

anthropoid

monkeys, apes, and humans

antibiotic

biological substance that, in low concentration, is antagonistic to the growth of prokaryotes

antibiotic resistance

ability of an organism to be unaffected by an antibiotic's actions

antibody

protein that is produced by plasma cells after stimulation by an antigen (also, immunoglobulin)

anticodon

three-nucleotide sequence in a tRNA molecule that corresponds to an mRNA codon

antidiuretic hormone (ADH)

hormone produced by the hypothalamus and released by the posterior pituitary that increases water reabsorption by the kidneys (also, vasopressin)

antigen

foreign or "non-self" protein that triggers the immune response

antigen-presenting cell (APC)

immune cell that detects, engulfs, and informs the adaptive immune response about an infection by presenting the processed antigen on the cell surface

antioxidant

agent that prevents cell destruction by reactive oxygen species

antipodal cells

site of growth-hormone accumulation in the embryo sac

antiporter

transporter that carries two ions or small molecules in different directions

Anura

frogs

anus

exit point for waste material

aorta

major artery of the body that takes blood away from the heart

apex consumer

organism at the top of the food chain

aphotic zone

part of the ocean where no light penetrates

apical bud

bud formed at the tip of the shoot

apical meristem

meristematic tissue located at the tips of stems and roots; enables a plant to extend in length

apocrine gland

scent gland that secretes substances that are used for chemical communication

Apoda

caecilians

apodeme

ingrowth of an animal's exoskeleton that functions as an attachment site for muscles

apomixis

process by which seeds are produced without fertilization of sperm and egg

apoptosis

programed cell death, as a part of defense, growth, or development

aposematic coloration

warning coloration used as a defensive mechanism against predation

appendicular skeleton

composed of the bones of the upper limbs, which function to grasp and manipulate objects, and the lower limbs, which permit locomotion

applied science

form of science that aims to solve real-world problems

appositional growth

increase in the diameter of bones by the addition of bone tissue at the surface of bones

aquaporin

channel protein that allows water through the membrane at a very high rate

arachnoid mater

weblike middle layer of the meninges that cover the central nervous system

arbuscular mycorrhizae

mycorrhizae commonly involving Glomeromycetes in which the fungal hyphae penetrate the cell walls of the plant root cells (but not the cell membranes)

Archaeopteryx

transition species from dinosaur to bird from the Jurassic Period

archegonium

female gametangium

archenteron

primitive gut cavity within the gastrula that opens outward via the blastopore

archosaur

modern crocodilian or bird, or an extinct pterosaur or dinosaur

Arctic tundra

biome located throughout the Arctic regions of the northern hemisphere

arcuate artery

artery that branches from the interlobar artery and arches over the base of the renal pyramids

aromatic hydrocarbon

hydrocarbon consisting of closed rings of carbon atoms

arteriole

small vessel that connects an artery to a capillary bed

artery

blood vessel that takes blood away from the heart

Arthropoda

phylum of animals with jointed appendages

articulation

any place where two bones are joined

ascending limb

part of the loop of Henle that ascends from the renal medulla to the renal cortex

ascocarp

fruiting body of ascomycetes

Ascomycota

phylum of fungi that store spores in a sac called ascus (also, sac fungi)

ascus

(plural, *asci*) saclike structure that contains haploid ascospores

asexual reproduction

form of reproduction that produces offspring that are genetically identical to the parent

assimilation

biomass consumed and assimilated from the previous trophic level after accounting for the energy lost due to incomplete ingestion of food, energy used for respiration, and energy lost as waste

assortative mating

when individuals tend to mate with those who are phenotypically similar to themselves

astrocyte

glial cell in the central nervous system that provides nutrients, extracellular buffering, and structural support for neurons; also makes up the blood-brain barrier

asymmetrical

describes animals with no axis of symmetry in their body pattern

asymptomatic disease

disease where there are no symptoms and the individual is unaware of being infected unless lab tests are performed

atherosclerosis

buildup of fatty plaques in the coronary arteries in the heart

atom

the smallest unit of matter that retains all of the chemical properties of an element

atomic mass

calculated mean of the mass number for an element's isotopes

atomic number

total number of protons in an atom

ATP

adenosine triphosphate, the cell's energy currency

ATP synthase

membrane-embedded protein complex that adds a phosphate to ADP with energy from protons diffusing through it (also, F_1F_0 ATP synthase)

atrial natriuretic peptide (ANP)

hormone produced by the heart to reduce blood volume, pressure, and Na^+ concentration

atrioventricular valve

one-way membranous flap of connective tissue between the atrium and the ventricle in the right side of the heart (also, tricuspid valve)

atrium

(plural, *atria*) chamber of the heart that receives blood from the veins and sends blood to the ventricles

attention-deficit/hyperactivity disorder (ADHD)

neurodevelopmental disorder characterized by difficulty maintaining attention and controlling impulses

attenuation

weakening of a virus during vaccine development

audition

sense of hearing

auditory ossicle

transduces sounds from the air into vibrations in the fluid-filled cochlea (also, middle ear)

auricle

cartilaginous outer ear (also, pinna)

Australopithecus

genus of hominins that evolved in eastern Africa approximately four million years ago

autism spectrum disorder (ASD)

neurodevelopmental disorder characterized by impaired social interaction and communication abilities

autoantibody

antibody that incorrectly marks “self” components as foreign and stimulates the immune response

autocrine signal

signal that is sent and received by the same or similar nearby cells

autoimmune response

inappropriate immune response to host cells or self-antigens

autoimmunity

type of hypersensitivity to self antigens

autoinducer

signaling molecule secreted by bacteria to communicate with other bacteria of its kind

autonomic nervous system

part of the peripheral nervous system that controls bodily functions

autopolyploid

polyploidy formed within a single species

autosome

any of the nonsex chromosomes

auxin

plant hormone that influences cell elongation (in phototropism), gravitropism, apical dominance, and root growth

avidity

total binding strength of a multivalent antibody with an antigen

axial skeleton

forms the central axis of the body and includes the bones of the skull, the ossicles of the middle ear, the hyoid bone of the throat, the vertebral column, and the thoracic cage (rib cage)

axillary bud

bud located in the axil; the stem area where the petiole connects to the stem

axon

tubelike structure that propagates a signal from a neuron’s cell body to axon terminals

axon hillock

electrically sensitive structure on the cell body of a neuron that integrates signals from multiple neuronal connections

axon terminal

structure on the end of an axon that can form a synapse with another neuron

AZT

anti-HIV drug that inhibits the viral enzyme reverse transcriptase

B**back mutation**

when a live virus vaccine reverts back to its disease-causing phenotype

bacteriophage

virus that infects bacteria

balanced chemical equation

statement of a chemical reaction with the number of each type of atom equalized for both the products and reactants

ball-and-socket joint

joint with a rounded, ball-like end of one bone fitting into a cuplike socket of another bone

barcoding

molecular biology technique in which one or more short gene sequences taken from a well-characterized portion of the genome is used to identify a species

bark

tough, waterproof, outer epidermal layer of cork cells

basal angiosperms

a group of plants that probably branched off before the separation of monocots and eudicots

basal ganglia

interconnected collections of cells in the brain that are involved in movement and motivation (also, basal nuclei)

basal metabolic rate (BMR)

metabolic rate at rest in endothermic animals

basal nuclei

see basal ganglia

basal taxon

branch on a phylogenetic tree that has not diverged significantly from the root ancestor

base

molecule that donates hydroxide ions or otherwise binds excess hydrogen ions and decreases the hydrogen ions’ concentration in a solution

basic science

science that seeks to expand knowledge and understanding regardless of the short-term application of that knowledge

basidiocarp

fruiting body that protrudes from the ground and bears the basidia

Basidiomycota

phylum of fungi that produce club-shaped structures (basidia) that contain spores (also, club fungi)

basidium

club-shaped fruiting body of basidiomycetes

basilar membrane

stiff structure in the cochlea that indirectly anchors auditory receptors

basophil

leukocyte that releases chemicals usually involved in the inflammatory response

Batesian mimicry

type of mimicry where a non-harmful species takes on the warning colorations of a harmful one

B cell

lymphocyte that matures in the bone marrow and differentiates into antibody-secreting plasma cells

bedrock

solid rock that lies beneath the soil (also, R horizon)

behavior

change in an organism’s activities in response to a stimulus

behavioral biology

study of the biology and evolution of behavior

behavioral isolation

type of reproductive isolation that occurs when a specific behavior or lack of one prevents reproduction from taking place

benthic realm

part of the ocean that extends along the ocean bottom from the shoreline to the deepest parts of the ocean floor (also, benthic zone)

beta cell

endocrine cell of the pancreatic islets that produces the hormone insulin

beta-human chorionic gonadotropin (β-HCG)

hormone produced by the chorion of the zygote that helps to maintain the corpus luteum and elevated levels of progesterone

beta-pleated sheet (β-pleated sheet)

secondary structure in proteins in which hydrogen bonding forms “pleats” between atoms on the polypeptide chain’s backbone

B horizon

soil layer that is an accumulation of mostly fine material that has moved downward

bicarbonate buffer system

system in the blood that absorbs carbon dioxide and regulates pH levels

bicarbonate (HCO_3^-) ion
ion created when carbonic acid dissociates into H^+ and HCO_3^-

bicuspid valve

one-way membranous flap between the atrium and the ventricle in the left side of the heart (also, mitral valve, left atrioventricular valve)

bilateral symmetry

type of symmetry in which there is only one plane of symmetry, so the left and right halves of an animal are mirror images

bile

digestive juice produced by the liver, important for digestion of lipids

binary fission

prokaryotic cell division process

binomial nomenclature

system of two-part scientific names for an organism, which includes genus and species names

biochemistry

study of the chemistry of biological organisms

biodiversity

variety of a biological system; typically conceived as the number of species but also applying to genes, biochemistry, and ecosystems

biodiversity hotspot

concept originated by Norman Myers to describe a geographical region with a large number of endemic species and a large percentage of degraded habitat

bioenergetics

study of energy flowing through living systems

biofilm

microbial community that is held together by a gummy-textured matrix

biogeochemical cycle

cycling of mineral nutrients through ecosystems and through the nonliving world

biogeography

study of the geographic distribution of living things and the abiotic factors that affect their distribution

biological carbon pump

process by which inorganic carbon is fixed by photosynthetic species that then die and fall to the sea floor where they cannot be reached by saprobes and their carbon dioxide consumption cannot be returned to the atmosphere

biological macromolecule

large molecule, necessary for life, that is built from smaller, organic molecules

biological nitrogen fixation (BNF)

conversion of atmospheric nitrogen into ammonia exclusively carried out by prokaryotes

biology

the study of life

bioluminescence

generation and emission of light by an organism, as in dinoflagellates

biomagnification

increasing concentrations of persistent, toxic substances in organisms at each trophic level, from the primary producers to the apex consumers

biomarker

individual protein that is uniquely produced in a diseased state

biomass

total weight, at the time of measurement, of living or previously living organisms in a unit area within a trophic level

biome

ecological community of plants, animals, and other organisms that is adapted to a characteristic set of environmental conditions

bioremediation

the use of naturally occurring organisms to consume and break down pollutants to clean up a contaminated environment

biosphere

collection of all the ecosystems on Earth

biotechnology

any technological application that uses living organisms, biological systems, or their derivatives to produce or modify other products

biotic

living components of the environment

biotic potential (r_{max})

maximal potential growth rate of a species

bipolar neuron

neuron with two processes from the cell body, typically in opposite directions

biramous

referring to two branches per appendage

birth rate (B)

number of births within a population at a specific point in time

Black Death

devastating pandemic that is believed to have been an outbreak of bubonic plague caused by the bacterium *Yersinia pestis*

blastocyst

structure formed when cells in the mammalian blastula separate into an inner and outer layer

blastopore

opening into the archenteron that forms during gastrulation

blastula

16–32 cell stage of development of an animal embryo

blending theory of inheritance

hypothetical inheritance pattern in which parental traits are blended together in the offspring to produce an intermediate physical appearance

blood pressure (BP)

pressure of blood in the arteries that helps to push blood through the body

blood urea nitrogen (BUN)

estimate of urea in the blood and an indicator of kidney function

body plan

morphology or defining shape of an organism

bolus

mass of food resulting from chewing action and wetting by saliva

bone

connective tissue that constitutes the endoskeleton (also, osseous tissue)

bone remodeling

replacement of old bone tissue by new bone tissue

boreal forest

found south of the Arctic Circle and across most of Canada, Alaska, Russia, and northern Europe (also, taiga or coniferous forest)

botany

study of plants

bottleneck effect

magnification of genetic drift as a result of natural events or catastrophes

botulism

disease produced by the toxin of the anaerobic bacterium *Clostridium botulinum*

Bowman's capsule

structure that encloses the glomerulus

brachiation

movement through tree branches via suspension from the arms

brainstem

portion of the brain that connects with the spinal cord; controls basic nervous system functions like breathing, heart rate, and swallowing

branch point

node on a phylogenetic tree where a single lineage splits into distinct new ones

brassinosteroid

plant hormone that regulates plant growth, development, and adaptation to biotic and abiotic stressors

bronchiole

airway that extends from the main tertiary bronchi to the alveolar sac

bronchus

(plural, *bronchi*) smaller branch of cartilaginous tissue that stems off of the trachea; air is funneled through the bronchi to the region where gas exchange occurs in alveoli

brumation

period of much reduced metabolism and torpor that occurs in any ectotherm in cold weather

budding (reproduction)

a type of asexual reproduction where a new organism develops from an outgrowth or bud generated by cell division

budding (virus)

method of exit from the cell used in certain animal viruses, where virions leave the cell individually by capturing a piece of the host plasma membrane

buffer

substance that resists a change in pH by absorbing or releasing hydrogen or hydroxide ions

bulb

modified underground stem that consists of a large bud surrounded by numerous leaf scales

bulbourethral gland

secretion that cleanses the urethra prior to ejaculation

bulk transport

transport of large molecules, particles, or cells across the cell membrane

buoyancy

property of floating on the surface of a liquid

bush meat

wild-caught animal used as food (typically mammals, birds, and reptiles); usually referring to hunting in the tropics of sub-Saharan Africa, Asia, and the Americas

bycatch

any fish, or other marine species, that is caught unintentionally while harvesting a target species

C**CAAT box**

(GGCCAATCT) essential eukaryotic promoter sequence involved in binding transcription factors

caecilian

legless amphibian that belongs to the clade Apoda

calcification

process of deposition of mineral salts in the collagen fiber matrix that crystallizes and hardens the tissue

calcitonin

hormone produced by the parafollicular cells of the thyroid gland that functions to lower blood Ca^{2+} levels and promote bone growth

calorie

amount of heat required to change the temperature of one gram of water by one degree Celsius

Calvin cycle

light-independent reactions of photosynthesis that convert carbon dioxide from the atmosphere into carbohydrates using the energy and reducing power of ATP and NADPH

calyptra

hoodlike structure that protects the capsule that contains the embryonic sporophyte

calyx (flower)

whorl of sepals

calyx (kidney)

(plural, *calyces*) structure that connects the renal pelvis to the renal medulla

Cambrian explosion

time during the Cambrian Period (541–485 million years ago) when most of the animal phyla in existence today evolved

camouflage

avoiding detection by blending in with the background

CA-MRSA

MRSA acquired in the community rather than in a hospital

canaliculus

microchannel that connects the lacunae and aids diffusion between cells

candela (cd)

unit of measurement of luminous intensity (brightness)

canopy

branches and foliage of trees that form a layer of overhead coverage in a forest

capillary

smallest blood vessel that allows the passage of individual blood cells and the site of diffusion of oxygen and nutrient exchange

capillary action

occurs because water molecules are attracted to charges on the inner surfaces of narrow tubular structures, such as glass tubes, drawing the water molecules to the tubes' sides

capillary bed

large number of capillaries that converge to take blood to a particular organ or tissue

capsid

protein coating of the viral core

capsomere

protein subunit that makes up the capsid

capsule (moss)

case of the sporangium in mosses

capsule (prokaryote)

external structure that enables a prokaryote to attach to surfaces and protects it from dehydration

captacula

tentacle-like projection that is present in tusk shells to catch prey

carbaminohemoglobin

molecule that forms when carbon dioxide binds to hemoglobin

carbohydrate

biological macromolecule in which the ratio of carbon to hydrogen and to oxygen is 1:2:1; carbohydrates serve as energy sources and structural support in cells and form arthropods' cellular exoskeleton

carbon fixation

process of converting inorganic CO_2 gas into organic compounds

carbonic anhydrase (CA)

enzyme that catalyzes carbon dioxide and water into carbonic acid

carboxypeptidase

protease that breaks down peptides to single amino acids; secreted by the brush border of small intestine

cardiac cycle

filling and emptying the heart of blood by electrical signals that cause the heart muscles to contract and relax

cardiac muscle tissue

muscle tissue found only in the heart; cardiac contractions pump blood throughout the body and maintain blood pressure

cardiac output

the volume of blood pumped by the heart in one minute as a product of heart rate multiplied by stroke volume

cardiomyocyte

specialized heart muscle cell that is striated but contracts involuntarily like smooth muscle

carnivore

animal that primarily consumes animal flesh

carotenoid

photosynthetic pigment (yellow-orange-red) that functions to dispose of excess energy

carpel

single unit of the pistil

carpus

eight bones that comprise the wrist

carrier protein

membrane protein that moves a substance across the plasma membrane by changing its own shape

carrying capacity (*K*)

number of individuals of a species that can be supported by the limited resources of a habitat

cartilage

type of connective tissue with a large amount of ground substance matrix, cells called chondrocytes, and some amount of fibers

cartilaginous joint

joint in which the bones are connected by cartilage

Casineria

one of the oldest known amniotes; had both amphibian and reptilian characteristics

Casparian strip

waxy coating that forces water to cross endodermal plasma membranes before entering the vascular cylinder, instead of moving between endodermal cells

catabolic

pathways in which complex molecules break down into simpler ones (also, catabolism)

catabolite activator protein (CAP)

protein that complexes with cAMP to bind to the promoter sequences of operons, which control sugar processing when glucose is not available

catalyst

substance that helps a chemical reaction to occur

Catarrhini

clade of Old World monkeys

cation

positive ion that is formed by an atom losing one or more electrons

caveolin

protein that coats the plasma membrane's cytoplasmic side and participates in the liquid uptake process by potocytosis

cDNA library

collection of cloned complementary DNA (cDNA) sequences

cell

smallest fundamental unit of structure and function in living things

cell cycle

ordered series of events involving cell growth and cell division that produces two new daughter cells

cell-cycle checkpoint

mechanism that monitors the preparedness of a eukaryotic cell to advance through the various cell-cycle stages

cell-mediated immune response

adaptive immune response that is carried out by T cells

cell necrosis

cell death

cell plate

structure formed during plant cell cytokinesis by Golgi vesicles, forming a temporary structure (phragmoplast) and fusing at the metaphase plate; ultimately leads to the formation of cell walls that separate the two daughter cells

cell-surface receptor

cell-surface protein that transmits a signal from the exterior of the cell to the interior even though the ligand does not enter the cell

cell theory

a biological concept that states that one or more cells comprise all organisms; the cell is the basic unit of life; and new cells arise from existing cells (also, unified cell theory)

cellular cloning

production of identical cell populations by binary fission

cellulose

polysaccharide that comprises the plants' cell wall; provides structural support to the cell

cell wall

rigid cell covering comprised of various molecules that protects the cell, provides structural support, and gives shape to the cell

centimorgan (cM)

relative distance that corresponds to a 0.01 recombination frequency (also, map unit)

central dogma

states that genes specify the sequence of mRNAs, which in turn specify the sequence of proteins

central vacuole

large plant cell organelle that regulates the cell's storage compartment, holds water, and plays a significant role in cell growth as the site of macromolecule degradation

centriole

rodlike structure constructed of microtubules at the center of each animal cell centrosome

centromere

region at which sister chromatids are bound together; a constricted area in condensed chromosomes

centrosome

region in animal cells made of two centrioles that serves as an organizing center for microtubules

cephalic phase

first phase of digestion, controlled by the neural response to the stimulus provided by food

Cephalochordata

chordate clade whose members possess a notochord, dorsal hollow nerve cord, pharyngeal slits, an endostyle, and a postanal tail in the adult stage

cephalothorax

fused head and thorax in some species

cerebellum

brain structure involved in posture, motor coordination, and learning new motor actions

cerebral cortex

outermost sheet of brain tissue; involved in many higher-order functions

cerebrospinal fluid (CSF)

clear liquid that surrounds the brain and spinal cord and fills the ventricles and central canal; acts as a shock absorber and circulates material throughout the brain and spinal cord

chain termination method

method of DNA sequencing using labeled dideoxynucleotides to terminate DNA replication (also, the dideoxy method or the Sanger method)

channel

width of a river or stream from one bank to the other bank

channel protein

membrane protein that allows a substance to pass through its hollow core across the plasma membrane

chaparral

found in California, along the Mediterranean Sea, and along the southern coast of Australia (also, scrub forest)

chaperone

protein that helps nascent protein in the folding process (also, chaperonin)

charophyte

other term for green algae; considered the closest relative of land plants

chelicera

(plural, *chelicerae*) modified first pair of appendages in subphylum Chelicerata

chemical bond

interaction between two or more of the same or different atoms that results in forming molecules

chemical defenses

discouraging animals from predation or herbivory by the production of noxious, odiferous, indigestible, toxic, or venomous substances that repel, deter, injure/harm, distract, or prevent detection by predators

chemical diversity

variety of metabolic compounds in an ecosystem

chemical energy

potential energy in chemical bonds that releases when those bonds are broken

chemical reaction

process leading to rearranging atoms in molecules

chemical reactivity

the ability to combine and to chemically bond with each other

chemical synapse

small space between axon terminals and dendrites of nerve cells where neurotransmitters function

chemiosmosis

process in which there is a production of adenosine triphosphate (ATP) in cellular metabolism by the involvement of a proton gradient across a membrane

chemoautotroph

organism that can build organic molecules using energy derived from inorganic chemicals instead of sunlight

chemotroph

organism that obtains energy from chemical compounds

chiasmata

(singular, *chiasma*) the structure that forms at the crossover points after genetic material is exchanged

chitin

a nitrogen-containing polysaccharide that forms the outer skeleton of all arthropods that include crustaceans and insects; it also forms fungi cell walls

chloride shift

exchange of chloride for bicarbonate into or out of the red blood cell

chlorophyll

green pigment that captures the light energy that drives the light reactions of photosynthesis

chlorophyll *a*

form of chlorophyll that absorbs violet-blue and red light and consequently has a bluish-green color; the only pigment molecule that performs the photochemistry by getting excited and losing an electron to the electron transport chain

chlorophyll *b*

accessory pigment that absorbs blue and red-orange light and consequently has a yellowish-green tint

chlorophyte

comprises most of the green algae

chloroplast

a membrane-bound organelle that contains chlorophyll and in which photosynthesis takes place

choanocyte

sponge cell that functions to generate a water current and to trap and ingest food particles via phagocytosis (also, collar cell)

cholecystokinin (CCK)

hormone that stimulates the contraction of the gallbladder to release bile

Chondrichthyes

jawed fish with paired fins and a skeleton made of cartilage

chondrocyte

cell found in cartilage

Chordata

phylum of animals distinguished by their possession of a notochord, a dorsal hollow nerve cord, pharyngeal slits, an endostyle or thyroid gland, and a postanal tail at some point during their development

chorion

membrane of the egg that surrounds the embryo and yolk sac

C horizon

layer of soil that contains the parent material and the organic and inorganic material that is broken down to form soil (also, soil base)

choroid plexus

spongy tissue within ventricles that produces cerebrospinal fluid

chromatid

single DNA molecule of two strands of duplicated DNA and associated proteins held together at the centromere

chromatin

protein-DNA that serves as the chromosomes' building material

chromophore

molecule that absorbs light

Chromosomal Theory of Inheritance

theory proposing that chromosomes are the genes' vehicles and that their behavior during meiosis is the physical basis of the inheritance patterns that Mendel observed

chromosome

structure within the nucleus that comprises chromatin that contains DNA, the hereditary material

chromosome inversion

detachment, 180° rotation, and chromosome arm reinsertion

chronic infection

describes when the virus persists in the body for a long period of time

chylomicron

small lipid globule

chyme

mixture of partially digested food and stomach juices

chymotrypsin

pancreatic protease

chytridiomycosis

disease of amphibians caused by the fungus *Batrachochytrium dendrobatidis*; thought to be a major cause of the global amphibian decline

Chytridiomycota

primitive phylum of fungi that live in water and produce gametes with flagella (also, chytrids)

chytrids

the simplest and most primitive true fungi; any simple microscopic and aquatic fungus that does not form a mycelium

cilium

(plural, *cilia*) short, hairlike structure that extends from the plasma membrane in large numbers and functions to move an entire cell or move substances along the cell's outer surface

cingulate gyrus

helps regulate emotions and pain; thought to directly drive the body's conscious response to unpleasant experiences

circadian

describes a time cycle about one day in length

circumduction

movement of a limb in a circular motion

cis-acting element

transcription factor binding sites within the promoter that regulate the transcription of a gene adjacent to it

CITES

Convention on International Trade in Endangered Species of Wild Fauna and Flora

citric acid cycle

series of enzyme-catalyzed chemical reactions of central importance in all living cells for extraction of energy from carbohydrates (also, Krebs cycle)

cladistics

system to organize homologous traits to describe phylogenies

cladogram

a branching diagram that shows relationships among groups of organisms (clades)

class

division of phylum in the taxonomic classification system

classical conditioning

association of a specific stimulus and response through conditioning

clathrates

frozen chunks of ice and methane found at the bottom of the ocean

clathrin

protein that coats the plasma membrane's inward-facing surface and assists in forming specialized structures, like coated pits, for phagocytosis

clavicle

S-shaped bone that positions the arms laterally

clay

soil particles that are less than 0.002 mm in diameter

cleavage

cell divisions subdividing a fertilized egg (zygote) to form a multicellular embryo

cleavage furrow

constriction formed by an actin ring during cytokinesis in animal cells that leads to cytoplasmic division

climate

long-term, predictable atmospheric conditions present in a specific area

climax community

final stage of succession, where a stable community is formed by a characteristic assortment of plant and animal species

cline

gradual geographic variation across an ecological gradient

clitellum

specialized band of fused segments, which aids in reproduction

clitoris

sensory structure in females; stimulated during sexual arousal

cloaca

common body opening for the digestive, excretory, and reproductive systems found in non-mammals, such as birds

clonal selection

activation of B cells corresponding to one specific BCR variant and the dramatic proliferation of that variant

clone

exact replica

closed circulatory system

system in which the blood is separated from the bodily interstitial fluid and contained in blood vessels

club mosses

earliest group of seedless vascular plants (also, lycophytes)

Cnidaria

phylum of animals that are diploblastic and have radial symmetry

cnidocyte

specialized stinging cell found in Cnidaria

cochlea

whorled structure that contains receptors for transduction of the mechanical wave into an electrical signal

codominance

in a heterozygote, complete and simultaneous expression of both alleles for the same characteristic

codon

three consecutive nucleotides in mRNA that specify the insertion of an amino acid or the release of a polypeptide chain during translation

coelom

lined body cavity

coenocytic hypha

single hypha that lacks septa and contains many nuclei

coenzyme

small organic molecule, such as a vitamin or its derivative, which is required to enhance an enzyme's activity

coevolve

when two or more species evolve together

cofactor

inorganic ion, such as iron and magnesium ions, required for optimal enzyme activity regulation

cognitive learning

knowledge and skills acquired by the manipulation of information in the mind

cohesin

proteins that form a complex that seals sister chromatids together at their centromeres until anaphase II of meiosis

cohesion

intermolecular forces between water molecules caused by the polar nature of water; responsible for surface tension

coleoptile

covering of the shoot tip, found in germinating monocot seeds

coleorhiza

covering of the root tip, found in germinating monocot seeds

colinear

in terms of RNA and protein, three "units" of RNA (nucleotides) specify one "unit" of protein (amino acid) in a consecutive fashion

collenchyma cell

elongated plant cell with unevenly thickened walls; provides structural support to the stem and leaves

colloid

fluid inside the thyroid gland that contains the glycoprotein thyroglobulin

columnar epithelia

epithelia made of cells taller than they are wide; specialized in absorption

commensalism

symbiotic relationship in which one member benefits while the other member is not affected

community

set of populations inhabiting a particular area

compact bone

forms the hard external layer of all bones

companion cell

phloem cell that is connected to sieve-tube cells; has large amounts of ribosomes and mitochondria

competitive exclusion principle

no two species within a habitat can coexist when they compete for the same resources at the same place and time

competitive inhibition

type of inhibition in which the inhibitor competes with the substrate molecule by binding to the enzyme's active site

complement system

array of approximately 20 soluble proteins of the innate immune system that enhance phagocytosis, bore holes in pathogens, and recruit lymphocytes; enhances the adaptive response when antibodies are produced

compliance

measurement of how well the lung expands

compound

substance composed of molecules consisting of atoms of at least two different elements

compound leaf

leaf in which the leaf blade is subdivided to form leaflets, all attached to the midrib

concentration gradient

difference in the concentration of a single substance between two locations

conceptual model

ecosystem model that consists of flow charts that show the interactions of different compartments of the living and nonliving components of the ecosystem (also, compartment model)

conclusion

section of a scientific paper that summarizes the importance of the experimental findings

condensin

proteins that help sister chromatids coil during prophase

conditioned behavior

behavior that becomes associated with a specific stimulus through conditioning

condyloid joint

oval-shaped end of one bone fitting into a similarly oval-shaped hollow of another bone

cone

weakly photosensitive, chromatic, cone-shaped neuron in the fovea of the retina that detects bright light and is used in daytime color vision

conidia

asexual spores

conidiospores

unicellular or multicellular spores that are released directly from the tip or side of the hypha

conifer

dominant phylum of gymnosperms with the greatest variety of trees

conspiral

shell shape coiled around a horizontal axis

conjugation

process by which prokaryotes move DNA from one individual to another using a pilus

connective tissue

type of tissue made of cells, ground substance matrix, and fibers

consensus sequence

a theoretical DNA sequence that lists the most common nucleotides at each position of a sequence shared across species

conspecifics

individuals that are members of the same species

contig

larger sequence of DNA assembled from overlapping shorter sequences

continuous variation

inheritance pattern in which a character shows a range of trait values with small gradations rather than large gaps between them

contour feather

feather that creates an aerodynamic surface for efficient flight

contraception

various means used to prevent pregnancy (also, birth control)

contractile vacuole

vesicle that fills with water (as it enters the cell by osmosis) and then contracts to squeeze water from the cell; an osmoregulatory vesicle

control

part of an experiment that does not change during the experiment

convergent evolution

process by which groups of organisms independently evolve to similar forms

coral reef

ocean ridges formed by marine invertebrates living in warm, shallow waters within the photic zone

core enzyme

prokaryotic RNA polymerase consisting of α , α' , β , and β' but missing σ ; this complex performs elongation

corm

rounded, fleshy underground stem that contains stored food

cornea

transparent layer over the front of the eye that helps focus light waves

corolla

collection of petals

corona

wheel-like structure on the anterior portion of the rotifer that contains cilia and moves food and water toward the mouth

coronary artery

vessel that supplies the heart tissue with blood

coronary vein

vessel that takes blood away from the heart tissue back to the chambers in the heart

corpus callosum

thick fiber bundle that connects the cerebral hemispheres

cortex (animal)

outer layer of an organ, like the kidney or adrenal gland

cortex (plant)

ground tissue found between the vascular tissue and the epidermis in a stem or root

cortical nephron

nephron that lies in the renal cortex

cortical radiate artery

artery that radiates from the arcuate arteries into the renal cortex

corticosteroid

hormone released by the adrenal cortex in response to long-term stress

cortisol

glucocorticoid produced in response to stress

cotyledon

primitive leaf that develops in the zygote; monocots have one cotyledon, and dicots have two cotyledons

countercurrent exchanger

peritubular capillary network that allows exchange of solutes and water from the renal tubules

countercurrent heat exchange

mechanism in which heat from warmer arterial blood is transferred to cooler venous blood returning from the extremities; allows blood to be warmed before reaching the internal organs

countercurrent multiplier

osmotic gradient in the renal medulla that is responsible for concentration of urine

courtship display

visual display used to attract a mate

covalent bond

type of strong bond formed between two atoms of the same or different elements; forms when electrons are shared between atoms

coxal bone

hip bone

cranial bone

one of eight bones that form the cranial cavity that encloses the brain and serves as an attachment site for the muscles of the head and neck

cranial nerve

sensory and/or motor nerve that emanates from the brain

Craniata

clade composed of chordates that possess a cranium; includes Vertebrata together with hagfishes

cranium

bony, cartilaginous, or fibrous structure surrounding the brain, jaw, and facial bones

Crocodylia

crocodiles and alligators

crop

cultivated plant

crossing over

exchange of genetic material between nonsister chromatids resulting in chromosomes that incorporate genes from both parents of the organism

cross-pollination

transfer of pollen from the anther of one flower to the stigma of a different flower

cross-reactivity

binding of an antibody to an epitope corresponding to an antigen that is different from the one the antibody was raised against

crozier

curled top of a young fern frond (also, fiddlehead)

Crustaceans

most dominant aquatic (both freshwater and marine) arthropods

Cryogenian Period

geologic period (720–635 million years ago) characterized by a very cold global climate

cryptochrome

protein that absorbs light in the blue and ultraviolet regions of the light spectrum

cryptofauna

invertebrates found within the calcium carbonate substrate of coral reefs

ctenidia

specialized gill structure in mollusks

cuboidal epithelia

epithelia made of cube-shaped cells; specialized in glandular functions

Cushing's disease

disorder caused by the hypersecretion of glucocorticoids

cutaneous respiration

gas exchange through the skin

cuticle (animal)

the tough, external layer possessed by members of the invertebrate class Ecdysozoa that is periodically molted and replaced

cuticle (plant)

the waxy, waterproof covering on the surface of plants organs, such as leaves and shoots, that prevents the loss of water

cutting

method of asexual reproduction where a portion of the stem containing nodes and internodes is placed in moist soil and allowed to root

cyanobacteria

bacteria that evolved from early phototrophs and oxygenated the atmosphere (also, blue-green algae)

cycad

gymnosperm that grows in tropical climates and resembles a palm tree; member of the phylum Cycadophyta

cyclic AMP (cAMP)

second messenger that is derived from ATP

cyclic AMP-dependent**kinase**

kinase that is activated by binding to cAMP (also, protein kinase A, or PKA)

cyclin

one of a group of proteins that act in conjunction with cyclin-dependent kinases to help regulate the cell cycle by phosphorylating key proteins; the concentrations of cyclins fluctuate throughout the cell cycle

cyclin-dependent kinase (Cdk)

one of a group of protein kinases that helps to regulate the cell cycle when bound to cyclin; it functions to phosphorylate other proteins that are either activated or inactivated by phosphorylation

cypris

larval stage in the early development of crustaceans

cytochrome complex

group of reversibly oxidizable and reducible proteins that forms part of the electron transport chain between photosystem II and photosystem I

cytogenetic mapping

technique that uses a microscope to create a map from stained chromosomes

cytokine

chemical messenger that regulates cell differentiation, proliferation, gene expression, and cell trafficking to affect immune responses

cytokinesis

division of the cytoplasm following mitosis that forms two daughter cells

cytokinin

plant hormone that promotes cell division

cytopathic

causing cell damage

cytoplasm

entire region between the plasma membrane and the nuclear envelope, consisting of organelles suspended in the gel-like cytosol, the cytoskeleton, and various chemicals

cytoplasmic streaming

movement of cytoplasm into an extended pseudopod such that the entire cell is transported to the site of the pseudopod

cytoskeleton

protein fiber network that collectively maintains the cell's shape, secures some organelles in specific positions, allows cytoplasm and vesicles to move within the cell, and enables unicellular organisms to move independently

cytosol

the cytoplasm's gel-like material in which cell structures are suspended

cytotoxic T lymphocyte (CTL)

adaptive immune cell that directly kills infected cells via perforin and granzymes and releases cytokines to enhance the immune response

D**dead space**

area in the lung that lacks proper ventilation or perfusion

dead zone

area within an ecosystem in lakes and near the mouths of rivers where large areas of ecosystems are depleted of their normal flora and fauna; these zones can be caused by eutrophication, oil spills, dumping of toxic chemicals, and other human activities

death rate (D)

number of deaths within a population at a specific point in time

decomposer

organism that carries out the decomposition of dead organisms

deductive reasoning

uses general principles or laws and then applies logic to deduce a conclusion or predict specific results

degeneracy

(of the genetic code)
describes that a given amino acid can be encoded by more than one nucleotide triplet; the code is degenerate but not ambiguous

dehydration synthesis

reaction that links monomer molecules, releasing a water molecule for each bond formed (also, condensation)

demographic-based population model

modern model of population dynamics incorporating many features of the *r*- and *K*-selection theory

demography

statistical study of changes in populations over time

denaturation

loss of shape in a protein as a result of changes in temperature, pH, or chemical exposure

denature

process that changes a substance's natural properties, such as a protein structure

dendrite

structure that extends away from the cell body to receive messages from other neurons

dendritic cell

immune cell that processes antigen material and presents it on the surface of other cells to induce an immune response

denitrification

transformation of nitrate from soil to gaseous nitrogen compounds, such as N_2O , NO , and N_2

density-dependent regulation

regulation of population that is influenced by population density, such as crowding effects; usually involves biotic factors

density-independent regulation

regulation of populations by factors that operate independent of population density, such as forest fires and volcanic eruptions; usually involves abiotic factors

dentary

single bone that comprises the lower jaw of mammals

deoxynucleotide triphosphate (dNTP)

individual DNA monomer (single unit)

deoxyribonucleic acid (DNA)

double-helical molecule that carries the cell's hereditary information

dephosphorylation

removal of a phosphate group from a molecule

depolarization

change in the membrane potential to a less negative value

depression

movement downward of a bone, such as after the shoulders are shrugged and the scapulae return to their normal position from an elevated position; opposite of elevation

dermal tissue

protective plant tissue covering the outermost part of the plant; controls gas exchange

descending limb

part of the loop of Henle that descends from the renal cortex into the renal medulla

descriptive science

form of science that aims to observe, explore, and investigate (also, discovery science)

desmosome

linkage between adjacent epithelial cells that forms when cadherins in the plasma membrane attach to intermediate filaments

determinate cleavage

cleavage pattern in which developmental fate of each blastomere is tightly defined

detrital food web

type of food web in which the primary consumers consist of decomposers; these are often associated with grazing food webs within the same ecosystem

Deuteromycota

former form phylum of fungi that do not have a known sexual reproductive cycle (presently members of two phyla: Ascomycota and Basidiomycota)

deuterostome

blastopore develops into the anus, with the second opening developing into the mouth

diabetes insipidus

disorder caused by underproduction of ADH

diabetes mellitus

disorder caused by low levels of insulin activity

diabetogenic effect

effect of GH that causes blood glucose levels to rise similar to diabetes mellitus

diacylglycerol (DAG)

cleavage product of PIP_2 that is used for signaling within the plasma membrane

diaphragm

domed-shaped skeletal muscle located under lungs that separates the thoracic cavity from the abdominal cavity

diaphysis

central shaft of bone, contains bone marrow in a marrow cavity

diapsid

animal having two temporal fenestrae in the cranium

diarthrosis

(plural, *diarthroses*) joint that allows for free movement of the joint; found in synovial joints

diastole

relaxation phase of the cardiac cycle when the heart is relaxed, and the ventricles are filling with blood

Dicer

enzyme that chops the pre-miRNA into the mature form of the miRNA

dicot

plants whose embryos possess two cotyledons

dideoxynucleotide triphosphate (ddNTP)

individual DNA monomer that is missing a hydroxyl group ($-OH$)

diffusion

passive transport process of a low-molecular weight material along its concentration gradient from an area of higher concentration to an area of lower concentration

digestion

mechanical and chemical breakdown of food into small organic fragments

dihybrid

result of a cross between two true-breeding parents that express different traits for two characteristics

dikaryotic stage

two haploid nuclei coexist in a single cell

dimer

chemical compound formed when two molecules join together

dimerization

(of receptor proteins)
interaction of two receptor proteins to form a functional complex called a dimer

dimorphic

animals exhibiting both polyp and medusa phases during their life cycle

dioecious

describes a species in which the male and female reproductive organs are carried on separate specimens

dipeptidase

protease that breaks down peptides to single amino acids; secreted by the brush border of small intestine

diphyodont

refers to the possession of two sets of teeth in a lifetime

diploblast

animal that develops from two germ layers

diploid

cell, nucleus, or organism containing two sets of chromosomes ($2n$)

diploitic

diploid stage is the dominant stage

dipole

a separation of positive and negative charges in a bond; a bond or molecule whose ends have opposite charges

directional selection

selection that favors phenotypes at one end of the spectrum of existing variation

disaccharide

two sugar monomers that a glycosidic bond links

discontinuous variation

inheritance pattern in which traits are distinct and are transmitted independently of one another

discussion

section of a scientific paper in which the author interprets experimental results, describes how variables may be related, and attempts to explain the phenomenon in question

dispersal

allopatric speciation that occurs when a few members of a species move to a new geographical area

dissociation

release of an ion from a molecule such that the original molecule now consists of an ion and the charge remains of the original, such as when water dissociates into H^+ and OH^-

distal convoluted tubule (DCT)

part of the renal tubule that is the most distant from the glomerulus

distraction display

visual display used to distract predators away from a nesting site

divergent evolution

process by which groups of organisms evolve in diverse directions from a common point

diversifying selection

selection that favors two or more distinct phenotypes

DNA barcoding

molecular genetic method for identifying a unique genetic sequence to associate with a species

DNA fingerprinting

a chemical test that shows the genetic makeup of a person or other living thing

DNA methylation

epigenetic modification that leads to gene silencing; a process involving adding a methyl group to the DNA molecule

DNA microarray

method to detect gene expression by analyzing many DNA fragments that are fixed to a glass slide or a silicon chip to identify active genes and identify sequences

DNA polymerase III (DNA pol III)

main enzyme that adds new DNA nucleotides during DNA replication

DNA sequencing

determining the order of the nitrogenous bases within a given stretch of DNA

dominant

trait which confers the same physical appearance whether an individual has two copies of the trait or one copy of the dominant trait and one copy of the recessive trait

dominant lethal

inheritance pattern in which an allele is lethal both in the homozygote and the heterozygote; this allele can only be transmitted if the lethality phenotype occurs after reproductive age

dormancy

period of no growth and very slow metabolic processes

dorsal cavity

body cavity on the posterior or back portion of an animal; includes the cranial and vertebral cavities

dorsal hollow nerve cord

hollow, tubular structure derived from ectoderm, which is located dorsal to the notochord in chordates

dorsiflexion

bending at the ankle such that the toes are lifted toward the knee

double circulation

flow of blood in two circuits: the pulmonary circuit through the lungs and the systemic circuit through the organs and body

double fertilization

two fertilization events in angiosperms; one sperm fuses with the egg, forming the zygote, whereas the other sperm fuses with the polar nuclei, forming endosperm

down feather

feather specialized for insulation

down-regulation

a decrease in the number of hormone receptors in response to increased hormone levels

downstream

nucleotides following the initiation site in the direction of mRNA transcription; in general, sequences that are toward the 3' end relative to a site on the mRNA

duodenum

first part of the small intestine where a large part of digestion of carbohydrates and fats occurs

dura mater

tough outermost layer that covers the central nervous system

E**eccrine gland**

sweat gland

Ecdysozoa

clade of protostomes that exhibit exoskeletal molting (ecdysis)

Echinodermata

phylum of deuterostomes with spiny skin; exclusively marine organisms

ecological pyramid

graphical representation of different trophic levels in an ecosystem based of organism numbers, biomass, or energy content

ecology

study of the interaction between living things and their environment

ecosystem

community of living organisms and their interactions with their abiotic environment

ecosystem diversity

variety of ecosystems

ecosystem dynamics

study of the changes in ecosystem structure caused by changes in the environment or internal forces

ecosystem services

human benefits and services provided by natural ecosystems

ectoderm

the outermost germ layer in an embryo, from which the nervous system and the outer epithelial covering of the body surface are derived

ectomycorrhizae

a type of mycorrhizae in which fungi form a dense sheath around roots and penetrate root tissue but do not penetrate cells

ectotherm

animal incapable of maintaining a relatively constant internal body temperature

Ediacaran Period

geological period (635–541 million years ago) when the oldest definite multicellular organisms with tissues evolved

effector cell

lymphocyte that has differentiated, such as a B cell, plasma cell, or cytotoxic T lymphocyte

effluent arteriole

arteriole that exits from the glomerulus

E horizon

soil layer composed of minerals from which most organic materials and clay have washed out; only found in certain soils

elastase

pancreatic protease

elastic recoil

property of the lung that drives the lung tissue inward

elastic work

work conducted by the intercostal muscles, chest wall, and diaphragm

elaters

structures that function in the dispersal of spores

electrocardiogram (ECG)

recording of the electrical impulses of the cardiac muscle

electrochemical gradient

a combined electrical and chemical force that produces a gradient

electrogenic pump

pump that creates a charge imbalance

electrolyte

ion necessary for nerve impulse conduction, muscle contractions, and water balance

electromagnetic spectrum

range of all possible frequencies of radiation

electron

negatively charged subatomic particle that resides outside of the nucleus in the electron orbital; lacks functional mass and has a negative charge of -1 unit

electron configuration

arrangement of electrons in an atom's electron shell (for example, $1s^22s^22p^6$)

electron microscope

an instrument that magnifies an object using an electron beam that passes and bends through a lens system to visualize a specimen

electron orbital

how electrons are spatially distributed surrounding the nucleus; the area where we are most likely to find an electron

electron transfer

movement of electrons from one element to another; important in creating ionic bonds

electron transport chain (photosynthesis)

group of proteins between PSII and PSI that pass energized electrons and use the energy released by the electrons to move hydrogen ions against their concentration gradient into the thylakoid lumen

electron transport chain (reactions)

a series of protein complexes and other molecules embedded in a membrane that couple the transfer of electrons via successive redox reactions with the transfer of protons across the membrane to generate an electrochemical gradient

electronegativity

ability of some elements to attract electrons (often of hydrogen atoms), acquiring partial negative charges in molecules and creating partial positive charges on the hydrogen atoms

electrophoresis

technique used to separate DNA fragments according to size

element

one of 118 unique substances that cannot break down into smaller substances; each element has unique properties and a specified number of protons

elevation

movement of a bone upward, such as when the shoulders are shrugged, lifting the scapulae

embryology

study of the anatomy of an organism's development from the earliest stage (fertilized egg) to its adult form

embryophyte

other name for land plant; embryo is protected and nourished by the sporophyte

emergent vegetation

wetland plants that are rooted in the soil but have portions of leaves, stems, and flowers extending above the water's surface

emerging disease

disease making an initial appearance in a population or that is increasing in incidence or geographic range

Emsleyan/Mertensian mimicry

type of mimicry where a harmful species resembles a less harmful one so that predators can survive encounters with the less harmful species and learn to avoid the harmful one

enantiomers

molecules that share overall structure and bonding patterns but differ in how the atoms are three-dimensionally placed such that they are mirror images of each other

Enantiornithes

dominant bird group during the Cretaceous Period

endemic disease

disease that is constantly present, usually at a low incidence, in a population

endemic species

species found only in a specific geographic area that is usually restricted in size

endergonic

describes chemical reactions that require energy input

endocardium

innermost layer of tissue in the heart

endocarp

innermost part of fruit

endochondral ossification

process of bone development from hyaline cartilage

endocrine cell

cell that releases ligands involved in endocrine signaling (hormones)

endocrine gland

gland that secretes hormones into the surrounding interstitial fluid, which then diffuse into blood and are carried to various organs and tissues within the body

endocrine signal

long-distance signal that is delivered by ligands (hormones) traveling through an organism's circulatory system from the signaling cell to the target cell

endocrine system

system that controls the response of the various glands in the body and the release of hormones at the appropriate times

endocytosis

type of active transport that moves substances, including fluids and particles, into a cell

endoderm

the innermost germ layer in an embryo, from which the lining of the digestive tract, the lining of the respiratory tract, and some of gastrointestinal organs are derived

endodermis

layer of cells in the root that forms a selective barrier between the ground tissue and the vascular tissue, allowing water and minerals to enter the root while excluding toxins and pathogens

endomembrane system

group of organelles and membranes in eukaryotic cells that work together modifying, packaging, and transporting lipids and proteins

endomycorrhizae

a type of mycorrhizae in which fungi are embedded within root tissue and penetrate the cells

endophytes

fungi that live inside tissue without damaging the host plant

endoplasmic reticulum (ER)

series of interconnected membranous structures within eukaryotic cells that collectively modify proteins and synthesize lipids

endoskeleton

skeleton of living cells that produces a hard, mineralized tissue located within the soft tissue of organisms

endosperm

triploid structure resulting from fusion of a sperm with polar nuclei, which serves as a nutritive tissue for the embryo

endospermic dicot

dicot that stores food reserves in the endosperm

endostyle

a longitudinal, ciliated groove on the floor of the pharynx that produces mucus to gather food particles to assist in filter feeding

endosymbiont

organisms that form a symbiotic relationship with another cell or organism

endosymbiosis

engulfment of one cell within another such that the engulfed cell survives and both cells benefit; the process responsible for the evolution of mitochondria and chloroplasts in eukaryotes

endosymbiotic theory

theory that states that eukaryotes may have been a product of one cell engulfing another, one living within another, and evolving over time until the separate cells were no longer recognizable as such

endotherm

animal capable of maintaining a relatively constant internal body temperature

energy budget

allocation of energy resources for body maintenance, reproduction, and parental care

enhancer

segment of DNA that is upstream, downstream, perhaps thousands of nucleotides away, or on another chromosome that influence the transcription of a specific gene

enterocoelom

coelom formed by fusion of coelomic pouches budded from the endodermal lining of the archenteron

enterocoely

mesoderm of deuterostomes develops as pouches that are pinched off from endodermal tissue; cavity contained within the pouches becomes the coelom

enthalpy

a system's total energy

entropy

measure of randomness or disorder within a system

envelope

lipid bilayer that encircles some viruses

environmental disturbance

change in the environment caused by natural disasters or human activities

enzyme

protein that catalyzes a biochemical reaction by lowering the activation energy

enzyme-linked receptor

cell-surface receptor with intracellular domains that are associated with membrane-bound enzymes

eosinophil

leukocyte that responds to parasites and is involved in the allergic response

ependymal

cell that lines fluid-filled ventricles of the brain and the central canal of the spinal cord; involved in production of cerebrospinal fluid

epicardium

outermost tissue layer of the heart

epicotyl

embryonic shoot above the cotyledons

epidemic

disease that occurs in an unusually high number of individuals in a population at the same time

epidermis (animal)

outer layer (from ectoderm) that lines the outside of the animal

epidermis (plant)

single layer of cells found in plant dermal tissue; covers and protects underlying tissue

epigenetic

heritable changes that do not involve changes in the DNA sequence

epilepsy

neurological disorder characterized by recurrent seizures

epinephrine

hormone released by the adrenal medulla in response to a short-term stress

epiphyseal plate

region between the diaphysis and epiphysis that is responsible for the lengthwise growth of long bones

epiphysis

(plural, *epiphyses*) rounded end of bone, covered with articular cartilage and filled with red bone marrow, which produces blood cells

epiphyte

plant that grows on other plants but is not dependent upon other plants for nutrition

epistasis

antagonistic interaction between genes such that one gene masks or interferes with the expression of another

epithelial tissue

tissue that either lines or covers organs or other tissues

epitope

small component of an antigen that is specifically recognized by antibodies, B cells, and T cells; the antigenic determinant

equilibrium (chemical reaction)

steady state of relative reactant and product concentration in reversible chemical reactions in a closed system

equilibrium (ecosystem)

steady state of an ecosystem where all organisms are in balance with their environment and each other

ergosterol

steroid molecule that replaces the cholesterol in animal cell membranes

erythrocyte

red blood cell

erythropoietin (EPO)

hormone produced by the kidneys to stimulate red blood cell production in the bone marrow

ESA

Endangered Species Act

esophagus

tubular organ that connects the mouth to the stomach

essential nutrient

nutrient that cannot be synthesized by the body; must be obtained from food

ester bond

a covalent bond that forms between a fatty acid and glycerol via a dehydration reaction

estivation

torpor in response to extremely high temperatures and low water availability

estrogens

a group of steroid hormones, including estradiol and several others, that are produced by the ovaries and elicit secondary sex characteristics in females as well as control the maturation of the ova

estuary

biomes where a source of fresh water, such as a river, meets the ocean

ethology

biological study of animal behavior

ethylene

volatile plant hormone that is associated with fruit ripening, flower wilting, and leaf fall

eucoelomate

animal with a body cavity completely lined with mesodermal tissue

eudicot

related group of angiosperms whose embryos possess two cotyledons

eugenics

using information and technology from a variety of sources to improve the genetic makeup of the human race

eukaryote

organism with cells that have nuclei and membrane-bound organelles

eukaryote-first hypothesis

proposal that prokaryotes evolved from eukaryotes

eukaryotic cell

cell that has a membrane-bound nucleus and several other membrane-bound compartments or sacs

eukaryotic initiation factor-2 (eIF-2)

protein that binds first to an mRNA to initiate translation

Eumetazoa

group of animals with true differentiated tissues

euploid

individual with the appropriate number of chromosomes for their species

eutherian mammal

mammal that possesses a complex placenta, which connects a fetus to the female; sometimes called placental mammals

eutrophication

process whereby nutrient runoff causes the excess growth of microorganisms, depleting dissolved oxygen levels and killing ecosystem fauna

evaporation

change from liquid to gaseous state at a body of water's surface, plant leaves, or an organism's skin

eversion

movement of the sole of the foot outward, away from the midline of the body; opposite of inversion

evolution

the process of gradual change in a population or species over time

evolutionary fitness

individual's ability to survive and reproduce (also, Darwinian fitness)

excitatory postsynaptic potential (EPSP)

depolarization of a postsynaptic membrane caused by neurotransmitter molecules released from a presynaptic cell

exergonic

describes chemical reactions that release free energy

exine

outermost covering of pollen

exocarp

outermost covering of a fruit

exocytosis

process of passing bulk material out of a cell

exoenzymes

external enzymes that digest nutrients absorbed by the body of the fungus

exon

sequence present in protein coding mRNA after completion of pre-mRNA splicing

exoskeleton

an external skeleton; made of a secreted substance that produces a hard encasement on the surface of an organism

exotic species

species that has been introduced to an ecosystem in which it did not evolve (also, invasive species)

expiratory reserve volume (ERV)

amount of additional air that can be exhaled after a normal exhalation

exponential growth

accelerating growth pattern seen in species under conditions where resources are not limited

expressed sequence tag (EST)

short sequence-tagged site (STS) that is identified with cDNA

extant

still-living species

extension

movement in which the angle between the bones of a joint increases; opposite of flexion

external fertilization

fertilization of egg by sperm outside animal body, often during spawning

extinct

no-longer-existing species

extinction

disappearance of a species from Earth; local extinction is the disappearance of a species from a region

extinction rate

number of species becoming extinct over time, sometimes defined as extinctions per million species-years to make numbers manageable (E/MSY)

extracellular digestion

when food is taken into the gastrovascular cavity, enzymes are secreted into the cavity, and the cells lining the cavity absorb nutrients

extracellular domain

region of a cell-surface receptor that is located on the cell surface

extracellular matrix

material secreted from animal or fungal cells that provides mechanical protection and anchoring for the cells in the tissue

extremophile

organism that grows under extreme or harsh conditions

F**F₁**

first filial generation in a cross; the offspring of the parental generation

F₂

second filial generation produced when F₁ individuals are self-crossed or fertilized with each other

facial bone

one of the 14 bones that form the face; provides cavities for the sense organs (eyes, mouth, and nose) and attachment points for facial muscles

facilitated transport

process by which material moves down a concentration gradient (from a high to a low concentration) using integral membrane proteins

FACT

complex that “facilitates chromatin transcription” by disassembling nucleosomes ahead of a transcribing RNA polymerase II and reassembling them after the polymerase passes by

facultative anaerobes

organisms that can perform both aerobic and anaerobic respiration and can survive in oxygen-rich and oxygen-poor environments

fallout

direct deposit of solid minerals on land or in the ocean from the atmosphere

false negative

incorrect test result that should have been positive

falsifiable

able to be disproven by experimental results

family

division of order in the taxonomic classification system

fecundity

potential reproductive capacity of an individual

feedback inhibition

a product’s effect of a reaction sequence to decrease its further production by inhibiting the first enzyme’s activity in the pathway that produces it

femur

longest, heaviest, and strongest bone in the body (also, thighbone)

fermentation

process of regenerating NAD⁺ with an organic compound serving as the final electron acceptor; occurs in the absence of oxygen

fern

seedless vascular plant that produces large fronds; the most advanced group of seedless vascular plants

fertilization

union of two haploid cells from two individual organisms

FEV1/FVC ratio

ratio of how much air can be forced out of the lung in one second to the total amount that is forced out of the lung; a measurement of lung function that can be used to detect disease states

fibroblast

a cell found in connective tissue that synthesizes and secretes collagen and other components of the matrix

fibrous connective tissue

type of connective tissue with a high concentration of fibers

fibrous joint

joint held together by fibrous connective tissue

fibrous root system

type of root system in which the roots arise from the base of the stem in a cluster, forming a dense network of roots; found in monocots

fibula

parallels and articulates with the tibia (also, calf bone)

filament

thin stalk that links the anther to the base of the flower

first messenger

the hormone that binds to a plasma membrane hormone receptor to trigger a signal transduction pathway

fission

method by which multicellular organisms increase in size, or asexual reproduction in which a unicellular organism splits into two separate organisms by mitosis (also, binary fission)

fitness

capacity of some members of a species to produce more reproductively viable offspring relative to others within the species

fixed action pattern

series of instinctual behaviors that, once initiated, always goes to completion regardless of changes in the environment

flagellum

(plural, *flagella*) long, hairlike structure that extends from the plasma membrane and moves the cell

flame cell

excretory cell found in flatworms (also, protonephridia)

flat bone

thin and relatively broad bone found where extensive protection of organs is required or where broad surfaces of muscle attachment are required

flexion

movement in which the angle between the bones decreases;

flight feather

feather specialized for flight

flower

branches specialized for reproduction found in some seed-bearing plants, containing either specialized male or female organs or both male and female organs

flow-resistive

work of breathing performed by the alveoli and tissues in the lung

fluid mosaic model

describes the plasma membrane’s structure as a mosaic of components, including phospholipids, cholesterol, proteins, glycoproteins, and glycolipids (sugar chains attached to proteins or lipids, respectively), resulting in a fluid character (fluidity)

follicle-stimulating hormone (FSH)

reproductive hormone, produced by the anterior pituitary, that causes sperm production in males and follicle development in females

foodborne disease

any illness resulting from the consumption of contaminated food, or of the pathogenic bacteria, viruses, or other parasites that contaminate food

food chain

linear representation of a chain of primary producers, primary consumers, and higher-level consumers used to describe ecosystem structure and dynamics

food web

graphic representation of a holistic, nonlinear web of primary producers, primary consumers, and higher-level consumers used to describe ecosystem structure and dynamics

foraging

behaviors species use to find food

forced expiratory volume (FEV)

measure of how much air can be forced out of the lung from maximal inspiration over a specific amount of time (also, forced vital capacity)

forearm

extends from the elbow to the wrist and consists of two bones: the ulna and the radius

foreign DNA

DNA that belongs to a different species or DNA that is artificially synthesized

foundation species

species that often forms the major structural portion of the habitat

founder effect

event that initiates an allele frequency change in part of the population, which is not typical of the original population

fovea centralis

region in the center of the retina with a high density of photoreceptors and which is responsible for acute vision

fragmentation (fungi)

process by which the fungal mycelium separates into fragments with each component, forming a new, separate mycelium

fragmentation (reproduction)

a form of asexual reproduction in which an organism splits into fragments, each of which develops into a new organism

frameshift mutation

a mutation, such as the insertion or deletion of a nucleotide, that alters the translational reading frame

free energy

the usable energy, or energy that is available to do work (also, Gibbs free energy)

free nerve ending

ending of an afferent neuron that lacks a specialized structure for detection of sensory stimuli; some respond to touch, pain, or temperature

frequency-dependent selection

selection that favors phenotypes that are either common (positive frequency-dependent selection) or rare (negative frequency-dependent selection)

frog

tail-less amphibian that belongs to the clade Anura

fronds

the leaves of a fern

frontal (coronal) plane

plane cutting through an animal, separating the individual into front and back portions

frontal lobe

part of the cerebral cortex that contains the motor cortex and areas involved in planning, attention, and language

fruit

thickened tissue derived from ovary wall that protects the embryo after fertilization and facilitates seed dispersal

FtsZ

tubulin-like protein component of the prokaryotic cytoskeleton that is important in prokaryotic cytokinesis (name origin: Filamenting temperature-sensitive mutant Z)

functional group

a group of atoms that provides or imparts a specific function to a carbon skeleton

functional residual capacity (FRC)

expiratory reserve volume plus residual volume

functional vital capacity (FVC)

amount of air that can be forcibly exhaled after taking the deepest breath possible

fungal fermentation

conversion of carbohydrates by fungi into ethanol, carbon dioxide, lactic acid, and hydrogen gas

furcula

wishbone formed by the fusing of the clavicles

fusiform

animal body shape that is tubular and tapered at both ends

fusion

method of entry by some enveloped viruses, where the viral envelope fuses with the plasma membrane of the host cell

G**G₀ phase**

distinct from the G₁ phase of interphase; a cell in G₀ is not preparing to divide

G₁ checkpoint

cell-cycle checkpoint during which the cell determines whether conditions are favorable for cell division and irreversibly commits to the cell division process (also, the restriction point in yeast)

G₁ phase

first phase of interphase centered on cell growth during mitosis (also, first gap)

G₂ checkpoint

cell-cycle checkpoint during which the cell ensures that all of the chromosomes have been properly replicated during S phase and that the replicated DNA is not damaged before entry into the mitotic phase

G₂ phase

third phase of interphase during which the cell undergoes final preparations for mitosis (also, second gap)

gall

appearance of a plant tumor

gallbladder

organ that stores and concentrates bile

gametangium

(plural, *gametangia*) structure on the gametophyte in which gametes are produced

gamete

haploid reproductive cell or sex cell (sperm, pollen grain, or egg)

gametic barrier

prezygotic barrier occurring when closely related individuals of different species mate, but differences in their gamete cells (eggs and sperm) prevent fertilization from taking place

gametophyte

multicellular stage of the plant that gives rise to haploid gametes or spores

gap junction

channel between two adjacent animal cells that allows ions, nutrients, and low-molecular weight substances to pass between cells, enabling the cells to communicate

gastric inhibitory peptide

hormone secreted by the small intestine in the presence of fatty acids and sugars; also inhibits acid production and peristalsis in order to slow down the rate at which food enters the small intestine

gastric phase

digestive phase beginning once food enters the stomach; gastric acids and enzymes process the ingested materials

gastrin

hormone which stimulates hydrochloric acid secretion in the stomach

gastrodermis

inner layer (from endoderm) that lines the digestive cavity

gastrovascular cavity

opening that serves as both a mouth and an anus, which is termed an incomplete digestive system

- gastrula**
stage of animal development characterized by the formation of the digestive cavity
- gastrulation**
process in which the blastula folds over itself to form the three germ layers
- GC-rich box**
(GGCG) nonessential eukaryotic promoter sequence that binds cellular factors to increase the efficiency of transcription; may be present several times in a promoter
- gel electrophoresis**
technique used to separate molecules on the basis of size using electric charge
- gemma**
(plural, *gemmae*) leaf fragment that spreads for asexual reproduction
- gemmule**
structure produced by asexual reproduction in freshwater sponges where the morphology is inverted
- gene**
a region of DNA that codes for a protein or other functional product
- gene expression**
processes that control the turning on or turning off of a gene
- gene flow**
flow of alleles in and out of a population due to the individual or gamete migration
- gene pool**
all the alleles that the individuals in the population carry
- gene targeting**
method for altering the sequence of a specific gene by introducing the modified version on a vector
- gene therapy**
treatment of genetic disease by adding genes, using viruses to carry the new genes inside the cell
- genetically modified organism (GMO)**
organism whose genome has been artificially changed
- genetic diagnosis**
diagnosis of the potential for disease development by analyzing disease-causing genes
- genetic diversity**
variety of genes in a species or other taxonomic group or ecosystem; the term can refer to allelic diversity or genome-wide diversity
- genetic drift**
effect of chance on a population's gene pool
- genetic engineering**
alteration of the genetic makeup of an organism
- genetic map**
outline of genes and their location on a chromosome
- genetic marker**
gene or sequence on a chromosome with a known location that is associated with a specific trait
- genetic recombination**
DNA exchange between homologous chromosome pairs
- genetic structure**
distribution of the different possible genotypes in a population
- genetic testing**
process of testing for the presence of disease-causing genes
- genetic variance**
diversity of alleles and genotypes in a population
- gene transfer agent (GTA)**
bacteriophage-like particle that transfers random genomic segments from one species of prokaryote to another
- genome**
total genetic information of a cell or organism
- genome annotation**
process of attaching biological information to gene sequences
- genome fusion**
fusion of two prokaryotic genomes, presumably by endosymbiosis
- genome mapping**
process of finding the location of genes on each chromosome
- genomic library**
collection of cloned DNA which represents all of the sequences and fragments from a genome
- genomics**
study of entire genomes including the complete set of genes, their nucleotide sequence and organization, and their interactions within a species and with other species
- genotype**
underlying genetic makeup, consisting of both physically visible and nonexpressed alleles, of an organism
- genus**
(plural, *genera*) division of family in the taxonomic classification system; the first part of the binomial scientific name
- geographical variation**
differences in the phenotypic variation between populations that are separated geographically
- geometric isomer**
isomer with similar bonding patterns differing in the placement of atoms alongside a double covalent bond
- germ cells**
specialized cell line that produces gametes, such as eggs or sperm
- germ layer**
collection of cells formed during embryogenesis that will give rise to future body tissues; more pronounced in vertebrate embryogenesis
- gestation**
length of time for fetal development to birth
- gibberellin (GA)**
plant hormone that stimulates shoot elongation, seed germination, and the maturation and dropping of fruit and flowers
- gigantism**
condition caused by overproduction of GH in children
- gill circulation**
circulatory system that is specific to animals with gills for gas exchange; the blood flows through the gills for oxygenation
- gills**
respiratory organs of fish and other aquatic animals that extract dissolved oxygen from and excrete carbon dioxide to water
- ginkgophyte**
gymnosperm with one extant species, the *Ginkgo biloba*: a tree with fan-shaped leaves
- gizzard**
muscular organ that grinds food
- glabrous**
describes the non-hairy skin found on palms and fingers, soles of feet, and lips of humans and other primates
- glia**
cells that provide support functions for neurons (also, glial cells)
- gliding movement**
when relatively flat bone surfaces move past each other
- global climate change**
altered global weather patterns, including a worldwide increase in temperature, due largely to rising levels of atmospheric carbon dioxide
- Glomeromycota**
phylum of fungi that form symbiotic relationships with the roots of trees

glomerular filtration

filtration of blood in the glomerular capillary network into the glomerulus

glomerular filtration rate (GFR)

amount of filtrate formed by the glomerulus per minute

glomerulus (brain)

(plural, *glomeruli*) in the olfactory bulb; one of the two neural clusters that receives signals from one type of olfactory receptor

glomerulus (kidney)

part of the renal corpuscle that contains the capillary network

glucagon

hormone produced by the alpha cells of the pancreas in response to low blood sugar; functions to raise blood sugar levels

glucans

polysaccharide component of the layers of fungal cell walls

glucocorticoid

corticosteroid that affects glucose metabolism

gluconeogenesis

synthesis of glucose from amino acids

glucose-sparing effect

effect of GH that causes tissues to use fatty acids instead of glucose as an energy source

glucose transporter (GLUT) protein

integral proteins that facilitate the uptake of glucose from the outside to the inside of the cell

glycogen

a branched glucose storage polymer

glycogenolysis

breakdown of glycogen into glucose

glycolipid

lipid with an attached carbohydrate

glycolysis

process of breaking glucose into two 3-carbon molecules with the production of ATP and NADH

glycoprotein

protein with an attached carbohydrate

glycosidic bond

bond formed by a dehydration reaction between two monosaccharides with eliminating a water molecule

gnathostome

jawed fish

gnetophyte

gymnosperm shrub with varied morphological features that produces vessel elements in its woody tissues; the phylum includes the genera *Ephedra*, *Gnetum*, and *Welwitschia*

goiter

enlargement of the thyroid gland caused by insufficient dietary iodine levels

Golgi apparatus

eukaryotic organelle comprised of a series of stacked membranes that sorts, tags, and packages lipids and proteins for distribution

Golgi tendon organ

muscular proprioceptive tension receptor that provides the sensory component of the Golgi tendon reflex

gomphosis

(plural, *gomphoses*) the joint in which the tooth fits into the socket like a peg

gonadotropin

hormone that regulates the gonads, including FSH and LH

gonadotropin-releasing hormone (GnRH)

hormone from the hypothalamus that causes the release of FSH and LH from the anterior pituitary

good genes hypothesis

theory of sexual selection that argues individuals develop impressive ornaments to show off their efficient metabolism or ability to fight disease

Gorilla

genus of gorillas

G protein

a membrane protein activated by the hormone first messenger to activate formation of cyclic AMP

G protein-linked receptor

cell-surface receptor that activates membrane-bound G proteins to transmit a signal from the receptor to nearby membrane components

gradual speciation model

model that proposes species diverge gradually over time in small steps

grafting

method of asexual reproduction where the stem from one plant species is spliced to a different plant

gram-negative

bacterium whose cell wall contains little peptidoglycan but has an outer membrane

gram-positive

bacterium that contains mainly peptidoglycan in its cell walls

granum

(plural, *grana*) stack of thylakoids located inside a chloroplast

granzyme

protease that enters target cells through perforin and induces apoptosis in the target cells; used by NK cells and killer T cells

gravitropism

growth in response to Earth's gravitational field

grazing food web

type of food web in which the primary producers are either plants on land or phytoplankton in the water; often associated with a detrital food web within the same ecosystem

greenhouse effect

warming of Earth due to carbon dioxide and other greenhouse gases in the atmosphere

greenhouse gases

atmospheric gases such as carbon dioxide and methane that absorb and emit radiation, thus trapping heat in Earth's atmosphere

gross primary productivity

rate at which photosynthetic primary producers incorporate energy from the sun

ground tissue

plant tissue involved in photosynthesis; provides support and stores water and sugars

group I virus

virus with a dsDNA genome

group II virus

virus with an ssDNA genome

group III virus

virus with a dsRNA genome

group IV virus

virus with an ssRNA genome with positive polarity

group V virus

virus with an ssRNA genome with negative polarity

group VI virus

virus with an ssRNA genome converted into dsDNA by reverse transcriptase

group VII virus

virus with a single-stranded mRNA converted into dsDNA for genome replication matrix protein

growth factor

ligand that binds to cell-surface receptors and stimulates cell growth

growth hormone (GH)

hormone produced by the anterior pituitary that promotes protein synthesis and body growth

growth hormone-inhibiting hormone (GHIH)

hormone produced by the hypothalamus that inhibits growth hormone production (also, somatostatin)

growth hormone-releasing hormone (GHRH)

hormone released by the hypothalamus that triggers the release of GH

guanosine triphosphate (GTP)

energy-providing molecule that binds to eIF-2 and is needed for translation

guard cells

paired cells on either side of a stoma that control stomatal opening and thereby regulate the movement of gases and water vapor

gustation

sense of taste

gymnosperm

seed plant with naked seeds (seeds exposed on modified leaves or in cones)

gynoecium

structure that constitutes the female reproductive organ (also, carpel)

gyrus

(plural, *gyri*) ridged protrusions in the cortex

H**habitat isolation**

reproductive isolation that occurs when a section of a population moves or is moved to a separate habitat that does not overlap with the habitat of the parent population

habituation

ability of a species to ignore repeated stimuli that have no consequence

hagfish

eel-like jawless fish that live on the ocean floor and are scavengers

hairpin

structure of RNA when it folds back on itself and forms intramolecular hydrogen bonds between complementary nucleotides

halophile

organism that requires a salt concentration of at least 0.2 M

halophyte

a salt-tolerant plant; a plant adapted to growing in soil or water of high salinity

handicap principle

theory of sexual selection that argues only the fittest individuals can afford costly traits

haplodiplontic

haploid and diploid stages alternate

haploid

cell, nucleus, or organism containing one set of chromosomes (*n*)

haplontic

haploid stage is the dominant stage

Hartig net

network of hyphae where the hyphae grow from the mantle into the root and envelope the outer layers of the root cells

haustoria

modified hyphae on many parasitic fungi that penetrate the tissues of their hosts, release digestive enzymes, and/or absorb nutrients from the host

Haversian canal

contains the bone's blood vessels and nerve fibers

haze-effect cooling

effect of the gases and solids from a volcanic eruption on global climate

heat

energy transferred from one system to another that is not work (energy of the molecules' motion or particles)

heat energy

total bond energy of reactants or products in a chemical reaction

heat of vaporization of water

high amount of energy required for liquid water to turn into water vapor

heirloom seed

seed from a plant that was grown historically but has not been used in modern agriculture on a large scale

helicase

during replication, this enzyme helps to open up the DNA helix by breaking the hydrogen bonds

helper T lymphocyte (T_H)

cell of the adaptive immune system that binds APCs via MHC II molecules and stimulates B cells or secretes cytokines to initiate the immune response

heme group

centralized iron-containing group that binds to oxygen in each of the four subunits of hemoglobin

hemizygous

presence of only one allele for a characteristic, as in X-linkage; hemizyosity makes descriptions of dominance and recessiveness irrelevant

hemocoel

cavity into which blood is pumped in an open circulatory system

hemoglobin

a red protein that transports oxygen in vertebrate blood; comprised of four subunits, each of which contains a heme group to which a molecule of oxygen binds

hemolymph

mixture of blood and interstitial fluid that is found in insects and other arthropods as well as most mollusks

herbaceous

grasslike plant noticeable by the absence of woody tissue

herbivore

an organism that only feeds on plants and not other organisms

herbivory

the consumption of primary producers (such as plants)

heritability

fraction of population variation that can be attributed to its genetic variance

hermaphrodite

referring to an animal where both male and female gonads are present in the same individual

hermaphroditism

state of having both male and female reproductive parts within the same individual

heterodont teeth

different types of teeth that are modified for different purposes

heterogeneity

number of ecological niches

heterospecifics

individuals that are members of different species

heterosporous

produces two types of spores

heterothallic

describes when only one mating type is present in an individual mycelium

heterotroph

organism that consumes organic substances or other organisms for food

heterotrophic

organisms that use complex organic compounds as sources of energy and carbon

heterozygous

having two different alleles for a given gene on the homologous chromosome

hibernation

torpor over a long period of time, such as a winter

hilum

region in the renal pelvis where blood vessels, nerves, and ureters bunch before entering or exiting the kidney

hinge joint

slightly rounded end of one bone fits into the slightly hollow end of the other bone

hippocampus

brain structure in the temporal lobe involved in processing memories

histone acetylation

epigenetic modification that leads to gene silencing; a process involving adding or removing an acetyl functional group

histone protein

one of several similar, highly conserved, low molecular weight, basic proteins found in the chromatin of all eukaryotic cells; associates with DNA to form nucleosomes

histones

proteins involved in packaging DNA into nucleosomes

holistic ecosystem model

study that attempts to quantify the composition, interactions, and dynamics of entire ecosystems; often limited by economic and logistical difficulties, depending on the ecosystem

holoblastic

complete cleavage; takes place in cells with a small amount of yolk

holoenzyme

prokaryotic RNA polymerase consisting of α , α' , β , β' , and σ ; this complex is responsible for transcription initiation

holoparasitic plant

plant that is not capable of photosynthesis and instead obtains nutrients from a host plant

homeostasis

ability of an organism to maintain constant internal conditions

hominin

species that are more closely related to humans than chimpanzees

hominoid

pertaining to great apes and humans

Homo

genus of humans

homologous chromosomes

chromosomes of the same morphology with genes in the same location; diploid organisms have pairs of homologous chromosomes (homologs), with each homolog derived from a different parent

homologous recombination

process by which homologous chromosomes undergo reciprocal physical exchanges at their arms (also, crossing over)

homologous structures

parallel structures in diverse organisms that have a common ancestor

homoplasy

see analogy

Homo sapiens sapiens

anatomically modern humans

homosporeous

produces one type of spore

homothallic

describes when both mating types are present in mycelium

homozygous

having two identical alleles for a given gene on the homologous chromosome

honest signal

trait that gives a truthful impression of an individual's fitness

horizon

soil layer with distinct physical and chemical properties, which differs from other layers depending on how and when it was formed

horizontal gene transfer (HGT)

transfer of genes between unrelated species (also, lateral gene transfer)

horizontal transmission

transmission of a disease between unrelated individuals

hormonal stimuli

release of a hormone in response to another hormone

hormone

chemical signaling molecule, usually protein or steroid, secreted by endocrine cells that act to control or regulate specific physiological processes

hormone receptor

the cellular protein that binds to a hormone

hornworts

group of nonvascular plants in which stomata appear

horsetail

seedless vascular plant characterized by joints

host

organism a parasite lives on

host DNA

DNA that is present in the genome of the organism of interest

***Hox* gene**

master control gene that can turn on or turn off large numbers of other genes during embryogenesis (also, homeobox gene)

human growth hormone (HGH or hGH)

a growth-promoting hormone influencing the cell cycle in humans

humerus

only bone of the upper arm

humoral immune response

adaptive immune response that is controlled by activated B cells and antibodies

humoral stimuli

control of hormone release in response to changes in extracellular fluids, such as blood or the ion concentration in the blood

humus

organic material of soil; made up of microorganisms, dead animals, and plants in varying stages of decay

hybrid

offspring of two closely related individuals, not of the same species

hybridization

process of mating two individuals that differ with the goal of achieving a certain characteristic in their offspring

hybrid zone

area where two closely related species continue to interact and reproduce, forming hybrids

hydrocarbon

molecule that consists only of carbon and hydrogen

hydrogen bond

weak bond between slightly positively charged hydrogen atoms and slightly negatively charged atoms in other molecules

hydrogenosome

organelle carried by parabasalids (Excavata) that functions anaerobically and outputs hydrogen gas as a byproduct; likely evolved from mitochondria

hydrolysis

reaction that causes breakdown of larger molecules into smaller molecules by utilizing water

hydrophilic

describes ions or polar molecules that interact well with other polar molecules such as water; "water-loving"

hydrophobic

describes uncharged nonpolar molecules that do not interact well with polar molecules such as water; "water-hating"

hydrosphere

area of the Earth where water movement and storage occurs

hydrostatic skeleton

skeleton that consists of aqueous fluid held under pressure in a closed body compartment

hydrothermal vent

fissure in Earth's surface that releases geothermally heated water

Hylobatidae

family of gibbons

Hylonomus

one of the earliest reptiles

hyoid bone

lies below the mandible in the front of the neck

hyperextension

extension past the regular anatomical position

hyperglycemia

high blood sugar level

hyperopia

visual defect in which the image focus falls behind the retina, thereby making images in the distance clear but close-up images blurry (also, farsightedness)

hyperplasia

abnormally high cell growth and division

hyperpolarization

change in the membrane potential to a more negative value

hypersensitivities

spectrum of maladaptive immune responses toward harmless foreign particles or self-antigens; occurs after tissue sensitization and includes immediate-type (allergy), delayed-type, and autoimmunity

hyperthermophile

organism that grows at temperatures between 80–122°C

hyperthyroidism

overactivity of the thyroid gland

hypertonic

situation in which extracellular fluid has a higher osmolarity than the fluid inside the cell, resulting in water moving out of the cell

hypha

(plural, *hyphae*) fungal filament composed of one or more cells

hypocotyl

embryonic axis above the cotyledons

hypoglycemia

low blood sugar level

hypophyseal portal system

system of blood vessels that carries hormones from the hypothalamus to the anterior pituitary

hypoplasia

abnormally low cell growth and division

hypothalamus

brain structure that controls hormone release and body homeostasis

hypothesis

suggested explanation for an observation that one can test

hypothesis-based science

form of science that begins with a specific question and potential, testable answers

hypothyroidism

underactivity of the thyroid gland

hypotonic

situation in which extracellular fluid has a lower osmolarity than the fluid inside the cell, resulting in water moving into the cell

Ichthyostega

one of the earliest known tetrapods; aquatic

ileum

last part of the small intestine; connects the small intestine to the large intestine; important for absorption of B₁₂

immune tolerance

acquired ability to prevent an unnecessary or harmful immune response to a detected foreign body known not to cause disease or to self-antigens

immunodeficiency

failure, insufficiency, or delay at any level of the immune system, which may be acquired or inherited

imprinting

identification of parents by newborns as the first organism they see after birth

inbreeding

mating of closely related individuals

inbreeding depression

increase in abnormalities and disease in inbreeding populations

inclusive fitness

a measure of the ability of an organism to transmit its genes to the next generation

incomplete dominance

in a heterozygote, expression of two contrasting alleles such that the individual displays an intermediate phenotype

incus

second of the three bones of the middle ear (also, anvil)

independent assortment

the random assortment of homologous chromosomes at the metaphase plate that, upon completion of meiosis I, introduces significant genetic variation into the resulting gametes or spores

indeterminate cleavage

cleavage pattern in which individual blastomeres have the character of "stem cells" and are not yet predetermined to develop into specific cell types

induced fit

dynamic fit between the enzyme and its substrate, in which both components modify their structures to allow for ideal binding

induced mutation

mutation that results from exposure to chemicals or environmental agents

inducer

small molecules in the cell's environment that either turn on an activator or turn off a repressor, increasing the expression of a gene based on the needs of the cell

inducible operon

an operon that is activated when inducers bind to a repressor, inactivating it and increasing transcription based on the needs of the cell

inductive reasoning

uses related observations to arrive at a general conclusion

inert gas

element with filled outer electron shell that is unreactive with other atoms (also, noble gas)

inferior vena cava

drains blood from the veins that come from the lower organs and the legs

infertility

inability to conceive, carry, and deliver children

inflammation

localized redness, swelling, heat, and pain that results from the movement of leukocytes and fluid through opened capillaries to a site of infection

ingestion

act of taking in food

inhibin

hormone made by Sertoli cells; provides negative feedback to hypothalamus in control of FSH and GnRH release

inhibitor

molecule that binds to a protein (usually an enzyme) and keeps it from functioning

inhibitory postsynaptic potential (IPSP)

hyperpolarization of a postsynaptic membrane caused by neurotransmitter molecules released from a presynaptic cell

initiation complex

protein complex containing eIF-2 that starts translation

initiation site

nucleotide from which mRNA synthesis proceeds in the 5' to 3' direction; denoted with a "+1"

initiator tRNA

in prokaryotes, called tRNA^{Metf}; in eukaryotes, called tRNA_i; a tRNA that interacts with a start codon, binds directly to the ribosome P-site, and links to a special methionine to begin a polypeptide chain

innate behavior

instinctual behavior that is not altered by changes in the environment

innate immunity

immunity that occurs naturally because of genetic factors or physiology and is not induced by infection or vaccination

inner cell mass

inner layer of cells in the blastocyst

inner ear

innermost part of the ear; consists of the cochlea and the vestibular system

inorganic compound

chemical compound that does not contain carbon; it is not part of or produced by a living organism

inositol phospholipid

lipid present at small concentrations in the plasma membrane that is converted into a second messenger; it has inositol (a carbohydrate) as its hydrophilic head group

inositol triphosphate (IP₃)

cleavage product of PIP₂ that is used for signaling within the cell

insectivorous plant

plant that has specialized leaves to attract and digest insects

inspiratory capacity (IC)

tidal volume plus inspiratory reserve volume

inspiratory reserve volume (IRV)

amount of additional air that can be inspired after a normal inhalation

insulin

hormone produced by the beta cells of the pancreas in response to high blood glucose levels; functions to lower blood glucose levels

insulin-like growth factor (IGF)

growth-promoting protein produced by the liver

integral protein

protein integrated into the membrane structure that interacts extensively with the membrane lipids' hydrocarbon chains and often spans the membrane

integument

layer of sporophyte tissue that surrounds the megasporangium and, later, the embryo

intercalary meristem

meristematic tissue located at nodes and the bases of leaf blades; found only in monocots

intercalated disc

tight connection between adjacent cardiac muscle cells that allows electrical impulses to be transmitted; appear as lines in cardiac muscle

intercellular signaling

communication between cells

intercostal muscle

muscle connected to the rib cage that contracts upon inspiration

interferon

cytokine that inhibits viral replication and modulates the immune response

interkinesis

brief period of rest between meiosis I and meiosis II (also, interphase II)

interleukin

a class of cytokines that mediate communication between white blood cells (leukocytes) and stimulate certain immune system processes

interlobar artery

artery that branches from the segmental artery and travels in between the renal lobes

intermediate filament

cytoskeletal component, comprised of several fibrous protein intertwined strands that bears tension, supports cell-cell junctions, and anchors cells to extracellular structures

intermittent symptom

symptom that occurs periodically

internal fertilization

fertilization of egg by sperm inside the body of the female

internal receptor

receptor protein that is located in the cytosol of a cell and binds to ligands that pass through the plasma membrane (also, intracellular receptor)

internode

region between nodes on the stem

interphase

period of the cell cycle leading up to mitosis; includes G₁, S, and G₂ phases (the interim period between two consecutive cell divisions)

intersexual selection

selection of a desirable mate of the opposite sex

interspecific competition

competition between species for resources in a shared habitat or environment

interstitial cell of Leydig

cell in seminiferous tubules that makes testosterone

interstitial fluid

fluid between cells

intertidal zone

part of the ocean that is closest to land; parts extend above the water at low tide

intervertebral disc

composed of fibrous cartilage; lies between adjacent vertebrae from the second cervical vertebra to the sacrum

intestinal phase

third digestive phase; begins when chyme enters the small intestine triggering digestive secretions and controlling the rate of gastric emptying

intine

inner lining of the pollen

intracellular hormone receptor

a hormone receptor in the cytoplasm or nucleus of a cell

intracellular mediator

small molecule that transmits signals within a cell (also, second messenger)

intracellular signaling

communication within cells

intramembranous ossification

process of bone development from fibrous membranes

intrapleural space

space between the layers of pleura

intrasexual selection

competition between members of the same sex for a mate

intraspecific competition

competition between members of the same species

introduction

opening section of a scientific paper, which provides background information about what was known in the field prior to the research reported in the paper

intron

non-protein coding intervening sequences that are spliced from mRNA during processing

inversion

soles of the feet moving inward, toward the midline of the body

invertebrata

category of animals that do not possess a cranium or vertebral column (also, invertebrates)

ion

atom or chemical group that does not contain equal numbers of protons and electrons

ion channel-linked receptor

cell-surface receptor that forms a plasma membrane channel, which opens when a ligand binds to the extracellular domain (ligand-gated channels)

ionic bond

chemical bond that forms between ions with opposite charges (cations and anions)

iris

pigmented, circular muscle at the front of the eye that regulates the amount of light entering the eye

irregular bone

bone with complex shapes; examples include vertebrae and hip bones

irreversible chemical reaction

chemical reaction where reactants proceed unidirectionally to form products

island biogeography

study of life on island chains and how their geography interacts with the diversity of species found there

islets of Langerhans

endocrine cells of the pancreas (also, pancreatic islets)

isomerase

enzyme that converts a molecule into its isomer

isomers

molecules that differ from one another even though they share the same chemical formula

isotonic

situation in which the extracellular fluid has the same osmolarity as the fluid inside the cell, resulting in no net water movement into or out of the cell

isotope

one or more forms of an element that have different numbers of neutrons

isthmus

tissue mass that connects the two lobes of the thyroid gland

iteroparity

life history strategy characterized by multiple reproductive events during the lifetime of a species

IUCN

International Union of Conservation of Nature

J**jasmonates**

small family of compounds derived from the fatty acid linoleic acid

jaw

a pair of hinged cartilaginous or bony structures attached to the cranium that allows an animal to grasp and tear its food

jejunum

second part of the small intestine where the bulk of chemical digestion and nutrient absorption occurs

joint

point at which two or more bones meet

J-shaped growth curve

shape of an exponential growth curve

juxtglomerular cell

cell in the afferent and efferent arterioles that responds to stimuli from the macula densa

juxtamedullary nephron

nephron that lies in the cortex but close to the renal medulla

K**karyogamy**

fusion of nuclei

karyogram

a karyotype's photographic image

karyokinesis

mitotic nuclear division

karyotype

an individual's chromosome number and appearance; includes the size, banding patterns, and centromere position

keystone species

species whose presence is key to maintaining biodiversity in an ecosystem and to upholding an ecological community's structure

kidney

organ that performs excretory and osmoregulatory functions

kinase

enzyme that catalyzes the transfer of a phosphate group from ATP to another molecule

kinesis

undirected movement of an organism in response to a stimulus

kinesthesia

sense of body movement

kinetic energy

energy type that takes place with objects or particles in motion

kinetochore

protein structure associated with the centromere of each sister chromatid that attracts and binds spindle microtubules during prometaphase

kinetoplast

mass of DNA carried within the single, oversized mitochondrion, characteristic of kinetoplastids (phylum: Euglenozoa)

kingdom

division of domain in the taxonomic classification system

kin selection

sacrificing one's own life so that one's genes will be passed on to future generations by relatives

Zozak's rules

determines the correct initiation AUG in a eukaryotic mRNA; the following consensus sequence must appear around the AUG: 5'-GCC(**purine**)CCAUGG-3'; the bolded bases are most important

Krebs cycle

alternate name for the citric acid cycle, named after Hans Krebs, who first identified the steps of the pathway in the 1930s in pigeon flight muscles (also, citric acid cycle)

K-selected species

species suited to stable environments that produce a few, relatively large offspring and provide parental care

L**labia majora**

large folds of tissue covering the inguinal area

labia minora

smaller folds of tissue within the labia majora

labyrinth

bony, hollow structure that is the most internal part of the ear; contains the sites of transduction of auditory and vestibular information

lac operon

operon in prokaryotic cells that encodes genes required for processing and intake of lactose

lactase

enzyme that breaks down lactose into glucose and galactose

lacuna

space in cartilage and bone that contains living cells

lagging strand

during replication, the strand that is replicated in short fragments (Okazaki fragments)

lamella

(plural, *lamellae*) layer of compact tissue that surrounds a central canal called the Haversian canal

lamina

leaf blade

lamprey

jawless fish characterized by a toothed, funnel-like, sucking mouth

lancelet

member of Cephalochordata; named for its bladelike shape

large 60S ribosomal subunit

second, larger ribosomal subunit that binds to RNA to translate it into protein

large intestine

digestive system organ that reabsorbs water from undigested material and processes waste matter

larynx

voice box; a short passageway connecting the pharynx and the trachea

latency

virus that remains in the body for a long period of time but only causes intermittent symptoms

lateral line

sense organ that runs the length of a fish's body; used to detect vibration in the water

lateral meristem

meristematic tissue that enables a plant to increase in thickness or girth

lateral rotation

rotation away from the midline of the body

law of dominance

in a heterozygote, one trait will conceal the presence of another trait for the same characteristic

law of independent assortment

genes do not influence each other with regard to sorting of alleles into gametes; every possible combination of alleles is equally likely to occur

law of mass action

chemical law stating that the rate of a reaction is proportional to the concentration of the reacting substances

law of segregation

paired unit factors (i.e., genes) segregate equally into gametes such that offspring have an equal likelihood of inheriting any combination of factors

layering

method of propagating plants by bending a stem under the soil

leading strand

the strand that is synthesized continuously in the 5'-3' direction, which is synthesized in the direction of the replication fork

learned behavior

behavior that responds to changes in the environment

lens

transparent, convex structure behind the cornea that helps focus light waves on the retina

lenticel

opening on the surface of mature woody stems that facilitates gas exchange

lepidosaur

modern lizards, snakes, and tuataras

leptin

hormone produced by adipose tissue that promotes feelings of satiety and reduces hunger

leukocyte

white blood cell

lichen

close association of a fungus with a photosynthetic alga or bacterium that benefits both partners

life cycle

sequence of events in the development of an organism and the production of cells that produce offspring

life history

inherited pattern of resource allocation under the influence of natural selection and other evolutionary forces

life science

field of science, such as biology, that studies living things

life table

table showing the life expectancy of a population member based on its age

ligand

molecule produced by a signaling cell that binds with a specific receptor, delivering a signal in the process

ligase

enzyme that seals DNA fragments together into a continuous strand

light-dependent reaction

first stage of photosynthesis where certain wavelengths of the visible light are absorbed to form two energy-carrying molecules (ATP and NADPH)

light-harvesting complex

complex that passes energy from sunlight to the reaction center in each photosystem; it consists of multiple antenna proteins that contain a mixture of 300 to 400 chlorophyll *a* and *b* molecules, as well as other pigments like carotenoids

light-independent reaction

second stage of photosynthesis, through which carbon dioxide is used to build carbohydrate molecules using energy from ATP and NADPH

light microscope

an instrument that magnifies an object using a beam of visible light that passes and bends through a lens system to visualize a specimen

lignin

complex polymer impermeable to water

limbic system

connected brain areas that process emotion and motivation

linkage

phenomenon in which alleles that are located in close proximity to each other on the same chromosome are more likely to be inherited together

linkage analysis

procedure that analyzes recombining genes to determine if they are linked

lipase

enzyme that chemically breaks down lipids

lipid-derived hormone

hormone derived mostly from cholesterol

lipids

macromolecules that are nonpolar and insoluble in water

litmus paper

filter paper treated with a natural water-soluble dye that changes its color as the pH of the environment changes in order to use it as a pH indicator (also, pH paper)

liver

organ that produces bile for digestion, processes vitamins and lipids, and detoxifies blood

liverworts

most primitive group of the nonvascular plants

loam

soil that has no dominant particle size and contains a mixture of sand, silt, and clay

lobes of the kidney

renal pyramid along with the adjoining cortical region

locus

position of a gene on a chromosome

logistic growth

leveling off of exponential growth due to limiting resources

long bone

bone that is longer than wide and has a shaft and two ends

long-term depression (LTD)

prolonged decrease in synaptic coupling between a presynaptic and postsynaptic cell

long-term potentiation (LTP)

prolonged increase in synaptic coupling between a presynaptic and postsynaptic cell

loop of Henle

part of the renal tubule that loops into the renal medulla

loose (areolar) connective tissue

type of connective tissue with small amounts of cells, matrix, and fibers; found around blood vessels

lophophore

feeding structure found in members of the superphylum Lophotrochozoa; composed of a set of ciliated tentacles surrounding the mouth

Lophotrochozoa

clade of protostomes that exhibit a trochophore larvae stage or a lophophore feeding structure

lower limb

consists of the thigh, the leg, and the foot

lung capacity

measurement of two or more lung volumes (how much air can be inhaled from the end of an expiration to maximal capacity)

lung volume

measurement of air for one lung function (normal inhalation or exhalation)

luteinizing hormone (LH)

reproductive hormone in both sexes; causes testosterone production in males and ovulation and lactation in females

lycophyte

club moss

lymph

watery fluid that bathes tissues and organs with protective white blood cells and does not contain erythrocytes

lymph node

specialized organ that contains a large number of macrophages that clean the lymph before the fluid is returned to the heart

lymphocyte

a type of white blood cell found in the lymphatic system

lysis

bursting of a cell

lysis buffer

solution to break the cell membrane and release cell contents

lysogenic cycle

type of virus replication in which the viral genome is incorporated into the genome of the host cell

lysosome

organelle in an animal cell that functions as the cell's digestive component; it breaks down proteins, polysaccharides, lipids, nucleic acids, and even worn-out organelles

lytic cycle

type of virus replication in which virions are released through lysis, or bursting, of the cell

M**macroevolution**

broader scale evolutionary changes that scientists see over paleontological time

macromolecule

large molecule, typically formed by the joining of smaller molecules

macronutrient

nutrient that is required in large amounts for plant growth; carbon, hydrogen, oxygen, nitrogen, phosphorus, potassium, calcium, magnesium, and sulfur

macrophage

large phagocytic cell that engulfs foreign particles and pathogens

macula densa

group of cells that senses changes in sodium ion concentration; present in parts of the renal tubule and collecting ducts

madreporite

pore for regulating entry and exit of water into the water vascular system

magnification

the process of enlarging an object in appearance

major depression

mental illness characterized by prolonged periods of sadness

major histocompatibility complex (MHC) class I/II molecule

protein found on the surface of all nucleated cells (I) or specifically on antigen-presenting cells (II) that signals to immune cells whether the cell is healthy/normal or is infected/cancerous; provides the appropriate template into which antigens can be loaded for recognition by lymphocytes

malleus

first of the three bones of the middle ear (also, hammer)

Malpighian tubule

excretory tubules found in arthropods

maltase

enzyme that breaks down maltose into glucose

mammal

one of the groups of endothermic vertebrates that possesses hair and mammary glands

mammary gland

in female mammals, a gland that produces milk for newborns

mantle

specialized epidermis that encloses all visceral organs and secretes shells (also, pallium)

mark and recapture

technique used to determine population size in mobile organisms

marsupial

one of the groups of mammals that includes the kangaroo, koala, bandicoot, Tasmanian devil, and several other species; young develop within a pouch

mass extinction

event or environmental condition that wipes out the majority of species within a relatively short geological time period

mass number

total number of protons and neutrons in an atom

mastax

jawed pharynx unique to the rotifers

mast cell

leukocyte that produces inflammatory molecules, such as histamine, in response to large pathogens and allergens

materials and methods

section of a scientific paper that includes a complete description of the substances, methods, and techniques that the researchers used to gather data

mating factor

signaling molecule secreted by yeast cells to communicate to nearby yeast cells that they are available to mate

matrix

component of connective tissue made of both living and nonliving (ground substances) cells

matrix protein

envelope protein that stabilizes the envelope and often plays a role in the assembly of progeny virions

matter

anything that has mass and occupies space

maximum parsimony

applying the simplest, most obvious way with the least number of steps

MBTA

Migratory Bird Treaty Act

M checkpoint

cell-cycle checkpoint occurring at the end of metaphase during which the cell determines whether all sister chromatids are correctly attached to the spindle microtubules (also, the spindle checkpoint)

mechanical defenses

discouraging animal predation and herbivory by causing physical pain to the predator or by physically preventing the predator from being able to eat the prey

mechanoreceptor

sensory receptor modified to respond to mechanical disturbance such as being bent, touch, pressure, motion, and sound

medial rotation

rotation toward the midline of the body

medulla

middle layer of an organ, like the kidney or adrenal gland

medusa

free-floating cnidarian body plan with mouth on underside and tentacles hanging down from a bell

megafauna

large animals

megagametogenesis

second phase of female gametophyte development during which the surviving haploid megaspore undergoes mitosis to produce an eight-nucleate, seven-cell female gametophyte, also known as the megagametophyte or embryo sac

megagametophyte

female gametophyte that develops from megaspores

megapascal (MPa)

pressure unit that measures water potential

megaphyll

larger leaves with a pattern of branching veins

megasporangium

tissue found in the ovary that gives rise to the female gamete or egg

megaspore

a spore that germinates into a female gametophyte; a female spore

megasporocyte

megaspore mother cell; diploid cell that undergoes meiosis to produce megaspores in a heterosporous plant

megasporogenesis

first phase of female gametophyte development during which a single cell in the diploid megasporangium undergoes meiosis to produce four megaspores, only one of which survives

megasporophyll

bract (a type of modified leaf) on the central axis of a female gametophyte

meiosis

a nuclear division process that results in four haploid cells

meiosis I

first round of meiotic cell division; referred to as reduction division because the ploidy level is reduced from diploid to haploid

meiosis II

second round of meiotic cell division following meiosis I; sister chromatids are separated into individual chromosomes, and the result is four unique haploid cells

Meissner's corpuscle

encapsulated, rapidly adapting mechanoreceptor in the skin that responds to light touch (also, tactile corpuscle)

membrane potential

difference in electrical potential between the inside and outside of a cell

memory cell

antigen-specific B or T lymphocyte that does not differentiate into effector cells during the primary immune response but that can immediately become an effector cell upon re-exposure to the same pathogen

meninge

membrane that covers and protects the central nervous system

menopause

loss of reproductive capacity in females due to decreased sensitivity of the ovaries to FSH and LH

menstrual cycle

cycle of the degradation and regrowth of the endometrium

meristem

plant region of continuous growth

meristematic tissue

tissue containing cells that constantly divide; contributes to plant growth

Merkel's disk

unencapsulated, slowly adapting mechanoreceptor in the skin that responds to touch

meroblastic

partial cleavage; takes place in cells with a large amount of yolk

mesocarp

middle part of a fruit

mesocosm

portion of a natural ecosystem to be used for experiments

mesoderm

the middle germ layer in a triploblast embryo, from which muscle, connective tissue, and most internal organs are derived

mesoglea

nonliving, gel-like matrix present between ectoderm and endoderm in cnidarians

mesohyl

collagen-like gel containing suspended cells that perform various functions in the sponge

mesophyll

middle layer of chlorophyll-rich cells in a leaf

messenger RNA (mRNA)

RNA that carries information from DNA to ribosomes during protein synthesis

metabolic pathway

a sequence of linked chemical reactions that convert an initial substrate to a final product

metabolism

all the chemical reactions that take place inside cells, including anabolism and catabolism

metabolome

complete set of metabolites which are related to an organism's genetic makeup

metabolomics

study of small molecule metabolites in an organism

metacarpus

five bones that comprise the palm

metagenomics

study of multiple species' collective genomes that grow and interact in an environmental niche

metamerism

series of body structures that are similar internally and externally, such as segments

metaphase

stage of mitosis during which chromosomes are aligned at the metaphase plate

metaphase plate

equatorial plane midway between the two poles of a cell where the chromosomes align during metaphase

metatarsal

one of the five bones of the foot

Metazoa

group containing all animals

microbial mat

multilayered sheet of prokaryotes that may include bacteria and archaea

microbiology

study of the structure and function of microorganisms

microcosm

re-creation of natural ecosystems entirely in a laboratory environment to be used for experiments

microevolution

changes in a population's genetic structure

microfilament

the cytoskeleton system's narrowest element; it provides rigidity and shape to the cell and enables cellular movements

microglia

glia that scavenge and degrade dead cells and protect the brain from invading microorganisms

micronutrient

nutrient required in small amounts (also, trace element)

microphyll

small size and simple vascular system with a single unbranched vein

micropropagation

propagation of desirable plants from a plant part; carried out in a laboratory

micropyle

opening on the ovule sac through which the pollen tube can gain entry

microRNA (miRNA)

short RNA molecules (approximately 21 nucleotides in length) that modulate the expression of a variety of different proteins

microsatellite polymorphism

variation between individuals in the sequence and number of microsatellite DNA repeats

microscope

an instrument that magnifies an object

microsporangium

tissue that gives rise to the microspores or the pollen grain

microspore

a spore that germinates into a male gametophyte; a male spore

microsporocyte

a diploid cell that undergoes meiosis to produce megaspores in a heterosporous plant

microsporophyll

central axis of a male cone on which bracts (a type of modified leaf) are attached

microtubule

the cytoskeleton system's widest element; it helps the cell resist compression, provides a track along which vesicles move through the cell, pulls replicated chromosomes to opposite ends of a dividing cell, and is the structural element of centrioles, flagella, and cilia

microvilli

microscopic membrane protrusions of intestinal cells that increase surface area

middle ear

part of the hearing apparatus that functions to transfer energy from the tympanum to the oval window of the inner ear

midsagittal plane

plane cutting through an animal, separating the individual into even right and left sides

migration

movement of organisms from one region to another

Milankovitch cycles

cyclic changes in the Earth's orbit that may affect climate

mineral

inorganic, elemental molecule that carries out important roles in the body

mineralocorticoid

corticosteroid produced in the adrenal cortex that affects ion and water balance

mineral soil

type of soil that is formed from the weathering of rocks and inorganic material; composed primarily of sand, silt, and clay

mismatch repair

type of repair mechanism in which mismatched bases are removed after replication

missense mutation

a point mutation (single nucleotide substitution) that results in a single amino acid change in the protein product

mitochondria

(singular, *mitochondrion*) cellular organelles responsible for carrying out cellular respiration, resulting in producing ATP, the cell's main energy-carrying molecule

mitochondria-first**hypothesis**

proposal that prokaryotes acquired a mitochondrion first, followed by nuclear development

mitosis

period of the cell cycle during which the duplicated chromosomes are separated into identical nuclei; includes prophase, prometaphase, metaphase, anaphase, and telophase (also, karyokinesis)

mitosome

nonfunctional organelle carried in the cells of diplomonads (Excavata) that likely evolved from a mitochondrion

mitotic phase

period of the cell cycle during which duplicated chromosomes are distributed into two nuclei and cytoplasmic contents are divided; includes mitosis (karyokinesis) and cytokinesis

mitotic spindle

apparatus composed of microtubules that orchestrates the movement of chromosomes during mitosis

mixotroph

organism that can obtain nutrition by autotrophic or heterotrophic means, usually facultatively

model organism

species that researchers study and use as a model to understand the biological processes in other species represented by the model organism

model system

species or biological system used to study a specific biological phenomenon to be applied to other species

modern synthesis

overarching evolutionary paradigm that took shape by the 1940s and scientists generally accept today

molality

number of moles of solute per kilogram of solvent

molarity

number of moles of solute per liter of solution

mold

tangle of visible mycelia with a fuzzy appearance

mole

gram equivalent of the molecular weight of a substance

molecular biology

study of biological processes and their regulation at the molecular level, including interactions among molecules, such as DNA, RNA, and proteins

molecular cloning

cloning of DNA fragments

molecular systematics

technique using molecular evidence to identify phylogenetic relationships

molecule

chemical structure consisting of at least two atoms held together by one or more chemical bonds

Mollusca

phylum of protostomes with soft bodies and no segmentation

monocarpic

plants that flower once in their lifetime

monocot

related group of angiosperms that produce embryos with one cotyledon and pollen with a single ridge

monocyte

type of white blood cell that differentiates into phagocytic macrophages and dendritic cells; helps fight viruses, bacteria, and other infections

monoecious

describes a species in which the male and female reproductive organs are on the same plant

monogamy

mating system whereby one male and one female remain coupled for at least one mating season

monogastric

digestive system that consists of a single-chambered stomach

monohybrid

result of a cross between two true-breeding parents that express different traits for only one characteristic

monomer

smallest unit of larger molecules that are polymers

monophyletic

descendants of a single common ancestor

monophyletic group

organisms that share a single ancestor (also, *clade*)

monosaccharide

single unit or monomer of carbohydrates

monosomy

otherwise diploid genotype in which one chromosome is missing

monotreme

egg-laying mammal

mortality rate

proportion of population surviving to the beginning of an age interval that die during the age interval

mosses

group of bryophytes in which a primitive conductive system appears

most recent common ancestor (MRCA)

branch point at which two or more organisms diverge

motor end plate

sarcolemma of the muscle fiber that interacts with the neuron

MRSA

(methicillin-resistant *Staphylococcus aureus*) very dangerous *Staphylococcus aureus* strain resistant to multiple antibiotics

mucin

complex glycoprotein found in mucus

mucosa-associated lymphoid tissue (MALT)

collection of lymphatic tissue that combines with epithelial tissue lining the mucosa throughout the body

mucus

sticky protein-containing fluid secretion in the lung that traps particulate matter to be expelled from the body

Müllerian mimicry

type of mimicry where species share warning coloration, and all are harmful to predators

multiple cloning site (MCS)

site that multiple restriction endonucleases can recognize

multiple fruit

fruit that develops from multiple flowers on an inflorescence

muscle spindle

proprioceptive stretch receptor that lies within a muscle and that shortens the muscle to an optimal length for efficient contraction

mutation

variation in the nucleotide sequence of a genome

mutualism

symbiotic relationship between two species where both species benefit

myc

oncogene that causes cancer in many cancer cells

mycelium

mass of fungal hyphae

mycetismus

ingestion of toxins in poisonous mushrooms

mycology

scientific study of fungi

mycorrhizae

symbiotic relationship between fungal hyphae, which provide soil minerals to the plant, and plant roots, which provide carbohydrates to the fungus

mycoses

(singular, *mycosis*) infectious diseases caused by fungi

mycotoxicosis

poisoning by a fungal toxin released in food

myelin

fatty substance produced by glia that insulates axons

myocardial infarction

complete blockage of the coronary arteries and death of the cardiac muscle tissue (also, heart attack)

myocardium

heart muscle cells that make up the middle layer and the bulk of the heart wall

myofibril

long cylindrical structures that lie parallel to the muscle fiber

myofilament

small structures that make up myofibrils

myopia

visual defect in which the image focus falls in front of the retina, thereby making images in the distance blurry, but close-up images clear (also, nearsightedness)

myosin

contractile protein that interacts with actin for muscle contraction

myriapods

arthropods with numerous legs; the number of legs varies from 10 to 750

Myxini

hagfishes

N**nacre**

calcareous secretion produced by bivalves to line the inner side of shells as well as to coat intruding particulate matter

nasal cavity

opening of the respiratory system to the outside environment

natural killer (NK) cell

lymphocyte that can kill cells infected with viruses or tumor cells

natural science

field of science that is related to the physical world and its phenomena and processes

natural selection

reproduction of individuals with favorable genetic traits that survive environmental change because of those traits, leading to evolutionary change

nauplius

larval stage in the early development of crustaceans

nectar

liquid rich in sugars produced by flowers to attract animal pollinators

nectar guide

pigment pattern on a flower that guides an insect to the nectaries

negative feedback loop

feedback to a control mechanism that increases or decreases a stimulus instead of maintaining it

negative gravitropism

growth away from Earth's gravity

negative polarity

ssRNA viruses with genomes complementary to their mRNA

negative regulation

type of regulation that inhibits or halts progression through cell-cycle checkpoints

negative regulator

protein that prevents transcription

nematocyst

harpoon-like organelle within cnidocyte with pointed projectile and poison to stun and entangle prey

Nematoda

phylum of wormlike animals that are triploblastic pseudocoelomates that can be free-living or parasitic

Nemertea

phylum of dorsoventrally flattened protostomes known as ribbon worms

Neognathae

birds other than the Paleognathae

Neornithes

modern birds

nephridia

excretory structures found in annelids

nephridiopore

pore found at the end of nephridia

nephron

functional unit of the kidney

neritic zone

part of the ocean that extends from low tide to the edge of the continental shelf

net consumer productivity

energy content available to the organisms of the next trophic level

net primary productivity

energy that remains in the primary producers after accounting for the organisms' respiration and heat loss

net production efficiency (NPE)

measure of the ability of a trophic level to convert the energy it receives from the previous trophic level into biomass

neural stimuli

stimulation of endocrine glands by the nervous system

neural tube

tubelike structure that forms from the ectoderm and gives rise to the brain and spinal cord

neurobiology

study of the biology of the nervous system

neurodegenerative disorder

nervous system disorder characterized by the progressive loss of neurological functioning, usually caused by neuron death

neuromuscular junction

synapse between a motor neuron nerve terminal and its muscle fiber

neuron

specialized cell that can receive and transmit electrical and chemical signals

neurotransmitter

ligand that carries a signal from one nerve cell to the next

neutron

uncharged particle that resides in an atom's nucleus; has a mass of one unified atomic mass unit (u)

neutrophil

phagocytic leukocyte that engulfs and digests pathogens

next-generation sequencing

group of automated techniques for rapid DNA sequencing

nitrification

conversion of ammonium into nitrite and nitrate in soils

nitrogenase

enzyme that is responsible for the reduction of atmospheric nitrogen to ammonia

nitrogen fixation

process by which gaseous nitrogen is transformed, or "fixed," into more readily available forms, such as ammonia

noble gas

see inert gas

nociception

neural processing of noxious (such as damaging) stimuli

node

point along the stem at which leaves, flowers, or aerial roots originate

nodes of Ranvier

gaps in the myelin sheath where the signal is recharged

nodule

novel structure on the roots of certain plants (legumes) that results from the symbiotic interaction between the plant and soil bacteria and is the site of nitrogen fixation

nondisjunction

failure of synapsed homologs to completely separate and migrate to separate poles during the meiosis' first cell division

nonelectrolyte

solute that does not break down into ions when dissolved in water

non-endospermic dicot

dicot that stores food reserves in the developing cotyledon

nonparental (recombinant) type

progeny resulting from homologous recombination that exhibits a different allele combination compared with its parents

nonpolar covalent bond

type of covalent bond that forms between atoms when electrons are shared equally between them

nonrandom mating

changes in a population's gene pool due to mate choice or other forces that cause individuals to mate with certain phenotypes more than others

nonrenewable resource

resource, such as fossil fuel, that is either regenerated very slowly or not at all

nonsense codon

one of the three mRNA codons that specifies termination of translation

nonsense mutation

a point mutation (single nucleotide substitution) that introduces a premature stop codon, resulting in a shortened protein

nontemplate strand

strand of DNA that is not used to transcribe mRNA; this strand is identical to the mRNA except that T nucleotides in the DNA are replaced by U nucleotides in the mRNA

nonvascular plant

plant that lacks vascular tissue, which is made up of specialized cells for the transport of water and nutrients

norepinephrine

neurotransmitter and hormone released by activation of the sympathetic nervous system

northern blotting

transfer of RNA from a gel to a nylon membrane

nosocomial infections

infections acquired in the hospital

notochord

flexible, rod-shaped support structure that is found in the embryonic stage of all chordates and in the adult stage of some chordates

NTP

nucleoside triphosphate

nuclear envelope

double-membrane structure that constitutes the nucleus's outermost portion

nucleic acid

biological macromolecule that carries the cell's genetic blueprint and carries instructions for the cell's functioning

nucleoid

central part of a prokaryotic cell's central part where the chromosome is located

nucleolus

darkly staining body within the nucleus that is responsible for assembling ribosome subunits

nucleoplasm

semisolid fluid inside the nucleus that contains the chromatin and nucleolus

nucleosome

subunit of chromatin composed of a short length of DNA wrapped around a core of histone proteins

nucleotide

monomer of nucleic acids; contains a pentose sugar, one or more phosphate groups, and a nitrogenous base

nucleotide excision repair

type of DNA repair mechanism in which the wrong base, along with a few nucleotides upstream or downstream, are removed

nucleotides

building blocks of DNA and RNA

nucleus (atom)

core of an atom; contains protons and neutrons

nucleus (cell)

cell organelle that houses the cell's DNA and directs ribosome and protein synthesis

nucleus-first hypothesis

proposal that prokaryotes acquired a nucleus first and then the mitochondrion

nutrient

essential substances for growth, such as carbon and nitrogen

O**obligate aerobes**

organisms, such as humans, that must perform aerobic respiration to survive

obligate anaerobes

organisms that only perform anaerobic respiration and often cannot survive in the presence of oxygen

obstructive disease

disease (such as emphysema and asthma) that arises from obstruction of the airways; compliance increases in these diseases

occipital lobe

part of the cerebral cortex that contains the visual cortex and processes visual stimuli

oceanic zone

part of the ocean that begins offshore where the water measures 200 m deep or deeper (also, pelagic realm)

ocean upwelling

rising of deep ocean waters that occurs when prevailing winds blow along surface waters near a coastline

octamer box

(ATTTGCAT) nonessential eukaryotic promoter sequence that binds cellular factors to increase the efficiency of transcription; may be present several times in a promoter

octet rule

rule that atoms are most stable when they hold eight electrons in their outermost shells

odorant

airborne molecule that stimulates an olfactory receptor

O horizon

layer of soil with humus at the surface and decomposed vegetation at the base

Okazaki fragments

DNA fragments that are synthesized in short stretches on the lagging strand

olfaction

sense of smell

olfactory bulb

neural structure in the vertebrate brain that receives signals from olfactory receptors

olfactory epithelium

specialized tissue in the nasal cavity where olfactory receptors are located

olfactory receptor

dendrite of a specialized neuron

oligodendrocyte

glial cell that myelinates central nervous system neuron axons

oligosaccharin

hormone important in plant defenses against bacterial and fungal infections

omega fat

type of polyunsaturated fat that the body requires; numbering the carbon omega starts from the methyl end or the end that is farthest from the carboxylic end

omnivore

animal that consumes both plants and animals

oncogene

mutated version of a normal gene involved in the positive regulation of the cell cycle

- oncogenic virus**
virus that has the ability to cause cancer
- oncolytic virus**
virus engineered to specifically infect and kill cancer cells
- one-child policy**
China's policy to limit population growth by limiting urban couples to have only one child or face the penalty of a fine
- oogenesis**
process of producing haploid eggs
- open circulatory system**
system in which the blood is mixed with interstitial fluid and directly covers the organs
- operant conditioning**
learned behaviors in response to positive and/or negative reinforcement
- operator**
region of DNA outside of the promoter region that binds activators or repressors that control gene expression in prokaryotic cells
- operculum**
apical portion of the moss capsule
- operon**
collection of genes involved in a pathway that are transcribed together as a single mRNA in prokaryotic cells
- opposition**
movement of the thumb toward the fingers of the same hand, making it possible to grasp and hold objects
- opsonization**
process that enhances phagocytosis using proteins to indicate the presence of a pathogen to phagocytic cells
- orbital**
region surrounding the nucleus; contains electrons
- order**
division of class in the taxonomic classification system
- organ**
collection of related tissues grouped together performing a common function
- organelle**
small structures that exist within cells and carry out cellular functions
- organic compound**
chemical compound that contains carbon
- organic molecule**
any molecule containing carbon (except carbon dioxide)
- organic soil**
type of soil that is formed from sedimentation; composed primarily of organic material
- organism**
individual living entity
- organ of Corti**
in the basilar membrane, the site of the transduction of sound, a mechanical wave, to a neural signal (also, spiral organ)
- organogenesis**
formation of organs in animal embryogenesis
- organ system**
level of organization that consists of functionally related interacting organs
- origin**
region of the prokaryotic chromosome where replication begins (origin of replication) (also, ORI)
- origin of replication**
specific point on DNA where replication begins
- Ornithorhynchidae**
clade that includes the duck-billed platypus
- osculum**
large opening in the sponge's body through which water leaves
- osmoconformer**
organism that changes its tonicity based on its environment
- osmolarity**
total amount of substances dissolved in a specific amount of solution
- osmophile**
organism that grows in a high sugar concentration
- osmoreceptor**
receptor in the hypothalamus that monitors the concentration of electrolytes in the blood
- osmoregulation**
mechanism by which water and solute concentrations are maintained at desired levels
- osmoregulator**
organism that maintains its tonicity irrespective of its environment
- osmosis**
transport of water through a semipermeable membrane according to the water's concentration gradient across the membrane that results from the presence of solute that cannot pass through the membrane
- osmotic balance**
balance of the amount of water and salt input and output to and from a biological system without disturbing the desired osmotic pressure and solute concentration in every compartment
- osmotic pressure**
the minimum pressure that must be exerted on a membrane to stop the flow of water across it
- osseous tissue**
connective tissue that constitutes the endoskeleton (also, bone)
- ossicle**
one of the three bones of the middle ear
- ossification**
process of bone formation by osteoblasts (also, osteogenesis)
- Osteichthyes**
bony fish
- osteoblast**
bone cell responsible for bone formation
- osteoclast**
large bone cells with up to 50 nuclei; responsible for bone remodeling
- osteocyte**
mature bone cells and the main cell in bone tissue
- osteon**
cylindrical structure aligned parallel to the long axis of the bone
- ostium**
(plural, *ostia*) holes between blood vessels that allow the movement of hemolymph through the body of insects, arthropods, and mollusks with open circulatory systems
- ostracoderm**
one of the earliest jawless fish covered in bone
- outer ear**
part of the ear that consists of the pinna, ear canal, and tympanum and conducts sound waves into the middle ear
- oval window**
thin diaphragm between the middle and inner ears that receives sound waves from contact with the stapes bone of the middle ear
- ovarian cycle**
cycle of preparation of an egg for ovulation and the conversion of the follicle to the corpus luteum
- ovary**
chamber that contains and protects the ovule or female megasporangium
- oviducts**
muscular tubes connecting the uterus with the ovary area (also, fallopian tubes)

oviger

additional pair of appendages present on some arthropods between the chelicerae and pedipalps

oviparity

process by which fertilized eggs are laid outside the female's body and develop there, receiving nourishment from the yolk that is a part of the egg

ovoviviparity

process by which fertilized eggs are retained within the female; the embryo obtains its nourishment from the egg's yolk and the young are fully developed when they are hatched

ovulate cone

cone containing two ovules per scale

ovulation

release of the egg by the most mature follicle

ovule

female gametophyte

oxidative phosphorylation

production of ATP using the process of chemiosmosis in the presence of oxygen

oxygen-carrying capacity

amount of oxygen that can be transported in the blood

oxygen dissociation curve

curve depicting the affinity of oxygen for hemoglobin

oxytocin

hormone released by the posterior pituitary to stimulate uterine contractions during childbirth and milk let-down in the mammary glands

P**P₀ (P)**

parental generation in a cross

p21

cell-cycle regulatory protein that inhibits the cell cycle; its levels are controlled by p53

p53

cell-cycle regulatory protein that regulates cell growth and monitors DNA damage; it halts the progression of the cell cycle in cases of DNA damage and may induce apoptosis

P680

reaction center of photosystem II

P700

reaction center of photosystem I

Pacinian corpuscle

encapsulated mechanoreceptor in the skin that responds to deep pressure and vibration

pairwise-end sequencing

method used to sequence multiple DNA fragments to generate the sequence of a large piece of DNA by matching overlapping DNA at each fragments end (also, double-barrel shotgun sequencing)

Paleognathae

ratites; flightless birds, including ostriches and emus

paleontology

study of life's history by means of fossils

palmately compound leaf

leaf type with leaflets that emerge from a point, resembling the palm of a hand

Pan

genus of chimpanzees and bonobos

pancreas

organ located between the stomach and the small intestine that contains exocrine and endocrine cells and secretes digestive juices

pandemic

an infection that spreads throughout the human population on a global scale

papilla

(plural, *papillae*) one of the small bump-like projections from the tongue

paracentric

inversion that occurs outside the centromere

paracrine signal

signal between nearby cells that is delivered by ligands traveling in the fluid-filled space between the cells

parafollicular cell

thyroid cell that produces the hormone calcitonin

parapodium

(plural, *parapodia*) fleshy, flat appendage that protrudes in pairs from each segment of polychaetes

parasite

organism that uses resources from another species, the host

parasitic plant

plant that is dependent on its host for survival

parasitism

symbiotic relationship in which one member of the association benefits at the expense of the other

parasympathetic nervous system

division of the autonomic nervous system that regulates visceral functions during rest and digestion

parathyroid gland

gland located on the surface of the thyroid that produces parathyroid hormone

parathyroid hormone (PTH)

hormone produced by the parathyroid glands in response to low blood Ca²⁺ levels; functions to raise blood Ca²⁺ levels

Parazoa

group of animals without true differentiated tissues

parenchyma

versatile tissue that fills soft parts of plants; it forms, among other things, the cortex and pith of stems, the cortex of roots, and the mesophyll of leaves

parenchyma cell

most common type of plant cell; found in the stem, root, leaf, and in fruit pulp; site of photosynthesis and starch storage

parental type

progeny that exhibits the same allelic combination as its parents

parent material

organic and inorganic material in which soils form

parietal lobe

part of the cerebral cortex involved in processing touch and the sense of the body in space

Parkinson's disease

neurodegenerative disorder that affects the control of movement

parthenogenesis

form of asexual reproduction where an egg develops into a complete individual without being fertilized

partial pressure

amount of pressure exerted by one gas within a mixture of gases

particulate matter

small particles such as dust, dirt, viral particles, and bacteria that are in the air

passive immunity

transfer of antibodies from one individual to another to provide temporary protection against pathogens

passive transport

method of transporting material through a membrane that does not require energy

patella

triangular bone that lies anterior to the knee joint (also, kneecap)

pathogen

an agent, usually a microorganism, that causes disease in the organisms that it invades

- pathogen-associated molecular pattern (PAMP)**
carbohydrate, polypeptide, and nucleic acid “signature” that is expressed by viruses, bacteria, and parasites but differs from molecules on host cells
- pattern recognition receptor (PRR)**
molecule on macrophages and dendritic cells that binds molecular signatures of pathogens and promotes pathogen engulfment and destruction
- peat moss**
Sphagnum moss; can be used as fuel
- pectoral girdle**
bones that transmit the force generated by the upper limbs to the axial skeleton
- pedipalp**
second pair of appendages in Chelicerata
- peer-reviewed manuscript**
scientific paper that a scientist’s colleagues, who are experts in the field of study, review
- pelagic realm**
open ocean waters that are not close to the bottom or near the shore (also, oceanic zone)
- pellicle**
outer cell covering composed of interlocking protein strips that function like a flexible coat of armor, preventing cells from being torn or pierced without compromising their range of motion
- pelvic girdle**
bones that transmit the force generated by the lower limbs to the axial skeleton
- penis**
male reproductive structure for urine elimination and copulation
- pepsin**
enzyme found in the stomach whose main role is protein digestion
- pepsinogen**
inactive form of pepsin
- peptide bond**
bond formed between two amino acids by a dehydration reaction
- peptide hormone**
hormone composed of a polypeptide chain
- peptidoglycan**
material composed of polysaccharide chains cross-linked to unusual peptides
- peptidyl transferase**
RNA-based enzyme that is integrated into the 50S ribosomal subunit and catalyzes the formation of peptide bonds
- perception**
individual interpretation of a sensation; a brain function
- perforin**
destructive protein that creates a pore in the target cell; used by NK cells and killer T cells
- perianth**
part of the plant consisting of the calyx (sepals) and corolla (petals)
- pericardium**
membrane layer protecting the heart; also part of the epicardium
- pericarp**
collective term describing the exocarp, mesocarp, and endocarp; the structure that encloses the seed and is a part of the fruit
- pericentric**
inversion that involves the centromere
- pericycle**
outer boundary of the stele from which lateral roots can arise
- periderm**
outermost covering of woody stems; consists of the cork cambium, cork cells, and the phelloderm
- periodic table**
organizational chart of elements indicating each element’s atomic number and atomic mass; provides key information about the elements’ properties
- peripheral protein**
protein at the plasma membrane’s surface, either on its exterior or interior side
- peripheral resistance**
resistance of the artery and blood vessel walls to the pressure placed on them by the force of the heart pumping
- perirenal fat capsule**
fat layer that suspends the kidneys
- peristalsis**
wavelike movements of muscle tissue
- peristome**
tissue that surrounds the opening of the capsule and allows the periodic release of spores
- peritubular capillary network**
capillary network that surrounds the renal tubule after the efferent artery exits the glomerulus
- permafrost**
perennially frozen portion of the Arctic tundra soil
- permanent tissue**
plant tissue composed of cells that are no longer actively dividing
- permissive**
cell type that is able to support productive replication of a virus
- peroxisome**
small, round organelle that contains hydrogen peroxide, oxidizes fatty acids and amino acids, and detoxifies many poisons
- petal**
modified leaf interior to the sepals; colorful petals attract animal pollinators
- petiole**
stalk of the leaf
- Petromyzontidae**
clade of lampreys
- phage therapy**
treatment of bacterial diseases using bacteriophages specific to a particular bacterium
- phagocytosis**
process by which a cell takes in large particles, including other cells
- phagolysosome**
cellular body formed by the union of a phagosome containing the ingested particle with a lysosome that contains hydrolytic enzymes
- phalange**
one of the bones of the fingers or toes
- pharmacogenomics**
study of drug interactions with the genome or proteome (also, toxicogenomics)
- pharyngeal slit**
opening in the pharynx
- pharynx**
throat; a tube that starts in the internal nares and runs partway down the neck, where it opens into the esophagus and the larynx
- phenotype**
observable traits expressed by an organism
- pheromone**
substance released by an animal that can affect the physiology or behavior of other animals
- phloem**
tissue responsible for the transport of sugars, proteins, and other solutes
- phosphatase**
enzyme that removes the phosphate group from a molecule that has been previously phosphorylated
- phosphoanhydride bond**
bond that connects phosphates in an ATP molecule

phosphodiesterase

enzyme that degrades cAMP, producing AMP, to terminate signaling

phosphodiesterase (PDE)

enzyme that deactivates cAMP, stopping hormone activity

phosphodiester bond

covalent chemical bond that holds together the polynucleotide chains with a phosphate group linking neighboring nucleotides' two pentose sugars

phospholipid

major constituent of plasma membranes; comprised of two fatty acids and a phosphate-containing group attached to a glycerol backbone

phosphorylation

addition of a high-energy phosphate to a compound, usually a metabolic intermediate, a protein, or ADP

photic zone

portion of the ocean that light can penetrate

photoact

ejection of an electron from a reaction center using the energy of an absorbed photon

photoautotroph

organism capable of producing its own organic compounds from sunlight

photomorphogenesis

growth and development of plants in response to light

photon

distinct quantity or "packet" of light energy

photoperiodism

occurrence of plant processes, such as germination and flowering, according to the time of year

photosystem

group of proteins, chlorophyll, and other pigments that are used in the light-dependent reactions of photosynthesis to absorb light energy and convert it into chemical energy

photosystem I

integral pigment and protein complex in thylakoid membranes that uses light energy to transport electrons from plastocyanin to NADP⁺ (which becomes reduced to NADPH in the process)

photosystem II

integral protein and pigment complex in thylakoid membranes that transports electrons from water to the electron transport chain; oxygen is a product of PSII

phototroph

organism that obtains energy from sunlight

phototropin

blue-light receptor that promotes phototropism, stomatal opening and closing, and other responses that promote photosynthesis

phototropism

directional bending of a plant toward a light source

pH paper

see litmus paper

phragmoplast

plant cell specific structure in which microtubules parallel to the spindle act as a scaffold for cell plate assembly and cell wall separation for the formation of the daughter cells

pH scale

scale ranging from zero to 14 that is inversely proportional to the hydrogen ions' concentration in a solution

phycoplast

plant cell specific structure in which microtubules are perpendicular to the spindle

phyllotaxy

arrangement of leaves on a stem

phylogenetic tree

diagram showing the evolutionary relationships among various biological species based on similarities and differences in genetic or physical traits or both; in essence, a hypothesis concerning evolutionary connections

phylogeny

evolutionary history and relationship of an organism or group of organisms

phylum

(plural, *phyla*) kingdom division in the taxonomic classification system

physical map

representation of the physical distance between genes or genetic markers

physical science

field of science, such as geology, astronomy, physics, and chemistry, that studies nonliving matter

physiological dead space

region of the lung that lacks proper ventilation/perfusion due to a physiological change in the lung, like inflammation or edema (also, physiological shunt)

phytochrome

plant pigment protein that exists in two reversible forms (Pr and Pfr) and mediates morphologic changes in response to red light

pia mater

thin membrane layer directly covering the brain and spinal cord

pigment

molecule that is capable of absorbing certain wavelengths of light and reflecting others (which accounts for its color)

pilidium

larval form found in some nemertine species

pilus

(plural, *pili*) surface appendage of some prokaryotes used for attachment to surfaces, including other prokaryotes

pinacocyte

epithelial-like cell that forms the outermost layer of sponges and encloses a jellylike substance called mesohyl

pinnately compound leaf

leaf type with a divided leaf blade consisting of leaflets arranged on both sides of the midrib

pinocytosis

variation of endocytosis that imports macromolecules that the cell needs from the extracellular fluid

pioneer species

first species to colonize barren environments during primary succession or new habitats created by disturbances during secondary succession

pitil

fused group of carpels

pith

ground tissue found towards the interior of the vascular tissue in a stem or root

pituitary dwarfism

condition caused by underproduction of GH in children

pituitary gland

endocrine gland located at the base of the brain composed of an anterior and posterior region (also, hypophysis)

pituitary stalk

stalk that connects the pituitary gland to the hypothalamus (also, infundibulum)

pivot joint

joint with the rounded end of one bone fitting into a ring formed by the other bone

placenta

organ that supports the diffusion of nutrients and waste between the pregnant person and fetus's blood

plagiarism

using other people's work or ideas without proper citation, creating the false impression that those are the author's original ideas

planar joint

joint with bones whose articulating surfaces are flat

planktivore

animal species that eats plankton

plankton

diverse group of mostly microscopic organisms that drift in marine and freshwater systems and serve as a food source for larger aquatic organisms

planospiral

shell shape coiled around a vertical axis

plantar flexion

bending at the ankle such that the heel is lifted, such as when standing on the toes

planuliform

larval form found in phylum Nemertea

plasma

liquid component of blood that is left after the cells are removed

plasma cell

immune cell that secretes antibodies; these cells arise from B cells that were stimulated by antigens

plasma membrane

phospholipid bilayer with embedded (integral) or attached (peripheral) proteins and separates the cell's internal content from its surrounding environment

plasma membrane hormone receptor

a hormone receptor on the surface of the plasma membrane of a cell

plasmid

extrachromosomal, covalently closed, circular DNA molecule that may only contain one or a few genes; common in prokaryotes

plasmodesma

(plural, *plasmodesmata*) channel that passes between adjacent plant cells' cell walls, connects their cytoplasm, and allows transporting of materials from cell to cell

plasmogamy

fusion of cytoplasm

plasmolysis

detaching the cell membrane from the cell wall and constricting the cell membrane when a plant cell is in a hypertonic solution

plastid

one of a group of related organelles in plant cells that are involved in the storage of starches, fats, proteins, and pigments

platelet

small cellular fragment that collects at wounds, cross-reacts with clotting factors, and forms a plug to prevent blood loss (also, thrombocyte)

Platyrrhini

clade of New World monkeys

Plesiadapis

oldest known primate-like mammal

pleura

tissue layer that surrounds the lungs and lines the interior of the thoracic cavity

pleurisy

painful inflammation of the pleural tissue layers

plumule

shoot that develops from the germinating seed

pneumatic bone

air-filled bone

point mutation

mutation that affects a single base

polar covalent bond

type of covalent bond that forms as a result of unequal electron sharing, creating slightly positive and negative charged molecule regions

polar nuclei

found in the ovule sac; fusion with one sperm cell forms the endosperm

pollen grain

structure containing the male gametophyte of the plant

pollen tube

extension from the pollen grain that delivers sperm to the egg cell

pollination

transfer of pollen from the anther to the stigma

polyandry

mating system where one female mates with many males

poly-A tail

modification added to the 3' end of pre-mRNAs to protect mRNA from degradation and assist mRNA export from the nucleus

polycarpic

plants that flower several times in their lifetime

polycistronic mRNA

mRNA strand that contains information for the coding of multiple polypeptide units

polygenic

phenotypic characteristic caused by two or more genes

polygyny

mating system where one male mates with many females

polymer

chain of monomer residues that covalent bonds link; polymerization is the process of polymer formation from monomers by condensation

polymerase chain reaction (PCR)

technique to amplify DNA

polynucleotide

long chain of nucleotides

polyp

stalklike sessile life form of cnidarians with mouth and tentacles facing upward; usually sessile but may be able to glide along surface

polypeptide

long chain of amino acids that peptide bonds link

polyphyletic group

organisms grouped together based on characteristics and not on a common ancestor

polyploid

individual with an incorrect number of chromosome sets

polyploidy

condition in which a cell or organism has one or more extra sets of chromosomes

polysaccharide

long chain of monosaccharides; may be branched or unbranched

polysome

mRNA molecule simultaneously being translated by many ribosomes all going in the same direction

polyspermy

condition in which one egg is fertilized by multiple sperm

polytomy

branch on a phylogenetic tree with more than two groups or taxa

Pongo

genus of orangutans

population

all of the individuals of a species living within a specific area

population density

number of population members divided by the area or volume being measured

population genetics

study of how selective forces change the allele frequencies in a population over time

population growth rate

number of organisms added in each reproductive generation

population size (*N*)

number of population members in a habitat at the same time

population variation

distribution of phenotypes in a population

Porifera

phylum of animals with no true tissues but a porous body with rudimentary endoskeleton

positive feedback loop

feedback to a control mechanism that continues the direction of a stimulus

positive gravitropism

growth toward Earth's gravitational center

positive polarity

ssRNA virus with a genome that contains the same base sequences and codons found in their mRNA

positive regulation

type of regulation that promotes progression through cell-cycle checkpoints

positive regulator

protein that increases transcription

postanal tail

muscular, posterior elongation of the body extending beyond the anus in chordates

posterior pituitary

extension of the brain that releases hormones produced by the hypothalamus along with the infundibulum (also, neurohypophysis)

post-transcriptional

control of gene expression after the RNA molecule has been created but before it is translated into protein

post-translational

control of gene expression after a protein has been created

postzygotic barrier

reproductive isolation mechanism that occurs after zygote formation

potential energy

energy type that has the potential to do work; stored energy

potocytosis

variation of pinocytosis that uses a different coating protein (caveolin) on the plasma membrane's cytoplasmic side

precapillary sphincter

small muscle that controls blood circulation in the capillary beds

predation

a type of interaction in which one organism (the predator) kills and eats the other (the prey)

predator

organism that kills and consumes another organism

preinitiation complex

cluster of transcription factors and other proteins that recruit RNA polymerase II for transcription of a DNA template

presbyopia

visual defect in which the image focus falls behind the retina, thereby making images in the distance clear but close-up images blurry; caused by age-based changes in the lens

prezygotic barrier

reproductive isolation mechanism that occurs before zygote formation

primary active transport

active transport that moves ions or small molecules across a membrane and may create a difference in charge across that membrane

primary bronchus

region of the airway within the lung that attaches to the trachea and bifurcates to each lung where it branches into secondary bronchi (also, main bronchus)

primary consumer

trophic level that obtains its energy from the primary producers of an ecosystem

primary electron acceptor

pigment or other organic molecule in the reaction center that accepts an energized electron from the reaction center

primary feather

feather located at the tip of the wing that provides thrust

primary growth

growth resulting in an increase in length of the stem and the root; caused by cell division in the shoot or root apical meristem

primary producer

trophic level that obtains its energy from sunlight, inorganic chemicals, or dead and/or decaying organic material

primary structure

linear sequence of amino acids in a protein

primary succession

succession on land that previously has had no life

primase

enzyme that synthesizes the RNA primer; the primer is needed for DNA pol to start synthesis of a new DNA strand

Primate

order of lemurs, tarsiers, monkeys, apes, and humans

primer

short stretch of nucleotides that is required to initiate replication; in the case of replication, the primer has RNA nucleotides

prion

proteinaceous infectious particle; misfolded proteins with the ability to induce normal variants of the same protein to misfold

probe

small DNA fragment to determine if the complementary sequence is present in a DNA sample

product

molecule that is a result of a chemical reaction

productive

viral infection that leads to the production of new virions

product rule

probability of two independent events occurring simultaneously can be calculated by multiplying the individual probabilities of each event occurring alone

progesterone

reproductive hormone in females; assists in endometrial regrowth and inhibition of FSH and LH release

prognathic jaw

long jaw

progymnosperm

transitional group of plants that resembled conifers because they produced wood yet still reproduced like ferns

prokaryote

single-celled organism that lacks organelles and does not have nuclei surrounded by a nuclear membrane

prolactin (PRL)

hormone produced by the anterior pituitary that stimulates milk production

prolactin-inhibiting hormone (PIH)

hormone produced by the hypothalamus that inhibits the release of prolactin

prolactin-releasing hormone (PRH)

hormone produced by the hypothalamus that stimulates the release of prolactin

prometaphase

stage of mitosis during which the nuclear membrane breaks down and mitotic spindle fibers attach to kinetochores

promoter

DNA sequence to which RNA polymerase and associated factors bind and initiate transcription

pronation

movement in which the palm faces backward

proofreading

function of DNA pol in which it reads the newly added base before adding the next one

prophage

phage DNA that is incorporated into the host cell genome

prophase

stage of mitosis during which chromosomes condense and the mitotic spindle begins to form

proprioception

sense of limb position; used to track kinesthesia

prosimians

division of primates that includes bush babies and pottos of Africa, lemurs of Madagascar, and lorises of Southeast Asia

prostate gland

structure that is a mixture of smooth muscle and glandular material; contributes to semen

prosthetic group

molecule bound to a protein that facilitates the function of the protein (also, prosthetic cofactor)

protease

enzyme that breaks down proteins

proteasome

organelle that degrades proteins

protein

biological macromolecule comprised of one or more amino acid chains

protein signature

set of uniquely expressed proteins in the diseased state

proteome

entire set of proteins that cell type produces

proteomics

study of proteomes' function

proton

positively charged particle that resides in the atom's nucleus; has a mass of one unified atomic mass unit (u) and a charge of +1

protonema

tangle of single-celled filaments that forms from the haploid spore

proto-oncogene

normal gene that, when mutated, becomes an oncogene

protostome

blastopore develops into the mouth of protostomes, with the second opening developing into the anus

protraction

anterior movement of a bone in the horizontal plane

proventriculus

glandular part of a bird's stomach

proximal convoluted tubule (PCT)

part of the renal tubule that lies close to the glomerulus

PrP^c

normal prion protein

PrP^{Sc}

infectious form of a prion protein

pseudocoelomate

animal with a body cavity located between the mesoderm and endoderm

pseudoelaters

surround the spores and help them propagate

pseudopeptidoglycan

component of archaea cell walls that is similar to peptidoglycan in morphology but contains different sugars

pseudopods

plasma membrane extensions that engulf cells or large particles during phagocytosis

pseudostratified

layer of epithelia that appears multilayered but is a simple covering

psychrophile

organism that grows at temperatures of -15°C or lower

pterygotes

winged insects

pulmocutaneous circulation

circulatory system in amphibians; the flow of blood to the lungs and the moist skin for gas exchange

pulmonary circulation

flow of blood away from the heart through the lungs where oxygenation occurs and then returns to the heart again

pump

active transport mechanism that works against electrochemical gradients

punctuated equilibrium

model of speciation that proposes species undergo rapid divergence followed by periods of stability

Punnett square

visual representation of a cross between two individuals in which the gametes of each individual are denoted along the top and side of a grid, respectively, and the possible zygotic genotypes are recombined at each box in the grid

pupil

small opening through which light enters

pure culture

growth of a single cell type in the laboratory

purine

type of nitrogenous base in DNA and RNA; adenine and guanine are purines

pyrimidine

type of nitrogenous base in DNA and RNA; cytosine, thymine, and uracil are pyrimidines

pyruvate

a 3-carbon sugar that can be decarboxylated and oxidized to make acetyl CoA, which enters the citric acid cycle under aerobic conditions; the end product of glycolysis

pyruvate dehydrogenase

a multi-subunit enzyme embedded in the mitochondrial membrane that catalyzes the conversion of pyruvate to acetyl CoA

Q**quadrat**

square made of various materials used to determine population size and density in slow-moving or stationary organisms

quaternary structure

association of discrete polypeptide subunits in a protein

quiescent

refers to a cell that is performing normal cell functions and has not initiated preparations for cell division

quorum sensing

method of cellular communication used by bacteria that informs them of the abundance of similar (or different) bacteria in the environment

R**radial cleavage**

cleavage axes are parallel or perpendicular to the polar axis, resulting in the alignment of cells between the two poles

radial glia

glia that serve as scaffolds for developing neurons as they migrate to their final destinations

radial symmetry

type of symmetry with multiple planes of symmetry, with body parts (rays) arranged around a central disk

radiation hybrid mapping

information obtained by fragmenting the chromosome with X-rays

radicle

original root that develops from the germinating seed

radioisotope

isotope that emits radiation comprised of subatomic particles to form more stable elements

radioresistant

organism that grows in high levels of radiation

radius

bone located along the lateral (thumb) side of the forearm; articulates with the humerus at the elbow

radula

tonguelike organ with chitinous ornamentation

raphe

slit in the silica shell of diatoms through which the protist secretes a stream of mucopolysaccharides for locomotion and attachment to substrates

reactant

molecule that takes part in a chemical reaction

reaction center

complex of chlorophyll molecules and other organic molecules that is assembled around a special pair of chlorophyll molecules and a primary electron acceptor; capable of undergoing oxidation and reduction

reading frame

sequence of triplet codons in mRNA that specify a particular protein; a ribosome shift of one or two nucleotides in either direction completely abolishes synthesis of that protein

reception

receipt of a signal (such as light or sound) by sensory receptors

receptive field

region in space in which a stimulus can activate a given sensory receptor

receptor

protein in or on a target cell that bind to ligands

receptor-mediated endocytosis

variation of endocytosis that involves using specific binding proteins in the plasma membrane for specific molecules or particles, and clathrin-coated pits that become clathrin-coated vesicles

receptor potential

membrane potential in a sensory receptor in response to detection of a stimulus

recessive

trait that appears “latent” or nonexpressed when the individual also carries a dominant trait for that same characteristic; when present as two identical copies, the recessive trait is expressed

recessive lethal

inheritance pattern in which an allele is only lethal in the homozygous form; the heterozygote may be normal or have some altered, nonlethal phenotype

reciprocal cross

paired cross in which the respective traits of the male and female in one cross become the respective traits of the female and male in the other cross

recombinant DNA

combining DNA fragments that molecular cloning generates that do not exist in nature (also, chimeric molecule)

recombinant protein

a gene’s protein product derived by molecular cloning

recombination frequency

average number of crossovers between two alleles; observed as the number of nonparental types in a progeny’s population

recombination nodules

protein assemblies formed on the synaptonemal complex that mark the points of crossover events and mediate the multistep process of genetic recombination between nonsister chromatids

recruitment

process of opening airways that normally remain closed when the cardiac output increases

rectum

area of the body where feces is stored until elimination

red blood cell

small (7–8 μm) biconcave cell without mitochondria (and in mammals without nuclei) that is packed with hemoglobin, giving the cell its red color; transports oxygen through the body

redox reaction

chemical reaction that consists of the coupling of an oxidation reaction and a reduction reaction

reduction

gain of electron(s) by an atom or molecule

reduction division

nuclear division that produces daughter nuclei each having one-half as many chromosome sets as the parental nucleus; meiosis I is a reduction division

reflex action

action in response to direct physical stimulation of a nerve

refractory period

period after an action potential when it is more difficult or impossible for an action potential to be fired; caused by inactivation of sodium channels and activation of additional potassium channels of the membrane

regulatory T (T_{reg}) cell

specialized lymphocyte that suppresses local inflammation and inhibits the secretion of cytokines, antibodies, and other stimulatory immune factors; involved in immune tolerance

reinforcement

continued speciation divergence between two related species due to low fitness of hybrids between them

relative fitness

individual’s ability to survive and reproduce relative to the rest of the population

relative species abundance

absolute population size of a particular species relative to the population sizes of other species within the community

renal artery

branch of the artery that enters the kidney

renal capsule

layer that encapsulates the kidneys

renal column

area of the kidney through which the interlobar arteries travel in the process of supplying blood to the renal lobes

renal corpuscle

glomerulus and the Bowman’s capsule together

renal fascia

connective tissue that supports the kidneys

renal pelvis

region in the kidney where the calyces join the ureters

renal pyramid

conical structure in the renal medulla

renal tubule

tubule of the nephron that arises from the glomerulus

renal vein

branch of a vein that exits the kidney and joins the inferior vena cava

- renin**
enzyme produced by the juxtaglomerular apparatus of the kidneys that reacts with angiotensinogen to cause the release of aldosterone
- renin-angiotensin-aldosterone**
biochemical pathway that activates angiotensin II, which increases blood pressure
- replication fork**
Y-shaped structure formed during initiation of DNA replication
- replicative intermediate**
dsRNA intermediate made in the process of copying genomic RNA
- repressor**
protein that binds to the operator of prokaryotic genes to prevent transcription
- reproductive cloning**
entire organism cloning
- reproductive isolation**
situation that occurs when a species is reproductively independent from other species; behavior, location, or reproductive barriers may cause this to happen
- residence time**
measure of the average time an individual water molecule stays in a particular reservoir
- residual volume (RV)**
amount of air remaining in the lung after a maximal expiration
- resilience**
speed at which an ecosystem recovers equilibrium after being disturbed
- resistance (biological)**
measurement of lung obstruction
- resistance (ecological)**
ability of an ecosystem to remain at equilibrium in spite of disturbances
- resolving power (resolution)**
a microscope's ability to distinguish two adjacent structures as separate; the higher the resolving power, the better the image's clarity and detail
- resorption**
process by which osteoclasts release minerals stored in bones
- respiratory bronchiole**
terminal portion of the bronchiole tree that is attached to the terminal bronchioles and alveoli ducts, alveolar sacs, and alveoli
- respiratory distress syndrome**
disease that arises from a deficient amount of surfactant
- respiratory quotient (RQ)**
ratio of carbon dioxide production to each oxygen molecule consumed
- respiratory rate**
number of breaths per minute
- restriction endonuclease**
enzyme that can recognize and cleave specific DNA sequences
- restriction fragment length polymorphism (RFLP)**
variation between individuals in the length of DNA fragments, which restriction endonucleases generate
- restrictive disease**
disease that results from a restriction and decreased compliance of the alveoli; respiratory distress syndrome and pulmonary fibrosis are examples
- results**
section of a scientific paper in which the author narrates the experimental findings and presents relevant figures, pictures, diagrams, graphs, and tables, without any further interpretation
- resuscitation**
process by which prokaryotes that are in the VBNC state return to viability
- retina**
layer of photoreceptive and supporting cells on the inner surface of the back of the eye
- retinoblastoma protein (Rb)**
regulatory molecule that exhibits negative effects on the cell cycle by interacting with a transcription factor (E2F)
- retraction**
movement in which a joint moves back into position after protraction
- reverse genetics**
method of determining the gene's function by starting with the gene itself instead of starting with the gene product
- reverse transcriptase**
enzyme found in Baltimore groups VI and VII that converts single-stranded RNA into double-stranded DNA
- reverse transcriptase PCR (RT-PCR)**
PCR technique that involves converting RNA to DNA by reverse transcriptase
- reversible chemical reaction**
chemical reaction that functions bidirectionally, where products may turn into reactants if their concentration is great enough
- review article**
paper that summarizes and comments on findings that were published as primary literature
- rhizobia**
soil bacteria that symbiotically interact with legume roots to form nodules and fix nitrogen
- rhizoid**
filamentous outgrowth on the underside of the thallus in some lower plants that anchors the plant or conducts water
- rhizome**
modified underground stem that grows horizontally to the soil surface and has nodes and internodes
- rhizosphere**
area of soil affected by root secretions and microorganisms
- rho-dependent termination**
in prokaryotes, termination of transcription by an interaction between RNA polymerase and the rho protein at a run of G nucleotides on the DNA template
- rhodopsin**
main photopigment in vertebrates
- rho-independent termination**
termination sequence-dependent termination of prokaryotic mRNA synthesis; caused by hairpin formation in the mRNA that stalls the polymerase
- R horizon**
the lowest layer of soil (also, bedrock)
- rhynchocoel**
cavity present above the mouth that houses the proboscis
- rib**
one of 12 pairs of long, curved bones that attach to the thoracic vertebrae and curve toward the front of the body to form the rib cage
- ribonuclease (RNases)**
enzyme that breaks down RNA
- ribonucleic acid (RNA)**
single-stranded, often internally base-paired, molecule that is involved in protein synthesis

ribosomal RNA (rRNA)

RNA that ensures the proper alignment of the mRNA and the ribosomes during protein synthesis and catalyzes forming the peptide linkage

ribosome

cellular structure that carries out protein synthesis

ring of life

phylogenetic model where all three domains of life evolved from a pool of primitive prokaryotes

RNA-binding protein (RBP)

protein that binds to the 3' or 5' UTR to increase or decrease the RNA stability

RNA editing

direct alteration of one or more nucleotides in an mRNA that has already been synthesized

RNA-induced silencing complex (RISC)

protein complex that binds along with the miRNA to the RNA to degrade it

RNA stability

how long an RNA molecule will remain intact in the cytoplasm

rod

strongly photosensitive, achromatic, cylindrical neuron in the outer edges of the retina that detects dim light and is used in peripheral and nighttime vision

root cap

protective cells covering the tip of the growing root

rooted

single ancestral lineage on a phylogenetic tree to which all organisms represented in the diagram relate

root hair

hairlike structure that is an extension of epidermal cells; increases the root surface area and aids in absorption of water and minerals

root system

belowground portion of the plant that supports the plant and absorbs water and minerals

rotational movement

movement of a bone as it rotates around its own longitudinal axis

roughage

component of food that is low in energy and high in fiber

rough endoplasmic**reticulum (RER)**

region of the endoplasmic reticulum that is studded with ribosomes and engages in protein modification and phospholipid synthesis

r-selected species

species suited to changing environments that produce many offspring and provide little or no parental care

Ruffini ending

slowly adapting mechanoreceptor in the skin that responds to skin stretch and joint position (also, bulbous corpuscle)

ruminant

animal with a stomach divided into four compartments

runner

stolon that runs above the ground and produces new clone plants at nodes

S**saddle joint**

joint with concave and convex portions that fit together; named because the ends of each bone resemble a saddle

sagittal plane

plane cutting through an animal, separating the individual into right and left sides

salamander

tailed amphibian that belongs to the clade Urodela

salivary amylase

enzyme found in saliva, which converts carbohydrates to maltose

saltatory conduction

“jumping” of an action potential along an axon from one node of Ranvier to the next

sand

soil particles between 0.1 and 2 mm in diameter

saprobe

organism that derives nutrients from decaying organic matter (also, saprophyte)

saprophyte

plant that does not have chlorophyll and gets its food from dead matter (also, saprobe)

sarcolemma

plasma membrane of a skeletal muscle fiber

sarcomere

functional unit of skeletal muscle

Sarcopterygii

lobe-finned fish

Sargassum

type of free-floating marine seaweed

satellite glia

glial cell that provides nutrients and structural support for neurons in the peripheral nervous system

saturated fatty acid

long-chain hydrocarbon with single covalent bonds in the carbon chain; the number of hydrogen atoms attached to the carbon skeleton is maximized

sauropsid

reptile or bird

savanna

grasslands with scattered trees, located in Africa, South America, and northern Australia

scapula

(plural, *scapulae*) flat, triangular bone located at the posterior pectoral girdle

scarification

mechanical or chemical processes to soften the seed coat

schizocoelom

coelom formed by groups of cells that split from the endodermal layer

schizocoely

during development of protostomes, a solid mass of mesoderm splits apart and forms the hollow opening of the coelom

schizophrenia

mental disorder characterized by the inability to accurately perceive reality; patients often have difficulty thinking clearly and can suffer from delusions

Schwann cell

glial cell that creates a myelin sheath around a peripheral nervous system neuron axon

science

knowledge that covers general truths or the operation of general laws, especially when acquired and tested by the scientific method

scientific method

method of research with defined steps that include observation, formulation of a hypothesis, testing, and confirming or falsifying the hypothesis

scion

the part of a plant that is grafted onto the root stock of another plant

sclerenchyma cell

plant cell that has thick secondary walls and provides structural support; usually dead at maturity

sclerocyte

cell that secretes silica spicules into the mesohyl

scrotum

sac containing testes; exterior to the body

- scutellum**
type of cotyledon found in monocots, as in grass seeds
- sebaceous gland**
in mammals, a skin gland that produces a lipid mixture called sebum
- secondary active transport**
movement of material that results from primary active transport to the electrochemical gradient
- secondary consumer**
usually a carnivore that eats primary consumers
- secondary feather**
feather located at the base of the wing that provides lift
- secondary growth**
growth resulting in an increase in thickness or girth; caused by the lateral meristem and cork cambium
- secondary metabolites**
compounds produced by organisms that are not directly required for growth, development, or reproduction but do promote survival by mediating interactions with other organisms
- secondary plant compound**
compound produced as byproducts of plant metabolic processes that is usually toxic but is sequestered by the plant to defend against herbivores
- secondary structure**
regular structure that proteins form by intramolecular hydrogen bonding between the oxygen atom of one amino acid residue and the hydrogen attached to the nitrogen atom of another amino acid residue
- secondary succession**
succession in response to environmental disturbances that move a community away from its equilibrium
- second messenger**
small, non-protein molecule that propagates a signal within the cell after activation of a receptor causes its release
- secretin**
hormone that stimulates sodium bicarbonate secretion in the small intestine
- seed**
structure containing the embryo, storage tissue, and protective coat
- seedless vascular plant**
plant that does not produce seeds
- segmental artery**
artery that branches from the renal artery
- selection pressure**
environmental factor that causes one phenotype to be better than another
- selectively permeable**
membrane characteristic that allows some substances through
- self-pollination**
transfer of pollen from the anther to the stigma of the same flower
- semelparity**
life history strategy characterized by a single reproductive event followed by death
- semen**
fluid mixture of sperm and supporting materials
- semicircular canal**
one of three half-circular, fluid-filled tubes in the vestibular labyrinth that monitors angular acceleration and deceleration
- semilunar valve**
membranous flap of connective tissue between the aorta and a ventricle of the heart (the aortic or pulmonary semilunar valves)
- seminal vesicles**
secretory accessory glands in males; contributes to semen
- seminiferous tubule**
site of sperm production in testes
- semipermeable membrane**
membrane that allows only certain solutes to pass through
- senescence**
process that describes aging in plant tissues
- sensory receptor**
specialized neuron or other cells associated with a neuron that is modified to receive specific sensory input
- sensory-somatic nervous system**
system of sensory and motor nerves
- sensory transduction**
conversion of a sensory stimulus into electrical energy in the nervous system by a change in the membrane potential
- sepal**
modified leaf that encloses the bud; outermost structure of a flower
- septa**
cell wall division between hyphae
- septum**
structure formed in a bacterial cell as a precursor to the separation of the cell into two daughter cells
- sequence mapping**
mapping information obtained after DNA sequencing
- serendipity**
fortunate accident or a lucky surprise
- serotype**
strain of bacterium that carries a set of similar antigens on its cell surface, often many in a bacterial species
- Sertoli cell**
cell in seminiferous tubules that assists in developing sperm and makes inhibin
- serum**
plasma without the coagulation factors
- sesamoid bone**
small, flat bone shaped like a sesame seed; develops inside tendons
- sessile**
leaf without a petiole that is attached directly to the plant stem
- seta/chaeta**
(plural, *setae/chaetae*)
chitinous projection from the cuticle
- set point**
midpoint or target point in homeostasis
- sex-linked**
any gene on a sex chromosome
- sexual dimorphism**
phenotypic difference between a population's males and females
- sexual reproduction**
mixing of genetic material from two individuals to produce genetically unique offspring
- sexual selection**
a form of natural selection in which members of one biological sex compete with members of the same sex for access to mate or choose mates of the opposite sex based on certain characteristics
- shared ancestral character**
describes a characteristic on a phylogenetic tree that all organisms on the tree share
- shared derived character**
describes a characteristic on a phylogenetic tree that only a certain clade of organisms share
- Shine-Dalgarno sequence**
(AGGAGG); initiates prokaryotic translation by interacting with rRNA molecules comprising the 30S ribosome

shoot system

aboveground portion of the plant; consists of nonreproductive plant parts, such as leaves and stems, and reproductive parts, such as flowers and fruits

short bone

bone that has the same width and length, giving it a cube-like shape

shotgun sequencing

method used to sequence multiple DNA fragments to generate the sequence of a large piece of DNA by matching the overlapping DNA at one end of the DNA fragment

sickle cell anemia

genetic disorder that affects the shape of red blood cells and their ability to transport oxygen and move through capillaries

sieve elements

specialized cells that are important for the function of the phloem

sieve-tube cell

phloem cell arranged end to end to form a sieve tube that transports organic substances such as sugars and amino acids

signal

method of communication between animals including those obtained by the senses of smell, hearing, sight, or touch

signaling cell

cell that releases signal molecules that allow communication with another cell

signaling pathway

chain of events that occurs in the cytoplasm of the cell to propagate the signal from the plasma membrane to produce a response (also, signaling cascade)

signal integration

interaction of signals from two or more different cell-surface receptors that merge to activate the same response in the cell

signal sequence

short tail of amino acids that directs a protein to a specific cellular compartment

signal transduction

propagation of the signal through the cytoplasm (and sometimes also the nucleus) of the cell

silent mutation

mutation that is not expressed

silica

mineral compound that serves to improve resistance against biotic and abiotic stresses

silt

soil particles between 0.002 and 0.1 mm in diameter

simple epithelia

single layer of epithelial cells

simple fruit

fruit that develops from a single carpel or fused carpels

simple leaf

leaf type in which the lamina is completely undivided or merely lobed

simulation model

ecosystem model that is created with computer programs to holistically model ecosystems and to predict the effects of environmental disturbances on ecosystem structure and dynamics

single nucleotide**polymorphism (SNP)**

variation between individuals in a single nucleotide

single-strand binding protein

during replication, protein that binds to the single-stranded DNA; this helps in keeping the two strands of DNA apart so that they may serve as templates

sink

growing parts of a plant, such as roots and young leaves, which require photosynthate

sinoatrial (SA) node

the heart's internal pacemaker; located near the wall of the right atrium

siphonoglyph

tubular structure that serves as an inlet for water into the mantle cavity

sister taxa

two lineages that diverged from the same branch point

skeletal muscle tissue

forms skeletal muscles, which attach to bones and control locomotion and any movement that can be consciously controlled

skull

bone that supports the structures of the face and protects the brain

S-layer

surface-layer protein present on the outside of cell walls of archaea and bacteria

sliding clamp

ring-shaped protein that holds the DNA polymerase on the DNA strand

small 40S ribosomal subunit

ribosomal subunit that binds to the RNA to translate it into protein

small intestine

organ where digestion of protein, fats, and carbohydrates is completed

small nuclear RNA

molecules synthesized by RNA polymerase III that have a variety of functions, including splicing pre-mRNAs and regulating transcription factors

smooth endoplasmic reticulum (SER)

region of the endoplasmic reticulum that has few or no ribosomes on its cytoplasmic surface and synthesizes carbohydrates, lipids, and steroid hormones; detoxifies certain chemicals (like pesticides, preservatives, medications, and environmental pollutants); and stores calcium ions

smooth muscle tissue

occurs in the walls of hollow organs, such as the intestines, stomach, and urinary bladder, and around passages, such as the respiratory tract and blood vessels

soil

outer loose layer that covers the surface of Earth

soil profile

vertical section of a soil

solar intensity

amount of solar power energy the sun emits in a given amount of time

solute

substance dissolved in a solvent (usually a liquid) to form a solution

solvent

substance capable of dissolving another substance

somatic cell

all the cells of a multicellular organism except the gametes or reproductive cells

somatosensation

sense of touch

somatostatin

hormone released to stop acid secretion when the stomach is empty

somite

group of cells separated by small spaces that form from the mesoderm and give rise to connective tissue

soredia

clusters of algal cells and mycelia that allow lichens to propagate

- sori**
cluster of sporangia in ferns
- source**
organ that produces photosynthate for a plant
- source water**
point of origin of a river or stream
- Southern blotting**
DNA transfer from a gel to a nylon membrane
- speciation**
formation of a new species
- species**
group of populations that interbreed and produce fertile offspring
- species-area relationship**
relationship between area surveyed and number of species encountered; typically measured by incrementally increasing the area of a survey and determining the cumulative numbers of species
- species dispersion pattern**
spatial location of individuals of a given species within a habitat at a particular point in time (also, species distribution pattern)
- species evenness**
number of individuals, or relative abundance of individuals, of different species in a given area
- species richness**
number of different species in a community
- specific heat capacity**
the amount of heat one gram of a substance must absorb or lose to change its temperature by one degree Celsius
- spectrophotometer**
instrument that can measure transmitted light and compute the absorption
- spermatheca**
specialized sac that stores sperm for later use
- spermatogenesis**
process of producing haploid sperm
- spermatophyte**
seed plant; from the Greek *sperm-* (seed) and *-phyte* (plant)
- S phase**
second, or synthesis, stage of interphase during which DNA replication occurs
- Sphenodontia**
clade of tuataras
- sphere of hydration**
when a polar water molecule surrounds charged or polar molecules, thus keeping them dissolved and in solution
- sphincter**
band of muscle that controls movement of materials throughout the digestive tract
- spicule**
structure made of silica or calcium carbonate that provides structural support for sponges
- spinal cord**
thick fiber bundle that connects the brain with peripheral nerves; transmits sensory and motor information; contains neurons that control motor reflexes
- spinal nerve**
nerve projecting between skin or muscle and spinal cord
- spiral cleavage**
cells of one pole of the embryo are rotated or misaligned with respect to the cells of the opposite pole
- spirometry**
method to measure lung volumes and to diagnose lung diseases
- splicing**
process of removing introns and reconnecting exons in a pre-mRNA
- spongocoel**
central cavity within the body of some sponges
- spongy bone tissue**
forms the inner layer of all bones
- spontaneous mutation**
mutation that takes place in the cells as a result of chemical reactions taking place naturally without exposure to any external agent
- sporangiospores**
spores directly produced from a sporangium
- sporangium**
(plural, *sporangia*)
reproductive sac that contains spores
- spore**
haploid cell that can produce a haploid multicellular organism or can fuse with another spore to form a diploid cell
- sporocyte**
diploid cell that produces spores by meiosis
- sporophyll**
leaf modified structurally to bear sporangia
- sporophyte**
multicellular diploid life-cycle stage that produces haploid spores by meiosis
- sporopollenin**
tough polymer surrounding the spore
- spring-and-fall turnovers**
seasonal processes that recycle nutrients and oxygen from the bottom of a freshwater ecosystem to the top
- Squamata**
clade of lizards and snakes
- squamous epithelia**
type of epithelia made of flat cells, specialized in aiding diffusion or preventing abrasion
- S-shaped growth curve**
shape of a logistic growth curve
- stability**
continued production of hybrids from the interaction of two species resulting in no real net change
- stabilizing selection**
selection that favors average phenotypes
- stamen**
structure that contains the male reproductive organs
- standard metabolic rate (SMR)**
metabolic rate at rest in ectothermic animals
- stapes**
third of the three bones of the middle ear (also, stirrup)
- starch**
storage carbohydrate in plants
- start codon**
AUG (or rarely, GUG) on an mRNA from which translation begins; always specifies methionine
- statolith**
plant organelle that contains heavy starch granules (also, amyloplast)
- stele**
inner portion of the root containing the vascular tissue; surrounded by the endodermis
- stereocilia**
in the auditory system, hairlike projections from hair cells that help detect sound waves
- stereoscopic vision**
two overlapping fields of vision from the eyes that produces depth perception
- sternum**
long, flat bone located at the front of the chest (also, breastbone)
- steroid**
type of lipid comprised of four fused hydrocarbon rings forming a planar structure

stigma

uppermost structure of the carpel where pollen is deposited

stipule

small green structure found on either side of the leaf stalk or petiole

stolon

modified stem that runs parallel to the ground and can give rise to new plants at the nodes

stoma

(plural, *stomata*) opening that regulates gas exchange and water evaporation between leaves and the environment, typically situated on the underside of leaves

stomach

saclike organ containing acidic digestive juices

stomata

a tiny pore in the leaf of a plant that allows the exchange of gases between the leaf and the atmosphere

stratified epithelia

multiple layers of epithelial cells

streptophytes

group that includes green algae and land plants

strigolactone

hormone that promotes seed germination in some species and inhibits lateral apical development in the absence of auxins

strobilus

(plural, *strobili*) plant structure with a tight arrangement of sporophylls around a central stalk, as seen in cones or flowers; the male strobilus produces pollen, and the female strobilus produces eggs

stroke volume

the volume of blood pumped into the aorta per contraction of the left ventricle

stroma

(plural, *stromata*) fluid-filled space surrounding the grana inside a chloroplast where the light-independent reactions of photosynthesis take place

stromatolite

layered sedimentary structure formed by precipitation of minerals by prokaryotes in microbial mats

structural isomers

molecules that share a chemical formula but differ in the placement of their chemical bonds

style

long, thin structure that links the stigma to the ovary

subduction

movement of one tectonic plate beneath another

substituted hydrocarbon

hydrocarbon chain or ring containing an atom of another element in place of one of the backbone carbons

substrate

molecule on which the enzyme acts

substrate-level phosphorylation

production of ATP from ADP using the excess energy from a chemical reaction and a phosphate group from a reactant

subtropical desert

between 15° and 30° north and south latitude and are centered on the Tropics of Cancer and Capricorn

sucrase

enzyme that breaks down sucrose into glucose and fructose

sulcus

(plural, *sulci*) indents or “valleys” in the cortex

summation

process of multiple presynaptic inputs creating EPSPs around the same time for the postsynaptic neuron to be sufficiently depolarized to fire an action potential

sum rule

probability of the occurrence of at least one of two mutually exclusive events is the sum of their individual probabilities

superior colliculus

paired structure in the top of the midbrain, which manages eye movements and auditory integration

superior vena cava

drains blood from the jugular vein that comes from the brain and from the veins that come from the arms

supination

movement of the radius and ulna bones of the forearm so that the palm faces forward

suprachiasmatic nucleus (SCN)

cluster of cells in the hypothalamus that plays a role in the circadian cycle

surface tension

tension at the surface of a body of liquid that prevents the molecules from separating; created by the attractive cohesive forces between the liquid's molecules

surfactant

detergent-like liquid in the airways that lowers the surface tension of the alveoli to allow for expansion

survivorship curve

graph of the number of surviving population members versus the relative age of the member

suspensor

part of the growing embryo that makes connection with the maternal tissues

sutural bone

small, flat, irregularly shaped bone that forms between the flat bones of the cranium

suture

short fiber of connective tissue that holds the skull bones tightly in place; found only in the skull

swim bladder

in fishes, a gas-filled organ that helps to control the buoyancy of the fish

symbiont

an organism living in symbiosis with another (i.e., plant in a symbiotic relationship with bacteria or fungi)

symbiosis

(plural, *symbioses*) close interaction between individuals of different species over an extended period of time that impacts the abundance and distribution of the associating populations

sympathetic nervous system

division of the autonomic nervous system that is activated during stressful “fight-or-flight” situations

sympatric speciation

speciation that occurs in the same geographic space

symphysis

(plural, *symphyses*) hyaline cartilage covers the end of the bone, but the connection between bones occurs through fibrocartilage; found at the joints between vertebrae

symporter

transporter that carries two different ions or small molecules, both in the same direction

synapse

a structure that permits a neuron (or nerve cell) to pass an electrical or chemical signal to another neuron or to the target effector cell

synapsid

mammal having one temporal fenestra

synapsis

formation of a close association between homologous chromosomes during prophase I

synaptic cleft

space between the presynaptic and postsynaptic membranes

synaptic signal

chemical signal (neurotransmitter) that travels between nerve cells

synaptic vesicle

spherical structure that contains a neurotransmitter

synaptonemal complex

protein lattice that forms between homologous chromosomes during prophase I, supporting crossover

synarthrosis

joint that is immovable

synchondrosis

(plural, *synchondroses*) bones joined by hyaline cartilage; found in the epiphyseal plates of growing bones in children

syncytium

multinucleated cell that is formed by the fusion of many single cells

syndesmosis

(plural, *syndesmoses*) joint in which the bones are connected by a band of connective tissue, allowing for more movement than in a suture

synergid

type of cell found in the ovule sac that secretes chemicals to guide the pollen tube towards the egg

synovial joint

only joint that has a space between the adjoining bones

systematics

field of organizing and classifying organisms based on evolutionary relationships

systemic circulation

flow of blood away from the heart to the brain, liver, kidneys, stomach, and other organs, the limbs, and the muscles of the body, and then the return of this blood to the heart

systems biology

study of whole biological systems (genomes and proteomes) based on interactions within the system

systole

contraction phase of cardiac cycle when the ventricles are pumping blood into the arteries

T**Tachyglossidae**

clade that includes the echidna or spiny anteater

tadpole

larval stage of a frog

tap root system

type of root system with a main root that grows vertically with few lateral roots; found in dicots

tardigrades

phylum of animals found in marine, freshwater, or damp terrestrial environments; known for their ability to undergo cryptobiosis

target cell

cell that has a receptor for a signal or ligand from a signaling cell

tarsal

one of the seven bones of the ankle

tastant

food molecule that stimulates gustatory receptors

taste bud

clusters of taste cells

TATA box

promoter sequence in eukaryotes that helps to establish the transcription initiation complex

taxis

directed movement in response to a stimulus

taxon

(plural, *taxa*) single level in the taxonomic classification system

taxonomy

science of classifying organisms

TCA cycle

alternate name for the citric acid cycle, named after the group name for citric acid, tricarboxylic acid (TCA) (also, citric acid cycle)

T cell

lymphocyte that matures in the thymus gland; one of the main cells involved in the adaptive immune system

tectorial membrane

cochlear structure that lies above the hair cells and participates in the transduction of sound at the hair cells

tegmen

inner layer of the seed coat

teichoic acid

polymer associated with the cell wall of gram-positive bacteria

telomerase

enzyme that contains a catalytic part and a built-in RNA template; it functions to maintain telomeres at chromosome ends

telomeres

DNA at the ends of linear chromosomes

telophase

stage of mitosis during which chromosomes arrive at opposite poles, decondense, and are surrounded by a new nuclear envelope

temperate forest

biome found throughout mid-latitude regions in eastern North America, Western Europe, Eastern Asia, Chile, and New Zealand

temperate grassland

biome throughout central North America, where they are also known as prairies; also in Eurasia, where they are known as steppes

template strand

strand of DNA that specifies the complementary mRNA molecule

temporal fenestra

non-orbital opening in the skull that may allow muscles to expand and lengthen

temporal isolation

differences in breeding schedules that can act as a form of prezygotic barrier leading to reproductive isolation

temporal lobe

part of the cerebral cortex that processes auditory input; parts of the temporal lobe are involved in speech, memory, and emotion processing

tendrill

modified stem consisting of slender, twining strands used for support or climbing

terminal bronchiole

region of bronchiole that attaches to the respiratory bronchioles

tertiary consumer

carnivore that eats other carnivores

tertiary structure

a protein's three-dimensional conformation, including interactions between secondary structural elements; formed from interactions between amino acid side chains

test

porous shell of a foram that is built from various organic materials and typically hardened with calcium carbonate

testa

outer layer of the seed coat

test cross

cross between a dominant expressing individual with an unknown genotype and a homozygous recessive individual; the offspring phenotypes indicate whether the unknown parent is heterozygous or homozygous for the dominant trait

testes

(singular, *testis*) pair of reproductive organs in males

testosterone

reproductive hormone in males that assists in sperm production and promoting secondary sexual characteristics

Testudines

order of turtles

tetrad

two duplicated homologous chromosomes (four chromatids) bound together by chiasmata during prophase I

tetrapod

phylogenetic reference to an organism with a four-footed evolutionary history; includes amphibians, reptiles, birds, and mammals

thalamus

brain area that relays sensory information to the cortex

thalassemia

rare genetic disorder that results in mutation of the alpha or beta subunits of hemoglobin, creating smaller red blood cells with less hemoglobin

thallus

vegetative tissue or the plant body

theory

tested and confirmed explanation for observations or phenomena

thermocline

layer of water with a temperature that is significantly different from that of the surrounding layers

thermodynamics

study of energy and energy transfer involving physical matter

thermophile

organism that lives at temperatures between 60–80°C

thermoregulation

regulation of body temperature

theropod

dinosaur group ancestral to birds

thick filament

a group of myosin molecules

thigmomorphogenesis

developmental response to touch

thigmonastic response

response of a plant to touch or vibration for which the direction of the response is not dependent on the direction of the stimulus

thigmotropism

directional growth of a plant in response to constant contact

thin filament

two polymers of actin wound together along with tropomyosin and troponin

thoracic cage

skeleton of the chest, which consists of the ribs, thoracic vertebrae, sternum, and costal cartilages (also, rib cage)

thorn

modified stem branch appearing as a sharp outgrowth that protects the plant

threshold of excitation

level of depolarization needed for an action potential to fire

thylakoid

disc-shaped, membrane-bound structure inside a chloroplast where the light-dependent reactions of photosynthesis take place; stacks of thylakoids are called grana

thylakoid lumen

aqueous space bound by a thylakoid membrane where protons accumulate during light-driven electron transport

thymus

gland located behind the sternum that produces thymosin hormones that contribute to the development of the immune system

thyroglobulin

glycoprotein found in the thyroid that is converted into thyroid hormone

thyroid gland

endocrine gland located in the neck that produces the thyroid hormones thyroxine and triiodothyronine

thyroid-stimulating hormone (TSH)

hormone produced by the anterior pituitary that controls the release of T₃ and T₄ from the thyroid gland

thyroxine

(tetraiodothyronine, T₄) thyroid hormone containing four iodines that controls the basal metabolic rate

tibia

large bone of the leg that is located directly below the knee (also, shinbone)

tidal volume (TV)

amount of air that is inspired and expired during normal breathing

tight junction

protein adherence that creates a firm seal between two adjacent animal cells

Ti plasmid

plasmid system derived from *Agrobacterium tumefaciens* that scientists have used to introduce foreign DNA into plant cells

tissue

group of similar cells carrying out related functions

tonic activity

in a neuron, slight continuous activity while at rest

tonicity

amount of solute in a solution

topoisomerase

enzyme that relieves the strain caused by underwinding or overwinding of DNA when DNA replication is taking place

topsoil

upper, outermost layer of soil

torpor

decrease in activity and metabolism that allows an animal to survive adverse conditions

total lung capacity (TLC)

sum of the residual volume, expiratory reserve volume, tidal volume, and inspiratory reserve volume

trabecula

(plural, *trabeculae*) tiny plate that makes up spongy bone and gives it strength

trachea

cartilaginous tube that transports air from the larynx to the primary bronchi

tracheal system

system of breathing tubes that connects with the outside of the body and carry oxygen directly to the cells in insects

tracheid

xylem cell with thick secondary walls that helps transport water

tracheophyte

vascular plant

TRAFFIC

Trade Records Analysis of Flora and Fauna in Commerce

tragedy of the commons

economic principle that resources held in common will inevitably be overexploited

trait

variation in the physical appearance of a heritable characteristic

transcription

process through which messenger RNA forms on a template of DNA

transcription bubble

region of locally unwound DNA that allows for transcription of mRNA

transcription factor

protein that binds to the DNA at the promoter or enhancer region and that influences transcription of a gene

transcription factor binding site

sequence of DNA to which a transcription factor binds

transcriptional start site

site at which transcription begins

transcytosis

type of potocytosis where molecules are taken up on one side of a cell, transported through the cell, and released on the other side

transduction

process by which a bacteriophage moves DNA from one prokaryote to another

trans fat

formed artificially by hydrogenating oils, leading to a different arrangement of double bond(s) than those in naturally occurring lipids

transfer RNA

RNA that carries activated amino acids to the site of protein synthesis on the ribosome

transformation

process by which a prokaryote takes in DNA found in its environment that is shed by other prokaryotes

transgenic

organism that receives DNA from a different species

transitional epithelia

epithelia that can transition from appearing multilayered to simple (also, uroepithelial)

transition state

high-energy, unstable state (an intermediate form between the substrate and the product) occurring during a chemical reaction

transition substitution

when a purine is replaced with a purine or a pyrimidine is replaced with another pyrimidine

translation

the generation of a chain of amino acids based on the mRNA that has been transcribed

translocation (chromosomal)

process by which one chromosome segment dissociates and reattaches to a different, nonhomologous chromosome

translocation (plant)

mass transport of photosynthates from source to sink in vascular plants

transpiration

loss of water vapor to the atmosphere through stomata

transporter

specific carrier proteins or pumps that facilitate movement

transport maximum

maximum amount of solute that can be transported out of the renal tubules during reabsorption

transport protein

transmembrane protein involved in facilitated transport that first binds a substance and then aids in its diffusion through the membrane

transverse (horizontal) plane

plane cutting through an animal, separating the individual into upper and lower portions

transversion substitution

when a purine is replaced by a pyrimidine or a pyrimidine is replaced by a purine

triacylglycerol

fat molecule; consists of three fatty acids linked to a glycerol molecule (also, triglycerides)

trichome

hairlike structure on the epidermal surface

tricuspid valve

one-way membranous flap of connective tissue between the atrium and the ventricle in the right side of the heart (also, atrioventricular valve)

triiodothyronine (T₃)

thyroid hormone containing three iodines that controls the basal metabolic rate

triploblast

animal that develops from three germ layers

trisomy

otherwise diploid genotype in which one entire chromosome duplicates

trochophore

free-swimming larva characterized by two bands of cilia surrounding a top-like body

trophic level

position of a species or group of species in a food chain or a food web

trophic level transfer efficiency (TLTE)

energy transfer efficiency between two successive trophic levels

trophoblast

outer layer of cells in the blastocyst

tropical wet forest

found in equatorial regions (also, tropical rainforest)

tropomyosin

acts to block myosin-binding sites on actin molecules, preventing cross-bridge formation and preventing contraction until a muscle receives a neuron signal

tropoanin

binds to tropomyosin and helps to position it on the actin molecule and also binds calcium ions

trp operon

series of genes necessary to synthesize tryptophan in prokaryotic cells

true fungi

reproduce both sexually and asexually

trypsin

pancreatic protease that breaks down protein

tryptophan

amino acid that can be synthesized by prokaryotic cells when necessary

tuber

modified underground stem adapted for starch storage; has many adventitious buds

tubular reabsorption

reclamation of water and solutes that got filtered out in the glomerulus

tubular secretion

process of secretion of wastes that do not get reabsorbed

tumor suppressor gene

segment of DNA that codes for regulator proteins that prevent the cell from undergoing uncontrolled division

tunicate

sessile chordate that is a member of Urochordata

tympnamum

thin diaphragm between the outer and middle ears (also, tympanic membrane or ear drum)

U**ubiquinone**

soluble electron transporter in the electron transport chain that connects the first or second complex to the third

ulna

bone located on the medial aspect (pinky-finger side) of the forearm

ultrasound

sound frequencies above the human detectable ceiling of approximately 20,000 Hz

umami

one of the five basic tastes, which is described as “savory” and may be largely the taste of L-glutamate

unidirectional circulation

flow of blood in a single circuit; occurs in fish where the blood flows through the gills, then past the organs and the rest of the body, before returning to the heart

uniporter

transporter that carries one specific ion or molecule

uniramous

referring to one branch per appendage

unsaturated fatty acid

long-chain hydrocarbon that has one or more double bonds in the hydrocarbon chain

untranslated region (UTR)

segment of the RNA molecule that is not translated into protein; these regions lie before (upstream, or 5') and after (downstream, or 3') the protein-coding region

up-regulation

an increase in the number of hormone receptors in response to increased hormone levels

upstream

nucleotides preceding the initiation site; in general, sequences toward the 5' end relative to a site on the mRNA

urea cycle

pathway by which ammonia is converted to urea

ureotelic

describes animals that secrete urea as the primary nitrogenous waste material

ureter

urine-bearing tube coming out of the kidney; carries urine to the bladder

uric acid

byproduct of ammonia metabolism in birds, insects, and reptiles

urinary bladder

structure that the ureters empty the urine into; stores urine

urine

filtrate produced by kidneys that gets excreted out of the body

Urochordata

clade composed of tunicates

Urodela

salamanders

uterus

environment for developing embryo and fetus

V**vaccine**

weakened solution of virus components, viruses, or other agents that produce an immune response

vacuole

membrane-bound sac, somewhat larger than a vesicle, which functions in cellular storage and transport

vagina

muscular tube for the passage of menstrual flow, copulation, and birth of offspring

valence shell

outermost shell of an atom

van der Waals interaction

very weak interaction between molecules due to temporary charges attracting atoms that are very close together

variable

part of an experiment that the experimenter can vary or change

variable number of tandem repeats (VNTRs)

variation in the number of tandem repeats between individuals in the population

variation

genetic differences among individuals in a population

vasa recta

peritubular network that surrounds the loop of Henle of the juxtamedullary nephrons

vascular bundle

strands of stem tissue made up of xylem and phloem

vascular plant

plant containing a network of cells that conducts water and solutes through the organism

vascular stele

strands of root tissue made up of xylem and phloem

vascular tissue

tissue made up of xylem and phloem that transports food and water throughout the plant

vasoconstriction

narrowing of a blood vessel

vasodilation

widening of a blood vessel

vasodilator

compound that increases the diameter of blood vessels

vasopressin

another name for antidiuretic hormone

vein (animal)

blood vessel that brings blood back to the heart

vein (plant)

bundle of vascular tissue made of xylem and phloem

veliger

second of the two larval stages in mollusks

vena cava

major vein of the body returning blood from the upper and lower parts of the body; see the superior vena cava and inferior vena cava

venation

pattern of veins in a leaf; may be parallel (as in monocots), reticulate (as in dicots), or dichotomous (as in *Ginkgo biloba*)

venous P_{CO_2}

partial pressure of carbon dioxide in the veins (40 mmHg in the pulmonary veins)

venous P_{O_2}

partial pressure of oxygen in the veins (100 mmHg in the pulmonary veins)

ventilation/perfusion (V/Q) mismatch

region of the lung that lacks proper alveolar ventilation (V) and/or arterial perfusion (Q)

ventral cavity

body cavity on the anterior or front portion of an animal that includes the thoracic cavities and the abdominopelvic cavities

ventricle (brain)

cavity within brain that contains cerebrospinal fluid

ventricle (heart)

large inferior chamber of the heart that pumps blood into arteries

venule

blood vessel that connects a capillary bed to a vein

vernalization

exposure to cold required by some seeds before they can germinate

vertebral column

surrounds and protects the spinal cord, supports the head, and acts as an attachment point for ribs and muscles of the back and neck (also, spine)

Vertebrata

members of the phylum Chordata that possess a backbone

vertical transmission

transmission of disease from parent to offspring

vesicle

small, membrane-bound sac that functions in cellular storage and transport; its membrane is capable of fusing with the plasma membrane and the membranes of the endoplasmic reticulum and the Golgi apparatus

vessel element

xylem cell that is shorter than a tracheid and has thinner walls

vestibular sense

sense of spatial orientation and balance

vestigial structure

physical structure with no apparent function that appears to have descended from a functional structure in an ancestor

viable-but-non-culturable (VBNC) state

survival mechanism of bacteria facing environmental stress conditions

vicariance

allopatric speciation that occurs when something in the environment separates organisms of the same species into separate groups

villi

folds on the inner surface of the small intestine whose role is to increase absorption area

viral receptor

glycoprotein used to attach a virus to host cells via molecules on the cell

virion

individual virus particle outside a host cell

viroid

plant pathogen that produces only a single, specific RNA

virus core

contains the virus genome

vision

sense of sight

vital capacity (VC)

sum of the expiratory reserve volume, tidal volume, and inspiratory reserve volume

vitamin

organic substance necessary in small amounts to sustain life

viviparity

process in which the young develop within the female, receiving nourishment from the female parent's blood through a placenta

W**water potential (Ψ_w)**

the potential energy of a water solution per unit volume in relation to pure water at atmospheric pressure and ambient temperature

water vascular system

system in echinoderms where water is the circulatory fluid

wavelength

distance between consecutive points of equal position (two crests or two troughs) of a wave in a graphic representation; inversely proportional to the energy of the radiation

wax

lipid comprised of a long-chain fatty acid that is esterified to a long-chain alcohol; serves as a protective coating on some feathers, aquatic mammal fur, and leaves

weather

conditions of the atmosphere during a short period of time

web of life

phylogenetic model that attempts to incorporate the effects of horizontal gene transfer on evolution

whisk fern

seedless vascular plant that lost roots and leaves by reduction

white blood cell

large (30 μm) cell with nuclei of which there are many types with different roles including the protection of the body from viruses and bacteria, and cleaning up dead cells and other waste

white-nose syndrome

disease of cave-hibernating bats in the eastern United States and Canada associated with the fungus *Geomyces destructans*

whole-genome sequencing

process that determines an entire genome's DNA sequence

whorled

pattern of leaf arrangement in which three or more leaves are connected at a node

X**X inactivation**

condensing X chromosomes into Barr bodies during embryonic development in females to compensate for the double genetic dose

X-linked

gene present on the X but not the Y chromosome

xylem

tissue responsible for long-distance transport of water and nutrients and provides physical support to the plant

Y**yeast**

general term used to describe unicellular fungi

Z**zero population growth**

steady population size where birth rates and death rates are equal

zoaea

larval stage in the early development of crustaceans

zona pellucida

protective layer of glycoproteins on the mammalian egg

zoology

study of animals

zoonoses

diseases that primarily infect animals that can be transmitted to humans

Zygomycota

previous phylum of fungi that form a zygote contained in a zygosporangium; organisms of Zygomycota now reclassified as belonging to phyla Mucoromycota or Zoopagomycota (also, conjugated fungi)

zygosporangium

structure with a thick cell wall that contains the zygote in zygomycetes

zygote

a diploid cell formed from the fusion of two haploid gametes; a fertilized egg