

GLOSSARY

A

aa jagged chunks of lava formed by rapid cooling on the surface of a lava flow (120)

abrasion mechanical weathering in which rocks collide and scrape against each other, wearing away the exposed surfaces (221)

absolute age actual age of an object (327)

absolute magnitude brightness of a star as it would appear if located 32.6 light-years from the Earth (553)

abyssal plain extremely level area of the deep ocean basin where the depth is often greater than 4 km (396)

abyssal zone benthic environment that extends from beneath the bathyal zone to a depth of 6,000 m (416)

adiabatic describing a change in temperature resulting from the cooling of rising air and the warming of sinking air (484)

advection fog condensation of water vapor that results from the cooling of warm, moist air as it moves across a cold surface (488)

advective cooling decrease in the temperature of a mass of air that results as it moves over a cold surface (486)

aftershock tremor that follows and is smaller than a major earthquake (99)

air mass large body of air with uniform temperature and moisture content (499)

albedo percent of solar radiation reflected by a surface (466)

alloy solid solution of two or more metals (151)

alluvial fan fan-shaped deposit of sediments at the base of a slope on land (252)

amber hardened tree sap in which fossils may be preserved (335)

anemometer instrument used to measure wind speed (509)

angular unconformity boundary between horizontal and tilted layers of rock (325)

anthracite hardest form of coal (199)

anticline upcurved fold in rock layers in which the oldest layer is the center of the fold (85)

anticyclone storm that spirals outward from a high-pressure center (505)

GLOSSARY

- aphelion** point in the orbit of a planet at which the planet is farthest from the Sun (29)
- apogee** point in the orbit of a satellite at which the satellite is farthest from the Earth (621)
- apparent magnitude** brightness of a star as it appears from the Earth (552)
- aquaculture** farming of the ocean (420)
- aquifer** body of rock that can store much water and from which water flows freely (261)
- arête** sharp, jagged ridge formed between cirques (282)
- artesian formation** sloping layer of permeable rock sandwiched between two layers of impermeable rock and exposed at the surface (267)
- artesian spring** natural flow of water to the Earth's surface from an artesian formation (267)
- artesian well** hole dug through the cap rock of an artesian formation through which water flows freely, with no pumping necessary (267)
- asteroid** fragment of rock that orbits the Sun (606)
- asteroid belt** the region between the orbits of Mars and Jupiter in which most asteroids are found (606)
- asthenosphere** zone of mantle beneath the lithosphere that consists of slowly flowing solid rock (72)
- astronomical unit** average distance between the Earth and the Sun, approximately 149.5 million km (592)
- astronomy** study of the universe beyond the Earth (6)
- atmosphere** thick blanket of gases surrounding the Earth (7)
- atmospheric pressure** ratio of the force of the air to the area of the surface on which it presses (457)
- atoll** nearly circular coral reef surrounding a shallow lagoon (311)
- atom** smallest unit of an element (140)
- atomic number** number of protons in the nucleus of an atom (141)
- aurora** sheets of colored light produced by a magnetic storm in the Earth's upper atmosphere (579)
- autumnal equinox** beginning of the fall season (31)
- axis** imaginary straight line running through the Earth from pole to pole (23)

GLOSSARY**B**

background radiation low levels of energy evenly distributed throughout the universe (16)

barometer instrument that measures atmospheric pressure (458)

barred spiral galaxy type of spiral galaxy with a bar of stars that runs through its center (563)

barrier island long, narrow ridge of sand that lies parallel to the shore (310)

barrier reef type of coral reef that surrounds the remnant of a partially submerged volcanic island (311)

basal slip movement of a glacier caused by the melting of ice in contact with the ground (279)

batholith intrusive formations with at least a surface exposure of 100 square kilometers and reaching a depth of thousands of meters (180)

bathyal zone benthic environment that begins at the end of the continental shelf and extends to a depth of 4,000 m (415)

bathyscaph self-propelled, free-moving submersible used for deep-ocean research (391)

bathysphere spherical submersible that remains attached to a research ship for communications and support (390)

beach deposit of rock fragments along an ocean shore or a lakefront (304)

bedding plane boundary between two sedimentary rock layers (324)

benthic environment major division of ocean environment that includes the five bottom zones: intertidal, sublittoral, bathyal, abyssal, and hadal (415)

benthos organisms that live on the ocean floor (415)

berm raised midsection of a beach, the part above which is usually used for recreation (305)

big bang theory theory that all matter and energy in the universe was compressed into an extremely small volume that suddenly, billions of years ago, began expanding in all directions (17)

bimetal thermometer instrument used to measure temperature, consisting of a bar made of two strips of different metals that curves when heated and straightens when cooled (509)

binary star pair of stars that revolve around each other (564)

biodegradable able to be broken down into component parts by microorganisms (8)

GLOSSARY

biosphere ecosystem encompassing all the life on Earth and the physical environment that supports it (7)

bituminous coal soft coal (199)

black hole hole in space with a gravity so great that not even light can escape, formed by the collapse of a very large supernova (560)

bora cold northern wind that blows down the mountains of Greece and the Balkan nations toward the Adriatic Sea (528)

breaker foamy mass of water that washes onto the shore (436)

breccia elastic sedimentary rock composed of angular fragments cemented together by minerals (182)

Bright Angel Shale rock layer of the Grand Canyon deposited during the Cambrian Period (374)

butte elevated, narrow, flat-topped area (237)

C

calcareous ooze type of ooze that is mostly calcium carbonate (401)

caldera large basin-shaped depression formed when an explosion destroys the upper part of a volcanic cone or when the magma chamber below a volcano is emptied during an eruption (124)

calendar system used to measure the passage of time (627)

Canadian Shield exposed portion of the craton around which North America has been built up (370)

cap rock top layer of impermeable rock in an artesian formation (267)

capillary fringe region of soil just above the water table that receives moisture from the zone of saturation by capillary action (263)

carbonation chemical weathering process in which minerals react with carbonic acid (222)

carbonization process in which plant materials are changed into carbon (198)

cartography science of map making (46)

cementation process in which dissolved minerals left by water passing through sediments bind the sediments together (182)

Cenozoic Era the most recent geologic era, beginning 65 million years ago; the Age of Mammals (346)

channel path that a stream follows (247)

GLOSSARY

chemical bond force that holds together the atoms that make up a compound (148)

chemical formula symbols indicating the elements a compound contains and the relative number of each element (150)

chemical property characteristic that describes how a substance interacts with other substances to produce different kinds of matter (139)

chemical sedimentary rock rock formed from minerals that precipitate from water (182)

chemical weathering process in which rock is broken down as a result of chemical reactions (219)

chinook warm, dry wind that flows down the eastern slope of the Rocky Mountains (528)

chromosphere thin layer of the Sun's atmosphere that lies above the photosphere and glows with a reddish light; color sphere (575)

cinder cone steep-sloped deposit of solid fragments ejected from a volcano (122)

circumpolar describing any star that is always visible in the night sky and, from the Northern Hemisphere, can be seen circling Polaris (549)

cirque bowl-shaped depression produced by a valley glacier (282)

cirrus cloud feathery cloud composed of ice crystals that has the highest altitude of any cloud in the sky (486)

clastic sedimentary rock rock made up of fragments from pre-existing rocks (182)

cleavage splitting of a mineral along smooth, flat surfaces (164)

climate general weather conditions over many years (455)

cloud seeding addition of freezing nuclei to supercooled clouds in an attempt to induce or increase precipitation (492)

coalescence combination of different-sized cloud droplets to form larger droplets (491)

Coconino Sandstone rock layer of the Grand Canyon deposited during the Permian Period (375)

cold front boundary formed where a cold air mass overtakes and lifts a warm air mass (502)

coma spherical cloud of gas and dust that surrounds the nucleus of a comet (607)

GLOSSARY

comet body of rock, dust, methane, ammonia, and ice that revolves around the Sun in a long, elliptical orbit (607)

compaction process in which air and water are squeezed out of sediments, resulting in the formation of sedimentary rock (182)

composite volcano also called *stratovolcano*, steep-sloped volcanic deposit with alternating layers of hardened lava flows and pyroclastic materials (123)

compound a substance that results when the atoms of two or more elements are chemically combined (147)

compression stress that squeezes crustal rocks together (84)

concretion nodule of rock with a different composition from that of the main rock body (186)

condensation process by which water vapor changes to liquid water (244)

condensation nuclei solid particles in the atmosphere, such as ice and dust, that provide the surfaces on which water vapor condenses (484)

conduction type of energy transfer in which vibrating molecules pass heat along to other vibrating molecules by direct contact (468)

cone of depression lowered area of a water table produced by pumping water from a well (266)

conglomerate sedimentary rock composed of rounded gravel or pebbles cemented together by minerals (182)

conic projection map projection in which the meridians converge at the poles; the parallels appear as equally spaced, concentric curves (47)

constellation pattern of stars (561)

contact metamorphism change in the structure and mineral composition of rock surrounding an igneous intrusion (187)

continental crust material that makes up landmasses (72)

continental drift hypothesis stating that the continents once formed a single landmass, broke up, and drifted to their present locations (67)

continental ice sheet mass of ice that covers large land areas (278)

continental margin shallower portion of the ocean floor that is made of continental crust and a thick wedge of sediment (393)

continental polar describing a cold, dry air mass that forms over land in polar regions (500)

continental rise accumulation of sediments at the base of a continental slope (395)

GLOSSARY

- continental shelf** edge of a continent covered by shallow ocean water (393)
- continental slope** steep incline at the edge of a continental shelf (394)
- continental tropical** describing a warm, dry air mass that forms over land in tropical regions (500)
- contour interval** difference in elevation between one contour line and the next (51)
- contour line** line on a map connecting points with the same elevation (50)
- convection** transfer of heat through the movement of heated material (74)
- convection cell** looping pattern of flowing air (470)
- convection current** movement in a fluid caused by uneven heating (74)
- convective cooling** decrease in the temperature of a mass of air that results as the air rises and expands (484)
- convective zone** region around the Sun's radiative zone in which moving gases transfer energy (574)
- convergent boundary** border formed by the collision of two lithospheric plates (73)
- coprolite** fossilized waste material from an animal (337)
- coral reef** ridgelike coastal feature made of millions of coral skeletons (311)
- core** center of a planetary body, such as the Earth (24)
- core sample** cylindrical sample of sediments from the deep-ocean floor (399)
- Coriolis effect** deflection of wind and ocean currents caused by the Earth's rotation (428)
- corona** outermost layer of the Sun's atmosphere; crown (575)
- covalent bond** bond based on the attraction between atoms that share electrons (150)
- covalent compound** compound formed from atoms that share electrons (150)
- crater** funnel-shaped pit at the top of a volcanic cone (124); bowl-shaped depression on the surface of a planetary body (616)
- craton** large area of Precambrian rocks found on all continents (366)
- creep** slow downhill movement of weathered rock material (236)
- crest** highest point of a wave (433)

GLOSSARY

crevasse large crack that forms on the surface of a glacier (280)

crude oil unrefined petroleum (200)

crust outermost zone of the solid Earth (24)

crystal natural solid substance that has a definite internal pattern (159)

cumulus cloud thick, billowy cloud that forms above stratus clouds and below cirrus clouds (486)

current steady movement in one direction, such as that of water in the ocean (427)

D

day time required for the Earth to make one rotation on its axis, about 24 hours (627)

daylight saving time system in which clocks are set one hour ahead of standard time from April to October (34)

deep current streamlike movement of water beneath the surface of the ocean (427)

deep ocean basin part of the ocean floor made of oceanic crust and a thin sediment layer (393)

deflation most common form of wind erosion in which fine, dry soil particles are blown away (298)

deflation hollow shallow depression left after the wind has eroded a layer of exposed soil (298)

deformation bending, tilting, and breaking of the Earth's crust (83)

delta fan-shaped deposit of sediments at the mouth of a stream (252)

density ratio of the mass of a substance to its volume, expressed as g/cm^3 (167)

depression contour contour line with short, straight lines drawn along the inside of the loop pointing toward its center that indicates a depression (55)

desalination process of removing salt from ocean water (246)

desert pavement surface of closely packed small rocks left after the top layer of soil has been removed by deflation (298)

dew type of condensation formed when air that is in contact with a cool surface loses heat until it reaches saturation (483)

dew point temperature to which air must be cooled to become saturated (483)

GLOSSARY

diatomic consisting of two atoms (147)

dike igneous intrusion that cuts across rock layers (181)

discharge volume of water moved by a stream within a given time (249)

disconformity boundary between layers of rock that have not been deposited continuously (325)

distillation process in which ocean water is heated until it evaporates in order to separate fresh water from dissolved salts (417)

divergent boundary boundary formed by two lithospheric plates that are moving apart (73)

divide elevated region that separates two watersheds (247)

doldrums narrow zone of low air pressure at the equator characterized by weak and undependable winds (471)

dome mountain landform created when molten rock pushes up rock layers on the Earth's surface and the layers then are worn away in places, leaving separate high peaks (93)

Doppler effect apparent shift in the wavelength of energy, such as a sound wave or a light wave, emitted by a source moving away from or toward an observer (15)

double refraction property exhibited by transparent minerals that produce a double image of any object viewed through them (168)

drift weak, slow-moving ocean current (429)

drumlin long, low, tear-shaped mound of till (285)

dune mound of windblown sand (299)

E

earth science study of the Earth and the universe around it (3)

earth-grazer asteroid that orbits the Sun in an elongated ellipse that may pass close to the Earth and Sun (607)

earthquake vibration of the Earth's crust (99)

earthshine sunlight reflected off the surface of the Earth (626)

eclipse passing of one planetary body through the shadow of another (623)

ecology study of the complex relationships between living things and their environment (7)

GLOSSARY

- ecosystem** community of organisms and the environment they inhabit (7)
- elastic rebound theory** theory that rocks that are strained past a certain point will fracture and spring back to their original shape (99)
- electrical thermometer** instrument used to measure temperature based on the increased flow of electricity through certain materials when the materials are heated (509)
- electromagnetic spectrum** complete range of wavelengths of radiation (463)
- electron** subatomic particle with a negative electrical charge (141)
- electron cloud** region of space around the nucleus of an atom in which electrons may be found (141)
- element** substance that has a characteristic set of physical and chemical properties (15)
- elevation** height above sea level (50)
- ellipse** oval whose shape is determined by two points within the figure (592)
- elliptical galaxy** type of galaxy with a very bright center that contains little dust and gas and is spherical to disklike in shape (563)
- emergent coastline** coast along which sea level falls or the land rises (310)
- energy level** arrangement of electrons within the electron cloud of an atom (147)
- epicenter** point on the Earth's surface directly above the focus of an earthquake (99)
- epicycle** small circular motion of the planets within their orbits proposed as an explanation for retrograde motion (591)
- epoch** subdivision of a geologic period (346)
- era** largest unit of geologic time (346)
- erosion** process by which the products of weathering are transported (231)
- erratic** large boulder transported and deposited by a glacier (284)
- esker** long, winding ridge of gravel and coarse sand deposited by a glacier (286)
- estuary** wide, shallow bay formed where ocean water submerges the mouth of a river and where salt water and fresh water mix (309)
- evaporites** sedimentary rocks formed from minerals left after water evaporates (183)

GLOSSARY

evapotranspiration process by which water enters the atmosphere; evaporation and transpiration combined (243)

evolution change of living things over time (334)

exfoliation process in which sheets of rock peel or flake as a result of weathering (219)

exosphere layer of the atmosphere above the ionosphere that merges with interplanetary space (461)

experimentation process by which a scientific procedure is carried out according to certain guidelines (12)

extrusive igneous rocks rocks formed from molten lava that hardens on the Earth's surface (178)

F

fault break in rock along which rocks on either side of the break move (86)

fault plane surface of a fault along which movement of rocks occurs (86)

fault zone group of interconnected faults (101)

fault-block mountain mountain formed where faulting breaks the Earth's crust into large blocks that become tilted, causing some blocks to drop down relative to other blocks (92)

felsic lava silica-rich lava (120)

fetch distance that wind can blow across open water (435)

fiord narrow, deep, steep-walled bay formed by flooding of a glacial valley due to a rise in sea level (310)

fireball brilliant flash of light produced by a meteor that vaporizes quickly (608)

firn grainy ice in a glacier that has been partially melted and refrozen (277)

fissure crack in a rock surface through which lava flows (119)

floodplain part of the valley floor that may be covered with water during a flood (253)

fluorescence ability to glow under ultraviolet light (168)

focus area along a fault at which slippage first occurs, initiating an earthquake (99); *also* one of two points within an ellipse that determines the shape of the figure (592)

foehn warm, dry wind that flows down the slopes of the Alps (528)

GLOSSARY

folded mountain landform created when tectonic movements bend and uplift rock layers (90)

folding permanent deformation or bending of a rock under stress (85)

foliated describing a metamorphic rock with parallel bands (187)

footwall in a nonvertical fault, the rock below the fault plane (86)

fossil trace or remains of a plant or an animal in sedimentary rock (186)

fossil fuel fuel formed from the remains of living organisms, such as coal, petroleum, and natural gas (198)

fracture break in rock along which there is no movement (86)

fracture zone faults running perpendicular to a mid-ocean ridge (398)

freezing nuclei condensation nuclei with a crystalline structure like that of ice (491)

fringing reef type of coral reef that forms around a volcanic island (311)

front boundary between air masses of different densities (502)

frost ice crystals formed when the dew point is below 0°C and water vapor directly enters the solid state (483)

full moon phase of the moon during which the entire half of the moon facing the Earth is visible (626)

G

galaxy large-scale group of stars (562)

Galilean moon any one of the four largest satellites of Jupiter, which were first seen by Galileo (631)

gas physical form of matter that does not have a definite volume or shape (145)

gastrolith fossilized stone found within the digestive system of a dinosaur or other reptile (337)

gemstone nonmetallic mineral that is brilliant and colorful when cut (196)

geocentric Earth-centered (591)

geologic column arrangement of rock layers based on the ages of the rocks (345)

geology study of the origin, history, and structure of the solid Earth and the processes that shape it (4)

GLOSSARY

geomagnetic pole point on the Earth's surface above a pole of the Earth's imaginary internal magnet (45)

geosphere the solid Earth (7)

geosynchronous orbit orbit directly above the Earth's equator and moving in the direction of the Earth's rotation (35)

geothermal energy energy contained in and available from water heated by magma or gases within the Earth (205)

geyser hot spring that erupts periodically (268)

giant very large, cool, bright star (554)

glacial drift sediments deposited by a glacier (285)

glacier mass of moving ice (277)

glaze ice thick layer of sheet ice formed when rain freezes as it contacts a surface (489)

globular cluster spherically shaped group of hundreds of stars located around the core of the Milky Way Galaxy (564)

gnomonic projection map projection in which the parallels appear as unevenly spaced, concentric circles, the meridians appear as straight lines radiating from a central point, and all other great circles appear as straight lines (47)

Gondwanaland southern landmass that broke away from Pangaea and later formed South America, Africa, India, Australia, and Antarctica (367)

graben long, narrow valley formed by faulting and downward slippage of a crustal block (92)

gradient change in elevation over a distance (249)

gravity force of attraction between all matter in the universe (27)

great circle any circle that divides the globe in half (44)

greenhouse effect process by which the atmosphere traps infrared rays over the Earth's surface (467)

Gregorian calendar revision of the Julian calendar by Pope Gregory XIII; currently used in most of the world (628)

ground moraine unsorted material left beneath a glacier when the ice melts (285)

groundwater water that soaks deep into soil and rock (243)

GLOSSARY

Gulf Stream swift, warm Atlantic current that flows from the Gulf of Mexico, around Florida, and up the east coast of North America (428)

guyot flat-topped, submerged seamount (398)

gyre huge circle of moving ocean water formed as a result of the wind belts and the Coriolis effect (428)

H

hadal zone benthic environment of the ocean deeper than 6,000 m (416)

hail type of precipitation in the form of lumps of ice (490)

hair hygrometer instrument used to measure relative humidity, based on the fact that human hair stretches as humidity increases (482)

half-life time required for half the mass of a radioactive element to decay into its daughter elements (330)

hanging valley small abandoned glacial valley suspended on a mountain above the main glacial valley (283)

hanging wall in a nonvertical fault, the rock above the fault plane (86)

hard water water that contains relatively large amounts of dissolved minerals (269)

hardness measure of the ability of a mineral to resist scratching (165)

headland change-resistant projection of rock out from shore into the water (303)

headward erosion lengthening and branching of a stream (247)

headwaters beginning of a stream (249)

heliocentric Sun-centered (591)

Hermit Shale rock layer of the Grand Canyon deposited during the Permian Period (375)

horizon layer of a soil profile (228)

horn sharp, pyramid-like peak formed where several arêtes join (282)

horse latitudes subtropical high-pressure belt of air, around 30° latitude (471)

hot spot area of volcanism within a lithospheric plate (119)

hot spring hot groundwater that rises to the surface before cooling (267)

GLOSSARY

H-R diagram Hertzsprung-Russell diagram; graph showing the relationship of the surface temperature and absolute magnitude of a star (553)

humid continental climate middle-latitude climate occurring between 35° and 50° north latitude, with warm, humid summers and cold winters (534)

humid subtropical climate very wet middle-latitude climate that occurs in southeastern coastal areas between 30° and 40° north and south latitude, with warm, humid summers and generally mild winters (534)

humidity amount of water vapor in the atmosphere (480)

humus dark, organic material formed from the decayed remains of plants and animals (227)

hurricane severe storm that develops over tropical oceans, with strong winds of over 120 km/h that spiral in toward the intensely low-pressure storm center (505)

hydrocarbon compound made up of atoms of carbon and hydrogen (198)

hydroelectric energy energy produced by running water (206)

hydrolysis chemical reaction between water and another substance (221)

hydrosphere all the Earth's water (7)

hypothesis possible explanation of a problem that is based on facts (11)

I

ice age long period of climatic cooling during which ice sheets cover large areas of the Earth's surface (289)

ice wedging mechanical weathering caused by the freezing and thawing of water that seeps into cracks in rocks (219)

igneous rock rock formed from cooled and hardened magma (175)

impermeable rock or sediment through which water cannot flow (263)

index contour every fifth contour line on a topographic map that is printed bolder for reference (53)

index fossil guide fossil; fossil found in the rock layers of only one geologic age and is used to establish the absolute age of the rock layers (338)

inertia tendency of a moving body to remain in motion or a stationary body to remain at rest until an outside force acts on it (593)

inorganic not made up of living organisms or the remains of living organisms (157)

GLOSSARY

intensity amount of damage caused by an earthquake (104)

internal plastic flow slow movement of a glacier in which ice crystals slip over each other (279)

International Date Line line running from north to south through the Pacific Ocean where the date changes from one day to the next (34)

intertidal zone benthic environment that lies between the low-tide and high-tide lines (415)

intrusive igneous rocks rocks formed from the cooling of magma beneath the Earth's surface (178)

invertebrate animal without a backbone (349)

ion atom or group of atoms that carries an electrical charge (149)

ionic bond bond in which electrons are transferred from one atom to another (148)

ionic compound compound formed through the transfer of electrons (148)

ionosphere lower region of the thermosphere, at an altitude of 80 to 550 km (461)

iron meteorite type of meteorite made of iron, with a characteristic metallic appearance (609)

irregular galaxy type of galaxy with no identifiable shape and an uneven distribution of stars within it (563)

island arc chain of volcanic islands formed along an ocean trench (74)

isobar line drawn on a weather map connecting points of equal atmospheric pressure (513)

isostasy balancing of the forces pressing up and down on the Earth's crust (83)

isostatic adjustment up-and-down movements of the Earth's crust to reach isostasy (83)

isotope atom of an element that has the same atomic number but different atomic mass than another atom of that element (145)

J

jet streams bands of high-speed, high-altitude westerly winds (472)

Jovian planet any one of the first four outer planets—Jupiter, Saturn, Uranus, or Neptune—with properties similar to those of Jupiter (598)

GLOSSARY

Julian calendar calendar devised by Julius Caesar's astronomers consisting of 12 months; 11 with 30 or 31 days, one with 28 days, and an extra day added every four years (628)

K

Kaibab Limestone rock layer of the Grand Canyon deposited during the Permian Period (375)

karst topography region where the effects of chemical weathering due to groundwater, such as sinkholes and caverns, are clearly visible (271)

kettle depression in a glacial outwash plain (286)

L

laccolith flat-bottomed intrusion that pushes overlying rock layers into an arc (181)

lagoon narrow region of shallow water between a barrier island and the shore (310)

landform physical feature of the Earth's surface (236)

landslide sudden movement of loose rock and soil down a slope (233)

lapilli pyroclastic particles between 2 mm and 64 mm in diameter (121)

latent heat energy stored in molecules (480)

lateral moraine unsorted material deposited along the sides of a valley glacier (285)

laterite thick infertile soils produced in tropical climates (229)

latitude angular distance north or south of the equator (43)

Laurasia northern landmass that broke away from Pangaea and later formed North America and Eurasia (367)

lava magma that reaches the Earth's surface (117)

lava plateau raised, flat-topped area made of layers of hardened lava (181)

law of crosscutting relationships principle that a fault or intrusion is always younger than the rock layers it cuts through (326)

law of gravitation principle that the force of attraction between two objects depends on the masses and the distance between the objects (28)

GLOSSARY

law of superposition principle that a sedimentary rock layer is older than the layers above it and younger than the layers below it (324)

leaching process in which water carries dissolved minerals to lower layers of rock (221)

leap year year with an extra day in it, occurring every four years (628)

legend list of map symbols and their meanings (48)

light-year distance that light travels in one year, about 9.5 trillion km (550)

lignite brown coal (199)

liquid physical form of matter with a definite volume but no definite shape (145)

lithosphere thin outer shell of the Earth consisting of the crust and the rigid upper mantle (72)

lode deposit formed by thick mineral veins (195)

loess thick, yellowish deposit of windblown dust (301)

longitude angular distance east or west of the prime meridian (44)

long-period comet comet with a period of several thousand or million years (608)

lunar eclipse passing of the Earth between the moon and the Sun during which the Earth's shadow crosses the lighted half of the moon (624)

luster light reflected from the surface of a mineral (164)

M

mafic lava dark-colored lava rich in magnesium and iron (120)

magma liquid rock produced deep inside the Earth (117)

magnetic declination angle between the direction of the Earth's geographic pole and the direction in which a compass needle points (45)

magnetosphere a region of space that is affected by the Earth's magnetic field (26)

magnitude a measure of the energy released by an earthquake; described as the amount of ground motion (104)

main-sequence star star with characteristics that place it within a band running through the middle of the H-R diagram (554)

mantle zone of rock below the Earth's crust (24)

GLOSSARY

map projection flat map that represents a three-dimensional curved surface (46)

maria (sing: mare) dark areas of smooth, dry, solidified lava on the moon that reflect little light (616)

marine west-coast climate wet middle-latitude climate that occurs in western coastal areas located between 40° and 60° latitude, with relatively cool summers and mild winters (533)

maritime polar describing a cold, moist air mass that is formed over the ocean in polar areas (500)

maritime tropical describing a warm, moist air mass that is formed over the ocean in tropical areas (500)

mass movement movement of rock fragments down a slope (233)

mass number sum of the numbers of protons and neutrons in an atom (141)

matter substance that takes up space and has mass (139)

mean sea level point midway between the highest and lowest tide levels of the ocean (50)

meander wide curve in a stream channel (251)

measurement comparison of a property of an object or phenomenon with a standard unit (9)

mechanical weathering process that changes the physical form of rocks (219)

medial moraine ridge of unsorted glacial material along the center of a valley glacier (285)

Mediterranean climate middle-latitude climate that occurs in coastal areas located between 30° and 40° latitude, with dry summers and wet winters (533)

meltwater melted ice flowing from a glacier (285)

Mercalli scale scale that expresses the intensity of an earthquake with a Roman numeral and a description (104)

Mercator projection map projection in which the meridians appear as straight, parallel, evenly spaced lines and form a grid with the parallels, which appear as straight, parallel, and unevenly spaced lines (47)

meridian semicircle on the Earth that runs from pole to pole (43)

mesa elevated, flat-topped area smaller than a plateau (237)

mesopause upper boundary of the mesosphere, marked by an increase in temperature (461)

GLOSSARY

mesosphere coldest layer of the atmosphere that extends upward from the stratosphere to an altitude of about 80 km (461)

Mesozoic Era geologic era that lasted from 248 million to 65 million years ago; the Age of Reptiles (346)

metamorphic rock rock formed from other rocks as a result of intense heat, pressure, or chemical processes (176)

metamorphism changing of one type of rock to another by heat, pressure, and chemical processes (187)

meteor a bright streak of light caused when a meteoroid burns up in the Earth's atmosphere (608)

meteor shower phenomenon caused by the burning up of large numbers of meteoroids as they enter the Earth's atmosphere (608)

meteorite meteoroid or part of a meteoroid left after it hits the Earth's surface (609)

meteoroid small bit of rock or metal moving through the solar system left by a comet or produced by a collision between asteroids (608)

meteorology study of the Earth's atmosphere (5)

microquake earthquake with a magnitude less than 2.5 on the Richter scale (104)

Mid-Atlantic Ridge undersea mountain range with a steep, narrow valley along its center (68)

middle-latitude climates climates with a maximum average temperature of 18°C in the coldest month and a minimum average temperature of 10°C in the warmest month (529)

middle-latitude desert climate middle-latitude climate that is very dry, with both a cold winter and a warm to very hot summer (533)

middle-latitude steppe climate middle-latitude climate with slightly more precipitation than a middle-latitude desert climate and a high yearly temperature range (533)

mid-ocean ridges system of undersea mountain ranges that wind around the Earth (68)

Milankovitch theory theory that small, regular changes in the Earth's orbit and in the tilt of the Earth's axis caused the ice ages (290)

mineral natural inorganic, crystalline solid found in the Earth's crust (157)

mineralogist scientist who specializes in the study of minerals (163)

GLOSSARY

mistral strong, cold, northern wind that blows down the Alps toward the Mediterranean Sea (528)

mixture material that contains two or more substances that are not chemically combined (151)

Moho the Mohorovičić discontinuity, boundary between the Earth's crust and mantle (24)

Mohs hardness scale standard against which the hardness of a mineral is tested (165)

molecule smallest complete unit of a compound (147)

monadnock knob of rock that protrudes above a peneplain (236)

monocline a fold in rock layers in which both limbs remain horizontal (85)

monsoon seasonal wind that blows toward the land in summer, bringing heavy rains, and away from the land in the winter, bringing dry weather (527)

month time required for the moon to go through one set of phases as it orbits the Earth, about 29.5 days (627)

moon body that is smaller than a planet and orbits the planet (580)

mountain belt group of large mountain systems (88)

mountain range group of adjacent mountains with the same general shape and structure (88)

mountain system group of adjacent mountain ranges (88)

Muav Limestone rock layer of the Grand Canyon deposited during the Cambrian Period (374)

mud fine particles of rock combined with water (401)

mud pot weathered rock around a hot spring that mixes with the hot water to form liquid clay that bubbles at the surface (268)

mudflow rapidly moving large mass of mud (233)

mummification preservation of a dead organism by drying (335)

N

natural bridge arch of rock formed by groundwater erosion (271)

natural levee raised riverbank that results when a river deposits its load at the river's edges (254)

GLOSSARY

neap tide tide with minimum daily tidal range that occurs during the first and third quarters of the moon (440)

nebula dark cloud of gas and dust in space; first stage in the development of a star (555)

nebular theory theory that the Sun and the planets condensed out of a spinning cloud of gas and dust (580)

nekton forms of ocean life that swim, such as fish, dolphins, and squid (415)

neritic zone pelagic environment above the sublittoral zone filled with marine life (415)

neutron subatomic particle with no electrical charge (141)

neutron star collapsed core of a supernova consisting of a small, extremely dense ball of neutrons (559)

new moon phase of the moon during which the side of the moon facing the Earth is unlighted (626)

nitrogen cycle process in which nitrogen moves from the air to the soil to animals and back to the air (457)

nodule lump of minerals on the ocean floor (401)

nonconformity unconformity in which stratified rock rests on unstratified rock (325)

nonfoliated describing a metamorphic rock without parallel bands (187)

nonrenewable resource substance of limited supply that cannot be replaced (195)

nonsilicate mineral mineral that does not contain silicon (158)

normal fault fault in which the hanging wall moves down relative to the footwall (86)

nova white dwarf star that explodes as it cools, temporarily becoming thousands of times brighter (559)

nuclear fission splitting of the nucleus of a large atom into smaller nuclei (202)

nuclear fusion combination of the nuclei of small atoms to form a larger nucleus (203)

nucleus region in the center of an atom that contains the protons and neutrons (141)

GLOSSARY

O

observation act of using the senses to gather information (9)

occluded front boundary formed where a fast-moving cold air mass overtakes and lifts a warm air mass, completely cutting it off from the ground (503)

ocean floor continental crust and oceanic crust that lie beneath the ocean (390)

ocean trench deep valley in the ocean floor that forms along a subduction zone (73)

oceanic crust material that makes up the ocean floor (72)

oceanic zone pelagic environment that extends seaward beyond the continental shelf (416)

oceanography study of the Earth's oceans (5)

Oort cloud spherical cloud of dust and ice surrounding the solar system that may contain as many as a trillion comets (608)

ooze soft organic sediment on the ocean floor (401)

open cluster loosely shaped group of hundreds of stars (564)

orbit period time required for a planet to make one revolution around the Sun (593)

ordinary spring natural flow of groundwater to the Earth's surface (266)

ordinary well hole dug below the water table that fills with groundwater (266)

ore deposit of minerals from which metals and nonmetals can be profitably removed (195)

organic sedimentary rock rock formed from the remains of organisms (182)

outcrop area of exposed rock (374)

outwash plain deposit of stratified drift in front of a glacier (286)

oxbow lake water remaining in an isolated meander in a floodplain (251)

oxidation chemical combination of metallic elements with oxygen (222)

ozone form of atmospheric oxygen that has three atoms per molecule (455)

GLOSSARY**P**

P wave primary wave; the fastest wave generated by an earthquake and the first to be recorded by a seismograph (103)

Pacific Ring of Fire major earthquake zone that forms a ring around the Pacific Ocean (100)

pack ice floating layer of sea ice that completely covers an area of the ocean surface (410)

pahoehoe solidified mafic lava with a wrinkled surface (120)

paleontologist scientist who studies fossils (334)

paleontology study of fossils (334)

Paleozoic Era geologic era that followed Precambrian time, lasting from 540 million to 248 million years ago (346)

Pangaea single landmass thought to have been the origin of all continents (67)

Panthalassa giant ocean surrounding Pangaea (67)

parallax method of determining the distance from the Earth to a star based on the shift in the apparent position of the star when viewed from different angles (550)

parallel any circle that runs east and west around the Earth parallel to the equator (43)

peat brownish-black material produced by partial decomposition of plant remains (198)

pelagic environment major division of ocean environment that includes the two water zones: neritic and oceanic (415)

peneplain low, almost level surface of a mountain in its old stage (236)

penumbra outer part of the shadow cast by the Earth or the moon in which sunlight is only partially blocked (623)

perched water table secondary water table formed by a layer of impermeable rock above the main water table (264)

perigee point in the orbit of a satellite at which it is closest to the Earth (621)

perihelion point in the orbit of a planet at which it is closest to the Sun (29)

period subdivision of a geologic era (346)

periodic table system for classifying the elements (141)

permeability the ease with which water flows through the open spaces in a rock or sediment (262)

GLOSSARY

- petrification** process in which organic materials are replaced by new materials (335)
- petrochemical** chemical derived from petroleum (200)
- phase** varying shape of the visible portion of the moon (626)
- phosphorescence** ability to glow during and after exposure to ultraviolet light (168)
- photosphere** innermost layer of the solar atmosphere; light sphere (574)
- physical property** characteristic that is observable in a substance without changing the chemical composition of the substance (139)
- phytoplankton** microscopic ocean plants (414)
- pillow lava** lava that flows out of fissures on the ocean floor and cools rapidly in rounded shapes (120)
- placer deposit** fragments of native metals that are concentrated in layers at the bottom of a stream bed (196)
- planet** any one of the nine major bodies that orbit the Sun (580)
- planetary nebula** expanding shell of gases shed by a dying star (558)
- planetesimal** small body of matter that formed in the outer regions of the solar nebula while the Sun was forming in its center (580)
- plankton** free-floating, microscopic ocean plants and animals (414)
- plate tectonics** theory that the lithosphere is made up of plates that float on the asthenosphere and that the plates possibly are moved by convection currents (72)
- plateau** large area of flat-topped rocks high above sea level (91)
- polar climates** climates with a maximum average monthly temperature of 10° C (529)
- polar easterlies** weak global winds located north of 65° north latitude and south of 65° south latitude that flow away from the poles (472)
- polar front** boundary at which cold polar air meets the warmer air of the middle latitudes (503)
- polar orbit** orbit that passes over the Earth's North and South poles (35)
- pollution** contamination of the environment with waste products or impurities (8)
- polyconic projection** map made by fitting together a series of conic projections of adjoining areas (48)

GLOSSARY

porosity percentage of open spaces in a rock or sediment (261)

porphyritic describing an igneous rock composed of both large and small crystals (178)

Precambrian time earliest and longest geologic era, lasting from 4.6 billion to 540 million years ago (346)

precession slow circular motion of the Earth's axis as it turns in space that traces a circle in space every 26 thousand years (32)

precipitation process by which water falls from clouds to the earth as rain, snow, sleet, and hail (244)

prime meridian the meridian that passes through Greenwich, England, designated as 0° (44)

principle of uniformitarianism theory that geologic processes at work in the present were also at work in the past (323)

prominence cloud of glowing gases that arches high above the Sun's surface (577)

proton subatomic particle with a positive electrical charge (141)

protoplanet large body of matter that formed from the coalescence of planetesimals in the solar nebula (580)

protostar inside a nebula, the shrinking, spinning center region; the second stage in the development of a star (555)

psychrometer instrument used to measure relative humidity (480)

pulsar neutron star that emits two beams of radiation that sweep across space (560)

pyroclastic material the rock fragments ejected from a volcano (121)

Q

quasar starlike object that gives off radio waves and X rays (565)

R

radar device that can detect objects and weather conditions in the upper atmosphere by sending and receiving radio waves (511)

radiation fog condensation of water vapor that results from the cooling of air that is in contact with the ground (488)

GLOSSARY

- radiative zone** region surrounding the core of the Sun in which energy is transferred in the form of electromagnetic waves (574)
- rain gauge** instrument used to measure the amount of rainfall (493)
- ray** streak of displaced rock material radiating from a crater (616)
- red shift** apparent lengthening of the light waves emitted by a star moving away from the Earth (550)
- Redwall Limestone** rock layer of the Grand Canyon deposited during the Mississippian Period (374)
- refraction** bending of a light ray as it passes from one substance to another (168); *also* bending of a wave as it reaches shallow water (437)
- regional metamorphism** metamorphism that affects rocks over large areas during periods of tectonic activity (187)
- regolith** layer of weathered rock fragments covering much of the Earth's surface (227)
- rejuvenated** describing a river with a gradient that has been made steeper by a movement of the Earth's crust (251)
- relative age** age of an object compared with the ages of other objects (324)
- relative humidity** ratio of the amount of water vapor in the air to the amount of water vapor the air can hold when saturated (480)
- relief** difference in elevation between the highest and lowest points of an area (51)
- renewable resource** substance that can be replaced (195)
- retrograde motion** apparent periodic reversal in the motion of some planets as viewed from the Earth (591)
- reverse fault** fault in which the hanging wall moves up relative to the footwall (86)
- revolution** movement of a planet around the Sun (29)
- rift valley** steep, narrow valley formed as lithospheric plates separate (73)
- rille** long, deep channel that runs through the maria on the moon (616)
- rip current** swift movement of water caused by the return of water to the ocean through channels in underwater sand bars (437)
- roche moutonnée** rounded knob of rock produced by glacial erosion (283)
- rock cycle** series of processes in which rock changes from one type to another and back again (176)

GLOSSARY

rockfall fall of rock from a steep cliff (233)

rock-forming mineral any common mineral that forms the rocks of the Earth's crust (157)

rotation spinning of a planet on its axis (29)

runoff water that flows over the land into streams and rivers (243)

S

S wave secondary wave; a wave generated by an earthquake and the second to be recorded by a seismograph (103)

salinity number of grams of dissolved salt in 1 kg of ocean water (408)

saltation movement of sand by short jumps, caused by wind or water (249)

sand bar long ridge of sand deposited offshore (305)

satellite object in orbit around a body with a larger mass (35)

saturated describing air that contains all the water vapor it can hold at a specific temperature (480)

scale relationship between distance shown on a map and actual distance (49)

scientific law rule that correctly describes a natural phenomenon (14)

scientific methods organized, logical approaches to scientific research (9)

seafloor spreading movement of the ocean floor away from either side of a mid-ocean ridge (70)

seamount submerged volcanic mountains on the ocean floor that are at least 1,000 meters high (398)

sediment fragments that result from the breaking of rocks, minerals, and organic matter (175)

sedimentary rock rock formed from hardened deposits of sediment (175)

seismic gap zone of rock in which a fault is locked and unable to move and in which no major earthquake has occurred for a long period of time (110)

seismic wave vibration that travels through the Earth (23)

seismograph instrument used to detect and record seismic waves (103)

shadow zone location on the Earth's surface where no seismic waves or only P waves can be detected (25)

shearing stress that pushes rocks in opposite horizontal directions (84)

GLOSSARY

sheet erosion process in which parallel layers of topsoil are stripped away, exposing the surface of the underlying subsoil or partially weathered bedrock (232)

shield volcano has a cone of hardened lava that forms a broad base and gentle slopes (122)

shoreline place where the ocean and the land meet (302)

short-period comet comet with a period of up to 100 years (608)

silicate mineral mineral that contains atoms of silicon and oxygen (158)

siliceous ooze type of ooze that is mostly silicon dioxide (401)

silicon-oxygen tetrahedron four oxygen atoms arranged in a pyramid with one silicon atom in the center (161)

sill sheet of hardened magma that forms between and parallel to layers of rock (181)

sinkhole circular depression caused when the roof of a cavern collapses (270)

sleet ice pellets that form when rain falls through a layer of freezing air (489)

slump downhill movement of a large block of soil under the influence of gravity (234)

smog air pollution formed from a mixture of dust and chemicals (151)

snowfield almost motionless mass of permanent snow and ice (277)

snowline elevation above which ice and snow remain throughout the year (277)

soft water water that contains few dissolved minerals (269)

soil profile cross section of soil layers and bedrock (228)

solar collector device for capturing solar energy (204)

solar eclipse passing of the moon between the Earth and the Sun during which the shadow of the moon falls on the Earth (623)

solar flare sudden, violent eruption of electrically charged atomic particles from the Sun's surface (578)

solar nebula cloud of gas and dust that developed into the solar system (580)

solar system the Sun and the bodies that revolve around it (580)

solar wind electrically charged atomic particles that stream out into space through holes in the Sun's corona (575)

GLOSSARY

solar year time required for the Earth to make one orbit around the Sun, about 365.24 days (627)

solid physical form of matter with a definite shape and volume (145)

solifluction slow downslope flow of wet, muddy topsoil over frozen or clay-rich subsoil (235)

solution mixture in which one substance is uniformly dispersed in another substance (151)

sonar acronym for sound navigation and ranging, method of mapping the ocean floor using reflected sound waves (391)

sorting uniformity in the size of the particles of a rock or sediment (261)

specific heat amount of heat needed to raise the temperature of 1g of a substance 1° C (526)

specific humidity actual amount of moisture in the air (483)

spectroscope instrument that splits white light into a band of colors (15)

spectrum band of the various colors of light (14)

spiral galaxy type of galaxy with a nucleus of bright stars and flattened arms that swirl around the nucleus (563)

spit long, narrow deposit of sand connected at one end to the shore (306)

spring tide tide with maximum daily tidal range that occurs during the new and full moons (440)

squall line long line of heavy thunderstorms that may occur just ahead of a fast-moving cold front (502)

stalactite cone-shaped calcite deposit suspended from the ceiling of a cavern (270)

stalagmite an upward-pointing, cone-shaped calcite deposit built up from the floor of a cavern (271)

standard atmospheric pressure the atmospheric pressure measured at sea level; 760 mm of mercury (459)

standard time zone one of 24 regions of the Earth in which noon is set as the time when the Sun is highest over the center of the region (33)

star body of gases that gives off a tremendous amount of radiant energy in the form of light and heat (547)

station model cluster of weather symbols plotted on a map indicating the weather conditions at a particular reporting station (512)

GLOSSARY

- stationary front** boundary formed where two air masses meet and neither is displaced (503)
- steam fog** condensation of water vapor that results when cool air moves over warm water (488)
- stock** igneous intrusion with an area less than 100 square kilometers (181)
- stony meteorite** most common type of meteorite, similar in composition to rocks found on the surface of the Earth (609)
- stony-iron meteorite** rare type of meteorite that contains both iron and stone (609)
- strain** change in shape and volume of rocks that occurs due to stress (84)
- stratification** layering of sedimentary rock (185)
- stratified drift** glacial deposit that has been sorted and layered by the action of streams or meltwater (285)
- stratopause** high-temperature zone that marks the upper boundary of the stratosphere (460)
- stratosphere** layer of the atmosphere that extends upward from the troposphere to an altitude of 50 km; contains most atmospheric ozone (460)
- stratovolcano** also called *composite volcano*, steep-sloped volcanic deposit with alternating layers of hardened lava flows and pyroclastic material (123)
- stratus cloud** cloud with a sheetlike or layered form that is the lowest cloud in the sky (486)
- streak** color of a mineral in powder form (164)
- stream load** sediments carried by a stream (249)
- stream piracy** capture of a stream in one watershed by a stream in another watershed (247)
- stress** the amount of force per unit area that is placed on a given material (84)
- strike-slip fault** fault in which the rock on either side of a fault plane slides horizontally (87)
- subarctic climate** type of polar climate that occurs in areas between 55° and 65° north latitude, with little precipitation and a large yearly temperature range (532)
- subduction zone** region where one lithospheric plate moves under another (73)
- sublimation** process in which a solid changes directly into a gas, or a gas changes directly into a solid (479)

GLOSSARY

sublittoral zone shallow benthic environment that is continuously submerged and that contains the largest number of benthos (415)

submarine canyon deep valley in the continental slope and shelf (395)

submergent coastline coast along which sea level rises or the land sinks (308)

submersible underwater research vessel (390)

subpolar low belt of low air pressure at about 60° north and 60° south latitude (472)

summer solstice the beginning of summer (31)

sunspot cool, dark area of gas within the photosphere caused by powerful magnetic fields (576)

sunspot cycle periodic variation in the number of sunspots that occurs approximately every 11 years (577)

Supai Group rock layers of the Grand Canyon deposited during the Pennsylvanian Period (374)

supercooling process in which water droplets are induced to remain liquid at temperatures below 0° C (491)

supergiant extremely large, giant star (554)

supernova star that blows apart with a tremendous explosion (559)

surface current streamlike movement of water on or near the surface of the ocean (427)

surface wave the slowest moving seismic wave generated by an earthquake and the last to be recorded by a seismograph (103)

swell one of a group of long, rolling waves that are all the same size (434)

syncline downcurved fold in rock layers in which the youngest layer is in the center (85)

T

talus pile of rock fragments that accumulates at the base of a slope (233)

Tapeats Sandstone rock layer of the Grand Canyon deposited during the Cambrian Period (374)

temperature inversion atmospheric condition in which warm air traps cooler air near the Earth's surface (462)

GLOSSARY

temperature range difference between the highest and lowest temperatures of a particular time period (523)

tension stress that pulls rocks apart (84)

terminal moraine till deposited at the leading edge of a melting glacier (286)

terrane piece of land with a geologic history distinct from that of the surrounding land (76)

terrestrial planet any one of the four planets closest to the Sun—Mercury, Venus, Earth, and Mars—with properties similar to those of the Earth (594)

theory hypothesis or set of hypotheses supported by the results of experimentation and observation (14)

theory of evolution theory that organisms change over time and that new organisms are derived from ancestral types (347)

theory of microplate tectonics theory that continents are a patchwork of pieces of land that have individual geologic histories (76)

thermocline zone of rapid temperature change that begins just below the surface of the ocean (410)

thermograph instrument that measures temperature changes by recording the movement of the bar of a bimetal thermometer (509)

thermosphere the atmospheric layer above the mesosphere (461)

thrust fault type of reverse fault in which the fault plane is nearly horizontal rather than vertical (86)

thunderstorm storm accompanied by thunder, lightning, and strong winds (506)

tidal bore surge of water that rushes upstream in a river as the tide rises (443)

tidal current movement of water toward and away from the coast due to the rise and fall of the tides (443)

tidal flat muddy or sandy part of a lagoon that is visible at low tide (310)

tidal oscillation slow, rocking motion of ocean water that occurs as tidal bulges move around the Earth (442)

tidal range difference between the levels of the high and low tides at a specific location (440)

tide daily change in the level of the ocean surface (439)

till unsorted rock material deposited by a glacier (285)

tombolo ridge of sand that connects an island to the mainland (306)

GLOSSARY

topographic map map that shows the surface features of the Earth (50)

topography surface features of the Earth (50)

tornado whirling, funnel-shaped cyclone (507)

Toroweap Formation rock layers of the Grand Canyon deposited during the Permian Period (375)

trace fossil fossil trace left by an ancient organism, such as a track, footprint, boring, or burrow (336)

trade winds global winds flowing toward the equator between 30° and 0° latitude (470)

transform boundary boundary formed where two lithospheric plates slide past each other (74)

travertine form of calcite that is deposited in terraces around the mouths of hot springs (268)

trench deep valley in the ocean floor (395)

tributary feeder stream that flows into a main stream (247)

Trojan asteroid asteroid that orbits the Sun just ahead of or behind the planet Jupiter (607)

tropical climates climates with a minimum average monthly temperature of 18° C (529)

tropical desert climate dry, warm climate that occurs in regions about 20° to 30° north and south of the equator (529)

tropical rain forest climate warm, humid climate that occurs within 5° to 10° on either side of the equator (529)

tropical savanna climate tropical climate located between tropical rain forest and tropical desert climates, producing very wet summers and very dry winters (529)

tropopause upper boundary of the troposphere in which the temperature remains almost constant (460)

troposphere atmospheric layer closest to the Earth's surface where nearly all weather occurs (460)

trough lowest point between two wave crests (433)

true north direction of the geographic North Pole (45)

tsunami giant ocean wave that often occurs after a major earthquake with an epicenter on the ocean floor (106)

GLOSSARY

tundra climate polar climate that occurs in areas near the ocean at the latitude of the Arctic Circle, with a small yearly temperature range and very little precipitation (532)

turbidity current dense current that carries large amounts of sediment down the continental slopes (395)

typhoon hurricane that forms over the Pacific Ocean (505)

U

umbra inner, cone-shaped part of the shadow cast by the Earth or the moon in which sunlight is completely blocked (623)

unconformity break in the geologic record created when rock layers are removed by erosion (325)

undertow irregular current that pulls water from a beach back to the ocean (437)

upslope fog condensation of water vapor that results from the lifting and adiabatic cooling of air rising up a slope of land (488)

upwelling process in which surface water moves farther out into the ocean and deep water moves upward to replace the surface water (414)

V

valley glacier long, narrow, wedge-shaped mass of ice that usually moves through a mountain valley (278)

variable factor in an experiment that can be changed (12)

varve annual layer of sedimentary deposit on a lake bed (328)

vein narrow band of mineral deposits in rock (195)

vent opening through which molten rock flows onto the Earth's surface (117)

ventifact any stone smoothed by wind abrasion (298)

vernal equinox the beginning of spring (32)

vertebrate animal with a backbone (350)

Vishnu Schist the bottommost and oldest rock layer of the Grand Canyon (374)

volcanic ash pyroclastic particles between 0.25 mm and 2 mm in diameter (121)

GLOSSARY

volcanic block the largest possible pyroclastic material that is formed from solid rock blasted from a volcanic fissure (122)

volcanic bomb large, spindle-shaped clot of lava thrown out of a volcano (122)

volcanic dust pyroclastic particles less than 0.25 mm in diameter (121)

volcanic mountain mountain formed when molten rock erupts onto the Earth's surface (92)

volcanic neck solidified central vent of a volcano (181)

volcanism any activity that includes the movement of magma toward or onto the Earth's surface (117)

volcano lava and pyroclastic material built up on the Earth's surface around a vent (117)

W

waning describing the phase of the moon during which the size of its visible portion is decreasing (626)

warm front boundary formed where a warm air mass overtakes and rises over a cold air mass (502)

water budget gains and losses of water from a region (244)

water cycle continuous movement of water from the air to the Earth and back again (243)

water gap deep notch left where a stream erodes through a mountain as it is uplifted (249)

water table upper surface of the zone of saturation (263)

watershed land from which water runs off into a stream (247)

waterspout tornado that occurs over the ocean (508)

wave periodic up-and-down movement of water (433)

wave cyclone large storm that develops along cold or stationary fronts, with winds that spiral in toward a central region of low air pressure (503)

wave height vertical distance between the crest and the trough of a wave (433)

wave period time required for a complete wavelength to pass a given point (433)

GLOSSARY

wave-built terrace extension of a wave-cut terrace that results from deposition of eroded material offshore (303)

wave-cut terrace nearly level platform of rock left beneath the water after the erosion of a sea cliff (303)

wavelength distance between wave crests (14)

waxing describing the phase of the moon during which the size of its visible portion is increasing (626)

weather general condition of the atmosphere at a particular time and place (455)

weathering change in the physical form or chemical composition of rock materials exposed at the Earth's surface (219)

westerlies global winds located between 40° and 60° latitude that flow from the southwest in the Northern Hemisphere and from the northwest in the Southern Hemisphere (471)

white dwarf small, hot, dim star (554)

whitecap crest of a wave that is blown off by high winds (435)

wind gap water-eroded notch in a mountain through which water no longer flows (249)

wind vane instrument used to determine the direction of the wind (509)

winter solstice the beginning of winter (31)

Z

zone of aeration upper region of groundwater between the water table and the Earth's surface (263)

zone of saturation lower region of groundwater where all the pore spaces in a rock or sediment are filled with water (263)

zooplankton microscopic ocean animals (414)