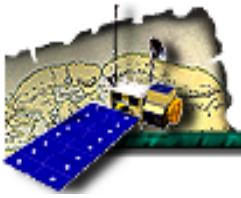

GLOSSARY

abiotic: not produced by organisms; not biologic.

acidity: a measure of the concentration of hydrogen ions in a solution. It is indicated by pH scale.

acoustic survey: survey technique that uses hydrophones to listen for sounds produced by whales.

acoustics: the science concerned with the production, control, transmission, reception, and effects of sound; or instruments and techniques that use sound for measurements.

active sensor: a sensor that produces energy and records the amount of energy that returns, *e.g*. radar is an active sensor. TOPEX/Poseidon actively generates radar pulses that bounce off the surface of the ocean.

aerobic: living or occurring only in the presence of oxygen.

albedo: a measure of how much electromagnetic energy is reflected from a surface. When applied to visible light, albedo gives a numerical indication of how bright an object is in reflected light. Low albedo objects reflect little light (*i.e.*, they are dark) and high albedo surfaces reflect a lot of light (*i.e.*, they are bright).

algae: simple plants, without a true stem, leaves, or roots; having an one-celled sex organ and possessing chlorophyll. Almost all seaweeds are algae.

alkaline: having the properties of alkali (a soluble salt obtained from the ashes of plants and consisting largely of potassium or sodium carbonate); having a pH of more than 7.

altimeter: an instrument that is used to measure altitude. The altimeters on TOPEX/Poseidon measure the distance between the spacecraft and ocean surface.

anaerobic: living, active, or occurring in the absence of free oxygen.

anomaly: the deviation from the norm or average.

aquifer: a water-bearing stratum of permeable rock, sand, or gravel.

artificial selection: in biology, the selective breeding of animals and plants by humans.

asteroid: any of the numerous rocky interplanetary objects in our solar system. They mainly lie between the orbits of Mars and Jupiter.

atmosphere: gaseous layer surrounding a planet; the whole mass of air surrounding Earth.

atmosphere (unit of pressure): force per unit area exerted by an atmospheric column (*i.e.*, the entire body of air above the specific area). It is known as air pressure or barometric pressure.

autotroph: living organism capable of producing its own energy resource.

backscatter: portion of microwave energy returned to a radar antenna to create a radar image.

baleen whale: member of the cetacean suborder *Mysticeti*, which comprises the right whales, gray whales, and rorquals. They have a horny material growing in comblike, fringed units from their upper jaw, which is their feeding structure.

barnacle: marine crustaceans with feathery appendages for gathering food that are free-swimming as larvae, fixed to rocks or floating objects as adults.

bathythermograph: (abbreviated BT) device for obtaining a record of temperature against depth (strictly speaking, pressure) in the ocean from a ship.

GLOSSARY

beam: the breadth or width of a ship.

benthic community: the area of the sea bottom; organisms inhabiting the sea bottom.

benthos: the collection of oranisms living on the sea floor.

bicarbonate compounds: chemicals that contain bicarbonate ions. The oceans act as a primary reservoir for calcium and carbonate. Bicarbonate ions (HCO_3^-) are the form in which most carbon dioxide (CO_2) is stored in ocean water. $CO_2 + H_2O$ (water) + $CaCO_3$ (Calcium carbonate) = Ca^{2+} (Calcium ion) + $2HCO_3^-$ (bicarbonate ions). Bicarbonate ions can combine with potassium, sodium, etc. to form bicarbonate compounds.

biodegradable: readily decomposable by bacterial action.

biogeography: biological study of the geographic distribution of animals and plants.

biological province: an environment or habitat for living organisms.

bioluminescence: the emission of light from living organisms.

biomass: amount of living matter per unit of water surface or volume expressed in weight units; the total weight of organisms in a particular habitat, species or group of species.

biosphere: transition zone between Earth and its atmosphere within which most terrestrial life is found; the outer portion of the geosphere and inner or lower portion of the atmosphere.

biotic: relating to life or specific life conditions.

boom: a barrier which can be used to contain ocean spills.

black smoker: a vent in a geologically active region of the sea floor from which issues superheated water laden with minerals (*e.g.*, sulfide precipitates).

bridle: in nautical terms, a span of chain, wire, or rope securable at both ends of an object and slung from its center point.

buffer: a substance capable in solution of neutralizing both acids and bases and thereby maintaining the original acidity or alkalinity of the solution; also, a solution containing such a substance.

buoyancy: 1) the tendency of an object to float or rise when submerged in a fluid. 2) the power of a fluid to exert an upward force on a body placed in it.

calcareous: composed chiefly of calcium carbonate.

calibration: the standardization of an instrument by determining the deviation from a known standard. Calibration is done to determine the type of adjustments needed for data taken by a certain instrument.

calorie: unit of energy defined as the amount of heat required to raise the temperature of 1 g of water 1ºC (1.8ºF). The term Calorie used in food packaging is actually 1 kilocalorie.

cape: a point or extension of land jutting out into water as a peninsula or as a projecting point.

carapace: a chitinous or bony shield covering the whole or part of the back of certain animals, such as crustaceans (*i.e.*, a turtle or crab).

carbohydrate: any group of chemical compounds that contain carbon, hydrogen, and oxygen only (the ratio of hydrogen to oxygen atoms is usually 2:1).

GLOSSARY

carbon dioxide (CO_2): a gas containing one atom of carbon and two atoms of oxygen. It is the fourth most abundant constituent of dry air. Over 99% of terrestrial CO_2 is found in the oceans.

carbon dioxide uptake: the process by which carbon dioxide is absorbed by the ocean. Carbon dioxide exists as a gas in the ocean and some of the gas is used by phytoplankton for growth. The carbon, in combination with other molecules enters the food chain and it is also deposited on the ocean floor as part of the sediments formed by micro-organisms.

carnivore: a flesh-eating animal.

cartilaginous fish: any fish that is a member of the class Chondrichthyes (or Selachii). They include the sharks, rays, skates, and chimaeras.

catalyst: chemical compound that accelerates or inhibits the rate of a chemical reaction without itself being consumed.

centimeter: 1/100 of a meter. Abbreviation: cm.

chemical energy: energy contained in the chemical bonds of molecules.

chemoluminescence: light generated as a by-product of chemical reactions.

chemosynthesis: the formation of organic compounds from inorganic substances using energy derived from oxidation. It is the process of combining water and carbon dioxide to make sugar by using the energy stored in chemicals, rather than in sunlight. Some bacteria practice chemosynthesis rather than photosynthesis.

chemotrophic: organisms that directly use chemicals as their only source of nutrition or energy. *E.g.*, the bacteria that lives near hydrothermal vents use hydrogen sulfide.

chlorofluorocarbons (CFCs): man-made substances used as coolant and computer-chip cleaner, which have been shown to destroy stratospheric ozone when they break down.

chlorophyll: group of green pigments active in photosynthesis.

chlorophyll fluorescence: chlorophyll gives off a red colored fluorescence when light is shined on it. Fluorometers are instruments which beam out light and measure the fluorescence. The measurement of fluorescence is used to calculate the amount of chlorophyll and phytoplankton.

circumnavigate: sail completely around Earth.

class: in biological classification, a group of closely related orders. Major subdivision of a biological phylum.

climate: the prevailing or normal pattern of weather at a place, or in a region, averaged over a long period of time; in contrast to weather, which is the state of the atmosphere at a particular time.

climate change: the long-term fluctuations in temperature, precipitation, wind, and other aspects of Earth's climate.

climatology: data that are averaged over a number of years or months. *E.g.*, a January climatology consists of average values for the available months of January.

coastal currents: currents paralleling the shore, seaward of the surf zone. These currents may be caused by tides or winds or by distributions of mass in coastal waters, associated with river discharges.

GLOSSARY

cocolithophore: tiny single-celled organism that makes a home from calcareous (*i.e.*, calcuim carbonate) disks or plates. When the organisms die, the little plates fall to the bottom of the sea, where they become part of the sediment. They are a major component of limestone.

cold-core eddy: a cold-core ring or eddy is a ring of seawater flowing counterclockwise around a cold, less saline (salty) mass of water. It is formed when a current (*e.g.*, the Gulf Stream) meanders and encircles a mass of colder water from elsewhere. A cold ring often can be tracked for months or years before it dissipates.

column: a cylindrical shaped object; a vertical section.

community: an integrated, mutually adjusted assemblage of plants and animals inhabiting a natural area. The assemblage may or may not be self-sufficient and is considered to be in a state of dynamic equilibrium. The community is usually characterized as having a definite species composition and may be defined by the habitat it occupies or by the species present.

concentration gradient: the direction and distance over which the concentration of a physical or chemical property changes. *E.g.*, as rivers flow into the ocean, the concentration gradient of salt increases from upstream to downriver to the ocean itself.

condensation: the conversion of water from the vapor to the liquid state. When it occurs, the energy required to vaporize the water is released. This is about 585 cal/g of water at 20°C (68°F).

condense: to make denser or more compact, especially to subject to condensation.

conduction: the transfer of heat within an object or between objects by molecular activity, without any net external motion.

consumer: an organism requiring complex organic compounds for food which it obtains by preying on other organisms or by eating particles of organic matter.

continental drift: term that describes the fact that landmasses or continents move over time. Continental drift is now known to be related to global plate tectonics.

continental shelf: a shallow submarine plain of varying width forming a border to continent or around an island, and typically extending from the low-water line to the depth at which the slope increases markedly.

contours: lines on a chart connecting points of equal value above or below a reference value; used to portray elevation, temperature, salinity, or other values.

convection: process by which, in a fluid being heated, the warmer part of the mass will rise and the cooler portions will sink. If the heat source is stationary, convection cells may develop as the rising warm fluid cools and sinks in regions on either side of the axis of rising.

convection current: the movement of air or liquid as a result of convection.

convergence: large horizontal flow of air or ocean currents toward a central region. In the case of ocean current, water is forced downward in the convergence zone, causing downwelling.

copepods: one of a subclass of tiny shrimp-like crustaceans, most species of which range between 0.5 and 10.0 mm in length. Copepods are found in the surface layers of temperate and subpolar waters in large concentrations.

GLOSSARY

Coriolis effect: apparent force acting on moving particles resulting from Earth's rotation. It causes moving particles to be deflected to the right in the Northern Hemisphere and to the left in the Southern Hemisphere; the deflection is proportional to the speed and latitude of the moving particle. Particle speed is unchanged by the apparent deflection.

covalent bonds: a chemical bond formed between atoms by the sharing of electrons.

cruise missile: type of low-flying strategic guided missile which operates within the atmosphere.

crustacean: any of a large class (*Crustacea*) of mostly aquatic arthropods that have a chitinous or calcareous and chitinous exoskeleton, a pair of often much modified appendages on each segment, and two pairs of antennae. *E.g.*, lobsters, shrimps, crabs, wood lice, water fleas, and barnacles.

CTD: sampling instrument that measures conductivity, temperature and depth of water.

current: a smooth and steady onward movement of a fluid (*i.e.*, liquid or gas). The part of any body of fluid that has a continuous onward movement.

current drifters: instruments on a floating platform that drift (*i.e.*, move over a fluid body such as the ocean) while collecting science data

cyclone: a weather system characterized by a relatively low surface air pressure compared with the surrounding air; same as a "low." Surface winds blow counterclockwise and spiral inward in the Northern Hemisphere.

decibels: a unit for expressing the relative intensity of sounds on a scale from zero for the average least perceptible sound to about 130 for the average pain level.

decomposer: any of various organisms (*e.g.*, many bacteria and fungi) that return constituents of organic substances to ecological cycles by feeding on and breaking down dead protoplasm.

deep ocean current: the movements of deep ocean water, caused by changes in the water's density resulting from changes in temperature and salinity.

deforestation: loss of forest. At least eleven million hectares of tropical forest are lost every year. Although the causes vary by region, one estimate indicates that slash-and-burn agriculture and scavenging for wood-fuel, often in the wake of commercial road-building, accounts worldwide for 40-50% of deforestation. Grazing accounts for 10%, commercial agriculture for 10-20%, forestry and plantations for 5-10%, and forest fires for 1-15%. The adverse effects of deforestation include the loss of habitat for countless animal and plant species, many as yet undiscovered by scientists; the destruction of the homes and livelihoods of native tribes; the denuding of mountain sides, providing an easy path for soils to wash away and rain to flood valleys below; and the addition of carbon dioxide to the atmosphere. Deforestation destroys what may be an important sink for excess CO_2 in the atmosphere, and the oxidation of organic matter releases CO_2 to the atmosphere, potentially adding to regional air pollution or global climate change.

dehydration: the process of removal of body fluid.

density: mass per unit volume of a substance. Usually expressed as grams per cubic centimeter. For ocean water with a salinity of 35‰ at 0°C, the density is 1.028 g/cm^3.

derive: to deduce from a specified source.

derived quantities: an amount that is calculated from initial measurements.

GLOSSARY

detritus: any loose material produced from disintegration of rocks or dead organic remains.

deuterium: an isotope of hydrogen; also known as "heavy water."

diatom: minute planktonic unicellular or colonial alga with skeleton made of silica.

dichotomous key: a key for identification of organisms based on a series of choices between two alternative characters.

diffusion: spread of particles such as atoms, molecules, and ions throughout a medium (water or air) so as to produce an even distribution of the particles in the medium. Particles move from a region of higher to one of lower concentration.

dihydrogen oxide: H_2O - This is what water is composed of.

disassociation (of water): the break-up of water molecule into hydrogen and oxygen.

dispersant: a substance for promoting the separation and scattering of one substance from another.

displacement: the volume or weight of a fluid (*e.g.*, water) displaced by a floating body (*e.g.*, a ship) of equal weight.

distinguishing characteristics: includes shape, size, coloration, and behavior that is used to identify plants and animals.

diurnal tides: tides that have the period of about 24 hours, *i.e.*, one high tide and one low tide a day.

divergence: large horizontal flow of air or ocean currents from a central region. In the case of ocean current, water is drawn upward in the convergence zone, creating upwelling.

downwelling: a vertical movement of ocean water where the movement is downward. It often occurs in the convergence zone or when the horizontal surface current meet the coast.

dredging: collecting samples of bottom sediment and life using a simple cylindrical or rectangular device; or removal of excess sediments in a river or shipping channel.

dynamics: a pattern or process of change, growth, or activity.

ecology: the relationships between organisms and their environment.

ecosystem: ecological unit including organisms and the non-living environment, each influencing the properties of other and both necessary for maintenance of life.

eddy: a current of any fluid forming on the side of or within a main current. It usually moves in a circular path and develops where currents encounter obstacles or flow past one another.

Ekman spiral: representation of currents resulting from a steady wind blowing across an ocean having unlimited depth and extent and uniform viscosity. The surface layer moves 45° to the right of the wind direction in the Northern Hemisphere. Water at successive depths drifts in directions more to the right until, at some depth, the water moves in a direction opposite to the wind. Speed decreases with depth throughout the spiral. The net water transport is 90° to the right of the wind in the Northern Hemisphere.

Ekman transport: the net movement of water 90° to the right of the wind in the Northern Hemisphere, and 90° to the left of the wind in the Southern Hemisphere.

GLOSSARY

El Niño: an oceanic condition where warm water, normally held near New Guinea and Indonesia, travels east to South America. This occurs when the normal easterly tradewinds slacken and allow the warm water to travel along the equator as Kelvin waves. The El Niño condition prevents the nutrient-rich cold water from upwelling off the coast of Peru, disrupts the food chain. Severe El Niño conditions can also affect the weather worldwide.

electromagnetic radiation: energy that travels as waves or particles with the speed of light. *E.g.*, the energy from the Sun's core migrates to the surface and is released in the form of electromagnetic radiation.

enzyme: any of the numerous proteins produced by living organisms and functioning as biochemical catalysts in living organisms.

epoch: a unit of geologic time. It is a subdivision of period.

equator: imaginary circle on Earth's surface that lies midway between the North and South poles and is the zero line of terrestrial latitude. It divides Earth into the Northern and Southern Hemispheres.

equatorial counter-current: eastward-flowing currents found between the north and south equatorial currents in all oceans, but particularly well developed in the Pacific Ocean.

equilibrium: a state of balance between opposing forces or actions. In the context of The Freezing Temperature of Salt Water activity, the temperature at which neither additional freezing or melting is occurring.

equinox: one of the two moments in the year when the Sun is exactly above the equator and day and night are of equal length.

estuarine: of, relating to, or occurring in an estuary.

estuary: The mouth of a river valley, or a bay or lagoon receiving fresh water, where it also mixes with seawater brought in by tides.

evaporating basins: basins located in coastal regions with relatively arid climates where heat from the Sun evaporates seawater to produce salts.

evaporation: the physical process of converting a liquid to a gas. Commonly considered to occur at a temperature below the boiling point of the liquid. Opposite of condensation.

evaporite deposits: salt deposits left behind by evaporation of saline water.

evolution: theory in biology that postulates that the various types of animals and plants have their origin in other pre-existing types and that the distinguishable differences are due to modifications in successive generations. The theory of evolution is one of the fundamental keystones of modern biological theory.

exponent: a symbol written above and to the right of a mathematical expression to indicate the operation of raising to a power.

external factors: from the perspective of Earth's climate, factors that affect climate from outside the ocean-atmosphere system. Examples include variation in the Sun's energy output, changes in Earth's orbit around the Sun, the movement of continental plates, or the eruption of volcanoes.

extinct: no longer existing.

GLOSSARY

family: in biological classification, a group of closely related genera. Major subdivision of a biological order.

fathom: a unit of water depth, 6 feet or 1.83 meters. It was originally derived from the distance between the hands of a large man with his arms outstretched. It is also sometimes used in expressing horizontal distances, in which case 120 fathoms make one cable, or very nearly 0.1 nautical mile.

fathometer: instrument used for a sonic (sound waves) depth finder.

feedback loop: a chain reaction where the result of an action results in modifying the action.

fetch: 1) area of the open ocean over which the wind blows with constant speed and direction, thereby creating a wave system. 2) The distance across the fetch (wave-generating area) measured in a direction parallel to the direction of the wind.

filter feeder: an animal, *i.e.*, clam, that obtains its food by filtering living and nonliving organic particles from the water.

fishery: the location or industry of taking fish or other sea organisms for human use.

fluorescence: emission of, or the property of emitting electromagnetic radiation usually as visible light, while incident radiation is being absorbed from some other source.

food chain: a sequence of organisms that are associated with each other by a simple feeding relationship in nature. In a food chain, each organism eats one other species, and it, in turn, is eaten by organisms of only one other species in the sequence.

food web: a sequence of organisms that are associated with each other by a feeding relationship in nature. In a food web, each organism eats many other species, and it is eaten by organisms of many other species. The combinations of all food chains in a given community or ecosystem.

forage: search for food, provisions.

fossil: a remnant, impression, or trace of an animal or plant of past geologic ages that has been preserved in Earth's crust.

fossil fuels: a fuel that is formed in Earth from plant or animal remains.

frequency (f): the number of waves that pass a fixed point in a given unit of time, usually one second.

g: a unit of acceleration based on the acceleration of falling bodies near Earth's surface. 1 g = 9.8 m/s^2 (32 ft/s^2).

galleon: general-purpose wooden sailing ship appearing in the 16th century, larger than the earlier carrack and caravel. The galleon featured a larger front and rear deck structure (forecastle and quarterdeck), and was rigged with a front spritsail, two main masts with several square sails each, and one or two lateen masts at the rear.

galley: oared Mediterranean ship, much larger and wider than the ancient trireme, and used by the Italian, French, and Turkish navies in the 15th and 16th centuries. More maneuverable than fully-rigged sailing ships, galleys were less effective in the more turbulent Atlantic due to their low freeboard.

genus: a class, kind, or group marked by common characteristics or by one common characteristic. Subdivision of a biological family.

GLOSSARY

geoid: the theoretical surface of Earth that coincides with mean sea level. It is everywhere perpendicular to the pull of gravity and approximates the shape of an oblate spheroid. Mathematically speaking, the geoid is an equipotential surface: that is, it is characterized by the fact that over its entire extent the potential function is constant.

geologic time scale: defines various time periods in Earth's history based upon plant and animal fossils from the stratigraphic record.

geostationary orbit: also called geosynchronous orbit. Orbit in which satellites have the same orbital period as that of Earth's. Thus they are always over the same region on Earth. Communication satellites and some weather satellites reside in geostationary orbits.

geostrophic: relating to, or arising from the deflective forces (Coriolis effect) caused by Earth's rotation.

gills: an organ on some aquatic animals (*e.g.*, fish) for obtaining oxygen from water.

glacier: a large mass of flowing ice formed on land by the recrystallization of old compacted snow. It flows from an area of accumulation to an area of wasting, where ice is removed from the glacier by melting or calving.

global climate: average long-term weather of Earth as a whole.

global conveyor belt: term which discribes an integrated system of surface and deep-ocean currents that move waters from the polar regions throughout the ocean and return them to polar regions where the deep-ocean water masses form.

global warming: increase in average global temperature. Some of the increases maybe the result of build-up of gases such as CO_2, $NO_{2,}$ and chlorofluorocarbons in the atmosphere as a result of industrialization.

glucose: a sugar that occurs widely in nature and is the usual form in which carbohydrate is assimilated by animals.

gradient: change in the value of a quantity (*e.g.*, temperature, pressure, or concentration) in a given direction.

graduated cylinder: a tall narrow container with a volume scale used esp. for measuring liquids.

gram: 1/1000 of a kilogram. Abbreviated g or gm.

gravimeter: a sensitive instrument for measuring variations in Earth's gravitational field.

gravimetric determination: a method of quantitative chemical analysis in which the constituent sought is converted into a substance (of known composition) that can be separated from the sample and weighed.

gravitational force: the force of attraction that exists between any two bodies in the universe that is proportional to the product of their masses and inversely proportional to the distance between the centers of their masses.

gravity: the gravitational force field of a planet or other celestial body at its surface. Earth's gravity produces an acceleration of 9.8 m/s^2 (32 ft/s^2) for any unsupported body.

grazer: organisms that feed on growing herbage, attached algae, or phytoplankton.

GLOSSARY

greenhouse: glass- or plastic-paned structure with a wood or metal frame. Temperature and humidity can be controlled for growing plants out of season.

greenhouse effect: the heating of Earth's atmosphere that results from the absorption of infrared radiation from Earth's surface by atmospheric gases such as water vapor and carbon dioxide.

greenhouse gas: atmospheric gas (water vapor, carbon dioxide, methane) that absorb energy radiated from Earth's surface.

Gulf Stream: a warm ocean current that flows from the Gulf of Mexico across the Atlantic to the European coast. The Gulf Stream is the western boundary current of the north Altantic's subtropical gyre. Its north Pacific counterpart is the Kuroshio Current that flows off Japan's east coast.

guyot: flat-topped seamount. A seamount is an undersea volcano taller than 1 km. Guyots originate as volcanic islands at the shallow crests of mid-oceanic ridges and rises. During and immediately after their formation, the islands are truncated by wave erosion. In some cases they are covered by coral reefs. As the lithosphere migrates away from the ridge and cools, the seafloor sinks, submerging the seamounts.

gyre: large circular flow of ocean water. Used mainly in reference to the circular motion of water in the major ocean basins centered in subtropical high-pressure regions.

H_2O: chemical formula of water.

habitable zone: an area that has an environment suitable for organisms to live.

Hadley cells: semi-closed system of vertical motions in the tropical atmosphere. Warm, moist air rises in equatorial regions, flows to mid-latitudes (30°N, 30°S), where it sinks, and returns along the surface to the equatorial zone as the trade winds.

heat capacity: amount of thermal energy required to raise the temperature of a substance by a given amount.

heat of vaporization: the thermal energy absorbed by a liquid at its boiling point as it changes to a gas.

heat sink: a body which can absorb thermal energy.

heat transfer: the passage of thermal energy from one substance to another, moving from warmer heat sources to cooler heat sinks.

hemisphere: one half of a sphere. The term is usually applied to regions north or south of the equator.

herbivore: an animal that consumes plants.

heterotroph: an organism that obtains organic and inorganic nutrients from other organisms, usually by eating the other organism.

heterotrophic: requiring complex organic compounds of nitrogen and carbon for metabolic synthesis.

homogeneous: a surface or a group of things that is the same. *E.g.*, a can of baked beans is usually homogeneous. It contains the same type of beans throughout the can.

hurricane: a tropical cyclone in which winds reach velocities above 120 km/h (73 mi/h). Generally applied to such storms in the north Atlantic ocean, eastern Pacific ocean, Caribbean sea, and Gulf of Mexico. Such storms in the western Pacific ocean are called typhoons.

GLOSSARY

hydrocarbons: organic compounds consisting solely of hydrogen and carbon. Petroleum is a mixture of many hydrocarbon compounds.

hydrogen bond: an intermolecular bond that forms within water because of the dipolar nature of water molecules.

hydrologic cycle: the cycle of water exchange among the atmosphere, land, and ocean through the processes of evaporation, precipitation, runoff, and subsurface percolation.

hydrometer: an instrument for determining the density and specific gravity of a liquid.

hydrosphere: water portion of Earth, as distinguished from the solid part and the gaseous outer atmosphere. It consists of liquid water in underground aquifers, rivers, lakes, and oceans, as well as ice in sea ice and continental ice sheets.

hydrothermal circulation: movement of water through crustal rocks caused by heating of water by recently formed volcanic rocks or cooling magma.

hydrothermal vents: on the ocean floor, these vents result from volcanic activity and movement of continental plates that create cracks in the seafloor. Surrounding these vents are biological communities which are supported by geothermal energy generated from hydrothermal vents, rather than by solar energy.

hydrowire: the cable that lowers an instrument such as a Van Dorn bottle into the water.

hypothesis: an assumption made to account for or relate known facts.

ice age: a period in geological time during which sheets of ice cover extensive parts of Earth.

in situ measurement: measurements taken at the source (*e.g.*, ocean measurements from ships and buoys).

infrared: see infrared radiation.

infrared radiation: the portion of the electromagnetic spectrum that extends from the long wavelength, or red, end of the visible-light range to the microwave range.

infrared sensor: a sensor that detects infrared radiation.

inorganic: being or composed of matter other than plant or animal.

insolation: the rate at which solar radiation is received per unit of surface area at any point at or above Earth's surface.

interglacial: the period between glacial ages.

internal factors: from the perspective of Earth's climate, factors that affect climate from inside the ocean-atmosphere system. Internal factors that lead to climate change are primarily changes in the abundance of greenhouse gases, *i.e.*, human industrial activity and the use of chlorofluorocarbons in aerosol sprays and refrigerants.

internal wave: a wave that develops below the surface of a fluid whose density changes with depth, either gradually or abruptly at an interface.

intertidal: the zone covered by the highest normal tides and exposed by the lowest normal tides; also, the water environment of tide pools within this region.

GLOSSARY

Intertropical Convergence Zone (ITCZ): zone where northeast trade winds and southeast trade winds converge. Average latitude of occurrence is about 5°N in the Pacific and Atlantic oceans and 7°S in the Indian ocean.

invertebrate: animal that lacks a vertebral column, or backbone. More than 90% of animals on Earth are invertebrates.

ions: positively or negatively charged atoms or molecules produced through loss or gain of one or more electrons.

ionosphere: the part of Earth's atmosphere beginning at an altitude of about 48 km (30 mi) and extending outward to 500 km (300 mi) or more. The ionoshpere contains a large quantity of positively and negatively charged particles or ions (a neutral plasma).

isobar: an imaginary line or a line on a map or chart connecting or marking places on Earth's surface where the height of the barometer reduced to sea level is the same either at a given time or for a certain period. In other words, isobars connect all points of equal or constant pressure.

isotopes: any of two or more species of atoms of a chemical element with the same atomic number and position in the periodic table and nearly identical chemical behavior but with differing atomic mass or mass number and different physical properties.

jet stream: a narrow band of easterly moving air mass at an elevation of about 10 km (6.2 mi). Moving at speeds that can exceed 300 km/h (186 mi/h), the jet stream follows a wavy path in the mid-latitudes and influences how far polar air masses may extend into the lower latitudes.

jetty: a structure extended into a sea, lake, or river to influence the current or tide or to protect a harbor.

Kelvin wave: a type of large internal wave. They travel eastward along the equator at relatively high speeds. An example of a Kelvin wave is the movement of warm water along the equator from near New Guinea to near Peru at the onset of El Niño.

kilogram: metric unit of mass equivalent to 2.2 pounds. Abbreviation: kg. The standard kilogram is retained in a vault in the International Bureau of Weights and Measure near Paris.

kinetic energy: energy of motion. It increases as the mass or velocity of the object in motion increases.

kingdom: in biological classification, a broad division of organisms according to fundamental body type.

knot: unit of speed equal to 1 nautical mile per hour (approximately 51 cm/s).

land reclamation: process whereby shallow coastal waters are converted into solid land through filling of sediments. The reclaimed land can then be developed for agriculture, housing, or other uses.

larva: an embryo that is on its own before it assumes the characteristics of the adults of the species.

latent heat: energy stored when water evaporates into vapor or ice melts into liquid. It is released as thermal energy when vapor condenses or water freezes.

latent heat of fusion: the amount of thermal energy associated with freezing of a liquid or melting of a solid.

latent heat of vaporization: the amount of thermal energy associated with vaporizing a liquid or a solid, or condensing a vapor.

GLOSSARY

latitude: location on Earth's surface based on angular distance north or south of the equator. Equator, 0°; North Pole, 90°N; South Pole, 90°S.

light meter: instrument which can measure light levels in the ocean, similar to light meters commonly used in cameras.

lithosphere: the outer layer of Earth's structure, including the crust and the upper mantle to a maximum depth of about 200 km (124 miles). It is this layer that breaks into the plates that are the major elements of global plate tectonics.

litmus paper: paper colored with litmus (a coloring matter that turns red in acid solutions and blue in alkaline solutions) and used as an acid-based indicator.

litter: things lying about in disorder, especially bits of rubbish.

local climate: long-term weather in a specific geographic region.

local current velocity: a measure of the speed and direction of surface air or water flow in a specific region.

longshore current: ocean flow that runs roughly parallel to the shoreline and is produced by breaking waves. The amount of material a longshore current carries depends on its velocity and particle size of the material. However, obstructions that cut across the current's path will slow its velocity and lessen its carrying power.

luciferase: an enzyme that catalyzes the oxidation of luciferin.

luciferin: a pigment in luminescent organisms (*e.g.*, fireflies) that furnishes practically heatless light in undergoing oxidation.

luminescence: an emission of light by processes that derive energy from essentially non-thermal sources. Sources of luminescence include chemical or physiological (as in the firefly), friction or electrical actions.

lunar day: the time interval between two successive transits of the moon over a meridian, approximately 24 hours and 50 minutes of solar time.

macroscopic: large enough to be viewed with the unaided eye.

magma: molten rock material within Earth from which an igneous rock results by solidification or cooling. When extruded it is called lava.

magnetic compass: device used to determine one's direction with respect to Earth's magnetic North Pole.

man-of-war: 1) combatant war ship of a navy during the sailing era. The larger men-of-war have 3 gun decks and over 100 guns. 2) Portuguese man-of-war (genus *Physalia*), any of various invertebrate, jellylike marine animals of the class Hydrozoa (phylum Cnidaria) noted for their floating habit and powerful sting.

manometer: an instrument for measuring the pressure of gases and vapors.

mantle: the zone between Earth's core and crust, from about 40 km to 2,900 km depth. The mantle convects slowly over geologic time.

GLOSSARY

mathematical models: any set of formulae or equations that describe the behavior of a physical system in purely mathematical terms.

maximum sustainable yield: the net tonnage of fish that can be taken from the ocean without causing the population of the species, as measured from year to year, to drop.

mean: the average.

medusa (**pl. medusae**): one of two principal body types occurring in members of the invertebrate animal phylum Cnidaria. It is the typical form of the jellyfish.

meridional overturning: a process where currents move water up or down at a particular latitude due to forcing from winds and Earth's rotational effects

messenger: 1) a substance (as a hormone) that mediates a biological effect. 2) the device at the bottom of a Van dorn bottle which seals the tube at the desired sample depth.

metabolic: of, relating to, or exhibiting the complex of chemical and physical processes involved in maintaining life.

metabolic process: chemical changes in living cells by which energy is provided for vital processes and activities and new material is assimilated.

metabolism: a general term referring to all physical and chemical processes that occur in a living organism.

meter: metric unit of length equivalent to 3.28 feet. Abbreviation: m. Originally designed to be one-ten millionth the distance from Earth's equator to a pole, it is now defined as a precise number of wavelengths of one particular frequency of light, 1,650,763.72 wavelengths of ^{86}Kr orange-red radiation.

mid-ocean ridge: continuous submarine mountain chain extending approximately 80,000 km (50,000 miles) through all the world's oceans. Ridges separate the oceans into distinct basins and may or may not be seismicly active. They mark the boundaries of tectonic plates where the plates are splitting apart and new material added.

migration: movement of an animal population to and from a given area.

millimeter: 1/1,000 of a meter. Abbreviation: mm.

missile: self-propelled flying weapon, powered by rocket, ramjet, or turbojet.

mixed tides: tides that can have both diurnal (one high and one low tide per day) and semidiurnal (two highs and two lows a day) oscillations.

model: system of data, inferences, and relationships, presented as a description of a process or entity.

monsoon: a name for seasonal winds derived from the Arabic word for season, mausim. The term was originally applied to winds over the Arabian Sea that blow from the southwest during summer and the northeast during winter, subsequently extended to similar seasonal winds in other parts of the world.

mutation: an alteration in the genetic material of a cell that is transmitted to the cell's offspring. Mutation may be spontaneous (the result of accidents in the replication of genetic material) or induced by external factors (*e.g.*, electromagnetic radiation and certain chemicals).

GLOSSARY

NSCAT: NASA Scatterometer. This satellite instrument sent pulses of microwave radiation toward the sea surface and measured the scatter patterns of the reflected signal. From these patterns, the instrument provided information about wind speed and direction over our oceans.

Nansen bottle: device used by oceanographers to obtain subsurface samples of seawater.

natural selection: the natural process that results in the survival of individuals or groups best adjusted to the conditions under which they live. It is equally important for the perpetuation of desirable genetic qualities and for the elimination of undesirable ones produced by genic recombination or mutation.

neap tide: lowest range of the tide, occurring near the times of the first and last quarters of the Moon, about every 2 weeks.

nekton: organisms in the ocean that actively swim; opposed plankton that generally float along ocean currents.

neritic division: portion of the pelagic province extending from low-water level to the approximate edge of a continental shelf. (Some writers have used this term to describe bottom organisms of a continental shelf.)

nonlinear: a process that does not follow an expected straight path. In math and science, non-linearity has two important features: 1) a small change in the initial condition may produce a disproportionately large change in response and 2) the response is not a simple combination of the inputs.

Northern Hemisphere: the part of Earth north of the Equator.

nuclear fission: subdivision of a heavy atomic nucleus, such as that of uranium or plutonium, into two fragments of roughly equal mass. This process requires the release of a large amount of energy.

nuclear fusion: process by which nuclear reactions between light elements form heavier ones. When the interacting nuclei have low atomic numbers, substantial energy is released in the process.

nuclei: the positively charged central portion of an atom that comprises nearly all of the atomic mass, and which is made up of protons and neutrons.

nutrients: in the ocean, any one of a number of inorganic or organic compounds or ions used primarily in the nutrition of primary producers. Nitrogen and phosphorus compounds are essential nutrients. Silicates are essential to diatoms. Vitamins such as B_{12} are essential to many algae.

obliquity: deviation from parallel or perpendicular. For example, the angle of obliquity between Earth's equator and the plane in which Earth orbits the Sun has a value of about 23°27'.

ocean circulation pattern: the pattern of global ocean currents.

ocean communities: a group of organisms living in a common environment within the ocean.

ocean currents: ocean waters that flow steadily in a certain direction.

ocean floor topography: the hills and valleys of the ocean floor. Maps of the ocean floor topography are called bathymetric maps.

ocean front: interface in the ocean that separates two very differenct types of water. Often water on one side is cold and the other warm. Sometimes the waters differ in salinity or plankton concentration. This interface extends hundreds, sometimes 1,000 - 2,000 meters in depth.

GLOSSARY

ocean topography: the difference between the sea-surface height and the ocean geoid.

oceanic division: marine environment not in close proximity to continental land masses.

offshore winds: winds that blow from land to the sea.

omnivore: an organism that consumes both plant and animal material.

onshore winds: winds that blow from the ocean to land.

open-ocean currents: currents in the open ocean, outside the coastal ocean.

orbit: 1) the path a body makes revolving around an attracting center of mass, as a planet around the Sun. 2) in water waves, the path of a water particle affected by wave motion. In deep-water waves the orbit is nearly circular, and in shallow-water waves the orbit is nearly elliptical. In general, the orbits are slightly open in the direction of wave motion, giving rise to mass transport.

orbit eccentricity: a measure of the circularity of a orbit. A perfectly circular orbit has zero eccentricity. A highly elliptical orbit has a high eccentricity.

orbit parameters: parameters that determine a specific orbit, *e.g.*, the tilt of the orbit plane and orbit eccentricity.

order: in biological classification, a group of closely related families. Major subdivision of a biological class.

organic: relating to, or derived from living organisms.

osmosis: the movement of water across a semipermeable membrane separating two solutions of differing concentrations. Water moves from the more dilute solution to the more concentrated. The spontaneous seepage of water through a membrane, from the side that is fresher to the side that is saltier.

osmotic pressure: the pressure that develops by or is associated with osmosis and is dependent on molar concentration and absolute temperature.

over-fishing: capturing so many members of a given species of fish that its ability to maintain its natural population is compromised.

oxidation-reduction reaction: the chemical process in which electrons are transferred from one chemical species to another. Whenever oxidation reaction occurs, reduction reaction occurs simultaneously and in an equivalent amount.

ozone (O_3): a form of oxygen which has three atoms instead of the usual two. In the troposphere, ozone is a pollutant. In the stratosphere, ozone filters out harmful ultraviolet radiation.

ozone layer: the portion of the stratosphere where most of Earth's ozone occurs.

parameter: any set of physical properties whose values determine the characteristics or behavior of something (*e.g.*, parameters of the atmosphere include temperature, pressure, and density).

particulates: very small, suspended pieces of solid or liquid matter such as particles of soot, dust, fumes, mists or aerosols.

passive sensor: instrument such as a camera, which measures radiation naturally emitted from a surface.

GLOSSARY

pelagic ocean community: the organisms that live in the water environment of the ocean, *i.e.*, plankton and nekton.

perigee: the point on the orbit of a satellite that is nearest to the body it's orbiting around. (Ant. apogee)

period: time interval for a wave to pass a point; usually measured from crest to successive crest.

pH: measure of the hydrogen-ion concentration in a solution. Measures both acidity and alkalinity on a scale from 0 to 14, with 7 representing neutrality, numbers less than 7 increasing acidity, and numbers greater than 7 increasing alkalinity.

photic zone: the surface layer of the ocean that receives sunlight.

phosphorescence: persistent emission of light following exposure to and removal of incident radiation.

photosynthesis: the manufacture of carbohydrate food from carbon dioxide and water in the presence of chlorophyll, using light energy and releasing oxygen.

phylum (**pl. phyla**): in biological classification, a group of closely related classes. Major subdivision of a biological kingdom.

phytoplankton: plant plankton. They are the basic synthesizers of organic matter (by photosynthesis) in the ocean.

pigment: a substance that imparts a characteristic color to plant or animal tissue.

planetary wave: type of wave that differs from gravity waves (*e.g.*, ripples in a pond or surfs at the beach) in that it has much longer wavelength (several miles between crests) and is much slower (taking weeks or months to travel crest to crest). Both gravity and planetary waves are found in the ocean and atmosphere.

plankton: the mostly microscopic organisms that are free-floating or drifting in the open water of the oceans having their lateral and vertical movements determined by water motion.

plankton bloom: a very high concentration of phytoplanktons resulting from a rapid rate of reproduction as conditions become favorable.

plastic: polymeric materials that have the capability of being molded or shaped, usually by the application of heat and pressure.

plate tectonics: the theory that deals with the dynamics of Earth's outer shell, the lithosphere. The lithosphere consists of about a dozen large plates and several small ones. These plates move relative to each other and interact at their boundaries, and are thought to be responsible for most of the seismic and volcanic activity on Earth.

polar ice cap: perennial cover of ice and snow over an extensive portion of Earth's land surface. The most important of the existing ice caps are those on Antarctica and Greenland.

polar molecule: distribution of electrons in a molecule such that it behaves as if it has a negative side and a positive side.

polar-orbiters: satellites that orbit over Earth's poles.

pollution: contamination of an environment with man-made waste.

GLOSSARY

polyp: a sessile or sedentary cnidarian individual with a cylindrical body and, usually, tentacles surrounding a mouth at the free end, such as a coral.

potential energy: energy in a particle as a result of its position. This energy is released when a particle moves to a lower energy position, such as rolling down a hill.

precession: phenomenon associated with the action of a spinning top or celestial orbits and consisting of a comparatively slow rotation of the axis of rotation of a spinning body about a line intersecting the spin axis. The smooth, slow circling of a spinning top is precession. Regarding the moon's orbit around Earth, the axis of this orbit slowly changes its direction and describes a complete cone every 18.6 years. This is accompanied by a clockwise rotation of the plane of the moon's orbit that is completed in the same time interval.

precipitation: water released from the atmosphere in the form of rain, snow, hail, or sleet from the atmosphere onto Earth's surface.

pressure: the perpendicular force per unit area, or the stress at a point within a confined fluid.

primary productivity: the amount of growth and reproduction of organisms that only need sunlight, water and basic nutrients.

producer: any of various organisms (as a green plant) which produce their own organic compounds from simple precursors (as carbon dioxide and inorganic nitrogen) and many of which are food sources for other organisms.

physical factors: non-living parameters that define an ecosystem.

quadrat: a square, usually one meter on each side, used to monitor biological populations.

quantitative measurements: measurements based on quantity or amount such as 100ºF. This is in contrast to a qualitative measurement which might be "very hot." Quantitative measurements are the foundation of modern science.

radar: from "radio detection and ranging", a method for detecting the position, velocity, and other characteristics of a distant object by analyzing the high frequency radio waves reflected from the object's surface.

radar altimeter: satellite-borne radar that measures distances between the spacecraft and the ocean surface. Ocean surface topography, calculated from the distance, indicates the current patterns; roughness of the ocean surface indicates average wave height.

radiation: the process by which energy is transmitted through space as electromagnetic waves.

radio wave: electromagnetic wave with frequencies lower than microwave.

radiometer: a device for measuring the intensity of electromagnetic radiation. Measurements in the infrared bands yield temperatures, and the visible bands yield color.

radiometric dating: the use of radio-isotope half-lives to determine the age of rock units in years with accuracy of 2 or 3%.

raw data: data from an instrument. This data needs to be corrected for various factors such as instrument temperature and atmospheric effects before it can be used as information.

reef: a chain of rocks, coral or a ridge of sand at or near the surface of water.

GLOSSARY

reference frame: an arbitrary set of axes used as a reference to describe the position or motion of an object.

remote sensing: collection of Earth or ocean data from satellites by electromagnetic devices, utilizing various segments of the electromagnetic spectrum such as infrared and microwave.

resolution: the capability of making distinguishable the individual parts of an object, closely adjacent optical images, or sources of light.

respire: (a cell or tissue) to take up oxygen and produce carbon dioxide through oxidation.

reversing thermometer: a mercury thermometer used for recording water sample temperatures at a specified depth. Attached to a Nansen bottle, when it reaches a specified depth it is inverted, and at that point its mercury column breaks. The amount of mercury left in the graduated capillary portion of the thermometer indicates the water temperature at the point of inversion.

rocky shore community: plants and animals that thrive on rocks along the coastal boundary.

Rossby wave: a type of large internal wave. Rossby waves result from Earth's rotation, always move westward, and are a key feature of large-scale ocean circulation. The speed of Rossby waves depends on latitude, faster along the equator, slower at high latitudes.

rotational axis: a line about which an object turns, spins, or rotates. Earth's rotations axis is an imaginary line between the North Pole and the South Pole.

runaway greenhouse: when a planetary atmosphere gets heated, it can become hot enough to emit significant quantities of infrared radiation. Some of this radiation gets absorbed by the ground and re-radiated, heating the atmosphere further still. At Venus, a large amount of carbon dioxide (CO_2) in the atmosphere has allowed a runaway greenhouse to occur and thus its surface temperatures are hot enough to melt lead.

runoff: the downward movement of surface water under gravity in channels ranging from small rills to large rivers.

saline: consisting of or containing salt.

salinity: a measure of the quantity of dissolved solids in ocean water. Formally, it is the total amount of dissolved solids in ocean water in parts per thousand by weight after all carbonate has been converted to oxide, the bromide and iodide to chloride, and all the organic matter oxidized. It is normally computed from conductivity, refractive index, or chlorinity.

sandy beach community: organisms that live on, in, or near sandy ocean beaches.

saturation: a state of maximum impregnation. A saturated solution or vapor contains the largest concentration of the dissolved or vaporized material attainable under given conditions of pressure and temperature.

scatter: to reflect irregularly and diffusely, randomly disperse the energy.

scatterometer: microwave radar to measure sea surface roughness beneath the spacecraft or aircraft. Used to determine heights of surface waves and surface-wind velocities.

sea level: the level of the surface of the sea at its mean position midway between mean high and low water.

sea surface height: the height of the sea surface relative to the center of Earth.

GLOSSARY

sea surface temperature: the temperature of the layer of seawater (approximately 0.5 m deep) nearest the atmosphere.

sea surface topography: the very subtle hills and valleys on the surface of the ocean caused by gravity and wind patterns. The pressure differences within these hills and valleys can drive ocean currents.

seafloor spreading: zones where oceanic crust forms and spreads away in a lateral direction. Seafloor spreading zones are usually marked by ridges and are thus know collectively as the mid-ocean ridge system. Seafloor spreading is an important component of global plate tectonics.

Secchi disk: an instrument that measures water transparency. It is a circular white disk that is lowered on a cable into the sea until it reaches a depth where it is barely visible.

sediment: particles of organic or inorganic origin that accumulate in loose, unconsolidated form.

semi-diurnal tides: tides that have the period of about 12 hours, *i.e.*, two high tides and two low tides a day.

semi-permeable membrane: a barrier, such as a cell wall, through which smaller molecules can pass but cannot be penetrated by larger molecules.

sine wave: a waveform with deviation that can be expressed as the sine or cosine of a linear function of time or space or both.

small pelagics: small sized (~5-20 cm) fish that spend their entire life in the water column.

solar constant: the amount of Sun's energy that reaches the top of the atmosphere.

solar energy: thermal and electromagnetic radiation from the Sun.

solstice: one of the two moments in the year when the Sun's apparent path is farthest north or south from Earth's Equator. The summer solstice for the Northern Hemisphere occurs on June 21 or 22.

solvent: substance, especially in liquid form, that dissolves and disperses other substances (solutes) to form a solution.

sonar: an acronym for SOund NAvigation Ranging. It refers to method or equipment for determining by underwater sound techniques the presence, location, or nature of objects in the sea.

sound wave: longitudinal pressure waves in any material medium regardless of whether they constitute audible sound. Earthquake waves and ultrasonic waves are sometimes called sound waves.

Southern Hemisphere: the part of Earth south of the Equator.

species: 1) in biological classification, consisting of a number of highly similar plants and animals. Organisms of the same species are usually capable of interbreeding to produce fertile young. 2) a chemical species is a chemical element, compound or ion.

specific gravity: the ratio of density of a given substance to that of pure water at 4ºC and at a pressure of one atmosphere.

spectral signature: the particular combination of wavelengths absorbed or emitted by a given atmospheric constituent.

spring tide: the tide of maximum range occurring every two weeks when the moon is new or full.

GLOSSARY

states of matter: a classification of substance according to its structural characteristics. Four states of matter are generally recognized: solid, liquid, gas and plasma.

stranded shoreline: an ancient shoreline that is now found above present water level. Stranded shorelines along the ocean indicate an apparent lowering of sea level, raising of land level, or a combination of both factors. In the case of an inland sea, it is the result of a change in climate or human activities.

stratify: to form, deposit, or arrange in layers.

stratigraphic dating: a method of discovering the age of rocks based upon their location within rock layers. The younger rocks are higher in the strata than the older ones.

stratigraphy: discipline of geology that deals with the origin, composition, distribution, and succession of strata.

stratosphere: the part of Earth's atmosphere between the troposphere and the mesosphere.

stratum (pl. strata): layer of sedimentary rock or earth lying between beds of other sediments.

substrate: the base on which organisms lives and grows.

superposition, principle of: one of the principles that scientists use to guide their understanding of long-term geological change. In a sequence of strata, as originally laid down, any stratum is younger than the one on which it rests and older than the one that rests upon it. Geologists who use this method must be careful to ensure that rock layers they are studying have not been turned up-side-down by faulting and folding.

swim bladder: structure on dorsal side of body cavity of bony fish that contains gas and is used by the fish to regulate buoyancy (also gas bladder).

succession: the process of the gradual replacement, through time, of one group of species in a community by others.

surface reflectance: the amount and wavelengths reflected by a surface. The way an object interacts with light that falls on it determines its surface reflectance or color. *E.g.*, plants appear green because they absorb red and blue light and reflect green light.

symbiosis: the intimate living together of two dissimilar organisms in a mutually beneficial relationship.

synoptic view: a general view of a whole. For example, from a satellite, the conditions over an entire ocean can be seen simultaneously.

system: 1) a regularly interacting or interdependent group of items forming a unified whole. 2) a manner of classifying. 3) a group of interacting bodies under the influence of related forces.

taxon (pl. taxa): in biological classification, a group of plants or animals which is classified according to its presumed natural relationships.

taxonomy: the study of the general principle of biological classification.

tectonic: study of origin and development of the broad structural features on Earth; relating to the deformation of the crust of a moon or planet (*e.g.*, Earth), the forces involved in or producing such deformation.

GLOSSARY

tectonic plates: about a dozen large plates and several small ones in the outer part of Earth (lithosphere) that float on and travel independently over Earth's mantle. These are part of the plate tectonic theory.

temperate latitude: the region between 30° and 60° latitudes in each hemisphere.

temperature: a direct measure of the average kinetic energy of the molecules of a substance. The degree of hotness or coldness of anything.

thermal energy: internal energy present in a system in a state of thermodynamic equilibrium by virtue of its temperature. Thermal energy cannot be converted to useful work as easily as the energy of systems that are not in states of thermodynamic equilibrium.

thermal inertia: resistance to change in temperature. For material with high thermal inertia, the changes in temperature occur relatively slowly.

thermal infrared: the wavelength of electromagnetic radiation emitted from a surface and is related to its temperature. Some instruments measure thermal infrared wavelengths radiated from the ocean surface. These data can be turned into maps of sea surface temperature.

thermistor chain: instrument-carrying chain (up to 400 m long) generally towed astern to get continuous temperature recordings from upper water layers at sea.

thermocline: a layer of water beneath the mixed layer in which a rapid change in temperature can be measured in the vertical direction.

thermohaline circulation: the vertical movement of ocean water driven by density differences resulting from the combined effects of variations in temperature and salinity.

tidal community: a wide range of life forms existing in tide pools.

tidal energy: energy from tides.

tidal motion: movement associated with the periodic rise and fall of the ocean surface and connected bodies of water that results from the shifts in gravitational pull within the moon-Sun-Earth system.

tide: periodic rise and fall of the ocean surface and connected bodies of water resulting from the unequal gravitational attraction of the moon and the Sun on different parts of Earth.

tidepool: area in the rocky intertidal that retains some volume of water at low tide.

till: nonsorted, nonstratified sediment or drift that is deposited directly from the ice of glaciers. It is a heterogeneous mixture of clay, sand, gravel, and boulders.

timescale: particular period of time encompassing the duration of an event.

titration: a method or the process of determining the concentration of a dissolved substance in terms of the smallest amount of a reagent of known concentration required to bring about a given effect in reaction with a known volume of the test solution.

topography: the configuration of a surface, including its relief. In oceanography, it refers to the ocean bottom or the surface of a mass of water.

torque: the vector quantity describing the rotational force about an axis.

trade winds: the air masses moving from subtropical high pressure belts toward the equator. They are northeasterly in the Northern Hemisphere and southeasterly in the Southern Hemisphere.

GLOSSARY

trophic level: an ecological system of classification of organisms according to their means of obtaining nutrition. The basic level is that of the autotrophs, the second is that of the herbivores, and the succeeding levels are carnivores.

trophic structure: the collection of levels that pertain to feeding or nutrition.

tropical storm: a cyclonic weather system originates usually in the tropical regions. See also cyclone.

troposphere: portion of the atmosphere next to Earth's surface where temperature generally rapidly decreases with altidude, clouds form, and convection is active.

tsunami: Japanese for harbor wave. A very long-period wave generated by submarine earthquakes, volcanic events or landslides. Not noticeable on the open ocean, but builds up to great heights in shallow water. Tsumanis can travel a long distances within an ocean basin and cause great damage to distant shores.

turbine: rotary engine that converts the energy of a moving stream of water, steam, or gas into mechanical energy. This mechanical energy is transferred through a drive shaft to operate a machine.

typhoon: a severe tropical storm in western Pacific. See also hurricane.

ultraviolet: the portion of the electromagnetic spectrum extending from the violet, or short-wavelength, end of the visible light range to the X-ray region.

umi botaru: the Japanese name for luminescent ostracods (sea fireflies).

upwelling: the process by which deep, cold, nutrient-laden water is brought to the surface, usually by the divergence of equatorial currents or coastal winds that push water away from the coast.

urea: the chemical compound that is the end product of the metabolic breakdown of proteins in all mammals and some fish.

Van Dorn bottle: instrument made of a brass tube with valves on both ends which can be used to obtain subsurface water samples.

vapor phase: gaseous phase of a substance.

vapor pressure: pressure exerted by a gas when it is in equilibrium with the liquid and/or solid form of the same substance.

variable: a quantity that may assume any one of a set of values in a system or equation; something that changes.

variability: deviation from the long-term average.

vertebrate: animal that have a vertebral column, or backbone. The vertebrates include the fish, amphibians, reptiles, birds, and mammals.

volume: the amount of space occupied by a three-dimensional object.

warm-core eddy: a warm-core ring or eddy forms when the edge of a current (for example, the Gulf Stream) moves into warmer water and forms a warm-core, clockwise flow of water. This ring of water drifts towards the coast and usually dissipates within a year as it collides with the shallow continental shelf.

water vapor: the gaseous state of water (H_2O). At sea level it forms at the boiling point of 100°C (212°F).

GLOSSARY

wave crest: the highest point of a wave.

wave form: a graphic representation of the shape of a wave that indicates its characteristics (*i.e.*, frequency and amplitude).

wave height: vertical distance between a crest and the preceding trough.

wavelength: horizontal distance between two corresponding points on successive waves, such as from crest to crest.

wave period: the amount of time it takes for two succesive wave crests to pass a fixed point.

whale shark: gigantic but harmless shark found worldwide but mainly in the tropics. The largest of living fish, it often grows to about 9 m (30 feet) long and reportedly may reach twice that.

wind circulation: the pattern of wind movement, usually over large regions.

wind velocity: the speed and direction at which wind travels.

wind-driven current: a movement of ocean water that is driven by winds. This includes most horizontal movements in the surface waters of the world's oceans.

zooplankton: animal forms of plankton. They include various crustaceans, such as copepods and euphausiids, jellyfish, certain protozoans, worms, molluscs, and the eggs and larvae of benthic and nektonic animals.

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GLOSSARY

Addendum:

acoustic tomography: technique using changes in sound velocity between acoustic transmitters and receivers in the ocean to obtain three-dimensional pictures of water-mass distributions and their movements.

bacterium: any of a group of microscopic organisms that lack a membrane-bound nucleus and organelles. Bacteria are unicellular (one-celled) and may have spherical, rodlike, or curved bodies. Different bacteria inhabit virtually all environments, including soil, water, organic matter, and the bodies of multicellular animals.

halocline: water layer with large vertical changes in salinity.

physical factor: parameter that defines the condition of a substance or environment. Physical factors for oceans include temperature, depth, salinity, pH, clarity, dissolved oxygen, and currents.

pycnocline: a layer of water in which density increases markedly with depth.

specific heat: the quantity of heat required to raise the temperature of 1 g of a given substance by 1°C.