



## Coral Reef Information System

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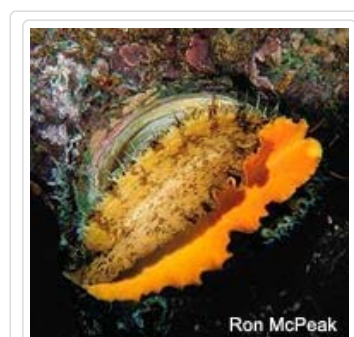
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## Glossary of Terminology

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### abalone

a univalve mollusk (class Gastropoda) of the genus *Haliotis*. Abalones are harvested commercially for food consumption. The shell is lined with mother-of-pearl and used for commercial (ornamental) purposes



Sea otters are in direct competition with humans for abalone. (Photo: Ron McPeak)

### abatement

reducing the degree or intensity of, or eliminating

### abaxial

away from, or distant from the axis

### abbreviate

shortened

### abdomen

in higher animals, the portion of the body that contains the intestines and other

viscera other than the lungs and heart; in arthropods, the rearmost segment of the body, which contains part of the digestive tract and all the reproductive organs



The ventral surface of the abdomen of an American lobster. Prominent are the swimmerettes, uropods, and telson.

## abdominal fin

a term used to describe the location of the pelvic (ventral) fins when they are inserted far behind pectorals. This is the more primitive condition. More recently evolved conditions have the pelvic fins in the thoracic or jugular positions. A salmon, for example, has its pelvic fins in the abdominal position. An angelfish has the pelvic fins in the thoracic position, and blennies have the pelvic fins in the jugular position, anterior to the pelvic girdle

## abductor

a type of muscle whose function is to move an appendage or body part away from the body of an animal. Abductors work antagonistically with adductors

## abiogenic

refers to things not involved with or produced by living organisms

## abiotic

refers to nonliving objects, substances or processes

## ablation

the experimental removal or killing of some part of an organism

## abnormal

not normal; contrary to the usual structure, position, behavior or rule

## aboral

situated opposite to, or away from the mouth; normally used to describe radially symmetrical animals, such as starfishes, sea urchins, and jellyfishes



Spines protect the aboral surface of

## abraded

worn or frayed

## abbranchiate

lacking gills

## abrasion

the mechanical process of gradually breaking down a hard layer

## absolute tautonymy

in taxonomy, the identical spelling of a generic-group name and one of its included specific-group names, such as the fish, *Badis badis*, or the western lowland gorilla, *Gorilla gorilla gorilla*

## absolute zero

the temperature at which all motion will cease (0 degrees Kelvin or -273.15 degrees C)

## absorption

the biological process that follows digestion, by which the products of digestion are transferred into the organism's internal environment, enabling them to reach the cells

## absorptive feeder

an animal, such as a parasitic tapeworm, that absorbs digested food products through the body wall



A parasitic tapeworm is an absorptive feeder. The narrowest point is the "head" or scolex which attaches the parasite to the intestinal lining by means of suckers and/or little hooks. Predigested nutrients are absorbed through the wall of each of the progressively larger segments. These animals have no digestive canal. (Photo: HHS/Centers for Disease Control and Prevention)

## abundance

the number or amount of something, e.g., the number of organisms per unit of habitat space or number of individuals in a stock or a population

## Acanthaster

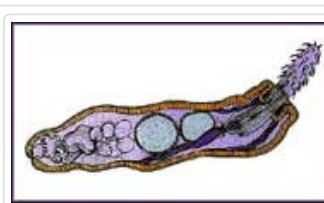
the Crown-of-Thorns starfish genus. *Acanthaster planci* is a voracious Indo-Pacific predator of corals



Crown-of-Thorns starfish (*Acanthaster sp.*), a voracious predator of corals.

## acantho-

a prefix meaning "with spines"



The phylum Acanthocephala contains about 1,000 species of spiny-headed worms. All are endoparasites in the intestinal tract of vertebrates, especially fishes. (Image: Dr. Rick Gillis, Biol. Dept., Univ. of Wisconsin)

## acanthocaulus

a juvenile coral of some species that is attached to the substrate either directly or on a stalk

## acanthoid

thorny, spiny, sharp

## acanthotrich (acanthotrichium)

in fishes, a spiny dorsal or anal fin ray

## acaudal

lacking a tail

## acaudal

lacking a tail

## accepted name

in taxonomy, a name adopted by an author as the correct name for a taxon

## accessory pigment

a photosynthetic pigment which absorbs light and transfers energy to chlorophylls during photosynthesis

## accessory respiratory organ

in fishes, a superficial or internal organ which complements the gills in respiration when the fish is in poorly oxygenated water or in air

## acclimation (acclimatization)

a change that occurs in an organism to allow it to tolerate a new environment

## accretion

growth by virtue of an increase in intercellular material

## accuracy

the closeness by which a set of measurements approaches the true value

## acellular

describes the construction of an organism or tissue that is a mass of protoplasm which is not divided into cells, e.g., some structural parts of slime molds and fungi

## aciculate

needle-like or having needle-like parts

## acid

a substance that increases the hydrogen ion concentration in a solution

## acid rain

the precipitation of sulfuric acid and other acids as rain. The acids form when sulfur dioxide and nitrogen oxides released during the combustion of fossil fuels combine with water and oxygen in the atmosphere

## acidic

having a pH of less than 7

## acidophilia

an abnormal increase in the number of eosinophils in the blood which is characteristic of allergic states and various parasitic infections; also called "eosinophilia"

## acidophilous

having an affinity for or thriving in acidic conditions, e.g., in a bog or marsh

## acoelomate

an animal that does not have a true coelom or body cavity, i.e., a body cavity between the outer wall and the gut and lined with mesoderm. Acoelomate phyla include the flatworms (Platyhelminthes), ribbonworms (Nemertea), and jaw worms (Gnathostomulida)



Acoelomate flatworms such as this *Pseudoceros sp.* lack a coelom (body cavity). (Photo: Adam Petrussek)

## acolonial coral

a solitary coral that does not form a colony

## acontium

a thread-like part of a coral polyp's or anemone's digestive system and employed as defensive or aggressive structures when extruded

## acoustic scattering

the irregular reflection, refraction, or diffraction of a sound in many directions

## acoustic tag

a sound transmitter attached to an aquatic animal to track its movements



Radio tag (anterior) and acoustic

tag (posterior) attached to a loggerhead turtle. (Photo: ALan Rees/ARCHELON)

## acquired

developed in response to the environment, not inherited, such as a character trait resulting from environmental effects (acquired characteristic)

## acquired character

a non-inherited character, of function or structure, developed in an organism as a result of environmental influences during the individual's life

## Acropora

a genus of hard (stony) corals that contain the elkhorn and staghorn corals



Staghorn coral (*Acropora* sp.).

## acrorhagus

a sac, covered with nematocysts, that protrudes from below the sweeper tentacles or on the column of certain anthozoans

## acrosome

a protrusion on the anterior end of a sperm cell that contains digestive enzymes that enables the sperm cell to penetrate the layers around the oocyte (ovum)

## acrosphere

the knobbed tentacle tip of an anthozoan, usually bearing numerous nematocysts

## actic

pertains to littoral rocky shores as a habitat

## actin

a contractile protein found in muscle cells. Together with myosin, actin provides the mechanism for muscle contraction

## actinometer

an instrument for measuring incident radiation

## actinopharynx

the tubular throat of an anthozoan polyp that lies between the mouth and the gastric cavity; the stomodaeum

## actinophore

a pterygiophore and its associated fin ray

## Actinopterygii

a class of bony fishes comprising the ray-finned fishes, which make up about half of all vertebrate species known. They are found in most aquatic habitats from the abyssal depths of the ocean, greater than 10,000 m, to high altitude freshwater streams and ponds; a few species can even move about on land for short periods of time. Ray-finned fishes constitute a major human food source



This squirrel fish is a member of the class Actinopterygii, the ray-finned fishes. Note the hard and soft rays in its fins.

## actinotroch

a larval form found in the Phoronida (horseshoe worms)

## action potential

the electrical signal which rapidly propagates along the membrane of the axon of nerve cells, as well as over the surface of some muscle and glandular cells. It is caused by change in membrane electrical potential, the underlying cause of which is a change in flow of ions across the membrane due to voltage-activated ion channels. It leads to an all-or-nothing action current, the nervous impulse

## activated charcoal

activated charcoal is generally called the "universal antidote" by toxicologists, since it is active in adsorbing most toxicants except inorganic salts and heavy metals

## activator

a substance or physical agent that stimulates transcription of a specific gene or operon

## active search

search behavior in which a herbivore or predator moves around its environment looking for food



## active site

a specific region of an enzyme where a substrate binds and catalysis takes place

## active transport

the pumping of molecules or ions through a membrane against their concentration gradient. This action requires the expenditure of energy through ATP hydrolysis

## aculeate

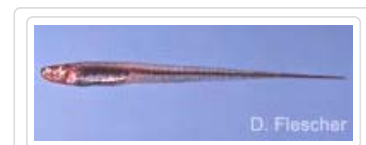
bearing a sharp point

## aculeiform

having a sharp point; needle-shaped

## acuminate

a shape which gradually tapers to a point



The fierasfer, *Carapus bermudensis*, possess an acuminate shape. The tapered end allows the fish to retreat tail first, for protection, into the digestive canal of a sea cucumber when threatened. (Photo: D. Flescher, NOAA/National Marine Fisheries Service)

## acute

sudden or brief

## adaptation

changes in gene frequencies resulting from selective pressures being placed upon a population by environmental factors. This results in a greater fitness of the population to its ecological niche

## adaptive behavior

any behavior that enables an organism to adjust to a particular situation or environment

## adaptive bleaching hypothesis (ABH)

a coral bleaching hypothesis wherein under changing environmental conditions, the loss of one or more kinds of zooxanthellae is rapidly followed by the formation of new symbiotic cnidarian-algal relationships with different zooxanthellae that are more suited to the new conditions in the host's habitat. Fundamental

assumptions of the ABH include (1) different types of zooxanthellae respond differently to environmental conditions, specifically temperature, and (2) bleached adults can secondarily acquire zooxanthellae from the environment

## adaptive radiation

the evolution of a single evolutionary stock into a number of different species

## adaptive value

the degree to which a characteristic helps an organism to survive and reproduce, or affords greater fitness in its environment

## adducent

leading or conducting toward

## adductor

a type of muscle whose function is to pull an appendage or body part inwards, towards the body of an animal

## ADELIE software

a post-processing tool-set which has been developed to visualize, handle, and enhance images, videos and data recorded during IFREMER underwater vehicle dives

## adenine

one of the four nitrogenous bases in DNA that make up the letters ATGC. Adenine is the "A". The others are guanine, cytosine, and thymine. Adenine always pairs with thymine

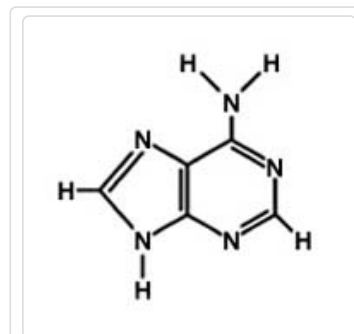


Diagram of the chemical structure of adenine, one of the four nitrogenous bases in DNA.

## adenosine triphosphate (ATP)

a nucleoside triphosphate, ATP is the predominant supplier of metabolic energy in living cells. ATP supplies the chemical energy to drive endergonic reactions (requiring work or the expenditure of energy), perform mechanical work, provide heat and even produce bioluminescence

## adenovirus

a group of DNA-containing viruses which cause diseases in animals. In humans, they produce acute

respiratory tract infections with symptoms resembling the common cold. They are used in gene cloning, as vectors for expressing large amounts of recombinant proteins in animal cells. They are also used to make live-virus vaccines against more dangerous pathogens

## adhesion

the molecular force of attraction between two unlike materials that acts to hold them together

## adhesive disc

in fishes, a sucker-like organ for clinging to various surfaces, e.g. the modified pelvic fins in clingfishes and snailfishes, and the dorsal fin in remoras (shark suckers)

## adhesive egg

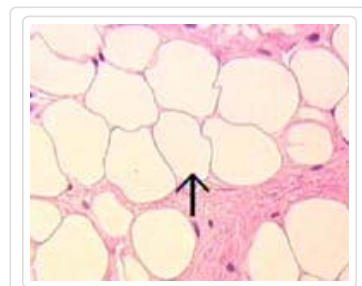
an egg which adheres on contact to a substrate or to other eggs

## Adiabatic process

a process in which no heat is gained or lost by the system

## adipocyte

a fat cell



Adipose tissue. The large empty looking structures are adipocytes (fat cells). (Photo: University of Saskatchewan Biology Dept.)

## adipose fin

in fishes, a small fleshy fin which lacks fin rays. It is found in fishes such as salmon, and most catfishes



The adipose fin of this chum salmon lies between the dorsal and caudal fins. (Image: U.S. Fish and Wildlife Service)

## adjacently sympatric

pertains to those aspects of a parapatric speciation event whereby the daughter species are minimally isolated geographically

## adnate

joined together

## Adobe Acrobat

Acrobat Reader is a software product from Adobe, designed to view .pdf (portable document format) documents downloaded from the World Wide Web

## adpressed

pressed close to or lying flat against something; apressed

## adradial canal

one of eight non-branched ciliated canals which originates from the gastric pouches of scyphozoan medusae. The flow of digested food materials is toward the ring canal

## adult

a fully developed and sexually mature animal, physically capable of reproducing under appropriate physiological, ecological and sociobiological conditions



An adult Nassau grouper. It is sexually mature and capable of reproducing.

## advanced

new, unlike the evolutionary ancestral or primitive condition

## Advanced Very High Resolution Radiometer (AVHRR)

a broad-band, four or five channel (depending on the model) scanner, sensing in the visible, near-infrared, and thermal infrared portions of the electromagnetic spectrum. This sensor is carried on NOAA's Polar Orbiting Environmental Satellites (POES). AVHRR is used for studying and monitoring vegetation conditions. Applications include agricultural assessment, land cover mapping, producing image maps of large areas and tracking regional and continental snow cover. AVHRR data are also used to retrieve various geophysical parameters such as sea surface temperatures (SST) and energy budget data



Artist's rendition of POES satellite.

## adventitious root

a root that originates from any part of the plant other than the root system

## aeolid nudibranch

a type of nudibranch (order Nudibranchia) in which the mantle is extended into long finger-like projections, the cerata (sing: ceras), rather than a feather-like external gill on the dorsal surface. The cerata contain branches of the digestive gland. The tips of the cerata contain cnidosacs which usually store nematocysts that are obtained from ingested cnidarian prey, such as hydroids, sea anemones and soft corals. If threatened, the nudibranch is capable of discharging these stinging cells through a terminal pore in the ceras. This action is an effective deterrent to predators

## aerenchyma

a specialized parenchymous tissue in seagrass leaves that has regularly arranged air spaces or lacunae. These internal air spaces serve for flotation and exchange of gasses

## aerial photography

photographs taken from an aircraft or satellite utilized to interpret environmental conditions and geographic features

## aerobic

deriving energy from a process requiring free oxygen

## aerobic respiration

a form of respiration in which molecular oxygen is consumed and carbon dioxide and water are produced

## aesthete

unique to chitons (Polyplacophora -Mollusca), aesthetes are photosensitive mantle cells, present in very high densities. Although they are involved in light responses, their exact function is unknown

## affinity index

a measure of the relative similarity of the composition of two samples. Reciprocal affinity is a measure of distance

## aft

in, near, or toward the stern (rear) of a vessel

## agamospecies

species which replicate asexually

## agar

a gelatinous material extracted from the walls of some red algae, mainly species of *Gelidium* and *Gracilaria*. Agar is used as a support medium, when supplemented by appropriate buffers and/or nutrients and other ingredients, for cultures of microorganisms and tissues, electrophoresis, etc

## agarose

a polysaccharide, which together with another class of polysaccharide, agarpectin, is a component of agar. Agarose is the preferred matrix for work with proteins and nucleic acids because of its neutral charge and lower degree of chemical complexity.

## agarose gel electrophoresis

a method used to separate a mixed population of nucleic acid (DNA and RNA) fragments by length of the molecule. Nucleic acid molecules are separated by applying an electrical field to move the negatively charged molecules through an agarose (a component of agar) matrix. Shorter molecules move faster and migrate farther than longer ones because shorter molecules migrate more easily through the pores of the gel

## age class

a group of individuals of a species all of the same age

## age distribution

the frequency of different ages or age groups in a given population

## age structure

the relative proportion of individuals in each age group in a population

## aggregate

a group of species, other than a subgenus, within a genus, or a group of subspecies within a species. An aggregate may be denoted by a group name

## aggregate

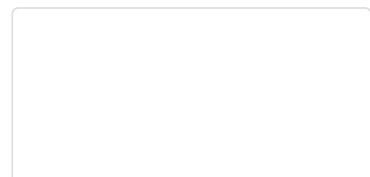
a collection of units or particles forming a body or mass (noun); to form such a body or mass (verb)

## aggressive mimicry

a type of mimicry which results in a deceived species being preyed upon or parasitized by a predator species. The mimic's cues may be visual, auditory, olfactory or behavioral

## Agnatha

agnathans are the most primitive and ancient of the vertebrates. As the name "Agnatha" implies, they lack jaws. Paired fins are also generally absent, and the the adult retains the notochord. The skeleton is cartilaginous. The



agnathans include the lampreys and hagfishes



The mouth of a jawless agnathan, the sea lamprey. Adults feed by attaching themselves to their prey, rasping a hole in the skin, and consuming blood and body fluids. (Photo: Minnesota Sea Grant)

### agonistic behavior

aggressive, negative behaviors, such as fighting, threatening, and fleeing

### agricultural pollution

the liquid and solid wastes from all types of farming, including runoff from pesticides, fertilizers and feedlots; erosion and dust from plowing, animal manure, carcasses, crop residues and debris

### Agulhas ring

large pulses of warm and salty water of Indian Ocean origin which enter the Atlantic Ocean directly south of the Cape of Good Hope in the form of anticyclonic eddies. The process of ring detachment is associated with perturbations of the Agulhas Current that retroflects south of Africa

### ahead

in front of, or forward of the vessel

### ahermatypic coral

a coral that lacks zooxanthellae and does not build reefs

### AIMS Reef Monitoring Data Entry System (ARMDES) adapted database

a data entry and analysis program running on Microsoft Access, which enables users to input data from line transects, manta tows, and fish visual censuses into a standard access database and to carry out basic analysis of the data. It was created by AIMS and is distributed free of charge

### AIMS Video Transect Analysis System (AVTAS)

video transects are systematically sampled by identifying the benthos occurring at fixed points along the transect to the highest taxonomic level possible. The AVTAS software is used to analyse the video transects.

During analysis the data are saved into a Microsoft Access¼ database. In order to eliminate confounding in data analyses due to observer biases, transects from each site are analysed by two observers. The observer who actually surveyed the reef in the field analyses transect one from site one and then every alternate transect. A second observer analyses the remaining transects

### air bladder

an air sac located in the coelomic cavity of many fishes. In some fishes it may retain a tubular connection with the pharynx or esophagus; also known as a gas bladder or swim bladder, it functions variously as a hydrostatic organ, a sound conductor, a sound production organ, and in respiration. It is absent in sharks and rays, and some bony fishes

### air compressor

an apparatus that compresses or pressurizes air for scuba tanks. Air is compressed from the atmospheric level (14.7 psi at sea level) to the capacity of the tank, which is generally between 2500-3000 psi

### aktological

pertaining to shallow inshore environments and communities

### alate

winged

### albatross

any of large web-footed birds belonging to the family Diomedidae, chiefly distributed throughout the oceans of the southern hemisphere. Albatrosses have a hooked beak and long, narrow wings

### albedo

the ratio of the amount of light reflected by an object and the amount light falling on it (incident light); a measure of the reflectivity or intrinsic brightness of an object (a white, perfectly reflecting surface would have an albedo of 1.0; a black perfectly absorbing surface would have an albedo of 0.0)

### albicant

whitish color

### albinism

hereditary absence of pigment in an organism. Albino animals have no color in their skin, scales, hairs and eyes. The term is also used for absence of chlorophyll in plants. Some organisms exhibit partial albinism. White tigers, for example, possess black stripes on a white background



An albino catfish. The fish's skin cells contain no dark melanin granules.



## albugineous

white colored

## alcohol

any of a class of organic compounds in which one or more hydroxyl groups are attached to a carbon compound

## alcyonarian

a soft coral of the order Alcyonacea, class Anthozoa, phylum Cnidaria. They consist of a firm body, throughout which calcareous spicules are dispersed. The surface is studded with polyps. They are closely related to the scleractinian (hard or stony) corals but lack the rigid, stony exoskeleton



Alcyonarians are colonial soft corals that lack the  $\text{CaCO}_3$  exoskeleton of the hard or stony corals. An endoskeleton of calcareous spicules provide support for the body, which is studded with polyps.

## alecithal

a type of egg that does not contain yolk

## Alee effect

the social dysfunction and failure to mate successfully when population density falls below a certain threshold

## algae

unicellular, multicellular, solitary, or colonial organisms that contain chlorophyll. They lack roots, stems, leaves, flowers, and seeds. Algae are in the Kingdom Protista

## algaecide

a chemical agent specifically designed and used to kill or inhibit the growth of algae; also called 'algicide'

## algaestat

a chemical agent which retards and prevents the reproduction and growth of algae

## algal bloom

a sudden spurt of algal growth that can indicate potentially hazardous changes in local water chemistry

## algal galls

a response of gorgonia (*Pseudoplexaura spp.*) to tissue invasion by the algae, *Entocladia endozoica*, in Florida and Caribbean waters. The host gorgonia react to the algal filaments by producing capsules (galls) composed of skeletal elements that isolate the algae from the host tissue, at the expense of the skeletons' tensile strength and elasticity. The gorgonium readily breaks apart at the sites of the weakened skeleton. For more information and illustrations, see: [http://www.coral.noaa.gov/coral\\_disease/algal\\_galls.shtml](http://www.coral.noaa.gov/coral_disease/algal_galls.shtml)

## algal mat

a dense layer of algae, usually filamentous, which blankets the bottom in a shallow water environment. An algal mat can also be a 'mat' of microscopic species, usually diatoms, covering soft bottoms, or a mat of floating algae

## algal reef

a reef, usually exposed to wave action, composed of coralline algae and vermatid gastropods. The coralline algae occur in forms of cups or funnels



Coralline algae makes up part of an algal reef.

## algal ridge

a low ridge at the seaward margin of a reef flat, largely composed of skeletons of calcareous algae. A synonym of **Lithothamnion ridge**

## algal turf

densely packed algae, usually filamentous, which rise less than one centimeter above the substratum upon which they are growing. A synonym of turf algae

## algin

a polysaccharide derived from brown algae. Algins are used for many industrial processes

## algorithm

A computer program (or set of programs) which is designed to systematically solve a certain kind of problem

## alien species

a species which does not naturally occur within an area and which has usually arrived as a result of deliberate or accidental human intervention. Alien species often have adverse effects on native species as a result of competition

## alimentary canal

the canal, including the stomach and intestines, leading from the mouth to the anus

## alkaline

having a pH of more than 7. Alkaline solutions are also said to be basic

## All Islands Coral Reef Initiative

a cooperative effort among Hawaii, American Samoa, Guam, the Commonwealth of the Northern Mariana Islands, Puerto Rico, and the U.S. Virgin Islands to improve the management of coral reefs in island areas

## all-or-none law

an action that occurs either completely or not at all, such as the generation of an action potential by a neuron, or the contraction of a muscle cell

## all-purpose tool (APT)

a tool used in the performance of visual fish censuses. An APT is a T-shaped, meter-long reference device used by scientific divers for measuring habitat vertical relief, estimating fish lengths, and the location of the center and outer edge of the sample cylinder. The shaft is a PVC t-stick marked at 10cm intervals with a 30cm cross-piece marked at 1cm intervals

## allantois

a vascularized extra-embryonic membrane of amniote embryos that forms as a narrow outgrowth of the hind portion of the gut. In birds and reptiles, it stores waste products of embryonic metabolism. The allantois fuses with the chorion to form the chorio-allantoic membrane in birds and reptiles, and a part of the placenta in mammals

## allele

one of the variant forms of a gene at a particular locus, or location, on a chromosome. Different alleles produce variation in inherited characteristics. In an individual, one form of the allele (the dominant one) may be expressed more than another form (the recessive one)

## allelochemical

a chemical substance produced by one organism that is toxic or inhibitory to the growth or well being of another

## allelopathic substance

a substance produced by one organism that adversely affects another organism

## allelopathy

a particular form of amensalism found in plants. In this interaction, one species produces and releases chemical substances that inhibit the growth of another species

## allergen

an antigen that provokes an immune response

## allo-

a prefix meaning other, or differing from the normal or usual

## alloantigen

an antigen that occurs in some but not other members of the same species

## allochoric

occurring in two or more communities within a given geographical region

## allochronic speciation

speciation without geographical separation through the acquisition of different breeding seasons or behavior patterns

## allochthonous population

an organism or a population of organisms foreign to a given ecosystem; they have arrived from elsewhere

## allograft

a piece of tissue or an organ transferred from one individual to another individual of the same species

## allometric growth

type of differential growth in which parts of the same organism grow at different rates. For example, in humans, the head and body grow at different rates, resulting in a human adult with completely different proportions from those of an infant

## allomone

a chemical substance that induces a response in an individual of another species that is beneficial to the emitting organism. Many allomones are essentially chemical deterrents. For example, a chemical substance that is produced by a prey species to repel a predator species

## alloparent

an animal which exhibits parental behavior towards another animal's offspring

## allopatric speciation

the evolution of a new species because of the isolation of a small group of individuals from the other members of a population

## allopatric species

species occupying mutually exclusive geographical areas

## allopolyploid

a type of polyploid species resulting from two different species interbreeding and combining their chromosomes

## allorecognition

the ability of an individual organism to distinguish its own tissues from those of another; the recognition of antigens, expressed on the surface of cells of non-self origin. Allorecognition has been described in nearly all multicellular phyla

## alloresponse

allorecognition, followed by the immune effector mechanisms generated by the recognition process

## allotopic

refers to species with overlapping ranges but do not occupy the same space. They do not "live together"

## allotype

in taxonomy, a paratype of the opposite sex to the holotype

## allozyme

a form of an enzyme that differs in amino acid sequence from other forms of the same enzyme and is encoded by one allele at a single locus

## alluvial

relating to mud and/or sand deposited by flowing water

## alluvium

sediments deposited by erosional processes, usually by streams

## almost atoll

an atoll whose rim is less than 75 percent complete as a circle at low tide

## Along Track Reef Imaging System (ATRIS)

a boat-mounted instrument, developed by the U.S. Geological Survey, that acquires continuous digital still images of shallow-marine substrates

## alpha animal

in animal behavior, the individual that takes a lead role and occupies the dominant position in a group

## alpha particle

a particle emitted from the nucleus of an atom, containing two protons and two neutrons, identical to the nucleus (without the electrons) of a helium atom

## alpha taxonomy

descriptive taxonomy concerned primarily with the discovery, description, and naming of species, usually on the basis of morphological characters

## alternation of generations

a life cycle in which a multicellular diploid stage is followed by a haploid stage, and so on; found in land plants and many algae and fungi

## alternative hypothesis

in statistics, the hypothesis that is adopted when the null hypothesis is rejected

## altimeter

an instrument for measuring altitude

## altimetry

a technique to measure the height of the sea surface from radar pulses transmitted from a satellite



Artist's rendition of a satellite

measuring altimetry.

## altruism

a form of behavior in which an individual risks lowering its fitness for the benefit of another; in evolutionary biology, an organism is said to behave altruistically when its behavior benefits other organisms, at a cost to itself. The costs and benefits are measured in terms of reproductive fitness, or expected number of offspring

## alveolus

one of thousands of tiny air sacs at the end of the bronchioles in lungs. Alveoli are the sites of gaseous exchange between the atmosphere and the blood. Oxygen passes into the lung capillaries and CO<sub>2</sub> passes from the capillaries into the lungs and is exhaled

## ambient noise

acoustic signals originating from a variety of underwater sources, such as propeller cavitation, engine noises, animal sounds, wind, waves, and rain



The sounds produced by the spotted boxfish, *Ostracion meleagris*, contribute to the ambient noise on Pacific reefs. (Photo: Hawai'i Coral Reef network)

## ambient pressure

the pressure surrounding an organism. On land, it results from the weight of the atmosphere. At depth, it comes from the weight of the water plus the weight of the atmosphere

## ambilateral

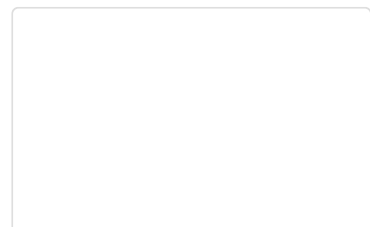
occurring on both sides

## ambit

the geographic range or extent in which an organism normally lives or grows

## ambulacrum

a row of tube feet of an echinoderm





The ray of a starfish revealing the ambulacral groove and tube feet.

### ambush predator

a predator that hides and waits for prey to pass in close proximity rather than actively hunting for it

### amensalism

a type of symbiosis where two (or more) organisms from different species live in close proximity to one another, and where one of the members suffers as a result of the relationship while the other is unaffected by it

### amino acid

the building block of a protein. Twenty different amino acids are used to synthesize proteins. The shape and other properties of each protein is dictated by its precise sequence of amino acids. Humans must include adequate amounts of 9 of the 20 amino acids in their diet. These "essential" amino acids cannot be synthesized from other precursors

### amino acid sequence

the order of amino acids as they occur in a polypeptide chain. This is referred to as the 'primary structure' of proteins

### amino group

a nitrogen atom single-bonded to two hydrogen atoms ( $\text{-NH}_2$ ); imparts basic properties to an amino acid

### amitosis

an unusual form of cell division in which the nucleus cleaves without change in its component structure (such as the formation of chromosomes), followed by the division of the cytoplasm. Amitosis may occur chiefly in highly specialized cells which are incapable of long-continued multiplication, in transitory structures, and in early stages of degeneration

### amnion

a non-vascular extra-embryonic membrane of amniote embryos that forms a fluid-filled cavity surrounding the embryo. It protects the embryo by functioning as a shock absorber



## amniote

a vertebrate whose embryo is surrounded by a fluid-filled sac, the amnion; characteristic of reptiles, birds, and mammals

## amoeba

a-naked freshwater or marine protozoan protist that forms temporary pseudopodia for food and water capture, and locomotion -



An amoeba thrusting out pseudopodia (false feet). (Photo: NASA)

## amoebocyte

a phagocytic cell found circulating in the body cavity of coelomates, particularly annelids and mollusks, or crawling by amoeboid movement through the interstitial spaces of sponges; an amoeboid cell in sponges that transports nutrients and is found in the matrix between the epidermal and collar cells; any cell having the shape or properties of an amoeba

## amoeboid

amoeba-like

## amoeboid movement

a type of motility of a cell in which cytoplasmic streaming (directional flow of cytoplasm) extrudes outward of the cell to form pseudopodia (false feet) so that the cell can change its location

## Amphibia

a class of vertebrates that consists of frogs, toads, newts, salamanders, and caecilians. These organisms live at the land/water interface and spend most of their life cycle in water. With exception of some tree frogs, all must reproduce in water or otherwise moist conditions. Amphibians are not typically marine



The African Bullfrog, *Pyxicephalus adspersus*. This amphibian is an inhabitant of Namibia. (Photo: Copyright Miguel Vences and Frank Glaw, 1998)

## amphidiploid

an allopolyploid; an organism produced by hybridization of two species followed by chromosome doubling

## amphidromic point

a point within a tidal system where the tidal range is almost zero

## amphimixis

sexual reproduction involving the fusion of male and female gametes and the formation of a zygote

## amphipathic

refers to molecules with both hydrophobic and hydrophilic regions. Proteins and lipids may be amphipathic

## amphophylic

having an affinity for both acidic and basic dyes

## amplification

in genomics, the process of increasing the number of copies of a particular gene or chromosomal sequence

## ampulla

a membranous vesicle

## ampullae of Lorenzini

small vesicles and pores around the head of a shark that form part of an extensive subcutaneous sensory network system that detects weak magnetic fields produced by other fishes, at least over short ranges. This enables the shark to locate prey that are buried in the sand, or orient to nearby movement. The ampullae may also allow the shark to detect changes in water temperature



The ampullae of Lorenzini are small vesicles and pores that form part of a subcutaneous sensory network of sharks. These vesicles and pores are found around the head of the shark and are visible to the naked eye. They appear as dark spots in this photograph of a porbeagle shark head. (Photo: Dr. Steven Campana, Bedford Institute of Oceanography)

## anabolism

the metabolic processes that consumes energy and involve the synthesis of larger, complex molecules from simpler ones

## anadromous species

a species that spends its adult life in the ocean but swims upriver to freshwater spawning grounds in order to reproduce, e.g., Pacific salmon



The chinook salmon is an anadromous fish which spends most of its life in the ocean, but returns to fresh water streams for spawning

## anaerobe

an organism that can live in the absence of oxygen

## anaerobic

deriving energy from a process that does not require free oxygen

## anagenesis

the evolutionary process whereby one species evolves into another without any splitting of the phylogenetic tree

## anal fin

the single fin situated on the ventral midline of a fish, behind the anus, and anterior to the caudal fin



Anal fin of a bony fish. (Photo: John Lyons, University of Wisconsin)

## analgesia

the absence of pain in response to stimulation that would normally be painful

## analgesic

any drug intended to alleviate pain. Analgesics increase a patient's pain threshold, thereby decreasing the sensation of pain. Analgesics range from aspirin and acetaminophen to narcotics

## analogous structure

a body part that serves the same function in different organisms, but differs in structure and embryological development, e.g., the wing of an insect and a bird

## analysis of covariance

an analysis of variance in which the data are adjusted or controlled for the presence of one or more other variables

## analysis of variance

a statistical technique for testing for differences in the means of several data populations

## anamniote

an aquatic vertebrate whose embryonic stage is not surrounded by an amnion. Fishes and amphibians are anamniotes



Fish eggs and larvae. These aquatic vertebrates do not possess an amnion during embryonic development. (Photo: NOAA/National Marine Fisheries Service)

## anastomose

a term that refers to coral branches which grow back together after the initial division

## anastomosis

the union or connecting of branches forming a meshwork or a network

## ancestor

any organism, population, or species from which some other organism, population, or species is descended

## ancestral polyp

an anthozoan polyp which develops from a sexually produced larva and gives rise to a colony by asexual budding

## ancestral trait

a trait shared by a group of organisms as a result of descent from a common ancestor

## ancestrula

the first (parental) zooid of a bryozoan colony, formed from a settled and metamorphosed larva. It is often smaller and morphologically distinct from the zooids that bud from it

## anchialine cave

a coastal cave formed in limestone or volcanic rock that is flooded with seawater. These marine or brackish water bodies lack surface connections to the sea. They include the longest submerged caves on Earth

## anchialine pool

a land-locked brackish body of water that displays tidal fluctuations but has no surface connection to the sea. Anchialine pools are restricted to highly porous substrates, such as recently solidified molten rock or limestone adjacent to the sea

## androgen

a principal male steroid hormone, such as testosterone, which stimulates the development and maintenance of the male reproductive system and secondary male sexual characteristics

## androgenesis

male parthenogenesis, i.e., the development of a haploid embryo from a male nucleus. The maternal nucleus is eliminated or inactivated subsequent to fertilization of the ovum, and the haploid individual (referred to as androgenetic) contains the genome of the male gamete only in its cells

## anemochory

the dispersal of seeds, fruits, or other plant parts by wind

## anemochory

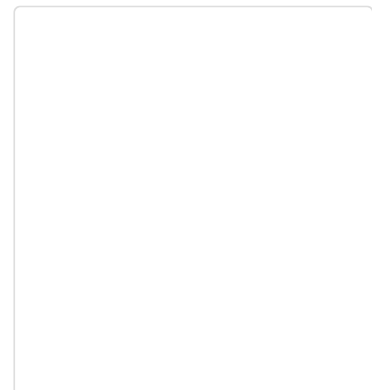
the dispersal of seeds, fruits, or other plant parts by wind

## anemometer

an instrument for measuring wind velocity

## anemone

a cnidarian of the class Anthozoa that possesses a flexible cylindrical body and a central mouth surrounded by tentacles





A sea anemone of the Phylum Cnidaria, Class Anthozoa. The tentacles bear stinging cells which are used for food capture and defense.

## aneuploidy

the condition of having an abnormal number of chromosomes; a chromosome number that is not an exact multiple of the haploid number

## angelfish

any species of colorful deep-bodied, laterally compressed, spiny-rayed fishes in the family Pomacanthidae. They resemble the closely related butterfly fishes, but generally possess a more robust body and a sharp preopercular spine. There are other kinds of unrelated fresh water angelfishes, belonging to the family Cichlidae, which are common home aquarium fishes

## angler

a person catching fish or shell fish with no intent to sell; includes people releasing the catch



A skiff, a guide, and an angler fishing for bonefish in Florida. (Photo: Bonefish and Tarpon Unlimited)

## angstrom

a unit of length equal to one ten-thousandth of a micron ( $10^{-4}$  micron) or  $10^{-10}$  of a meter

## animal communication

animals use several ways to communicate with one another. These include the visual, auditory, and tactile senses, as well as certain chemicals involved in taste and smell. Other possibilities are magnetic fields and electrical discharges. Communication among animals helps them to recognize each other, cause reproductive behavior, and to organize social behaviors

## animal hemisphere

the half of an oocyte or egg which contains less yolk, or the corresponding half of an early embryo with the more actively dividing cells

## animal pole

the pole of a spherical oocyte or egg that is closest to the nucleus and contains most of the cytoplasm. The opposite pole is the vegetal pole, which, depending upon the type of egg, contains most of the nutritive or yolk granules. There is a graded distribution of cytoplasm and yolk along an axis between the poles that passes through the nucleus. After the fertilized egg undergoes cleavage and develops into a blastula, the same "geographic" points or reference are used

## Animalia

the kingdom of multicellular heterotrophic eukaryotes that are capable of motility during some stage of their life history

## animated GIF (Graphics Interchange Format) file

a graphic image on a Web page that moves

## anisogamous

characterized by reproducing by the fusion of gametes that differ only in size, as opposed to gametes that are produced by oogamous species. Gametes of oogamous species, such as egg and sperm cells, are highly differentiated

## ankylose

to fuse together

## anneal

the pairing of complementary DNA or RNA sequences, via hydrogen bonding, to form a double-stranded polynucleotide. It is most often used to describe the binding of a short primer or probe

## Annelida

an animal phylum that comprises the segmented worms, and includes earthworms, leeches, and a number of marine and freshwater species



A marine segmented worm of the phylum Annelida.

## Annual Composite HotSpot map

a map that composites all of the average monthly HotSpot (see HotSpot) images for a given year

## annular

ring-shaped

## anomaly

the deviation of a particular variable (e.g., temperature) from the mean or normal over a specified time

## anonymous work

according to the International Code of Zoological Nomenclature, a published work that does not state the name of the author(s)

## anoxic

the absence of free oxygen

## antenna

one of the paired, flexible, and jointed sensory appendages on the head of a crustacean, an insect, or a myriapod (e.g., a centipede)



A spiny lobster displaying its paired uniramous antennae and biramous antennules. (Photo: Copyright Corel Corporation)

## antennule

a small antenna, especially the first pair of antennae in crustaceans



## anterior

morphologically, toward the head or front end of an individual, or proximal portion of a bodily part



Close up of the anterior end of a spotlight parrotfish supermale.

## anthocaulus

a polyp that develops asexually on the skeletons of some coral species

## anthocodium

the free oral end of an anthozoan polyp, the basal portion of which is united with other zooids in a common mass. It is a site of bioluminescence in some anthozoans

## anthostele

the lower part of a cnidarian polyp, into which the distal portion of the polyp, the anthocodium (which includes the mouth and the tentacles) is withdrawn

## Anthozoa

a class of Cnidaria that includes the stony corals, soft corals, sea anemones, gorgonians, and corallimorpharians



A deep-sea anemone photographed by the *Alvin 2001* during a survey of Blake Ridge off the U.S. Georgia coast (Deep East expedition).

## anthropogenic

made by people or resulting from human activities

## anthropogenic climate change

climate change due to human activities

## anthropomorphism

attributing a human characteristic to an inanimate object or a non-human species

### anti-codon

a triplet of nucleotide bases (codon) in tRNA (transfer RNA) that pairs with (is complementary to) a triplet in mRNA (messenger RNA). For example, if the codon is UCG, the anticodon is AGC

### antibiosis

the inhibition of growth of a microorganism by a substance produced by another microorganism

### antibiotic

a chemical substance, e.g., penicillin, that kills or inhibits the growth of bacteria

### antibody

a protein produced by higher animals in response to the presence of a specific antigen

### anticyclone

an area of high pressure. Circulation is clockwise around the high in the Northern Hemisphere and counterclockwise in the Southern Hemisphere

### antienzyme

a substance that neutralizes an enzyme

### antigen

a foreign macromolecule introduced into a host organism that elicits an immune response

### antihelminthic

a chemical agent used to combat parasitic worms, such as roundworms and tape worms

### antinutrient

a compounds that inhibits the normal uptake of nutrients

### antioxidant

a molecule that is capable of reacting with free radicals and neutralizing them; a compound that slows the rate of oxidation reactions

### antioxidant

a substance that prevents cellular damage caused by free radicals, which are are highly reactive chemicals

that often contain oxygen. They are produced when molecules are split to yield products that have unpaired electrons (oxidation). Antioxidants counteract the damaging effects of oxidation in body tissues

## Antipatharia

an order of corals which contains the black and horny corals



Black coral in the order Antipatharia.

## antipathin

a proteinaceous and chitinous material that forms the axis of a black coral (Antipatharia)

## antisense DNA

the strand of chromosomal DNA that is transcribed; a DNA sequence that is complementary to all or part of an mRNA molecule

## anus

the posterior opening of the digestive tract, through which waste products of digestion are released

## apex

the tip, top, point, or angular summit of anything

## apex predator

an organism at the top of the food chain, relying on smaller organisms for food



This large blue shark is an apex predator in the ocean. (Photo: Greg Skomal, NOAA/NOS National Marine Sanctuaries)

## aphotic zone

that portion of the ocean where light is insufficient for plants to carry on photosynthesis

## apical

relating to or located at the tip (an apex)

## apiculate

ending in a short, sharp point

## Aplacophora

a class of Mollusca. They are a small group (less than 300 species) of wormlike mollusks that lack a shell. Some are associated with soft corals. Creeping species feed on cnidarians. Burrowing species are deposit feeders and carnivores

## Apo Reef

the second largest contiguous coral reef in the world, after Australia's Great Barrier Reef. Apo Reef is located around 33 kilometers west of the mid-western coast of the Philippine island of Mindoro. The reef and its surrounding waters are administered as a National Park as part of the Apo Reef Natural Park project

## apobiosis

the local death of a part of an organism

## apode fish

a fish which lacks pelvic (ventral) fins, such as the American or European eel

## apogee

the point in the orbit of the Moon or man-made satellite farthest from the Earth; the point in the orbit of a satellite farthest from its companion body

## apomixis

the asexual production of diploid offspring without the fusion of gametes. The embryo develops by mitotic division of the maternal or paternal gamete, or in the case of plants, by mitotic division of a diploid cell of the ovule

## apomixis

in flowering plants, asexual reproduction through seed

## apomorph

a derived character differing from the ancestral condition

## apomorphy

a relatively derived or advanced or unique character state

## apopinacocyte

in sponges, an endopinacocyte lining the excurrent canal

## apopinacoderm

in sponges, a surface lined with apopinacocytes

## apoptosis

a normal cellular process involving a genetically programmed series of events leading to the death of a cell

## apopyle

the opening of a choanocyte chamber of a sponge into an excurrent canal

## aposematism

conspicuous warning coloration



A venomous lionfish (*Pterois volitans*) with conspicuous coloration. (Photo: Copyright Corel Corporation)

## apparent shoreline

in areas where the land is obscured by marsh grass, mangrove forests, cypress or similar marine vegetation, the actual shoreline can not be accurately represented. Instead, the outer limit line of the vegetation area is delineated (where it would appear to the eye as the shoreline) and is referred to as the apparent shoreline

## appendicular

relating to the appendages, as opposed to axial, which refers to the trunk and head of an organism

## applet

a small Java program that can be embedded in a web page to create special effects. Applets differ from full-fledged Java code. They are not allowed to access certain resources on the local computer such as files and serial devices, and are prohibited from communicating with most other computers across a network

## approximate

in morphology, placed close together

## approximate

in morphology, placed close together

## apron reef

the initial stage of a fringing reef. It is discontinuous and covers a small area

## aquaculture

the growing of aquatic organisms in controlled environments for any commercial, recreational, or public purpose; sector of fisheries that includes the rearing or raising under controlled conditions of aquatic products such as fishes, mollusks, crustaceans, sea weeds and other aquatic resources in sea, lakes and rivers. Examples are fish ponds, fish pens, and fish cages. Aquaculture is widespread, and in tropical countries has been a significant source of pollution in coastal waters and also contributes to the destruction of mangrove forests

## aquarist

a hobbyist or professional that keeps organisms in an aquarium

## Aquarius

*Aquarius* is an underwater ocean laboratory located in the NOAA Florida Keys National Marine Sanctuary. The laboratory is deployed three and half miles offshore, at a depth of 60 feet, next to spectacular coral reefs. Scientists live in *Aquarius* during ten-day missions using saturation diving to study and explore the coastal ocean. *Aquarius* is owned by NOAA and is operated by the National Undersea Research Center at the University of North Carolina at Wilmington



The *Aquarius*, an underwater ocean laboratory located in the NOAA Florida Keys National Marine Sanctuary. (Photo: NOAA/OAR National Undersea Research Program)

## Aquarius Reef Base

NOAA's Aquarius Reef Base is composed of the undersea laboratory, a separate ocean observing station with real-time results available via the Internet and limited plug-in capability for additional sensors, and a shore

base. Together, these assets provide a state-of-the-art diving facility for coral reef science along with synchronous ocean observing, a test bed for technology development, and advanced communications that allow for telepresence research, education, and outreach; see also "Aquarius"

## aqueous solution

a solution in which water is the solvent

## aquifer

a subterranean layer of porous water-bearing rock, gravel, or sand capable of storing and conveying water to wells and streams

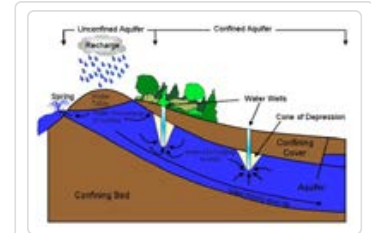


Diagram of an aquifer system.  
(Diagram: Texas A&M Univ.)

## aquiferous system

water circulatory system in sponges composed of choanoderm, pores and chambers

## arachnactis

a planktonic larva of tube anemones (Ceriantharia)

## aragonite

a mineral species of calcium carbonate ( $\text{CaCO}_3$ ) with a crystal structure different from the other two forms of  $\text{CaCO}_3$  (vaterite and calcite). It is precipitated from ocean surface waters mainly by organisms (e.g., coral) that use it to make their shells and skeletons

## aragonite skeleton

skeletons primarily composed of the aragonite form of calcium carbonate

## arborescent

having a large tree-like appearance

## arborescent colony

a coral colony with a tree-like growth structure

## arch-

a prefix meaning 'ultimate beginning'

## Archaea

a group of organisms that resemble bacteria. However, these organisms are biochemically and genetically different from bacteria. Some species live in the most extreme environments found on Earth

## Archaeobacteria

an ancient group of prokaryotes, over 3.5 billion years old; sometimes this group is placed into a separate kingdom, the Archaea. Most biologists currently place it within the Kingdom Monera. Archaeobacteria inhabit extreme environments

## archaeocyte

in sponges, an amoeboid cell capable of phagocytosis. Archaeocytes are totipotent, having the capability of differentiating into other types of sponge cells

## archenteron

the primitive endoderm-lined gut of an animal embryo formed during gastrulation. It is formed by the invagination of blastula cells (blastomeres) into the blastocoel. The archenteron develops into the digestive tract of the adult animal

## archetype

the plan or fundamental structure on which a group of organisms, or their systems of organs, are assumed to have been constructed; as, for example, the vertebrate archetype

## archi-

a prefix meaning primitive, original, or ancestral

## arciform

bow-shaped

## ArcIMS

ESRI software that allows for centrally hosting and serving GIS maps, data, and applications for use on the Internet

## arcuate

crescent-shaped

## arenaceous

a condition of skeletal architecture in sponges in which sand and/or foreign spicule debris partly or completely replaces native spicules within the sponge skeleton; resembling or containing sand; or growing in sandy areas



## arenicolous

living in sand

## areolate

appearance of a surface characterized by circular spots of tissue or areolae

## argent

silvery color

## Aristotle's lantern

a highly developed chewing apparatus used for feeding in some sea urchins

## aromatic

a type of hydrocarbon, such as benzene or toluene, with a specific type of ring structure

## arrayed library

in genomics, Individual primary recombinant clones (hosted in phage, cosmid, YAC, or other vector) that are placed in two-dimensional arrays in microtiter dishes. Each primary clone can be identified by the identity of the plate and the clone location (row and column) on that plate. Arrayed libraries of clones can be used for many applications, including screening for a specific gene or genomic region of interest

## arrhenotoky, arrhenotokous

parthenogenetic production of haploid males from unfertilized eggs. Fertilized eggs produce viable diploid females

## arterial gas embolism

a hazardous condition for scuba divers that is characterized by air bubbles released from ruptured lung air pockets (alveoli) into the pulmonary circulation. The bubbles then travel to the arterial circulation, where they may block blood flow in the small arteries or capillaries of the brain or heart. The results may be fatal. Arterial gas embolism in divers may be caused by holding one's breath during an ascent, wherein the lungs expand to the danger point

## Arthropoda

an animal phylum that contains lobsters, crabs, shrimp, mantis shrimp, barnacles and copepods, fairy shrimp (all crustaceans), insects, centipedes, millipedes, spiders, scorpions, horseshoe crabs, pycnogonids (sea spiders), ticks and mites. Approximately three quarters of a million species are described, many more than all the other animal phyla combined. The crustaceans are the arthropods associated with coral reefs



A spiny lobster (phylum Arthropoda).

## articulated

jointed, as in for example, the soft fin rays of fishes

## articulating

united by means of a moveable joint

## artifact

an object made by human workmanship, usually for some practical purpose

## artificial classification

in taxonomy, classification based on convenient or conspicuous diagnostic characters without attention to characters which indicate phylogenetic relationship; often a classification based on a single arbitrarily chosen character, rather than an evaluation of the totality of characters

## artificial reef

an artificial structure placed on the ocean floor to provide a hard substrate for sea life to colonize. Artificial reefs are constructed by sinking dense materials, such as old ships and barges, concrete ballasted tire units, concrete and steel demolition debris and dredge rock on the sea floor within designated reef sites



These concrete blocks were the first artificial structures deployed to provide a substrate for reestablishing colonies of *Oculina* coral (*Oculina varicosa*) and simulating fish habitat on *Oculina* Bank (central Florida Atlantic coast), which were destroyed by bottom trawling in the 1990s.

## artificial selection

the practice of choosing individuals from a population for reproduction (selective breeding), usually because these individuals possess one or more desirable traits

## artificial selection

a process in which humans select desirable genetic characteristics in plants and animals and selectively breed those animals and cultivate those plants to ensure that future generations of descendants have those specific desirable traits

## artisanal fishing

fishing which is typically a small-scale operation that uses simple fishing methods; fishing for subsistence by coastal or ethnic island groups using traditional methods; fishing with the purpose of catching/collecting aquatic products for sale

## ascanoid

simplest body form of sponges, with canals leading directly from the surrounding water to the interior spongocoel

## ascidian

a solitary or colonial sea squirt of the phylum Chordata, class Ascidiacea. The adult form does not resemble vertebrate chordate animals but the larval stage possesses all basic chordate characteristics. Adult ascidians are sedentary, filter-feeding, cylindrical or globular animals, usually found attached to a substrate. The soft body is surrounded by a thick gelatinous to leathery test, or tunic (which also gives them the name of tunicate), often transparent or translucent. The test is secreted by the body wall of the adult animal. It is composed of cellulose, a carbohydrate unique in the animal kingdom



These adult ascideans (sea squirts) resemble invertebrates, but they are closely related to vertebrates and other members of the phylum Chordata.

## ASCII (American Standard Code for Information Interchange)

a set of codes for representing alphanumeric information (e.g., a byte with a value of 77 represents a capital M). Text files, such as those created with the text editor of a computer system, are often referred to as ASCII files

## asexual embryogenesis

the sequence of events whereby embryos develop from somatic cells

## asexual reproduction

reproduction that does not involve the union of sex cells (gametes) to produce a zygote. Examples in corals are budding and fragmentation

## aspergilliform

brush-shaped

## aspergillosis

a widespread fungal infection of Caribbean soft corals. It affects six species of sea fans and sea whips. The pathogen is *Aspergillus sydowii*, a terrestrial fungus which infects gorgonia after germination of spores on the coral surface. This is followed by penetration and spread of hyphae in coral tissue, resulting in highly visible

lesions which may be associated with complete loss of tissue and skeleton. Lesions often occur at multiple sites across an infected colony.-Purple galls may be produced by the coral host to encapsulate fungal hyphae. For more information and illustrations, see: [http://www.coral.noaa.gov/coral\\_disease/aspergillosis.shtml](http://www.coral.noaa.gov/coral_disease/aspergillosis.shtml)

## asperity

a peak or projection from a surface; pertains to roughness of a surface

## assay

in general, the qualitative or quantitative analysis of a substance to determine its constituents and the relative proportion of each, or to determine the biological, chemical, or pharmacological potency of a drug

## Association of Marine Laboratories of the Caribbean (AMLC)

AMLC is a confederation of more than 30 marine research, education, and resource management institutions endeavoring to encourage the production and exchange of research and resource management information, advance the cause of marine and environmental education in the region, and facilitate cooperation and mutual assistance among its membership. It was founded in 1956 by marine researchers with interests in the marine science of the tropical Atlantic and the Caribbean. The strength of AMLC lies in the diversity of its member laboratories and the extensive expertise of its membership

## astaxanthin

a carotenoid pigment found in crustaceans. Astaxanthins may give a green color to the musculature of fishes which feed on crustaceans

## astern

behind the vessel; toward the rear of the vessel

## asthenosphere

a layer of soft but solid, mobile rock comprising the lower part of the upper mantle from about 100 to 350 km beneath the Earth's surface

## asymmetric competition

competition between two organisms (or species) in which one is much more adversely affected than the other

## ata (atmosphere absolute)

one (1) ata is the atmospheric pressure at sea level

## Atlantic and Gulf Rapid Reef Assessment (AGRRA)

an international collaboration of scientists and managers aimed at determining the regional condition of reefs in the Western Atlantic and Gulf of Mexico

## atmosphere

a unit of pressure, abbreviated as *atm*; "one atmosphere" is the pressure of the atmosphere at sea level, i.e., 760 mm Hg. Two atmospheres is twice this pressure, 1520 mm Hg, etc.; the air surrounding the earth, from sea level to outer space

## atmospheric pressure

the pressure of the atmosphere at any given altitude or location; it is synonymous with barometric pressure

## atoke

the anterior, nonreproductive part of a marine polychaete worm, as distinct from the posterior, reproductive part (epitoke) during the reproductive season

## atoll

a horseshoe or circular array of reef islets, capping a coral reef system that encloses a lagoon, and perched around an oceanic volcanic seamount



A small Pacific atoll. Note the coral reef encircling the calm and shallow lagoon.

## atom

the smallest component of an element, made up of neutrons, protons, and electrons

## atomic force microscopy (AFM)

a very high-resolution type of scanning microscopy with resolution of fractions of a nanometer (one nanometer = one billionth of a meter); also called "scanning force microscopy (SFM)"

## ATPase

an enzyme that functions in producing or using adenosine triphosphate (ATP)

## atramentous necrosis (AtN)

a coral disease characterized by spreading black lesions, often covered by a white film

## atresia

an abnormal condition in which a normal opening or tube in the body is closed or absent

## atrium

a body cavity; a heart chamber which receives blood

## atrophy

a wasting or decrease in size of a tissue or organ because of a reduction in the size or number of its cells. Atrophy may result from cellular death, reduced cellular division, pressure, ischemia, malnutrition, decreased activity or hormonal changes

## atrophy

a wasting or decrease in size of a tissue or organ because of a reduction in the size or number of its cells. Atrophy may result from cellular death, reduced cellular division, pressure, ischemia, malnutrition, decreased activity or hormonal changes

## atrous

jet black color

## attachment stage

a stage in an animal's life cycle when it ceases being free swimming or motile, and becomes attached to a substrate

## attendant male

a male fish which is not a member of a spawning pair, but hovers close by; often a sneaky male

## attenuated

the gradual loss in intensity of any kind of flux through a medium; a gradual diminishing in the strength of something; long and tapering

## attribute

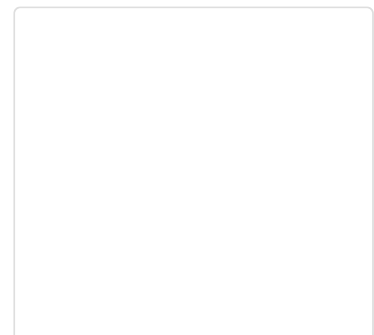
a measurable component of a biological system

## auditory ossicle

one of a series of bones conducting sound in some fishes

## auricularia larva

larva of a sea cucumber; an early bipennaria larva of a starfish





Late-stage auricularia of *Stichopus californicus* - ca. 17-18 days old, raised in culture by T.H.J. Gilmour. (Photo: University of Saskatchewan Archives)

## austral

relating to or coming from the south; of the south temperate region, between the antarctic and tropical regions

## Australian Centre of Excellence for Innovative science for sustainable management of coral reef biodiversity

the primary goal of this Australian Research Council Centre of Excellence is to undertake research programs of international significance (through the establishment of new collaborative teams of Australia's leading coral reef researchers) that transcend traditional disciplinary, institutional and geographic boundaries. The Centre of Excellence cements Australia's leading contribution to coral reef sciences, and fosters stronger collaborative links between James Cook University, The Australian National University, University of Queensland, and 28 other leading institutions in nine countries. Collectively, the JCU-led Centre creates the world's largest concentration of coral reef scientists. The aim is to add focus, scale and scope to build an enduring program of innovative research development, leading to world leadership in coral reef science. A key outcome of the Centre of Excellence is to actively transfer scientific knowledge to industry partners and end-users, to increase their capacity and effectiveness, and provide benefits to all Australians

## Australian Institute of Marine Science (AIMS)

the Australian Institute of Marine Science (AIMS) was established by the Commonwealth government in 1972 to generate and transfer the knowledge needed for the sustainable use and protection of the marine environment through innovative, world-class scientific and technological research. It is a federally-funded and independent statutory authority governed by a Council appointed by the Australian government. AIMS has its headquarters at Cape Ferguson, 25km east of Townsville in North Queensland



AIMS field operations jetty at Cape Ferguson. (Photo: AIMS)

## autapomorphy

an apomorphy (derived character differing from the ancestral condition) possessed by a species or clade that is shared with no other species or clade, i.e., a derived character found only in a terminal taxon

## autecology

the ecology of a single species

## author

in taxonomy, the person(s) to whom a work, a scientific name, or a nomenclatural act is attributed

## authority

in taxonomy, the name of the author of a taxonomic name, cited after the name

## autochory

the process of seeds and fruits dispersal by means of some kind of explosive physical expulsion. The fruit "explodes", propelling its seeds some distance to the ground surrounding the parent plant; also called "discharge dispersal"

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the process of seeds and fruits dispersal by means of some kind of explosive physical expulsion. The fruit "explodes", propelling its seeds some distance to the ground surrounding the parent plant; also called "discharge dispersal"

## autochthonous

native; indigenous; originating or occurring naturally in the place specified

## autoimmune disease

a disease in which the organism produces antibodies against its own tissues

## autoimmunity

a condition in which an organism mounts an immune response against one of its own organs or tissues; i.e., an organism's immune system attacking its own body

## autologous cells

cells that are taken from an individual, cultured, and possibly genetically manipulated before being infused back into the original donor

## autolysis

the destruction (lysis) of a cell through the digestive action of its own enzymes



## automated bleaching early warning system

automated bleaching alerts/warnings directly from satellite and/or in situ derived indices

## Autonomous Reef Monitoring Structures (ARMS)

Structures designed to mimic the complex coral reef environment and attract colonizing coral reef organisms in order to assess invertebrate biodiversity by measuring/monitoring diversity of cryptic organisms globally over time. ARMS provide standard methods for taxonomic and molecular analyses to assess invertebrate biodiversity. Information from the ARMS will provide managers with a tool to assess this diversity along with the affects of climate change and ocean acidification, globally. More than 500 ARMS have been deployed throughout the Pacific, Indian, and Atlantic Oceans

## autonomous replicating sequence (ARS)

any eukaryotic DNA sequence that initiates and supports chromosomal replication; also called autonomous(ly) replicating segment

## autopolyploid

a polyploid formed from the doubling of a single genome

## autoradiography

a technique that uses X-ray film to visualize radioactively labeled molecules or fragments of molecules; it is used in analyzing length and number of DNA fragments after they are separated by gel electrophoresis

## autosome

any chromosome that is not a sex chromosome; distinguished from a sex chromosome

## autotomy

the voluntary shedding of an appendage by snapping it off the base; in corals, some, reproduce asexually by autotomy (fragmentation), for example, *Fungia sp*

## autotrophic

relating to organisms that have a type of nutrition in which organic compounds used in metabolism are obtained by synthesis from inorganic compounds

## autozoid

a feeding polyp of a bryozoan (Ectoprocta). Autozooids compose the majority of a bryozoan colony

## autumnal equinox

the equinox at which the sun approaches the Southern Hemisphere and passes directly over the equator. It occurs around September 23

## auxotroph

a polyploid formed from the doubling of a single genome

## auxotroph

an organism which is unable to synthesize a particular organic compound required for its growth. An auxotrophic alga, for example, is one which requires a few organically derived substances, such as vitamins, along with dissolved inorganic nutrients for photosynthesis; in microbiology, a mutant strain that requires a new nutrient for growth

## available name

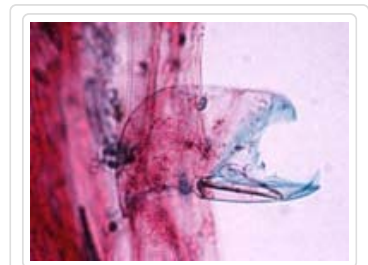
in taxonomy, any name which conforms to all mandatory provisions of the Code. There are general requirements of publication and date, language, name formation etc. An available name is not necessarily a valid name, as an available name may be in synonymy. Conversely a valid name must always be an available one

## avian

of, relating to, or characteristic of birds

## avicularium

a small bryozoan heterozoid in which the zoecium and operculum form a beak-like, snapping structure that deters small predators



A magnified view of an avicularium from the marine colonial bryozoan *Bugula* sp. (Photo: Dr. Rick Gillis, Biol. Dept., Univ. of Wisconsin)

## avirulent

unable to cause disease

## axial

refers to the head and trunk of an individual

## axial corallite

a corallite which forms the tip of a branch

## axial polyp

the longest and terminal polyp of a group of polyps, from which secondary (daughter) polyps are produced by budding

## axial sheath

the part of the coenenchyme immediately surrounding the axis of octocorals (gorgonians and pennatulaceans)

## axial skeleton

in a vertebrate skeleton, the skull, vertebral column, ribs, and sternum

## axial swimming

the predominant swimming mode of fishes. This swimming movement involves lateral bending of the body caused by contractions of the lateral body musculature and oscillating movements of the caudal fin

## axis

the internal, usually calcium carbonate skeletal rod of sea fans (Gorgonacea) and sea pens (Pennatulacea)

## axis cortex

the layer surrounding the central core of the axis (inner supporting structure), secreted by the axis epithelium

## axis epithelium

a layer of ectodermal cells that produce the axis of octocorals and cells that attach the soft tissues to the axis

## axocoel

the most anterior of three coelomic spaces that appear during larval development of echinoderms

## axon

the single motor branch of a neuron that passes the nervous impulse away from the cell body to another neuron or effector organ

## axoneme

a bundle of microtubules and other proteins forming the core of each cilium or flagellum

## azooxanthellate coral

a coral which does not have symbiotic zooxanthellae in its tissues

## azure

light or sky blue color

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#) | [N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#) |

## bacillus

a bacterium with a rod-like shape

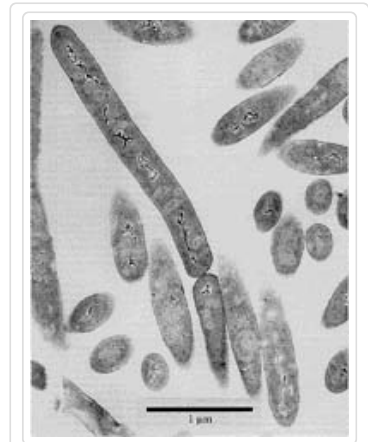


Image of rod-shaped bacterium, *Bacillus infernus*, collected from deep (20-2800 meters) terrestrial subsurface. (Photo: U.S. Dept. of Energy/Subsurface Microbial Culture Collection)

## back reef

the shoreward side of a reef, including the area and sediments between the reefcrest/algal ridge and the land. It corresponds to the reef flat and lagoon of a barrier reef and platform margin reef systems



Emergent coral heads in a back reef zone. (Photo: Great Barrier Reef Marine Park Authority)

## backcross

crossing an organism with one of its parents, or with the genetically equivalent organism. The offspring of such a cross are referred to as the backcross generation or backcross progeny

## background level

the concentration or level of a substance or other factor in an environment that is not the result of human activities, e.g., background levels of chemicals, light, sound, etc

## background noise

noise coming from sources other than the noise source being monitored

## backscatter

the deflection of acoustic radiation in a scattering process through an angle greater than 90 degrees. Backscatter is the term commonly used to describe the return of energy from the seabed to the receiver in an active sonar

## bacterial bleaching

loss of zooxanthellae with resultant bleaching caused by a specific bacterial infection, as opposed to environmental stress. The bacteria (*Vibrio sp.*) produce a toxin which cause lysis of the zooxanthellae. For additional information and illustrations, see:

[http://www.coral.noaa.gov/coral\\_disease/bacterial\\_bleaching.shtml](http://www.coral.noaa.gov/coral_disease/bacterial_bleaching.shtml)

## bacterial bleaching hypothesis (BB)

an alternative hypothesis that mass coral bleaching is triggered by the presence of bacteria in the genus *Vibrio*, rather than from thermal stress

## bacterial chlorophyll

chlorophylls (bacteriochlorophylls a, b, c, d, e, and g) found in photosynthetic bacteria. They differ from plant chlorophyll in chemical construction and absorption spectra characteristics

## bacterial generation time

the time interval required for a bacterial cell to divide, or for a population of bacterial cells to double. Generation times for bacterial species growing in nature may be as short as 15 minutes or as long as several days

## bactericide (bacteriocide)

a substance that kills bacteria

## bacteriophage (phage)

a virus that attacks and infects bacterial cells. Phages consist of a protein coat enclosing the genetic material, DNA or RNA, that is injected into the bacterium. Upon infection, synthesis of host DNA, RNA and proteins ceases and the phage genome is used to direct the synthesis of phage nucleic acids and proteins using the host's transcriptional and translational apparatus

## balanced polymorphism

a type of polymorphism in which the frequencies of the coexisting forms do not change noticeably over many generations

## ballast

a weight at the bottom of the boat to help keep it stable. Ballast can be placed inside the hull of the boat or externally in a keel. Water picked up as ballast in one location may be released in another, and in doing so, may introduce non-native species

## band

a thick, pigmented vertical marking that encircles the circumference of an organism's body



*Chaetodon striatus*, the banded butterfly fish, has two black bands of pigment encircling its body. (Image: NOAA)

## bank

a broad elevation of the sea floor around which the water is relatively shallow but not a hazard to surface navigation

## bank reef

large reef growths, generally having irregular shape, which develop over submerged highs of tectonic or other origin and are surrounded by deeper waters

## bank/shelf

deepwater area extending offshore from the seaward edge of the fore reef to the beginning of the escarpment where the insular shelf drops off to the deep, oceanic water. If no reef crest is present, it is the flattened platform between the fore reef and the deep ocean waters or between the intertidal zone and open ocean

## bar

a thick, pigmented vertical marking that does not encircle the body of an organism; an elongate submarine shoal



The royal gramma, *Gramma loreto*, has a darkly pigmented bar across its eye.

## bar

unit of pressure of one million dynes per square centimeter

## barb

a type of spine armed with teeth pointing backwards

## barbel

a slender elongate sensory structure protruding from the lips or jaws of certain fishes, such as catfishes, goatfishes, drums, cods, and many deep-sea fishes. Barbels may appear singly or in groups. They are primarily tactile in function but may also bear tastebuds, allowing the fish to taste its environment



A yellow goatfish with two prominent barbels protruding from its chin. (Photo: NOAA)

## barcode

short nucleotide sequences from a standard genetic locus for use in species identification

## Barcode of Life

a project to create a public collection of reference sequences from vouchered specimens of all species of life. A Barcode sequence is a short nucleotide sequence from a standard genetic locus for use in species identification. For animals, this standard genetic locus is a 650 base pair region on the 5' end of the mitochondrial cytochrome oxidase subunit I (COI) gene.

## barometer

an instrument for measuring air pressure

## barophile

a microorganism which grows best (or can only grow) in high-pressure environments, such as deep-sea environments

## barotrauma

an injury that results from rapid or extreme changes in pressure. Scuba divers may experience ear barotrauma, a condition of discomfort in the ear caused by pressure differences between the inside and the outside of the eardrum

## barrel

a unit of volume equal to 42 U.S. gallons or 159 liters at 60 o F, often used to measure volume in oil production, transportation, and trade

## barren zone

the region of a coral reef seaward of the lower palmata zone and just landward of the buttress or mixed zone

## barrier

in biogeography, an environment that prevents or impedes the dispersal of a species from one location to another

## barrier island

a long, usually narrow accumulation of sand, that is separated from the mainland by open water (lagoons, bays, and estuaries) or by salt marshes



Cape Lookout National Seashore currently consists of 4 barrier islands. (Photo: U.S. National Park Service)

## barrier reef

a long, narrow coral reef, roughly parallel to the shore and separated from it by a lagoon of considerable depth and width. It may lie a great distance from a continental coast. It is often interrupted by passes or channels



Healthy *Acropora* coral in Australia's Great Barrier Reef. (Photo: Ray Berkelmans/Great Barrier Reef Marine Park Authority)

## basal

of, at or forming a base

## basal plate

lower part of the coral cup, separating the polyp from the substratum. A synonym of pedal disc

## basalt

a dark, fine-grained igneous rock composed of minerals rich in ferromagnesian silicates

## base

a substance that reduces the hydrogen ion concentration in a solution



## base

in genomics, a key component of DNA and RNA molecules. Four different bases are found in DNA: adenine (A), cytosine (C), guanine (G) and thymine (T). In RNA, uracil (U) substitutes for thymine; also known as nitrogenous bases; a base, a phosphate molecule and a sugar joined together constitute a nucleotide

## base pair

two nitrogenous bases which form a "rung of the DNA ladder." A DNA nucleotide is made of a molecule of sugar, a molecule of phosphoric acid, and a base molecule. The bases are the "letters" that spell out the genetic code. In DNA, the code letters are A, T, G, and C, which stand for the chemicals adenine, thymine, guanine, and cytosine, respectively. In base pairing, adenine always pairs with thymine, and guanine always pairs with cytosine. In RNA, thymine is replaced by uracil

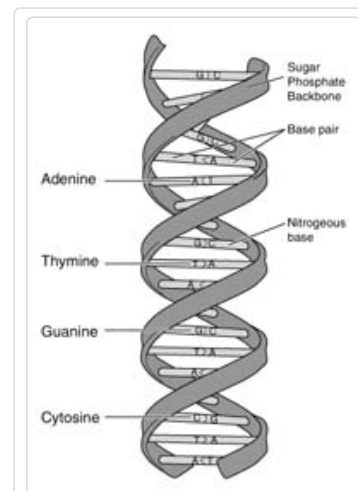


Diagram of a DNA molecule.  
(Diagram: U.S. NIH/Human Genome Project)

## base pairs (bp)

pairs of nucleotide bases in DNA

## base sequence

the order of nucleotide bases in a DNA molecule

## baseline data

a quantitative level or value from which other data and observations of a comparable nature are referenced

## basic research

research conducted with the sole goal of obtaining knowledge; in contrast with applied research

## basicaudal

on the base of the caudal fin of fishes

## basicaudal spot

a spot on the base of the caudal fin, common in many unrelated fish species

## basilar

forming a foundation

## basipinacocyte

a pinacocyte that adheres a sponge to a substrate by the external secretion of a collagenous matrix

## basket star

a basket star is a specialized type of brittle star (Echinodermata). It has a series of complexly branched arms which are used to capture plankton

## basophylic

having an affinity for basic dyes

## Batesian mimicry

a type of mimicry in which a harmless species resembles a different species that is unpalatable, poisonous, or otherwise noxious or harmful to a predator

## bathymetric map

a map which delineates the form of the bottom of a body of water by the use of depth contours (isobaths)

## bathymetry

the science of measuring ocean depths to determine the topography of the sea floor

## baud

unit of data transmission speed of one bit per second

## beach

an aggregation of unconsolidated sediment, usually sand, that covers the shore

## beak

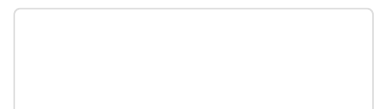
in cephalopods, one of two chitinous mandibles (jaws) used primarily to cut prey tissues during feeding

## beam

the widest part of a vessel

## beche-de-Mer

commercially harvested sea cucumbers (Class Holothuroidea). In Asia, it is



considered to be a delicacy

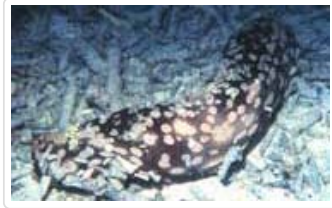


Image of the commercially harvested -beche de mer+.

## bedrock

the solid rock of the earth's crust that lies under the soil and other unconsolidated earth materials

## behavioral isolating mechanism

a difference in behavior (usually reproductive behavior) that prevents genetic exchange between members of different populations or species

## bel

unit of noise intensity equal to ten decibels

## belt transect

a linear or circular transect with the observation area being a specified distance on either side of the transect line

## benchmark

a measurement or standard that serves as a point of reference by which process performance is measured

## benign introduction

the purposeful introduction of members of a species into an appropriate habitat, foreign to the "home" habitat or area, for the purposes of conservation of that species

## benthic

bottom dwelling; living on or under the sediments or other substrate

## benthic organism (benthos)

an organism whose habitat is on or near the bottom of a stream, lake, or ocean

## benthic region

the bottom layer of a body of water





A benthic crab (phylum Arthropoda).

## beta animal

in animal behavior, the subordinate or second animal in a social group

## beta particle

a high-speed particle, identical to an electron, emitted from an atomic nucleus

## beta taxonomy

in taxonomy, the process of arranging taxa into higher categories which reflect the evolutionary history of a group of organisms.

## BibTeX

a reference management software for formatting lists of references. BibTeX makes it easy to cite sources in a consistent manner, by separating bibliographic information from the presentation of this information

## bicentric distribution

the presence of a species (or other taxonomic unit) in two widely separated geographic areas

## bicuspid

having two cusps or points

## bifacial

describes plates which have corallites on both sides

## bifid

divided or cleft into two parts or lobes

## bifurcate

a coral branch that divides into two equal branches

## Big Old Fat Fecund Female (BOFFF) hypothesis

in all species of fishes, the older larger females produce more eggs than the younger smaller ones. In some species, the larger older females can produce exponentially greater quantities of eggs. The BOFFF hypothesis refers to this phenomenon

## bigeye

any species of bony fishes in the family Priacanthidae. Bigeyes ( also called "catalufas") are most typically colored bright red, but other coloration patterns exist. The common name of "bigeye" refers to their unusually large eyes which are adapted their predatory and nocturnal behavior. Most species reach lengths of 12-20 inches. Bigeyes are generally associated with rock formations or coral reefs

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any species of bony fishes in the family Priacanthidae. Bigeyes ( also called "catalufas") are most typically colored bright red, but other coloration patterns exist. The common name of "bigeye" refers to their unusually large eyes which are adapted their

## bight

an indentation of the coast forming a large open bay

## bilateral symmetry

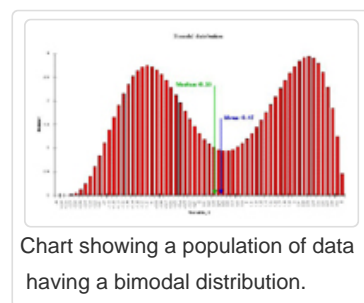
a bilaterally symmetric organism is one that is symmetric about a plane running from its frontal end to its caudal end (head to tail), and has nearly identical right and left halves. Most animals are bilaterally symmetrical. The exceptions are sponges (no symmetry), cnidarian polyps and medusae, and ctenophores (radial symmetry), and echinoderms (partial radial symmetry).

## Bilateria

group containing all multicellular animals with bilateral symmetry; the name has no taxonomic status

## bimodal

a distribution in which the frequency curve has two peaks. A single peak is called a mode



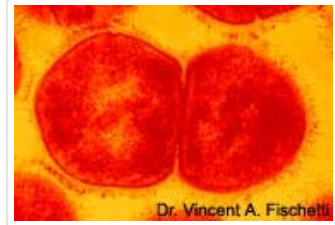
## bimodal curve

a frequency curve characterized by two peaks

## binary fission

type of cell division found in prokaryotic cells, in which dividing daughter cells

each receive a copy of the parental chromosome



A bacterial cell reproducing by binary fission. The two resultant daughter cells are genetically identical. (Photo: Dr. Vincent A. Fischetti, Laboratory of Bacterial Pathogenesis and Immunology, Rockefeller University)

## binding

the ability of molecules to stick to each other because of the exact shape and chemical nature of parts of their surfaces

## binding site

the reactive part of a macromolecule that directly participates in its specific combination with another molecule

## binomen

a two-part name given to a species in which the first part is the name of the genus and the second is the specific name

## binomial nomenclature

a system of nomenclature where each animal has a dual name consisting of genus and species, e.g., the boulder coral, *Montastrea annularis*

## bioaccumulation

the buildup of chemical substances in the cells or tissues of an organism

## bioacoustics

a discipline of zoology that is concerned with sounds of biological origin: their mechanisms of production, physical properties, receptors and reception physiology, and the role of the sounds in behavior

## bioassay

an assay for the activity or potency of a substance that involves testing its activity on living materials

## bioaugmentation

the addition of microorganisms to the existing native oil-degrading population

## biochemical cycle

the flow of an element through the living tissue and physical environment of an ecosystem, e.g., the carbon, hydrogen, oxygen, nitrogen, sulfur, and phosphorus cycles

## biochemical genetics

the study of the relationships between genes and enzymes, specifically the role of genes in controlling the steps in biochemical pathways

## biochemical oxygen demand (BOD)

the amount of oxygen taken up by microorganisms that decompose organic waste matter in water. It is therefore used as a measure of the amount of certain types of organic pollutant in water. A high BOD indicates the presence of a large number of microorganisms, which suggests a high level of pollution

## biochip

an electronic device that uses organic molecules to form a semiconductor; a microchip that uses tiny strands of DNA to latch onto and quickly recognize thousands of genes at a time; collection of miniaturized test sites (microarrays) arranged on a solid substrate that permits many tests to be performed at the same time in order to achieve higher throughput and speed. A biochip can perform thousands of biological reactions, such as decoding genes, in a few seconds. Biochips can also be used to rapidly detect chemical agents used in biological warfare so that defensive measures can be taken

## biochore

a group of similar biotopes

## bioclastic sediment

a sediment type composed of fragments of organic skeletal materials

## biocoenose

an assemblage of diverse organisms inhabiting a common biotope

## biocoenosis

a community or natural assemblage of organisms. The term often is used as an alternative to ecosystem, but strictly it is the fauna/flora association excluding physical aspects of the environment

## biocycle

a subdivision of the biosphere, e.g., a biochore

## biodegradable

capable of undergoing rapid decomposition by microorganisms under aerobic and/or anaerobic conditions. Most organic materials are biodegradable

## biodiversity

the total diversity and variability of living things and of the systems of which they are a part. This includes the total range of variation in and variability among systems and organisms at the bioregional, ecosystem and habitat levels, at the various organismal levels down to species, populations and individuals and at the level of the population and genes



A coral reef contains a great variety of species of all major kingdoms of living forms. (Photo: Dr. Anthony Picciolo)

## biodiversity hot spot

an area that features exceptional concentrations of species, including many endemics. Many such hot spots also experience large habitat losses, putting these ecosystems at risk

## biodiversity indicators

in conservation biology, sets of species or taxa whose presence may indicate areas of high species richness

## bioerosion

erosion of the physical/geological environment by organism activities such as boring, scraping, etching, etc.

## biofuel

any liquid, gaseous, or solid fuel produced from plant or animal organic matter

## biogenesis

a central concept of biology that all living organisms are descended from predecessor living organisms

## biogenic

refers to things which came about as a result of the activities of living organisms

## biogenic reef

a mound-like layered structure built by and predominantly composed of organic remains such as shells and skeletons of sedentary organisms

## biogenic rock



an organic rock produced by the physiological activities of plants or animals

## biogenous

produced by living organisms

## biogenous sediment

sediment that is composed of the skeletons and shells of marine organisms, primarily plankton

## biogeochemical cycle

the chemical interactions among the atmosphere, biosphere, hydrosphere, and lithosphere

## biogeography

a branch of biology that deals with the geographical distribution of organisms

## bioherm

a body of rock built up by or composed mainly of sedentary organisms, e.g., hard corals, calcareous algae or mollusks, and enclosed or surrounded by rock of different origin

## bioinformatics

the analysis of biological information using computers and statistical techniques; the science of developing and utilizing computer databases and algorithms to accelerate and enhance biological research. Bioinformatics is particularly important as an adjunct to genomics research, because of the large volume of complex data generated

## biolimiting

relating to the environmental factors determining or restricting the growth of a particular life form

## biolistics

a technique to insert DNA into cells. The DNA is mixed with small metal particles, usually tungsten or gold, a fraction of a micrometer across. These are then fired into a cell at very high speed.

## biological clock

an internal biological mechanism which controls certain biological rhythms and biocycles, such as metabolism, sleep cycles, and photosynthesis

## biological control

the use of living organisms, such as parasites, disease agents, and predators, to control or eliminate other unwanted living organisms, rather than by using toxic chemicals or other means of elimination

## Biological Data Profile of the Content Standard for Digital Geospatial Metadata

provides a common set of terminology and definitions for the documentation of biological data through the creation of extended elements and a profile of the FGDC Content Standard for Digital Geospatial Metadata. Its purpose is to provide a user-defined or theme-specific profile of the FGDC Content Standard for Digital Geospatial Metadata to increase its utility for documenting biological resources data and information. This standard can be used to specify metadata content for the full range of biological resources data and information. It also serves as the metadata content standard for the National Biological Information Infrastructure (NBII)

## biological half-life

the time required for one-half of the total amount of a particular substance in a biological system to be consumed or broken down by biological processes when the rate of removal is approximately exponential. Toxic chemicals with a long biological half-life will tend to accumulate in the body and are more likely to be harmful. A substance with a short biological half-life may still accumulate if a portion of it it becomes tightly bound to bone or other tissues, even if most of it is quickly eliminated from the body

## biological indicator

an organism, species or community whose characteristics show the presence of specific environmental conditions. Other terms used are indicator organism, indicator plant and indicator species

## biological navigation

the ability of certain animals to navigate by instinct to specific sites. Depending upon the species, the cues involved may be related to star patterns, sun angle, polarized light, chemical scents or tastes, or the Earth's magnetic field

## biological productivity

the amount of organic matter, carbon, or energy content that is accumulated during a given time period

## biological rank

in animal behavior, when a hierarchy of dominance exists between different species which compete for food, water or space

## biological rhythm

an overt, measurable activity generated by some internal oscillator (or 'clock')

## biological survey

collecting, processing, and analyzing a representative portion of the resident aquatic community to determine its structural and/or functional characteristics

## bioluminescence

light produced by organisms as a result of conversion of chemical energy to light energy



A bioluminescent comb jelly of the phylum Ctenophora.

## biomagnification

the accumulation and amplification of chemical substances at each succeeding trophic level

## biomarker

a characteristic that is objectively measured (at the visual or molecular level) and evaluated as an indicator of normal biological processes, pathogenic processes, or pharmacological responses to a therapeutic intervention

## biomass

an estimate of the amount of living matter per some unit volume or area

## biome

a community of animals and plants occupying a climatically uniform area on a continental scale

## biometrics

the use of statistics for the study of biological events

## biomineralization

the taxonomically widespread process by which living organisms produce minerals for, inter alia, support, defence, and feeding. These minerals often form structural features such as shells of mollusks, skeletons of corals, tests of echinoderms, and bones of vertebrates

## biopharming

to genetically engineer an organism to produce a pharmaceutical drug, vaccine or industrial substance

## biophysics

the scientific study of the physics of organisms, their biological structure and processes

## bioregion

any geographical region characterized by a distinctive biota

## bioremediation

the use of organisms such as plants or microorganisms to aid in removing hazardous substances from an area

## biosphere

the thin region surrounding the Earth that is capable of supporting life

## biostimulation

with reference to an oil spill, the method of adding nutrients such as phosphorus and nitrogen to a contaminated environment in order to stimulate the growth of the microorganisms capable of biodegradation; also known as nutrient enrichment

## biota

all life forms of a given area

## biotechnology

biological techniques used in applied research research and product development. In particular, the use by industry of recombinant DNA, cell fusion, and new bioprocessing techniques; any technology that is applied to living organisms to make them more valuable to humans

## biotope

an area of relatively uniform environmental conditions, occupied by a given plant community and its associated animal community

## biotoxin

any poisonous or venomous substance produced by any living organism

## bioturbation

the rearrangement of sediments by organisms that burrow through them and ingest them

## biotype

a physiological variety or a group of individuals having distinctive genetic characters in common

## biparental

the situation where the young are raised by both parents

## bipectinate

having two margins which are toothed, like a comb; descriptive of the gills (ctenidia) of aquatic mollusks

## bipectinate gill (ctenidium)

in mollusks, refers to having gill lamellae on both sides of the ctenidial axis

## bipinnaria larva

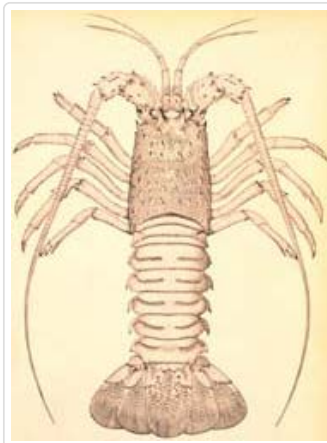
an early starfish larva with ciliated bands running about the periphery



Mature bipinnaria of *Pisaster ochraceus*, ca 24 days old, raised in culture by T.H.J. Gilmour. (Photo: University of Saskatchewan Archives)

## biramous appendage

a type of appendage that is characteristic of crustaceans. It forks from the basal protopodite to form two branches, the inner endopodite and the outer exopodite. Each of these branches can be composed of either one or more segments. There are many variations on this generalized structure; the branches often possess highly specialized extensions



Note the biramous antennules of the spiny lobster.

## bit

the smallest unit of information that a computer can store and process. A bit has two possible values, 0 or 1, which can be interpreted as yes/no, true/false, or on/off

## bitmap

a format for storing graphics in an uncompressed manner

## bitmap image

also called raster or paint images. They are made of individual dots called pixels (picture elements) that are arranged and colored differently to form a pattern. Compared to a vector image, bitmap images are great for photographs because they tend to offer greater subtleties for shading and texture but require more memory and take longer to print. Vector images are best for drawings that need sharper lines, more detail, and easy modification. Vector images require far less printing resources than bitmap images

## Bivalvia (Pelecypoda)

a class of Mollusca that includes clams, oysters and mussels. Bivalves are laterally compressed and possess a shell composed of two valves that hinge dorsally and enclose the body. They are common inhabitants of coral reefs



A scallop (class Bivalvia) displays its rows of light-sensitive eyespots.

## black coral

black corals are colonial cnidarians in the Order Antipatharia. They are found throughout the world's oceans, but are most common in tropical deep water habitats from 30-80 m depth. These species of black coral have rigid, erect skeletons that form branched, bush-like colonies. Black coral is commercially harvested primarily for jewelry, and may be globally threatened in many parts of the world as a result of over-harvesting



Black coral isn't really black. The name refers to the black color of their proteinaceous skeletons. The living colonies are made up of thousands of tiny coral polyps whose colors may be yellow, green or orange. (Photo: Dr. A. Bruckner, NOAA)

## black-band disease

a world-wide disease of corals that is characterized by a dark ring, or band, that separates apparently healthy coral tissue from freshly exposed coral skeleton. It migrates across coral colonies and completely degrades coral tissue. The infecting agent is a synergistic assortment of photosynthetic and non-photosynthetic bacteria. For more details and illustrations, see: [http://www.coral.noaa.gov/coral\\_disease/black\\_band.shtm](http://www.coral.noaa.gov/coral_disease/black_band.shtm)



Black band disease. (Photo: Dr. A. Bruckner, NOAA)

## blade

a leaf-like structure

## blastocoel

the fluid-filled cavity formed within the mass of cells of the blastula of many animals during the later stages of cleavage

## blastocyst

a preimplantation embryo. The blastocyst consists of a sphere made up of an outer layer of cells (trophoblast), a fluid-filled cavity (blastocoel), and a cluster of cells on the interior (inner cell mass)

## blastomere

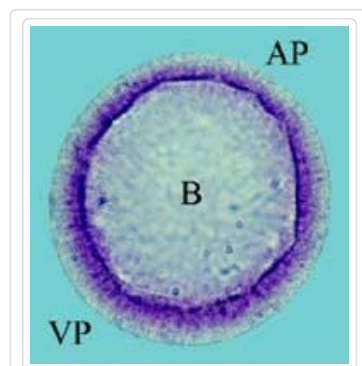
an undifferentiated cell of a cleaving embryo, and of the morula and blastula stages of embryonic development

## blastopore

the opening into the archenteron (primitive gut) of a gastrula. In some animals it develops into the mouth and, in others, into the anus

## blastula

a stage of embryonic development of animals near the end of cleavage (cell division), but before gastrulation. In animals where cleavage involves the whole egg, the blastula usually consists of a hollow ball of cells (blastomeres) surrounding a fluid-filled central cavity, the blastocoel



A late blastula characterized by a single layer of cells surrounding the central hollow area - the blastocoel (B). The blastomeres at the vegetal pole (VP) are taller than those at the animal pole (AP), making the vegetal pole appear slightly thicker. (Photo: Cell and Developmental Biology Online website (University of Guelph); URL: <http://www.uoguelph.ca/zoology/devobio/>)

## bleach

to become whitened or colorless by means of stressful agents, such as chemicals, elevated temperatures, exposure to sunlight, etc.

## bleaching

the process in which a coral polyp, under environmental stress, expels its symbiotic zooxanthellae from its body. The affected coral colony appears whitened

## bleaching index

index based on the strength and duration of local HotSpots to monitor bleaching events

## bleaching outbreaks

development of bleaching events

## bleaching stressors

environment-induced stress that results in bleaching, e.g., disease, excessive or insufficient light, increased levels of ultraviolet radiation, sedimentation, pollution, salinity changes, and increased temperatures

## blenny

the common name of a large group of over 800 species within seven families of bony fishes in the suborder Blennioidei. Blennies are small, usually scaleless fishes with comb-like teeth living in coastal and coral reef areas, including seagrass beds and tidepools. At least one species lives in fresh water. Most are characterized by possessing blunt foreheads, elongated, tapering bodies, and a continuous long dorsal fin. The pelvic fins are usually anterior to the pelvic fins, and in the jugular in position. Many species are cryptic or inhabit the surge zone. Most are herbivores.

## blind test

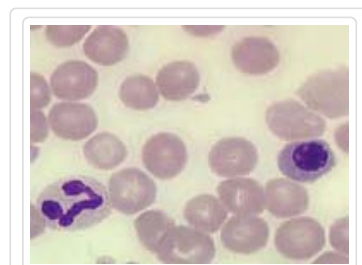
a method of testing or experimentation, in which an independent observer records the results of any test, drug, placebo, or procedure without knowing the identity of the samples or what result might be expected

## blog (weB LOG)

basically a journal that is available on the web. The activity of updating a blog is "blogging" and someone who keeps a blog is a "blogger"

## blood

a circulating tissue composed of a fluid portion (plasma) with suspended formed elements (red blood cells, white blood cells, and platelets) that delivers nutrients and hormones to cells and removes wastes; In some invertebrates, the blood is called the haemolymph



Red and white blood cells. The white blood cells are the larger



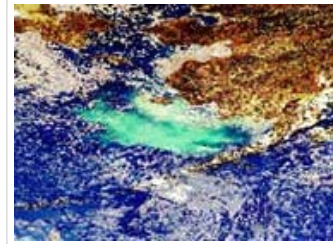
ones with irregular nuclei. The small particles are platelets.  
(Photo: U.S. National Institutes of Health)

## bloodworm

a marine polychaete worm used as bait in angling

## bloom

a sudden increase in the biomass of phytoplankton or benthic algae in a given area



A SeaWiFS (Sea-viewing Wide Field-of-view Sensor) image of a coccolithophore bloom in the Bering Sea.

## blotch

a patch or a spot of pigment with irregular edges



The blotch-necked moray (*Gymnothorax margaritophorus*) from American Samoa bears darkly pigmented blotches along its body. (Photo: NPS, Copyright Richard C. Wass)

## blowout

with reference to offshore drilling for oil and gas, a blowout is an uncontrolled flow of reservoir fluids into the wellbore, and sometimes catastrophically to the surface. A blowout may consist of salt water, oil, gas or a mixture of these

## blue carbon

carbon stored in the Earth's marine and coastal ecosystems

## blue carbon initiative

UNEP in cooperation with the Food and Agriculture Organization (FAO) and the United Nations Education and Science Organization (UNESCO) have introduced a new concept of Blue Carbon. The Blue Carbon Initiative emphasizes the important role being played by marine and coastal ecosystems in being carbon sinks. The areas where this is possible is with marine vegetation like mangrove forests, sea-grasses, brackish marshes, and salt marshes. This together with terrestrial forests could help to sequester atmospheric carbon in large quantities

## blue coral

the blue coral, *Heliopora coerulea*, is an octocoral that has a massive aragonite skeleton and is an important reef builder in some areas



Blue coral (*Heliopora coerulea*) from American Samoa. (Photo: NPS, Eva DiDonato)

## blue revolution

a movement aimed at increasing global human food production using aquacultural techniques, as in fish or shrimp farming

## blue-green algae

the former name for the blue-green bacteria, now classified as Cyanobacteria. A group of prokaryotic cells that use chlorophyll on intracytoplasmic membranes for photosynthesis. The blue green color is due to the presence of phycobiliproteins. they occur as single cells, colonies or simple filaments



Blue-green algae (Cyanobacteria). (Photo: J. Waterbury, Woods Hole/NASA Astrobiology Institute)

## BOD (Biological (or Biochemical) Oxygen Demand)

the oxygen used in meeting the metabolic needs of aerobic microorganisms in water rich in organic matter (as water polluted by sewage)

## body wall

in cnidarians, the wall of a polyp, composed of the outer epidermis, the middle non-cellular mesoglea, and inner gastrodermis which surrounds the gastrovascular cavity

## bond

a physicochemical association between atoms

## bond energy

the energy required to form a particular chemical bond

## boom

a temporary floating barrier used to control the spread of spilled oil to reduce the possibility of polluting shorelines and other resources, as well as to concentrate oil in thicker surface layers, making recovery easier

## booties

short "boots" usually made of neoprene, worn inside open-heel fins. they protect a scuba diver's feet from rubbing against the fins while swimming, as well as protecting the entire foot while walking to and from a dive site. Booties also provide warmth



A pair of booties worn by scuba divers under an open-heel fin.

## boring sponge

a marine sponge that chemically digests the limestone skeletons of corals and other calcareous organisms and structures during its search for food and living space. These "boring" activities can damage a coral reef; also called "excavating sponge"

## boss

a columnar, flat-topped coral-algal growth or erosion structure usually found on the upper surfaces of spurs and buttresses

## botryoid

shaped like a bunch of grapes

## bottlebrush branching

describes a branch with compact radial sub-branches

## bottom trawl

a method of fishing in which a large bag-shaped net is dragged along the bottom, behind the vessel. The mouth of the net is kept open by various methods, such as a wooden beam (beam trawl) or large flat boards (otter trawl). Bottom trawling has been very

## bottom trawler

a fishing vessel that uses an open-mouthed fishing net drawn along the sea bottom. This type of fishing is destructive to shallow water and deep sea coral reef communities



Small stern trawler fishing. (Photo: David Comb/New England Biolabs)

## bow

the front part of a vessel

## Boyle's Law

if the temperature is kept constant, the volume of a given mass of gas is inversely proportional to the absolute pressure

## brachial

pertaining or belonging to the arm

## brachiolaria larvae

a starfish larval stage following the bipinnaria stage. It has projecting arms and a developed stomach

## Brachiopoda

a phylum of marine invertebrates that superficially resemble bivalve mollusks because of their hinged bilaterally symmetrical shells. They are commonly known as "lampshells"

## brachy-

a prefix from the Greek, meaning "short"

## brackish

mixed fresh and salt water



A brackish water area showing a mix of salt and freshwater marsh

species in the Weeks Bay National Estuarine Research Reserve, AL.  
(Photo: NOAA)

## bradycardia

an unusually slow heart rate

## bradytelic

an exceedingly slow rate of evolution manifested by slowly evolving lineages which survive much longer than would be expected

## branchial

pertaining to gills

## branchial plume

a respiratory structure or external gills, usually located on the dorsal side toward the posterior of dorid nudibranchs. This plume surrounds the anus and in some species, it may be retracted. The branchial plume is the major respiratory structure in nudibranchs



The feathery structure toward the posterior of this nudibranch gastropod (marine sea slug) is its respiratory organ.

## branching colony

a coral growth pattern where branches are formed

## branchiostegal

one of the dermal bony or cartilaginous struts that support the branchiostegal membranes of fishes. Sometimes called branchiostegal rays, but not to be confused with the fin rays

## breaker

a wave that approaches shallow water, causing the wave height to exceed the depth of the water, in effect tripping it. The wave changes from a smooth surge in the water to a cresting wave with water tumbling down the front of it; a wave breaking on the shore

## breaker zone

the area of a coral reef most exposed to breaking waves

## breast

in fishes, the anterior ventral surface under the head

## breeding season

the time of the year during which mating occurs

## breeding season

that period of a year in which organisms are sexually active

## bristles

stiff hairs

## brittle star

brittle stars are echinoderms (class Ophiuroidea) which are closely related to sea stars (starfish). They possess radial symmetry with a central body disc from which five highly flexible snake-like arms protrude. There is no replication of internal organs, as in the arms of sea stars, just one set in the central disk. Compared to starfish, brittle stars have a much smaller central disc and no anus. Wastes are eliminated through the mouth, which is situated on the underside of the disc. The name is derived from their arms breaking off as a means of defense. New arms are easily regenerated. They are also called serpent stars because of the snakelike movements of the five arms

## broadcast spawner

an organism that releases gametes directly into the sea for external fertilization

## brood

all of the offspring that hatch from a single clutch of eggs or the offspring of a single birth; to incubate eggs

## brooder

a coral which harbors or broods developing larvae within its polyps

## brooding

the development of larvae within the gastrovascular cavity of an adult coral polyp

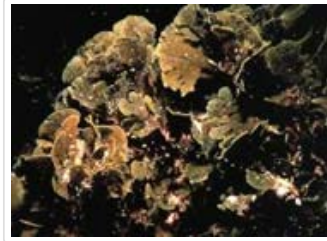
## brooding

parental care of young

## brown algae

brown algae belong to the Division Phaeophycophyta, whose approximately

1,500 species are almost exclusively marine. They include the largest of the seaweeds and the kelps. The brown algae have chlorophyll a and c, as well as carotenes and xanthophylls, but the green chlorophyll coloration is masked by the brown and yellow pigments. Brown algae are among the largest photosynthetic organisms on earth. The largest kelps may grow to more than 60 meters in length, forming dense underwater forests in colder waters. Many microscopic brown algae grow as epiphytes on underwater vegetation, forming networks of branched filaments, or broad encrustations. All species are multicellular and do not form colonies. Their life cycles are complex, involving alternation of generations. In general, they are not free-floating organisms, but are attached to rock, coral, or other firm surfaces. Sargassum weed, however, is a floating brown algae that stays afloat by producing gas-filled bladders



Brown algae. (Photo: NOAA)

## brown tree snake

the mildly venomous brown tree snake (*Boiga irregularis*) is an introduced species on some Pacific islands that has become a serious pest, especially on Guam. In the absence of natural population controls and with vulnerable prey on Guam, the snakes have become an exceptionally common pest causing major ecological and economic problems. The snakes probably arrived on Guam hidden in ship cargo from the New Guinea area. By 1968, they had dispersed throughout the island and caused havoc by virtually wiping out Guam's native bird species and helped decimate their fruit bat populations. In addition to Guam, brown tree snakes have been sighted on Saipan, Tinian, Rota, Kwajalein, Wake, Oahu, Pohnpei, Okinawa, and Diego Garcia. To date, this snake is not known to be established on any of these islands except Guam



The brown tree snake (*Boiga irregularis*) is an invasive species that has caused great ecological and economic damage on Guam. (Photo: U. S. Geological Survey)

## browser

a herbivore that feeds on a variety of plant foods; a software program, such as Netscape Navigator or Microsoft Internet Explorer, that allows one to view pages on the Internet

## brunneous

dark brown color

## Bryozoa

an animal phylum synonymous with Ectoprocta that contains approximately 5,000 living species. They are all sessile colonial forms composed of zooids. Zooids are tubular, oval or box-like structures that contain a lophophore, which is a circular or horseshoe-shaped fold of the body wall that encircles the mouth and bears numerous ciliated tentacles. Most species form erect or encrusting colonies. They occur in many different habitats, including coral reefs



Bryozoa colony.

## bubblegum coral

a deep water gorgonian, *Paragorgia arborea*, found in the North Pacific and North Atlantic Oceans at depths that may exceed 1400m. It can grow to 5m in height and 8 m in width. It is called the bubblegum coral because because it is

usually orange or pink in color, and has a lumpy surface texture



Bubble gum coral on Gulf of Alaska Seamounts. (Photo: NOAA Ocean Explorer )

## buccal

pertaining to the cheek or oral cavity

## buddy

a scuba diving partner. For safe diving, a pair of divers (buddies) stay close to each other in order to offer assistance if needed



NOAA divers working in buddy pairs. (Photo: NOAA/National Undersea Research Program)

## buddy breathing

two scuba divers sharing air from one second stage regulator



Scuba divers practicing buddy breathing. (Photo: John Buchanan)

## buffer

a solution or liquid whose chemical makeup neutralizes acids or bases without a great change in pH

## buffer zone

the region near the border of a protected area; a transition zone between areas managed for different objectives



## bulbous

a rounded or swollen shape

## bullate

describes a blistered or puckered surface

## bulliform

blister or boil-shaped

## bulwark

the side of a ship above the deck

## buoy

a floating platform for navigational purposes or supporting scientific instruments that measure environmental conditions

## buoyancy

the tendency of object to float or sink when placed in a liquid. Positively buoyant objects float, negatively buoyant objects sink, and neutrally buoyant objects stay in place

## buoyancy control device (BCD)

the BCD is a mandatory piece of equipment for SCUBA diving. It is an expandable bladder, most commonly worn as an expandable vest, that can be inflated with air from the tank to increase buoyancy while diving. To decrease buoyancy, the BCD is deflated through special air-dump valves or hoses. It provides positive buoyancy for resting, swimming or lending assistance to others under water. The BCD allows maintenance of neutral buoyancy at any depth simply by adding or releasing air. It is also called a buoyancy compensator (BC)



A buoyancy control device (BCD). It is a vest-like expandable bladder that can be inflated with air to increase or decrease a scuba diver's buoyancy while diving.

## burrower

an animal that makes a hole or burrow in the substratum and lives in it. For example, a fiddler crab

## butterflyfish

any species of colorful, oval-shaped, deep-bodied and strongly compressed spiny-rayed fishes in the family Chaetodontidae. They have small mouths with flexible, brush or comb-like teeth. They resemble the closely related angelfishes. They feed on a variety of foodstuffs from zooplankton to tiny crustaceans and mollusks, soft and hard corals, anemones, segmented worms, and other soft and encrusting invertebrates associated with coral reefs. Some species are omnivores that primarily feed on marine algae as well as animals, while others are obligate corallivores

## butress

see spur and groove

## bycatch

organisms taken in a fishery which are not of the species intended for harvest. For example, mammals or turtles captured in trawl or seine fishing

## byssal thread

one of many thin, hairlike filaments secreted by certain mollusks for attachment to a substrate



The byssal gland is located within the foot of the mussel. It produces secretions which are used to form byssal threads for attachment to substrates. (Photo: Great Lakes Sea Grant Network Exotic Species Library, Ontario Ministry of Natural Resources)

## byte

a memory and data storage unit composed of contiguous bits, usually eight. For example, file sizes are measured in bytes or megabytes (one million bytes). Bytes contain values of 0 to 255 and most often represent integer numbers or ASCII characters

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#) | [N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#) |

## c-card

a scuba diving certification card from scuba certifying agencies, such as NAUI, BSAC, NOAA, PADI, etc.

## cadaster

a public register showing the details of ownership and value of land; also spelled "cadastre"

## cadastral survey

a survey which creates, marks, defines, retraces or reestablishes the boundaries and subdivisions of the public land of the United States. It is derived from the word cadastre, meaning a public record, survey, or map of the value, extent, and ownership of land as a basis of taxation

## caecum

a blindly ending sac arising from the gut or some other hollow organ

## calathiform

cup-shaped

## calcareous

composed of or containing a substance made of calcium carbonate

## calcareous ooze

a biogenous sediment that is made of the calcium carbonate shells and skeletons of marine organisms

## calcification

the process by which corals and calcareous algae extract calcium from seawater and produce it as calcium carbonate

## calcite

a mineral made up of a crystalline form of calcium carbonate

## calcite skeleton

a skeleton composed of the calcite form of calcium carbonate

## calcium carbonate (CaCO<sub>3</sub>)

a molecule consisting of calcium, carbon and oxygen secreted by corals to their skeleton. It is also secreted by mollusks to form their protective shells



This Queen Conch (*Strombus gigas*) utilizes calcium carbonate in forming its protective shell. (Photo: Andy Bruckner)

## calibrate

to check or adjust the graduations of a quantitative measuring instrument

## calice

the upper surface of the corallite; a cup-shaped depression on the corallite surface

## calicle

one of the small cuplike cavities, often with elevated borders, covering the surface of most corals. Each is formed by a coral polyp; the calyx

## calicoblast

the primary cell of the calicoblastic epithelium (calicodermis). The calicoblast secretes the organic matrix leading to the calcification and formation of the calcareous skeleton of scleractinian (hard or stony) corals

## calicoblastic epithelium

a thin squamous epithelial layer of cells in stony (hard) corals which deposits the white calcium carbonate skeleton

## caliculate

cup-shaped

## calorie

a unit of measurement defined as 4.184 absolute joules or the amount of energy it takes to raise the temperature of one gram of water from 15 to 16 degrees Celsius (or 1/100th the amount of energy needed to raise the temperature of one gram of water at one atmosphere pressure from 0 degrees C to 100 degrees C). Food calories are actually equal to 1,000 calories (1 food calorie = 1 kilocalorie)

## calyx

the upper or open end of the corallite or coral polyp cup; the central body of entoprocts (goblet worms) or crinoids (sea lilies and feather stars)

## campaniform

bell-shaped

## cancellous

possessing a spongy or porous surface

## cancellous

reticular, spongy, or lattice-like structure; usually pertains to bone

## cancriform

crab-shaped

## canine tooth

a pointed, conical tooth that is located at the front or edge of the jaw. Canine teeth are used for piercing and grabbing prey



Moray eels are armed with sharp canine teeth used for capturing prey and also for defense. (Photo: Dr. Tom Doepner, Brown University)

## cannibalism

predation of an animal by a member of its own species

## canopy

the more or less continuous cover of branches and foliage formed collectively by the tops, or crowns, of adjacent trees

## cape

a piece of land that that projects out into a large body of water

## capsid

the protein coat of a virus particle

## captaculum

a filamentous tactile organ with an adhesive, sucker-like end near mouth of a tusk shell (mollusks in the class Scaphopoda). The captacula are used to gather small particles of food in the sand and pass them to the mouth

## captive breeding

raising animals (or plants) in controlled conditions to produce stock for subsequent release into the wild

## carapace

a hard shield, or shell covering, found over all or part of the anterior dorsal portion of an animal. In lobsters, shrimps, crayfish, and crabs, the carapace is the part of the exoskeleton that covers the head and thorax and protects the dorsal and lateral surfaces. In many crustaceans, the term carapace is also used to describe the hard, protective covering of the cephalothorax, as that of the horseshoe crab. The carapace of a turtle's shell is composed of expanded ribs and vertebrae overlain by dermal plates and horny scales



The carapace is the hard shell covering of the cephalothorax of this spiny lobster.

## carbohydrase

an enzyme that acts upon a carbohydrate

## carbohydrates

organic compounds composed of carbon, oxygen, and hydrogen; includes the simple sugars, double sugars, and complex sugars (starches)

## carbon capture and storage (CCS)

a process consisting of the separation of atmospheric CO<sub>2</sub> from industrial and energy-related sources, transport to a storage location, and longterm isolation from the atmosphere

## carbon cycle

the cycling of carbon in the form of carbon dioxide, carbonates, organic compounds, etc., between various reservoirs, e.g., the atmosphere, the oceans, land and marine biota and, on geological time scales, sediments and rocks

## carbon fixation

the conversion of inorganic carbon into organic carbon, usually by photosynthesis

## carbon sequestration

the capture and long-term storage of atmospheric carbon dioxide in forests, soils, lakes, and oceans; the net process of storing carbon in a carbon sink. Sinks can include terrestrial (soil, trees), marine, atmospheric, and geological systems

## carbonate compensation depth

the depth in the ocean below which material composed of calcium carbonate (CaCO<sub>3</sub>) is dissolved and does not accumulate on the sea floor

## carbonate mound

a seabed feature usually constructed from carbonate-producing organisms and current-controlled sedimentation. Carbonate mounds are a unique combination of cold-water coral framework and rubble,

sediment deposition, and local hydrodynamic influences

## carboxyl group

the -COOH functional group, acidic in nature, found in all amino acids; the acid group of organic molecules

## carcinogen

a chemical substance that causes cancer

## carcinology

the study of crabs and other crustaceans

## cardinal

deep scarlet red color

## cardinalfish

any species of bony fishes in the family Apogonidae. Cardinal fishes are often brightly colored with attractive patterns, usually in shades of red or brown. Most are small tropical marine species, although some live in brackish and even fresh water waters

## Caribbean ciliate infection (CCI)

a coral disease distributed throughout the wider Caribbean, caused by a ciliate protozoan in the genus *Halofolliculina*. The disease is characterized by a dark, mostly spotted, scattered or dense band formed of ciliates. The disease slowly kills tissues and colonies over time

## Caribbean Coastal Marine Productivity (CARICOMP)

a regional coral reef, seagrass and mangrove monitoring program and network involving a number of Caribbean laboratories, parks and reserves to study land-sea interaction processes in the wider Caribbean region. Twenty-seven institutions in 17 countries participate in CARICOMP

## Caribbean Coral Reef Institute (CCRI)

NOAA's Caribbean Coral Reef Institute (CCRI), inaugurated in May, 2005, is located at the the University of Puerto Rico-Mayaguez. The CCRI focuses exclusively on the acute problems of Caribbean coral reefs. Its main objective is to aid in the management and conservation of Puerto Rico's coral reefs by providing timely, relevant information to the Puerto Rico Department of Natural and Environmental Resources and the scientific community at large. CCRI projects include conducting habitat mapping of the western shelf of Puerto Rico, assessing the status of reef resources, and assessing fishery impacts

## Caribbean Marine Protected Area Management (CaMPAM)

a network of managers of marine and coastal protected areas in the wider Caribbean organized to achieve goals of conservation and sustainable use of Caribbean coastal and marine environmental resources. General

activities conducted through CaMPAM's membership include sharing experiences and addressing management challenges by facilitating training opportunities, information exchange, communication, and problem solving

## caridean shrimp

caridean shrimps can be distinguished from other shrimp-like creatures by the way in which the plate of the second abdominal segment overlaps the segments both in front and behind, forming a saddle. They are found in marine, brackish and freshwater habitats from the tropics to the polar regions. Carideans are taxonomically and ecologically diverse, with many remarkable adaptations for survival and reproduction. These crustaceans are placed in the infraorder Caridea, order Decapoda, and class Malacostraca

## carinate

shaped like a keel or ridge

## carnivore

an organism that feeds upon animals



A carnivore (barracuda) caught in the act.

## carotene

a red, orange, or yellow pigment belonging to the group of carotenoids; a precursor of vitamin A

## carotenoid

any of a group of red, orange, and yellow accessory pigments of plants or algae

## carpogonium

the female gamete-producing reproductive organ in red algae, consisting of a single cell and its extension, the trichogyne

## carposporangium

a single-celled structure in red algae that produces diploid carpospores on the carposporophyte

## carospore

a non-motile diploid spore formed on the carposporophyte stage of the red algae life cycle which germinates to form the tetrasporophyte stage



## carposporophyte

the diploid stage of red algae which develops after fertilization of the carpogonium

## CARRUS Alliance (Comparative Analysis of Reef Resilience Under Stress Alliance)

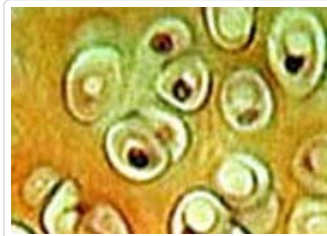
the CARRUS Alliance was organized at the 2004 International Coral Reef Symposium held in Okinawa. Its objective is to provide a basis for better understanding of coral reefs at the scale of the whole reef system. The Alliance consists of researchers conducting independently-supported long-term, interdisciplinary research on whole reef systems, including associated social and economic systems, united through agreements for the exchange of information, methods, expertise, and software. One focus of the Alliance will be on developing common research objectives, including the development of decision support systems to facilitate reef management. The Alliance will be linked to a variety of international efforts

## carrying capacity

the maximum population size that can be regularly sustained by an environment; the point where the population size levels off in the logistic growth model

## cartilage

a type of connective tissue where the functional component is the rubbery intercellular matrix that is secreted by cartilage-producing cells called chondrocytes. Cartilage exists in several forms, from glassy to fibrous in appearance



A microscopic section of hyaline cartilage. The cartilage cells (chondrocytes) exist in little cavities (lacunae) in the smooth, glassy cartilaginous matrix. (Photo: NIH/National Cancer Institute)

## cartilagenous

pertaining to or composed of cartilage; of the consistence of cartilage or gristle

## cartography

the science, technology, and art of making maps and charts. Cartography includes all the steps necessary to produce a map: planning, aerial photography, drafting, editing, color separation, and multicolored printing

## caruncle

a fleshy outgrowth

## catabolic pathway

a metabolic processes that releases energy as complex molecules are broken down into simpler ones

## catabolism

a destructive metabolic process by which organisms convert substances into excreted compounds

## catadromous species

a species that spawns in the ocean but lives parts of its life in fresh water, e.g., American eel



The American eel is a catadromous species that spawns in the ocean, near the Sargasso Sea, but grows to maturity in freshwater streams.

## catalysis

the acceleration of a chemical reaction by a catalyst.

## catalyst

a substance that accelerates a chemical reaction, but is not consumed or changed in the process

## catchment area

the area drained by a river or body of water; also called "drainage basin"

## catenation

linking of multiple copies of a macromolecule to each other

## cation

a particle that carries a positive electrical charge. The cation gets this positive charge from losing negatively charged electrons

## caudal

pertaining to the tail; denoting a position more toward the tail of an animal, e.g., the tail fin of a fish is called the caudal fin. Caudal vertebrae are the vertebrae which extend into the tail of an animal



Caudal fin of a shark. The dorsal lobe of the caudal fin is elongated. (Photo: Copyright Corel Corporation)

## caudal peduncle

the narrowest portion of a fish's body, located just posterior to the anal fin and just anterior to the caudal fin



The caudal peduncle of the spotted unicorn fish (*Naso brevirostris*) is located between the anal and caudal fins. (Photo: Copyright Richard C. Wass)

## cay

a small, low coastal island or emergent reef of sand or coral; flat mound of sand and admixed coral fragments built upon a reef flat or just above high tide level. A synonym of **key**, as in the Florida Keys

## CD-ROM (Compact Disk-Read Only Memory)

an optical medium. A CD-ROM 5.25-inch disk can hold about 650 megabytes of information

## cDNA library

a collection of cDNA clones that were generated *in vitro* from the mRNA sequences isolated from an organism, or a specific tissue or cell type, or population; a library of cDNA sequences

## cell

the smallest unit of living matter. All organisms are composed of cells and cell products (Cell Theory). Organisms exist either as single cells (unicellular) or as multicellular units



This example of a single-celled organism, the dinoflagellate *Gambierdiscus toxicus*, produces toxins including ciguatoxin and maitotoxin. The toxins are associated with ciguatera fish poisoning.

## cell adhesion

adherence of cells to surfaces or to other cells

## cell body

the enlarged portion of a neuron which contains most of the organelles

## cell culture

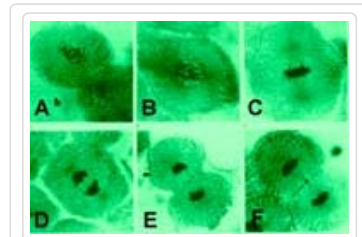
the *in vitro* growth of cells derived from multicellular organisms. The cells are usually of one type

## cell cycle

the period between the formation of a cell by the division of its parent cell and the formation of two new cells by cell division

## cell division

the separation of one cell into two daughter cells, involving both nuclear division (karyokinesis) and subsequent cytoplasmic division (cytokinesis). Genetically, the daughter cells are identical to the mother cell (mitosis); however, in gametogenesis (meiosis), the resultant daughter cells (gametes) have the chromosome number reduced by one-half



Cell division by mitosis. A-B: Prophase - the replicated (daughter) chromosomes (chromatids) undergo extensive condensation. They are greatly thickened and shortened but are still contained within the nuclear membrane. Prophase ends with the sudden breakdown of the nuclear membrane. C: Metaphase - the replicated chromosomes converge toward the center of the cell. D: Anaphase - sister chromatids split at their centromeres. These daughter chromosomes then begin to separate from each other, and move toward one of the two spindle polar regions. E-F: Telophase/Cytokinesis - Chromatids arrive at opposite poles of cell, and new membranes form around the daughter nuclei. The chromosomes disperse and are no longer visible. Cytokinesis or the partitioning of the cell may also begin during this stage. In animal cells, cytokinesis results when a fiber ring composed of a protein (actin) around the center of the cell contracts and pinches the cell into two daughter cells, each

with one identical nucleus.  
Chromosomal replicaton occurs during the interphase between mitotic activities. (Photo: Dept. of Biology, University of New Mexico)

## cell line

cells that have been extracted from human or animal tissue and now grow and replicate continuously outside the living organism

## cell membrane

the structure enveloping a cell, enclosing the cytoplasm and forming a selective permeability barrier which permits the passage of solvents and solutes into and out of cells. It consists of lipids, proteins and some carbohydrates

## cell wall

an extracellular material that forms the outer surface of plant, fungus, and certain bacterial cells. It is external to the cell membrane and serves in a structural and supporting role. The cell wall is composed primarily of cellulose and lignin in plants, chitin in Fungi, and peptidoglycans in bacteria

## cellular differentiation

genetically-induced divergence in the structure and function of cells as they become specialized during a multicellular organism's development

## cellulolytic enzyme

an enzyme that acts upon cellulose

## cellulose

a polysaccharide that is composed of unbranched chains of glucose. It is the major structural carbohydrate of plants

## cement

the chemically precipitated calcium carbonate present in spaces within skeletons or between grains of internal sediment

## Cenozoic

the current geologic era, which began 66.4 million years ago and continues to the present

## Census of Marine Life (CoML)

a global network of researchers in more than 80 nations engaged in a 10-year scientific initiative to assess and explain the diversity, distribution, and abundance of life in the oceans

## Census of Marine Life (CoML)/Census of Coral Reefs (CReefs) Project

a research initiative to conduct a taxonomically diversified census of coral reef ecosystems throughout the globe. This international partnership, led by NOAA's Pacific Islands Fisheries Science Center, the Australian Institute of Marine Science, Scripps Institution of Oceanography, and the Hawaii Institute of Marine Biology, will expand tropical taxonomic knowledge (with a particular focus on understudied species), increase the exchange of coral reef ecosystem data dispersed throughout the globe, and develop new and innovative technology and sampling strategies, as well as contribute to the CoML barcode initiative. CReefs plans to work closely with the NOAA Coral Reef Conservation Program (CRCP) and other organizations on outreach and education, collaboration with other existing coral reef efforts, and collection and unification of data into the Ocean Biogeographic Information Center for research, management, and preservation purposes

## center line

the imaginary line running from bow (front) to stern (rear) along the middle of a vessel

## Centigrade Temperature Scale

a thermometric scale in which 0 degrees C (Celsius) marks the freezing point of water and 100 degrees C indicates the boiling point of water at sea level

## centiMorgan

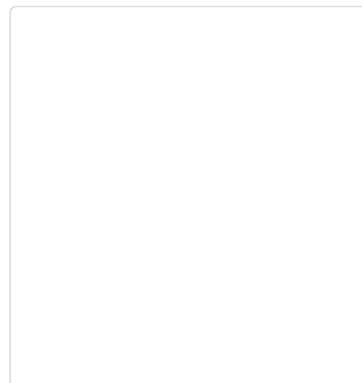
the unit of genetic map distance between two loci that show one (1) percent recombination

## Central Dogma (of molecular biology)

the principal statement of the molecular basis of gene action. Genetic information is stored in and transmitted as DNA. Genes are expressed by being copied as RNA (transcription), which is processed into mRNA (messenger RNA) via splicing and polyadenylation. The information in mRNA is translated into a protein sequence using a genetic code to interpret three-base codons as instructions to add one of twenty amino acids, or to stop translation; or more simply put, DNA carries the genetic information which is transcribed to RNA and subsequently translated to protein. Francis Crick, the co-discoverer of the double helix structure of DNA, coined the term "Central Dogma" in 1958 to characterize the all-important cellular processes whereby DNA is "transcribed" into RNA and RNA is "translated" into protein

## centrifugation

the spinning of a mixture at very high speeds to separate substances of different densities





A centrifuge used to "spin down" materials.

### centriole

one of two small cylindrical cell organelles composed of nine triplet microtubules. They form the asters during cell division

### centrolecithal

a type of egg cell that has its yolk in the very center of the cytoplasm, such that the initial meroblastic cleavage of the zygote happens all around the embryo. Most arthropods have centrolecithal eggs

### centromere

the center part of a chromosome that appears 'pinched', in between the short arm (p) and the long arm (q). The centromere holds the two chromatids together, and during cell division (mitosis) it is the site of attachment for the spindle fibers

### centrosome

a granular region of a cell which contains two centrioles and is a center of microtubule organization during the division of the nucleus

### cephalic

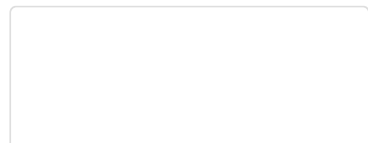
pertaining to the head

### cephalization

the localization of neural coordinating centers and sensory organs at the anterior end of the body

### Cephalopoda

a class of the phylum Mollusca that includes squids, octopods, cuttlefishes and nautili. Many species are inhabitants of coral reefs





Squid (class Cephalopoda) with egg mass.

## cephalothorax

the region of the body in decapod crustaceans that is covered by the carapace, with the boundary between the fused head and thorax indicated by the cervical groove. In lobsters, the cephalothorax is called the "body"; in shrimps, it is called the "head"

## ceras

one of many multifunctional horn or lobe-shaped or leaf-like process on the back or side of a nudibranch mollusk (sea slug). It has a major function as a respiratory organ (a gill), and with a branch of the digestive gland, it also serves as an organ for the exchange of gases and other molecules with the blood. The ceras also stores stinging nematocysts in a structure called the cnidosac, from the cnidarians upon which they feed, which gives it a defensive function. Its ability to change color also gives it a protective camouflage function



Cerata (plural of ceras) of *Aeolidiella foulisi* showing the brown duct of the digestive gland and the whitish cnidosac at the tip.

## cerulean

dark blue color

## cetacean

a marine mammal of the Order Cetacea. The Cetacea includes whales, dolphins and porpoises



The killer whale is actually a dolphin in the cetacean family, Delphinidae



## chaeta

a stiff hair or bristle, made of chitin, characteristic of annelid worms. In the earthworm they occur in small groups projecting from the skin in each segment and function in locomotion. The chaetae of marine polychaete worms are borne in larger groups on paddle-like appendages called parapodia

## Chaetodontidae

a family of fishes (butterfly fish) whose number and behavior may serve as indicators of reef health



A pair of butterfly fishes (Chaetodontidae). Their presence and behavior serve as biological indicators of reef health.

## chain transect

a linear transect where a chain is used to mark the line under study. By following the surface contour of the reef, chain transects provide data that may be used to calculate the estimated spatial index (the ratio of reef surface contour to linear distance of the reef)

## channel

a deep and relatively narrow body of water (as in a river, harbor, or a strait linking two larger bodies) that allows the best passage for vessels; an open conduit either naturally or artificially created which periodically or continuously contains moving water, or which forms a connecting link between two bodies of water. River, creek, run, branch, and tributary are some of the terms used to describe natural channels. Canal and floodway are some of the terms used to describe artificial channels.

## character

in taxonomy, any attribute of organisms used for recognizing, differentiating or classifying taxa

## character displacement

the process by which two closely related species, with overlapping ecological requirements, interact so as to cause one or both of them to diverge evolutionarily in one or more traits. They differ more when they co-occur than when they do not

## Charles Law

under conditions of constant pressure and quantity, there is a direct relationship between the volume and absolute temperature for an ideal gas

## chart datum

the level of water from which charted depths displayed on a nautical chart are measured. A chart datum is

generally a tidal datum (a datum derived from some phase of the tide)

## chela

a pinching claw of a decapod crustacean, composed of a moveable finger, the dactylus, and a fixed finger, a distal extension of the propodus



The large pinching claw of this crustacean is the chela. The entire leg bearing the chela is termed the cheliped. (Photo: NOAA)

## Cheliceramorpha

an order of arthropods that includes horseshoe crabs, daddy-longlegs, and extinct "sea-scorpions, spiders and scorpions, mites and ticks, " Most of its marine representatives are extinct, but were prominent in the Paleozoic



The horseshoe crab is an arthropod in the order Cheliceramorpha

## cheliform

pincer-shaped

## cheliped

one or more pairs of thoracic legs of decapod crustaceans that terminate in a chela, or claw. The entire cheliped is often referred to as a claw



A cheliped of this American lobster (*Homarus americanus*) is a leg bearing a pinching claw.

## chelonitoxism

a type of food poisoning caused by eating the flesh of sea turtles.

## chemical bond

the link between two atoms within a molecule. Different types of chemical bonds include hydrogen bonds,

covalent bonds, and ionic bonds

## chemical evolution

the chemical changes that transformed simple atoms and molecules into the more complex chemicals needed for the origin of life

## Chemical Oxygen Demand (COD)

a measure of the chemically oxidizable material in water which provides an approximation of the amount of organic and reducing material present. The determined value may correlate with biochemical oxygen demand (BOD) or with carbonaceous organic pollution from sewage or industrial wastes

## chemical species

in general, atoms, molecules, molecular fragments, ions, etc., being subjected to a chemical process or to a measurement. Specifically a chemical species may be defined as an ensemble of chemically identical molecular entities or the specific form of an element defined as to isotopic composition, electronic or oxidation state, and (or) complex or molecular structure

## chemiluminescence

a chemical reaction that gives off energy in the form of light instead of heat



Commercially available light sticks contain a solution in a glass vial. When the vial is broken, a second solution mixes with the first and light (chemiluminescence) is generated. Different dyes give off different colors when they are caused to fluoresce by the light of the chemiluminescent reaction. (Photo: American Chemical Society)

## chemoautotroph

an organism that utilizes oxidation of inorganic chemicals for its energy and carbon from inorganic carbon dioxide for cell growth; these organisms are also called chemolithotrophs

## chemocline

a sharp gradient in chemical concentration

## chemokinesis

the response by a motile cell to a soluble chemical that involves an increase or decrease in speed, or frequency of movement, or a change in the frequency or magnitude of turning behavior

## chemoorganotroph

an organism that obtains energy from the oxidation of organic compounds and cellular carbon from preformed organic compounds

## chemoreceptor

a receptor that is stimulated by the presence of certain chemical substances

## chemosynthesis

the process whereby chemical energy is used to synthesize organic compounds from inorganic compounds, e.g., the oxidation of ammonia to nitrite by nitrifying bacteria

## chemotaxis

a unidirectional response of motile cells or organisms in which the direction of movement is affected by the gradient of a diffusible substance

## chemotrophs

organisms (usually bacteria) that derive energy from inorganic reactions; also known as chemosynthetic organisms

## chi-square

a statistical technique whereby variables are categorized to determine whether a distribution of scores is due to chance or experimental factors

## chi-square distribution

a distribution in which a variable is distributed like the sum of the the squares of any given independent random variable, each of which has a normal distribution with a mean of zero and a variance of one

## chi-square test

a statistical test used to compare observed data with data expected to be obtained according to a specific null hypothesis. The chi-square tests the null hypothesis which states that there is no significant difference between the expected and observed result

## Chile Margin Triple Junction (CMTJ)

the only presently active ridge-trench collision where the overriding plate is composed of continental lithosphere. Three tectonic plates meet here at the southern coast of Chile (46.5°S, 75.5°W): the South American Plate, the Nazca Plate, and the Antarctic Plate. The Chile Margin Triple Junction is the only known location on Earth that can co-host every known form of deep-sea chemosynthetic ecosystem: hydrothermal vents, cold seeps, and oxygen minimum zones; also called "Chile Triple Junction (CTJ)"

## chimaera

a cartilaginous fish that has a compressed body and rodent-like teeth. Chimaeras are closely related to sharks and rays (class Chondrichthyes, subclass Holocephali), but have larger heads and eyes, the mouth is more towards the front of the head, the gills are protected by a gill cover, the skin is smooth, and most species have a whip-like tail; also called ghost sharks or ratfish

## chimera

the individual produced by grafting an embryonic part of one individual onto an embryo of either the same or of a different species

## chitin

a polysaccharide made up of chains of N-acetyl-D-glucosamine, a derivative of glucose. Chitin is structurally very similar to cellulose and serves to strengthen the supporting structures of various invertebrates. It also occurs in fungi

## chiton

a marine mollusk of the Subclass Polyplacophora, which contains about 600 species of sedentary animals commonly known as chitons. They are found from shallow waters to depths of about 400 m. A chiton has a broad foot and a shell consisting of eight overlapping plates



A dorsal view of a chiton shell. Chitons are distinguished from all other mollusks by the presence of their convex shell, which is divided into eight articulating plates (valves). (Photo: Rick Gillis, Ph.D., Biology Dept., University of Wisconsin-La Crosse)

## chlorocruorin

a greenish iron-containing respiratory pigment dissolved in the blood plasma of certain marine polychaete worms. It may give the green color to the blood of these worms

## chlorofluorocarbons (CFC)

gases that can be dissociated by solar radiation, which release chlorine, which in turn destroys ozone

## chlorophyll

a green pigment present in green plants and cyanobacteria. Chlorophyll is essential in the transformation of light energy to chemical energy in photosynthesis

## chlorophyll a

the major photosynthetic pigment found in all oxygen-evolving photosynthetic organisms (higher plants, and red and green algae)

## chlorophyll b

the chlorophyll generally characteristic of higher plants and green algae .It is absent in other types of algae

## chlorophyll c

the chlorophyll present in brown algae, diatoms, and flagellates

## chlorophyll d

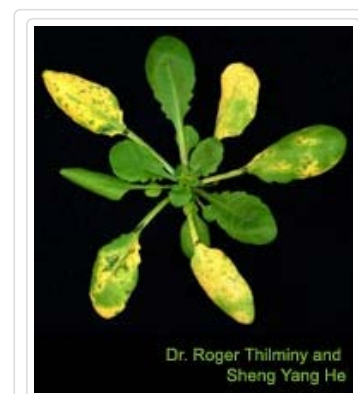
the chlorophyll present in red algae, together with chlorophyll a

## chloroplast

a disk-like organelle with a double membrane, found in some protists and all green plant cells, that contains chlorophyll and is the site of photosynthesis

## chlorosis

the yellowing or bleaching of plant tissues due to the loss of chlorophyll or failure of chlorophyll synthesis. It can be caused by insufficient light or nutrients, and also by certain diseases



Disease symptoms (necrotic lesions surrounded by chlorosis) caused by a bacterial infection. (Photo: Dr. Roger Thilminy and Sheng Yang He, Michigan State University)

## choanocyte (collar cell)



a flagellated cell that lines the interior of the central cavity (spongocoel) of a sponge. Choanocytes have a tubular collar with an extended flagellum that faces the spongocoel and creates currents that force water into the interstices of the sponge. Suspended food particles, such as plankton, are trapped by the choanocytes and passed to an amoebocyte that carries the food to other cells

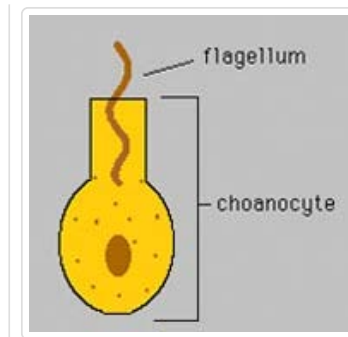


Diagram of choanocyte. The flagella create water currents that bring nutrients into the interior of a sponge. (Diagram: U.S. Environmental Protection Agency)

### choanocyte chamber

in sponges, a cavity lined with choanocytes and located between incurrent and excurrent systems

### choanoderm

in sponges, a surface lined with choanocytes

### choanosome

the internal region of a sponge, including the choanocyte chambers

### Chondrichthyes

the class of cartilaginous fishes that includes sharks, rays, skates, and chimaeras. Their skeleton is composed of cartilage, not bone



A manta ray, a member of the class Chondrichthyes. (Photo: NOAA)

### chondriome

refers to all of the mitochondria in a cell

### Chordata

an animal phylum that includes sea squirts (tunicates), lampreys and hagfishes, fishes, amphibians, reptiles, birds and mammals. Many species of marine chordates play prominent roles in the ecology of coral reef ecosystems



The phylum Chordata includes the mammals such as this large humpback whale (*Megaptera novaeangliae*).

## chorion

a thick, vascularized extra-embryonic membrane of amniote embryos that forms around the entire undersurface of the eggshell in birds and reptiles, and in direct contact with the uterine wall in mammals. It unites with the allantois to form the major structure for exchange between the embryo and the outside (birds and reptiles) or the maternal circulation (mammals)

## chorology

the study of the spatial distribution of organisms

## chromatid

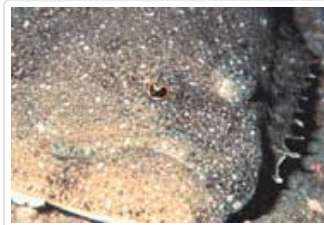
each of a pair of identical DNA molecules after DNA replication, joined at the centromere

## chromatin

replicated DNA and associated proteins; highly folded ribbon-like complexes of deoxyribonucleic acid (DNA) and a class of proteins called histones; protein/DNA complex making the chromosome

## chromatophore

a cell whose cytoplasm contains pigment granules that can be rapidly concentrated or dispersed, producing an overall effect of altering the color, color pattern or tone of the whole or part of an animal



This flounder is rarely noticed unless disturbed because of its remarkable ability to change color to match the substrate, by concentrating or dispersing pigment granules in its chromatophores.

## chromophore



a part of a molecule that absorbs certain wavelengths of visible light and reflects or transmits others; that part of a molecule that is responsible for its color

## chromoplast

a plastid containing pigments other than chlorophyll, usually yellow or orange carotenoids

## chromoprotein (CP)

any of a group of conjugated proteins in which the protein is joined to a pigmented prosthetic group. An example of a chromoprotein is hemoglobin, which contains heme, the iron-containing molecule that makes oxygenated blood appear red

## chromosomal aberration

any change in chromosome structure or number. Although chromosomal aberrations can be mechanisms for enhancing genetic diversity, such alterations are usually deleterious or ill-adaptive; includes deficiency, duplication, inversion, translocation, aneuploidy, polyploidy, or any other change from the normal pattern

## chromosomal deletion

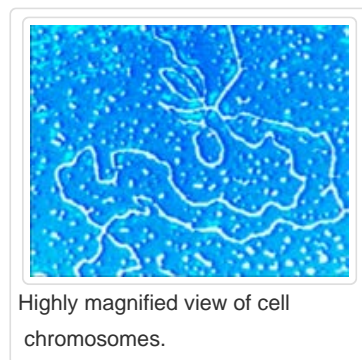
a mutation resulting from the loss of a small segment of DNA

## chromosomal mutation

a mutation involving a long segment of DNA. These mutations can involve deletions, insertions, or inversions of sections of DNA. In some cases, deleted sections may attach to other chromosomes, disrupting both the chromosomes that loses the DNA and the one that gains it; any type of change in the chromosome structure or number

## chromosome

one of the threadlike "packages" of genes and other DNA in the nucleus of a cell. Different species of organisms have different numbers of chromosomes. In sexually reproducing species, each parent contributes one chromosome of each pair, so offspring get half of their chromosomes from the maternal parent and half from the paternal parent. Bacterial cells do not possess a nucleus, therefore their chromosomes are located in the cellular cytoplasm



Highly magnified view of cell chromosomes.

## chronic

long term or frequently recurring

## chronobiology

the field of biology concerned with the timing of biological events, especially repetitive or cyclic phenomena in individual organisms.

## chronograph

an instrument for recording the moment of an event

## chronology

the age-depth relationship in ice, sediment, or another deposit. Ages are usually measured for discrete samples, and the ages of intermediate samples are interpolated between samples with measured ages

## chronometer

an instrument for measuring time

## ciguatera

a food poisoning of humans caused by eating some species of tropical fishes whose flesh is contaminated with toxins obtained through the food chain



Ciguatera food poisoning may be contracted by eating the flesh of a contaminated barracuda.

## ciguatoxin

a toxin found in flesh of marine animals, especially some fishes, at some times, in some localities. It is probably of algal origin and causes paresthesia, gastrointestinal symptoms, neuromuscular blockade, and respiratory paralysis due to interference with membrane function



Barracuda (*Sphyraena sp.*) are often the culprits in ciguatera food poisoning, caused by ciguatoxin. (Photo: Copyright Corel Corporation)

## cilia

short, motile, generally microscopic, hairlike projections found on many protists and larvae of some invertebrates. Cilia are used for locomotion, the generation of a current, or filter feeding; A cilium is made up of microtubules and has basically the same internal structure as a flagellum. Movement is caused by the interactions of the microtubules. In higher animals, cilia are found projecting from cells that line certain tubes and passages, such as the tracheae (windpipe) of mammals

## ciliary

relating to any cilia or hairlike processes; can relate to muscles concerned with visual focusing

## ciliated epithelium

any epithelium having motile cilia on the free surface



Pseudostratified ciliated columnar epithelium - the ciliated epithelium that lines the trachea (windpipe) of mammals. (Photo courtesy of Dr. Franklin S. Carman III, donated from URL: <http://tooldoc.wncc.edu>)

## Ciliophora

a group of protists bearing cilia



The stalked ciliate, *Stentor*. (Photo: Jon Houseman/BIODIDAC)

## cinclide

one of many blister-like openings in the lower part of the body column of some anemones, through which the animal expels long, thread-like acontia

## circa

about; around

## circadian

being, having, characterized by, or occurring in approximately 24 hour periods or cycles

## circadian rhythm

the regular recurrence, in cycles of about 24 hours, of biological processes or activities

## circinate

ring-shaped

### circumesophageal nerve ring

anterior concentration of nervous tissue in several invertebrate groups, such as mollusks, annelid worms, sipunculids (peanut worms), and echiurans (spoon worms or innkeeper worms)

### cirrus

a slender, flexible appendage or part of an organism, usually having a tactile function

### cistron

a DNA sequence that codes for a specific polypeptide; an alternate name for a gene

### citreous

lemon color

### citric acid cycle

see: Krebs cycle

### clade

a group of species with a common evolutionary ancestry

### cladist

a systematist who attempts to classify life forms according to their evolutionary relationships, not just overall similarity

### cladistic distance

the number of branching points between any two nodes on a phylogenetic tree

### cladistic species

the concept of species in which a species is a lineage of populations between two phylogenetic branch points (speciation events)

### cladistics

the systematic classification of groups of organisms on the basis of the order of their assumed divergence from ancestral species

### cladogenesis

the evolutionary process whereby one species evolves into two or more species

## cladogram

a tree-like diagram, resulting from a cladistic analysis, which depicts a hypothetical branching sequence of lineages leading to the taxa under consideration. The points of branching within a cladogram are called nodes. All taxa occur at the endpoints of the cladogram

## clasper

a rod-like modification of the pelvic fin of a male elasmobranch that is used to transfer sperm into the female during mating



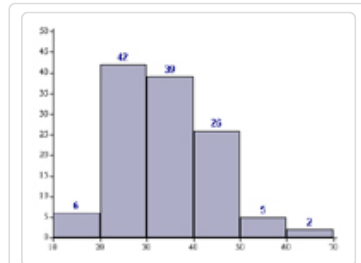
NOAA scientist measuring the length of a ray's clasper.

## class

in taxonomy, a category just beneath the phylum and above the order; a group of related orders

## class interval

one of the ranges into which data in a frequency distribution table (or histogram) are binned. The ends of a class interval are called class limits, and the middle of an interval is called a class mark. In plotting a histogram, begin by dividing the range of all values into non-overlapping class intervals, in such a way that every piece of data is contained in some class interval



A histogram in which the population of data are grouped into non-overlapping class intervals.

## classical conditioning

a form of associative learning, in which an animal recognizes that two or more events are related. The animal performs a behavior in response to a substitute stimulus rather than the normal stimulus

## classification

a system of nested hierarchical categories used to efficiently store information about biological diversity

## clathrate

resembling an open latticework

## clavate

club-shaped

## clean development mechanism (CDM)

a mechanism under the Kyoto Protocol designed to assist developed countries in meeting their emissions reduction targets

## Clean Water Act (CWA)

an act passed by the U.S. Congress to control water pollution. Growing public awareness and concern for controlling water pollution led to enactment of the Federal Water Pollution Control Act Amendments of 1972. As amended in 1977, this law became commonly known as the Clean Water Act. The Act established the basic structure for regulating discharges of pollutants into the waters of the United States. It gave EPA the authority to implement pollution control programs such as setting wastewater standards for industry. The Clean Water Act also continued requirements to set water quality standards for all contaminants in surface waters. The Act made it unlawful for any person to discharge any pollutant from a point source into navigable waters, unless a permit was obtained under its provisions. It also funded the construction of sewage treatment plants under the construction grants program and recognized the need for planning to address the critical problems posed by nonpoint source pollution

## cleaning behavior

mutualistic behavior in which larger animals, usually fishes, permit smaller animals, usually other species of fishes or invertebrates, to clean them of external parasites



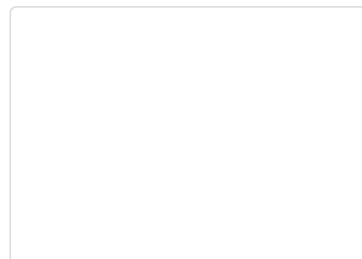
Pederson's Cleaning Shrimp (*Periclimenes pedersoni*) on a reef in the Virgin Islands. This small (to 1 inch) shrimp favors habitat and a steady food supply offered by Ringed and Giant Caribbean anemones.

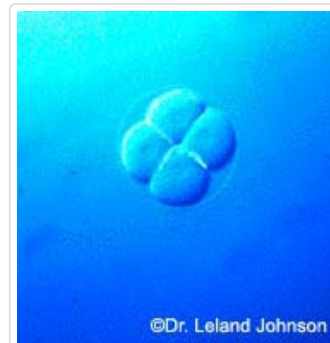
## cleaning station

a site visited by fishes where, in a mutually symbiotic relationship, cleaning shrimp or fish remove parasites from their bodies

## cleavage

the early mitotic cellular divisions of the fertilized egg (zygote)





A four-cell stage of a cleaving sea urchin embryo. (Photo: Copyright Dr. Leland Johnson, Augustana College, Illinois)

## client

a software program that is used to contact and obtain data from a server software program on another computer, often across a great distance. Each client program is designed to work with one or more specific kinds of server programs, and each server requires a specific kind of Client. A web browser is a specific kind of client

## climate

long-term characteristics of weather

## climate change

the long-term fluctuations in temperature, precipitation, wind, and all other aspects of the Earth's climate. It is also defined by the United Nations Convention on Climate Change as "change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods"; an observed change in the prevailing or average weather conditions

## climate change adaptation (CCA)

actions taken to help society, communities, and ecosystems moderate, cope with, or take advantage of actual or expected changes in climate conditions. Adaptation can reduce vulnerability, both in the short and long term

## climate modeling

Quantitative methods to simulate the interactions of the atmosphere, oceans, land surface, and ice. They are used for a variety of purposes from study of the dynamics of the climate system to projections of future climate.

## climate threats

the overall change in environmental conditions (e.g., increasing sea surface temperature) resulting from changes in climate due to increasing global greenhouse gas concentrations.

### climate variability

changes (variability/trends) in the long-term characteristics of weather; the normal range of climatic variables over a specific climatic period

### climate-induced bleaching

coral bleaching as a result of changing climate patterns, e.g., temperature

### climatic variable

any climate parameter that changes over a period of time; e.g., temperature, rainfall, humidity

### climax

the final stage in ecological succession that is able to persist in the absence of environmental change

### climax community

a relatively stable community which is in equilibrium with the existing natural environment

### clinal speciation

a form of allopatric speciation in which a vicariant event interrupts gene flow in a former cline

### cline

the gradual variation, in a character of a species, in geographical space

### cloaca

the common passage for fecal, urinary and reproductive discharge in most lower vertebrates

### clone

an individual genetically identical to the parent organism, created by the splitting off or budding of cells from the parent organism

### clone cells

a group of genetically identical cells all descended from a single common ancestral cell by mitosis in eukaryotes, or by binary fission in prokaryotes. Clone cells also include populations of recombinant DNA molecules all carrying the same inserted sequence of bases

### cloned DNA

exact copies of DNA segments prepared by using recombinant DNA technology



## cloning

the process of asexual reproduction in an otherwise multicellular organism

## cloning vector

DNA molecule originating from a virus, a plasmid, or the cell of a higher organism into which another DNA fragment of appropriate size can be integrated without loss of the vector's capacity for self-replication; vectors introduce foreign DNA into host cells, where the DNA can be reproduced in large quantities. Examples are plasmids, cosmids, and yeast artificial chromosomes; vectors are often recombinant molecules containing DNA sequences from several sources

## closed circuit scuba

a diving apparatus which allows divers to re-breathe exhaled air after removal of carbon dioxide and addition of supplemental oxygen. It is not generally used by recreational scuba divers

## closed circulatory system

a circulatory system in which blood flows through blood vessels at all times. Blood flows from arteries to capillaries and through veins, but the tissues surrounding the vessels are not directly bathed by blood. Some invertebrates and all vertebrates have closed circulatory systems

## closed system

a system in which no matter or energy can leave or enter from the outside

## clupeoid fish

any soft-rayed, bony fish species belonging to the order Clupeiformes. These include herrings, shads, wolf herrings, sardines, and anchovies

## clupeoid fish poisoning

a very serious form of fish poisoning caused by eating clupeotoxic fishes; also called clupeotoxism

## clupeotoxic fish

fishes in the orders Clupeiformes (herrings and herring-like fishes), and Elopiformes (ladyfishes and tarpons) whose flesh might contain a toxin, clupeotoxin, by ingesting certain dinoflagellates which contain the toxin

## clupeotoxin

the poison in clupeotoxic fishes. It is a neurotoxin, palytoxin, found in marine dinoflagellates and presumably ingested by the fish

## cluster analysis

a multivariate statistical technique for solving classification problems. The object is to sort items into groups such that the degree of association is strong between members of the same cluster and weak between

members of different clusters

## cnida

an organelle located in cnidocytes that is capable of eversion

## Cnidaria

a multicellular animal phylum, with a tissue grade of construction, that contains the stony (hard) corals, anemones, sea fans, sea pens, hydroids, and jellyfish



An Atlantic coast cnidarian, a dahlia sea anemone (*Tealia* sp.)  
(Photo: Andy Bruckner)

## cnidocyte

a stinging cell of jellyfish, hydroids, sea anemones and corals. The cnidocyte contains the eversible cnida. The most common type of cnidocyte is the stinging structure known as the nematocyst. Nematocysts are located throughout the epidermis, but are especially abundant on the tentacles

## cnidoglandular band

in cnidarians, the central ridge of a mesenteric filament which bears nematocysts and gland cells that secrete digestive enzymes

## cnidosac

a sac located in a ceras of a nudibranch gastropod which contains undischarged nematocysts (obtained through feeding upon cnidarians) passed from the slug's digestive system. When a predator attacks the nudibranch, the nematocysts may discharge as a defensive mechanism



Section through the ceras of *Aeolidiopsis ransonii* showing the cnidosac with three nematocysts.  
(Photo: Dr. Bill Rudman)

## co-adaptation

development and maintenance of advantageous traits benefiting one or both parties in a two-species interaction; evolution of characteristics of two or more species to their mutual advantage; predator-prey and

cleaning symbioses are examples of such evolving interactions in marine communities

## co-management

the sharing of authority, responsibility, and benefits between government and local communities in the management of natural resources

## coacervate

an aggregate of colloidal droplets held together by electrostatic forces. Coacervate droplets may contain a mixture of organic compounds. One theory of the evolution of life is that the formation of coacervates in the primeval soup was a step towards the development of cells

## coalesce

to come together so as to form one whole; to fuse

## coastal area

the areas of land and sea bordering the shoreline and extending seaward through the breaker zone. Coastal areas throughout the world are under enormous environmental stress, which is caused by a wide range of factors, including pollution and the destruction and deterioration of marine habitats



Rainbow over Hawaii, HI coast  
(Photo: Dr. James P. McVey,  
NOAA Sea Grant Program)

## coastal flooding

flooding that occurs from storms where water is driven onto land from an adjacent body of water



A coastal storm leaves flooded streets in its wake. (Photo: U.S. Army Corps of Engineers)

## coastal reef

a coral reef occurring near and parallel to a coastline

## coastal zone

coastal waters and adjacent lands that exert a measurable influence on the uses of the oceans and their living and nonliving resources



Spectacular Oregon coastline.  
(Photo: Rear Admiral Harley D. Nygren, NOAA Corps)

## Coastal Zone Color Scanner (CZCS)

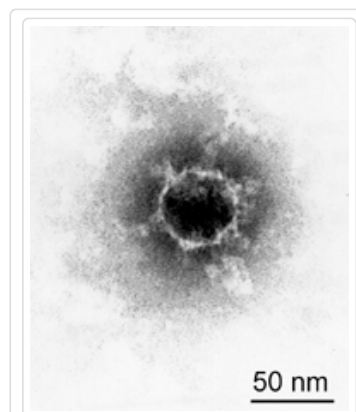
a scanning radiometer with six spectral channels centered at 0.443, 0.520, 0.550, 0.670, 0.750 and 11.5 micrometers and selected to allow measurement of ocean color and temperature, suspended sediment and chlorophyll concentrations, and ocean pollutants

## Coastal Zone Management Act

passed in 1972, the CZMA provides for management of shoreline areas that may include coral reefs

## coat protein

the coating protein that encloses the nucleic acid core of a viral particle; the capsid



A single coat protein (capsid) of a cyovirus surrounded by a loose polyhedrin matrix. (Photo: Dr. Hans Ackermann, Medical Faculty, Laval University, Quebec, Canada)

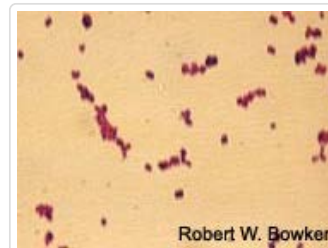
## coccidia

microscopic, spore-forming, obligate, intracellular single-celled parasites belonging to the phylum Apicomplexa. Coccidian parasites infect the intestinal tracts of animals, causing the disease "coccidiosis"

## COCCUS

a bacterium with a spherical shape





Coccus bacteria. (Photo: Robert W. Bowker, Glendale Community College Glendale, AZ)

## Code

in taxonomy, the International Code of Zoological Nomenclature. An authoritative document containing a system of rules and recommendations to be followed in giving a scientific name to an animal or animal group

## coding

the specification of a peptide sequence by the code contained in DNA molecules

## coding region

a sequence of DNA, bounded by start and stop codons, which consists of a series of nucleotide bases that gives rise to mRNA (messenger RNA) that will be translated into the specific amino acids of the protein product

## coding sequence

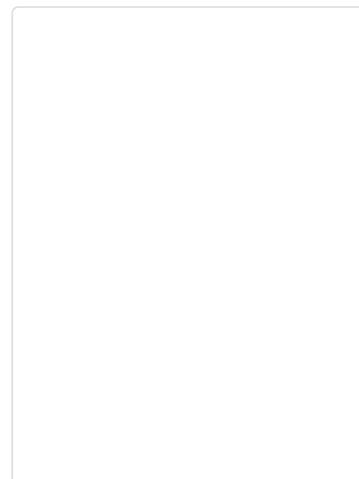
that portion of a gene which directly specifies the amino acid sequence of its protein product

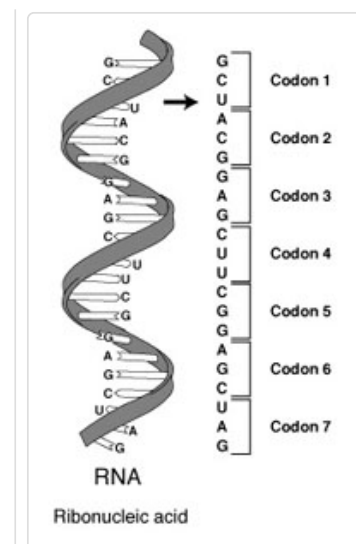
## coding strand

the strand of duplex DNA which contains the same base sequence (after substituting Uracil for Thymine) found in the mRNA molecule resulting from transcription of that segment of DNA., known as the sense strand. The mRNA molecule is transcribed from the other strand, known as the template or antisense strand

## codon

three bases in a DNA or RNA sequence which specify a single amino acid





RNA codons. A = adenine; C = cytosine; G = guanine; U = uracil.  
(Diagram: NIH/Human Genome Project)

## coefficient

a number expressing the amount of some change or effect under certain conditions

## coefficient of faunal similarity (CFS)

The CFS compares the fauna of one area with that of another.  $CFS = 2C/(a+b)$ , where C = the number of species in common between two areas, a = the number of species in the first area, and b = the number of species in the second area. The higher the CFS, the greater the resemblance

## coefficient of variation

in statistics, it refers to the standard deviation of a distribution divided by the distribution's mean, providing a standardized measure of the variation in a distribution, which does not increase simply because the mean itself increases or because the units of measurement change

## coefficient of variation (c.v.)

the standard deviation divided by the mean and multiplied by 100

## Coelenterata

an older name for the phylum Cnidaria

## coelenteron

the gastrovascular (digestive) cavity of a cnidarian or ctenophore

## coelobite

an organism that lives in pores and spaces within a reef

## coeloblastula

a larval form associated with oviparous development, with a cytologically undifferentiated central region, and an even distribution of small flagella. Coeloblastulae are found in sponges, brachiopods and other invertebrate groups

## coelom

an internal fluid-filled body cavity within a coelomate organism. It lies between the gut and the outer body wall, and is lined entirely with tissue (peritoneum) derived from the mesoderm. Most internal organs are located within the coelom. The structure and development of the coelom is an important taxonomic character for recognizing major groups of animals

## coelozoic

living in the lumen of a hollow organ, such as the intestine, gall bladder, urinary tract, etc

## coenecium

a branching tubular network inhabited by pterobranch (Hemichordata) colonies that is secreted from glands in the oral shields of the zooids

## coenenchyme

all of the mesenchymal tissue, perforated with channels, that is common to all polyps of a colonial cnidarian

## coenocline

a sequence of communities along an environmental gradient

## coenosarc

the living tissue of a cnidarian polyp, consisting of the outer, nonciliated epidermis and the inner, ciliated gastrodermis with the thin, acellular mesoglea in between. The coenosarc connects the coral polyps of a coral colony. It spreads along the surface of the calcareous exoskeleton

## coenosteum

the common surface of corallum between calices; the skeleton deposited between the corallite walls of a colonial scleractinian coral

## coenosteum pit

the point of insertion or commencement of septa in some corals

## coenzyme

an organic nonprotein molecule that binds with the protein molecule to form the active enzyme

## coevolution

a change in the genetic composition of one species (or infraspecific group) in response to a genetic change in another, i.e. two or more species evolving, each in response to the other

## cofactor

a nonprotein substance required for certain enzymes to function. Cofactors can be co-enzymes or metallic ions

## cohort

individuals all of the same age

## cohort

in taxonomy, a taxonomic rank between infraclass and superorder

## COI

a protein which ranges in length from 510-530 amino acids among different animal species

## cold front

in meteorology, a mass of cold air moving toward a mass of warm air. Strong winds and rain typically accompany a cold front

## cold water

temperature regime usually between 4°C - 13°C, and not exceeding 20°C. This is not an exact definition, and is meant only to distinguish between cold-water and tropical warm-water coral environments

## cold-water coral ecosystem

a large aggregation of cold-water corals with their associated fauna in terms of spatial coverage at a given locality

## coliform bacteria

bacteria whose presence in water is an indicator of pollution and of potentially dangerous contamination



A coliform-caused fish kill. Fecal coliforms originate from sewer



overflows, septic tank seepage and animal defecation. They are indicators of fecal contamination which could also contain bacteria and viruses responsible for cholera and typhoid infections, hepatitis and gastroenteritis. (Photo: Pine River Shire Environmental Services, Australia)

## collagen

the protein substance of the collagenous fibers (white fibers) of skin, tendon, bone, cartilage and all other connective tissue. Collagen also serves as skeletal support in some sponges

## collagenous

producing or containing collagen

## collagenous fiber

white connective tissue fiber that occurs in bundles. They possess a high tensile strength and make up the principal element of irregular connective tissue, tendons, and aponeuroses, and occur in the matrix of cartilage and bone tissue

## collar cell

a specialized cell found in the epithelia of mesenterial filaments and the actinopharynx; the choanocyte of sponges.

## collection

an assemblage of specimens compiled and maintained for purposes of study and/or display

## collection

an assemblage of specimens compiled and maintained for purposes of study and/or display

## collenchyme

in cnidarians, mesenchyme with sparse cellular components

## collencytes

a contractile, collagen-secreting amoebocyte in sponges

## colloblast

a cell that discharges a sticky filament upon contact with a prey organism. Colloblasts are found in the tentacles of ctenophores (comb jellies). As the tentacles are dragged through the water, the colloblasts discharge and capture prey



Colloblast discharge organ of ctenophorans (comb jellies). (Image: Livingstone, Copyright BIODIDAC)

## colloid

a stable suspension of particles that, though larger than in a true solution, do not settle out

## colonial

a level of cellular organization intermediate between unicellular and multicellular; refers to organisms that occur in a fixed location, with one generation growing on top previous generations, as in coral reefs; types of animal that are organized into associations of incompletely separated individuals; eg, Portuguese man o' war, sponges and corals; in plants, describes cloning by asexual reproduction in which seemingly separate plants grew from rhizomes, stolons, or roots of a single or neighboring parent plant

## colonial coral

a coral composed of many individuals

## colonization

a movement of individuals or propagules of a species to a new territory

## colonized hardbottom

a substrate formed by the deposition of calcium carbonate by reef building and other organisms. Habitats within this category have some colonization by live coral

## colony

a group of the same kind of animals, plants, or one-celled organisms living or growing together

## color

a quality of light, depending on its wavelength. Perceived color (or visual color) is the quality of light emission as conveyed by the eye, i.e., the visual perception of light that enables humans and other organisms to differentiate between wavelengths of the visible spectrum

## colorimeter

an instrument for measuring and determining color

## coloumb

unit of electrical charge of one ampere over period of one second

## columella

any small column-like structure in various plants and animals, often forming the central axis of development for the organism as a whole, or an anatomical structure; the thickened axial pillar around which the whorls of gastropods are constructed; the central axis of a corallite; the central structure of the calyx formed by fusion of the septa



The columella inside a *Strombus* oyster drill. (Photo: Jesuit Dallas Museum)

## column

the cylindrical body of an anthozoan polyp

## columnar

column-shaped

## columnar colony

a coral colony formed into one or more columns

## commensal

having benefit for one member of a two-species association but neither positive nor negative effect on the other

## commercial extinction

the decline in the population of a wild species, used as a resource, to a level where it is no longer profitable to harvest the species

## Commission

refers to the International Commission on Zoological Nomenclature (ICZN)

## common ancestor

the most recent ancestral form or species from which two different species evolved

## communication network

telecommunications infrastructure that transfers data from observing systems to data centers, and then to end users

## community

a naturally occurring assemblage of organisms that live in the same environment and are mutually sustaining and interdependent; a group of populations that interact in time and space

## community-based ecosystem management

a process whereby non-government organizations, community groups, or individuals participate in long-term management of selected species, habitats, or ecosystem processes with the ultimate goal of improving management of ecosystems and natural resources

## Compact Airborne Spectrographic Imager (CASI)

a digital airborne multispectral sensor

## compact branching

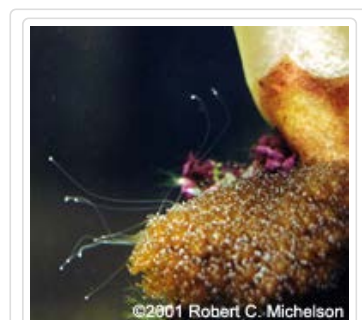
a growth pattern where the coral branches are close together

## compensation depth

the depth in the ocean at which the difference between the oxygen produced by algae through photosynthesis and that consumed by them through respiration is zero, i.e., net oxygen production is zero

## competition

a biological interaction that can limit population growth. Competition occurs when two or more populations vie for the same limited resource



Sweeper tentacles from a *Galaxia* colony. The stinging cells kill neighboring "non-self" corals in the competition for space. Mesenterial

filaments which dissolve neighboring non-self corals are another means of competitive tactics by scleractinian corals. (Photo: Copyright 2001 Robert C. Michelson)

## competitive exclusion

the principle that when the populations of two species compete for resources, one will use the resources more efficiently, therefore outcompete and eventually eliminate the other population

## competitive release

the expansion of a species' ecological niche, associated with the lack of competition with other species

## complement

the complement of a nucleic acid sequence replaces each base by its complementary base: adenine (A) by thymine (T), cytosine (C) by guanine (G), and vice versa. In RNA, adenine is paired not with thymine but with uracil (U)

## complementarity

the relationship between the two strands of a double helix of DNA. Thymine in one strand pairs with adenine in the other strand, and cytosine in one strand pairs with guanine in the other strand

## complementary base pair

the specific matching of purine and pyrimidine base pairs in nucleic acids. This matching occurs because the structure of one base precisely fits with, and bonds to, another specific base. In DNA, adenine and thymine are complementary and form a base pair, as do cytosine and guanine. In pairing between DNA and RNA, adenine and uracil are complementary, and cytosine and guanine are complementary

## complementary DNA (cDNA)

a strong, cloned DNA copy of otherwise fragile mRNA, made using reverse transcriptase. A cDNA is so-called because its sequence is the complement of the original mRNA sequence. However, when double-stranded cDNA is synthesized, it contains both the original sequence and its complement

## complementary nucleotide

a member of the pairs adenine-thymine, adenine-uracil, and guanine-cytosine that have the ability to hydrogen bond to one another

## complementary resources

a pair of resources for which consumption by the consumer of one resource reduces its requirement for the other

## complete protein

a protein that has all of the essential amino acids and in the correct proportions

## complexity

in ecology, the number of species at each trophic level and the number of trophic levels in a community; in molecular genetics, used to describe a DNA molecule or a mixture of DNA molecules. It is the length of the nucleotide sequence without including any sequence repetition

## compound

a material made up of two or more elements combined in a fixed ratio

## compound chromatophore

a chromatophore that contains more than one kind of pigment

## compound eye

the eye of arthropods, most highly developed in insects and crustaceans. It consists of a group of functionally related visual elements (ommatidia), each having its own refractive system and each forming a portion of an image

## compressed

a body shape which is flattened laterally, bringing the right and left sides closer together, e.g., a butterfly fish or a flounder



The compressed body shape of a garibaldi. (Photo: Copyright Corel Corporation)

## compressed air

air compressed to a pressure higher than the surrounding atmospheric pressure (ambient pressure)

## compression

in information technology, decreasing the size of stored information by reducing the representation of the information without significantly diminishing the information itself, usually by removing redundancies. The information requires decompression upon retrieval. Lossless compression allows the original data to be recreated exactly. Lossy compression sacrifices some accuracy to achieve greater compression

## conchiform

shell-shaped

## conchology

the study of shells

## confidence interval

the probability, based on statistics, that a number will be between an upper and lower limit

## confluent

joined together

## congenor

a member of the same genus

## conger eel

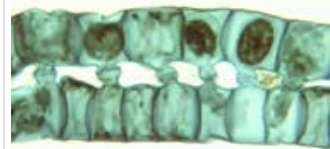
any species of eel in the family Congridae. Conger eels have a thick cylindrical body and tapering snout. They possess a smooth and scaleless skin and large pectoral fins. They are much less common than moray eels in coral reef communities. During the day they tend to hide in crevices and holes under rocks or coral, or burrow into sand. They emerge at night to feed

## conjugated protein

a protein complex combining amino acids with other substances

## conjugation

a process of sexual reproduction whereby two cells come in contact and exchange genetic material. In prokaryotes and unicellular algae, the transfer is a one-way process. The union of two bacterial cells, during which chromosomal material is transferred from the donor to the recipient cell. Conjugation in protozoans is a two-way process, genetic material is passed between each conjugant



*Spirogyra* is a filamentous green alga. Certain filaments in a loose parallel bundle of *Spirogyra* assume the female role, and others the male. The cells of adjacent filaments develop tubular extensions which grow towards

one another and eventually fuse to form a continuous tube between the cells. Meanwhile the contents of each cell have formed a round sphere. The spheres from the male filament squeeze their way down the connecting tubes to fuse with a sphere of the female cell in the other filament. The result of this sexual union is the formation of a zygote (zygospore) within the chambers of the female filament. After a dormant period, the zygotes undergo meiosis and germinate, resulting in new filaments. (Photo: Wappinger Schools)

### conopeptide

a family of molecules found in the venom of species of marine cone shell snails (*Conus* sp) that can act as an analgesic and alleviate pain. One particular group, the omega-conopeptides, blocks channels on nerve cells that transport calcium ions and thereby interfering with the production of neurotransmitters. Synthetic copies of conopeptides from the magician's cone shell, *Conus magus*, are used to make the drug Prialt, generally known as ziconotide

### conotoxin

a toxin produced by cone-shell snails of the genus *Conus*

### Conservation

under the NOAA Coral Reef Conservation program, the term 'conservation' means the use of methods and procedures necessary to preserve or sustain corals and associated species as diverse, viable, and self-perpetuating coral reef ecosystems, including all activities associated with resource management, such as assessment, conservation, protection, restoration, sustainable use, and management of habitat; mapping; habitat monitoring; assistance in the development of management strategies for marine protected areas and marine resources consistent with the National Marine Sanctuaries Act (16 U.S.C. 1431 et seq.) and the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1801 et seq.); law enforcement; conflict resolution initiatives; community outreach and education; and that promote safe and ecologically sound navigation

### conservation

the political/social/economic process by which the environment is protected and resources are used wisely

### conservation biology

a multidisciplinary science that deals with the conservation of genes, species, populations, communities, and ecosystems that make up the Earth's biodiversity. Its goals are to investigate human impacts of biodiversity



and to develop approaches to prevent extinction of species through stewardship of entire biological communities

### conserved name

in taxonomy, a name otherwise unavailable or invalid that the International Commission on Zoological Nomenclature, by the use of its Plenary Power, has enabled to be used as a valid name by removal of the known obstacles to such use

### consexual

of the same sex

### conspecific

of the same species

### consumer

an organism which must consume other organisms (living or dead) in order to satisfy its energy needs

### contaminant

an undesirable substance not normally present, or an usually high concentration of a naturally occurring substance in the environment; a substance in water that might adversely affect the health and welfare of the biota

## Content Standard for Digital Geospatial Metadata

provides a common set of terminology and definitions for the documentation of digital geospatial data. The standard establishes the names of data elements and compound elements (groups of data elements) to be used for these purposes, the definitions of these compound elements and data elements, and information about the values that are to be provided for the data elements

### contiguous

adjacent or touching; having a common boundary; adjoining; connected without a break

### contiguous habitats

refers to habitats that are connected to each other by sharing a common boundary

### continental margin

the water-covered edges of continents consisting of the continental shelf, the continental slope, and the continental rise

### continental rise

the enormous wedge of sediment deposited at the base of the continental slope

### continental shelf

the shallow, near-horizontal sea floor extending from the coast to the upper continental slope

### continental slope

the sloping sea bottom of the continental margin that begins at a depth of about 100 to 150 m at the shelf edge and ends at the top of the continental rise or in a deep-sea trench

### continuum

a continuous set of data for which each data point is related to the adjacent point; a gradual or imperceptible intergradation between two or more extreme values

### contour

on a map or chart, a line connecting points of equal surface value

### contour interval

the difference in surface values between contours

### controlled environment

the environment in which parameters, such as light, temperature, salinity, etc., are fully controlled

### controlled experiment

a scientific experiment, in which results from an experimental group with variable conditions, is compared with a control group with nonvariable conditions

### convection current

a movement of air or water caused by changes in density or thermal gradients

### Convention on International Trade in Endangered Species (CITES)

the 'Washington' Convention on International Trade in Endangered Species of Wild Fauna and Flora, more commonly known as CITES, aims to protect certain plants and animals by regulating and monitoring their international trade to prevent it reaching unsustainable levels. There are more than 150 Parties to the Convention. The CITES Secretariat is administered by the United Nations Environment Programme (UNEP). CITES regulates international trade in over 30,000 species, of which approximately 25,000 are plants

### convergence

come together and meet at a point

## convergent evolution

the development of superficially similar structures in unrelated organisms, e.g., the wings of insects and birds

## coordinate taxon

in cladistics, a group within a monophyletic lineage at the same branching level as another. Therefore, it requires equivalent taxonomic rank in the Linnean classification hierarchy

## copepod

any of a large subclass (Copepoda) of usually minute freshwater and marine crustaceans that form an important element of the zooplankton in the marine environment and in some fresh waters. A common feature uniting all the copepod orders is a single simple eye in the middle of the head, at least in the larval stage. The cephalosome, a shield over the head and some thoracic segments distinguishes the free living forms from parasitic ones. Some species are ectoparasites of marine fishes

## copepodid

postnaupliar developmental stages of copepods

## coprophagous

pertains to feeding on fecal matter

## coral

a general term used to describe a group of cnidarians; indicates the presence of skeletal material that is embedded in the living tissue or encloses the animal altogether



Finger coral (*Porites compressa*) in Hawaii (Photo: M. White)

## coral assemblage

a group of corals

## coral bleaching

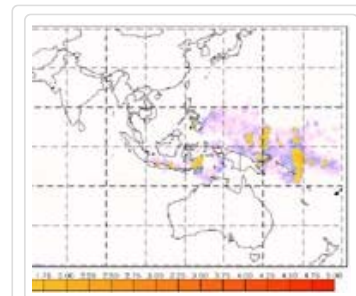
the process in which a coral polyp, under environmental stress, expels its symbiotic zooxanthellae from its body. The affected coral colony appears whitened



Bleached *Acropora* coral in Florida

## coral bleaching hotspot

a region of sea surface temperature (SST) that exceeds the climatological maximum for a region by 1 deg C or more. These conditions may cause sufficient stress to coral reefs to result in coral bleaching



Section of a graphic depicting areas of elevated ocean temperatures that may result in coral bleaching events.

## Coral Bleaching HotSpot monitoring program

a NOAA program that uses satellite and in situ monitoring stations to monitor high sea surface temperature events and to analyze conditions that may lead to coral bleaching

## Coral Disease and Health Consortium (CDHC)

in response to the dramatic increase of coral diseases observed over recent years, the U.S. Coral Reef task force (2002) recommended the creation of the CDHC from a cross-section of internationally recognized experts in coral diseases, biomedical and veterinary sciences, pathology, chemistry, biology, biotechnology, and marine management. It organizes and coordinates the scientific resources of the U.S. and its territories to meet the challenge of globally declining coral reefs

## coral growth line

a minute growth line on the outer surfaces of corals that have a calcified outer wall. The carbonate is produced by zooxanthellae which create a series of diurnal growth increments

## Coral Health And Monitoring Program (CHAMP)

a NOAA program whose mission is to provide services to help improve and sustain coral reef health throughout the world. Long term goals are: establish an international network of coral reef researchers for the purpose of sharing knowledge and information on coral health and monitoring; provide near real-time data products derived from satellite images and monitoring stations at coral reef areas; provide a data repository for historical data collected from coral reef areas; and add to the general fund of coral reef knowledge

## Coral Literature, Education & Outreach (CLEO)

the CLEO project is designed to provide easy access to gray literature and pre-1990's literature on the coral reef environments near the Coral Reef Early Warning System (CREWS) monitoring stations to support education, research and management objectives. The Education modules leverage techniques developed at NOAA/AOML in the Explorer of the Seas, Coral Health and Monitoring and CREWS programs under which knowledge transfer of oceanographic instrumentation and coral reef processes have been developed.

Education modules for middle school students engage the students in oceanographic instrumentation, classroom experiments and use of data, and the live Coral Cam observations

## coral necropolis

an area on the ocean floor covered mostly by (dead) coral skeletons

## Coral Parks Program (CPP)

a global initiative that supports existing Coral Parks, assists in the establishment on new Coral Parks, and engages divers and the dive industry in coral reef protection. CPP is an initiative of The Coral Reef Alliance, a non-profit organization dedicated to keeping coral reefs alive around the world

## Coral Point Count with Excel extensions (CPCe)

a software program distributed by the National Coral Reef Institute that provides a tool for the estimation of benthic habitat cover using underwater images. The coverage can be estimated using the random point count method, and areas can also be traced, digitized, and calculated via image calibration. More information can be found at [www.nova.edu/ocean/cpce](http://www.nova.edu/ocean/cpce)

## coral probiotic hypothesis

"this hypothesis posits that a dynamic relationship exists between symbiotic microorganisms and environmental conditions which brings about the selection of the most advantageous coral holobiont. Changing their microbial partners would allow the corals to adapt to changing environmental conditions more rapidly (days to weeks) than via mutation and selection (many years). An important outcome of the Probiotic Hypothesis would be development of resistance of the coral holobiont to diseases" (Reshef et al, 2006. Environmental microbiology 8 (12):2068 - 2073

## coral product

any living or dead specimens, parts, or derivatives, or any product containing specimens, parts, or derivatives, of any species of coral in the cnidarian Orders: Antipatharia (black corals), Scleractinia (stony corals), Gorgonacea (horny corals), Stolonifera (organpipe corals and others), Alcyonacea (soft corals), and Coenothecalia (blue coral), of the Class Anthozoa; and all species of the Order Hydrocorallina (fire corals and hydrocorals) of the Class Hydrozoa

## coral reef

a wave-resistant structure resulting from cementation processes and the skeletal construction of hermatypic corals, calcareous algae, and other calcium carbonate-secreting organisms

## Coral Reef Alliance (CORAL)

CORAL promotes coral reef conservation around the world by working with the dive industry, governments, local communities and other organizations to protect and manage coral reefs, establish marine parks, fund conservation efforts, and raise public awareness with the mission to keep coral reefs alive for future generation

## coral reef bleaching monitoring product

near real-time information derived from data either from satellite images or in situ monitoring stations at coral reef areas to help improve and sustain coral reef health throughout the world

## Coral Reef Degradation in the Indian Ocean (CORDIO)

CORDIO is an international program created to respond to the degradation of coral reefs throughout the Indian Ocean. In the western Indian Ocean region coral reefs are key ecosystems that support large sectors of the countries' populations and economies, through artisanal fisheries, tourism and large-scale investments. Projects within CORDIO focus on determining a) the biophysical impacts of coral degradation as a result of bleaching and other disturbances, and the long term prospects for recovery, b) the socio-economic impacts of coral mortality and options for mitigating these through management and development of alternative livelihoods, and c) the prospects of restoration and rehabilitation of reefs to accelerate the ecological and economic recovery.

## Coral Reef Early Warning System (CREWS)

*in situ* NOAA meteorological and oceanographic monitoring sites that collect data continuously which are transmitted hourly via satellite to a data archival site. An automated system (hardware and software) that monitors select oceanographic and meteorological parameters and produces specialized alerts when conditions may result in environmental stresses conducive of coral bleaching. NOAA plans to expand the CREWS from the Florida Keys/Bahamian sites to many remote coral reef sites throughout the world



A CREWS station on site.

## Coral Reef Ecosystems Integrated Observing System (CREIOS)

The Coral Reef Ecosystem Integrated Observing System (CREIOS) will provide a diverse suite of long-term ecological and environmental observations and information products over a broad range of spatial and temporal scales. The CREIOS goal is to understand the condition and health of, and processes influencing, coral reef ecosystems, to assist stakeholders in making improved and timely ecosystem-based management decisions to conserve coral reefs

## Coral Reef Virtual Laboratory (CoRViL)

a joint venture of the National Oceanic and Atmospheric Administration (NOAA), the Great Barrier Reef Marine Park Authority (GBRMPA), and the Australian Institute of Marine Science (AIMS). This venture will provide an automated, cooperative exchange of electronic data, computer processing power and remote sensing tools for the purpose of monitoring the coral reef environment on the Great Barrier Reef. It is anticipated that this effort will eventually provide a model for monitoring physical processes at other sensitive coral reef areas throughout the world

## Coral Reef Watch (CRW)

formed in 2000, NOAA's CRW maximizes NESDIS's coral reef resources by joining and building on existing NESDIS coral reef strengths under a more coordinated program. It seeks to develop a long-term coral reef monitoring system with the ability to predict coral bleaching episodes in all major U.S. coral reef areas

## coral rock

products used in the aquarium trade. Coral rock is consolidated material, greater than 3 cm in diameter, formed of fragments of dead coral and which may also contain cemented sand, coralline algae and other sedimentary rocks. 'Live rock' describes pieces of coral rock to which are attached live specimens of invertebrate species and coralline algae



Coral rock for sale in the marine aquarium trade. (Photo: Shell Horizons, Inc.)

## Coral Stress Index

an index that indicates the relative accumulated thermal stress experienced by a given coral reef

## Coral Triangle Support Partnership (CTSP)

in 2009, the World Wildlife Fund (WWF) and other partners supported the launch of the Coral Triangle Initiative (CTI), which included commitments by the governments of Indonesia, Malaysia, Papua New Guinea, the Philippines, the Solomon Islands, and Timor-Leste, to safeguard their marine resources and ensure income and food security for the millions of people who depend on those resources. In support of the CTI, the Coral Triangle Support Partnership (CTSP) was created with the goal of improving the management of biologically and economically important coastal and marine resources and associated terrestrial ecosystems that support the livelihoods of people's economies in the Coral Triangle. The CTSP is a five-year, \$40 million project executed through a Cooperative Agreement with the United States Agency for International Development (USAID) to the WWF, which includes a consortium of the WWF, Conservation International (CI), and the Nature Conservancy (TNC).

## Corallimorpharia

an order of the subclass Zoantharia (Hexacorallia) of the phylum Cnidaria. They are mostly solitary species (some are colonial) that resemble true corals, but lack a calcareous skeleton

## coralline algae

algae that form solid calcium carbonate accretions



Coralline algae remove calcium from water. This calcium carbonate gives them a coral-like look. As they die, they turn white. (Photo: Nancy Sefton)

## Coralline Lethal Orange Disease (CLOD)

a disease which infects coralline algae

## corallite

a coral cup; the skeleton of an individual polyp

## corallite wall

a raised skeletal structure surrounding the corallite, separating it from its neighboring corallites on the surrounding colony surface

## corallivore

an organism that eats coral



Parrotfish are often corallivorous, scraping the coral polyps with beaklike jaws.

## corallum

a complete coral colony; a coral head

## cordate

heart-shaped; in the form of two rounded lobes

## core

a cylindrical sample, obtained with a hollow drill, extracted from, inter alia, a seabed, lake bottom, or coral to investigate the composition and depths of layers

## core (geology)

the innermost layer of the Earth, consisting primarily of pure metals such as iron and nickel. The core is the most dense layer of the Earth, and is divided into the outer core, which is believed to be liquid, and the inner



core, which is believed to be solid

## COREMO 2

a data entry and analysis program developed by the southern Indian Ocean Global Coral Reef Monitoring Program (GCRMN) node. It is based on ARMDES (AIMS Reef Monitoring Data Entry System) but has been extensively modified from COREMO to suit the needs of the GCRMN

## Corexit

a trade name for a toxic mix of chemicals used to disperse spilled or oozing oil (a dispersant). It breaks up the oil, allowing it to decompose more quickly or evaporate before being washed to shore

## cornetfish

any species of spiny-rayed fishes in the family Fistulariidae. Cornetfishes are elongated, depressed-bodied fishes with a greatly extended tubular snout, a very small mouth, and a long thin filament extending from the middle of the caudal fin. They are closely related to the trumpetfishes (Aulostomidae) which are more robust and lack the caudal filament. At present there are approximately five known species of cornetfishes

## correlate

to show a relationship between entities

## correlation

a relation between a variable and one or more related variables

## correlation coefficient

a measure of the relationship between variables

## correlogram

a graph illustrating the auto-correlations between members of a time series (vertical axis) for different separations in time (horizontal axis)

## corridor

a connection between two segments of habitat that allows for the safe movement of individuals between the segments

## corrugated

having a surface with alternating parallel ridges and grooves

## cortex

the outer portion (layer) of an organ

### corticocyte

a cell that produces gorgonin and forms the axis in a gorgonian

### corymbose

describes coral colonies with horizontal interlocking branches and short upright branches

### cosmid

a DNA vector that allows the insertion of long fragments of DNA (up to 50 kbases)

### cosmopolitan

having a global distribution

### cosmopolitan distribution

worldwide distribution within habitat limits

### cost-benefit analysis

an assessment of the short-term and long-term costs (losses) and benefits (gains) that arise from an economic decision. If the calculated benefits exceed the calculated costs, the decision to buy an economic good or provide a public good is considered profitable

### costa

the extension of the septa outside the calyx into the coenosteum

### coulombmeter

an instrument for measuring electric charge

### Coulter counter

an instrument that measures particle size distribution from the change in electrical conductivity as particles flow through a small opening



A Coulter counter is an instrument used to measure the distribution of particle size.

### counter shading



protective body coloration where the dorsal surface (above) is dark and the ventral surface (below) is lighter



Counter shading in a white shark. The darker dorsal surface and lighter ventral surface allows the shark to blend in with the environment when viewed from above or below. (Photo: NOAA)

## covalence

the number of pairs of electrons an atom can share with other atoms

## covalent bond

a bond between two or more atoms that is provided by electrons that travel between the atoms' nuclei, holding them together but keeping them a stable distance apart

## cove

a small sheltered indentation in the shoreline. A cove is smaller than a bay

## CPCe

See: Coral Point Count with Excel extensions (CPCe)

## craggy

a surface which is rocky and steep

## craterform

massive shape with a broad base and a large, central depression

## crateriform

cup-shaped

## Craton

an old and stable part of the continental lithosphere, generally found in the interiors of tectonic plates. Cratons are composed of ancient basement rock which may be covered by younger sedimentary rock

## creel survey

a survey of anglers in a particular area to discover the types and numbers of fish caught

## crenulate

a shape in which the edge is slightly scalloped

## crepuscular

most active at low light levels during dusk and dawn



The large eyes of a squirrelfish hint about its crepuscular behavior, allowing it to be active and feed during periods of diminished light. (Photo: Copyright Corel Corporation)

## criterion

a standard rule or test on which a judgment or decision can be based.

## critical depth

the depth in seawater below which carbon loss through respiration by phytoplankton exceeds carbon gain through photosynthesis; no net phytoplankton production occurs

## critical habitat

the ecosystem upon which endangered and threatened species depend; habitat crucial to the survival of the species

## critical value

in statistics, the value of a test statistic at or beyond which the null hypothesis is rejected

## crocodile

in addition to freshwater environments, crocodiles also inhabit brackish waters and coral reef habitats. The American crocodile can be found on offshore cayes and atolls, and in mainland coastal habitats. Two endangered species of crocodile, the American crocodile (*Crocodylus acutus*) and Morelet's crocodile (*Crocodylus moreletii*), occur in Belize. The largest American crocodile population (less than 300) in Belize is found in the Turneffe Atoll, which is one of the largest remaining nesting areas in the Caribbean. Morelet's crocodile can be found in brackish water around coastal areas. The saltwater crocodile (*Crocodylus porosus*), the world's largest reptile, can be found in coastal, coral reef-rich waters from eastern India and Bangladesh

through Southeast Asia to Papua New Guinea and Australia. They occur as far east as the Solomon Islands and Vanuatu

## crocodilefish

any of about 60 species of bony fishes in the family Platycephalidae. Crocodilefishes have distinct pits immediately behind the eyes and a concave head margin. Their eyes have iris lappets which help break up the black pupil and improve its camouflage. Cr

## cross

in genetics, the mating of two individuals or populations

## cross section

a section sliced at right angles to the longitudinal axis of the animal or structure examined; a transverse section

## crossing over

in genetics, the breaking during meiosis of one maternal and one paternal chromosome, the exchange of corresponding sections of DNA, and the rejoining of the chromosomes. This process can result in an exchange of alleles between chromosomes

## crust (geology)

the outermost layer of the Earth, consisting of relatively low-density rocks

## Crustacea

a subphylum of Arthropoda that includes shrimp, mantis shrimp, lobsters, crabs, water fleas, copepods, crayfish and wood lice. There are almost 40,000 described species of crustaceans. The Crustacea are mainly aquatic, but include some semi-terrestrial and terrestrial groups



A marine shrimp (Crustacea).

## crustose

grows flat along the substrate; crust-like

## crustose coralline algae

crustose coralline algae are red algae of the division Rhodophyta. They are very important members of a reef community in which they cement and bind the reef together. They are particularly common in high wave energy areas but can also be found throughout all reef zones. Crustose corallines resemble pink or purple pavement. Morphology can range from smooth and flat, to rough and knobby, or even leafy



Crustose coralline algae are very common on reefs. (Photo: <http://www.botany.hawaii.edu>)

## cryophile

an organism that inhabits habitats with extremely cold temperatures ranging from  $-15^{\circ}\text{C}$  -  $+10^{\circ}\text{C}$ ; also known as "Psychrophiles"

## Cryophillic

refers to organisms that grow and reproduce at extremely low temperatures, typically below 10 degrees C

## crypsis

protective camouflage coloration where the individual resembles its background

## cryptic

pertaining to concealment, usually in reference to color pattern or behavior (e.g., hiding in reef crevices)



The viper moray is a cryptic fish, concealing itself in crevices and holes in the coral reef. (Photo: Dr. Anthony Picciolo)

## cryptobiosis

a suspension of life processes when conditions become unfavorable. In these resistant states some animals, such as nematodes, rotifers and tardigrades, can survive extreme drying, heat, or cold, and then return to "life" when favorable conditions return

## cryptogenic

of obscure or unknown origin

## cryptogenic species

species whose endemic or alien status is unclear. For many species, data are lacking on their original geographic distribution, and it cannot be determined whether they are native or introduced into a particular location

## ctene

the locomotor structure of ctenophores (comb jellies) made up of cilia arranged into flattened plates. The ctenes are arranged into eight longitudinal bands, from the aboral to the oral surface



Light refracts off the ctenes of the comb-jelly *Mertensia ovum* producing stripes of rainbow color. (Photo: Kevin Raskoff, MBARI.)

## ctenidium

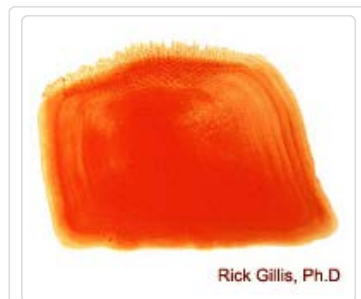
a comb-like structure; the respiratory organ of a mollusk (ctenidial gill)

## cteniform

comb-shaped

## ctenoid

comb-shaped; with a comb-like margin



A ctenoid scale of a bony fish. It is thought that the combed edge helps to reduce hydrodynamic drag during swimming. (Photo: Rick Gillis, Ph.D., Biology Dept., University of Wisconsin-La Crosse)

## ctenophore

a member of the animal phylum Ctenophora. A small phylum (about 50 species) whose members, known as comb jellies and sea walnuts, superficially resemble jelly fishes. These planktonic organisms are thought to have evolved from a medusoid cnidarian

## cue

in animal behavior, a signal from one animal which acts as a stimulus to elicit a behavioral response in another. The cue may be visual, acoustic, or chemical

## culling

the selective removal of animals from a population for conservation purposes

## culture

a population of plant or animal cells or microorganisms that is grown under controlled conditions

## culture medium

a substance which contains nutrients and a favorable environment for the *in vitro* growth of microorganisms and cells

## cuneiform

wedge-shaped

## curvilinear relationship

a situation that is best represented by something other than a straight line

## cuspid

a point or projection on a tooth

## cutaneous

pertaining to the skin

## cuticle

an extracellular, protective external body covering, secreted by the epidermis, of some invertebrate animals, usually composed of fibrous material, such as chitin or collagen; the waxy layer of epidermal cells of plant parts, such as leaves, stems, and fruit

## Cuvierian tubules

clusters of sticky tubules, located at the base of the respiratory tree, which may be discharged by some sea cucumbers (holothurians) when mechanically stimulate, as for example, when being threatened by a predator. Their great adhesivity, combined with their high tensile strength, allows the Cuvierian tubules to entangle and immobilize potential predators with which they come into contact. After expulsion, the lost tubules are readily regenerated, making them a formidable defense mechanism



## cyanide fishing

a destructive fishing technique in which sodium cyanide or some other cyanide compound is used to stun and capture coral reef fishes for the aquarium and live food trade

## cyano-

a prefix denoting blue or dark blue

## cyanobacteria

photosynthetic aquatic bacteria, often called blue-green algae, but have no relationship to algae. Cyanobacteria get their name from the bluish pigment phycocyanin, which they use to capture light for photosynthesis. They also contain chlorophyll a, the same photosynthetic pigment found in the chloroplasts of plants. Not all "blue-green" bacteria are blue; some common forms are red or pink, resulting from the pigment phycoerythrin



A bloom caused by cyanobacteria (-blue-green algae+).

## cyanotoxin

a toxin produced by cyanobacteria that has been implicated in human and animal illness and death. Cyanotoxins can accumulate in animals such as fishes and shellfish, and cause illnesses such as shellfish poisoning

## cybernetics

an interdisciplinary field of science concerned with processes of communication and control in biological and artificial systems; the design or discovery and application of principles of regulation and communication

## cyberspace

the whole range of information resources available through computer networks

## cycloid

having a smooth-edged margin

## cyclomorphosis

cyclical changes in form such as seasonal changes in morphology, as seen in some planktonic crustaceans

## cyclone

an area of low pressure. Circulation is counterclockwise around a low pressure system in the Northern Hemisphere and clockwise in the Southern Hemisphere

## cyclonic

refers to a region of low atmospheric sea level pressure; or, the wind system around such a low pressure center that has a clockwise rotation in the Northern Hemisphere and a counterclockwise rotation in the Southern Hemisphere

### cyclosystem

a system of very small tubules that links the polyps of calcareous colonial hydrozoans

### cydippid larva

a larva of ctenophores

### cystid

the exoskeleton and body wall of the stationary trunk of bryozoans

### cytochrome oxidase

an oxidizing enzyme found in mitochondria of cells. It contains iron and a porphyrin and is important in cellular respiration as an agent of electron transfer from certain cytochrome molecules to oxygen molecules.

Cytochrome c is a highly conserved protein found in plants, animals, and many unicellular organisms. This, along with its small size, makes it useful in studies of evolutionary divergence

### cytogenetics

the science that links the study of inheritance (genetics) with that of cells (cytology) and is concerned mainly with the study of the structure, and function of chromosomes

### cytokinesis

the division of the cytoplasm of a cell during cell division

### cytology

the study of the structure and function of cells

### cytometer

an instrument for counting cells

### cytoplasm

the protoplasm of a cell exclusive of that of the nucleus. It consists of a continuous aqueous solution (cytosol) and the organelles and inclusions suspended in it. The cytoplasm is the site of most of the chemical activities of the cell

### cytoplasmic genes

DNA-containing bodies in the cell but external to the nucleus

## cytoplasmic inheritance

inheritance via genes found in cytoplasmic organelles, e.g., mitochondria, rather than the nuclear genes;  
inheritance via the maternal lineage; extrachromosomal inheritance

## cytosine

one of the four nitrogenous bases in DNA that make up the letters ATGC.  
Cytosine is the "C". The others are adenine, guanine, and thymine. Cytosine always pairs with guanine

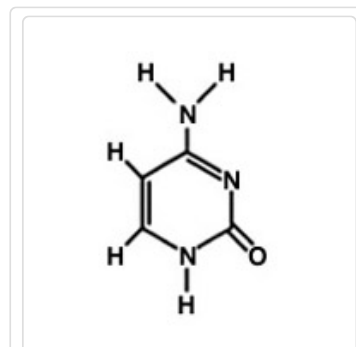


Diagram of the chemical structure of cytosine, one of the four nitrogenous bases in DNA.

## cytoskeleton

the network of microtubules, microfilaments, and larger filaments that provides a eukaryotic cell with its structural support, shape, and its capacity to move and arrange its organelles within the cell

## cytosol

the fluid, less structured part of the cytoplasm of a cell, excluding organelles and membranous structures; the portion of the cytoplasm which remains after removal of particulate components

## cytotoxic

able to cause cell death; causing damage to cell structure or function

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#) | [N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#) |

## dacriform

tear-drop shaped

## dactyloid

finger-shaped

## dactylozoid

a colonial hydrozoan polyp that possesses a large, nematocyst-bearing fishing tentacle, and functions in defense and in food capture

## Dalton's Law

the total pressure exerted by a mixture of gases is the sum of the pressures that would be exerted by each of the gases if it alone were present and occupied the total volume

## damselfish

a large family (Pomacentridae) of bony fishes which are abundant and common inhabitants of coral reefs. They possess robust, deep, and laterally compressed bodies. The majority of damselfishes do not have particularly brilliant markings or coloration. Exceptions are the brilliantly colored anemone fishes, the banded sergeant major, and the bright orange garibaldi. Many species of damselfishes are highly territorial

## dark-field microscope

a microscope that has a special condenser and objective with a diaphragm that scatters light from the observed object. The object appears bright on a dark background

## dark-spots disease

a coral disease characterized by darkly pigmented areas of tissue on stony corals. At present, there is no known pathogen. The coral tissue remains intact, although at times lesions and coral tissue death are observed in the centers of the pigmented areas. Tissue loss is minimal, if present. This disease is widespread throughout the Caribbean.



## Darwin Core

a body of data and metadata standards that consists of a vocabulary of terms to facilitate the discovery, electronic retrieval, and integration of information about organisms, their spatiotemporal occurrence, and supporting evidence in natural history specimen collections and species observation databases. It provides a stable standard reference for sharing information on biological diversity

## Darwin Mounds

two areas of hundreds of sand and cold-water coral mounds at depths of about 1,000 m, in the northeast corner of the Rockall Trough, approximately 185 km northwest of the northwest tip of Scotland. The Darwin Mounds cover an area of approximately 100 sq. km. The tops of the mounds are covered with *Lophelia pertusa* corals and coral rubble

## Darwin point

the latitude at which reef growth just equals reef destruction by various physical forces

## Darwinian evolution

evolution of life forms by the process of natural selection acting on random genetic variations

## data

multiple facts (usually but not necessarily empirical) used as a basis for inference, testing, models, etc.; the word is plural (sing. datum) and takes a plural verb

## data management

the act, process, or means by which data are managed. This includes the planning, collection, compilation, archival, safe-guarding, listing, organization, extraction, retrieval, manipulation, and dissemination of data

## data mining

an information extraction activity whose goal is to discover hidden facts contained in databases. Using a combination of machine learning, pattern recognition, statistical analysis, modeling techniques and database technology, data mining finds patterns and subtle relationships in data and infers rules that allow the prediction of future results

## data warehouse

a database, frequently very large, that can access vast arrays of heterogeneous data, stored within a single logical data repository, that are accessible to different querying and manipulation methods . While the warehouse can be distributed over several computers and may contain several databases and information from numerous sources in a variety of formats, it should be accessible through a server. Thus, access to the warehouse is transparent to the user, who can use simple commands to retrieve and analyze all the information. The data warehouse also contains data about how the warehouse is organized, where the information can be found, and any connections between data. Frequently used for decision support within an organization, the data warehouse also allows the organization to organize its data, coordinate updates, and see relationships between information gathered from different parts of the organization

## database

a structured file of information or a set of logically related data stored and retrieved using computer-based means

## database management system (DBMS)

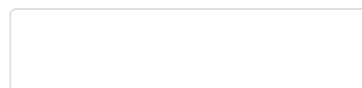
a set of computer programs for organizing the information in a database. A DBMS supports the structuring of the database in a standard format and provides tools for data input, verification, storage, retrieval, query, and manipulation

## daughter cell

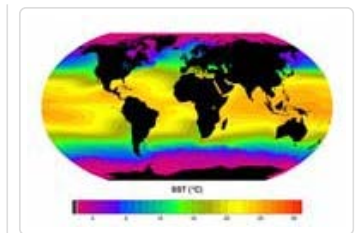
one of the two cells formed by the division of a parent cell

## Day/Night SST

observations of sea surface temperature obtained during both daytime and



nighttime orbits from the Advanced Very High Resolution Radiometer (AVHRR) on NOAA's polar satellite



1985-2000 average sea surface temperature from AVHRR Pathfinder.

### de facto

in fact; in reality; existing but not officially recognized or legally established

### dead ahead

a position directly in front of a vessel

### dead zone

hypoxic (low-oxygen) areas in the world's oceans, usually in coastal zones, where little marine life is present, mostly because of eutrophication with subsequent algal blooms. Notable dead zones in the United States include the Gulf of Mexico area surrounding the outfall of the Mississippi River, and coastal regions of the Pacific Northwest

### decadal

refers to a climatic process that re-occurs every decade or once every few decades

### decapod crustacean

a members of the Order Decapoda, Class Malacostraca, Superclass Crustacea, Phylum Arthropoda; has five pairs of thoracic legs. Examples are shrimps, lobsters, crabs, and hermit crabs



A spider crab is a decapod crustacean.

### decibel

a logarithmic scale used to denote the intensity (loudness), of a sound relative to the threshold of human hearing. A step of 10 dB is a 10-fold increase in intensity or sound energy

### decibel

unit for measuring sound intensity

## deciduous

periodically shed

## decomposer

a heterotrophic organism that breaks down dead biological matter and uses some of the products and releases others for use by consumer organisms

## decomposition

the breakdown of organic matter by bacteria and fungi

## decompression

a change from one ambient pressure to a lower ambient pressure as the scuba diver ascends. Decompression also occurs in a decompression chamber. Decompression results in a reduction of gas pressures within the body

## decompression chamber

a hyperbaric steel enclosure used to treat victims of decompression sickness (the "bends") in which the air pressure is first gradually increased and then gradually decreased. This shrinks the nitrogen bubbles and allows the nitrogen to safely diffuse out of the victim's tissues



A NOAA decompression chamber.

## decompression dive

any dive where the scuba diver is exposed to a higher pressure than when the dive began. Decompression occurs as the diver ascends

## decompression diving

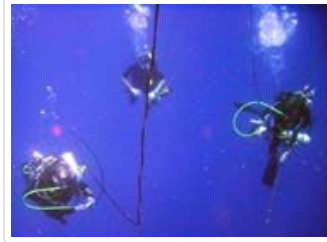
scuba diving that requires in-water stops during ascent to the surface to allow off-gassing of nitrogen

## decompression sickness (the bends)

a dangerous and potentially lethal condition of divers precipitated by rapid changes in ambient atmospheric pressure, mostly in rapid ascent from underwater, but can also result from flying in an aircraft too soon after a dive. It occurs because at high pressures (such as SCUBA divers experience while underwater) the blood can contain more dissolved nitrogen than at lower pressures. When the diver ascends too rapidly, the blood can no longer contain this dissolved nitrogen and tiny gas bubbles begin to form in the blood. Symptoms include: body pain (mainly in the joints), headache, confusion, itchy skin rash, visual disturbances, weakness or paralysis, dizziness, or vertigo. Treatment involves the administration of oxygen and placing the patient into a decompression chamber until the nitrogen bubbles shrink and safely diffuse from the tissues

## decompression stop

a specified time spent at a specific depth as a scuba diver ascends from a dive for purposes of releasing nitrogen gas from the tissues (nitrogen off-gassing)



These NOAA divers are making a decompression stop to allow nitrogen to escape from their tissues. (Photo: NOAA/National Marine Fisheries Service)

## deductive reasoning

an inference in which the conclusion about particulars follows necessarily from general theory. In science, deductive reasoning would involve stating an hypothesis first, and then trying to find facts that reject the hypothesis

## deep fore reef

the deepest seaward part of a coral reef; a vertical cliff beginning at a depth of about 60 m

## deep scattering layer

a thin sound-reflecting layer of zooplankton and nekton that ascends toward the surface at night and descends each day (diurnal vertical migration) in response to changing levels of light

## deep water

the water beneath the permanent thermocline that usually has a low and uniform temperature

## deep-sea corals

stony, soft, gorgonian, black, and horny corals that inhabit the colder deep waters of continental shelves and offshore canyons, ranging from 50 -1000m+ depths. They lack zooxanthellae and may build reef-like structures or occur solitarily



*Lophelia pertusa*, a deep-sea stony coral.



## deep-sea sponge community

an assemblage of structure-forming deep-sea sponges and other associated species below 50 m

## defensome

genes encoding protein complexes that participate in defense mechanisms to environmental chemical stressors; also called "chemical defensome"

## definitive host

in a parasite's life cycle, it is the host organism in which the parasite reproduces sexually

## deforestation

the removal of trees from a habitat dominated by forest

## degeneracy

in relation to the genetic code, more than one codon can code for the same amino acid

## degenerate character

a character, trait or structure that has evolved to a less developed state from its ancestral form or function

## degeneration

a process by which tissue deteriorates, loses functional activity, and may become converted into or replaced by other kinds of tissue; deterioration which causes some degree of loss of original function; the process of declining from a higher to a lower level

## Degree Heating Week (DHW)

the NOAA satellite-derived Degree Heating Week (DHW) is an experimental product designed to indicate the accumulated thermal stress that coral reefs experience. A DHW is equivalent to one week of sea surface temperature 1 deg C above the expected summertime maximum. For example, 2 DHWs indicate one week of 2 deg C above the expected summertime maximum

## Degree Heating Week accumulation

accumulated thermal stress that coral reefs experience over a typical 12-week period

## degrees of freedom

in statistics, the number of independent comparisons that can be made between the members of a sample; in a contingency table it is one less than the number of row categories multiplied by one less than the number of column categories. The number of degrees of freedom is defined as the number of observations that can be chosen freely, i.e., an estimate of the number of independent categories in a particular statistical test or experiment

## deimatic behavior

defensive postures or other visual displays, including color changes, that function to intimidate or frighten another animal

## delayed fertilization

when fertilization of an egg does not occur immediately following introduction of spermatozoa into the female reproductive tract, but may be delayed for weeks or months

## delta

the fan-shaped area at the mouth or lower end of a river formed by eroded material that has been carried downstream and dropped in quantities larger than can be carried off by tides or currents

## delta notation

the absolute abundance of an isotope is difficult to measure with accuracy. Therefore, we compare isotopic ratios in a sample with those in a standard resulting in the delta-notation:  $d(x) = [(R_x - R_{st})/R_{st}] \times 10^3$ , where  $d(x)$  is the delta-value of a sample,  $R_x$  and  $R_{st}$  are the isotopic ratios in sample ( $R_x$ ) & standard ( $R_{st}$ ). The  $d$ -value is the relative difference in the isotopic ratio of the sample and the standard. It is expressed in part per mille (‰); that is why the right-hand side of the equation is multiplied by 10<sup>3</sup> (1000). Carbon and oxygen data from carbonates are usually referred to the PDB standard (a belemnite, *Belemnitella americana*, from the Late Cretaceous PeeDee Formation in South Carolina)

## deme

a local interbreeding population of a species

## demersal

pertains to an organism that is essentially bottom living but may feed and swim in the water column

## demography

the rate of growth and the age structure of populations, and the processes that determine these properties

## denaturation

the inducing of structural alterations that disrupt the biological activity of a molecule. It often refers to breaking hydrogen bonds between base pairs (by heat) in double-stranded nucleic acid molecules to produce single-stranded polynucleotides, or altering the secondary and tertiary structure of a protein, destroying its activity

## denatured alcohol

ethyl alcohol (ethanol) to which a poisonous substance, such as acetone or methanol, has been added to make it unfit for consumption

## dendriform

having a structure that resembles a tree or shrub

## dendrite

a sensory branch of a neuron that carries a nervous impulse to the cell body

## dendritic

branched like a tree



Black coral is dendritic in shape.  
(Photo: Waikiki Aquarium)

## dendrogram

a branching tree-like diagram used to represent phylogenetic paths of evolution

## denitrification

the formation of gaseous nitrogen and/or nitrogen oxides from nitrate or nitrite by denitrifying bacteria during anaerobic respiration

## denitrify

to remove nitrogen from any substance or chemical compound

## denitrifying bacteria

anaerobic bacteria in soil or water that use the nitrate ion as a substitute for molecular oxygen during their metabolism. The nitrate is reduced to nitrogen gas ( $N_2$ ), which is lost to the environment during the process

## dentate

having teeth or tooth-like points; serrate

## denticle

a little tooth

## denticulate

having an edge with small projecting teeth

## deoxyribonucleic triphosphates

unreactive nucleotides that closely resemble the nucleotides that make up DNA. They are 'dummy' nucleotides that act as placeholders when DNA is sequenced

## depauperate

an area poor in species richness and/or biodiversity; an impoverished habitat

## dependent species

a species dependent on another for survival, e.g., a predator on a prey, a commensal or other kind of symbiont

## dependent variable

the variable being measured

## deposit

material left in a new position by a natural transporting agent, such as water, wind, ice, or gravity, or by human activity

## deposit feeder

an animal that feeds on nutrients in the sediments

## depressed

a body shape which is flattened dorso-ventrally, e.g., a ray, skate, monkfish

## depth contour

a line on a nautical chart connecting points of equal depth

## derived character

in evolution, an advanced trait which only appears in some members of a taxonomic group. For example, a derived character for some mammals would be the loss of the tail, which occurs in the great apes and man. Another derived character is the presence of feathers in birds. Scales are the ancestral feature. Derived characters are also called apomorphies

## dermal

pertaining to or affecting the skin

## dermal flap

a small skin flap

## dermis

the layer of the skin beneath the epidermis. The dermis is largely fibrous and contains collagen and elastin which are the proteins responsible for the support and elasticity of the skin. Depending upon the species, the dermis also contains tiny sensory nerve endings, blood and lymph vessels, and sweat and sebaceous glands

## designated Use

classification specified in water quality standards for each waterbody or segment describing the level of protection from perturbation afforded by the regulatory programs. The designated aquatic life uses established by the state or authorized tribes set forth the goals for restoration and/or baseline conditions for maintenance and prevention from future degradation of the aquatic life in specific waterbodies

## desmocyte

a cell specialized in binding soft tissues onto skeletal structures in scleractinian corals

## determinate cleavage

cleavage resulting in blastomeres each capable of developing only into a particular embryonic structure, not into a complete organism

## detritus

the particulate decomposition or disintegration products of plankton, including dead cells, cell fragments, fecal pellets, shells, and skeletons, and sometimes mineral particles in coastal waters



Low tide along South Carolina shoreline with bits of sea shells and other detritus (Photo: Richard B. Mieremet, NOAA)

## detrivore

an animal that eats detritus

## deuterostome

one of two distinct evolutionary lines of coelomates, consisting of the echinoderms and chordates and characterized by radial cleavage of the early embryo. The cleaving cells are indeterminate (if early embryonic cells are separated, each one develops into a complete organism). The anus develops from the blastopore

## developed country

describes nations or countries with social, cultural, industrial and technological advancement

## developing country

describes regions and countries that are still in the process of acquiring modern technology and becoming economically productive. These regions are sometimes called the "Third World"

## development

the chronological series of changes, from a lower to a higher state of organization, which multicellular organisms undergo from the fertilized egg (zygote) to maturity

## developmental response

morphological and physiological characteristics an organism developed in response to prolonged exposure to environmental conditions

## deviation

in statistics, the difference between an actual observation and the mean of all observations

## dewlap

a fold of loose skin

## dextral

right, as opposed to sinistral, or left

## diadromous species

a species which undertakes a spawning migration from ocean to river or vice versa

## diagenesis

all of the changes that occur to a deposited sediment during its conversion to rock; includes changes that result from chemical, physical as well as biological processes

## diagnosis

with reference to disease, the determination of the nature and cause of a disease; in taxonomy, a description of those characteristics that distinguish one taxon from another

## diagnostic characters

in taxonomy, the characters, or most important characters, which distinguish a taxon from other similar or

closely related taxa

## diapause

a state of arrested development or growth, accompanied by greatly decreased metabolism

## diaphanous

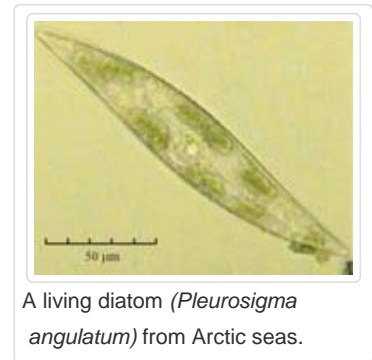
thin and translucent; semi-transparent

## diastema

a space; a gap

## diatom

a unicellular alga that consists of two interlocking valves composed of silica



## diatomaceous

pertaining to diatoms or their fossil remains

## dichopatric

pertains to allopatric populations with non-contiguous ranges

## dichopatric speciation

a type of speciation in which a formerly contiguous population is split by the rise of some geographical barrier, e.g., a mountain range

## dichotomous key

a tool to help identify taxa. It is made up of pairs of choices. Each choice is between statements describing specific traits of the taxa under consideration. Only one statement will be true for each choice. Each choice points to another set of choices until finally only one choice remains

## diel

pertaining to the day-night cycle

## diffusion

the movement of particles from an area of higher concentration to an area of lower concentration

## digestion

the breakdown, by hydrolysis, of complex ingested nutrient compounds (carbohydrates, fats, proteins) into their building blocks, i.e., the conversion of food, in the alimentary canal, into soluble and diffusible products, capable of being absorbed into the circulating fluid and the cells

## Digital Versatile Disc (DVD)

an advanced type of CD-ROM that holds a minimum of 4.7 gigabytes (unit of storage) to a maximum of 17 gigabytes of information. They are compressed using the MPEG codec, which stores only the changes from one frame to another instead of the entire frame

## digitiform

finger-shaped

## dimorphism

having two different distinct forms of individuals within the same species or two different distinct forms of parts within the same organism. It could refer to different colors or color patterns, sizes, anatomical parts, etc. Sexual dimorphism is a common case, where the two sexes have different shapes, sizes, etc.

## dinghy

a small open boat

## dioecious

having separate sexes. Individuals within the species contain only one or the other of male and female reproductive systems

## diphycercal

a caudal fin shape which is primitively symmetrical and pointed, and with the vertebral column or notochord extending to the tip, as found in primitive fishes, such as lampreys and chimaeras

## diploid

the condition in which a cell contains a nucleus with two complete sets of chromosomes, one set inherited from each parent. The diploid condition is often abbreviated as  $2n$ . Most plants and animals are diploid. The term also represents the number of chromosomes in most cells except the gametes, which are haploid in chromosome number

## directional selection



a type of natural selection that removes individuals from one end of a phenotypic distribution and thus causes a shift in the distribution. The frequency of an allele is changed in a constant direction, either toward or away from fixation for that allele. Directional selection occurs when individuals at one phenotypic extreme have an advantage over individuals with more common phenotypes

### disaccharide

a sugar (carbohydrate) formed by the covalent bonding of two monosaccharides. Table sugar, sucrose, is a disaccharide

### disciform

round or oval-shaped

### discoidal

disc-shaped; flat and round shape

### discrete random variable

a random variable whose range of possible values is finite or countably infinite

### discrimination

differential response to different stimuli

### disease

any impairment of an organism's vital functions or systems, including interruption, cessation, proliferation, or other malfunction



Coral with yellow band disease, which results in serious losses of coral tissue.

### disease vector

an organism which transmits infective organisms from one host to another

### disjunct

distinctly separate; disjunct populations are populations separated from other potentially interbreeding populations by a distance large enough to prevent exchange of genetic materials

## disjunct distribution

the discontinuous or separated geographical distribution of a species or other taxonomic unit

## dispersal

the spread of a species to a new location. In many organisms, this happens at a particular stage in the life cycle, and is often critical for the species' survival. Organisms may disperse as spores, seeds, eggs, larvae, juveniles, or adults; to diffuse, spread or scatter as in oil spills

## dispersant

a toxic liquid used to place oil in suspension in the water mass and promote its dispersal in order to accelerate break down by the environment, including bacterial decomposition. Dispersants are mixtures of solvents, surfactants, and other additives

## displacement behavior

a behavioral response that is appropriate for one situation appears in another situation, for which it is inappropriate

## display

in animal behavior, visual messages or body language, used by animals primarily to communicate anger, fear, and other basic emotions. Displays are strong indications of an animal's emotional state

## disruptive coloration

a color pattern that breaks up the outline of an organism



The color pattern of the juvenile spotted drum, *Equetus punctatus*, is an example of disruptive coloration. (Photo: Dr. Tom Doeppner, Brown University)

## dissociation

the temporary or reversible chemical process in which a molecule or ion is broken down into smaller molecules or ions

## dissolved organic carbon (DOC)

a measure of the organic compounds that are dissolved in water

## dissolved oxygen

the concentration of oxygen dissolved in water, expressed in mg/l or as percent saturation, where saturation is the maximum amount of oxygen that can theoretically be dissolved in water at a given temperature and pressure

## distal

the direction away from the midline of the body; the opposite of proximal

## distinct

clearly defined and easily recognized

## distinct population segment

"population," or "distinct population segment," are terms with specific meaning when used for listing, delisting, and reclassification purposes to describe a discrete vertebrate stock that may be added or deleted from the list of endangered and threatened

## disulfide bond

a chemical bond between the sulfur atoms of two different amino acids in a protein

## diurnal

active during the day light hours

## dive computer

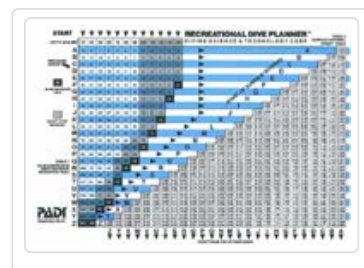
a small electronic sensor and calculator, carried by the scuba diver, that calculates and displays the basic information needed during a dive, i.e., depth, time, decompression status and tank pressure. By constantly monitoring depth and bottom time, dive computers automatically recalculate the diver's no-decompression status, giving longer dive times while still keeping the diver within a safe envelope of no-decompression time. Computers also monitor ascent rates, logs dives, and measures time intervals between dives

## dive computer algorithm

a suite of equations that compute nitrogen uptake and elimination in tissues from changes in the diver's depth and elapsed time underwater

## dive table

dive tables present dive times for specific depths, adherence to which, the scuba diver can avoid contracting decompression sickness (the bends). The theory behind dive tables is based on our understanding of how nitrogen is taken up on compression (descent) and given off on decompression (ascent). The first dive tables were devised by John S. Haldane in the period 1906-1908



The PADI (Professional Association of Diving Instructors) recreational dive planner (dive table) has three tables. Table 1 gives the maximum amount of time the diver can stay at a certain depth on the first dive, and it also indicates how much nitrogen the diver has in the tissues after a dive. Table 2 is concerned with the diver's surface interval time (how long a diver must remain at the surface before the next dive), and Table 3 allows the diver to determine safe diving limits on the next dive. (Photo: PADI)

## divergent evolution

the evolution from one species of organism into a number of different species. As the original population increases in size, it spreads out from its center of origin to exploit other habitats and ecological niches. In time, this results in a number of populations, each adapted to its particular habitat. Eventually these populations, genetically may differ from each other sufficiently to become new species. Divergent evolution has also been termed "adaptive radiation"

## diversity index

a mathematical index of species diversity within a community

## diverticulum

a blind sac branching off a cavity or canal

## diving bell

a hollow, usually inverted vessel, such as one used for diving deep in a body of water. It is open on the bottom and supplied with air under pressure. During the *Monitor* 2001 Expedition, navy divers utilized a 12-person, two-chamber saturation system with a two-person closed diving bell. The system can operate as deep as 1,500 ft—considerably deeper than the *Monitor*, which rests on the sea floor at a depth of 235 ft. Saturation systems are often used in deep-water situations (below 200 ft) in order to reduce the time lost to decompression during the slow ascent to the surface required for preventing decompression sickness



The SAT system diving bell is raised to the surface after an eight hour dive on the wreck of the USS

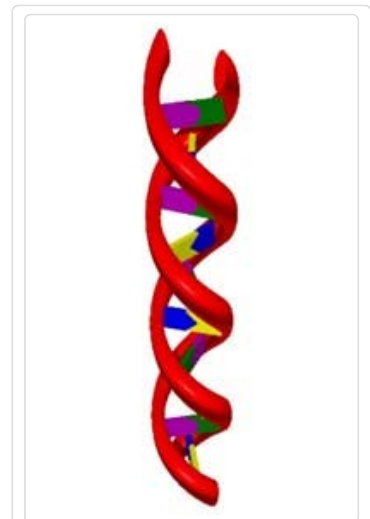
*Monitor.* The bell is the divers' "taxi" between their topside saturation living quarters and their work site, some 240 ft below the surface. (Photo: official U.S. Navy photo by Photographer's Mate Chief Petty Officer (DV/SW) Andrew McKaskle)

## division

in botanical nomenclature, "division" is used instead of "phylum", and is equal in taxonomic status to the phylum

## DNA (deoxyribosenucleic acid)

also termed deoxyribonucleic acid. The molecule that encodes genetic information in the cells. It resembles a double helix held together by weak bonds of four nucleotides (adenine, guanine, cytosine, and thymine) that are repeated ad infinitum in various sequences. These sequences combine into genes that govern the production of proteins. The DNA located within the nuclear membrane of eukaryotic cells is sometimes referred to as nDNA



Graphic of DNA shows the spiral double helix structure of the molecule.

## DNA annealing

the reformation of double stranded DNA from thermally denatured DNA. The rate of reassociation depends upon the degree of repetition and is slowest for unique sequences

## DNA chip

a small piece of glass or silicon that has small pieces of DNA arrayed on its surface

## DNA hybridization

the process of joining two complementary strands of DNA, or one each of DNA and RNA, to form a double-stranded molecule; a technique in which single stranded nucleic acids are allowed to interact so that complexes or hybrids are formed by molecules with sufficiently similar, complementary sequences. By this means the degree of sequence identity can be assessed and specific sequences detected

## DNA library

a collection of cloned DNA fragments that collectively represent the genome of an organism

## DNA marker

segments of chromosomal DNA known to be linked with heritable traits or diseases. Although the markers themselves do not produce the conditions, they exist in concert with the genes responsible and are passed on with them

## DNA polymerase

an enzyme that replicates DNA. DNA polymerase is the basis of PCR ( polymerase chain reaction)

## DNA probe

in genomics, the DNA affixed to a microarray; a small piece of nucleic acid that has been labeled with a radioactive isotope, dye, or enzyme that is used to locate a particular nucleotide sequence or gene on a DNA molecule

## DNA replication

DNA replication or DNA synthesis is the process of copying the double-stranded DNA prior to cell division. The two resulting double strands are identical (occasionally errors (mutation) in replication can result in a less than perfect copy) and each of them consists of one original and one newly synthesized strand

## dolioform

barrel-shaped

## doliolaria larva

the larval stage of sea cucumbers immediately following the auricularia stage. It is cylindrical in shape and possesses five transverse bands of cilia

## dome shaped

a form that resembles half of a sphere

## dominant

having the ruling or controlling power over; to predominate over

## dominant species

a species which make up a large proportion of a community in terms of its biomass or numbers of individuals

## domoic acid

an acidic cyanotoxin found associated with certain diatom blooms. Domoic acid can bioaccumulate in marine organisms that feed on the phytoplankton, such as shellfish and some fishes. In mammals, including humans, domoic acid is a neurotoxin responsible for Amnesic Shellfish Poisoning (ASP) , causing short term memory loss, brain damage, and in severe cases, death

## doppler radar

radar that can measure radial velocity, the instantaneous component of motion parallel to the radar beam (i.e., toward or away from the radar antenna)

## doppler shift

the change in the tone of a sound caused by the sound source moving away or towards the listener

## dorid nudibranch

a type of nudibranch (order Nudibranchia) possessing a feather-like external gill on the back and a rhinophoral sheath. The mantle is thick and extends over the foot. The surface of the mantle may bear tubercles which vary in size, shape and number, and are often a taxonomic diagnostic character

## dormancy

a period of suspended growth and metabolic activity. Many plants, seeds, spores, cysts, and some invertebrates become dormant during unfavorable conditions

## dorsal

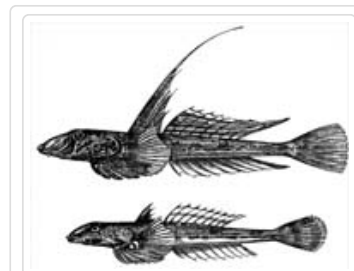
refers to the upper or back surface of an animal



The upper or back surface of this queen angelfish is the dorsal surface, as opposed to the opposite belly surface, which is the ventral surface. (Photo: Chris Huss, Florida Keys National Marine Sanctuary)

## dorsal fin

in fishes, one or more fins situated on the midline of the back, having spines or rays, sometimes both; excludes the adipose fin found in some fishes, such as catfishes and salmon



*Callionymus*

Dragonets, such as *lyra*, exhibit strong sexual dimorphism in the dorsal fin (male [top] and female [bottom]). (Image: NOAA)

## dorsoventral

an axis extending from the dorsal to ventral surface of an animal body

## dot grid

a technique used to analyze a photograph of a quadrat (photo-quadrat), in which a grid of random dots is placed over an image of the photo-quadrat. It assumes that the proportion of dots that lies on a substrate is equal to the proportional area of the substrate

## double helix

the normal structural configuration of DNA consisting of two helices winding about the same axis. The structure of DNA was first proposed by Watson and Crick (1953) with two interlocking helices joined by hydrogen bonds between paired bases

## double stranded RNA (dsRNA)

long double-stranded RNAs (dsRNAs; typically >200 nt) can be used to silence the expression of target genes in a variety of organisms and cell types

## download

transferring data (usually a file) from one computer to another. The opposite of "upload"

## downscaling

refers to techniques that take output from the model and add information at scales smaller than the grid spacing

## downstream

in the direction of the water movement

## downwelling

a downward current of surface water in the ocean, usually caused by differences in the density of seawater

## dredge

a metal collar with an attached collecting bag that is dragged along the bottom to obtain samples of rock, sediment, or benthic organisms



## dredging

a method for deepening streams, swamps or coastal waters by scraping and removing solids from the bottom. The resulting mud is usually deposited in marshes in a process called filling. Dredging and filling can disturb natural ecological cycles. For example, dredging can destroy coral reefs and other aquatic life; filling can destroy the feeding and breeding grounds for many fish and invertebrate species

## drift net

a fishing net, often miles in extent, arranged to drift with the tide or current and buoyed-up by floats or attached to a boat



A marine turtle is caught in a drift net. (Photo: NOAA)

## drop root

an adventitious root in mangroves that originates from the branches, and roots in the surface-sediments

## drowned river

a former river inundated by a rise in sea level in past times

## dry weight

the moisture-free weight of a biological sample obtained by drying at high (oven-drying) or low (freeze-drying) temperatures for an time sufficient to remove all water

## Dublin Core

a set of metadata elements used in digital libraries, primarily to describe digital objects and for collections management, and for exchange of metadata; a set of metadata elements used to describe electronic information and data resources

## duct

any tubular structure

## duplex DNA

double-stranded DNA

## DVD-ram

a high-capacity, high-performance optical disk that allows data to be read, written, and erased. It is comparable to a rewritable CD, and can hold up to 2.6 gigabytes of information per side

## dynamic optical demarcation

in animal behavior, a special signalling device used by an animal in a stereotypical movement, as for example, the waving of a fiddler crab's claw to attract the attention of other members of its species

## dyne

unit of force to accelerate 1 gram to 1 cm per second per second

## dystrophy

a degenerative disorder that mostly affects muscles; some lakes have dystrophic waters which have organically-rich waters from decomposing plants

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#) | [N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#) |

## early life history

the stages from egg to juvenile in fish development

## ebb current (ebb)

the movement of a tidal current away from shore or down a tidal river or estuary

## ebb strength

phase of the ebb tidal current at the time of maximum speed; also, the speed at this time

## ebb tide

that period of tide between a high water and the succeeding low water; falling tide

## ecad

a non-inheritable plant or animal form produced in response to particular habitat environmental factors; an environmentally induced form

## ecdysone

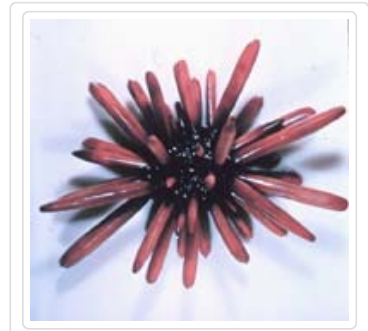
a molting hormone of arthropods. It stimulates growth and ecdysis (molting)

## Ecdysozoa

the ecdyzoans comprise one of the major and largest protostome groups within the animal kingdom. It includes both the arthropods and the nematodes, as well as lesser groups such as rotifers, cephalorhynchs (which include priapulids, kinorhynchs, and loriciferans), and onychophorans. Ecdysozoans build a cuticle, an outer layer of organic material that functions as a lightweight flexible exoskeleton. The name Ecdysozoa refers to the fact that many members of this group regularly shed their cuticle, a process called ecdysis

## Echinodermata

an animal phylum that contains starfishes, sea cucumbers, sand dollars, brittlestars, basket stars, sea lilies, feather stars, and sea urchins. Adults exhibit pentamerous radial symmetry, secondarily derived from a bilateral ancestor. They are not at all related to the other radiate phyla, such as the Cnidaria



A pencil urchin of the phylum Echinodermata.

## echinopluteus larva

a larval form of some echinoderms



Free-swimming echinopluteus sea urchin (*Echinocardium cordatum*) larva feeds on microplankton captured with its ciliated arms. (Photo: Jan Parmentier)

## Echiura

an animal phylum that contains the echiurans or spoonworms. Some species inhabit coral crevices. Echiurans are deposit feeders

## echolocation

the sonar-like ability used by bats, dolphins, some whales, and two groups of cave-dwelling birds to detect objects in their environment. Using echolocation, the animal emits high-frequency sounds that reflect off of an object and return to the ears or other sensory receptors

## ecocline

a gradual and continuous change in environmental conditions of an ecosystem or community; gradual transition between ecotypes; a continuous change in form as a response to a continuous change in an environment

## ecodeme

an intrabreeding population occupying any specified ecological habitat

## ecological equivalent

a different species that occupies a similar ecological niche in a similar ecosystem in a different part of the world

## ecological isolation

a form of reproductive isolation in which two closely-related species are separated by what is often a slight difference in the niches they occupy

## ecological restoration

the process whereby an entire ecosystem is brought back to healthy condition

## ecological species

a concept of species, in which a species is a set of organisms adapted to a particular ecological niche

## ecology

the study of the interrelationships between organisms and their environment, including the biotic and abiotic components

## ecomorph

a local population or group whose appearance is determined by ecological factors

## ecophenotype

a phenotype showing non-genetic adaptations associated with the habitat or environment

## ecoregion

a geographic area of relative homogeneity in ecological systems or in relationships between organisms and their environment; a relatively large area of land or water that contains a geographically distinct assemblage of natural communities

## ecospecies

an assemblage of ecotypes which are separated by incomplete sterility barriers

## ecosystem

an ecological community considered together with the non-living factors of its environment as a unit

## ecosystem (or environmental) services

these are "benefits people obtain from ecosystems." These benefits are obtained from both direct use of ecosystems, and when ecosystems are not used directly, their services still play an important socioeconomic role

## ecosystem approach (EA)

a strategy for the integrated management of land, water, and living resources that promotes conservation and sustainable use in an equitable way. Often used interchangeably with ecosystem-based management

## ecosystem based management (EBM)

EBM integrates knowledge of ecological interrelationships to manage impacts within an ecosystem. Effective implementation of EBM should: (1) consider ecological processes that operate both inside and outside ecosystem boundaries, (2) recognize the importance of species and habitat diversity, and (3) accommodate human uses and associated benefits within the context of conservation requirements

## ecosystem integrity

the ability to support and maintain a balanced, integrated, adaptive biological community having a species composition, diversity and functional organization comparable to that of a natural habitat in the region

## ecosystem restoration

actions taken to modify an ecosystem for the purpose of re-establishing and maintaining desired ecological structures and processes



Two divers work to reattach a large fragment of elkhorn coral, *Acropora palmata*, at Mona Island, Puerto Rico. The coral in the background has been attached to the reef framework using stainless steel wires. The wire binds the coral fragment to the living coral where it is expected to reattach to the live coral. (Photo: Erik Zobrist, NOAA Restoration Center)

## ecosystem services

The benefits people obtain from ecosystems. These include provisioning services such as food and water; regulation services such as the regulation of climate, floods, disease, wastes, and water quality; cultural services such as recreation, aesthetic enjoyment, and spiritual fulfillment; and supporting services such as photosynthesis and nutrient cycling.

## ecotone

a transitional area between two adjacent ecological communities

## ecotope

the abiotic or non-living part of an ecosystem

## ecotourism

travel undertaken to experience sites or regions of unique natural or ecological quality, or the provision of services to facilitate such travel

## ecotype

a genetically differentiated subpopulation that is restricted to a specific habitat

## ecotype

a population in a given ecosystem that is adapted to a particular set of environmental conditions

## ecto-

a prefix meaning 'outside'

## ectoderm

the outer germ layer of cells in an embryo that gives rise to the outer layer of skin (epidermis) and neural tissue

## ectodermis

the outer cellular covering of a polyp

## ectoparasite

a parasite which lives on the surface of its host



A marine ectoparasite lodged in a fish's mouth. (Photo: NOAA Ocean Explorer)

## ectoplasm

the clear, nongranular portion of the cell cytoplasm just inside the cell membrane

## Ectoprocta

an animal phylum synonymous with the phylum Bryozoa, the "moss animals"

## ectosarc

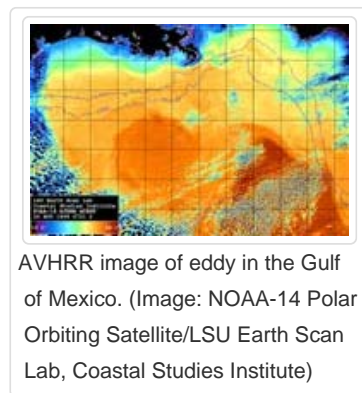
the ectoplasm of of some unicellular forms; the thin outer layer of cytoplasm adjacent to the cell membrane

## ectothermic

having an internal body temperature that is dependent on the surrounding temperature. Most aquatic animals are ectotherms; also caled poikilothermal or "cold blooded"

## eddy

a circular movement of water formed on the side of a main current



## edentate

toothless

## edge effect

habitat conditions created at or near the more-or-less well-defined boundary between ecosystems (ecotone). Typically there is an increased richness of organisms resulting from the mixing of two communities where they join

## eelgrass

a common seagrass (*Zostera marina*) distributed from Greenland to Florida that serves as an important habitat for fishes and shellfish. Unfortunately, approximately 90 percent of all eelgrass throughout its range along the Atlantic coast has been destroyed



Eel grass meadows. (Photo: NOAA)

## effluent

a discharge of pollutants into the environment, partially or completely treated or in its natural state. Generally used in regard to discharges into waters; in contrast to an emission, which is generally used in regard to discharges of pollutants into the air

## effort

the amount of time and fishing power used to harvest fish. Fishing power includes gear size, boat size, and horsepower

## egestion

the elimination of undigested food materials from an organism

## egg

a female sex cell or gamete with the haploid number of chromosomes. It may be fertilized by a sperm cell to produce a zygote with the diploid number of chromosomes for that particular species. The eggs of some species may develop into multicellular individuals without being fertilized by a sperm cell. This is the process of parthenogenesis

## egg case

the leathery case which contains the developing embryo in hagfishes, sharks, rays, skates and chimaeras; also called a "mermaid's purse"

## eiloid

coil-like

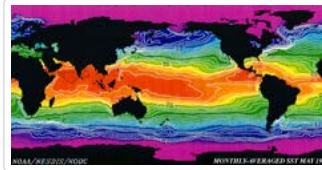


## Ekman layer

the thin horizontal layer of water riding on top of the ocean that is affected by wind

## El Niño

an irregular variation of ocean current that from January to March flows off the west coast of South America, carrying warm, low-salinity, nutrient-poor water to the south. It is associated with the Southern Oscillation. These two effects are known as the El Niño Southern Oscillation (ENSO). El Niño usually occurs during the Christmas season when the equatorial counter current strengthens and flows eastward to overlie the cold, nutrient-rich waters of the Peru current. It does not usually extend farther than a few degrees south of the equator, but occasionally it does penetrate beyond 12 deg S, displacing the relatively cold Peru Current. The effects of this phenomenon are generally short-lived, and fishing is only slightly disrupted. Occasionally, the effects are major and prolonged



Graphic of sea surface temperatures show El Niño, May 1997.

## elasmobranch

a member of the Subclass Elasmobranchii of cartilaginous fishes. These include sharks, rays, and skates



The manta ray is a large, graceful, mostly plankton-feeding elasmobranch. They also feed on small fishes. (Photo: Jackie Reid/Flower Garden Banks National Marine Sanctuary)

## elastic

capable of returning to an initial form or shape after deformation; resilient

## electrocyte

a cell that generates electricity. The electric currents produced by some species of fishes, such as torpedo rays and electric eels, are generated in stacks or columns of electrocytes. The electrocytes of most 'electric fishes' are modified muscle cells. They are usually arranged in columns within electric organs. When an electrocyte is stimulated, a movement of ions (electrically charged atoms) across the cell membrane results in an electric discharge

## electrogenic

capable of generating electric currents and a painful electric shock, as in electric rays

## electromagnetic radiation

energy that travels through space in the form of waves. The highest frequencies in the spectrum of electromagnetic radiation are gamma-rays; the lowest frequencies are radio waves. All electromagnetic radiation travels at the speed of light. Shorter wavelength radiation (eg, ultraviolet) carries more energy and is likely to be more harmful to living tissue

### electromagnetic receptor

a neurological receptor that responds to light, electricity, and magnetism. Photoreceptors respond to light and electroreceptors detect electrical energy

### electron microscope

a microscope which beams electrons, instead of light beams, at and through the object of interest. This type of microscope provides the greatest resolution of extremely small details in the nanometer size range. Magnification may be up to x300,000

### electrophoresis

a technique for separating different types of molecules based on their patterns of movement in an electrical field

### electroporation

the creation of reversible small holes in a cell wall or membrane through which foreign DNA can pass. This DNA can then integrate into the cell's genome

### electroreceptor

a receptor organ that senses changes in an electrical current in the surrounding water, for example, the ampullae of Lorenzini in sharks

### electrotaxis

the movement of organisms in response to an electric field

### ELF (eliminate lionfish) tool

a short, hand-held spring propelled spear (patent pending, Reef Protection Inc.) used by scuba divers and snorkelers to spear and kill lionfish without causing damage to the coral reef

### emarginate

a notched margin, but not so deeply as to be forked. As an example, a trout possesses an emarginate caudal fin



The caudal fin of this trout has an emarginate shape. (Image: U.S. Fish and Wildlife Service)

## embayment

an indentation in the shoreline that forms a bay

## embryo

the stage of early growth and differentiation of tissues and the formation of primitive organs and organ systems of a multicellular organism, from fertilization until birth or hatching. In seed plants, it is the young sporophyte that resulted from the union of the egg and one of the two tube nuclei

## emergent vegetation

plants growing in water but emerging from it, usually at the water's edge

## emersed

rising above the water surface

## emigration

the movement of individuals out of a population or from one area to another

## empirical

based on experience or observations, as opposed to theory or conjecture

## emulsion

a suspension of small globules of one liquid in a second liquid with which the first will not mix

## enantiomer

a molecule that is not superimposable on its mirror image; an enantiomorph is either one of a pair of compounds that are mirror images on each other but are not identical

## encrustation

a crustlike deposit or growth over a substratum

## encrusting colony

a thin colony which adheres closely and is attached to the substrate



Encrusting tunicates at Gray's Reef off Sapelo Island, Georgia (Photo: [unintelligible])

## Endangered Species Act (ESA)

an Act of Congress passed in 1966 that establishes a federal program to protect species whose survival is threatened by habitat destruction, overutilization, disease, etc.

## endangered taxa

taxa in danger of extinction and whose survival is unlikely if causal factors continue operating. Included are taxa whose numbers have been drastically reduced to a critical level or whole habitats have been so drastically impaired that they are deemed to be in immediate danger of extinction. Also included are those that possibly are already extinct, in so far as they have not been seen in the wild in the past 50 years

## endemic species

a species whose distribution is restricted to a particular area

## endo-

a prefix meaning 'inside'

## endobenthic

refers to meiofaunal-sized organisms that move within the sediments

## endocoel

in coral and anemone polyps, the space between two mesenteries belonging to one and the same pair.

## endocoelic tentacle

in anemones, a tentacle whose tentacular cavity communicates with the endocoel

## endocrine gland

a gland that manufactures hormones and secretes them directly into the circulatory system to act at distant sites in the body

## endocrine system

the system of ductless glands in animals that secrete hormones

## endocytosis

uptake of material into a cell by the formation of a membrane-bound vesicle

## endoderm

the inner germ layer of diploblastic and triploblastic embryos that gives rise to internal tissues such as the gut and gut derivatives, e.g., air bladder, lungs, and the lining of the digestive tract

## endogenous

having its origin, or produced within the organism or one of its parts

## endogenous rhythm

a metabolic or behavioral rhythm that originates within the organism and persists regardless of external conditions

## endolithic

growing within a rock or any other hard inorganic substratum

## endolithic algae

algae which burrow into calcareous rocks or corals

## endonuclease

a nuclease that cleaves nucleic acids at specific internal sites

## endoparasite

a parasite which lives in the internal organs of its host

## endophytic

living within the tissues of a host plant or alga

## endopinacocyte

in sponges, a pinacocyte lining the incurrent and excurrent canals

## endopinacoderm

in sponges, a surface lined with endopinacocytes

## endoplasm

the granular portion of the cell cytoplasm between the ectoplasm and nuclear membrane

## endoskeleton

skeleton, or support structure, which is on the inside of the organism's body. All



vertebrates possess an endoskeleton that is made of either bone and/or cartilage



Endoskeleton of a 35-ton, 13-m gray whale on the floor of the Santa Cruz Basin.

## endosymbiont

an organism which lives within the body of another organism as part of a symbiotic relationship. The relationship may be mutualistic or commensalistic; also called an 'endobiont'

## endosymbiosis

a symbiotic association in which one organism lives inside another

## endosymbiotic

being symbiotic and living within the body of an individual of the associated species

## endothecal dissepiment

one of many horizontal partitions across the corallite within the corallite wall

## endothermic

an animal that is able to maintain a body temperature that varies only within narrow limits by means of internal mechanisms. Most birds and mammals are considered endothermic; also called homeothermal or "warm blooded"



Whale fat (blubber) aids these humpback whales in maintaining a relatively constant body temperature. (Photo: Dave Matilla, NOAA/NOS National Marine Sanctuaries)

## endothermic reaction

a reaction which absorbs heat

## endozoochory

the dispersal of plant seeds or spores within the body of an animal, as passing through the animal's digestive system; also called "endochory"

### endozoic

living inside an animal

### energy flow

the movement of energy through a community via feeding webs

### Enriched Air Nitrox (EANx)

a breathing gas mixture for scuba divers which has a percentage of oxygen greater than 21 percent as is found in normal air. This mixture allows longer bottom times at limited depths

### enrichment

the addition of nitrogen, phosphorus and carbon compounds or other nutrients into a lake or other waterway that greatly increases the growth potential for algae and other aquatic plants. Most frequently, enrichment results from the inflow of sewage effluent or from agricultural runoff

### ENSO (El Niño Southern Oscillation)

see El Niño and Southern Oscillation

### enterocoelous

the mesoderm and coelom initially develop as pouches off of the primitive digestive tract (archenteron) of an embryo. Enterocoelous development of the coelom occurs in deuterostomes

### enteron

the alimentary canal or the gut of an embryo. Some structures of the enteron may not be completely developed or differentiated in early embryonic growth

### entrainment

the synchronisation of one biological rhythm to another or to a zeitgeber cycle, e.g. circadian rhythms are often entrained to the light-dark cycle; also, the process of small organisms being captured in the cooling water of a power plant

### entropy

the measure of the disorder or randomness of energy and matter in a system

### environment

everything external to the organism

## environmental impact assessment

detailed studies which predict the effects of a development project on the environment. They also provide plans for the mitigation of adverse impacts

## environmental sensitivity index (ESI) map

ESI maps serve as quick references for oil and chemical spill responders and coastal zone managers. They contain three kinds of information: (1) Shorelines (color-coded to indicate their sensitivity to oiling); (2) Sensitive biological resources (such as seabird colonies and marine mammal hauling grounds. They are depicted by special symbols on the maps); and (3) Sensitive human-use resources (such as water intakes, marinas, and swimming beaches). Project scientists have created collections of ESI maps, called ESI atlases, for most coastal areas in the US, including Alaska, Hawaii, the Great Lakes, and the Trust Territories. Each atlas includes maps and additional data and information. Starting in 1995 with the outer coast of California, ESI project members began using a Geographic Information System (GIS) to produce updated ESI maps that are higher in quality and can be more readily reproduced

## environmental stress

severe environmental effects on the natural ecosystem



A catastrophic environmental stress-the 1989 grounding of the *Exxon Valdez*, which spilled an estimated 11 million gallons of crude oil over 1,300 miles of coastline.

## environmentalism

advocacy for, or work toward, protecting the natural environment from destruction by human activities

## enzootic

an infectious disease constantly present in an animal population but having low incidence

## enzyme

an organic catalyst

## enzyme-linked immunosorbent assay (ELISA)

a rapid test where an antibody or antigen is linked to an enzyme as a means of detecting a match between the antibody and antigen; a technique for detecting specific proteins by using antibodies linked to enzymes



## EosFP

a fluorescent marker protein with UV-inducible green-to-red fluorescence conversion. EosFP was isolated from the stony coral *Lobophyllia hemprichii*

## eosinophile

a type of white blood cell (leukocyte) that engulfs and digests bacteria. Eosinophils, along with other types of white blood cells, are important in an organism's internal defense system

## eosinophylic

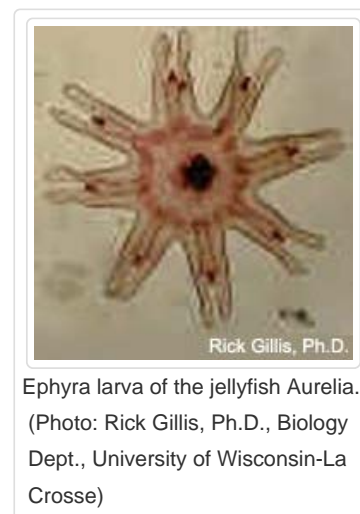
having an affinity for eosin dyes

## ephemeral

short-lived, transitory

## ephyra larva

a jellyfish (Scyphozoa) larval stage that develops into the adult medusa or jellyfish



Ephyra larva of the jellyfish *Aurelia*.  
(Photo: Rick Gillis, Ph.D., Biology Dept., University of Wisconsin-La Crosse)

## epibenthic (epifaunal or epifloral)

refers to organisms living on the surface of the substrate

## epibiont

an organism that lives on the outside of another organism

## Epicratic Sea

a large shallow sea covering a craton, which is an old and stable part of a continental lithosphere generally found in the interiors of tectonic plates

## epidemic

the widespread outbreak of a disease, or a large number of cases of a disease in a single community or relatively small area

### epidemic spawning

the simultaneous shedding of gametes by a large number of individuals



Star coral shedding gametes in an epidemic spawning event.

### epidermis

the outer epithelial layer of the body

### epifauna

animals that live upon or are associated with substratum features

### epilithic

growing on rock or stone. Epilithic organisms live attached to rocks

### epimeletic behavior

in animal behavior, the giving of care or attention, including parental care and also including non-parental care

### epipelic

living on or in fine sediments, such as mud or sand

### epiphyte

microalgal organism living on a surface (e.g., on a seaweed frond); a plant living on the surface of another plant

### epipsammic

attached to, or moving through, sand particles

### epistasis

the prevention or masking of the expression of an allele at one locus by an allele at another locus

### epistome

the flap over the mouth of some lophophorates

## epitheca

a layer of calcium carbonate that grows outside corallite walls

## epithelium

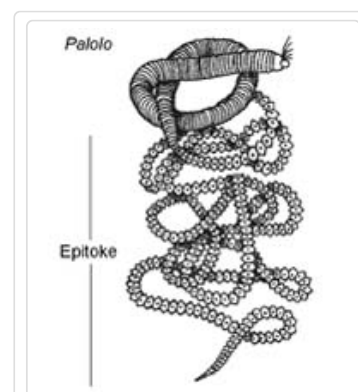
a tissue layer of cells which lines body cavities and tubules, or covers surfaces. The cells may be ciliated or non-ciliated, and may be squamous (flat, scale-shaped), cuboidal (cube-shaped), or columnar (column-shaped) in shape. The cells may occur in a single layer, or may be multi-layered (stratified)

## epithet

in taxonomy, part of the full name of a species. A complete species name consists of the name of the genus to which the species belongs, plus the specific epithet, plus the author of the species. For example, the four-eye butterflyfish, *Chaetodon capistratus* Linnaeus, 1758

## epitoky

a mode of reproduction unique to polychaete worms in which the worm undergoes a partial or entire transition into a pelagic, sexually reproductive form, known as an epitoke. In many cases, epitoky involves loss or degeneration of digestive structures and enhancement of swimming, sensory, and reproductive structures. The epitoke is considered a delicacy in some islands of the South Pacific.



*Palolo (Eunice viridis)* are polychaete worms that are about 12 inches long and live in burrows dug into the coral pavement on the outer reef flat. The worm is composed of two distinct sections. The front section is the basic segmented polychaete with eyes, mouth, etc., followed by a string of segments, called the "epitoke," that contain reproductive gametes. (Image: www.nps.gov)

## epizoite

an animal that lives on the surface of another organism

## epizootic

a temporal pattern of disease occurrence in an animal population in which the disease occurs with a frequency

clearly in excess of the expected frequency in that population during a given time interval; an outbreak (epidemic) of disease in an animal population

## epizootiology

the study of the factors which determine frequencies and distributions of infectious diseases among non-human animals

## epoch

a division of geologic time next shorter than a period. Example: the Pleistocene epoch is in the Quaternary period

## equilibrium

the state in which the action of multiple forces produces a steady balance, resulting in no change over time

## equinox

either of the two times during a year when the sun crosses the celestial equator and the length of day and night are equal

## era

a division of geologic time next smaller than the eon and larger than a period. Example: The Paleozoic era is in the Phanerozoic eon and includes, among others, the Devonian period

## erectile

capable of being raised or erected, often referring to spines of bony fishes

## erg

unit of work measuring force of one dyne applied over one centimeter

## ergo

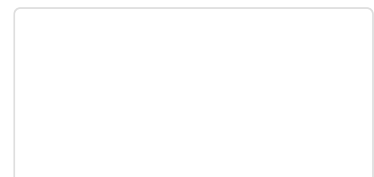
therefore; hence

## erosion

the wearing away of the land surface naturally by wind or water, but is often intensified by human's land-clearing practices. The runoff is harmful to coral reefs

## errant

motile or free swimming





The polychaete *Nereis sp.* is an errant species of worm. (Photo: U.S. Geological Survey)

### erythrophore

a chromatophore which contains reddish pigments found in carotenoids and pteridines

### esca

in some fishes, e.g. frogfishes, the first dorsal fin ray is modified to function as a fishing pole and lure. The part close to the body is the illicium or fishing pole. The esca is the lure on the end of the illicium

### escape reaction

in animal behavior, a response to a predator or other dangerous situation, in which the threatened animal may flee, hide, or stay motionless in order to avoid contact

### escarpment

a steep slope or long cliff that results from erosion or faulting and separates two relatively level areas of differing elevations

### ESRI (Environmental Systems Research Institute, Inc.)

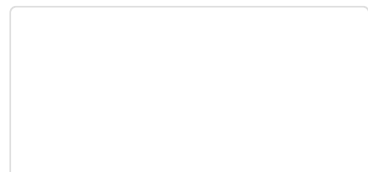
a world leader in GIS (geographic information system) software and technology

### essential amino acid

an amino acid that cannot be synthesized by animals and therefore has to be ingested with food

### essential fish habitat

under the Magnuson-Stevens Fishery Conservation and Management Act, those waters and substrates that fishes require to spawn, breed, feed, or grow to maturity





This tangle of red mangrove roots in the Jobos Bay, Puerto Rico National Estuarine Research Reserve is an essential fish habitat, serving as a both a nursery area and protection for many marine animals. (Photo: NOAA)

### establishment

the subsequent growth and/or reproduction of a colonized species in a new territory

### ester

a chemical compound formed by the reaction of an organic or inorganic acid with an alcohol, with the elimination of water

### esterification

any chemical reaction between an acid and an alcohol that results in the production of an ester

### esthetasc

a sensory seta covered by cuticle projecting from most antennules and antennae in crustaceans

### esthete

a light sensitive organ in a minute vertical canal in the upper layer of the shell plate of a chiton

### estimate

the best guess arrived at after considering all the information given in a problem

### et-epimeletic behavior

in animal behavior, calling or signaling for care or attention, typically seen in young animals, but also occurring in adults

### ethanoic acid

acetic acid

## ethogram

an inventory or catalog of all of the behavioral patterns of an organism or a species

## etiology

the science that is concerned with origins and causes of disease

## euchromatic

describes cells or tissues that stain the color of the stain (dye) solution used to stain them

## euchromatin

the genetically active portion of chromatin that is largely composed of genes

## eukaryotic

descriptive of organisms with cells having a distinct nucleus with nDNA, and intracellular membranes. This includes all protists, fungi, plants and animals. The organisms are termed eucaryotes

## eumetazoa

all multicellular animals excluding the sponges

## euphotic depth

the depth to which significant phytoplankton photosynthesis can take place. It is typically taken to be the depth at which PAR falls to 1 percent of its value just below the surface

## euphotic zone

the layer of the ocean that receives sufficient sunlight for photosynthesis. The depth to which 1% of incident light penetrates (1% is the minimum amount of light required for photosynthesis)

## euryhaline

pertaining to an aquatic organism that can withstand a broad salinity range

## euryokous

adapted to numerous ecological niches

## euryphagous

describes an organism which gains its nourishment from a large variety of foods

## eurythermal

pertaining to an aquatic organism that can withstand a broad temperature range

## eurytopic

tolerating a wide variation in one or more environmental factors

## eutrophic

a situation in which the increased availability of nutrients such as nitrate and phosphate stimulates the growth of plants such that the oxygen content is depleted and carbon sequestered



Eutrophic conditions can result in large fish kills, as many fish die from reduced levels of oxygen in the water.

## eutrophication

The movement of a body of water's trophic status in the direction of increasing biomass, by the addition of artificial or natural substances, such as nitrates and phosphates, through fertilizers or sewage, to an aquatic system.

## evanescent

short-lived, temporary, soon disappearing

## event

in probability, an event is an occurrence or the possibility of an occurrence that is being investigated

## everted

turned inside out

## evo-devo (evolutionary developmental biology)

a relatively new approach in biology that seeks to explain the causes biodiversity. It attempts to integrate every area of biology from molecular genetics through embryology, molecular and population genetics, comparative morphology, paleontology, molecular evolution, ecology and functional morphology. It offers both an account of developmental processes and also new integrative frameworks for analyzing interactions between development and evolution. A major challenge lies in integrating these approaches to understand the evolution of biodiversity at a mechanistic level. The "evo-devo" community needs access to genomic information on a wide range of organisms



## evolutionarily significant unit (ESU)

a population or group of populations that is considered distinct (and hence a "species") for purposes of conservation under the Endangered Species Act. To qualify as an ESU, a population must 1) be reproductively isolated from other conspecific populations, and 2) represent an important component in the evolutionary legacy of the biological species

## evolutionary significant unit (ESU)

a group of organisms that has undergone significant genetic divergence from other groups of the same species. Identification of ESUs is based on natural history information, range and distribution data, and results from analyses of morphometrics, cytogene

## evolutionary tree

a lineage designed to show the evolutionary history of relationships among groups of organisms

## ex situ conservation

the preservation of components of biological diversity outside their natural habitats, e.g., in zoos, aquaria, botanic gardens and gene banks

## Exclusive Economic Zone (EEZ)

the sovereign waters of a nation, recognized internationally under the United Nations Convention on the Law of the SEA as extending out 200 nautical miles from shore. Within the U.S. the EEZ typically is between three and 200 miles from shore

## excretion

a physiological process, originating in cells, that removes waste materials produced by the body

## excurrent canal

in sponges, an excurrent canal discharges water received from the apopyle, into the spongocoel (atrium). The water then passes through the osculum or oscula to the outside

## Executive Order 13089

on June 11, 1998, President Clinton issued Executive Order 13089 directing all agencies to increase their efforts to protect our nation's coral reef resources. The executive order calls for the establishment of a U.S. Coral Reef Task Force, cochaired by the Secretaries of the Interior and of Commerce. The Task Force will develop and implement a comprehensive program of inventory, monitoring, and research to map and identify the major causes and consequences of degradation of coral reef ecosystems

## Executive Order 13158

on May 26, 2000, President Clinton signed Executive Order 13158 on Marine Protected Areas (MPAs) to strengthen the protection of U.S. ocean and coastal resources. This significant milestone in ocean conservation directs the Departments of Commerce and the Interior, and other federal agencies, to strengthen

and expand a national system of MPAs by working closely with state, territorial, local, tribal, and other stakeholders

### exhalant system

in sponges, part of the aquiferous system between the apopyle and the and osculum

### exocoel

in coral and anemone polyps, the space between mesenteries belonging to different pairs

### exocoelic tentacle

in anemones, a tentacle whose tentacular cavity communicates with the exocoel

### exocrine gland

a gland that secretes its product through a duct

### exogenous

having its origin external to the organism or ecosystem

### exon

a nucleotide sequence (of DNA or RNA) in a gene that codes for part or all of the gene product or for some control function. In eukaryotes, exons are separated by non-coding sequences called introns; that part of the gene (a section of DNA) that is transcribed into messenger RNA and encodes a protein

### exopinacoderm

the unicellular external surface of a sponge (ectosome composed of pinacocytes)

### exoskeleton

an external skeleton or supportive covering of an animal formed from the ectoderm, as for example, the shell coverings of a crustacean, the calcium carbonate secretions of stony corals, or the bony plates of an armadillo

### exothermic reaction

a reaction that gives off heat

### exotic species

a non-native species that is introduced into an area; also referred to as alien or invasive species

### exozoochory

the dispersal of plant seeds or spores accidentally attached to the outside of an animal's body; also called

"epizoochory"

## expected value

in statistics, the mean value calculated for a statistic over an infinite number of samples

## explanate coral colony

a colony that spreads horizontally as the branches fuse into a solid or near solid plate

## exponent

an expression of the number of times that a base is used as a factor

## exponential growth

growth in the size of a population in which the rate of growth increases as the size of the population increases; change in a population growth rate that is proportional to the size of the population

## exposure

contact with infectious agents such as bacteria or viruses in a manner that promotes transmission and increases the likelihood of disease

## exposure suit

a full or partial garment that is worn by scuba divers for protection against heat loss. Water conducts heat away from the body about 20 times faster than air. In addition to providing warmth, exposure suits also serve to protect from minor scrapes, stings and abrasions. There are three kinds of exposure suits: *wet suits*, which allows water to seep in between the insulated rubber covering and the skin. They come in a variety of thicknesses suitable for insulation in water as cold as 50 degrees F; *body suits*, made from Lycra or nylon. They provide full length abrasion protection, but only minimal insulation; and *dry suits* which are water-tight garments that keeps the divers body warm by providing insulation with a layer of gas, such as air. It is used for diving in waters that are too cold for comfortable wet suit protection, usually below 65 degrees F



Arctic diver with rebreather and heated dry suit prepares to descend into the ice. (Photo: NOAA/OAR/National Undersea Research Program)

## expressed sequence tag (EST)

a small part of the active part of a gene, made from cDNA which can be used to fish the rest of the gene out of the chromosome by matching base pairs with part of the gene. The EST can be radioactively labeled in order to locate it in a larger segment of DNA

## exsert corallite

a corallite that extends above the surface of the colony

## extant

of a taxon: having living representatives; of a specimen: still in existence

## extant species

species which are now living

## Extended Reconstruction of SST (ERSST) data set

a globally complete reconstruction of of sea surface temperatures (SST) based on *in situ* measurements and satellite data produced at a monthly, 2 degree resolution

## extension rate (linear extension rate)

annual normalized growth rate (measured as accretion or lengthening) of a branching coral caused by calcification

## exteroceptor

a neurological receptor that receives information from the environment external to the organism

## extinct

of a taxon: having no living representatives.

## extinct species

species for which there are no living representatives

## extinction

the evolutionary termination of a species caused by the failure to reproduce and the death of all remaining members of the species; the natural failure to adapt to environmental change



Manatees are threatened with extinction from both habitat destruction and direct effects from human encroachment, such as serious wounds from boat propellers.

## extinction coefficient

a coefficient measuring the rate of extinction, or diminution, with distance of transmitted light in sea water

## extirpated species

a species that has been destroyed or removed completely from a particular area, region, or habitat

## extra-

outside, beyond

## extra-embryonic membrane

membranes possessed by amniote (reptiles, birds, and mammals) embryos that allow these classes of vertebrates to be free of aquatic habitats for reproduction, and in their evolution, occupy terrestrial habitats. The membranes are the amnion, yolk sac, allantois and chorion

## extracellular digestion

a form of digestion that takes place within the lumen of the digestive system. The resulting nutrient molecules are transferred into the blood or body fluids through the process of absorption

## extratentacular budding

an asexual form of reproduction where daughter corallites grow from the outside wall of the parent corallites

## extreme environment

an environment characterized by extremes in growth conditions, including temperature, salinity, pH, among others



Crowded life in an extreme environment—*Riftia* tubeworms, mussels, and scavenging crabs found at a hydrothermal vent site in the Pacific Ocean. Most hydrothermal vents are found at an average depth of about 2,100 meters (7,000 ft) in areas of seafloor spreading along the Mid-Ocean Ridge system. (Photo courtesy of C. Van Dover.)

## extremophile

a microorganism that lives at extreme levels of pH, temperature, pressure or salinity

## extrinsic

not forming an essential part of a thing; arising or originating from the outside

## extrinsic factor

a biotic or abiotic factor acting on an organism or population from outside the organism or population. These are the physical and chemical features of the environment, as well as other organisms

## exumbrella

the upper surface of the bell of a medusa or jellyfish



The rounded upper surface of this jellyfish is the exumbrella.

## exuvia

the cast off exoskeleton and related body parts left behind after moulting

## eyespot

any light-sensing structure in some primitive organisms that consists of a pigmented area and light sensitive cells; also called an ocellus



Eyespots of a free-living flatworm, *Planaria dugesia*.

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#) | [N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#) |

## F-test

a statistical test designed to test if two population variances are equal. It does this by comparing the ratio of two variances. Therefore, if the variances are equal, the ratio of the variances will be 1. The F-distribution is formed by the ratio of two independent chi-square variables divided by their respective degrees of freedom

## facies

a geographical variant of a community, or a variant which includes a conspicuous or abundant species not present in the main community; all of the characteristics of a particular rock unit. The characteristics of the rock unit come from the depositional e

## facultative

able to exist under more than one set of environmental conditions. For example, a facultative parasite may exist either as a parasite or as a saprotroph (gaining nutrients from dead organic matter)

## facultative mutualism

mutualism in which one or both species in the association may survive and maintain populations in the absence of the other species

## Fagatele Bay National Marine Sanctuary

Fagatele Bay, located on Tutuila, the largest island of American Samoa, was designated as a National Marine Sanctuary in 1986. It is the smallest and most remote of all the national marine sanctuaries encompassing only 163 acres (.25 sq. mi.). Fagatele is the only true tropical coral reef in the National Marine Sanctuaries Program



Fagatele Bay, a National Marine sanctuary in American Samoa.  
(Photo: NOAA)

## faginism

cannibalism by adults on their young

## Fahrenheit temperature scale

a thermometric scale on which the freezing point of water is at 32 degrees F (Fahrenheit) above the 0 degree (F) mark on the scale, and the boiling point of water is at 212 degrees F

## falcate

scythe-shaped



Falcate-shaped dorsal fin of an Orca Whale. (Photo: Robyn

## falciform

curved like a long, narrow scythe

## falciate

a shape that is curved and sharp-pointed, like a claw

## family

a taxonomic group containing one or more genera

## fan palm

the only species of tree (*Pritchardia remota*) on the island of Nihoa in the Northwestern Hawaiian Islands

## FAQ (Frequently Asked Questions)

documents that list and answer the most common questions on a particular subject

## farctate

a filled or solid structure, as opposed to one that is tubular or hollow

## faro

a rhomboid-shaped, steep-sided, continental shelf atoll

## FASTA

a format for recording nucleotide sequences for barcodes

## FASTA format

a text-based format for representing either nucleotide sequences or peptide sequences, in which base pairs or amino acids are represented using single-letter codes. The format also allows for sequence names and comments to precede the sequences

## fat

a triglyceride (lipid) that is usually solid at room temperature

## fathom

is a unit of length often used to measure depth of water and is equivalent to 6 feet or 1.8 meters



## fathometer

an instrument for measuring underwater depth using sound

## fatty acid

a major building block of cellular lipids. A fatty acid is a long carbon chain that ends in a carboxylic acid (a chemical structure = -COOH); any of a class of saturated aliphatic monocarboxylic acids that form part of a lipid molecule; a product of fat hydrolysis

## fault

a crack or fracture in the Earth's crust accompanied by a displacement of one side of the fracture. Movement along the fault can cause earthquakes or, in the process of mountain-building, can release underlying magma and permit it to rise to the surface

## fault zone

an area in which there are several closely spaced faults

## fauna

the entire group of animals found in an area

## feather star

feather stars are echinoderms in the class Crinoidea. The juveniles attach to the substrate by a stalk with rootlike branches. The mouth side faces upward. In the adult stage they break away from the stalk and move about freely. They possess appendages, known as cirri, attached to the underside of the body with which they cling to sponges or corals. Some can swim by undulating movements of the arms. Some have five arms, others up to 200

## feces

egested undigested food wastes

## fecundity

the productiveness or potential productiveness of an organism, measured in the number of viable offspring it may produce; the number of eggs an animal produces each reproductive cycle; the potential reproductive capacity of an organism or population

## Federal Geographic Data Committee (FGDC)

coordinates the development of the National Spatial Data Infrastructure (NSDI). The NSDI encompasses policies, standards, and procedures for organizations to cooperatively produce and share geographic data. The 17 federal agencies that make up the FGDC are developing the NSDI in cooperation with organizations from state, local and tribal governments, the academic community, and the private sector

## Federal Ocean Acidification Research and Monitoring (FOARAM) Act of 2009

FOARAM mandates that NOAA has an active monitoring and research program to determine potential impacts of decreased ocean pH and carbonate saturation states, which are happening in direct response to rising atmospheric CO<sub>2</sub>

## Federal waters

generally waters from 3 - 200 miles offshore

## feeding guild

a group of unrelated fishes that feed on similar foods, e.g., benthivore, detritivore, herbivore, insectivore, omnivore, planktivore, piscivore, etc

## feral

existing in a wild or untamed state. The term is often used to describe an animal which has reverted to such a state from domestication. An example of the latter is a once farmed fish, or the progeny of a farmed fish, which is living (but not necessarily breeding) in a wild state

## fermentation

the anaerobic breakdown by microorganisms of complex organic substances, especially carbohydrates, to CO<sub>2</sub> and alcohol; fermentation is also used to describe the process by which various chemical or pharmaceutical compounds can be made in large tanks, called fermenters, that contain microorganisms or plant or animal cells, and the nutrients they require to live and grow

## fermi

unit of length equal to one quadrillionth of a meter

## ferruginous

rust color

## fertilization

the process where a spermatozoan (sperm cell) penetrates the cell membrane of an egg cell and the nuclei of the sperm and egg cells join together and their chromosomes combine to form a diploid zygote

## fetch

the uninterrupted distance over which the wind blows (measured in the direction of the wind) without a significant change of direction

## fibropapillomatosis

a fibroepithelial tumor, probably caused by a herpes-type virus, found in juvenile, subadult, and adult sea

turtles, causing them to be emaciated, weak, depressed, and anemic. Affected turtles may have flotation problems resulting from fibrous tumors in the lungs. Fibrous tumors are also found in visceral sites, such as liver, lung, kidney and gastrointestinal tract.

## fide

on the authority of, according to, with reference to a publication or to a cited published statement

## field guide

a pocket-size book or a CD containing taxonomic keys for identification, illustrations and/or photographs of organisms, distribution maps, and some natural history notes

## field research

the study of organisms in their natural habitat

## fila

a thread-like structure, a filament

## filamentous

slender and/or threadlike

## filamentous algae

algae comprised of a linear group of cells joined at their end walls, forming thread-like strands

## filefish

any species of bony fishes in the family Monacanthidae. The body of filefishes is laterally compressed and roughly diamond-shaped in profile. The filefish gets its name from its very rough skin. The first dorsal fin is essentially a single sharp spine which

## filial

an offspring generation

## filiform

thread-shaped

## filter feeder

an organism that feeds by capturing particles suspended in the water column. A synonym of suspension feeder.

## fimbriate

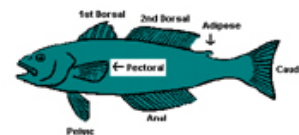
a structure that is fringed at the margin



The papillae of this scorpion fish possess a fimbriate appearance.

## fin

organ of locomotion and balance in fishes and some other aquatic animals; in fishes, fins are of two types: paired (pectoral and pelvic fins) and unpaired or median (dorsal, adipose, anal, and caudal fins and finlets). Fins of bony fishes contain hard spines and/or soft rays, which may be jointed and branched. The spines and rays are covered by integument. Counts of spines and rays are used as diagnostic characters in fish taxonomy; a membranous, finlike, swimming organ, as in pteropod (having the anterior lobes of the foot modified so as to form a pair of winglike swimming organs), and heteropod (where the foot developed into a median fin) mollusks



Drawing of a bony fish that shows the locations of the median and paired fins. (Graphic: Cristi A. Cave, Stream Biology and Ecology)

## fin (scuba)

a rubber or plastic shoe-like device attached to the feet to increase surface area for greater thrust while swimming; they may be open heeled or full-footed. Scuba divers prefer the open heel style, usually worn with booties



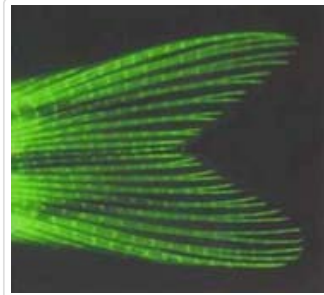
Open heel SCUBA fins with mask and snorkel. This type of adjustable-strap fin is worn over neoprene booties.

## fin membrane

the thin membrane between and connecting fin rays and spines of fishes

## fin ray

a slender, rod-shaped structure that supports the membranes of the fins of fishes. There are two types of rays, soft rays and spines. Soft rays are jointed, often branched, and flexible near their tips. Spines are unjointed, unbranched, and usually sharp at the tip and stiff along the shaft



Caudal fin of a fish. The fin is stained with the vital dye calcein which colors calcium/calcified bone matrix. Note the soft segmented fin rays. (Photo: Dr. M. Kathy Lovine, Washington University, St. Louis, MO)

## fingerling

a young or small fish

## finlet

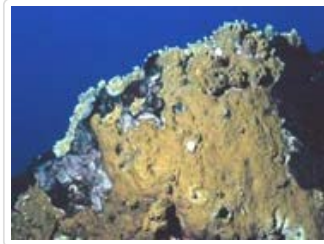
one of several small non-retractable fins located dorsally and ventrally between the second dorsal and anal fins and the caudal fin of scombroids (mackerals, tuna) and some other fishes, e.g., sauries and snake mackerals. Finlets appear to have a hydrodynamic function in fishes that have been studied for this character



A series of small finlets between the dorsal and anal fins and the tail of a bluefin tuna. (Photo: NOAA)

## fire coral

a species of hydroid (*Millepora sp.*) that frequently is brownish to orange-yellow in color and forms encrusting colonies that can assume the shape of its support structure. Their nematocysts release a virulent toxin which causes painful welts on human skin. Fire corals are not true corals (see Hydrozoa)



Fire coral in the Flower Garden  
Banks National Marine Sanctuary  
(Photo: Jackie Reid)

## fire wall

a combination of hardware and software that separates a network into two or more parts for security purposes

## first reviser

in taxonomy, the first person after a taxon was proposed to select one of the names over the other (or one nomenclatural act over another) when both names (or acts) were published at the same time. Also applies to first selection of multiple original spellings

## first revisor

the person who first selects one of two or more simultaneously published names that he or she believes represent the same taxon, or who selects which one of two or more taxa the name will apply to for which identical names have been simultaneously published

## First Revisor (Principal of)

the principle that the relative precedence of two or more names or nomenclatural acts published on the same date, or of different original spellings of the same name, is determined by the first reviser

## first stage regulator

attached to the scuba tank, the first stage regulator reduces the high tank pressure to an intermediate pressure of 100 to 150 psi above the surrounding water pressure



The first stage regulator is attached to the scuba tank. (Photo: NOAA/National Undersea Research Program)

## firth

a partly land-locked arm of the sea

## fish census

the collection of data over time concerning the species of fishes in an area, their relative abundances, and population densities

## fish kill

the sudden death of fishes due to the introduction of pollutants, toxic blooms, or the reduction of the dissolved oxygen concentration

## fish louse

a parasitic crustacean on marine and freshwater fishes

## FishBase

a repository of available information on the taxonomy, biology, ecology, occurrence and utilization of fishes. It holds published information on almost all of the estimated 25,000 existing fish species. The information is arranged in 55 subject tables. It can be accessed through the Internet ( <http://www.fishbase.org>) or installed on a PC from a CD-ROM. At the heart of FishBase is the authoritative taxonomic fish classification established by W.N. Eschmeyer (California Academy of Science). It ensures that all information is assigned to current scientific names, even if a publication uses an outdated name

## Fisher's LSD (Least Significant Difference)

in statistics, a method for comparing treatment group means after The analysis of variance (ANOVA) null hypothesis that the expected means of all treatment groups under study are equal, has been rejected using the ANOVA F-test. If the F-test fails to reject the null hypothesis this procedure should not be used

## Fishery Conservation and Management Act

the federal law that created the regional councils and is the federal government's basis for fisheries management in the EEZ. Also known as the Magnuson Act after a chief sponsor, Senator Warren Magnuson of Washington State

## fishery management council

a regional, quasi-governmental group with authority to manage fisheries in federal waters, generally from three to 200 miles offshore

## fisheye lens

an ultra-wide angle lens giving 180o angle of view. The widest fisheye lenses produce a circular and very distorted image

## FishNet

a collaborative effort by natural history museums and other biodiversity institutions to establish a global network of Ichthyological collections

## fissure

a deep and narrow depression cutting across the reef front with origins relating to jointing planes in the reef limestone or non-limestone bedrock

## fistula

an abnormal passage between two organs or between an organ and the outside of the body. Fistulae are caused by ulceration, congenital malformation, or when damaged tissues come into contact with each other and join together while healing

## fistule

in sponges, a tubular structure on the upper surface, upon which the osculum is situated. A fistule is frequently found on species that burrow into mud or excavate coral

## fitness

the potential evolutionary success of an allele or genotype, which is defined as the reproductive success or the proportion of genes that an individual leaves in the gene pool of a population (expected contribution to future generations). The individuals with the greatest fitness leave the largest numbers of offspring. The fitness of genes and organisms is always relative to the other genes and organisms that are present in the same population

## five prime and three prime ends (5' and 3' ends)

a double stranded DNA (the double helix) always has an orientation or directionality. Because of this directionality, the nucleotides along one strand are heading in one direction (e.g. the 'ascending strand') and the others are heading the other (e.g. the 'descending strand'). For reasons of chemical nomenclature, the asymmetric termini of each strand are called the 5' and 3' ends (pronounced "five prime" and "three prime"). Nucleotide sequences are read by enzymes in the "5' to 3' direction". In a vertically oriented double helix, the 3' strand is said to be ascending while the 5' strand is said to be descending

## fixed action pattern

in ethology or animal behavior, a complex behavioral response which once released by a key stimulus, runs to completion

## fjord

a deep-water inlet, carved out by glacial action and usually surrounded by mountains or steep slopes

## flabellate

fan-shaped



## flabelliform

fan-shaped

## flagelliform

whip-shaped

## flagellum

a whip-like appendage used for locomotion in sperm cells and some bacteria, fungi, and protists



A bacterium with a whip-like flagellum. (Photo: U.S. National Institutes of Health)

## flagship species

popular, charismatic, socially appealing species that serve as symbols and rallying points to evoke public sympathy and stimulate conservation awareness and action. Whales, seals, sea lions, and marine turtles are flagship species

## flaring corallite

a corallite with expanding, trumpet-like curves to the outer corallite wall

## flat

very shallow and still water, usually with a sand or mud bottom

## flatfish

any fish species in the order Pleuronectiformes, which includes flounders, flukes, dabs, halibuts, plaice, soles, and turbot. All flatfishes have an unusually compressed body form adapted to life on the bottom. As the bilaterally symmetrical immature forms develop, one eye migrates to either the left or right side, depending upon the species. The body compresses laterally with changes in the skeletal and internal organ systems, and the animal rests on either its left or right side. The side on the bottom is pale, while the other side is strongly pigmented. Some species are able to change their pigmentation to match the appearance of the bottom

## flavescent

yellowish color

## flavoprotein

a protein that contains a nucleic acid derivative of riboflavin, either flavin adenine dinucleotide (FAD) or flavin mononucleotide (FMN). Flavoproteins are involved in a many biological processes, including bioluminescence, photosynthesis, DNA repair, and apoptosis (genetically programmed cell death)

## floating plant

a non-anchored plant that floats freely in the water or on the surface

## flocculent

a mass of particles that form into a clump as a result of a chemical reaction; having a fluffy appearance;resembling bits of wool; flaky

## floodplain

a lowland along a riverbank, lake, and coastline which is subjected to periodic inundation

## flora

the entire group of plants found in an area

## Florida Current

the segment of current between the Gulf of Mexico Loop Current and the Gulf Stream, from the Dry Tortugas to the southeastern tip of Florida, and confined by the 250 meter and 500 meter isobaths

## Florida Keys National Marine Sanctuary

the Florida Keys National Marine Sanctuary was designated as a national marine sanctuary in November of 1990. The Florida reef tract is the most extensive living coral reef system in North American waters and the third largest barrier reef system in the world. The sanctuary extends 220 miles in a northeast to southwest arc between the southern tip of Key Biscayne, south of Miami, to beyond, but not including the Dry Tortugas Islands



The Florida Keys National Marine Sanctuary. (Graphic: NOAA)

## Florida Reef Tract

the third largest barrier reef in the world, running from the Miami area southwest to the Dry Tortugas

## floriform

flower-shaped

## flotsam

wreckage or discarded material, e.g. garbage, found floating on the surface of the ocean or washed up on the beach



Seahorses caught in flotsam off the Colombian/Panamanian coast.  
(Photo: NOAA)

## flow cytometry

a technique used to sort cells or other biological materials by means of flow through apertures of defined size or by laser sorting

## flow-through exposure

a laboratory setup in which organisms are held in continuously flowing water, in contrast to static exposure, in which organisms are held in a given volume of water with no exchange

## Flower Garden Banks National Marine Sanctuary

the Flower Garden Banks National Marine Sanctuary was designated as a national marine sanctuary on January 17, 1992. The sanctuary is located about 110 miles off the coasts of Texas and Louisiana, and harbors the northernmost coral reefs in the United States and serves as a regional reservoir of shallow water Caribbean reef fishes and invertebrates. The coral reefs rise to within 66 feet of the surface. The area containing both the East and West Banks is 41.7 square nautical miles in size and contains 350 acres of reef crest. In October 1996, Congress expanded the sanctuary by adding a small third bank, Stetson Bank, located about 70 nautical miles south of Galveston, Texas. Environmental conditions at Stetson Bank do not support the establishment and growth of coral reefs



Graphic depicting location of the Flower Garden Banks National Marine Sanctuary in the Gulf of Mexico.

## fluctuating asymmetry (FA)

a pattern of small, random deviations between sides in the size of a given trait - the random component of bilateral asymmetry, i.e., subtle random deviations from perfect bilateral symmetry. It arises when genetic or environmental stressors disrupt developmental processes that normally promote symmetrical growth. Fluctuating asymmetry is of particular interest because of its potential as a biomonitor of environmental quality.

It is a relatively new tool for assessing the impact of environmental and genetic stresses on populations. One of the main advantages of FA is its increased sensitivity relative to other bioindicators. If effective, this tool could allow biologists to monitor populations and make recommendations before a severe problem arises, often without the high cost of other solutions

## fluorescence

the emission of light from a substance caused by exposure to radiation from an external source

## fluorescence *in situ* hybridization (FISH)

hybridization of cloned DNA to intact chromosomes, where the cloned DNA has been labelled with a fluorescent dye. This is the major method of physical mapping of cloned DNA fragments on chromosomes

## fluorescent pigment

a pigment that absorbs light at one wavelength and emits it at a different wavelength. The emitted light usually has a lower energy than the light absorbed by the pigment

## fluorometer

an instrument for measuring fluorescence

## flux

the rate of flow of energy or particles across a given surface

## flyway

the route followed by migratory birds

## focal species

the species that is identified as being most sensitive to a threat in a changing environment. Species are being lost from areas in which their habitats are being destroyed, fragmented or simplified. Focal species can be used to identify the appropriate spatial and functional parameters that must be present in an environment if it is to retain the biota that occurs there

## Folger primer

in order to obtain barcode sequences from a broad spectrum of animal taxa, researchers require an arsenal of primer sets. Some primers will amplify COI across a wide range of organisms, while others may be designed to target specific taxonomic groups. The Folger primer set LCO1490 and HCO2198 amplify a 658 bp fragment of the COI gene in a wide range of invertebrate taxa

## foliaceous

leaf-like; also foliose





Foliaceous coral. (Photo: NOAA)

## foliform

leaf-shaped

## foliose coral

a coral whose skeletal form approximates that of a broad, flattened plate

## food chain / food web

all the interactions of predator and prey, included along with the exchange of nutrients into and out of the ecosystem. These interactions connect the various members of an ecosystem, and describe how energy is converted and passes from one organism to another

## food pyramid

pyramid-shaped diagram which shows feeding relationships within a food chain, e.g. that herbivores are smaller, more numerous and faster breeding than the predators that feed on them

## forage

to search for food

## forage fishes

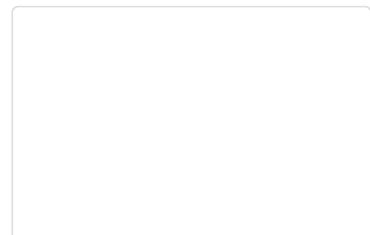
small fishes which which occur in large numbers and serve as food for predatory fishes

## foramen

an opening in a structure

## Foraminifera

planktonic and benthic protozoan protists that have a test (shell) composed of calcium carbonate





Rick Gillis, Ph.D.

These foraminiferans have a test composed of calcium carbonate. (Photo: Rick Gillis, Ph.D., Biology Dept., University of Wisconsin-La Crosse)

### fore reef

the portion of a reef seaward of reef crest. A synonym of reef slope

### fore reef escarpment

a slope or cliff seaward of the fore reef terrace, at a depth of about 25-30m

### fore reef slope

a sand covered, gradual or sharply descending slope; the next-to-deepest part of the fore reef

### fore reef terrace

the uppermost portion of the fore reef; a flat plain beginning at the base of the buttress or mixed zone, at a depth of about 60 m

### formal metadata

metadata that follows an FGDC approved standard

### formalin

formaldehyde gas dissolved in water. Formalin is used as a fixative and preservative in some collections of biological specimens

### formenkreis

a group of related allopatric species or subspecies

### fossa

a hole or cavity in the coral skeleton

## fossorial

adapted for a digging or burrowing life style or behavior

## foveolate corallite

a corallite of some species which is located at the base of a funnel-shaped depression

## FRA (Fish Replenishment Area)

a designated area, within a Fisheries Management Area (FMA), where certain specified fish harvesting activities are prohibited

## fractal

the smallest part of a mathematical set of numbers which when repeated or scaled will maintain the primary permutation; an object which is self-similar at all scales. Regardless of scale the same level of detail and appearance is present

## fragmentation

a type of asexual reproduction common in branching corals. Branches break off from the parental colony to establish other colonies nearby; see also "habitat fragmentation"

## framework

a rigid, wave resistant calcareous structure constructed by sessile organisms such as sponges, corals, and bryozoans, in a high energy environment

## free

unconstrained or not chemically bound in a molecule or not fixed and capable of relatively unrestricted motion

## free dive

diving without the assistance of any breathing apparatus, such as scuba

## free radical

an atom or group of atoms possessing an unpaired electron; free radicals are highly reactive and bind with other molecules, thus disrupting normal cellular processes and causing cellular damage (oxidative stress)

## free-living coral

a coral which is not attached to a substrate

## French Frigate Shoals

an open atoll in the Northwest Hawaiian Islands (NWHI) that consists of a large, crescent-shaped reef surrounding numerous small, sandy islets. While



the land area is only one-fourth square kilometer (67 acres), the total coral reef area of the shoals is over 938 square kilometers (232,000 acres). The reef system associated with French Frigate Shoals supports the greatest variety of coral species in the NWHI, with 41 species of stony corals documented. It also supports more than 600 species of invertebrates, many of which are endemic to the area, over 150 species of algae, and many species of fishes. Hundreds of green sea turtles travel to the shoals for safe nesting. The many small islets of French Frigate Shoals also provide refuge to the largest sub-population of endangered Hawaiian monk seals



Sponges in French Frigate Shoals reef. (Photo: NOAA)

## frequency

the number of items occurring in a given category

## frequency

the number of cycles of a wave per second. Frequency is expressed as units of Hertz (Hz)

## frequency distribution

a graphical, tabular, or mathematical summary of a set of data showing the frequency (or number) of items in each of several non-overlapping classes

## frequency of recombination

the number of crossover events observed between two linked loci expressed as a proportion of the total number of meioses sampled

## fringing reef

a shelf reef that grows close to shore. Some develop around oceanic islands. A synonym of shore reef



A fringing reef off a South Pacific Island.

## frogfish

any of over 40 species of bony fishes in the family Antennariidae. They are small globose fishes with loose prickly skin, limb-like pectoral fins with an elbow-like joint, small round gill openings, and a very large upward directed mouth. The first dorsal

## frond



a leaf-like thallus, such as the body of a kelp

## frontal threat display

agonistic display behavior in which a fish faces another fish and flares its gill covers (opercula) and opens its mouth wide. This behavior may indicate aggression, territoriality or self defense (by making it appear too large to attack or eat)

## frustule

the siliceous hard and porous cell wall or external layer of diatoms

## fry

newly hatched, active feeding post larval fishes; may include all fish stages from hatching to fingerling

## Frying Pan Tower

a Texas Tower 46 miles south of Masonboro Inlet, North Carolina. It marks the shallows around Frying Pan Shoals, a line of shallow sandbars extending from the southeastern tip of Bald Head Island southward for more than 28 miles into the Atlantic Ocean. Frying Pan Shoals is a popular shallow (~50 ft) recreational dive site, habitat to many tropical fish species, commonly found on coral reefs

## fucoid

seaweed-shaped

## fulvous

dark yellow, orange-yellow

## fulvous

dull yellow color

## functional group

a collection of species that performs a similar function in ecosystem processes irrespective of their taxonomic grouping, such as predators, grazers, bioeroders, primary producers, and habitat builders

## Fungi

the Kingdom of usually multicellular, heterotrophic eukaryotes that have multinucleated cells enclosed within cell walls. Nutrition is obtained by decomposing dead and dying organisms and absorbing the decomposition products



Fungi growing in an Oregon

## fungicide

a chemical compound used to retard or prevent the growth of fungi

## furcate

to divide into branches; to fork

## fusiform

a shape that is tapered at both ends; spindle-shaped; torpedo-shaped, like a mackerel

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#) | [N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#) |

## G1

phase in the cell cycle between the completion of cell division and the initiation of DNA synthesis

## G2

phase in the cell cycle between the completion of DNA synthesis and the next cell division

## Gaia theory

a model in which the organisms on the Earth have radically altered its composition. A stronger position is that the Earth's biosphere effectively acts as if it is a self-organizing system, which works in such a way as to keep its systems in some kind of equilibrium that is conducive to life

## gale

a storm with wind speeds between 34 to 40 knots

## galeiform

helmet-shaped

## gall

an abnormal outgrowth caused by infection or irritation by certain fungi or bacteria

## game species

species of animals that are hunted or fished, for purposes of sport, recreation, and food capture

## gamefish

a species of fish considered to possess sporting qualities on fishing tackle

## gamete

a sex cell, e.g., a spermatozoan or egg cell, produced by sexually reproducing organisms

## gamete bundle

in coral sexual reproduction, the polyps of many species release bundles of eggs and sperm cells, called gamete bundles, that float to the sea surface. The layers surrounding the egg and sperm bundles soon rupture, releasing the gametes at the surface, where fertilization occurs

## gametocyte

a reproductive cell capable of dividing by meiosis to produce gametes, e.g., a spermatocyte or oocyte

## gametogenesis

the development and maturation of gametes (sex cells) through meiosis. The process is termed 'spermatogenesis' in the development of sperm cells and 'oogenesis' in the development of egg cells

## gametophyte

a life cycle stage in certain algae that produces male and female reproductive organs

## gamma ray

an electromagnetic wave or photon emitted from the nucleus

## gamodeme

a deme forming a more or less isolated local intrabreeding community

## ganglion

a structure containing an aggregation of cell bodies of nerve cells (neurons)

## gap analysis

a Geographic Information System (GIS) methodology to identify the distribution of biodiversity over large spatial areas. It was developed in 1988 by the U.S. Geological Survey in an effort to ensure that regions rich in species diversity are conserved with the hope that this will eliminate the need to list species as threatened or endangered in the future. The gap analysis approach uses maps of vegetation and predicted animal distributions to locate centers of species richness outside areas currently managed for biodiversity protection. These are considered the "gaps" of gap analysis. Thus far, its use primarily has been in the terrestrial sphere

## gap phases

the phases of the cell cycle known as G1 and G2, during which relatively less obvious cellular activity is visible

## garden eel

a family of eels (Heterocongridae) that occur in colonies in the sandy bottoms adjacent to coral reefs, where they live individually in burrows from which they protrude to feed on plankton. From a distance these eels resemble a field of seagrass. They are very shy and disappear into their burrows at the approach of a potential predator

## gas chromatograph/mass spectrometer (GC/MS)

an instrument that identifies the molecular composition and concentrations of various chemicals in water and soil samples

## gas chromatography

a method of separating chemical components of a mixture, which involves the passage of a gaseous sample through a column having a fixed adsorbent phase

## gas laws

laws that predict how gases will behave with changes in temperature, pressure, and volume

## gastric

pertaining to the stomach

## gastric filaments

in scyphozoan medusae, a fringe of short, threadlike filaments whose secretory cells secrete digestive enzymes. They are located on the floor of each gastric pouch

## gastrodermis

the epithelial lining of the gastrovascular (digestive) cavity of cnidarians and ctenophores (comb jellies)

## Gastropoda

a class of the phylum Mollusca that includes snails, sea slugs, nudibranchs, limpets, and cone shells. There are approximately 30,000 living species described. Many species are inhabitants of coral reefs and nearby seagrass beds



A sea slug of the Class Gastropoda, Phylum Mollusca.

## gastrovascular canal

a series of tubes that connect the gastrovascular cavities of colonial coral polyps

## gastrovascular cavity

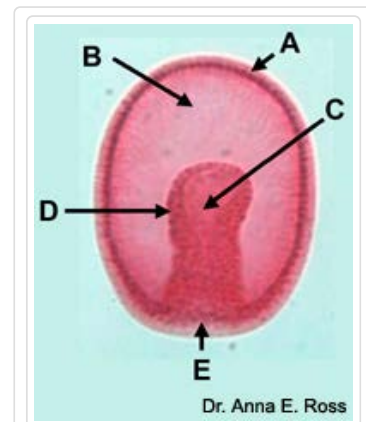
the internal digestive cavity of cnidarians and ctenophores that is lined with the gastrodermis

## gastrozoid

a polyp in hydrozoans and other colonial cnidarians which is specialized for feeding

## gastrula

the embryonic stage of an animal that has cells differentiated into germ layers. Sequentially, it follows the blastula stage

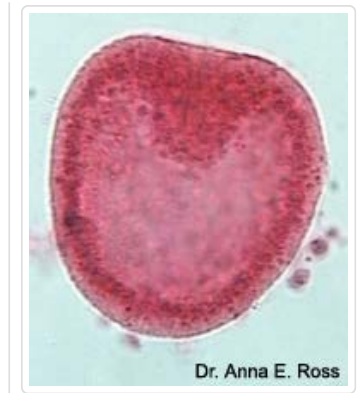


An echinoderm gastrula. It was formed by the invagination of blastomeres at the vegetal pole area of the blastula to produce the archenteron, which will become the digestive system. The opening into the archenteron is the blastopore, which will become the anus of the adult. The cavity of the archenteron is the gastrocoel. The roof of the archenteron, which forms the mesoderm, will expand and pinch off mesodermal vesicles with an internal cavity that will become the coelom (see: mesoderm). A - ectoderm; B - blastocoel; C - archenteron; D - endoderm; E - blastopore. (Photo: Dr. Anna E. Ross, Christian Brothers University, TN)

## gastrulation

during embryonic development of most animals, a complex and coordinated series of cellular movements occurs at the end of cleavage. The details of these movements vary among species, but usually result in the formation of an embryonic stage termed the gastrula. The gastrula has two primary germ layers, the ectoderm and endoderm in diploblastic animals, and three primary

germ layers with the development of the mesoderm in triploblastic animals



Dr. Anna E. Ross  
An early gastrula. The cells at the vegetal hemisphere have begun to invaginate into the blastocoel, forming the archenteron. (Photo: Dr. Anna E. Ross, Christian Brothers University, TN)

### Gause's principle

the principle that "no two species can coexist indefinitely on the same limiting resource." Also called Gause's Law, or the 'competitive exclusion principle'

### gb (gigabase pairs)

one billion ( $10^9$ ) pairs of nucleotide bases in DNA

### gel

a jelly-like substance formed by the coagulation of a colloidal liquid; a cytoplasmic phase

### gel electrophoresis

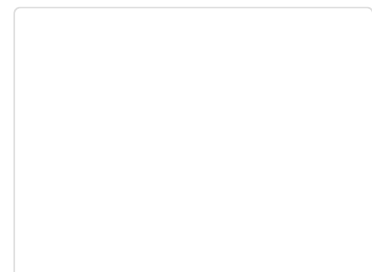
a process for separating molecules by forcing them to migrate through a gel under the influence of an electric field

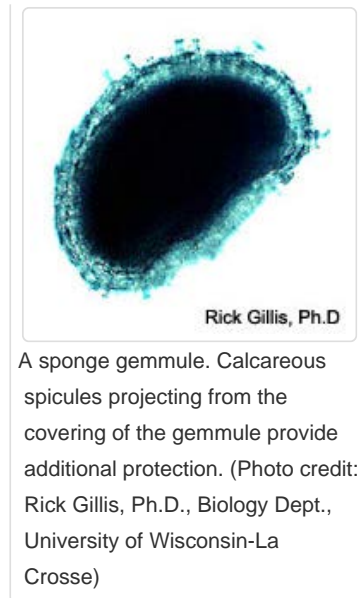
### geminate species

a little differentiated species evolved from a close common ancestor; a "twin" species. For example, pairs on either side of the Isthmus of Panama who are each other's closest relative and were probably one species before the sea level dropped

### gemmule

an asexual, spore-like reproductive unit in sponges, capable of overwintering and developing into an adult sponge the following summer





### gen. et sp. nov.

in taxonomy, the abbreviation for genus et species nova, meaning new genus and species

### Genbank

a database of nucleotide sequences

### gene

the functional and physical unit of heredity passed from parent to offspring. Genes are pieces of DNA, and most genes contain the information for making a specific protein

### gene array

a regular pattern of DNA fragments, or oligonucleotides, spotted onto a solid support and used as a diagnostic tool to measure many individual gene expression levels simultaneously

### gene expression

the conversion of information from gene to protein via transcription and translation

### gene flow

the movement of genes through or between populations as the result of out-crossing and natural selection

### gene frequency

the relative occurrence of a gene in a given population, usually expressed as a percentage

### gene index

a listing of the number, type, label and sequence of all the genes identified within the genome of a given organism

### gene locus

the specific place on a chromosome where a gene is located

### gene mapping

determination of the relative locations of genes on a chromosome

### gene pool

the sum total of genes, with all their variations, possessed by a particular species at a particular time

### gene product

the product, either RNA or protein, that results from expression of a gene. The amount of gene product reflects the activity of the gene

### gene silencing

the interruption or suppression of the expression of a gene at the levels of transcription or translation

### gene splicing

a cell process by which a gene is cut into different parts, exons and introns. The exons are the coding region and are put back together to make the gene that is transcribed and translated into a protein

### gene therapy

an approach to preventing and/or treating disease by replacing, removing or introducing genes or otherwise manipulating genetic material. In some cases, the material can be injected with a genetic vaccination. In other cases the material is introduced through harmless bioengineered viruses that carry the therapeutic gene to the cell. Globules known as liposomes can also be used to carry therapeutic genes to specific cells

### gene-based medicine

instead of solely replacing defective genes, gene-based medicine is the application of nucleic acids (DNA, RNA) containing genetic information as therapeutic reagents in general. Nucleic acids are used to add a therapeutically beneficial function to cells, delete pathological functions from cells, or utilize cells for the production of therapeutic proteins. This can be either a transient or a permanent effect

### genecology

the study of the genetic basis of ecological differentiation; the study of the genetic composition of populations in relation to their habitats



## generalist

an organism which can survive under a wide variety of environmental conditions, and does not specialize to exist under any particular set of circumstances

## generation

offspring from the same parental group going through their life cycle together

## generation time

the average amount of time between the appearances of two successive generations (parent and offspring)

## genet

In corals, the genetic individual that results from a single planula. For clonal corals, e.g., *Acropora*, a genet often includes numerous asexually-produced individuals (ramets)

## genetic code

the chemical code by which genetic information in DNA is translated into biological function. A set of three nucleotides (codons), the building blocks of DNA, signifies one amino acid. Amino acids are the building blocks of proteins

## genetic disease

a disease that has its origin in changes to the genetic material. Genetic diseases usually refer to diseases that are inherited in a Mendelian fashion, although non-inherited forms may also result from genic (DNA) mutation

## genetic distance

a measure of the genetic similarity between any pair of populations. Such distance may be based on phenotypic traits, allele frequencies or DNA sequences

## genetic diversity

the variety of different types of genes or alleles in a species or population

## genetic drift

random changes in the frequency of alleles in a population. In small populations, it can lead to the elimination of a particular allele by chance alone. It is thought to be one cause of speciation when a group of organisms is separated from its parent population

## genetic engineering

the technique of selectively removing, modifying, or adding genes to a DNA molecule by use of recombinant DNA or other specific molecular gene transfer or exchange techniques. These techniques produce endogenous proteins with properties different from those of the normal, or to produce entirely different proteins altogether. Organisms modified by genetic engineering are sometimes referred to as transgenic,

bioengineered, or genetically modified

### genetic map position

the location of a gene on a genetic map, deduced from recombination frequencies

### genetic marker

a DNA sequence used to "mark" or track a particular location (locus) on a particular chromosome

### genetic modification

human-designed changes in an organism, whether done through traditional breeding or genetic engineering. The terms "genetically modified" and "genetically engineered" are sometimes used interchangeably

### genetic mutation

a permanent structural alteration in DNA. In most cases, DNA changes either have no effect or cause harm, but occasionally a mutation can improve an organism's chance of surviving and passing the beneficial change on to its descendants

### genetic pollution

the accidental transfer of genetic material from a genetically engineered organism to one that is not genetically engineered

### genetic stability

a measure of the resistance to change, with time, of the sequence of genes within a DNA molecule or of the nucleotide sequence within a gene

### genetically modified organism

an organism that has been modified by the application of recombinant DNA technology

### genome

all the DNA contained in an organism or a cell, which includes both the chromosomes within the nucleus and the DNA in mitochondria

### genome size

the size of a genome (all the genetic material in the chromosomes of a particular organism) is generally given as its total number of base pairs

### genomic library

a collection of clones made from a set of randomly generated overlapping DNA fragments that represent the entire genome of an organism

## genomics

the comprehensive analysis of all the genes of an organism; molecular characterization of all the genes and gene products of a species, including the study of gene sequences, gene mapping, and gene function; genomics usually involves high speed sequencing of the DNA and computer searches for sequences that code for genes. Genomics allow researchers to identify specific genes responsible for specific proteins with specific functions in an organism

## genotype

the genetic constitution of an individual or group. In taxonomy, the genotype is the type species of a genus

## genus

a taxonomic group containing one or more species

## geo-referenced data

refers to data with geographic location information included, such as latitude and longitude

## geochemistry

the study of the chemical elements, their isotopes, and related processes with respect to the abundance and distribution of materials within the Earth's waters, crust, and atmosphere

## geoecotype

a regional ecotype (a population adapted to a restricted habitat as a result of natural selection within a local environment)

## Geographic Information System (GIS)

a system that allows automatic location of information suitable for mapping. Usually involves a software system that takes geographic position data and other data (e.g., type of bottom sediment) in order to create a map. Data on processes (e.g., current speed) can be incorporated to make a geographic model of flow

## geographical isolation

a form of reproductive isolation in which members of a population become separated from another population by geographical barriers that prevent the interchange of genes between the separated populations

## geographical speciation

speciation occurring during a period of geographical isolation

## geoid

a surface of constant gravitational potential at zero elevation; an imaginary elliptical surface around the earth with constant gravitational potential. The surface of the sea, measured over time and without waves, would be

a geoid; the hypothetical surface of the Earth that coincides everywhere with the mean sea level

## geologic time scale

a relative time scale based upon fossil content. Geological time is divided into eons, eras, periods, and epochs

## geoportal

a web portal used to locate and access geospatial information and associated geographical services via the internet

## geostationary satellite

satellite whose orbit around the equator equals that of the Earth's rotation, making it possible for them to view the same disc of Earth's surface below continuously



Artist's rendition of GOES I/M, geostationary satellites whose mission includes data collection and broadcasting, and environmental sensing. (Image: NASA/Goddard Space Flight Center)

## geostrophic current

a flow that sustains a balance between Coriolis deflection and a pressure gradient

## Geotiff

a file format that embeds image registration information directly into a raster file; an industry-neutral raster file format widely used and recognized by all of the major GIS software vendors. ESRI began support for Geotiff at version 7.0 of ARC/INFO and version 3.0 of ArcView. Geotiff represents an effort by over 160 different remote sensing, GIS, cartographic, and surveying related companies and organizations to establish a TIFF-based interchange format for georeferenced raster imagery

## germ cell

a reproductive cell; a sperm cell or ovum; a gamete; an oocyte or spermatocyte

## germ layers

distinct layers of cells, produced during the early embryonic developmental process of gastrulation, which gives rise to all cells, tissues, organs, and organ systems of the organism's body. The three types of germ layers are the ectoderm, endoderm, and mesoderm. Diploblastic organisms (e.g. cnidarians) have two layers, ectoderm and endoderm; triploblastic organisms (all higher animal groups) have mesoderm between these two layers

## germ line

a term used to refer to the cell lineage that contributes to the formation of gametes

## germinal epithelium

the tissues of the primary reproductive organs that produce eggs and sperm cells

## gestation period

the period of development of the young in viviparous animals, from the time of zygote formation (fertilization) until birth

## ghost crab

any of several light-colored burrowing crabs of the genus *Ocyropa* frequenting the tide line along sandy shores from the northeast United States to Brazil. Ghost Crabs have a relatively thin, light exoskeleton and two large black eyes that stand up like periscopes. They are called ghosts because of their ability to instantly disappear from sight, moving at speeds up to 10 miles per hour, while making sharp directional change and disappearing into their burrows

## ghost net

a lost or abandoned fishing net that drifts through the oceans posing a danger to fishes and other marine life

## gibbosity

swelling or protuberance; a convex hump; something that bulges out or is protuberant or projects from a form

## giemsa stain

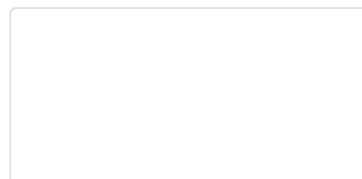
a stain that contains both acidic and basic dyes, used in staining histological sections for identifying acidic and basic cell components, including protozoan parasites

## gigabyte (gb)

a measurement of storage space equal to a thousand megabytes

## gill

a highly vascularized respiratory organ with a large surface area in aquatic animals. Gills are in direct contact with the surrounding water for gas exchange





The gill cover (operculum) of this fish is lifted to expose the gills, which are the respiratory organs of fishes and many other aquatic animals.

## gill arch

one of several curved bony or cartilaginous structures located on either side of the pharynx that support the gills of fishes and amphibians. Each gill arch is made up of an upper and a lower limb that are joined posteriorly. The gill filaments and gill rakers are attached to the gill arches

## gill chamber

in fishes, the cavity containing the gills on each side of the rear of the head, enclosed by the operculum and the branchiostegal membrane

## gill filament

a fingerlike projection from a gill arch through which respiratory gases enter and leave the blood

## gill net

a net primarily designed to catch fish by entanglement in a mesh that consists of a single sheet of webbing which hangs between cork line and lead line, and which is fished from the surface of the water



A fisherman setting out a gill net.  
(Photo: NOAA)

## gill raker

one of a series of knob- or comb-like projections on the front edge of the gill arch. Gill rakers aid in the fish's feeding. Their shape and number are a good indication of the diet of the fish. Fishes which eat large prey, such as other fishes, have short, widely spaced gill rakers that prevent the prey item from escaping between the gills. Fishes which eat smaller prey have longer, thinner and more numerous gill rakers. Species which feed on plankton have the longest, thinnest and most numerous gill rakers. Gill rakers also protect and clean the gill fillaments. Counts of gill rakers are used as taxonomic characters



Gill arch of an almaco jack (*Seriola rivoliana*) showing the gill rakers and gill filaments. (Photo: NOAA)

### **gill tuft**

a fluffy cluster of gill filaments

### **gladiate**

sword-shaped

### **gland**

a group of cells or a single cell in animals or plants that is specialized to secrete a specific substance

### **glider**

a type of autonomous underwater vehicle (AUV) that uses small changes in its buoyancy in conjunction with wings to convert vertical motion to horizontal, and thereby propel itself forward with very low power consumption

## **Global Biodiversity Information Facility (GBIF)**

an international non-profit organization that provides free and universal access to data regarding the world's biodiversity. A wide range of countries and organizations participate in GBIF and have made their data available through the GBIF web site (<http://www.gbif.org>)

### **global change**

a transformation which occurs on a worldwide scale (for example, an increase in CO<sub>2</sub> in the atmosphere) or exhibits sufficient cumulative effects to have worldwide impact (for example, local species extinction resulting in global loss of biodiversity)

## **Global Coral Reef Monitoring Network (GCRMN)**

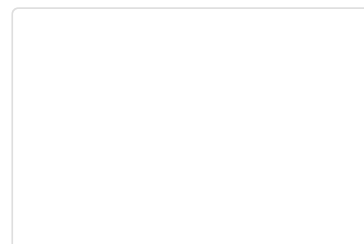
a global network whose aim is to improve management and sustainable conservation of coral reefs for people by assessing the status and trends in the reefs and how people use and value the resources. It does this by providing many people with the capacity to assess their own resources, within a global network, and to spread the word on reef status and trends

### **global warming**

an increase in temperature that occurs globally

### **globular**

globe-shaped; having the form of a sphere, or nearly so





The porcupine fish, when threatened, swallows water and takes on a globular shape. (Photo: Copyright Corel Corporation)

## glucose

a monosaccharide,  $C_6H_{12}O_6$ , that is the end product of carbohydrate metabolism and is the chief source of energy for living organisms

## glutinous

sticky

## gnathic

pertaining to the jaw

## Gnathostomata

the group of vertebrates that possess jaws; includes fishes, amphibians, reptiles, birds, and mammals

## goatfish

any species of bony fishes in the family Mullidae. Goatfishes, also called surmullets, are elongate, moderately sized fishes which are characterized by a pair of long, tactile barbels under the chin. Some species are brilliantly colored and some are noted

## goby

any species of bony spiny-rayed fishes in the family gobiidae. Gobies are small fishes with large heads and elongated tapering bodies. They comprise the largest family of marine fishes, with over 2000 species. Gobies range in size from the mudskipper (about 15-30 cm) to the tiny pygmy goby, *Eviota sigillata*, a 1-2 cm long coral reef-dwelling goby which has the shortest lifespan for any known vertebrate

## GOES (Geostationary Operational Environmental Satellite)

a class of satellite operated by NOAA, positioned in a nearly stationary orbit over the equator at an altitude of about 22,500 miles. GOES-8 is currently the





operational "east" spacecraft at 75 degrees West longitude, while GOES-10 is the "west" spacecraft located at 135 degrees West. GOES-11 is in standby at 110 degrees West



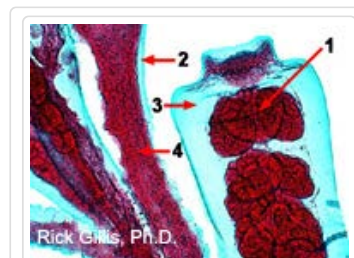
Image developed by NASA from GOES data-Hurricane Floyd at the U.S. coast on September 15, 1999 (Hal Pierce, NASA Goddard Space Flight Center)

## gonads

the primary sex organs of an animal. In males they are the testes, and in females, the ovaries

## gonangium

a reproductive polyp of a colonial hydrozoan. It consists of a stalk containing medusa buds surrounded by a thin membrane, the gonotheca



A gonangium of the hydrozoan *Obelia*. 1= medusa bud; 2= perisarc; 3=gonotheca; 4= coenosarc. (Photo: Rick Gillis, Ph.D., Biology Dept., University of Wisconsin-La Crosse)

## gonochoric

having separate sexes. Individuals within the species contain only one or the other of male and female reproductive systems

## gonoduct

any duct that generally transfers eggs or sperm cells

## gonophore

a sexual zoid produced as a medusa bud upon a hydroid, sometimes becoming a free hydromedusa and sometimes remaining attached

## gonopodium

a term given to the anal fin (or the anterior portion of it) of a male fish when it is modified to function as a copulatory organ, e.g., in guppies

## gonotheca

a thin membrane covering the body of a gonangium, the reproductive polyp of a colonial hydrozoan

## gonozooid

a reproductive polyp of a colonial hydrozoan

## gorgonian

an anthozoan of the subclass Octocorallia, commonly called sea fans and sea whips



A sea fan, *Gorgonia ventalina*, in the Florida Keys.

## gorgonin

a fibrous protein in the mesoglea which provides skeletal support for sea fans and other members of the Order Gorgonacea

## GPS (Global Positioning System)

a network of satellites and receiving devices used to compute accurate geographical positions on the Earth. A GPS is used in navigation, and its precision supports cadastral surveying



Portable GPS unit utilized in surveying.

## gradient analysis

an intuitive method to portray variation along a single or multiple environmental gradients. The plots display species or community abundance in response to a known environmental gradient, i.e., the analysis of species

composition along a gradient of environmental conditions

## gradualism

a model of evolution that assumes slow, steady rates of change, as contrasted with punctuated equilibrium, an evolutionary model in which change occurs in relatively rapid bursts

## Gram's stain

a method for differential staining of bacteria; Gram-positive cells stain purple-black and Gram-negative cells stain pink; useful in bacterial taxonomy and identification

## granular gland cell

an epithelial cell that contains lysosomes that are secreted into the gastrovascular cavity of cnidarian polyps for extracellular digestion of food materials

## Graphics Interchange Format (GIF)

a bit-mapped digital image graphics file format suitable for efficiently importing image data into computer files or for transmitting or displaying the formatted image on a computer monitor or printing it out. GIF supports color and various resolutions. It also includes data compression, making it especially effective for scanned photos

## gravid

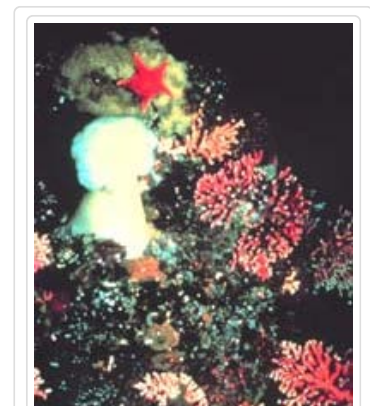
pregnant; heavy with young; full of ripe eggs or distended by such fullness



Gravid green crab with egg mass on the abdomen. (Photo: Gary Weber)

## Gray's Reef National Marine Sanctuary

Gray's Reef comprises one of the largest nearshore sandstone reefs in the southeastern United States. It is located 32 kilometers (17.5 nautical miles) off Sapelo Island, Georgia. Designated in 1981, the Gray's Reef National Marine Sanctuary boundaries protect 17 square miles of open ocean. Sandstone outcroppings and ledges up to ten feet in height separate the sandy, flat-bottomed troughs in a reef that combines temperate and tropical flora and fauna. The rocky platform, some 60 to 70 feet below the surface, is covered by a carpet of attached organisms and is known locally as a "live bottom habitat." Gray's reef is not a coral reef. It is a consolidation of marine and terrestrial sediments (sand, shell, and mud) which was laid down as loose aggregate between 6 and 2 million years ago



A reef scene showing biodiversity at Gray's Reef. (Photo: NOAA)

## grazer

an animal which feeds on plants



Sea urchins are important grazers on coral reefs. Their diet, however, is not totally restricted to plants and algae.

## Great Barrier Reef

the largest complex barrier coral reef in the world, approximately 2,000 km (1,250 mi) long, in the Coral Sea, forming a natural breakwater for the northeastern coast of Australia. It is separated from the mainland by a shallow lagoon from 16-161 km (10 to 100 mi) wide. It is composed of more than 2,800 individual reefs and in some places it is more than 122 m (400 ft) thick. The Great Barrier Reef Marine Park, more than 340,000 km<sup>2</sup> (130,000 mi<sup>2</sup>), encompasses most of the reefs and interreef areas as well as the neighboring lagoon and a large section of the continental shelf. It is the largest UNESCO World Heritage Area

## green algae

green algae belong to the Division Chlorophycota. These algae contain photosynthetic pigments similar to those in higher plants (chlorophylls a and b, as well as secondary pigments: carotenes, lutein, and zeaxanthin) and have a green color. Green algae include unicellular forms, filamentous forms, and leaf-like thalluses.



The green alga *Caulerpa taxifolia* with feather-like branches. The leaf is 5-65 cm in length. (Photo: NOAA)

## green carbon

carbon stored in the Earth's forests and their soils

## greenhouse effect

the heating that occurs when gases such as carbon dioxide trap heat escaping from the Earth and radiate it back to the surface

## greenhouse gases

atmospheric gases, primarily carbon dioxide, methane, and nitrous oxide restricting some heat-energy from

escaping directly back into space

## gregarious

living or moving in a group with others of its kind, as in a flock of birds or school of fish

## Grenada Bank

an archipelago of over 30 islands and cays extending from Grenada to St. Vincent. The Grenada Bank supports the most extensive coral reefs and related habitats in the southeastern Caribbean

## grid

a network of uniformly spaced parallel lines intersecting at right angles. When superimposed on a map, it usually carries the name of the projection used for the map. For example: Lambert grid, transverse Mercator grid, and universal transverse Mercator grid

## griseous

blue-grey color

## groin

a solid structure built at an angle from a shore prevent erosion from currents, tides and waves, or to trap sand

## gross photosynthetic rate

the total rate of CO<sub>2</sub> fixation with no allowance for the CO<sub>2</sub> simultaneously lost during respiration

## gross primary production

the total amount or weight of organic matter created by photosynthesis over a defined time period (total product of photosynthesis)

## ground truthing

measurements conducted on the ground or at sea to calibrate, compare or verify observations made from satellites or aircraft

## ground water

underground water that is generally found in the pore space of rocks or sediments and that can be collected with wells, tunnels, or drainage galleries, or that flows naturally to the earth's surface via seeps or springs. The term is not applied to water that is percolating or held in the top layers of the soil, but to that water in the zone of saturation below the water table

## groundfish

fishes, usually of commercial value, that live on or near the bottom; also called "bottom fish"

## grounding

a ship's striking a shoal or reef

## grouper

any species of bony fishes in the subfamily Epinephelinae of the sea bass family, Serranidae. Groupers have a typical seabass appearance with robust bodies, large mouths and sharp teeth. Some get to be enormous in size, many feet long and reaching weights

## Grouper Moon Project

a collaborative conservation program between REEF and the Cayman Islands Department of the Environment studying the Nassau grouper (*Epinephelus striatus*)

## growth band

a band formed yearly on coral by the secretion of  $\text{CaCO}_3$ ; one yearly growth band contains two smaller bands representing winter growth and summer growth

## growth factor

any of various chemicals, particularly polypeptides, that have a variety of important roles in the stimulation of new cell growth and cell maintenance. They bind to the cell surface on receptors. Specific growth factors can cause new cell proliferation

## growth rate

the increase in mass per unit of time

## growth

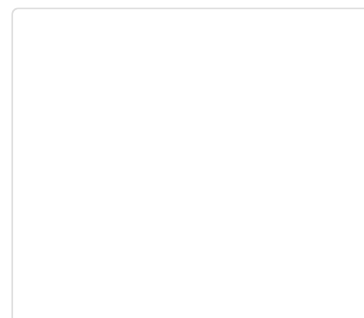
an increase in cell size or cell number, or both

## grunt

any species of bony spiny-rayed fishes in the family Haemulidae. Grunts are medium-sized tropical fishes that are capable of making a grunting sounds by the grinding of pharyngeal teeth. They inhabit coral reef or hard bottom areas. Many forage at night over nearby sand and grass flats

## guanine

one of the four nitrogenous bases in DNA and RNA that make up the letters ATGC, guanine is the "G". The others are adenine, cytosine, and thymine. Guanine always pairs with cytosine



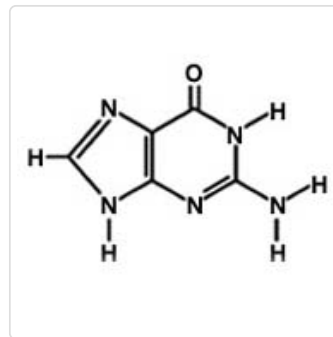


Diagram of the chemical structure of guanine, one of the four nitrogenous bases in DNA.

## guano

the manure of birds and bats that is often used as fertilizer

## guild

a group of species that use the same resources in a similar way; an ecological association based on similar roles in a community rather than evolutionary descent, as for example, filter feeders or browsers

## gular

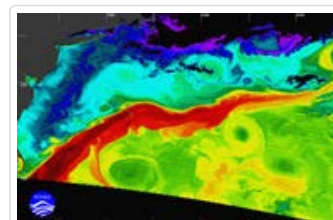
of, relating to, or located on the throat

## gulf

a portion of an ocean or sea that extends into the land; a partially land-locked sea, e.g., the Gulf of Oman

## Gulf Stream

the warm ocean current of the North Atlantic. It originates in the westward equatorial current and is deflected northward by the coast of South America into the Gulf of Mexico and then follows the coast of North America to Nantucket, where it is deflected eastward toward northern Europe



Sea surface temperature image of the Gulf Stream, derived from infrared measurements of the Moderate-resolution Imaging Spectroradiometer (MODIS), May 8, 2000. (Image produced from 11- and 12-micron bands by Bob Evans, Peter Minnett, and co-workers, University of Miami)

## gunwale

the upper edge of the side of a ship

## gustation

pertains to the sense of taste

## guyot

a flat-topped submarine mountain

## gynetype

a female type specimen

## gynogenetic

containing genetic material derived from the female parent only

## gyre

a large water-circulation system of geostrophic currents rotating clockwise in the Northern Hemisphere or counterclockwise in the Southern Hemisphere

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#) | [N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#) |

## habitat

the place or environment where a particular organism, population, or species lives

## habitat affinity index

defines habitat affinity based on the relative concentration of a species in a particular habitat, compared with the availability of that habitat in a given study area

## habitat complexity

the areal extent and number and diversity of habitat types and distinct ecological zones within a specified area

## habitat distribution

the structure and spatial characterization of all habitat types in a specified area

## habitat diversity

the number of different types of habitats within a given area



## habitat equivalency analysis (HEA)

an analysis designed to determine the compensation the public is due to reconcile injuries to the ecosystem and the lost services the ecosystem provides to the biotic component

## habitat fragmentation

the breaking up of a habitat into unconnected patches interspersed with other habitats which may not be inhabitable by species occupying the habitat that was disrupted. The breaking up is usually by human action

## habitat patch

any discrete area that is used by a species for reproduction or obtaining other resources, such as food and shelter; an area of distinct habitat type; patchiness occurs when a habitat is divided (fragmented) into usable areas, called "patches," which are separated from one another by nonusable habitat

## habitat sharing

a situation in which species occupy the same habitat without competition, either through requiring different resources or being present at different times

## habituation

in animal behavior, the temporary waning or disappearance of an innate response when it is elicited many times in succession

## hair cell

a mechanoreceptor cell having hair-like processes (stereocilia and kinocilia). Vibrations or pressure deform these processes which relay the induced nervous impulses to the central nervous system. They are responsive to sound and other mechanical stimuli

## half-life

the time required for a radioactive substance to lose half of its nuclei

## Halimeda

an important genus of calcareous green algae in coral reef environments

## hallucinogenic fish poisoning

see "ichthyotoxicity"

## halo

in animal coloration, a circle of color around a spot of another color; a ring of sand surrounding a patch reef

## halocline

the boundary where there is a marked change in salinity between surface fresh water and underlying saltwater in a stratified coastal environment

## Halofolliculina

a genus of sessile heterotrich ciliates, of which one species (*H. corallasia*), causes skeletal eroding band (SEB) disease in corals in the Indian and Pacific Oceans and the Red Sea, and a congeneric species causes a similar disease in Caribbean corals (Caribbean ciliate infection)

## halophile

an organism which lives in an environment of high salt concentration. Halophiles have special adaptations to permit them to survive under these conditions

## halophyte

a plant that grows in soils that have a high content of various salts



A black mangrove is an example of a halophyte, a plant that thrives in a saline environment.

## hamular

hook-shaped

## hamulus

a small hook-like projection

## handline

a fishing line with attached hook(s) that is tended directly by hand

## haplogroup

a population descended from a common ancestor; a group of similar haplotypes that share a common ancestor with a single nucleotide polymorphism (SNP) mutation

## haploid

a haploid cell contains a nucleus with a single complete set of chromosomes. The haploid condition is often abbreviated as *n*. Most fungi, protists, and algae are haploid, as are some insects, bryophytes, and the

gametes of all organisms

## haplotype

a set of closely linked genes that tends to be inherited together as a unit; a particular set of alleles at linked loci that are found together on a single homolog; a genetic type; a unique DNA sequence

## hapteron

a single branch within a holdfast

## hard bottom

a substrate formed by the deposition of calcium carbonate by reef building corals and other organisms or existing as bedrock or volcanic rock usually of minimal relief

## hard coral

a coral in the anthozoan order Scleractinia. Also known as the stony corals, these organisms possess a hard external calcareous skeleton. A synonym of **stony coral**



## hard coral forms

may be conveniently summarized as: encrusting (lichen-like); branched (staghorn-like); massive (rock-like); sub-massive (pillar-like); tabulate (table-like); foliose (scroll-like); and solitary

## Hardy-Weinberg Law

the frequency of a given genotype will reach equilibrium in a randomly mating population and will stay constant over many generations in the absence of selection pressures

## harmonics

pertaining to sound, harmonics are multiples of the fundamental frequency (a single sine wave)

## harvest

to capture, catch, collect or harvest organisms by any means

## hastate

spear-shaped

## hatch

the process of an embryo leaving the egg envelopes

## hatchling

a fish larva just out of the egg

## Hawaiian Archipelago

the Hawaiian Archipelago consists of eight large islands and 124 small islands, reefs, and shoals. It stretches for over 2,400 km from 19 degrees - 28 degrees N to 155 degrees -178 degrees E. It can be divided into two distinct regions: the Northwestern Hawaiian Islands (NWHI), primarily uninhabited atolls, islands, and banks accounting for the majority of U.S. reefs, and the Main Hawaiian Islands (MHI) largely made up of populated, high, volcanic islands with non-structural reef communities, fringing reefs, and two barrier reefs

## hawser

a large rope for mooring or towing a ship

## hazardous waste

a discarded material which contains substances known to be toxic, mutagenic, carcinogenic, or teratogenic to humans or other life; ignitable, corrosive, explosive, or highly reactive alone or with other materials

## heading

the direction in which a vessel is pointed at any given moment

## heat shock proteins (HSPs)

a group of proteins that are present in the cells of all living organisms. They are induced when a cell is exposed to various types of environmental stresses, e.g., heat, cold and oxygen deprivation. Heat shock proteins are also present in cells under normal conditions, assisting in other cellular protein functions and behavior. They also trigger immune responses through both intracellular and extracellular activities; also called stress proteins

## heavy metal

a metal having a specific gravity of 5.0 or greater. Heavy metals are generally toxic to organisms in relatively low concentrations, and tend to accumulate in the food web. Examples include arsenic, cadmium, chromium, lead, and mercury

## hectare

a metric measure equal to 10,000 square meters or 2.47 acres

## heiau

a traditional Hawaiian place of worship; a religious shrine

## helicoid

spiral-shaped

## heliophilous

having an attraction for sunny places

## heliotropism

an orienting response to the sun

## heliox

a breathing gas mixture for scuba divers that contains only oxygen and helium, used for deep diving to remove the narcotic effect of nitrogen

## helix

a structure with a spiral shape

## helophilous

having an affinity for marshes

## heme

a complex red organic pigment containing iron and other atoms to which oxygen binds

## hemichordate

any of various worm-like marine animals belonging to the phylum Hemichordata, having a primitive notochord and gill slits



An acorn worm in the phylum Hemichordata. (Photo: BIODIDAC)

## hemocoel

the extensive spaces of an arthropod's body through which the hemolymph (blood) circulates

## hemocyanin

a bluish, copper-containing respiratory pigment with an oxygen-carrying function similar to that of hemoglobin

that is present in the blood of certain mollusks and arthropods

## hemoglobin

the iron-containing protein (pigment) found in red blood cells of vertebrates. Hemoglobin transports oxygen from the respiratory surface (gills, lungs) to the body's tissues. It is red when oxidized

## hemolymph

the circulating and tissue-bathing fluid of the arthropod open circulatory system. It is composed of cells and plasma and often loosely termed as blood

## Henry's Law

the amount of gas that will dissolve in a liquid at a given temperature is almost directly proportional to the partial pressure of that gas

## hepato-

pertaining to the liver

## herbivore

an animal that feeds on plants

## heredity

the transfer of genetic information from parent cells to progeny

## hermaphrodite

an animal or plant which is equipped with both male and female reproductive organs

## hermatypic coral

a reef-building coral with zooxanthellae in its tissues

## herpetology

the scientific study of amphibians and reptiles



Herpetologists study the biology of amphibians and reptiles, such as this Indopacific sea snake, *Laticauda colubrina*. This species lays its eggs on land. Other

species are livebearers and give birth to their young in the ocean.  
(Photo: Sohan Shetty)

## hertz

unit of frequency equal to one cycle per second

## heterocercal

a caudal fin where the upper lobe is larger than the lower lobe. Most sharks have heterocercal caudal fins

## heterochrony

a change in the timing of ontogenetic events between two species. These can be the result of relatively small genetic changes between an ancestor and its descendant species

## heterodont

a type of dentition where the teeth are not all similar. For example, a mixture for special functions, such as canines, incisors and molars for piercing and tearing, snipping and grinding

## heterogeneous

consisting of dissimilar elements, parts or forms; having non-uniform structure or composition

## heteroscedasticity

in statistics: time-dependent variance; the property of a series of random variables of not every variable having the same finite variance; a sequence of random variables is heteroscedastic if the random variables have different variances

## heterosis

a situation where crossing two inbred lines yields offspring that are more healthy/vigorous than their parents; hybrid vigor

## Heterotrichea

a class of unicellular ciliates in the phylum Ciliophora. Heterotrichs are among the largest protozoan forms. Some sessile species cause coral diseases in the Pacific and Indian Oceans, the Red Sea, and the wider Caribbean

## heterotroph

an organism that cannot manufacture its own food, and therefore requires external sources of energy

## heterotypic school

a well-defined group or school of several kinds of fishes

## heterozoid

a specialized non-feeding bryozoan zoid. Heterozoids include forms specialized for producing and brooding eggs, or, more rarely, spermatozoa. Others are specialized to protect the colony, or have a cleaning function, or strengthen and support the colony

## heterozygote

an individual having a heterozygous gene pair. A diploid or polyploid with different alleles at a particular locus

## heterozygous gene pair

a gene pair having different alleles in the two chromosome sets of the diploid individual, for example, **Aa**

## heuristic

problem analysis based on informal judgment or experience versus data manipulation; a guideline or rule of thumb that is normally effective in dealing with a given situation

## hexamerous

having six parts, or parts in multiples of six arranged radially, as found in anthozoans in which the tentacles and mesenteries are in multiples of six

## hexaxon

in sponges, a spicule with six rays

## hiatus

a gap, e.g., unoccupied space between the distributions of two species or populations; a space between teeth

## hierarchy

in animal behavior, any social rank-order established through physical or ritualistic combat, threat, passive submission or some combination of these behavioral patterns

## high tide

the tide at its fullest extent, when the water reaches its highest level



A small island at the mouth of the



Amazon River at high tide. See **low tide** for contrast. (Photo: Alessandra and Michael)

## high-resolution satellite SST climatology

9 km monthly or yearly averages of satellite-derived (see AVHRR) sea surface temperatures obtained over periods of 10 years or longer

## high-throughput sequencing

a rapid method of determining the sequence of bases in a DNA molecule

## High-throughput sequencing (Next-Generation Sequencing)

technologies that parallelize the nucleotide sequencing process, producing thousands or millions of sequences at once. Using these technologies may lower the cost of DNA sequencing beyond what is possible with standard methods

## hinge

the elastic part of a bivalve (Mollusca) shell that unites the valves along the top of the shell

## histogram

a bar graph in which the area over each class interval is proportional to the relative frequency of data within this interval

## histology

the branch of biology that studies the microscopic structure of animal or plant tissues. The four basic types of animal tissues are: epithelial tissue, nervous tissue, muscular tissue and connective tissue (bone, cartilage, blood, fat, and areolar (fibrous)). The three basic plant tissues are: dermal tissue, ground tissue, and vascular tissue

## histone

a type of protein present in the nucleus of eukaryotic cells that helps to compact DNA into tightly packed chromosomes

## histone H2B

a small, highly conserved nuclear protein that, together with 2 molecules each of histones H2A, H3 and H4, forms the eukaryotic nucleosome core

## historical data

data sets from previous studies

## histosol

soil with a high organic content

## hoa

a channel or pass connecting the atoll lagoon with the open ocean

## holdfast

a root-like structure for attachment that anchors attached seaweeds and other algae to the substrate; also applied to the structure that attaches octocorals to the substrate

## holobenthic

pertaining to fauna that are confined to a benthic existence throughout their entire life cycle

## holoblastic cleavage

complete cleavage of the zygote. The cleavage furrows pass all the way through the zygote; typical of isolecithal and mesolecithal eggs

## Holocene epoch

an epoch of the Quaternary period dating from the end of the Pleistocene approximately 8,000 years ago until the present

## holoeuryhaline

pertains to organisms that inhabit fresh, brackish and marine waters

## holoplankton

planktonic organisms that spend their entire life cycle in the floating state, as contrasted with organisms, such as fishes, which spend only a portion of their life cycle (eggs, larvae) as members of the planktonic community

## holothurian

a sea cucumber in the echinoderm class Holothuroidea



A holothurian (sea cucumber),  
*Holothuria atra*.

## holothurin

a toxic substance released by some holothuroids (sea cucumbers)

## holotype

in taxonomy, a single specimen designated or indicated the type specimen by the original author at the time of publication of the original description

## home page

the first page that a browser opens when accessing a Web address (URL). The home page generally serves as a gateway to the rest of the Web site by providing links to the other pages

## home range

the area over which an animal normally travels in its daily activities

## homeobox

family of genes that regulates activities of other genes (turns genes 'on' and 'off' )

## homeostasis

the ability to maintain a relatively constant internal environment

## homeotic gene

a gene that controls the activity of other genes involved in the development of a body plan

## homeotic mutation

a mutation that causes a body part of an organism to develop in an inappropriate position

## homing behavior

a type of behavior where the adult organism returns to its place of origin

## homocercal

a caudal fin with upper and lower lobes that are approximately equal in size; characteristic of most bony fishes

## homodont

type of dentition where the teeth are all similar, indicative of a uniform diet

## homogeneous

of similar or uniform structure or composition throughout; refers to anything which displays a uniform or consistent composition

## homolog

in genetics, one member of a chromosome pair. Homologous chromosomes have corresponding DNA sequences and come from separate parents, i.e., one homolog comes from the maternal parent and the other comes from the paternal parent; in evolution, a characteristic that is similar in different species because it evolved from a common ancestor

## homologous chromosomes

the pair of chromosomes in a diploid individual that have the same overall genetic content. One member of each homologous pair of chromosomes is inherited from each parent

## homology

the relationship of any two characters that have descended from a common ancestor. The term can apply to a morphological structure, a chromosome, an individual gene, or a DNA sequence

## homonym

in taxonomy, each of two or more identical but independently proposed names for the same or different taxa. A junior homonym is the later published of two homonyms. A senior homonym is the earlier published of two homonyms

## Homonymy, Law of (Principle of)

any name that is a junior homonym of an available name must be rejected and replaced; the principle that the name of each taxon must be unique

## homoscedasticity

in statistics: time-independent variance; the standard error of estimate is the same for all fitted values of the dependent variable; a property of a set of random variables where each variable has the same finite variance

## homotypic school

a well-defined school of fish composed of one species with individuals all of similar size

## homozygote

an individual having a homozygous gene pair. A diploid or a polyploid with identical alleles at a locus

## homozygous gene pair

a diploid gene pair having identical alleles in both copies, for example, **AA** or **aa**

## hookah

"hookah" refers to diving where the diver is supplied with breathable air from the surface via an air compressor and an airline (hose). This type of diving is ideal for shallow water commercial applications

## horizontal classification

in taxonomy, classification which stresses grouping together taxa in a similar stage of evolution, rather than location on the same phyletic line

## horn

a bony projection, e.g. the "horns" on the heads of cowfishes

## horse latitudes

two belts or regions of subtropical high-pressure areas, located between 30-35 degrees north and south, in which the wind is light and varied and weather is hot and dry

## host

an organism which serves as the habitat for a parasite or symbiont. The host may provide nutrition to the parasite or symbiont, or simply a place in which to live

## hotspot

an environmentally endangered region that is both rich in species and found nowhere else

## HotSpot animation

animations from HotSpot imagery denoting coral reef bleaching events over time

## HotSpot charts

charted regions that highlight sea surface temperature (SST) anomalies that are greater than 1 deg C above the maximum monthly climatological SST. See also coral bleaching and coral bleaching hotspot

## hump

the raised area behind the head in certain fish species, usually mature adults or breeding males

## hurricane

an intense tropical cyclone in which winds tend to spiral inward toward a core of low pressure, with maximum surface wind velocities that equal or exceed 33.5 m/sec (75 mph or 65 knots) for several minutes or longer at some point



Infrared image of Hurricane Hugo making landfall September 22, 1989. (Image: NOAA)

## hurricane surge

a rise in the sea surface on an open coast, often resulting from a hurricane



Surge from 1969's Hurricane Carol swamps a yacht club. (Photo: Providence Journal Co., NOAA/NWS Historic Collection)

## hyaline

translucent or transparent

## hyalinization

a form of tissue degeneration in which the tissues develop a homogeneous and glassy appearance

## hybrid

an individual with parents of different species

## hybrid name

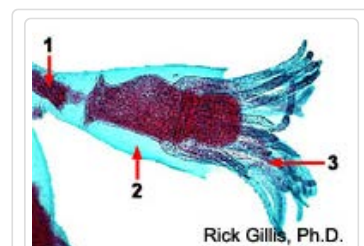
in taxonomy, names of progeny of two individuals belonging to different taxa. Names given to hybrids are not normally available, as they are individuals, not populations, and hence not taxa

## hybridization

the production of offspring (hybrids) from genetically dissimilar parents

## hydranth

a feeding polyp of a colonial hydrozoan. It bears tentacles armed with nematocysts, a mouth and a thin outer covering, the hydrotheca



Hydranth of the hydrozoan, *Obelia*.  
1=coenosarc; 2=hydrotheca;  
3=tentacles. (Photo: Rick Gillis,  
Ph.D., Biology Dept., University of  
Wisconsin-La Crosse)

## hydrocarbon

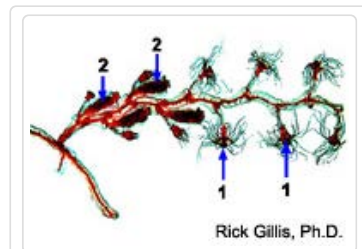
an organic molecule, such as methane (CH<sub>4</sub>), which consists only of carbon and hydrogen atoms

## hydrocarbon seep

an area where hydrocarbons seep slowly from the sea floor

## hydrocaulus

the main stem of a colonial hydrozoan which consists of a cylindrical tube of living tissue (coenosarc) covered by a thin outer membrane (perisarc)



Rick Gillis, Ph.D.

Hydrocaulus of the hydrozoan, *Obelia*. (Photo credit: Rick Gillis, Ph.D., Biology Dept., University of Wisconsin-La Crosse)

## hydrochory

spread of plant seeds, spores or propagules by water

## hydrogen bond

a relatively weak chemical bond consisting of a hydrogen atom between two electronegative atoms (e.g., oxygen or nitrogen), with one side being a covalent bond and the other being an ionic bond

## hydrogen ion

an individual atom of hydrogen which is not attached to a molecule and therefore has a positive (+) charge

## hydrological cycle

the movement of water in all of its phases (gas, liquid, solid) from the Earth to the atmosphere and back to the Earth

## hydrology

the science dealing with the properties, distribution and circulation of water and snow

## hydrolysis

the breaking down of a compound into fragments by the addition of a molecule of water. The hydroxyl group is incorporated in one fragment and the hydrogen atom in the other

## hydrophilic

having a strong affinity for water; tending to dissolve in, mix with, or be wetted by water -

## hydrophobic

refers to molecules that do not interact with water and are not soluble in water. Hydrophobic compounds do not dissolve easily in water, and are usually non-polar. Oils and other long hydrocarbons are hydrophobic

## hydrophone

an underwater microphone

## hydrophyte

a plant that grows partly or wholly in water whether rooted in the substrate or floating without anchorage, as the water hyacinth; an aquatic plant

## hydropic

containing an excess of water or of watery fluid; swelling of cells, usually associated with cell injury

## hydrosere

an ecological succession beginning in a habitat with abundant water, typically on the submerged sediments of a standing water body (e.g. lake or lagoon), and ending on dry land

## hydrostatic skeleton

a type of skeleton found in many soft-bodied invertebrates which consists of a turgid column of liquid within one of the body spaces that provides support or rigidity to the organism or to one of its parts. Hydrostatic skeletons are found in echinoderms (starfish, sea urchins), annelids (worms), nematodes (roundworms), and a number of other wormlike invertebrate phyla

## hydrotheca

a thin outer covering of a hydranth, the feeding polyp, of a colonial hydrozoan

## hydrothermal plume

a cloud of hot, mineral-rich water that flows out of a hydrothermal vent and disperses into the ocean, usually several hundred meters above the seafloor vent site. Rock particles and minerals in the plume water often make the plume look smoky

## hydrothermal vent

a sea floor fissure from which a spring of geothermally heated mineral and gas rich seawater issues. Hydrothermal vents are found on some oceanic ridges in zones of active seafloor spreading (plate tectonics)



## hydroxyl group

an [-OH] or alcohol group on a larger molecule. The oxygen is single-bonded to the hydrogen and has one free bond to the rest of the molecule

## Hydrozoa

a class within the phylum Cnidaria. The Hydrozoa contains five orders that include: small medusae with no polyp generation; colonial forms with alternating polyp and medusa stages and a chitinous exoskeleton; solitary polyps that lack a medusoid stage; colonial forms with massive aragonite skeletons (e.g., fire coral); and complex colonial forms, with individual polyps specialized for feeding, swimming, prey capture, and reproduction. Some, but not all, float by means of a large pneumatophore, or gas bag



White-tipped mustard-colored fire coral in the Flower Garden Banks.

## hyoid

having a "U" shape

## hyper-

above, exceeding, higher, more than, abnormally increased

## hypereosinophilia

a disease characterised by a marked increase in the eosinophil (a type of white blood cell) count in the blood

## hyperlink

text or images on a Web page that, when clicked with a mouse, causes the browser to load another page of HTML. Because a simple mouse click allows the user to easily go from one page of hypertext to another, these pages are said to be "hyperlinked." Text links are usually, but not always underlined in blue, while hyperlinks that are images often take the form of "buttons"

## hyperparasite

a parasite whose host is also a parasite

## hyperplasia

abnormal increase in the size/volume of a tissue due to multiplication of cells

## hypersaline

referring to water with a salinity higher than that of natural seawater

## Hyperspectral AVIRIS (Airborne Visible/Infrared Imaging

## Spectrometer)

a hyperspectral image is a very high resolution image which was acquired with a hyperspectral scanner. These instruments acquire data in 224 contiguous channels of approximately 10nm bandwidth. They are spanning the visible, near-infrared and mid-infrared portion of the electromagnetic spectrum

## hypertrophy

the over-development of a structure

## hypertrophy

the excessive enlargement or development of an organ or tissue, with increase in cell size but without increased cell division

## hypha

one of the long, branching filaments that forms the mycelium of a fungus

## hypo-

under, below, beneath, lower than, small size, deficiency

## hypobranchial gland

a gland in the mantle cavity of mollusks that secretes mucus

## hypolithic

living on lower surfaces of rocks

## hyposaline

referring to water with a salinity lower than that of natural seawater

## hypostome

in cnidarians, the circular raised area of a hydrozoan polyp that lies between the tentacles and the mouth. The term is also used to describe mouthparts in other phyla

## hypothermia

a condition when the body temperature is colder than normal (37 degrees C/98.6 degrees F in humans)

## hypothesis

a tentative assumption made for the purpose of empirical scientific testing. A hypothesis becomes a scientific theory when repeated testing and the great body of evidence suggests that the hypothesis has a strong probability of being correct

## hypoxia

a condition that may occur in aquatic environments as the concentration of dissolved oxygen becomes reduced to a level harmful to aquatic organisms; in physiology, hypoxia is the condition where oxygen concentrations are below normal physiological limits in a specific tissue

## hypural plate

in fishes, the flattened bony plate at the posterior end of the vertebral column

A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |

## ichnotaxon

a taxon based on the fossilized work of an animal, including fossilized trails, burrows, and tubes

## ichthyo-

pertaining to fishes

## ichthyoallyeinotoxic fish

an algal-grazing fish species which is effected by ichthyoallyeinotoxism. Ingesting affected fishes may lead to hallucinogenic fish poisoning

## Ichthyoallyeinotoxism

hallucinogenic fish poisoning caused by ingesting the heads or flesh of certain types of reef fishes (e.g., mullets, goatfishes, surgeonfishes, damselfishes, and rabbitfishes) in the tropical Pacific and Indian Oceans. The toxin affects primarily the central nervous system. Symptoms consist of dizziness, loss of equilibrium and motor coordination, hallucinations, and mental depression. Incidences have also been reported in the Mediterranean Sea, caused by ingesting a species of bream (*Sarpa salpa*). The effects have been compared to LSD-induced hallucinations; also called "hallucinogenic fish poisoning"

## ichthyochory

the dispersal of plant seeds or spores by fishes

## ichthyology

the scientific study of fishes



The diver is studying the behavior and ecology of squirrelfishes on a Caribbean coral reef. (Photo: Dr. Anthony R. Picciolo, NOAA)

## Ichthyosarcotoxism

food poisoning caused by the toxic substance, ichthyosarcotoxin, in the flesh or organs of fishes

## icon

a small picture displayed on a computer monitor that identifies a command or file.

## iconotype

in taxonomy, a drawing or photograph of a type specimen

## idiopathic

denotes a disease of unknown cause or origin

## igneous rock

a rock formed by the cooling and crystallization of molten magma

## IKONOS satellite

high-resolution (1-2 meter resolution) imaging satellite; the world's first commercial satellite for imagery of this type



Four-meter true color IKONOS image of Buck Island Reef National Monument shows an extensive underwater coral reef ecosystem.

## illicium

a "fishing rod-like" appendage on the head of some fishes, usually a modified dorsal fin spine

## image resolution

the area represented by each pixel of a satellite image. The smaller the area represented by a pixel, the more accurate and detailed the image

## imagery

visible representation of objects and (or) phenomena as sensed or detected by cameras, infrared and multispectral scanners, radar, and photometers

## imbricate

with overlapping parts, such as scales

## imitation

a behavior that occurs when an animal immediately mimics the actions of another animal while they are in each other's presence

## immature

describes an animal that has not reached sexual maturity, regardless of size or age

## immersed corallite

a corallite that forms a depression in the surface of the colony

## immersed corallite

a corallite that is embedded in the surrounding coenosteum, i.e., one that forms a depression on the colony surface

## immune system

a system that provides the organism with a defense against infection. In higher organisms it is afforded by the presence of circulating antibodies and white blood cells. Antibodies are manufactured specifically to deal with the antigens associated with different diseases as they are encountered. White blood cells attack and destroy foreign particles in the blood and other tissues

## immunogen

any substance that can elicit an immune response

## impact

a change, caused by external sources, in the chemical, physical (including habitat) or biological quality or condition of a habitat or environment

## imperforate coral

corals with solid skeletons with no inter-polyp connections

## impermeable

having the property of restricting the passage of substances across a membrane

## imposex

the imposition of male characteristics on female organisms, as caused by some pollutants. For example, a pseudo-hermaphroditic condition in female gastropods (development of a false penis) caused by tributyltin (TBT), a biocide used in anti-fouling paints

### imprimis

in the first place

### in adnot.

in an annotation (*in adnotatio*)

### in hospite

within the host

### in litt.

in correspondence or communicated in writing; used for an unpublished source of information (*in litteris*)

### in situ

in the natural or original position

### in situ data

measurements made at the actual location of the object or material measured, in contrast to remote sensing

### in situ hybridization

a method of detecting the presence of specific nucleic acid sequences within a cytological preparation. A DNA or RNA probe is labeled, radioactively or chemically, and hybridized to a cytological preparation to detect RNA, or to a denatured cytological preparation to detect complementary DNA. The hybridization is detected by autoradiography (for radioactive probes) or by chromogenic reactions or fluorescence (for chemically-labeled probes)

### in syn.

in synonymy (*in synonymis*)

### in vitro

a laboratory experiment or study performed outside the body of a living organism in a test tube, petri dish, or other vessel

### in vivo

studies conducted in intact living organisms or cells

### inc. sed.

of uncertain taxonomic position or affinities (*incertae sedis*)

### incidental parasite

an accidental parasite

### incipient population

a small population that is just beginning to reproduce and become established in an area or community

### incisiform tooth

a chisel-shaped tooth used for cutting. Typically, it wider than it is thick

### inclined corallite

a corallite that grows at an angle up from the colony surface

### incomplete dominance

in genetics, an interaction between alleles in which both alleles are expressed more or less equally. The expression for a phenotype for a given trait exhibits a blending of the genetic messages from the allele partners controlling that trait. An example may be a cross between a homozygous red trait (AA) and a homozygous white trait (aa), where neither the red (A) nor white (a) trait is dominant. The phenotypic expression of the offspring is pink (Aa), the intermediate phenotype

### incomplete protein

a protein which does not supply all the essential amino acids

### incurrent canal

in sponges, an inpocket of the epidermis (pinacoderm) which opens into a choanocyte chamber via a small opening, the prosopyle

### independent assortment

the random alignment of homologous chromosomes during meiosis. Each member of a pair of homologous chromosomes separates independently of the members of other pairs so the results are random

### independent variable

a variable controlled by the experimenter

### indeterminate cleavage

cleavage where the fate of the resulting daughter cells is not determined after the initial division of a fertilized

egg. If the cells separate, each has the potential to develop into an entire organism and the resulting individuals are genetically identical (identical twins). Indeterminate cleavage is characteristic of deuterostomes

### indeterminate species

a category used in grading the severity of threat to an endangered species. When graded 'indeterminate', the species is thought to be under severe threat but adequate data is unavailable

### indicator species

any organism that by its presence or absence, its frequency, or its vigor, indicates a particular property of its surrounding environment; a species whose presence is a sign that certain environmental conditions exist

### indigenous

native to a particular country or area

### Indo-Pacific

a vast region encompassing the tropical Indian and Pacific Oceans from Africa in the west to Hawaii and French Polynesia in the east. This area represents the largest marine biogeographic region in the world

### inductive reasoning

the process of observing data, recognizing patterns, and making generalizations from the observations; reasoning from particular facts to a general conclusion

### inert

refers to unmoving or unchanging. In chemistry, a substance which does not or rarely combines with other substances. In medicine, it means a substance that has little or no effect on the human body

### infauna

animals that inhabit the sandy or muddy surface layers of the ocean bottom, i.e., those that live buried or dig into the substrate

### infection

a pathological state resulting from the invasion and multiplication of pathogenic microorganisms in the body of an organism

### infectious

capable of spreading disease

### infectious agent



an organism capable of spreading disease

## inferior

anatomically beneath, lower, or toward the bottom (e.g., the mouth is inferior to the nose)

## inflammation

a protective response of vascular tissues to injuries to the body caused by pathogens or other harmful agents. Inflammation is a protective attempt by the organism to remove the injurious stimuli and to initiate the healing process

## inflated

swollen or expanded

## informatics

the management and analysis of data using advanced computing techniques

## information management

the integration of a variety of activities designed to manage information and information resources throughout their life cycle. Activities include planning, budgeting, organizing, directing, training, promoting, and controlling the information and information resources throughout the process of collecting, processing, transmitting, disseminating, and disposing of information; the manipulation, reorganization, analysis, graphing, charting, and presentation of data for specific management and decision-making purposes

## Information Technology (IT)

a very general term referring to the entire field of Information Technology - anything from computer hardware to programming to network management

## infra-

a prefix meaning "below"

## infrared radiation (IR)

earth-emitted radiation over thermal wavelengths: 3-15 micrometers. Used for satellite remote sensing because it can be used to monitor weather and oceanographic conditions 24 hours a day

## infrared scanner

an instrument that detects infrared radiation and converts the detected energy to an electrical signal for recording on another medium

## infrasonic

sound waves that have a frequency that is lower than what humans can hear (i.e. below about 20 hertz). Some baleen whales and elephants produce infrasounds to communicate over long distances

## intraspecific name

in taxonomy, a general term for any name below the rank of species. The term includes subspecific and infrasubspecific names

## infrasubspecific

in taxonomy, a category below the subspecies level

## infundibuliform

funnel-shaped

## ingestion

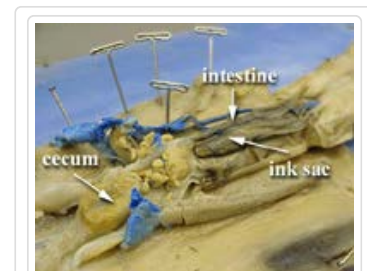
the intake of water or food substances by "swallowing" them, taking them into the body cavity or into a cell vacuole

## inhalant system

in sponges, part of the aquiferous system between the ostia and prosopyle

## ink sac

a diverticulum of the rectum of most cephalopods, where an "inky" melanin solution is stored. The ink is ejected from a duct opening at the base of the siphon. It serves to cloud the water, and enable these animals to escape from predators



Ventral view of a dissected squid revealing the ink sac. (Photo: Biology Dept., Fairfield University, Fairfield, CT)

## innate

not established by conditioning or learning; "an unconditioned reflex"; a genetic behavior pattern

## innate releasing mechanism

in ethology or animal behavior, an innate system within an animal that responds to a stimulus in the environment to produce a genetic stereotyped behavior; a stimulus-response mechanism

### inner cell mass

the cluster of cells inside the mammalian blastocyst. These cells give rise to the embryonic disk of the later embryo and, ultimately, to the fetus

### inorganic matter

chemical substances of mineral origin which contain no organically produced carbon

### inquilinism

a symbiotic association in which one symbiont lives in close association with another, generally in its shell, tube or burrow, or actually within a body cavity of the host

### inquilinism

a symbiotic association in which one symbiont lives in close association with another, generally in the tube or burrow or actually within a body chamber of the host

### inserted gene

a gene introduced into the DNA of a recombinant organism which is not present at the same position in the DNA of the organism before genetic modification

### insolation

the amount of solar radiation received on a given body or in a given area

### instar

a discreet, in-between molt stage, during the metamorphosis of an arthropod from larva to adult

### instinct

an unlearned, genetically coded behavior pattern that is internally motivated and characteristic of the species; the innate capacity of an animal to respond to a given stimulus in a relatively fixed way

### insular

relating to, or characteristic of, or situated on an island

### integer

a number without a decimal (0, 1, 25, 173, 1032, etc.). Integer values can be less than, equal to, or greater than zero

### integrated coastal zone management

the process of combining all aspects of the human, physical and biological aspects of the coastal zone within a single management framework

## Integrated Coral Observing Network (ICON)

As of October 2005, the coral research program at NOAA's Atlantic Oceanographic and Meteorological Laboratory (AOML) was titled the "Integrated Coral Observing Network" (ICON), rather than the Coral Reef Early Warning System (CREWS). ICON is focusing up

## Integrated Ocean Observing System (IOOS)

a "user-driven" integrated system of observations, data management and communications, and data analysis and modeling that provides data and information required to achieve seven societal goals: 1) Improve predictions of climate change and variability (weather) and their effects on coastal communities and the nation; 2) Improve the safety and efficiency of marine operations; 3) More effectively mitigate the effects of natural hazards; 4) Improve national and homeland security; 5) Reduce public health risks; 6) More effectively protect and restore healthy coastal marine ecosystems; and 7) Enable the sustained use of marine resources

## Integrated Taxonomic Information System (ITIS)

a partnership of U.S., Canadian, and Mexican agencies, other organizations, and taxonomic specialists cooperating on the development of an online, scientifically credible, list of biological names. ITIS is also a participating member of Species 2000, an international project indexing the world's known species

## intensity

pertaining to sound, the average amount of sound power (sound energy per unit time) which is transmitted through a unit area in a specified direction. The magnitude of the intensity is often referred to as the intensity, without specifying the direction from which the sound is travelling

## intention movement

an incomplete behavior pattern that provides information about the activity a particular animal is about to perform, and acts as a signal to others

## Interactive Data Language (IDL)

a commercial array-oriented language with numerical analysis and display features, first released in 1977. It supports interactive reduction, analysis, and visualisation of scientific data

## interannual

refers to a climatic process that re-occurs every three to ten years. El Niño is an example of a climatic process that re-occurs every 4-6 years

## interface

the common boundary between two substances such as a water and a solid, water and a gas, or two liquids, such as water and oil

## interferon

a family of small proteins that stimulate viral resistance in cells

### intermediate form

a fossil or modern species that possesses characters definitive of two or more different taxa, or that displays characters morphologically intermediate between two different taxa



Some experts believe that the "living fossil" genus *Neopilina*, an internally segmented mollusk in the class Monoplacophora, is an evolutionary link between mollusks and other more obviously segmented invertebrates, such as annelid worms. (Graphic: BIODIDAC)

### intermediate host

in a parasite's life cycle, it is a host organism in which a parasite undergoes a stage of asexual development

### intermittent spawning

spawning at intervals

### International Code of Zoological Nomenclature (the Code)

in taxonomy, an authoritative document containing a system of rules and recommendations to be followed in giving a scientific name to an animal or animal group. It has been adopted by the International Congresses of Zoology (more recently the International Union of Biological Sciences) and is administered by the International Commission on Zoological Nomenclature. The most recent version of the Code is the Fourth Edition published in September 1999 and took effect on January 1, 2000; usually referred to as the "Code"

### International Commission on Zoological Nomenclature (ICZN)

the judicial body empowered to enforce and interpret the International Code of Zoological Nomenclature

### International Coral Reef Initiative (ICRI)

an environmental partnership and network that brings all the stakeholders together with the objective of sustainable use and conservation of coral reefs for future generations. ICRI is an informal mechanism that allows representatives of over 80 developing countries with coral reefs to sit in equal partnership with major donor countries and development banks, international environmental and development agencies, scientific associations, the private sector and non-governmental organizations (NGOs) to decide on the best strategies to conserve the world's coral reef resources

## International Zoological Congresses

the legislative bodies responsible for the rules of the International Code of Zoological Nomenclature and for authorization of the activities of the International Commission on Zoological Nomenclature

## Internet Service Provider (ISP)

a company or organization that provides access to the Internet

## interorbital

the space between the eyes

## interoreceptor

a neurological receptor that is located within the organism's body and detects physiological changes, e.g. pH, temperature, chemicals in blood

## interpolated name

in taxonomy, a name placed within parentheses (after a generic name to denote a subgenus; after a genus-group name to denote an aggregate of species, or after a specific name to denote an aggregate of subspecies. Names used in this way are not counted as one of the names in a binomen or trinomen

## interradial

in fishes, between the rays (or spines), e.g. interradian pigment is pigment on the membrane between the rays.

## interradial canal

one of four branched ciliated canals in scyphozoan medusae that originates from the gastric pouches and move materials from the ring canal back toward the stomach and gastric pouches

## interradial membrane

in fishes, the tissue between the fin rays or spines

## interradial pigment

in fishes, interradian pigment is pigment on the membrane between the fin rays

## intersex

an organism which possesses a mixture of male and female characteristics

## intersexual

involving both sexes, male and female

## interspecific

between members of different species

## interspecific competition

competition between individuals of different species

## interspinous membrane

in fishes, the membrane between fin spines

## interstices

the openings or pore spaces in a rock, soil, and other such material

## interstitial

refers to the interstices or pore spaces in rock, soil, or other material subject to filling by water; fluid-filled spaces between cells in tissues

## interstitial fauna

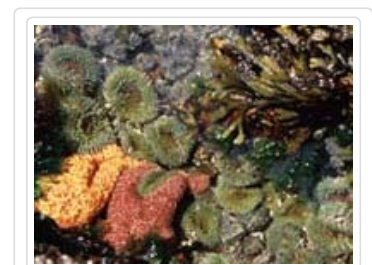
animals that live in the spaces within sediment particles (interstitial spaces)

## interstitial water

water in the pore spaces of soil or rock

## intertidal zone

the region between the highest water line and the mean low tide level



Sea anemones crowd a rocky intertidal zone (Photo: Nancy Sefton)

## Intertropical Convergence Zone (ITCZ)

the region near the equator where the trade winds of the Northern and Southern Hemispheres converge

## intolerant organism

an organism (or species) that is not adaptable to human alterations to its environment and thus declines in number where alterations occur

## intranet

a private network inside an organization that uses the same kinds of software found on the public internet, but which is only for internal use

## intrasexual

involving only one of the sexes, male or female

## intraspecific

among members of the same species

## intraspecific competition

competition between individuals of the same species

## intratentacular budding

a type of asexual reproduction where daughter corallites grow from the inside wall of parent corallites, usually by division of the parent corallite

## intrinsic

belonging to a thing by its very nature; the essential nature or constitution of a thing; inherent; in and of itself

## introgression

the movement or incorporation of genes from one population into another through hybridization followed by backcrossing. Usually refers to movement of genes from one species to another or among sub-species that have been geographically isolated then brought back together by changes in the species ranges or planting of exotic populations

## introgressive hybridization

the spread of genes of one species to another species through hybridization. The hybrids are able to breed back into one of the parental populations. This allows the reintroduction of alleles that may have been lost during the speciation process

## intromittent organ

a copulatory structure employed by the males of species that practice internal fertilization to transfer sperm cells into the reproductive tube of the female, e.g., the clasper of a shark, skate or ray; penis; modified anal fin (gonopodium) of live-bearer fishes

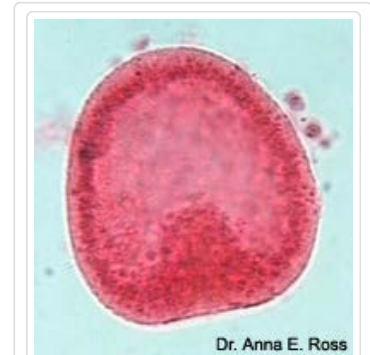


## intron

DNA sequences that interrupt the protein-coding sequence of a gene; introns are transcribed into mRNA but the sequences are eliminated from the RNA before it is used to make protein; junk DNA; in eukaryotic cells, a sequence of DNA that is contained in the gene but does not encode for protein. The presence of introns "splits" the coding region of the gene into segments called exons

## invagination

an inward folding of a layer of cells forming an interior pocket



The cells at the vegetal hemisphere of this starfish blastula have begun to push into the blastocoel (invagination), forming a diploblastic embryo with a new cavity, the primitive gut, or archenteron. The cells lining the archenteron are endodermal cells. (Photo: Dr. Anna E. Ross, Christian Brothers University, TN)

## invalid name

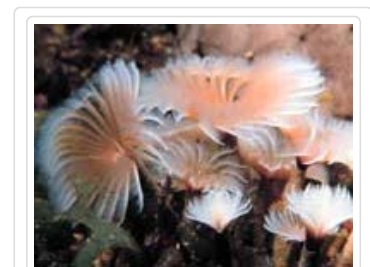
in taxonomy, any name for a given taxon other than the valid name

## inversion

a chromosomal re-arrangement that reverses the order of a linear array of genes on the chromosome

## invertebrate

an animal that lacks a vertebral column (backbone)



Feathery invertebrate tube worms in the Caribbean Sea (Photo: Dr. Anthony Picciolo).

## involute

rolled inwards from the edges

## ion

a positively or negatively charged atom produced through loss or gain of one or more electrons

## ion channel

a pore in a cell membrane, formed by an integral protein, that selectively regulates the diffusion of ions into and out of the cell. An ion channel switches between open and closed when the protein undergoes a conformational change. Ion channels are usually selective for a specific ion type (e.g., Na, or K, or Cl, or Ca)

## ionic bond

a chemical bond in which one atom loses an electron to form a positive ion and the other atom gains an electron to form a negative ion

## ionizing radiation

high-energy radiation capable of producing ionization in substances through which it passes, i.e., radiation that has enough energy to eject electrons from electrically neutral atoms, leaving behind charged atoms or ions; examples are alpha particles (helium nuclei), beta particles (electrons), neutrons, and gamma rays (high frequency electromagnetic waves, x-rays)

## ionocyte

a type of cell commonly found in the gills of fishes and some crustaceans. They play a role in regulating the salt concentration of cells in relation to the external environment, and differ greatly between freshwater and saltwater organisms; also called "chloride secretory cell"

## iridescent

exhibiting rainbow colors



This deep-sea fish called a "green

eye" (Chlorophthalmidae) exhibits a beautiful iridescent pattern around its large eyes and head. (Photo: NOAA Ocean Exploration)

## iridiophore

a colorless chromatophore which contains purines, mostly guanine in the form of large, nonmotile crystals

## irruption

a sudden sharp increase in the relative numbers of a population which may cause the mass movement of a population from one place to another

## irruptive growth

a growth pattern defined by population explosions and subsequent sharp population crashes; sometimes called Malthusian growth

## ischemia

a condition in which a tissue or organ does not receive a sufficient supply of blood

## isobath

a line on a map or chart that connects all points having the same depth below a water surface

## isoenzyme

one of a group of enzymes that are very similar in catalytic properties, but may be differentiated by variations in physical properties, such as isoelectric point or electrophoretic mobility; also called 'isozyme'

## isogamous

having haploid gametes that are similar in size, structure and motility. An isogamete can unite with another to form a zygote

## isogenic chromosome

in a diploid organism, a chromosome in which both alleles at every locus are identical on both copies

## isohyetal line

a line drawn on a map or chart joining points that receive the same amount of precipitation

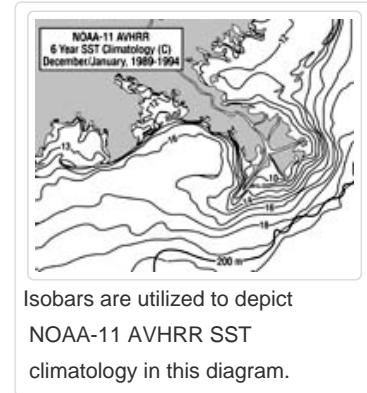
## isolecithal

an egg cell in which the total amount of yolk is small and the yolk granules are fairly uniformly distributed

throughout the cytoplasm, and cleavage completely bisects the cell, e.g., the egg of a starfish. A synonym is "homolecithal"

## isoline

a line on a surface connecting points of equal value



## isometric contraction

a muscular contraction in which tension increases while the length of the muscle remains constant

## isometric growth

growth that occurs at the same rate for all parts of an organism so that its shape is consistent throughout development

## isomorphic

having the same or similar form

## isotonic contraction

a muscular contraction in which tension is constant while the length of the muscle changes

## isotope

one of two or more species of atoms of the same chemical element that have the same atomic number and occupy the same position in the periodic table. They are nearly identical in chemical behavior, but they differ in atomic mass or mass number. Therefore, they behave differently in the mass spectrograph, in radioactive transformations, and in physical properties, and may be separated or detected by means of these differences

## isthmus

a narrow strip of land connecting two larger land masses, such as the isthmus of Panama

## iterative process

a process for calculating a desired result by means of a repeated cycle of operations. An iterative process should come closer to the desired result as the number of iterations increases. Each repetition of the process is also called an "iteration", and the results of one iteration are used as the starting point for the next iteration

## iteroparity

the reproductive condition in which individuals reproduce several times during their lifetime

## iteroparous

a life history in which individuals reproduce more than once in a lifetime

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#) | [N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#) |

## J curve

a J-shaped growth curve that depicts exponential growth

## JabRef

an open source bibliography reference manager; a reference management software that uses BibTeX as its native format. JabRef provides an easy-to-use interface for editing BibTeX files, for importing data from online scientific databases, and for managing and searching BibTeX files

## Jack

any species of bony fishes in the family Carangidae (which also includes the pompanos). Jacks are cosmopolitan in warm and temperate marine waters, some even venturing into brackish and fresh water. As a group, they are swift and strong predators. Typical

## Java

a programming language created by Sun Microsystems which allows the user to create programs which run well in a networked environment (such as the World Wide Web). Java programs are commonly called "applets" and can be used to add anything from calculators to animated images to web sites

## jetsam

objects that have been thrown overboard in order to lighten a ship when it is in trouble

## jetty

a structure extending into the ocean to influence the current or tide in order to protect harbors, shores, and banks



A jetty protecting the shore line.  
(Photo: NOAA)

## joint probability

the probability of two or more things occurring together

## Jordan's Rule

In general, closely related species do not have identical ranges, but often their ranges are not very far apart. They are usually adjacent but separated by some kind of a geographic barrier, such as a mountain, desert, or river. A second Jordan's Rule is: fishes develop more vertebrae in cold environments than in warm ones

## JPEG (Joint Photographic Experts Group)

the original name of the committee that wrote the standard. It is a lossy compression technique for color images. Although it can reduce files sizes to about 5% of their normal size, some detail is lost in the compression

## jugostegalia

a basket-like structure formed midventrally by overlapping branchiostegals in some families of eels

## jugular

pertaining to the throat area



## junior homonym

in taxonomy, the younger, or most recently established taxonomic name

## junior synonym

in taxonomy, the younger name of two synonyms

## junk DNA

a term used to describe the excess DNA which is present in the genome beyond that required to encode proteins. The term is misleading since these regions are likely to be involved in gene regulation, and other not yet known functions; a non-coding sequence of DNA; an intron

## juvenile

a young animal that has not reached sexual maturity

## juxtaposed

placed near together

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#) | [N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#) |

## kairomone

a class of pheromone which is an interspecific chemical secretion that benefits the receiver but not the emitter; also defined as a pheromone produced by organisms to attract a mate, though in some cases can also undesirably attract the attention of a predator

## Karst

a limestone terrain characterized by sinks, caverns, abrupt ridges, protuberant rocks and drainage characteristics due to greater solubility of limestone in natural waters than is common. The term is derived from the geographical name of part of Slovenia

## Karst cave

a cave caused by dissolution of limestone by water

## karyogamy

a process of fusion of the nuclei of two sex cells or gametes; the second step in syngamy

## karyology

the study of the nucleus of a cell

## karyolysis

the disintegration and dissolution of a cell nucleus upon death of the cell

## karyorrhexis

the rupture of a cell nucleus, releasing disintegrated chromatin

## karyotype

the entire chromosome complement of an individual cell, as seen during the mitotic phase

## Kelvin scale

an absolute scale of temperature in which each degree equals one kelvin. Water freezes at 273.15 K and boils at 373.15 K

## kenozooid

a small bryozoan heterozoid that strengthens and supports the colony, as well as fill spaces; long, branching, tubular, transparent stolons which extend above the substratum and to which the feeding individuals (autozooids) are attached

## key

a small, low coastal island or emergent reef of sand or coral; flat mound of sand and admixed coral fragments built upon a reef flat or just above high tide level. A synonym of **cay**



A number of small keys (cays) in Jobos Bay, Puerto Rico.

## key character

in taxonomy, a diagnostic character used in a taxonomic key

## key stimulus

in ethology or animal behavior, the stimulus which releases a fixed action pattern

## keystone predator

the dominant predator or the top predator that has a major influence on community structure

## keystone species

a species that is disproportionately important in the maintenance and balance of its community integrity

## kilobase (kb)

a length unit equal to 1000 base pairs of a double-stranded nucleic acid molecule; 1000 pairs of nucleotide bases in DNA

## kindling fluorescent protein

a photoactivatable marker that turns itself off after a selectable period

## kinetic energy

energy associated with motion

## kinetics

the study of acceleration, motion, or rate of change



## kinetochore

a structure forming at the centromere during mitosis for binding microtubules; a platelike structure necessary for chromosomal movement during mitosis; it develops on the centromere and links the chromosomes to the mitotic spindle

## kingdom

in taxonomy, the highest ranked category in the taxonomic hierarchy. All organisms are classified into one of five kingdoms: Monera (the prokaryotic Kingdom. Includes archaeobacteria, eubacteria and cyanobacteria); Protista (unicellular eukaryotes); Fungi (yeasts and mushrooms); Plantae (plants); and Animalia (animals). Some scientists recognize slightly different classification schemes

## kinocilium

a minute short cellular hair-like process (microvillus) responsible for locomotion in motile unicellular organisms, or in higher forms, generates a current of fluid

## knee root

an aerial root of a mangrove that emerges from the ground then loops back in. It is also called a peg root. It is not clear whether knee roots have a role in respiration

## knob

a projecting structure on the reef margin or reef front wherein the upper surface flares outward, giving the surface a greater diameter than the basal section

## knoll

a small reef within the lagoon or on shallow shelves

## knot

The unit of speed used in navigation that is equal to 1 nautical mile (6,076.115 ft or 1,852 m) per hour

## Koch's Postulates

a set of criteria for judging whether a given bacterium is the cause of a given disease; a useful benchmark in judging whether there is a cause-and-effect relationship between a bacteria (or any other type of microorganism) and a clinical disease. The postulates are as follow: The bacteria must be present in every case of the disease; The bacteria must be isolated from the host with the disease and grown in pure culture; The specific disease must be reproduced when a pure culture of the bacteria is inoculated into a healthy susceptible host; The bacteria must be recoverable from the experimentally infected host

## Krebs cycle

a series of enzymatic reactions in mitochondria involving oxidative metabolism of acetyl compounds to produce high-energy phosphate compounds that are the source of cellular energy ; also known as the tricarboxylic acid (TCA) cycle and as the citric acid cycle

## Kure Atoll

the most remote of the Northwestern Hawaiian Islands, and the northern-most coral atoll in the world, located at the extreme northwest end of the Hawaiian archipelago. The atoll has almost 80,000 acres of coral reef habitat with 28 species of stony corals so far documented. Kure Atoll is an important pupping and resting area for Hawaiian Monk seals. The island is also a nesting area for many species of sea birds, and a wintering area for a variety of migratory bird species from North America and Asia

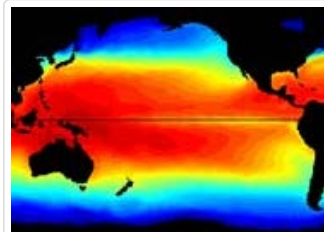


Photos: (Left) The Kure Atoll Reserve Preservation Area includes approximately 17 square nautical miles (57 square kilometers) of submerged coral reef habitats; (Right) An endangered Hawaiian monk seal and her pup. (Photos: NOAA)

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#) | [N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#) |

## La Niña

a phenomenon characterized by unusually cold ocean temperatures in the eastern Equatorial Pacific, compared to El Niño, which is characterized by unusually warm ocean temperatures in the eastern Equatorial Pacific



Graphic showing December 1998 La Niña event.

## label

a compound or atom that is either attached to, or incorporated into, a macromolecule and is used to detect the presence of a compound, substance, or macromolecule in a sample; also called a 'tag'

## labeled

to mark substances in a way that they can easily be identified. In an organism, substances may be labeled using stable isotopes or harmless radioactive components so that they can be traced, analyzed or measured

## labial

pertaining to the lips

## labium

any lip-like structure

## Lacey Act

the Lacey Act, passed in 1900, and amended several times, makes it unlawful to import, export, transport, sell, buy, or possess fish, wildlife, or plants taken, possessed, transported, or sold in violation of any federal, state, foreign, or Native American tribal law, treaty, or regulation

## lacriform

tear-drop shaped; also called "dacriform"

## lacuna

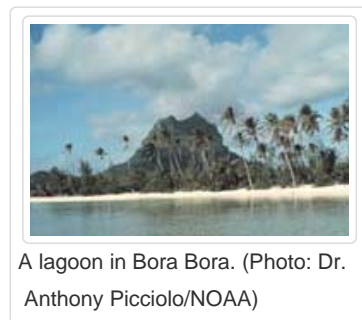
a cavity ("little lake") in a matrix-like substance. For example, cartilage cells (chondrocytes) are located in lacunae in the cartilagenous matrix; bone cells (osteocytes) are located in lacunae in bone matrix

## lageniform

bottle-shaped

## lagoon

a warm, shallow, quiet waterway separated from the open sea by a reef crest



## lagoon slope

the back reef on a barrier or atoll reef

## Lakshadweep Islands

an archipelago situated in the Arabian Sea between 08o 00' N and 12o 30' N latitude and 71o 00' E and 74o 00' E longitude and at a distance of 220 - 440 km from the west coast of India. Lakshadweep is the tiniest Union Territory of India. The coral reefs of the islands are mainly atolls except for one platform reef

## lambert

unit of brightness of light

## lamina

a thin, flat layer

## laminarian

a brown alga in the plant class Phaeophyceae; a kelp

## lanceolate

spear-shaped, tapered at both ends

## lanceolate

shaped like a lance head

## lanceiform

lance-shaped

## lander system (benthic lander)

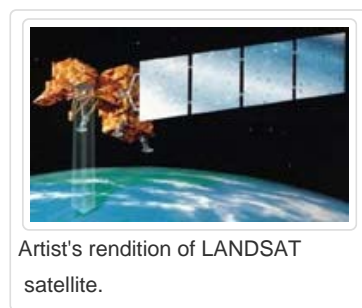
a scientific instrument system designed for temporary deployment on the sea floor in order to monitor environmental parameters. It is an unmanned vehicle that falls to the seafloor unattached to a cable, and then operates autonomously on the bottom. At t

## Landsat Program

the Landsat Program (NASA) provides the world's scientists and application engineers with a continuing stream of remote sensing data for monitoring and managing the Earth's resources. Landsat 7 has produced an uninterrupted multispectral record of the Earth's land surface since 1972. Along with data acquisition and the USGS archival and distribution systems, the program includes the data processing techniques required to render the Landsat 7 data into a scientifically useful form. Special emphasis has been placed on periodically refreshing the global data archive, maintaining an accurate instrument calibration, providing data at reasonable prices, and creating a public domain level one processing system that creates high level products of superior quality

## Landsat satellite

U.S. satellite used to acquire high-resolution (500-800m) remotely sensed multi-spectral images of the earth's land surface and surrounding coastal regions



Artist's rendition of LANDSAT satellite.

## langley

unit of solar radiation

## lappet

a sensory structure in some jellyfish (Scyphozoa), associated with a rhopalium, which responds to touch (pressure); a fleshy lobe

## larva

a sexually immature juvenile stage of an animal's life cycle. However, there are a few exceptions, where the larval form never metamorphoses into the adult stage and is sexually mature (neoteny)



Microscopic photograph of a crab larva (megalops stage) from a plankton collection.

## lateral

refers to the side or flank of an animal

## lateral display

a type of threat or reproductive behavior exhibited by many species of fishes, in which two male fish align beside each other, spread their dorsal, anal, and pelvic fins, and intensify the coloration of their bodies. These threats are usually accompanied by tail beats and body quivering

## lateral line scale

one of a series of scales that bear the pores and tubes of the lateral line system

## lateral line system

a series of sense organs that detect pressure or vibrations along the heads and sides of cyclostomes, fishes, and some amphibians. It consists of a network of sensory hair cell clusters (neuromasts) and small water-filled canals that lie immediately beneath the skin and extend along the sides of its body. This network is sensitive to external motion



Note the lateral line of the Caribbean red snapper (*Lutjanus purpureus*) with 49 to 53 scales, which extend onto the base of the caudal fin. (Photo: U.S. Food and Drug Administration)

## latitude

the angular distance between an imaginary line around the Earth, or any spherical body, parallel to its equator and the equator itself; an imaginary line around the Earth parallel to the equator

## launch

to start up any computer program by clicking on its icon or selecting it from the Start menu

## Law

a description of how a natural phenomenon will occur under certain circumstances; a statement that summarizes the results observed in an experiment that is repeated many times by many different scientists. A scientific law is widely accepted as true or as a fact, such as Newton's Laws of Gravitation

## Law of Conservation of Energy

energy can be transferred from one system to another in many forms, however, it can not be created nor destroyed. Thus, the total amount of energy available in the universe is constant

## Law of Parsimony (Occam's Razor)

when you have two competing theories which make exactly the same predictions, the one that is simpler is the better; also called "Occam's Razor"

## Law of the Minimum

the growth of a population is limited by the resource in shortest supply. Also known as 'Liebig's Law'

## lead line

a line with a lead weight on the end used to measure depth. The lead is dropped into the water and marks on the line are read to determine the current water depth. The lead usually has a cavity to return a sample of the bottom type (mud, sand, etc.)

## least squares

a statistical criterion for the estimation of the goodness of fit in correlation analysis. Least squares methods aim to minimize the sum of squared differences between the observations and the predictions from a model

## lecithotrophic larva

a planktonic larva that gains its nutrition from yolk (semi-crystalline phospholipoprotein granules). In most bony fishes, yolk is supplied by the yolk sac, a bag-like ventral extension of the gut containing yolk granules

## lectotype

in taxonomy, one of several syntypes, designated by any author after the original publication of a species name as the 'type specimen' for the taxonomic name. Designated only where there was no original holotype

## leeward

referring to the side of an island or reef that faces away from the prevailing wind

## lek

a polygynous mating system where a number of males aggregate at a particular site during the breeding period and engage in courtship behavior, especially displays. Females attracted to the site "select " males for mating

and subsequent fertilization of eggs. Once mated, the females usually go elsewhere to lay their eggs or to complete gestation. Lekking behavior (also called arena behavior) has been observed among cuttlefish, fishes, birds, antelope, and insects. Lekking species tend to stay at a single lek throughout a breeding season and to return to the same lek site from breeding period to breeding period

## lenticel

aerial roots (pneumatophores) of mangroves contain spongy tissue connected to the exterior of the root via small pores called lenticels. During low tide, when lenticels are exposed to the atmosphere, oxygen is absorbed from the air and transported to and even diffused out of the roots below ground. This diffusion of oxygen maintains an oxygenated microlayer around the roots that enhances nutrient uptake.

## leptocephalus larva

a long, ribbon-like larval form that is characteristic of eels, tarpons, and bonefishes

## lepton

a class of subatomic particles that constitute matter which have no measurable size and do not interact with the strong nuclear force. The charged leptons are the electron, the muon, the tau and their antiparticles. Neutral leptons are called neutrinos

## lesion

any pathological or traumatic discontinuity of tissue, or loss of function of a part; a wound or injury to the tissues

## lethal gene

a mutant form of a gene whose phenotypic effect eventually results in the death of the bearing organism. Death from different lethal genes may occur at any time, from fertilization of the egg to advanced age. Lethal genes may be dominant, incompletely dominant, or recessive; also called a 'lethal allele'

## leucocyte

a cellular component of blood. Leucocytes help to defend the organism's body against infectious disease and foreign materials as part of the immune system; also called "white blood cell"

## leuconoid

the body form of highest complexity in sponges. The leuconoid form is highly irregular, displays the greatest degree of folding of the body wall, and has lost radial symmetry. The choanocytes line the pockets formed by the convoluted body wall

## leucophore

a colorless chromatophore which contains purines, usually guanine, in the form of small, motile crystals in the cell's cytoplasm

## library

in genomics, an unordered collection of clones (i.e., cloned DNA from a particular organism) whose relationship to each other can be established by physical mapping; a collection of cloned DNA fragments representing the genome of a particular organism

## LIDAR (Light Detection And Ranging)

a remote-sensing technique that uses a laser light source to probe the characteristics of a surface target. A laser emission may be directed downward from a low flying aircraft. Information about the target is derived from back-scattered reflectance or fluorescence of the target. Chlorophyll pigments in coral reef organisms (e.g., algae, seagrasses, coral), when excited by shorter (blue or green) wavelength light, emit light at longer (red) wavelengths, i.e., it fluoresces

## ligand

a molecule, such as a hormone or growth factor, that binds to a specific site on a receptor protein

## ligase

an enzyme used to join DNA (DNA ligase) or RNA (RNA ligase) segments together

## light emitting diode (LED)

a very small light often used in electronic instrumentation

## limits of acceptable change (LAC)

a framework for establishing acceptable and appropriate resource and social conditions in recreation settings. LAC is an approach to balance recreational use of a "wilderness" area with environmental and resource protection needs

## limnology

the study of the physical, chemical, meteorological and biological aspects of fresh waters

## limoniform

lemon-shaped

## limu

general Hawaiian name for all kinds of aquatic plants and soft corals; also terrestrial algae growing in any damp place on the ground, on rocks, and on other plants

## limu kohu

the Hawaiian name for the red alga, *Asparagopsis taxiformis*, an edible species that is no longer common in the Main Hawaiian Islands, but is relatively abundant the shallow waters of some of the Northwestern Hawaiian Islands



## line intercept transect

a linear transect protocol where a tape is secured at each end of the transect with the tape draped over the reef in between. Observations are collected on each species and substrate component and their length under the tape

## line point intercept (LPI)

a line of specified length (transect) laid out within a study site. Measurements and observations may be taken at specified intervals (points) along the line

## line precedence

in taxonomy, when two different names for the same taxon are first published in the same publication, then the one which appears on the earlier line has line precedence. Line precedence does not necessarily mean priority as well. This is determined by the action of the first reviser

## lineage

a genetically continuous line of evolutionary descent

## linear acceleration

the rate of change of velocity in a linear direction (along a straight line) with respect to time

## linear reef

a linear coral formation that is oriented parallel to the shore or the shelf edge

## linear regression

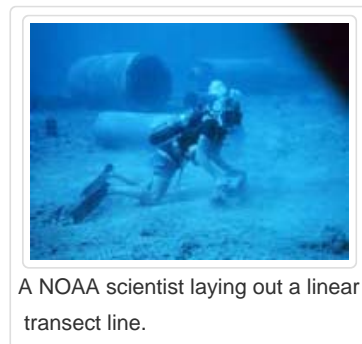
regression in which the relationship is linear

## linear relationship

a situation in which the best-fitting regression line is a straight line

## linear transect

a line of specified length laid out within a study site. They are generally positioned parallel to the shore along depth contours. Measurements and observations may be taken along the entire surface beneath the line (line intercept transect) or at specified intervals along the line (point intercept transect)



A NOAA scientist laying out a linear transect line.

## linguiform

tongue-shaped

## linkage

the proximity of two or more markers (genes, etc.) on a chromosome; the closer together the markers are, the lower the probability that they will be separated during DNA repair or replication processes, and hence the greater the probability that they will be inherited together

## linked genes

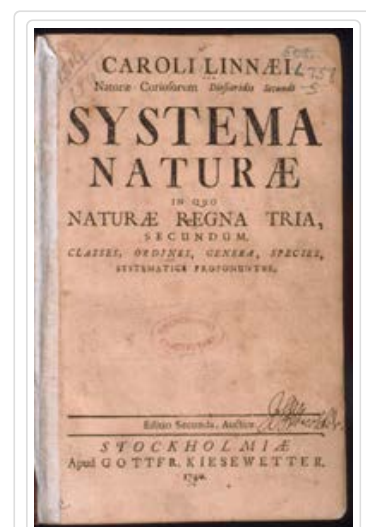
genes that are so closely associated on a chromosome that the allelic forms found on a chromosome are inherited together by an offspring at least 80 percent or more of the time

## Linnaean tautonymy

in taxonomy, the identical spelling of a new genus-group name and a pre-Linnaean (i.e., before 1758) one-word name cited as a synonym of only one of the species or subspecies originally included in that genus

## Linnaeus, Carolus

the 18th century Swedish botanist (1707-1778) who established the modern binomial system of biological nomenclature for plants and animals. His non-latinized name was Carl von Linne



In the 18th century, Linnaeus made a great contribution to science by developing systems of classification and nomenclature to organize the explosion of information on plants and animals. The tenth edition (1758-59), of Linnaeus's classic work, *Systema Naturae*, was chosen as the starting point for zoological nomenclature. (Photo: Smithsonian Institution Libraries)

## lionfish

the red lionfish (*Pterois volitans*) is a venomous coral reef fish belonging to the scorpion fish family (Scorpaenidae). Native to the Indian and western Pacific oceans, lionfish are now an invasive species found in the western Atlantic Ocean from southern Florida to New York and Bermuda. They appear to be reproducing along the southeastern U.S. coast; Other common names are turkeyfish, dragonfish, and firefish



The lionfish, *Pterois volitans*, is a recent invasive species in the western Atlantic Ocean. Like some other members of the scorpion fish family, the lionfish is a venomous animal, possessing venom glands at the base of the dorsal, anal and pelvic fin spines. The venom is injected in a potential predator via the spines. The genus *Pterois* contains eight species variously referred to as lionfishes, turkeyfishes, or firefishes. The lionfish is an inhabitant of near and offshore coral and rocky reefs. During the day, it seems to prefer shelter under ledges or in caves or crevices. (Photo: Paula Whitfield, NOAA Beaufort Laboratory)

## Lionfish Tissue Repository

a large, multi-national collaborative program, jointly managed by NOAA and the Reef Environmental Education Foundation (REEF), intended to maintain and provide tissue samples for research into the ecological and evolutionary processes driving the ongoing invasion of lionfish (*Pterois* spp.) in the Caribbean and western Atlantic

## lipase

an enzyme, secreted by the pancreas and the glands of the small intestine, that breaks down fats into glycerol and fatty acids during digestion

## lipid

a group of organic compounds, including the fats, oils, waxes, steroids, and triglycerides, that are insoluble in water but soluble in common organic solvents, and are oily to the touch. Together with carbohydrates and proteins, lipids constitute the principal structural materials of cells

## lipophilic

having an affinity for, attracting, or the ability to adsorb or absorb lipids (fats)

## lipopolysaccharide

a compound containing a lipid bound to a polysaccharide

## liposome

an artificial, single or multilaminar vesicle, made from a lipid, that is used for the delivery of a variety of biological molecules or molecular complexes to cells, e.g., drug delivery and gene transfer. Liposomes are also used to study membranes and membrane proteins

## Listserv Â®

the most common kind of maillist found on the internet

## lithoherm

a deep-water mound of limestone, usually formed by submarine consolidation of carbonate mud, sand and skeletal debris

## lithosphere

the outer solid part of the earth, including the crust and uppermost mantle. The lithosphere is about 80-100 km thick, although its thickness is age dependent The lithosphere below the crust is brittle enough at some locations to produce earthquakes by faulting, such as within a subducted oceanic plate

## Lithothamnion ridge

a synonym for algal ridge. The algal genus *Lithothamnion* is important in maintaining reef integrity by cementing various pieces of calcium carbonate

## littoral

intertidal; between low and high tide levels



This sea slug is a denizen of northwest U.S. rocky littoral (intertidal) zones.

## live rock

calcareous rock which is removed from the vicinity of a coral reef with some of the life forms on it still living. These may include bacteria, coralline algae, sponges, worms, crustaceans and other invertebrates. Live rock is commonly used in reef aquaria because it contains bacteria that can help filter the water through nitrification



Live rock from Tonga, crated for shipping to an aquarist. (Photo: <http://www.reefscience.com>)

## liveboard

a commercial dive boat with sleeping and eating accommodations. Scuba divers live aboard the boat for several days and usually visit dive locations inaccessible to other divers



A liveboard dive boat designed and constructed with divers and underwater photographers in mind. A vessel such as this may accommodate up to 20 passengers in private cabins, all with full bathrooms. It is fully air-conditioned with a state-of-the-art dive center, and complete photo and video labs with daily E6 processing. Wide dive platforms provide easy water entries and exits. (Photo: *Belize Aggressor*)

## lobate

lobe-shaped



This comb jelly (ctenophore) possesses a lobate shape. (Photo: NOAA)

## lobe

a rounded projection

## local extinction

the complete loss of an organism in a specific part of its range

## locomotion

the act of moving, or the ability to move, from place to place

## loculus

an anatomical term for any small compartment or recess; a small cavity or space within an organ or in a plant or animal; a calcified area or fiber-filled space within the axial skeleton (axis) of a gorgonian; a space within the gastrovascular cavity between septa

## locus

the position of a gene, DNA marker, or genetic marker on a chromosome

## logarithmic phase

the steepest slope of the growth curve of a culture; the phase of vigorous growth during which cell number doubles every 20-30 minutes; also called 'log or exponential growth phase'

## logarithmic scale

a constant ratio scale in which equal distances on the scale represent equal ratios of increase. For example, in a logarithmic scale, the distance between 10 and 100 is the same as the distance between 100 and 1000, or between 1000 and 10,000. Logarithmic scales are used when the range of numbers being represented is large

## long gill net

a gill net that has a float line that is more than 1,000 yd (914 m) in length

## long term monitoring

the repeated surveying of organisms, populations, communities, or environmental parameters over time to help us understand a variety of natural processes

## longitude

an imaginary great circle on the surface of the Earth passing through the north and south poles at right angles to the equator; "all points on the same meridian have the same longitude"

## longline

a fishing line that is deployed horizontally to which baited hooks are attached. A longline may be a bottom longline, i.e., designed for use on the bottom to catch ground fishes, or a pelagic longline, i.e., designed for use off the bottom to catch pelagic fishes such as tuna and swordfish. The longline hauler may be manually,

electrically, or hydraulically operated

## longshore current

a current that flows parallel to the shore just inside the surf zone. It is also called the littoral current

## look bucket

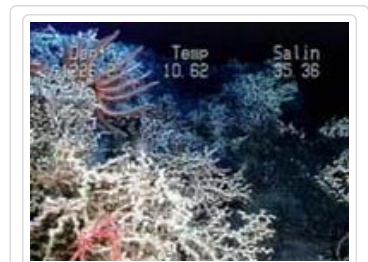
a bucket with a see-through bottom made of glass or plexiglass. The transparent bottom is lowered below the water surface allowing the user to observe underwater features

## Loop Current

a warm, swift, ocean current that flows northward between Cuba and the Yucatán peninsula, moves into the Gulf of Mexico, loops clockwise in the eastern Gulf before exiting east into the Atlantic Ocean through the Florida Straits. It is part of the western boundary current system of the North Atlantic subtropical gyre and may extend to great depths. An eddy, or Loop Current ring, separates from the Loop Current and may drift slowly westward into the central and western Gulf of Mexico

## Lophelia reef

a reef formed by *Lophelia pertusa*, a deep-sea coral found in all oceans except the Arctic Ocean



This photo of a *Lophelia* coral garden was taken via a manned submersible on the ocean floor. (Photo: NOAA)

## lophocyte

a mobile cell in sponges that produces collagen

## lophophorate

an informal taxonomic unit that includes colonial metazoans which possess a specialized filter-feeding organ, the lophophore. Almost all lophophorates are marine organisms and all are suspension feeders. Lophophorates are deuterostomes and are typically considered relatively closely related to chordates and echinoderms. There are three lophophorate phyla: Phoronida, Bryozoa and Brachiopoda

## lophophore

a feeding organ possessed by lophophorates. It is a disk or horseshoe-shaped structure which surrounds the mouth and bears the tentacles of the Bryozoa (moss animals), Brachiopoda (lamp shells) and Phoronida (horseshoe worms). The tentacles are hollow (coelomic) and covered with cilia which generate water currents that draw food toward the mouth

## LORAN (LONg RANge Navigation)

a navigation system developed in the 1950's based on the time displacement between signals from two or more fixed shore based antennae

## lotic

refers to a flowing or running body of fresh water, i.e., streams and rivers



A peaceful lotic environment, the Patuxent River, eastern Maryland, in December 2000. (Photo: Mary Hollinger, NOAA/National Oceanographic Data Center)

## low recruitment

a low influx of new members into a population by reproduction or immigration

## low tide

the lowest level of the tide; the minimum height reached by each falling tide



A small island at the mouth of the Amazon River at low tide. See **high tide** for contrast. (Photo: Alessandra and Michael)

## lower palmata zone

the part of a reef crest that is seaward of the palmata zone. It consists primarily of elkhorn coral (*Acropora palmata*) at a depth of about 3-6 m in Caribbean reefs



A young *Acropora palmata* colony in St. Croix, U.S. Virgin Islands (Photo: J. Halas)



## luciferase

the enzyme which activates luciferin, in the presence of ATP, to produce bioluminescence

## luciferin

a compound whose activated form emits light. In the presence of the enzyme luciferase and ATP, luciferin is oxidized to produce oxyluciferin and energy given off as cold light (bioluminescence)

## lumen

the interior space of a tubular organ, such as a blood vessel or an intestine

## lumen

unit of luminous flux

## luminous

emitting light.

## luminous flux

the rate of flow of light energy

## lumisome

in some cnidarians, a small, intracellular membrane-enclosed vesicle which contains all the proteins necessary for bioluminescence

## lumper

refers to a taxonomist who focuses more on similarities than differences among taxa, discounting the importance of minor variation among individuals, and who tends to recognize fewer taxa

## lunate

crescent-shaped



Blue tangs with lunate-shaped caudal fins. (Photo: NOAA)

## lux

unit of illumination equal to one lumen per square meter

## lycra

a spandex textile fiber which has unique elastic qualities in that it can be used in very lightweight, durable fabrics of long-lasting elasticity. It has excellent tensile strength, a long flex life, and high resistance to abrasion and heat degradation. Lycra skin coverings are popular with scuba divers as they give some protection against abrasions and jellyfish and fire coral stings. They also offer (minimal) protection against cold

## lysis

the breakdown of a cell caused by rupture of its cell membrane and loss of cytoplasm. Lysis can be caused by viral action, chemical or physical means; to break down

## lysosome

a spherical organelle found in animal cells that contains hydrolytic enzymes for breaking down (digesting) complex molecules. They are part of the intracellular digestive system. Lysosomes bud from the cell's Golgi apparatus

## lysozyme

a bacteriolytic enzyme found in many animal secretory products. Lysozymes attack the cell wall of gram-positive bacteria leading to the bacterium's death

A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |

## macerate

to disintegrate tissues by means of cutting, soaking or enzymatic action to obtain a cell dissociation

## macro

a text file containing a sequence of commands that can be executed as one command.

## macroalgae

algae that project more than one centimeter above the substratum



Macroalgae are important habitat on temperate and northern reefs.

## macrobenthos (macrofauna or macroflora)

benthic organisms (animals or plants) whose shortest dimension is greater than or equal to 0.5 mm

## macroevolution

evolution on the grand scale resulting in the origin of higher taxa

## macrogamete

the larger of the two gamete types in a heterogametic organism. It is considered as the the female gamete

## macromolecule

a large polymer, such as DNA, RNA, protein, lipid or polysaccharide, made up of thousands of atoms

## macronutrient

a nutrient, such as a nitrate or phosphate, that is required by plants in relatively large quantities in order to undergo photosynthesis and growth

## macrophage

an amoeboid cell capable of moving through tissues, engulfing and destroying dead cells or bacteria. Certain white blood cells are the most aggressive macrophages

## macrosmatic

pertains to animals with a well developed olfactory (smell) sense

## macula

a dark spot, blemish; the small, highly sensitive area (of the human eye) which is located in the center of the retina. It is responsible for near and fine detail vision

## Madden Julian Oscillation (MJO)

a major perturbation of tropical convection which moves and completes a global circuit every 30 to 60 days. It is a dominant cause of intraseasonal variability in tropical equatorial regions

## madreporite

a perforated platelike structure in most echinoderms that forms the intake for their water vascular systems



The white spot in the middle of the

central disc of the starfish is the madreporite, the opening into the echinoderm+s water vascular system.

## maerl

a collective term for two or three species of calcareous algae in the family Corallinaceae. Ground or granulated products from these algae are used as a fertilizer; fine-grained carbonate-rich mud

## magenta

reddish purple color

## magma

molten rock that forms naturally within the Earth. Magma may be either a liquid or a fluid mixture of liquid, crystals, and dissolved gases

## magmatic hotspot

in geology, a hotspot is a location on the Earth's surface that has had volcanism for a long period of time. Geologists have identified some 40-50 such hotspots

## magnetic north

the direction a compass needle points when there are no local interfering influences

## maillist (mailing list)

a system that allows people to send e-mail to one address, whereupon their message is copied and sent to all of the other subscribers to the maillist. In this way, people who have many different kinds of e-mail access can participate in discussions together

## maitotoxin

a neurotoxic compound which is produced by certain marine dinoflagellates and associated with the digestive tract of herbivorous fishes. It is responsible for a form of seafood poisoning in humans eating tropical coral reef fishes

## makatea

a fossil coral reef

## malacology

the scientific study of mollusks



A Pacific octopus (Mollusca) photographed during the NOAA Submarine Ring of Fire expedition, 2002. (Photo: NOAA Ocean Explorer)

## Malacostraca

a class of arthropods in the subphylum Crustacea. The more than 20,000 described species of Malacostraca can be divided into two groups, the Phyllocarida, and the Eumalacostraca. Phyllocarida contains the oldest crustacean known and includes only one living group. The Eumalacostraca consists of all Malacostracan groups other than the Phyllocarida. Eumalacostracans generally possess a well-developed carapace and a long, muscular abdomen. It is the group that contains most of the animals the general public recognize as crustaceans, such as shrimp, crabs, lobsters

## maladaptation

an action implemented to reduce vulnerability to climate and/or ocean change that impacts adversely on or increases the vulnerability of other systems, sectors, or social groups

## malar

pertaining to the cheek region of vertebrates

## Mammalia

a class of warm blooded animals (mammals) whose common characteristics include the presence of hair, milk-secreting glands, a muscular diaphragm between the abdominal and pleural and mediastinal cavities, a lower jaw composed of a single pair of bones, a middle ear containing three bones, and the presence of only a left systemic arch



Dolphins are among the most recognizable marine mammals; this one floats serenely in the Caribbean Sea. (Photo: Copyright Corel Corporation)

## mammalian dive reflex

the physiological responses, including bradycardia and shutdown of the peripheral circulation, which occurs during dives by an air-breathing vertebrate

## mammalogy

the scientific study of mammals

## mandible

pertains to mouth parts; the lower jaw

## mangal

relating to a shoreline ecosystem dominated by mangrove trees, with associated mud flats

## mangrove

a general name for several species of halophyte belonging to different families of plants (including trees, shrubs, a palm tree and a ground fern) occurring in intertidal zones of tropical and subtropical sheltered coastlines and exceeding one half meter in height. The term is applied to both the individual and the ecosystem, the latter of which is termed mangal. Mangroves provide protected nursery areas for juvenile reef fishes, crustaceans, and mollusks. They also provide a feeding ground for a multitude of marine species. Many organisms find shelter either in the roots or branches of mangroves. Mangrove branches are nesting areas for several species of coastal birds. The root systems harbor organisms that trap and cycle nutrients, organic materials and other important chemicals. Mangroves also contribute to higher water quality by stabilizing bottom sediments, filtering water and protecting shorelines from erosion. They protect reefs from land runoff sedimentation. Conversely, coral reefs protect mangroves and seagrasses from erosion during heavy storms and strong wave action. The nations with the largest mangrove areas include Indonesia (with 21% of global mangroves), Brazil (9%), Australia (7%), Mexico (5%), and Nigeria (5%). The global area of mangroves - 150 000 square kilometers - is equivalent to the area of the state of Illinois, or half the area of the Philippines. About one fifth of all mangroves are thought to have been lost since 1980, and although loss rates are declining, they are still 3 to 4 times higher than average global forest loss estimates



Mangrove nursery area, Puerto Rico.

## manta tow technique

a technique used to provide a general description of large areas of reef and to gauge broad changes in abundance and distribution of organisms on coral reefs. The technique, widely used in Australia, involves towing a snorkel diver (observer) at a constant speed behind a boat. The observer holds on to a 'manta board' attached to a small boat by a 17-meter length of rope. This person makes a visual assessment of specific variables during each manta tow (2 minutes duration), and records these data when the boat stops, on a data sheet attached to the manta board. The manta tow technique is used to provide a general description of large areas of reef and to gauge broad changes in abundance and distribution of organisms on coral reefs. The advantage of manta tow over other survey techniques is that it enables large areas of reefs to be surveyed quickly and with minimal equipment

## mantle

a membranous or muscular structure in mollusks that surrounds the visceral mass and secretes a shell if one is present



A cowrie, *Cypraea sp.*, with partially extended mantle.

## mantle (geology)

the middle layer of the Earth, lying just below the crust and consisting of relatively dense rocks. The mantle is divided into the upper mantle and the lower mantle; the lower mantle has greater density than the upper mantle

## mantle cavity

the space between the mantle and the rest of the body parts of a mollusk, which contains several important respiratory and reproductive organs

## manubrium

the proboscis of a jellyfish: a tubular structure that connects the mouth to the digestive cavity



The mouth of a jellyfish is at the end of the manubrium, which extends to engulf prey. (Photo: NOAA/Florida Keys National Marine Sanctuaries)

## marae

in the Marquesas, a Polynesian sacred enclosure or a place of worship . In Hawaii, it is called a "heiau"

## mareogram

a graphic representation of the rise and fall of the sea level, with time as abscissa and height as ordinate, usually used to measured tides; may also show tsunamis; also called 'marigram'

## margin

a boundary, edge or border of a structure or surface

## Marianas Archipelago Reef Assessment and Monitoring Program (MARAMP)

a multi-agency effort that began in 2003 with the first cruise to the Mariana Archipelago. The objective of MARAMP is to rapidly evaluate and map the shallow water reef habitats in the Mariana Archipelago. Scientists on board the National Oceanographic and Atmospheric Administration (NOAA) research vessel Oscar Elton Sette use a variety of techniques to study the oceanography and coral, fish, algae, and benthic habitats around most of the islands and offshore banks of the archipelago

## mariculture

the cultivation of marine organisms under controlled conditions; a synonym for marine aquaculture



Shrimp farms and their waste runoff have resulted in the destruction of coastal habitats and added to pollution in critical estuarine waters.

## Marine Aquarium Council (MAC)

an international, not-for-profit organization that brings marine aquarium animal collectors, exporters, importers and retailers together with aquarium keepers, public aquariums, conservation organizations, and government agencies. Its mission is to conserve coral reefs and other marine ecosystems by creating standards and certification for those engaged in the collection and care of ornamental marine life from reef to aquarium

## marine debris

debris composed primarily of plastics, nets, lines, other fishing gear, glass, rubber, metal, wood and cloth. Sources of debris are people on beaches, storm drains, fishing boats, waste treatment sites, and industrial facilities. These materials have damaging effects on coral reefs



Marine debris, such as this plastic bag, can kill coral. (Photo: NOAA)

## marine iguana

the marine iguana (*Amblyrhynchus cristatus*) inhabits the Galapagos Island, an



archipelago on the Equator, 800 kilometers west of the Ecuadorian coast. It differs from the mainland iguanas by the shape of the snout and other morphological features. The species probably rafted to the islands many millions of years ago, and developed a new ecological niche. They feed almost exclusively on marine algae and seaweed in the intertidal zone, and some make shallow dives past the breaker zone



A marine iguana from the Galapagos Islands. (Photo: NOAA)

## Marine Life Conservation District (MLCD)

a designated area for the conservation and replenishment of marine resources. MLCDs allow only limited fishing and other consumptive uses, or prohibit such uses entirely. They provide fishes and other aquatic life with a protected area in which to grow and reproduce, and are home to a great variety of species

## Marine Managed Area (MMA)

see: Marine Protected Area

## Marine Protected Area (MPA)

any area of the marine environment that has been reserved by federal, state, territorial, tribal or local laws or regulations to provide lasting protection to part or all of the natural or cultural resources within them. Familiar examples of U.S. MPAs include National parks, wildlife refuges, monuments and marine sanctuaries, fisheries closures, critical habitat, habitat areas of particular concern, state parks, conservation areas, estuarine reserves and preserves, and numerous others. Areas which are not MPAs are areas where access is restricted for reasons other than conservation (such as security zones, shellfish closures, sewage discharge areas, and pipeline and cable corridors), or unprotected areas that are logistically inaccessible due to weather, sea state, etc; MPAs are sometimes called Marine Managed Areas (MMA). However, "marine protected area" is a broad, inclusive term which includes both multi-purpose sites with some restrictions as well as the more restrictive "no take marine reserves."

## marine protected area (MPA) spillover

MPA spillover refers two types of movements outside the MPA: (1) adults and juvenile animals swim into adjacent areas, and (2) eggs, larvae and young post-larval stages can drift out from the MPA into the surrounding waters

## Marine Protection, Research, and Sanctuaries Act (MPRSA )

the MPRSA (1972) provides protection for many coral reefs by authorizing NOAA to designate areas as marine sanctuaries and promulgate regulations for the conservation and management of those areas. Since the Act was passed, thirteen sanctuaries have been designated, several of which contain coral reef communities. Coral research, monitoring, and management activities are conducted in these sanctuaries, as well as in the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, which is currently (June 2004) under consideration to become the nation's fourteenth sanctuary

## marine reserve

an area in the ocean that is protected from uses that remove animals, plants, and other organisms, or alter their habitats

## Marine Resources Pacific Consortium (MAREPAC)

MAREPAC is a consortium made up of representatives from nine islands in Micronesia (Marshall Islands, Federated States of Micronesia, Northern Marianas, Guam, Palau, and American Samoa). MAREPAC's mission is to develop regional capabilities, foster collaboration, and disseminate accurate information in support of sound policy development on sustainable use of marine resources of cultural, economic, and scientific value

## marine snow

dense concentrations of particulate organic detritus and living organisms whose downward drift appears similar to a snowfall

## marine tenure

locally specified entitlements to marine territories and resources claimed and exercised by the 'guardians' or "owners" of those territories and resources

## maritime climate

a climate strongly influenced by an oceanic environment, found on islands and the windward shores of continents. It is characterized by small daily and yearly temperature ranges and high relative humidity

## marker gene

in genetic engineering, an easily identified gene that is inserted into an organism, along with a desired gene. The presence of the marker gene demonstrates that the transformation was successful

## marl

fine-grained carbonate-rich mud; a calcareous clay which contains approximately 30 to 65 percent calcium carbonate

## marsh

a soft, wet area periodically or continuously flooded to a shallow depth, usually characterized by a particular group of grasses, cattails and other low plants



Coastal marsh in Monterey Bay  
National Marine Sanctuary, CA.  
(Photo: Kip Evans)

## marsupium

an abdominal pouch where certain animals carry their young, as in some crustaceans and the brood pouch of the male seahorse

## MARXAN

software designed to provide decision support assistance for those designing biodiversity reserves or networks of reserves. MARXAN is a decision support tool to consider options in terrestrial and marine reserve design, supporting the implementation of ecosystem-based management (EBM) principles

## Mascarene Plateau

a submerged volcanic plateau dominating the western Indian Ocean, extending approximately 2,000 km between Seychelles and Mauritius. It covers an area of over 115,000 square kilometers of shallow water with depths ranging from 8 m to 150 m on the plateau, plunging to depths of 4000 m at its edges. It is the major marine ecosystem of the western Indian Ocean

## mass extinction

a catastrophic, widespread perturbation where major groups of species become extinct in a relatively short time

## mass spawning

spawning events where many different species spawn simultaneously

## mass spectrometer

a laboratory instrument that measures the mass-to-charge ratio of individual molecules that have been converted into ions. This information is then used to determine the masses of the molecules

## mass spectrometry

an analytical technique where ions are separated according to their ratio of charge to mass. The atomic weight of the particle can be obtained from the mass spectrum produced

## massive

having a large compact structure without a definable shape



Scuba divers examine a massive coral colony. (Photo: Australian Institute of Marine Sciences)

## massive colony

a coral colony that is solid and typically hemispherical in shape

## maternal mRNA

messenger RNA found in oocytes and early embryos that is derived from the maternal genome during oogenesis

## MATLAB

an integrated technical computing environment that combines numeric computation, advanced graphics and visualization, and a high-level programming language. MATLAB enables one to perform computationally intensive tasks faster than with traditional programming languages

## maxilla

pertains to mouth parts; the upper jaw

## maxilliped

one of the mouth appendages of crustaceans, situated behind the maxillae. Crabs have three pairs, but many of the lower crustaceans have only one pair

## maximum sustainable yield

the maximum number of a food or game population that can be harvested without harming the population's ability to grow back; the largest average catch or yield that can continuously be taken from a stock under existing environmental conditions

## mean

a statistical measure of central tendency. The sum of a set of observations divided by the number of observations. It is also referred to as 'arithmetic mean' and 'sample mean'

## mean high tide

the level to which the water rose on an average day over a previous period of time (years or decades); the average of all the high tides as calculated over a long period of time

## Mean Higher High Water (MHHW)

A tidal datum. The average of the higher high water height of each tidal day observed over the National Tidal Datum Epoch; The average height of the higher of the two daily high tides

## mean low tide

the average altitude of all low tides recorded at a given place over a long period of time

### mean lower low water (MLLW)

the average of the lowest tide recorded at a tide station each day during the recording period; The average height of the lower of the two daily low tides

### mean sea level

the level of the surface of the sea between mean high and mean low tide. It is used as a reference point for measuring elevations; the average height of the sea measured over 18.61 years.

### meandroid colony

a massive colony that has corallite mouths aligned in valleys, such that there are no individual polyps

### mechanoreceptor

a neurological receptor that responds to mechanical energy, e.g. pressure, touch, and gravity

### median

a statistical measure of central tendency. The middle-most value in a set of observations with an equal number of observations lying above and below the median value

### median fin

in fishes, an unpaired fin located on the sagittal plane of the body, i.e., the dorsal, caudal and anal fins

### medusa

the free swimming stage of some corals, jellyfish, anemones, hydroids and comb jellies, shaped like a bell or umbrella and swims by pulsations of the body



A jellyfish (medusa stage) showing its oral or subumbrella surface. The hanging tentacles bear stinging cells, used for food capture.

### medusa bud

one of the buds of a hydroid, destined to develop into a gonophore or medusa. Medusa buds are released from

the gonangium through a central opening, the gonopore

## medusoid

a body form resembling a medusa; umbrella shaped

## megabase (Mb)

unit of DNA or RNA sequence equal to one million (10<sup>6</sup>) pairs of nucleotide bases. Abbreviated Mb

## megabyte (mb)

a measure of storage space. One megabyte roughly translates to a million characters of text, or 180,000 words

## megafauna

animals exceeding 2 cm in length; a term referring to late Pleistocene large terrestrial mammals whose body weight exceeded 44 kg (100 lbs)

## megalops larva

the larval stage in brachyuran crabs that follows the zoea larval stage

## megasclere

a large spicule in sponges

## meio-

smaller; less than

## meiobenthos (meiofauna or meioflora)

benthic organisms whose shortest dimension is less than 0.5 mm but greater than or equal to 0.1 mm

## meiosis

a two-stage type of cell division in sexually reproducing organisms that results in the development of sperm and egg cells. In meiosis, a diploid cell divides to produce four haploid cells, each with half the original chromosome content. In organisms with a diploid life cycle, the products of meiosis are called gametes. In organisms with an alternation of generations, the products of meiosis are called spores

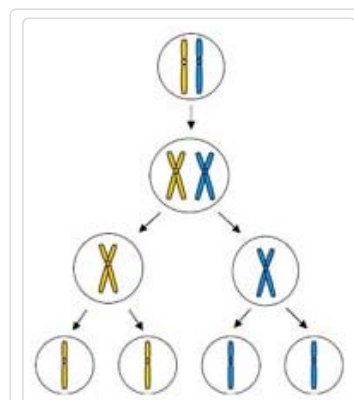
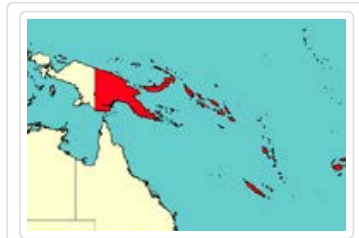


Diagram showing the meiotic division of a diploid cell, which in two divisions, results in the

production of four haploid daughter cells. This process is also termed gametogenesis because it results in haploid sperm and egg cells.

## Melanesia

a large region of volcanic islands which includes New Guinea, the Solomon Islands, Vanuatu, Fiji, Maluku, the Torres Strait Islands, and New Caledonia. The name "Melanesia" means "black islands", referring to the dark-complexioned inhabitants these islands



Map showing location of Melanesia. (Graphic: Melanesian Cultural Heritage Management Identification Study)

## melanic

very dark or black color

## melanin

a pigment in the skin of animals which determines skin and coat color. It is found in two chemically different forms: eumelanin (which produces brown and black) and pheomelanin (which produces yellow and red). Melanin also provides protection against the damaging effects of ultraviolet radiation

## melanistic

dark or blackish

## melanocyte

a cell in the inner layer of the epidermis that produce melanin

## melanophore

a chromatophore which contains black and brown pigments called melanin

## melon

a lens-shaped fatty deposit lying in the facial depression of many toothed whales, such as the bottle-nosed dolphin. It appears as the bulging forehead just in front of the blowhole. It contains fatty deposits, muscles, and nasal air sacs and passages. The melon is used in focusing a whale's sounds, functioning as an acoustical lens for echolocation. The fatty deposits change shape as the whale is producing sounds

## membrane filter

a thin microporous material of specific pore size used to filter bacteria, algae, and other very small particles from water

## Memorandum of Understanding (MOU)

an interagency agreement defining the role and responsibility which each agency has in dealing with particular issues

## Mendel's Laws of Heredity

the *Law of Segregation* states that each hereditary characteristic is controlled by two 'factors' (alleles), which segregate and pass into separate germ cells (gametes). The *Law of Independent Assortment* states that pairs of 'factors' segregate independently of each other when germ cells are formed

## Mendelian inheritance

one method in which genetic traits are passed from parents to offspring. It is named after the Austrian monk, Gregor Mendel, who first studied and recognized the existence of genes and this method of inheritance; a hereditary process explainable in terms of the behavior of chromosomes, e.g., segregation of chromosomes, independent assortment, and homologous exchange of parts



Gregor Mendel (1822-1884), the "father" of the science of genetics.

## Mendelian population

a natural, interbreeding unit of sexually reproducing organisms sharing a common gene pool

## menisciform

crescent-shaped

## meristic

pertains to serially repeated structures which can be counted, e.g. scales, vertebrae, fin rays, fin spines, other spines, myomeres, photophores, scutes, laterel line pores, etc

## mermaid's purse

an egg case of a shark or ray, usually oblong in shape with horns or tendrils



## meroblastic cleavage

incomplete cleavage of the zygote, restricted to the blastodisc, the non-yolky cytoplasm at one end of the egg; typical of teloblastic eggs

## merogony

a process that increases the number of infective cells of some parasites. A single large schizont gives rise to a large number of small merozoites that infect other host cells

## meroplankton

planktonic eggs and larvae which are temporary members of the plankton community

## mesenchyme

in cnidarians, a primitive "connective tissue" located between the epidermis and the gastrodermis. If it contains no cell components, it is termed "mesoglea"; undifferentiated cells of an embryo, derived from mesoderm, which give rise to connective tissue and the circulatory and lymphatics systems; amoebocytic cells often embedded in a gelatinous matrix

## mesenterial filament

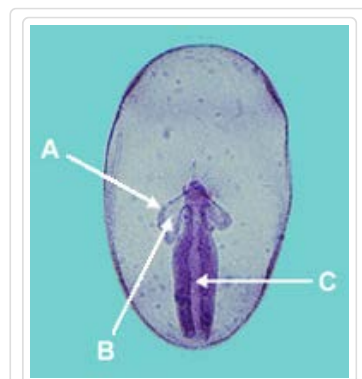
a thickened rim or ribbon-like extension running along the free border of a mesentery from the end of the actinopharynx downwards. They aid in the capture and digestion of food materials and may also assist in inhibiting substrate competitors

## meso-

a prefix meaning 'middle'

## mesoderm

the middle of the three germ layers of a triploblastic embryo that gives rise to the skeletal and support, muscular, blood vascular, urogenital and reproductive systems, and contributions to some glands



Late gastrula. This photograph is a dorsal view of the embryo, with the anterior being toward the animal pole and the posterior toward the vegetal pole. Note the beginning of the formation of enterocoelic (mesodermal) pouches, from which the mesoderm is derived, on

the right and left side of the anterior end of the gastrocoel. A - mesoderm; B - coelom; C - archenteron (Photo: Cell and Developmental Biology Online website (University of Guelph) <http://www.uoguelph.ca/zoology/devobio/>)

## mesoglea

the connective tissue layer between the epidermis and gastrodermis of cnidarians and ctenophores (comb jellies)



Inner tissues of this Giant Green Anemone (*Anthopleura xanthogrammica*) are separated by the mesoglea. (Photo: Lisa Eschenbach)

## mesohyle

the non-cellular gel layer (also called 'mesenchyme') of sponges. It is located between the epidermis (pinacoderm) and the choanoderm, the cell layer that lines the spongocoel. The mesohyle contains either spicules (supportive needles made of calcium carbonate) or spongin fibers (a flexible skeletal material made from protein); also called mesohyl

## mesolamella

a collagenous layer that separates the choanochambers of hexactinellid sponges (glass sponges)

## mesolecithal

a moderately telolecithal egg, typical of amphibians

## mesophotic coral ecosystems (MCEs)

light-dependent coral communities and their associated populations of algae, sponges and other invertebrates, and fishes, that occur in the deepest half of the photic zone (starting at 30-40 m and extending to over 150 m) in tropical and subtropical regions. This zone of diminished light is also referred to as the "twilight zone"

## Mesozoic

an era of time during the Phanerozoic eon lasting from 245 million years ago to 66.4 million ago

## messenger RNA (mRNA)

an RNA molecule that encodes the amino acid sequence of a protein. It is the mediating template between DNA and proteins. The encoded information from a particular gene is transferred from a strand of DNA by the construction of a complementary template strand of RNA (mRNA) through the *transcription* process. Next, three nucleotide segments of RNA, called tRNA (transfer RNA), which are attached to specific amino acids, match up with the template strand of mRNA to order the correct sequence of amino acids. These amino acids are then bonded together to form a protein in a process, called *translation*. Translation occurs in the ribosomes, which are composed of proteins and a third kind of RNA, rRNA (ribosomal RNA)

## metabolic gas

a gas which is released by the body as a result of metabolism. Carbon dioxide is an example of a metabolic gas

## metabolism

the sum of all the physical and chemical processes by which living organised materials are produced and maintained (anabolism), and also the destructive transformation processes by which energy is made available for the uses of the organism (catabolism)

## metabolite

a substance that takes part in the process of metabolism, which involves the breakdown of complex organic constituents of the organism's body with the liberation of energy for use in bodily functioning. The various compounds that take part in, or are formed by, these reactions are called metabolites

## metadata

information about data or other information. Metadata or "data about data" describe the content, quality, condition, and other characteristics of data

## metagamy

pertains to a reproductive cycle that alternates between sexual and asexual phases

## metagenesis

an alternation of sexual and asexual generations. When metagenesis occurs in cnidarians, the polyp is the asexual generation and the medusa is the sexual generation. A generalized life cycle occurs as follows: medusae produce gametes which unite to form zygotes. Each zygote divides repeatedly and develops into a free-swimming planula larva, which eventually settles and develops into a polyp. Each polyp then asexually produces medusae to complete the life cycle

## metagenome

all the genetic material present in an environmental sample, consisting of the genomes of many individual microbial organisms; the comprehensive range of all DNA sequences of a mixed bacterial sample from nature

## metagenomics

the application of modern genomics techniques to the study of communities of microbial organisms directly in their natural environments, bypassing the need for laboratory cultivation of individual species

## metamere

in biology, any of the homologous segments lying in a longitudinal series that make up the body of certain animals, such as earthworms and lobsters. A metamere is also called a 'somite'

## metamerism

in biology, the division of the body into a series of more or less similar segments (metameres), as in an annelid worm or a lobster



A polychaete worm exhibiting metamerism. (Photo: Rick Gillis, Ph.D., Biology Dept., University of Wisconsin-La Crosse)

## metamorphosis

change of body shape, e.g., the change from a larval form to a juvenile or adult form

## metanauplius larva

postnaupliar larva of crustaceans with the same general body and limb morphology as the nauplius, but having additional appendages



Crustacean metanauplius larva. (Photo: Dep.de formation des maitres. Physiologie animale, Universite Pierre & Marie Curie, Paris VI.)

## metanephridium

a type of excretory tubule in annelid worms. The metanephridium has internal openings called 'nephrostomes' that collect body fluids and conducts them to the outside through external openings, the 'nephridiopores'

## metanephros

the final excretory organ that develops in a vertebrate embryo. In birds, reptiles, and mammals it replaces the mesonephros as the functional excretory organ, and develops into the adult kidney

## metapopulation

a group of populations, usually of the same species, which exist at the same time but in different places. The dispersed population can replenish one another with migrants

## metazoa

multicellular animals having cells differentiated into tissues and organs, and usually a digestive cavity and nervous system

## metecdysis

the final stage in arthropod molting in which the new cuticle is hardened

## meteorology

the science that deals with atmospheric phenomena, especially weather and weather conditions



Meteorologists often study violent weather. (Photo: NOAA)

## meter

a unit of length which constitutes the basis of the Metric System. It is one ten-millionth part of the distance measured on a meridian of the Earth from the equator to the pole. One meter equals 39.37 inches

## methane

an odorless gas produced by the decomposition of organic matter

## method

a description of how data and information are collected

## metric system

a decimal system of measures and weights with the meter and the gram as bases

## microarray

in genomics, a tool for studying how large numbers of genes interact with each other and how a cell's regulatory networks control vast batteries of genes simultaneously. A robot is used to precisely apply tiny

droplets containing functional DNA to glass slides. Researchers then attach fluorescent labels to DNA from the cell they are studying. The labeled probes are allowed to bind to cDNA strands on the slides. The slides are put into a scanning microscope to measure how much of a specific DNA fragment is present

### microatoll

a circular colonial corallum up to 1 m height and 4 m diameter. Growth is mainly lateral, as upward growth is limited by aerial exposure

### microbe

a nonspecific term for small organisms that can be seen only with the aid of a microscope. The term encompasses viruses, bacteria, yeasts, molds, and protists. The term, however, is used most frequently in reference to bacteria

### microbenthos (microfauna or microflora)

benthic organisms whose shortest dimension is less than 0.1 mm

### microbial loop

a micro-food chain that works within (or along side) the classical food chain. In the microbial loop the smallest organisms, the heterotrophic bacteria and pico-plankton, use dissolved inorganic material directly as carbon and energy sources. These organi

### microbiology

the study of organisms that can be seen only with the aid of a microscope

### microbiota

organisms which are invisible, or nearly so, to the naked eye

### microecology

the study of the interactions between microorganisms and their environment

### microenvironment

a specific set of physical, biological, and chemical factors immediately surrounding the organism

### microevolution

relatively minor change in the composition of a species' gene pool over time

### microfauna

animals which are invisible, or nearly so, to the naked eye

## microflora

plants which are invisible, or nearly so, to the naked eye

## microhabitat

a smaller part of a habitat that has some internal interactions allowing it to function self-sufficiently within a generally larger habitat, such as a patch reef in a lagoon

## micrometer

an instrument for measuring very small distances

## micron ( $\mu$ )

a unit of length equivalent to a micrometer ( $\mu\text{m}$ ), one-millionth of a meter or 0.00003937 inch

## Micronesia

a region situated between the Mariana Trench in the west and the Line Islands in the east. The name "Micronesia" means "tiny islands." the Federated States of Micronesia consists of the states of Yap, Chuuk, Pohnpei, and Kosrae. This region is composed of thousands of small islands, mostly atolls



Map of Micronesia. (Graphic: U.S. CIA)

## micronutrient

a nutrient, such as iron, copper, or zinc, that is required in very small amounts by plants in order to photosynthesize and thrive

## micropyle

the minute aperture in the egg membrane for the entry of the sperm cell

## microsatellites

loci (or regions within DNA sequences) where short sequences of DNA nucleotides are repeated in tandem arrays (the sequences are repeated one right after the other). The lengths of sequences used most often are di-, tri-, or tetra-nucleotides. In the literature they can also be called simple sequence repeats (SSR), short tandem repeats (STR), or variable number tandem repeats (VNTR). Microsatellites are inherited in a Mendelian fashion. They are widely used in the following applications: forensic identification and relatedness testing; diagnosis and identification of diseases; population studies (by looking at the variation of microsatellites in populations, inferences can be made about population structures and differences, genetic drift, genetic bottlenecks and even the date of a last common ancestor); and conservation biology where they can be used to detect sudden changes in population, effects of population fragmentation, and interaction of different populations. Microsatellites are useful in identification of new and incipient populations

## microclere

a small spicule in sponges

## microscopic section

a very thin slice of biological tissue or mineral or other substance for examination under a microscope

## microsmatic

pertains to animals with a poorly developed olfactory (smell) sense

## microvillus

any of the minute hairlike structures projecting from the surface of certain types of cells

## microwave

any electromagnetic radiation having a wavelength in the approximate range from one millimeter to one meter, the region between infrared and short-wave radio wavelengths

## midlittoral zone

the portion of the intertidal zone that is covered and uncovered by water each day



## migration

the large-scale movement of a population for some specific purpose





## migration corridor

a set route that migratory animals follow when they migrate from one area to another

## Millennium Coral Reef Mapping Project (MCRMP)

the Institute for Marine Remote Sensing (IMaRS) at the University of South Florida is funded by the Oceanography Program of the National Aeronautics and Space Administration (NASA) to provide an exhaustive worldwide inventory of coral reefs using high-resolution satellite imagery. The project uses Landsat 7 satellite imagery to map the extent and diversity of coral reefs worldwide at geomorphological levels

## milliammeter

an instrument for recording very small electrical currents

## millipore filter

a thin membrane composed of cellulose fibers that is used, for example, as a filter in the bacteriological examination of water

## milt

the testes of fishes when filled with semen; fish seminal fluid



The testes of this male adult salmon produce milt when ready to spawn. The milt becomes a liquid, containing sperm cells, and exits through the vent opening to fertilize eggs. (Photo: Pacific Streamkeepers Federation)

## mimicry

the appearance or characteristics of one organism that copies or "mimics" another in order to gain some advantage; the organism may resemble some other natural object as an aid in concealment

## Minamata disease

mercury poisoning of humans from eating contaminated seafood

## mineral accretion

a technique used to grow corals on artificial reefs using electricity to accrete minerals thereby cementing coral colonies to the substrate. Applying a low voltage to a metallic structure causes calcium carbonate (CaCO<sub>3</sub>) to build on the metal, upon which coral larvae can attach, settle and feed. This greatly speeds the coral reef growth process. The voltage is low enough that it can easily be generated by floating solar panels or from wave action

## mineral deposit

an accumulation of naturally occurring minerals

## mini-atoll

a ring-shaped patch reef with a central area (lagoon) containing sand

## mitigation

the act of making less severe or intense; measures taken to reduce adverse impacts on the environment

## mitigation plan

a proposal to reduce or alleviate potentially harmful impacts

## Mitochondrial DNA (mtDNA)

DNA that is located in the mitochondria of cells. It is inherited only from the female parent

## mitochondrial genome

the genetic material of the mitochondria. It is similar in structure to that of the prokaryotic genetic material, formed of a single circular DNA molecule. The mitochondria of sexually-reproducing animals usually comes only from the maternal side, and is essentially the same as that of the mother. Sometimes mitochondria from spermatozoa are also passed on to offspring. Mitochondrial DNA has been studied to trace lineage far back in time

## mitochondrion

an organelle found in the cells of most eukaryotes. Mitochondria are sometimes described as cellular "power plants" because their primary function is to manufacture adenosine triphosphate (ATP), which is used as a major source of cellular energy



Electron micrograph of a single mitochondrion showing the organized arrangement of the protein matrix and the inner mitochondrial membranes. (Photo:

## mitogen

any substance that causes cells to begin dividing by mitosis

## mitogenome

mitochondrial genome; DNA found in mitochondria, which contains some structural genes and is generally inherited only through the female line

## mitosis

the process of nuclear division in eukaryotic cells that produces two daughter cells from one mother cell, all of which are genetically identical to each other. See cell division -

## mitotic spindle

a network of fiber-like microtubules that forms in a cell's nucleus during mitosis (nuclear division) which connects the centrosomes to the kinetochores and helps move the chromosomes around

## mixed layer

near-surface waters subject to mixing by the action of wind and waves. There is little variation in salinity or temperature at depths below the mixed layer

## mixed zone

the populous region of most bank/barrier reefs seaward of the lower palmata zone. It begins at a depth of 6-8 m

## MMM (Maximum Monthly Mean SST climatology)

the highest expected (climatological) monthly SST expected at all ocean locations based on 15 years of monthly mean SST data (serves as the input threshold for the Coral Bleaching HotSpot charts)

## mode

a statistical measure of central tendency. The number that appears most in a sequence of numbers. A list of numbers can have more than one mode

## Modern Synthesis

the synthesis of natural selection and mendelian inheritance

## modifier gene

a gene that modifies the effect produced by another gene

## moiety

a component part of a complex molecule

## molar

a large flat or ridged-topped tooth adapted for crushing or grinding

## molariform

shaped like a molar tooth, being rounded and flattened. In fishes, molariform teeth are used for crushing mollusks and crustaceans

## mole

the mass of a compound in grams numerically equal to its molecular weight. Also, the mass of a compound containing Avogadro's number of molecules

## molecular biology

a branch of biology that studies the biology of a cell at the molecular level. Molecular biological studies are directed at studying the structure and function of biological macromolecules and the relationship of their functioning to the structure of a cell and its internal components. Great attention is given to genetic aspects such as replication, transcription and translation

## molecular genetics

the study of how genes function to control cellular activities

## molecular weight

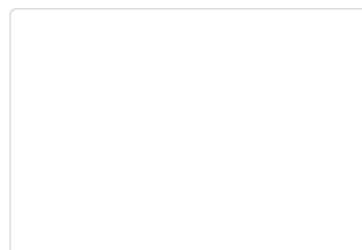
the sum of the atomic weights of the atoms in a molecule

## molecule

a small particle composed of two or more atoms. Molecules are a stable configuration of atomic nuclei and electrons bound together by electrostatic and electromagnetic forces. They have characteristic physical and chemical properties, different from the atoms of which they are composed

## Mollusca

an animal phylum that includes bivalves, squids, octopuses and snails. They are distinguished by a muscular foot, a calcareous shell secreted by the underlying body wall (the mantle) and a feeding organ (the radula). Many species are common inhabitants of coral reefs





Atlantic deer cowrie (*Cypraea cervus*) grazing in the Flower Garden Banks National Marine Sanctuary. (Photo: Frank and Joyce Burek)

## molt

to shed part or all of a coat or outer covering, such as, shell, feathers, cuticle or skin, which is replaced periodically by a new growth

## monaxon

a linear spicule in sponges; a single rod or ray with a pointed, hooked, or knobbed end

## Monera

the Kingdom composed of prokaryotic organisms. They have a cell wall, and lack both membrane-bound organelles and multicellular forms. The Archaeobacteria, the most ancient of this Kingdom, are so different that they may belong to a separate kingdom. Monera include the cyanobacteria and eubacteria

## moniliform

contracted at short, regular intervals like a string of beads; bead-like

## monitoring

the systematic collection of data over time

## monk seal

an endangered species of seal (*Monachus schauinslandi*) normally found on the leeward (southwest) sides of the Northwestern Hawaiian Islands, and occasionally sighted in the Main Hawaiian Islands. It is estimated that fewer than 1500 Hawaiian monk seals exist today. The Hawaiian monk seal was officially designated endangered 1976 and is protected by the Endangered Species Act and the Marine Mammal Protection Act. It is illegal to kill, capture or harass monk seals. A critically endangered species of monk seal (*Monachus monachus*) is found in the Mediterranean Sea. The Caribbean monk seal (*Monachus tropicalis*) is thought to be extinct

## mono-

a prefix meaning one

### monoecious

having combined sexes. Individuals of monoecious species contain the reproductive systems of both males and females

### monofilament

a single large filament or threadlike structure of a synthetic fiber, such as a monofilament fishing line

### monogamy

a male and a female mating only with each other

### monomer

in chemistry, a single molecule that is the subunit of a polymer; in genetics, a character determined by a gene or genes at a particular locus

### monomorphic

occurring in only one form

### monopectinate gill (ctenidium)

in mollusks, refers to having gill lamellae on one side of the ctenidial axis

### monophagous

eating one kind of food only

### monophyletic group

a group of organisms descended from a common ancestor

### monosaccharide

a sugar that does not hydrolyse to produce other sugars; the simplest group of carbohydrates

### monotonic function (monotone function)

in mathematics, a function that either never decreases or never increases as its independent variable increases

### monotype

in taxonomy, a situation where a genus group taxon is established with only one immediately subordinate taxon, e.g., a genus containing only one species

## monsoon

a periodic wind caused by the effects of differential heating, with the largest being the Indian monsoon found in the Indian Ocean and southern Asia

## Montastraea

a genus of hard (stony) coral that includes the boulder coral and the great star coral



Great star coral (*Montastraea cavernosa*) is one of four species of *Montastraea* found at the Flower Garden Banks in the Gulf of Mexico. (Photo: Dr. Stephen Gittings)

## montiform

mountain-shaped

## moorish idol

a bony fish species (*Zanclus cornutus*) in the family Zanclidae. The moorish idol is the only species in the family. It has a long, white, sickle-shaped dorsal fin, two broad vertical black bars on the body, and a yellow-orange saddle across the s

## moray eel

any of numerous chiefly tropical, brightly colored marine eels of the family Muraenidae that commonly inhabit coral reefs

## morbidity

illness or disease; the incidence and prevalence of a specific disease

## morgan

unit of inferred distance between genes on a chromosome

## morph

a distinct genetic form or variant of a particular species. For example, a distinct color phase of a species that exhibits more than one color

## morphogenesis

a change in the shape or structure of an organism through growth and differentiation

## morphology

a branch of biology that deals with the form and structure of organisms, apart from their functions (physiology)

## morphometric character

a measurement of a body part, e.g., head length or eye diameter

## mortality

the death rate, measured as the number of deaths per a certain population during a specific time period; may describe the population as a whole, or a specific group within a population

## morula

a stage of embryonic development in which the cleaving cells (blastomeres) appear as a cluster of blastomeres without a cavity; precedes the blastula stage of embryonic development

## mosaic teeth

the series of rows of flat teeth found in rays, skates and some sharks. They are used for crushing hard foods as mollusks and crustaceans; also called "pavement teeth"

## motile

capable of self-locomotion in organisms

## motu

a coral island in the lagoon of an atoll

## mouth brooder (oral brooder)

a fish which broods or protects the eggs or young by taking them into the mouth cavity

## mouthparts

a collective term for the appendages around the mouth of crustaceans which are concerned with feeding: mandibles, maxillae and maxillipeds



## muciferous

producing or containing mucus

## mucophagy

feeding on the mucus of fishes or invertebrates

## mucus

a gelatinous material secreted by specialized mucous cells. In corals, it functions in protection from bacterial invasion, food capture, and removal of sediment particles. Mucus is usually moved by cilia (motile hair-like extensions of the cell membrane)

## mucus cell

a cell which secretes mucin, which, when mixed with water forms mucus; in cnidarian polyps, mucus trap food particles, removes sediments, lubricates the actinopharynx, protects against desiccation, UV radiation, and other environmental stresses; also called mucocyte or mucosecretory cell,

## mud

a fine sediment often associated with river discharge and buildup of organic material in areas sheltered from high-energy waves and currents

## mud flat

a relatively level area of fine silt along a shore (as in a sheltered estuary) or around an island, alternately covered and uncovered by the tide, or covered by shallow water



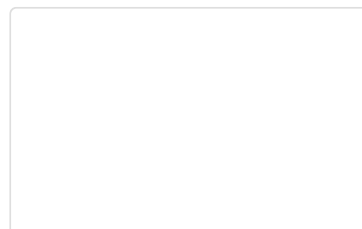
Nutrient-rich mudflats at the Gulf of the Farallones National Marine Sanctuary in California. (Photo: Dan Howard)

## Mullerian mimicry

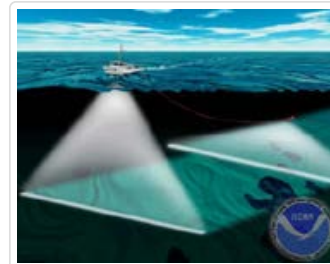
a form of protective mimicry in which noxious species evolve through convergent evolution to resemble each other

## multibeam sonar

sonar signals arriving at a target, or the towfish, from a single source but along different paths. The multibeam sonar system consist of a transducer, motion sensor, gyrocompass, and navigation system. When collected in slightly overlapping swaths (fanlike coverages from sonar scans), multibeam sonars can produce a sonar data set that represents nearly 100 percent acoustic



coverage of the seafloor



Hull-mounted multibeam sonar (left) and towed side scan sonar (right) (Graphic: NOAA)

## multimedia

the use of computers to present video, sound, graphics, and text

## multimodal distribution

a distribution with more than one mode

## Multipurpose Marine Cadastre (MMC)

a multi-agency effort to build a GIS-based marine information system for U.S. waters that provides authoritative geospatial data and supporting information to inform decision making on a range of ocean issues

## Multispectral Scanner (MSS)

a scanner system that simultaneously acquires images of the same scene in various wavelength bands

## multivariate analysis of variance

an analysis of variance with two or more dependent variables

## multivariate community analyses

statistical methods for analyzing physical and biological community data using multiple variables

## municipal discharge

discharge of effluent from waste water treatment plants, which receive waste water from households, commercial establishments, and industries in the coastal drainage basin

## municipal Sewage

wastes (mostly liquid) originating from a community; may be composed of domestic wastewaters and/or industrial discharges

## muon

a charged lepton about 200 times more massive than an electron; an elementary particle with a negative charge and a half-life of 2 microsecond; decays to electron and neutrino, and antineutrino

## mutagen

an agent that causes a permanent genetic change in a cell other than that which occurs during normal genetic recombination

## mutation

changes in the nature of single genes or segments of chromosomes, which are then inherited by successive generations

## mutualism

a symbiotic interaction between two species in which both derive some benefit

## mycelium

the mass of filamentous growth (hyphae) from which the vegetative part of a fungus develops



Drawing of the mycelium of a fungus. (Photo: Jon Houseman\BIODIDAC)

## mycophage

an animal which primarily eats fungi

## mycosis

any disease caused by a fungus

## mycosporine-like amino acids (MAA)

MAAs are a family of compounds which act as nature's sunscreen in the marine environment. Shallow-water environments of tropical coral reefs are characterized by high levels of ultraviolet-A and ultraviolet-B radiation. Corals have developed an efficient defence against the potential damage of long-term solar irradiation, which often includes the production of natural "sunscreen"-type UV-absorbing compounds and related antioxidants. These compounds in shallow-water corals were identified to be a group of mycosporine-like amino acids

(MAAs) having absorption maxima in the range 310-360 nm. MAAs are assumed to be produced by the zooxanthellae in coral tissues, since their biosynthesis involves a biochemical pathway not found in invertebrates. The major distribution of MAAs, however, resides within the coral tissues, suggesting that the algal partner of the mutualistic relationship provides UV protection to the whole of the relationship via MAA translocation. MAAs have been identified in a number of taxonomically diverse organisms such as fungi, marine heterotrophic bacteria, cyanobacteria, eukaryotic algae, marine invertebrates, fishes, and a wide variety of other marine organisms

## myocin

a contractile protein found in muscle cells which, together with actin, provides the mechanism for muscle contraction

## myoepithelial cell

a contractile cell in cnidarians

## myoglobin

an oxygen-binding protein found in the muscle cells of animals. It functions as an oxygen storage unit, providing oxygen to the muscles. Diving marine mammals, such as seals and whales are able to remain submerged for long periods because they have greater amounts of myoglobin in their muscles than other animals do. There is a close chemical similarity between myoglobin and hemoglobin, the oxygen-binding protein of red blood cells

## myoneme

in protists, the differentiated threads of ectosarc, which are contractile and perform the function of muscular fibers in the Metazoa; in cnidarians, the myoneme is the contractile portion of epitheliomuscular cells contained within the cell membrane that anchors it to the mesoglea. They may be diffuse or arranged in circular and longitudinal contracting bands

## myotome

any segment of embryonic mesoderm that develops into skeletal (voluntary) muscle in the adult; any of the segmentally arranged blocks of muscle in lower vertebrates, such as fishes

## mysid

a small shrimp-like crustacean belonging to the order Mysidacea. Mysids are also called "opossum shrimp" because the females carry their eggs in a pouch beneath the thorax

## myxopterygium (clasper)

the copulatory organ or clasper of sharks, rays, skates and chimaeras

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#) | [N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#) |

## nacre



the iridescent innermost layer of a molluscan shell that is secreted by the mantle. It is also called the mother-of-pearl layer



A mussel shell showing the nacre or mother-of-pearl layer.

## nadir

the satellite viewing angle directly downward; that point on the Earth vertically below the observer (satellite); the lowest point of a dry basin or depression, or the deepest point of a body of water (an oceanic "deep")

## naked skin

pertains to a fish whose body lacks scales; scaleless

## nanobiology

biological studies at the extremely small to molecular levels. Many fundamental biological functions are carried out at the level of molecular machineries that have the sizes of 1-100 nm. The emergence of nanobiology allowed understanding of the functions of these machineries, with the invention of nano- technology, e.g., scanning probe microscopy, modern optical techniques, and micro- manipulating techniques

## nanometer

a unit of length equal to 0.001 microns (one thousandth of a micron), 0.000001 millimeters, or 0.000000001 meters; also called a millimicron

## nanoscience

the extension of existing sciences into the realms of the extremely small, as in nanomaterials, nanochemistry, nanobiology, nanophysics, nanoengineering, etc

## nape

the area behind the head of a fish, extending from the back of the skull to the origin of the dorsal fin

## nare

nostril; an opening, external and internal, of the nasal passage. Nares (pl) in fishes lead to blind olfactory sacs and do not connect with an internal passageway. There is an incurrent aperture and an excurrent aperture. Movement of water into the olfactory sacs is for smelling rather than respiration

## nasal

pertains to the nose

## natant

swimming or floating

## National Association of Underwater Instructors (NAUI)

a scuba diving certifying and instruction agency

## National Biological Information Infrastructure (NBII)

a broad, collaborative program to provide increased access to data and information on the nation's biological resources. The NBII links diverse, high-quality biological databases, information products, and analytical tools maintained by NBII partners and other contributors in government agencies, academic institutions, non-government organizations, and private industry

## National Center for Biotechnology Information (NCBI)

established in 1988 as a national resource for molecular biology information, NCBI creates public databases, conducts research in computational biology, develops software tools for analyzing genome data, and disseminates biomedical information - all for the better understanding of molecular processes affecting human health and disease. NCBI is a division of the National Library of Medicine (NLM) at the National Institutes of Health (NIH)

## National Environmental Policy Act (NEPA)

passed in 1969, the purposes of NEPA are: to declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation; and to establish a Council on Environmental Quality

## National Environmental Satellite, Data, and Information Service (NESDIS)

the NOAA agency that operates and manages the U.S. civilian weather satellites and the national environmental data centers, such as the National Oceanographic Data Center (NODC), the National Climatic Data Center (NCDC), and the National Geophysical Data Center (NGDC)

## National Marine Protected Areas Center

the National Marine Protected Areas (MPA) Center's mission is to facilitate the effective use of science, technology, training, and information in the planning, management, and evaluation of the nation's system of marine protected areas. The MPA Center, located within the National Oceanic and Atmospheric Administration (NOAA), develops operational and program policy, supports the MPA Federal Advisory Committee, manages national, regional, and international MPA coordination, conducts outreach and education, consults with federal agencies, state agencies, tribal agencies, fishery management councils, and others, maintains the U.S. MPA website, and oversees the collection of data for the marine managed areas inventory

## National Oceanic and Atmospheric Administration (NOAA)

the National Oceanic and Atmospheric Administration (NOAA) is a federal agency within the US Department of Commerce that is dedicated to predicting and protecting the environment. NOAA's overall mission is to understand and predict changes in the Earth's environment, protect life and property, provide decision makers with reliable scientific information, conserve and manage the Nation's living marine and coastal resources to meet our Nation's economic, social, and environmental needs, and foster global environmental stewardship. To achieve its mission, NOAA's focus through 2008 will be on four mission goals:

1. Protect, restore, and manage the use of coastal and ocean resources through ecosystem-based management
2. Understand climate variability and change to enhance society's ability to plan and respond
3. Serve society's needs for weather and water information
4. Support the Nation's commerce with information for safe, efficient, and environmentally sound transportation



The National Oceanic and Atmospheric Administration (NOAA) is a federal agency within the U.S. Department of Commerce that is dedicated to predicting, protecting, and providing information about the marine environment.

## National Pollutant Discharge Elimination System (NPDES)

a provision of the Clean Water Act (CWA) which prohibits discharge of pollutants into waters of the United States unless a special permit is issued by EPA, a state, or where delegated, a tribal government on an Indian reservation

## national response team (NRT)

an organization composed of several federal agencies, each of which has responsibilities and expertise in responding to oil spill and hazardous materials emergencies

## native species

a species that occurs naturally in a given area. Therefore, one that has not been introduced by humans either accidentally or intentionally; also called an indigenous species

## Natural Area Reserve System (NARS)

the State of Hawai'i created the Natural Area Reserves System, or NARS, to preserve and protect representative samples of Hawaiian biological ecosystems and geological formations. The diverse areas found

in the NARS range from marine and coastal environments to lava flows, tropical rainforests, and even an alpine desert. One can find rare plants and animals within these areas, many of which are on the edge of extinction. The reserves also protect some of the major watershed areas which provide vital sources of fresh water

### natural climate record

a record of climatic events found by examining the natural environment (e.g., coral growth bands, tree rings, layers of ice in glaciers)

### natural recruitment

the way a population naturally reproduces or replenishes itself

### natural selection

a natural process by which organisms (and their genes) that adapt to their environment survive while those that do not adapt become eliminated progressively

### nauplius larva

a free-swimming, planktonic larval stage of many crustaceans

### nautical chart

a chart used to navigate bodies of water

### nautical mile

the length of a minute of arc, 1/21,600 of an average great circle of the Earth. Generally one minute of latitude is considered equal to one nautical mile. The accepted United States value as of 1 July 1959 is 1,852 meters (6,076.115 feet)

### Navassa

a small (35 km<sup>2</sup>) isolated and uninhabited island located at 18°25'N, 75°05'W, approximately 55 km west of the Tiburon Peninsula of Haiti and 220 km northeast of Jamaica. Navassa was designated as a United States National Wildlife Refuge in 1999. Corals and sponges grow on large underwater rocks that have broken off from the cliffs

### navicular

boat-shaped

### naviform

boat-shaped



## neap tide

a tide that occurs when the difference between high and low tide is least; the lowest level of high tide. Neap tide comes twice a month, in the first and third quarters of the moon

## near infrared

electromagnetic radiation with wavelengths from just longer than the visible (about 0.7 micrometers) to about two micrometers

## necrolysis

the decomposition of an organism's body after it dies

## necromass

the weight of dead organisms, usually expressed per volume of water or per unit of land surface or volume

## necrophagy

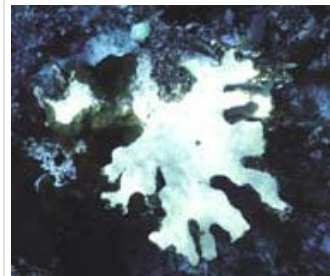
feeding on dead animals or carrion

## necropsy

an examination and dissection of a body of a dead organism in order to determine the cause of death or changes produced by disease

## necrosis

the death of living tissues due to infection or injury



Elkhorn coral, suffering from recent necrosis. (Photo: U.S. Geological Survey)

## nectophore

a highly modified medusa that remains with a floating hydrozoan colony and pulsates for locomotion of the colony

## negative binomial regression model

a useful empirical methodology when data are overdispersed, that is, when the variance of the distribution is considerably larger than the mean

## negative charge

an electrical charge created by having more electrons than protons.

## nekton

organisms with swimming abilities that allow them to move actively through the water column and to move against currents



Fish are a large component of marine nekton. (Photo: Dr. Anthony Picciolo)

## nematocyst (cnidocyte)

a specialized stinging cell found in cnidarians

## nematode

any unsegmented roundworm of the phylum Nemata, having a tough outer cuticle. The phylum includes free-living forms and disease-causing parasites

## Nemertea

a phylum of elongated, often flattened marine worm-like animals comprising nearly 1000 species which range in size from less than an inch to nearly 30 m. They are carnivorous and feed upon annelid worms as well as other marine animals. Their most distinctive structure is a proboscis which is used for food capture, defense, and burrowing into the soft substrate. The sexes are separate in most species and fertilization is external. Many are capable of reproducing asexually by fragmentation of the body. They are also called "ribbon worms"

## neo-Darwinism

the unification of natural selection and Mendelian genetics; also called the Modern Synthesis

## Neogene Period

a geologic period covering approximately 23 million years to the present time or ending approximately 2.6 million years ago with the beginning of the Quaternary. The name "Neogene" is a new name for part of the old Tertiary Period and some include the old Quaternary Period

## neonate

a newborn animal

## neoplasm

a cancerous growth

## neoprene

a synthetic rubber with good resistance to oil, chemical, and fire. Wet suits and other "rubber" diving accessories used by scuba divers are made of neoprene

## neotype

in taxonomy, a specimen selected as type specimen subsequent to the original description in cases where the original holotype, or lectotype, or all paratypes, or all syntypes are lost or destroyed, or suppressed by the Commission (Zoology)

## nephridium

a simple excretory organ of many invertebrates, consisting of a tube through which waste products pass to the exterior

## neritic

refers to the ocean environment landward of the shelf-slope break

## neritic zone

the relatively shallow water zone that extends from the high tide mark to the edge of the continental shelf

## nerve

a bundle of neurons (nerve cells); specifically, a bundle of axons which are the motor processes of neurons which carry nervous impulses in the direction away from the cell bodies

## net photosynthetic rate

the total rate of photosynthetic CO<sub>2</sub> fixation minus the rate of loss of CO<sub>2</sub> during respiration

## net primary productivity

the total amount of chemical energy fixed by the processes of photosynthesis minus the chemical energy lost through respiration; same as 'net photosynthetic rate'

## Netherlands Antilles Coral Reef Initiative (NACRI)

NACRI was established in 2000 as part of an effort to improve nature conservation and management in the Netherlands Antilles in general, and specifically targeting coral reefs in order to give more attention to, and better coordinate protection of the coral reefs of the islands. Beginning in 2004, NACRI plans to establish a central monitoring node and database for the Netherlands Antilles as part of the Global Coral Reef Monitoring Network (GCRMN), to complement other existing sub-regional nodes in the Caribbean. A catch survey of reef fisheries in all islands is also planned. The Netherlands Antilles consists of five islands in the Caribbean: Bonaire and Curacao just over 100 km off the Venezuelan mainland, and Saba, St. Eustatius and St. Maarten about 900 km to the north-east in the arc of the Lesser Antilles. The Netherlands Antilles is a so-called territory

of the Kingdom of the Netherlands, although it is an independent state

## network

two or more computers connected together so that they can share resources. Two or more networks connected together is an internet

## Network Common Data Form (NetCDF)

a set of software libraries and machine-independent data formats that support the creation, access, and sharing of array-oriented scientific data

## neuritis

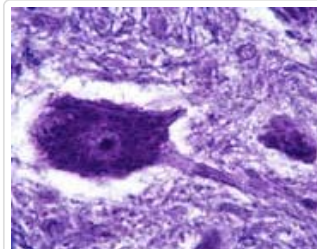
inflammation of the nerves

## neuromast

a sensory cell with a hair-like process capable of detecting motion or vibrations in water

## neuron

a nerve cell; a specialized cell that can react to stimuli and transmit impulses. A neuron consists of a cell body which contains the nucleus; dendrites, which are usually short sensory branches off the cell body that receive incoming impulses; and a single, long axon which carries impulses away from the body (motor function) and to the next neuron, gland or muscle



A neuron in a mammalian brain.  
(Photo: University of Kansas  
Medical Center)

## neuropeptide

a short chain of amino acids (a small protein) that functions as a neurotransmitter. Neuropeptides are synthesized and released by neurons (brain cells) to allow interneuronal communication; neuronal signaling molecules

## neurophysiology

the branch of neuroscience that studies the physiology of the nervous system

## neuropodium

a lobe of the parapodium closer to the ventral side in polychaete worms

## neuroscience

the scientific disciplines concerned with the development, structure, function, chemistry, pharmacology, clinical assessments and pathology of the nervous system

## neurotoxin

a toxic substance which interferes with the electrical activities of nerves and inhibits, damages or destroys the tissues of the nervous system, especially neurons (nerve cells)

## neurotransmitter

a chemical substance ("messenger") produced in and released by one neuron that carries a nervous impulse across a synapse (the small gap between the axon and dendrite of communicating neurons). They relay nervous impulses among neurons and between neurons and other types of cells, such as in muscle and glandular tissues. Neurotransmitters can excite or inhibit another neuron or receptor organ. There are more than 300 known neurotransmitters. A few of the more common ones are acetylcholine, dopamine, norepinephrine, and serotonin

## neuston

planktonic organisms associated with the air-water interface

## neutralism

the lack of any interaction between two organisms or species in a shared habitat. Neither has any effect on the other

## neutrino

a lepton with no electric charge. Neutrinos participate only in weak (and gravitational) interactions and therefore are very difficult to detect. There are three known types of neutrino, all of which have very low or possibly even zero mass

## Neyman allocation

in statistics, a sample allocation method that may be used with stratified samples to provide the most precision, given a fixed sample size

## niche

the role of an organism in an ecological community; the environmental requirements and tolerances of a species; sometimes seen as a species' "profession" or what it does to survive

## niche overlap

an overlap in resource requirements by at least two species

## nictitating eyelid

a movable eyelid found in sharks that can be closed over the eye to protect it from damage. Sharks also have non-moving upper and lower eyelids

## nictitating membrane

a semi-transparent membrane which can be drawn across the eye in birds, reptiles and many mammals. It functions to either moderate the effects of strong light or to sweep away dust and similar particles from the surface of the eye

## Ningaloo Reef

Australia's longest fringing reef (approximately 260 km) located off the western coast along the length of the North West Cape. Ningaloo Reef is known for its seasonal feeding concentrations of whale sharks

## nitrogen narcosis

a hazardous condition that scuba divers may experience at depths usually in excess of 80 ft (24.38 m). It occurs when nitrogen builds up in the body tissues and replaces some of the oxygen required by the brain. The longer a diver with conventional scuba stays at a deep depth, the more nitrogen accumulates. As the brain is deprived of oxygen, the ability to think and function clearly diminishes. It may progress from a slightly confused feeling to an almost intoxicated state, where thinking and judgement is severely impaired. If the diver does not ascend to a shallower depth and off-gas nitrogen, nitrogen narcosis may eventually cause death. Although this can happen at any depth, it is especially a problem with dives in excess of 80 feet. Nitrogen narcosis is also called 'rapture of the deep'

## nitrox

any mixture of nitrogen and oxygen that contains less than the 78 percent nitrogen as found in ordinary air

## no take zone

a marine protected area that is completely (or seasonally) free of all extractive or non-extractive human uses that contribute impact (some exceptions may be permitted for scientific activities); also called "marine reserve" or "fully protected area"

## NOAA Coral Reef Conservation Program (CRCP)

a NOAA program whose purposes are: (1) to preserve, sustain, and restore the condition of coral reef ecosystems; (2) to promote the wise management and sustainable use of coral reefs; (3) to develop sound scientific information on the condition of coral reef ecosystems and the threats to such ecosystems; (4) to assist in the preservation of coral reefs by supporting conservation programs, including projects that involve affected local communities and nongovernmental organizations; (5) to provide financial resources for those programs and projects; and (6) to establish a formal mechanism for collecting and allocating monetary donations from the private sector to be used for coral reef conservation projects

## NOAA Diving Program

the NOAA Diving Program is administered by NOAA and is headquartered at the NOAA Diving Center in Seattle, WA. The Program trains and certifies scientists, engineers and technicians to perform the variety of tasks carried out underwater to support NOAA's mission. With more than 300 divers, NOAA has the largest complement of divers of any civilian federal agency. In addition, NOAA's reputation as a leader in diving and safety training has led to frequent requests from other governmental agencies to participate in NOAA diver

training courses

## NOAA National Undersea Research Program (NURP)

a unique national service that provides undersea scientists with tools and expertise that they need to work in the undersea environment. Each year, the program supports 200 or more undersea research projects related to NOAA's mission as steward of oceanic resources and environments. A key strength of NURP is its partnership with the nation's science community, carried out primarily through six regional NURP Centers

## NOAA's Center for Sponsored Coastal Ocean Research (CSCOR)

NOAA's Center for Sponsored Coastal Ocean Research (CSCOR) develops and improves predictive capabilities for managing the Nation's use of its coastal resources through competitive research programs. CSCOR also supports efforts to translate the results of its research investments, and those of others, into accessible and useful information for coastal managers, planners, lawmakers, and the public to help balance the needs of economic growth with those of conserving the resources of our Nation's Great Lakes, estuaries, and coastal ocean. Its mission is to provide the highest quality research in support of coastal management decisions through competitive, peer-reviewed research and holistic ecosystem studies

## NOAA's Coral Reef Conservation Grant Program

each year, subject to the availability of funds, NOAA publishes its Coral Reef Conservation Grant Program Funding Guidance, as authorized by the Coral Reef Conservation Act of 2000, to solicit proposals for coral reef conservation activities. The Act authorizes the Secretary of Commerce, through the NOAA administrator and subject to the availability of funds, to issue matching grants of financial assistance for broad-based coral reef conservation activities, consistent with the purposes of the Act

## NOAA's Coral Reef Watch (CRW) Satellite Bleaching Alert (SBA) system

an automated coral bleaching e-mail alert system designed to monitor the status of thermal stress conducive to coral bleaching via the use of the CRW global satellite near-real time HotSpot suite of products. The SBA was developed by the NOAA as a tool for coral reef managers, scientists and other interested people. The SBA became operational in July 2005

## NOAA's National Marine Fisheries Service (NOAA Fisheries)

NOAA Fisheries is the federal agency responsible for the stewardship of the nation's living marine resources and their habitat. It is responsible for the management, conservation and protection of living marine resources within the United States' Exclusive Economic Zone (water three to 200 miles offshore). Using the tools provided by the Magnuson-Stevens Act, NOAA Fisheries assesses and predicts the status of fish stocks, ensures compliance with fisheries regulations and works to reduce wasteful fishing practices. Under the Marine Mammal Protection Act and the Endangered Species Act, it recovers protected marine species (i.e. whales, turtles) without unnecessarily impeding economic and recreational opportunities. With the help of the six regional offices and eight councils, NOAA Fisheries is able to work with communities on fishery management issues. NOAA Fisheries works to promote sustainable fisheries and to prevent lost economic potential associated with overfishing, declining species and degraded habitats. It strives to balance competing public needs and interest in the use and enjoyment of our oceans' resources. For more information, see: <http://www.nmfs.noaa.gov/>

## NOAA's National Ocean Service (NOS)

NOS is a scientific and technical organization of NOAA whose mission is to preserve and enhance the nation's coastal resources and ecosystems along 95,000 miles of shoreline and 3.5 million square miles of coastal ocean. At the same time, it works to support economic growth for the long-term benefit of the nation. This theme is central to the sustainable development agenda of both NOAA and the U. S. Department of Commerce (DOC). For detailed information, see: <http://www.oceanservice.noaa.gov/about/welcome.html>

## NOAA's Office of Oceanic and Atmospheric Research (NOAA Research)

the Office of Oceanic and Atmospheric Research (OAR) or "NOAA Research" works in partnership with NOAA's National Weather Service, National Ocean Service, National Environmental Satellite Data Information Service and National Marine Fisheries Service as the research and development organization of the agency. It is through NOAA Research that work results in better weather forecasts, longer warnings for natural disasters and an overall greater understanding of our oceans, climate and atmosphere. NOAA Research explores the Earth and atmosphere from the very surface of the sun to the depths of the ocean. Its role within NOAA is to provide products and services that describe and predict changes in the environment. NOAA Research results allow decision makers to make effective judgments in order to prevent the loss of human life and conserve and manage natural resources. Research is conducted, with its partners in academia, in three major areas: atmosphere, climate, and ocean and coastal resources. For more information, see:

<http://www.research.noaa.gov/>

## nociceptor

a sensory receptor which responds to potentially harmful stimuli; produces a sensation of pain

## nocturnal

being primarily active at night

## node

any bulge or swelling of an anatomical structure or part; any single computer connected to a network

## nodule

a small node; a knob-like or roughly spherical structure which may be abnormal; a little lump; a small rounded lump of mineral substance

## nodulose

with small nodules, knobs or swellings

## noise

unwanted sound

## nomen illegitimum

in taxonomy, an illegitimate name; a validly published name that must be rejected for the purposes of priority in



accordance with the International Code of Zoological Nomenclature

### nomen negatum

in taxonomy, a denied name: an unavailable name which has incorrect original spellings as defined by the International Code of Zoological Nomenclature

### nomen novum

in taxonomy, a new name which is published to replace an earlier name (and valid only if the latter is preoccupied) and which is expressly proposed as a replacement name; a new name, not to be confused with a new species, or a new genus, etc., which represent new taxa. It is commonly applied to names proposed to replace junior homonyms

### nomen nudum

in taxonomy, a naked name, i.e., a name that, if published before 1931, was not accompanied by a description, definition, or indication, or if published after 1930, is not accompanied by a statement that purports to give characters differentiating the taxon; or is not accompanied by a definite bibliographic reference to such a statement; or is not proposed expressly as a replacement for a pre-existing available name. A *nomen nudum* is not an available name

### nomen nullum

in taxonomy, a null name, i.e., an unavailable name which, as defined by the International Code of Zoological Nomenclature, is a non-demonstrably intentional change of an original spelling, i.e. a form of incorrect subsequent spelling

### nomen oblitum

in taxonomy, a forgotten name; an unused senior synonym rejected under the provisions of the International Code of Zoological Nomenclature

### nomen oblitum

in taxonomy, a forgotten taxonomic name

### nomen vetitum

in taxonomy, an impermissible name; an unavailable name published for divisions of the genus group other than genus and subgenus, which are not accepted by the International Code of Zoological Nomenclature

### nomenclature

the description of new taxa or alterations to the concept of previously described taxa which involve changes in the names of taxa

### nominal exposure

with reference to oil spills, oil exposure concentrations based on the proportions of oil added to water (without actually measuring how much oil was ultimately mixed into the water)

### nominal taxon

in taxonomy, a named taxon, objectively defined by its type taxon. Thus the nominal family Chaetodontidae is always the one to which its nominal type genus, *Chaetodon*, belongs

### nominate subordinate taxon

in taxonomy, a subordinate taxon which bears the same names as its immediate higher taxon. Thus *Badis badis* is the nominate species of the genus *Badis*

### non-coding linker sequences

short pieces of DNA between genes which do not direct protein synthesis or perform a regulatory function

### non-extant

no longer existing

### Non-governmental Organization (NGO)

a non-profit group or association organized outside of institutionalized political structures to obtain particular social objectives (such as environmental protection) or serve particular constituencies

### non-point source pollution

a pollution source without a single point of origin, or not introduced into a receiving stream from a specific outlet. It occurs when rainfall, snowmelt, or irrigation runs over land or through the ground, picks up pollutants, and deposits them into rivers, lakes, and coastal waters or introduces them into ground water. Common nonpoint sources are agriculture, forestry, mining, construction, dams, channels, land disposal, saltwater intrusion, and city streets

### non-target species

species that were not targeted in the fisheries; by-catches

### nonallele

a gene that is not a competitor at the same locus (specific location on the chromosome)

### nonbiodegradable material

a material that cannot be broken into simpler chemicals by living organisms

### noncoding DNA

DNA that does not encode any product (RNA or protein). The majority of the DNA in plants and animals is

noncoding

## nondegradable pollutant

a polluting substance that is not broken down by natural processes

## nonessential amino acid

an amino acid which can be synthesized by the organism's body, and not required in the nourishment source. Humans can make 13 nonessential amino acids

## nonionizing radiation

radiation that carries enough energy to excite an atom or molecule, but not enough energy to remove an electron from the atom or molecule. This type of radiation does not cause damage to cells and tissues; examples include radio waves, microwaves, infrared light, and ordinary light

## nonrenewable resource

an environment resource which is not replaced or replenished by natural processes at a rate comparable to the use of the resource; a resource depleted or exhausted by use

## nonseptate

lacking cross walls (septa); also termed "aseptate"

## nonvascular plant

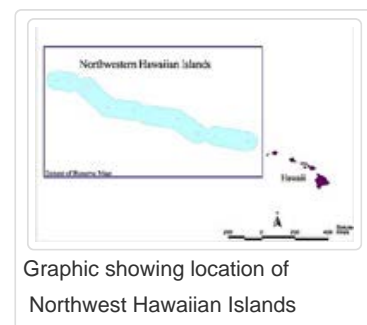
a plant which lacks tissues to conduct water and nutrients. Nonvascular plants do not produce flowers or seeds

## North Star

Polaris, the North Star, is visible in the northern hemisphere and indicates the direction of north. In the southern hemisphere the Southern Cross is used to find the direction of south

## Northwestern Hawaiian Islands (NWHI)

the Northwestern Hawaiian Islands (NWHI) are a chain of small islands, atolls, submerged banks, and reefs beginning approximately 120 nautical miles west of the main Hawaiian islands, and stretching northwest for more than 1,079 nautical miles or 2,000 kilometers. This vast archipelago is uninhabited (except for Midway Island) and is surrounded by some of the most extensive and pristine coral reefs in U.S. waters



## Northwestern Hawaiian Islands Coral Reef Assessment and Monitoring Program (NOWRAMP)

a multi-agency, multi-year effort that began in 2000. NOWRAMP's objective is to rapidly evaluate and map the shallow water reef habitats in the NWHI. The agencies which contribute to NOWRAMP are: NOAA, the U.S. Fish and Wildlife Service, the State of Hawai'i Department of Land and Natural Resources, the University of Hawai'i, the Bishop Museum, the Hawai'i Maritime Service, the U.S. National Park Service, and scientists from the University of California at Santa Cruz

## notch

an indentation

## notochord

a flexible rodlike structure that forms the supporting axis of the body in the lowest chordates, (e.g., tunicates and lancelets) and lowest vertebrates (e.g., lampreys), and in the embryos of all higher vertebrates, where it is replaced by the vertebral column; a prime defining characteristic of the phylum Chordata

## nuchal

pertaining to the neck

## nuchal organ

a sense organ on upper side of head in many branchiopods; photoreceptor-like sensory cells in the nuchal region (posterodorsal region of the head) of some cephalopods; paired chemosensory structures in some annelids

## nuclear family

a monogamous mating pair where both male and female partner share in caring for the eggs and young

## nuclease

one of the several classes of enzymes that degrade nucleic acid; an enzyme that can degrade DNA or RNA by breaking phosphodiester bonds that link adjacent nucleotides

## nucleic acid

a large molecule found in biological cells composed of nucleotide subunits

## nucleic acid isolation

a prerequisite for molecular genetic studies is, by definition, the ability to isolate nucleic acids (DNA and RNA)

## nucleoprotein

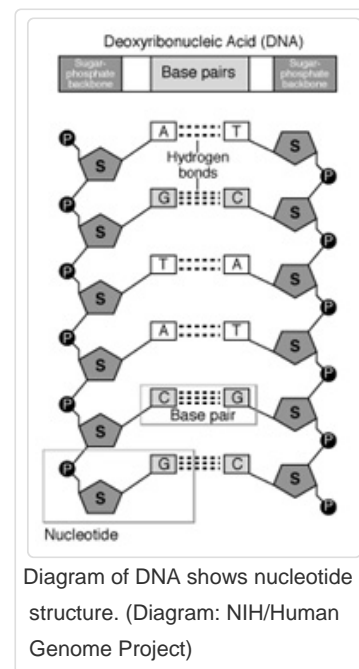
a conjugated protein composed of nucleic acid and protein; chromosomes are composed of nucleoproteins

## nucleosome

a fundamental packing unit of DNA consisting of a short segment of DNA wrapped around a core histone protein. Nucleosomes are typically packed together inside the chromatin allowing long strands of DNA to be compacted inside the cell nucleus

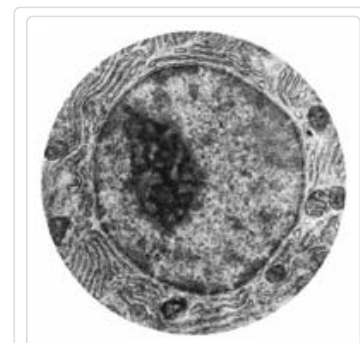
## nucleotide

one of the structural components, or building blocks, of DNA and RNA. A nucleotide consists of a base (one of four nitrogenous bases: adenine, thymine, guanine, and cytosine) plus a molecule of sugar and one of phosphoric acid



## nucleus

a central cell structure that contains the chromosomes, and as such, controls the activities of the cell; the center of an atom, containing protons, neutrons, and most of the mass



A cell with a large central nucleus. The dark mass within the nucleus are the chromosomes.

## nudibranch

a opisthobranchiate mollusk (sea slugs), having no shell except while very young. The gills are naked and situated upon the back or sides



## null hypothesis (H<sub>0</sub>)

the statistical hypothesis that states that there are no differences between observed and expected data. The null hypothesis is used in experimental research. It asserts arbitrarily that there is no relationship among the variables being studied. Then statistical tests are used to determine if any relationship shown by the research data is due to chance alone or to alternative hypotheses

## numerical ecology

a field of quantitative ecology concerned with the numerical analysis of complex ecological data sets. Numerical ecology makes use of mathematical tools from many disciplines in order to analyze multidimensional (multivariate) data

## numerical taxonomy

study of the relationships of taxa by the application of numerical similarity values to characters so as to rank into categories based on degree of overall similarity

## numericlature

an attempt to express the natural order (i.e. classification) of organisms in numbers, so that each taxon name is represented by a numerical code, the structure of which indicates its taxonomic position, rank and affinities

## nuptial

a term associated with reproductive or breeding behavior, e.g., nuptial coloration, nuptial tubercles (in fishes)

## nursery

an area favored for birth or egg deposition and where juveniles and immature members of a community feed and grow. For example, mangrove root areas serve as nursery grounds for many coral reef fishes

## nutrient

any substance assimilated by organisms that promotes growth. Marine scientists typically measure nitrites, nitrates, phosphates, and silicates as nutrients for plant growth

## nutrient cycle

the cyclic conversion of nutrients from one form to another within biological communities

## nutrient cycling

all the processes by which nutrients are transferred from one organism to another. For instance, the carbon cycle includes uptake of carbon dioxide by plants, ingestion by animals, and respiration and decay of the

animal

## nutrient pollution

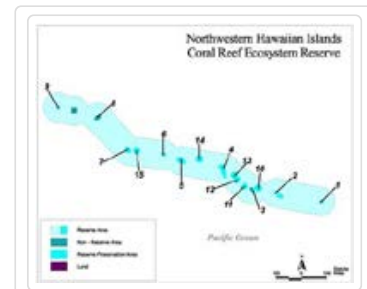
contamination of water resources by excessive inputs of nutrients. In surface waters, excess algal production is a major concern

## nutrient regeneration

the release of nutrients from organic matter by decomposer organisms

## NWHI Coral Reef Ecosystem Reserve

the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve was established by Executive Order 13178 in December 2000, and January 2001 (Executive Order 13196). It was established to conserve and protect the NWHI coral reef ecosystem and related natural and cultural resources of the area



Reference map of the Northwestern Hawaiian Islands Ecosystem Reserve. (1) Nihoa Island, (2) Necker Island, (3) French Frigate Shoals, (4) Gardner Pinnacles, (5) Maro Reef, (6) Laysan Island, (7) Lisianski Island, (8) Pearl and Hermes Atoll, (9) Kure Atoll, (10) The First Bank immediately east of French Frigate Shoals, (11) Southeast Brooks Bank (the first bank immediately west of French Frigate Shoals), (12) St. Rogatien Bank, (13) The First Bank immediately west of St. Rogatien Bank, (14) Raita Bank, and (15) Pioneer Bank. (Graphic: NOAA)

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#) | [N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#) |

## obligate mutualism

a mutualistic relationship where one species cannot survive without the presence of the other

## obligatory

obligate or required. For example, an obligatory cleaner fish relies entirely on this feeding mode to obtain nutrients; opposite of facultative

## oblique section

a diagonal cross section that is not at right angles to the longitudinal axis of the animal or structure examined

## oblong

elongated (stretched) from a square or circular shape

## observational learning

a learning process where an animal learns by copying the behavior of other animals

## obtuse

blunt or rounded at the end

## ocean acidification

ocean acidification occurs when CO<sub>2</sub> from the atmosphere is absorbed into the ocean and reacts with water to create carbonic acid. This decreases both ocean pH and the concentration of the carbonate ion, which is essential for calcification by calcifying marine organisms such as corals

## Ocean Biogeographic Information System (OBIS)

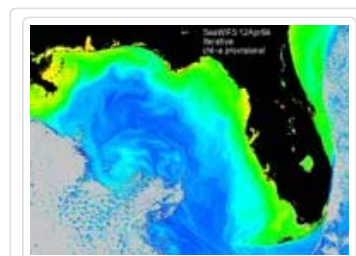
the marine component of the Global Biodiversity Information Facility. It links marine databases around the world to provide an internet accessible, dynamic interface for comparing species level, geo-referenced biodiversity data in relation to ocean habitats. All Census of Marine Life (CoML) field project data will be managed in and accessible through OBIS ([www.iobis.org](http://www.iobis.org))

## ocean catchment

the term is described as an attempt to quantify the area of ocean that a benthic system may depend on for planktonic food production and supply. This concept of ocean catchment may be used as a basis for examining the spatial scale of pelagic processes which influence benthic systems

## ocean color

a term that refers to the spectral dependence of the radiance leaving a water body



SeaWiFS (Sea-viewing Wide Field-of-view Sensor) ocean color image of chlorophyll-a in the Gulf of Mexico.

## ocean color sensor



an instrument for the remote sensing of ocean color, usually from aircraft or satellite



This SeaWiFS (Sea-viewing Wide Field-of-view Sensor) is an ocean color sensor.

## ocean uptake

the process whereby the ocean takes up heat, atmospheric gases, and other chemical species

## oceanic

associated with sea-water environment seaward of the shelf-slope break

## oceanic crust

that part of the Earth's crust underlying the ocean basins. It is composed of basalt and has a thickness of about 5 km

## oceanic island

an island in the ocean formed by breaking away from a continental landmass, volcanic action, coral formation, or a combination of sources

## oceanic reef

a reef that develops adjacent to deeper waters, often in association with oceanic islands

## oceanodromous

used to describe organisms that migrate only within the ocean, usually from spawning grounds to feeding grounds

## ocellus

an eye-like spot, usually surrounded with a ring of a lighter color, e.g. the ocellus toward the caudal peduncle of some butterflyfish. It may function to deflect attacks to the eyes in agonistic encounters. Ocelli are also present in other animal groups, especially insects



These butterflyfish have a prominent ocellus (pl. ocelli), which may serve to deflect predator

attacks from the head region of the fish.

## ochre

yellowish or yellow-brown color

## Octocorallia

a subclass of the Anthozoa that contains the sea pens, sea pansies, sea fans, whip corals, and pipe corals. Octocorals always possess 8 tentacles and 8 complete septa (hard corals and anemones possess 12 or more tentacles and septa). They are colonial cnidarians whose polyps are connected by a tissue mass called the coenenchyme. This tissue connects the gastrovascular (digestive) cavities of all the polyps in the colony



An octocorallian (sea fan) with brain coral (sceractinian) in the foreground.

## octopus

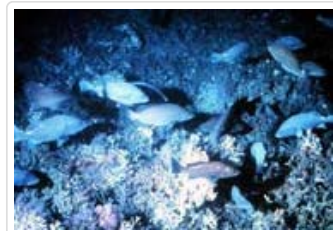
in scuba, a backup second stage regulator connected to the first stage, intended for the benefit of other scuba divers in case their air supply should fail. It is the alternate air source that forms the basis for the "buddy" system

## ocular

pertains to the eye

## Oculina Banks

a series of deepwater coral pinnacles and ridges, 15 to 30 miles off the east coast of Florida, extending from Ft. Pierce to Cape Canaveral. Formed by a single species of coral, the Ivory Tree Coral, *Oculina varicosa*, they form pinnacles of up to 100 feet tall, growing below the Gulf Stream at depths of approximately 70 to 100 meters. This is a slow-growing, branching coral often associated with high biodiversity because they provide ideal habitats and spawning sites for numerous species of fishes and invertebrates



The Oculina Banks are deep water coral reefs occurring along the shelf edge off the central east coast of Florida. The *Oculina varicosa* habitat hosts a diverse array of macroinvertebrates and fishes. The habitat also comprises significant spawning grounds for economically important species of reef fishes.

## odontophore

a tooth-bearing structure found in most mollusks, except bivalves. It consists of several muscles and a cartilage which support the radula and radula sac; the term is also applied to the radula alone

## off-reef

a synonym of reef slope

## official index

in taxonomy, a list of names or works suppressed or declared invalid by action of the International Commission on Zoological Nomenclature

## official list

in taxonomy, a list of names or works which have been conserved or declared valid by action of the International Commission on Zoological Nomenclature

## offshore current

any current flowing away from shore

## offshore wind

a wind blowing seaward from the land in the coastal area.

## oil plume

underwater globules of oil that do not float to the surface of the ocean. Heavy use of chemical dispersants, which breaks up surface oil, is said to contribute to the formation of these plumes, which may pose a threat to the marine ecosystem

## oil slick

a layer of oil floating on the surface of water

## oil spill

the accidental release of oil into the environment

## oligomer

a molecule of intermediate relative molecular mass, the structure of which essentially comprises a small plurality of units derived, actually or conceptually, from molecules of lower relative molecular mass; a polymer that consists of two, three, or four monomers

## oligonucleotide

a short sequence (usually 2-50 bases) of DNA. Oligonucleotides of up to 30 bases are routinely synthesized for

use as PCR primers or as probes for their sequence compliments in a complex mixture of DNA

### oligotrophic

refers to water bodies with low concentrations of nutrients

### omegoid

horse shoe-shaped

### omnivore

an organism whose diet consists of a wide variety of foodstuffs, including plants and animals

### oncogene

a gene thought to be capable of causing cancer

### oncology

the science dealing with the physical, chemical and biological properties and features of cancer, including the causes and progression of the disease

### one-gene--one-polypeptide hypothesis

the concept that one gene in DNA codes for a sequence of amino acids in a specific polypeptide

### onomatophore

in taxonomy, a specimen which acts as the name bearer; a nomenclatural type (holotype, syntype, lectotype, neotype)

### onshore

a direction landward from the sea

### onshore wind

a wind blowing landward from the sea in the coastal area

### ontogenesis

the entire development of an individual organism from fertilization to completion of its life history

### ontogeny

the development, growth, and maturation of an individual

## oocyte

a female gametocyte that develops into an ovum after two meiotic divisions; the female reproductive cell, also called an egg or ovum

## ooecium

a brood chamber for developing embryos in the Ectoprocta (bryozoans); one of the special zooids of ectoprocts destined to receive and develop ova; an ovicell.

## oogamous

characterized by reproducing by the fusion of small motile male gametes and large nonmotile female gametes

## oogamy

the union of a large nonmotile egg with a small motile or nonmotile male sperm cell

## oogenesis

the process of ovum (egg) development in female animals, in which the diploid number of chromosomes is reduced by half to the haploid number in the ovum

## oolite

a sedimentary rock made of spherical or egg-shaped grains of calcium carbonate (ooids). If the ooids are greater than two mm in diameter, the rock may be called a "pisolite"; also called "egg stone"

## oolitic limestone

rock composed primarily of petrified corals or the skeletons of other calcareous animals

## oolitic sand

a very fine sand made up of tiny egg-shaped oolites. oolites form in Baffin Bay (Texas), the eastern Mediterranean Sea, the Persian Gulf, the waters surrounding the Bahamas, and in Great Salt lake. Oolites are often used in the home aquarium industry because their small grain size

## ootheca

an egg mass protected by a surrounding tough covering or a hard foam-like protein covering. Oothecae are made by many insect species and mollusks; an egg case

## open circuit scuba

a diving apparatus in which exhaled air is expelled into the water as bubbles; no part is rebreathed by the diver. It is most commonly used in recreational scuba diving

## open circulatory system

a circulatory system, characteristic of some invertebrates, e.g., arthropods, in which blood flows through an interconnected system of open sinuses rather than blood vessels. The tissues and cells are directly bathed by the blood for gaseous exchange and nutrient uptake. The circulatory fluid is called the hemolymph

### open ocean

the ocean where the water depth exceeds 200m around the boundaries of the major continental land masses. This definition excludes the marginal enclosed and semi-enclosed seas, but includes all ocean regions bordering lesser island systems regardless of water depth

### open reading frame (ORF)

the sequence of DNA or RNA located between the start-code sequence (initiation codon) and the stop-code sequence (termination codon)

### open sea

that part of the ocean that extends outward from the continental shelf

### open system

a system that exchanges energy and matter with its environment

### operant conditioning

a learning process where an animal learns by connecting its own behavior with a response from its environment

### operator gene

a region of the chromosome, adjacent to the operon, where a repressor protein binds to prevent transcription of the operon

### opercular spine

in fishes, a spine projecting from the operculum (gill cover)

### operculate

having an operculum

### operculum

a lid or flap covering an aperture, such as the gill cover in most bony fishes; the gill cover; also the horny lid closing the aperture of various species of mollusks



A ventral view of the gill chamber

and opercular chamber of a fish. Note the gill (branchial) arches, each with a large number of gill filaments. (Photo: University of California at Davis)

## operon

a sequence of genes responsible for synthesizing the enzymes needed for biosynthesis of a molecule. An operon is controlled by an operator gene and a repressor gene

## ophiopluteus larva

larva of a brittle star (phylum Echinodermata)

## opisthobranch

a marine gastropod, many of which have lost or reduced their shell, mantle and gills

## opportunistic feeder

a species adapted for utilizing variable, unpredictable or transient environments to obtain food

## optical oceanography

the subdiscipline of oceanography concerned with the propagation and interaction of radiation, typically at wavelengths between about 350 and 750 nm, with seawater

## optimum

a state that is the best fit for the current situation. All minor changes make the situation worse; in biology, it is the level of some environmental factor, within a species' or population's tolerance range, at which the species or population can function most efficiently or with the greatest positive effect to its physiological or reproductive fitness

## optimum allocation

a procedure used in stratified sampling to allocate numbers of sample units to different strata so as to maximize some desirable quantity

## oral cavity

the cavity within the mouth

## oral disc

the area around the mouth of an anthozoan polyp that bears from eight to several hundred tentacles

## orbit

a bony or cartilaginous eye socket

## order

a taxonomic group containing one or more families

## organ

a collection of tissues which performs a particular function or set of functions in an animal's body. Organs are composed of tissues, and may be organized into larger organ systems

## organ system

collection of organs which have related roles in an organism's functioning. The nervous system, circulatory system, and muscle system are all organ systems

## organ-pipe coral

the organ-pipe coral, *Tubipora musica*, is a reef-building (hermatypic) octocoral



The organ-pipe coral, a reef-building octocoral. (Photo: A. Bruckner, NOAA)

## organelle

a structurally discrete component of a cell, e.g., the nucleus or a mitochondrion

## organic

refers to those substances produced by the metabolism of a living organism, especially carbon-containing compounds

## organic enrichment

the addition of nutrients from organic matter

## organic molecule

a molecule that contains one or more carbon atoms



## organically polluted

made unfit for living organisms by excess addition of organic matter

## organism

any form of unicellular or multicellular life; a living thing that has (or can develop) the ability to act or function independently

## organogenesis

the process of formation of specific organs in a plant or animal involving morphogenesis and differentiation

## organophosphate

organophosphate compounds are a diverse group of chemicals used in both domestic and industrial settings. Examples include insecticides, nerve gases, ophthalmic agents, and antihelmintics. Organophosphate pollution may adversely effect coral health

## orientation

the way an organism positions itself in relation to environmental cues

## original description

in taxonomy, the description of a taxonomic group when first established

## original diagnosis

in taxonomy, a formal statement of characters which distinguish a taxon from other similar or closely related taxa, published at the time of proposal of a new taxonomic name

## original spelling

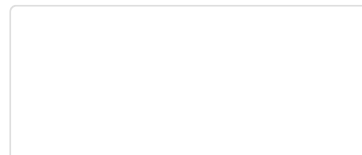
in taxonomy, the spelling of an available name when first published. The original spelling of a name is to be kept as the "correct original spelling" unless it does not meet the requirements of the International Code of Zoological Nomenclature. An incorrect original spelling is an original spelling that is incorrect. Multiple original spellings are two or more different original spellings for the same name

## ornamental

a non-food species that is produced and maintained solely for exhibit purposes in home or public aquaria, or in ornamental garden ponds

## ornithology

the scientific study of birds





A white tern from Laysan Island, Hawaiian Archipelago. (Photo: NOAA)

### orphan receptor

a potential receptor gene identified on the basis of nucleotide sequence similarities with known steroid hormone receptors

### ortholog

a gene found in different species that evolved from a common ancestral gene by speciation. Normally, orthologs retain the same function in the course of evolution

### oscillation

any steady back and forth movements

### oscillator

the internal biological clock mechanism that produces a measurable biological rhythm in an organism

### osculum

a large opening through which water flows out of a sponge. Sponges may have more than one osculum



Distinct osculi of some Caribbean sponges. (Photo: Copyright Digital Stock Corp.)

## osmol

unit of osmotic pressure

## osmoregulation

the process of controlling the amount of water in tissues and cells

## osmosis

the passage of water through a semipermeable membrane from a solution with a lower concentration of solute to one with a higher concentration of solute

## osmotic pressure

the pressure that is needed to counteract the osmotic passage of water molecules across a semipermeable membrane into the more concentrated solute

## osmotroph

an organism that obtains nutrients through the active uptake of soluble materials across the cell membrane

## osseus

bony

## ossicle

one of numerous small calcareous structures that form the exoskeleton of certain echinoderms. Their size, shape and location are highly variable, and they may be movable or fixed in position. They may appear as thin fused plates. In brittle stars they form "vertebrae" in the arms, which with together with their attached muscles, gives the brittle star its serpentine ophiuroid motion. Sea cucumbers hve microscopic ossicles embedded in their dermis. The small, sound transmitting bones in the vertebrate middle ear are also called 'ossicles'

## ossified

made or converted into bone

## ostium

in sponges, a microscopic pore through which water enters the sponge body

## ostracitoxin

a toxin, discharged with mucus into the water, by trunkfishes of the genus *Ostracion* when they are stressed

## otolith

a calcareous structure of the inner ear of some animals, such as fishes, that functions in the detection of

changes in gravitational forces relative to orientation. Otoliths are used to determine the age of fishes by counting the number of annual rings deposited

### out year

a fiscal year after the fiscal year covered in a budget

### outbreak

the sudden appearance of a disease in a specific geographic area or population

### outbreak

a sudden appearance or increase in something, such as an outbreak of a particular disease in a coral community

### outer slope

a synonym of reef slope. It is sometimes used to represent the lower reef slope

### outrigger

a floatation device attached to one or both sides of the hull of a boat to help prevent a capsizing

### overexploitation

the removal of individuals or biomass from a population at a rate greater than the population is able to compensate for with its own recruitment

### overfishing

the removal of marine organisms from the environment at a level that is not sustainable. A reduction of this level would, in the medium term, lead to an increase in the total catch

## Overseas Territories (OTs) of the United Kingdom (UK)

The UK's 14 OTs are located in practically every geographic region of the world, and are home to unique ecosystems, including rare and globally threatened species, many of which are found nowhere else in the world. The OTs are: Turks and the Caicos Islands, Sovereign Base Areas of Akrotiri and Dhekelia, South Georgia and the South Sandwich Islands, Saint Helena, Ascension and Tristan da Cunha, The Pitcairn Islands, Montserrat, Gibraltar, Falkland Islands, Cayman Islands, The British Indian Ocean Territory (BIOT), British Virgin Islands, The British Antarctic Territory, Bermuda, and Anguilla

### ovicell

the brood chamber of a bryozoan (Ectoprocta), usually located at the distal end of the maternal zooid. Embryos are brooded until they develop into non-feeding larvae, which swim briefly, then settle and metamorphose to found a new colony

## ovigerous

carrying eggs or modified for carrying eggs

## oviparity

the reproductive mode where eggs are released from the body and later hatch

## oviposition

the process of depositing eggs



A marine turtle depositing eggs (oviposition) on a tropical beach. (Photo: Seaturtle Preservation Society of Brevard County, FL)

## ovoid

egg-shaped

## ovoviviparity

the reproductive mode where the eggs hatch and develop in the female's reproductive tract (or a specialized pouch in the males of some species), are not nourished in any way by the female, and are free-swimming when released from the parent

## ovulation

the release of an egg from the ovary

## ovum

the mature female germ cell (egg; female gamete)

## oxidant

an oxidizing agent

## oxidation

the combination of a substance with oxygen. Oxidation can also describe a type of reaction in which the atoms in an element lose electrons and the valence is correspondingly increased

## oxidative stress

a process whereby the metabolic balance of a cell is disrupted by exposure to environmental substances, resulting in the accumulation of free radicals, which can damage components of cells' membranes, proteins or genetic material by "oxidizing" them

## oxygen isotope ratio (18O)

an expression for the ratio of the  $^{18}\text{O}$  to  $^{16}\text{O}$  atoms in a sample relative to a standard, defined as:  $\delta^{18}\text{O} = \frac{(^{18}\text{O}/^{16}\text{O} \text{ sample} - ^{18}\text{O}/^{18}\text{O} \text{ standard})}{^{18}\text{O}/^{16}\text{O} \text{ standard}}$

## oxygen isotopes

oxygen atoms that have the same atomic number (protons) but different mass numbers (and different numbers of neutrons). The two stable isotopes of oxygen are  $^{16}\text{O}$  and  $^{18}\text{O}$

## ozone

a gaseous molecule that contains three oxygen atoms ( $\text{O}_3$ ), instead of the usual two ( $\text{O}_2$ ). Ozone can exist either high in the atmosphere (stratosphere), where it shields the Earth against harmful ultraviolet rays from the sun, or close to the ground (troposphere), where it is the main component of smog. Ground-level ozone is a product of reactions involving hydrocarbons and nitrogen oxides in the presence of sunlight. Ozone is a potent irritant that causes lung damage and a variety of respiratory problems

## ozone shield

the ozone ( $\text{O}_3$ ) layer in the stratosphere that gives protection to the Earth's surface because of intense absorption of harmful solar ultraviolet radiation by the gas

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#) | [N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#) |

## P-value

in a statistical hypothesis test, the P value is the probability of observing a test statistic at least as extreme as the value actually observed, assuming that the null hypothesis is true. This probability is then compared to the pre-selected significance level of the test. If the P value is smaller than the significance level, the null hypothesis is rejected, and the test result is termed significant; the significance of a statistical test. P-values of less than 0.05 are generally considered to be an indicator that a statistical model is significant; a quantitative estimate of the probability that the observed difference between two groups could have happened by chance alone

## paedogenic

sexual reproduction by larval or immature forms

## paedomorphosis

phylogenetic retention of juvenile or larval characters in the adult

## paedomorphy

the retention of juvenile features in an adult organism



Cope's giant salamander (*Dicamptodon copei*) is an example of paedomorphy. The adult retains the juvenile external gills. (Photo: U.S.D.A. Forest Service)

## paedophagous

larvae or embryo eating; larvivorous

## page precedence

in taxonomy, when two names for the same taxon are first published in the same publication, the one which appears on the earlier page has precedence

## pair bond

the temporary or permanent association formed between a female and male animal during courtship and mating. Pair bonding is characteristic of monogamous species

## paired fins

the pectoral and pelvic fins of fishes



Note the paired fins on this Townsend angelfish. The pelvic fins (and pelvic girdle) are in the thoracic position. (Photo: Jackie Reid, NOAA)

## palate

roof of the mouth cavity

## palatine

a bone in the roof of the mouth of fishes. The palatine is cartilaginous in some primitive bony fishes

## paleobiogeography

the distribution of organisms as revealed by the fossil record

## Paleocene-Eocene Thermal Maximum (PETM)

an interval of maximum temperature, approximately 55 million years ago, which lasted approximately 100,000 years during the late Paleocene and early Eocene epochs. The PETM was characterized by the highest global temperatures of the Cenozoic Era (65 million years ago to the present); also called the "Initial Eocene Thermal Maximum (IETM)"

## paleoclimatology

the study of past climates throughout geological history, and the causes of the variations among them

## paleoecology

the study of the relationship of extinct organisms or groups of organisms to their environments



A paleoecological microfossil, this rotifer (*Callindina angusticollis*) is from the Beringia region of the Arctic. (Photo:Wendy Eisner)

## paleoenvironmental proxy

an environmental remnant of the past (pollen grains, tree rings, lake sediments, pack rat middens, ice cores, coral skeletons) used to assist researchers in deciphering past climatic conditions

## paleopathology

the study of sickness, injuries and other abnormalities in the health of ancient organisms

## paleothermometer

a proxy that provides absolute estimates of past temperature. An example is the Sr/Ca ratio found in coral skeletons

## Paleozoic

an era of geologic time lasting from 570 to 245 million years ago



## paliform crown

a circle of paliform lobes that surround the columella

## paliform lobe

an upright skeletal rod or plate at the inner margin of septa formed by upward growth of the septum

## pallial

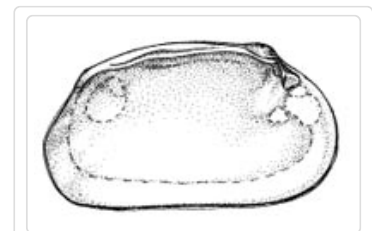
of or pertaining to a mantle, especially to the mantle of mollusks

## pallial chamber

the cavity enclosed by the mantle in mollusks

## pallial line

a linear impression which marks the attachment of the mantle on the inner surface of a bivalve shell



One side of a bivalve shell showing muscle scars, pallial line created by the mantle, hinge and hinge teeth. (Graphic: Biodidac)

## palmata zone

the region of a reef crest of a bank or barrier reef that is closest to the water surface. It is composed almost completely of elkhorn coral (*Acropora palmata*) in the Caribbean



*Acropora palmata* in a shallow reef zone.

## palmate

hand-shaped

## Palmerston Atoll

a small atoll lying at 18° 04' S, 163° 10' W on the western margin of the Cook Islands group in the South Pacific. This extremely isolated atoll hosts nesting green sea turtles in the spring and summer and humpback whales in the winter

## palolo

a polychaete worm (*Palola viridis*) that burrows in the coral reefs of some Pacific Islands. Just before the last quarter of the moon in October and November, they swarm and breed in vast numbers at the sea surface. They are gathered and highly esteemed as food by the islanders. An allied species inhabits the tropical Atlantic and swarms in June or July



The portion containing the reproductive gametes (the epitoke) of the palolo worm, *Palola viridis*, is considered a delicacy in Samoa and other Pacific islands. (Photo: Smithsonian Institution)

## palus

one of several upright slender calcareous processes which surround the central part of the calicle of certain corals; vertical radially arranged plates forming one or more cycles between the septa and the central axis in the scleractinian skeleton

## palustrine

pertaining to swamps or marshy habitats



Palustrine habitat in the Jobos Bay National Estuarine Research Reserve. (Photo: NOAA)

## palynology

the scientific study of pollen, pollen stratigraphy, paleobotany, and paleoclimatology of plants

## palytoxin

an extremely powerful neurotoxin naturally found within the bodies of certain soft corals in the genus *Palythoa* (family Zoanthidae)

## pan-tropical

throughout the tropics

## panarchy

a theoretical hierarchical structure or nested set of adaptive cycles in which systems of nature, humans, human-nature systems, and social-ecological systems are interlinked in never-ending adaptive cycles of growth, accumulation, restructuring, and renewal. Panarchy forms the basis of ecosystems and social-ecological systems across time/space scales

## panchromatic

sensitive to all or most of the visible spectrum

## pandemic

an epidemic that is geographically widespread; occurring throughout a region or even throughout the world

## Pangea

a supercontinent that existed from about 300 to 200 million years ago. It included most of the continental crust of the Earth

## panmictic

refers to random-mating populations; one in which all members are equally likely to interbreed

## panmixis

random mating in a population

## papilla

a raised bump or nipple-like projection on a tissue surface; a cellular outgrowth. Papillae have the appearance of little bumps or fingers on the surface of cells

## papilliform

slender, elongate and pointed

## papilliform

nipple-shaped

## papillose

covered with papillae

## paradigm

a pattern or model that provides a framework for interpreting observations

## paradox

a statement that seems self-contradictory, yet may nevertheless be true

## paralectotype

in taxonomy, any one of the original syntypic series remaining after the selection of a lectotype

## parallel evolution

the development of similar forms by related but distinct phylogenetic lineages

## parameter

a particular physical, chemical, or biological property that is being measured

## parapatric

pertains to the ranges of species that are contiguous but not overlapping; adjacent but non-overlapping distributions

## parapatric speciation

speciation in which the new species forms from a population contiguous with the ancestral species' geographic range

## parapatric speciation

speciation in which the new species forms from a population contiguous with the ancestral species' geographic range. The evolution of reproductive isolating mechanisms occurred when the population entered a new niche or habitat within the range of the parent species

## paraphyletic

a group of taxa that includes an ancestral taxon but not all descendants of that taxon

## parapodium

one of the short unsegmented processes located on each side of most of the body segments in many annelid worms. Parapodia (pl) function in locomotion and often also as tactile or branchial organs. In some marine snails (e.g., sea hares and pteropods) it is a broad lateral expansion of either side of the foot, forming a broad swimming organ



A polychaete worm showing a pair

of parapodia per segment. Note the bristle-like chaetae borne by each parapodium. (Photo: Dr. Anthony Picciolo)

## parasite

an organism that lives in or on the living tissue of a host organism. It gives its host nothing beneficial in return, and often is injurious and even lethal to the host

## parasitic spawning

fertilization of eggs by a subordinate male while the female and dominant male are spawning

## paratype

in taxonomy, every specimen in a type series, other than the holotype, which were before the author at the time of preparation of the original description, and were so designated and indicated there

## parenchyma

the primary tissue of higher plants composed of thin-walled cells that remain capable of cell division, even when mature. Parenchyma constitutes the greater part of leaves, roots, the pulp of fruits, and the pith of stems. They are fundamental plant tissues as opposed to more highly differentiated tissues. In animals, the parenchyma constitutes the essential functional part of an organ, as contrasted with the organ's connective tissue, nerves, and blood vessels

## parenchyme

in cnidarians, mesenchyme with dense cellular components

## parenchymula

a sponge larva which appears as a solid ball with exterior flagellated cells (except at the "posterior end")

## parent population

any population considered as the source or origin for the population under study or analysis

## paresthesia

abnormal neurological sensations which include: numbness, tingling, burning, prickling and hyperesthesia (increased sensitivity); one possible symptom of ciguatera poisoning

## parrotfish

any species of tropical bony fishes in the family Scaridae. Parrotfishes are abundant and common inhabitants of coral reef communities. Their teeth are fused into a sharp "parrot-like" beak strong enough to bite off pieces

of stony corals. Some parrotfishes produce an enveloping mucous envelope that surrounds and presumably protects the body at night

### parsimony

the principle that the simplest explanation, the one that requires the fewest hypotheses, is the one most likely to be correct; same as Occam's Razor: the simplest of two competing theories is to be preferred

### parthenogenesis

reproduction without fertilization; the development of an unfertilized ovum, seed, or spore. It occurs naturally in several species and may also be induced artificially by chemical or mechanical means

### partial pressure

the pressure exerted by a single component of a gas within a gas mixture, or dissolved in a liquid

### particulate

a very small solid suspended in water

### particulate organic matter

particulate material of biological origin that is suspended in water

### partim

in part

### Partnerships for Enhancing Expertise in Taxonomy (PEET)

the National Science Foundation in partnership with academic institutions, botanical gardens, freshwater and marine institutes, and natural history museums, seeks to enhance and stimulate taxonomic research and help prepare future generations of experts. NSF announces a special competition, Partnerships for Enhancing Expertise in Taxonomy (PEET), to support competitively reviewed research projects that target groups of poorly known organisms. This effort is designed to encourage the training of new generations of taxonomists and to translate current expertise into electronic databases and other formats with broad accessibility to the scientific community

### parts per million (ppm)

number of parts of a substance found in one million parts of a particular gas, liquid, or solid

### parts per thousand (ppt)

number of parts of a substance found in one thousand parts of a particular gas, liquid, or solid

### parturition

the process of giving birth

### passive search

a feeding strategy where the predator remains more or less stationary and ambushes the prey animal when it comes within range

### patch reef

a coral boulder or clump of corals formed on a shelf, usually of less than 70 m depth, often in the lagoon of a barrier reef or atoll. It is unattached to a major reef structure

### patchiness

the condition where organisms occur in aggregations

### patchy necrosis

a disease of corals. Colonies with this condition have small (2-10 cm diameter) circular to irregular patches of denuded skeleton that will increase in diameter an additional 1-10 cm over a period of 5-7 days. The disease typically affects the top surface of elkhorn coral (*Acropora palmata*) branches. In most cases most of the affected tissue dies rapidly, and subsequent enlargement of the bare skeletal areas slows after a few days and eventually stops. A bacterium has been identified as a causal agent

### pathogen

an organism which causes a disease within another organism

### pathogenesis

the origin and development of disease

### pathognomonic

a term that means "distinctively characteristic of a particular disease or condition." A pathognomonic sign is a particular sign whose presence means that a particular disease is present beyond any doubt

### pathophysiology

study of the physiological changes in a diseased organism as the disease progresses

### patronym

a taxonomic name derived from the name of a person

### pavement

rock exposed at the Earth's surface in the form of a more or less horizontal surface, usually with crevices or joints

## Payment for Ecosystem Services (PES)

the practice of offering incentives to "ecosystem owners" in exchange for managing their land to provide some sort of ecological service

## pectinate

comb-like; in mollusks, it refers to the comb-like lamellae of the ctenidia (gills)

## pectiniform

comb-shaped

## pectoral

pertaining to the chest area

## pectoral fin

the farthest forward or uppermost of the paired fins of most fishes, usually located in the thoracic position



A flying fish with huge pectoral fins.  
(Photo: NOAA)

## pedal disc

a disc at the aboral end of the body trunk used for attachment. A synonym of basal plate



An anemone maintains its grip on substrate with its pedal disc.  
(Photo: Copyright Digital Stock Corp.)

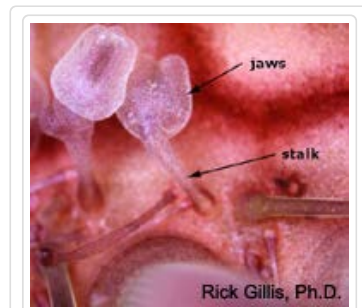
## pedal laceration



a type of asexual reproduction in some sea anemones in which parts of the pedal disc break off and are left behind as the anemone moves

## pedicellarium

a forceps-like organ which occurs in large numbers on starfishes and sea urchins. Pedicellariae, in general, are multifunctional appendages involved in defense, feeding, and cleaning. They are mainly used to keep small organisms from settling on the aboral surface, to capture small prey, and to discourage predators from feeding on soft tissue. The basic structure of pedicellariae consists of a head, neck, and stalk. The head usually has three jaws and, in some pedicellariae, contains poison glands



A single pedicellarium from a starfish. (Photo: Rick Gillis, Ph.D., Biology Dept., University of Wisconsin-La Crosse)

## pedunculate

having a stem or stalk

## peeler crab

a crab that has just recently shed its exoskeleton, i.e., a recently-molted crab

## pelagic

refers to organisms that inhabit open water, as opposed to benthic



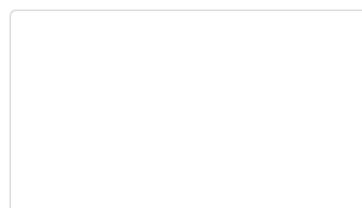
An ocean sunfish, *Mola mola*, is a pelagic species, frequently seen basking at the surface of the water.

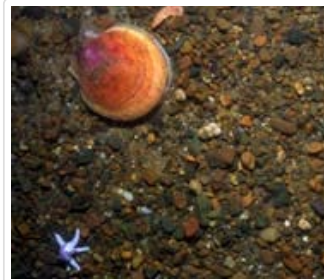
## pelagic larval duration

refers to the amount of time the pelagic larvae spend in the open ocean before settlement on a coral reef

## Pelecypoda (Bivalvia or Lamellibranchia)

a class of Mollusca that includes clams, oysters and mussels





A member of the Pelecypoda, a live scallop (*Placopecten magellanicus*) in the Stellwagen Bank National Marine Sanctuary. (Photo: Dann Blackwood and Page Valentine, USGS)

## pellucid

transparent

## pelvic fin

the paired fin located ventrally beneath, in front of, or behind, the pectoral fin

## penicillate

brush-like; having or resembling a tuft or brush of fine hairs

## penis fencing

a type of reproductive behavior found in hermaphroditic flatworms (some have two penises and one or more genital pores for receiving sperm cells delivered during copulation). During penis fencing, each flatworm tries to pierce the skin of the other using one of its penises. The first to succeed becomes the de facto male, delivering its sperm into the other, the de facto female

## penniform

feather-shaped

## pentamerous

divided into five parts; a characteristic of the body plan of echinoderms



Bright orange seastar (*Pseudarchaster myobrachius*) with a typical pentamerous body shape.

## penultimate

the one before the last; the second from the end

## peppered

used to describe a pigment pattern of dark stippling

## peptide

two or more amino acids joined by a peptide bond

## peptide bond

the bond between two amino acids formed when a carboxyl (-COOH) group of one amino acid joins an amino (-NH<sub>2</sub>) group of another amino acid, releasing water in the process

## percentile

one of the division points that divides a set of ranked data into one hundred equal points; a value on a scale of zero to one hundred that indicates the percent of a distribution that is equal to or below it. A score in the 95th percentile is a score equal to or better than 95 percent of all other scores

## perforate coral

coral that has a porous skeleton with gastrovascular canals that connect the gastrovascular cavities of the polyps along the surface and throughout the skeleton

## peri-

around

## perianal

near or surrounding the anus

## periderm

an external layer of secreted cuticular material in many Anthozoa. The term is synonymous with "cuticle." In woody plants, the periderm is a protective secondary tissue produced by the cork cambium

## perigee

the point in the orbit of the Moon or man-made satellite nearest to the Earth; the point in the orbit of a satellite nearest to its companion body

## Period

in the geologic time scale, a unit of time less than an era and greater than an epoch

## Periodic Table

a chart of the known chemical elements, arranged according to their atomic numbers. Elements with similar physical and chemical properties and similar electron arrangements are in the same column

## periostracum

the outside layer or covering of a bivalve (Mollusca) shell

## peripatric speciation

a type of speciation in which a founder or sink population is isolated from the parent or metapopulation, usually via colonization of some new region

## periphery

the outermost part or region within a precise boundary

## periphyton

algae attached to some substrate, for example a rock or coral

## perisarc

the chitinous outer coat of common tissue connecting individuals in some colonial hydrozoans

## peristome

the area around the mouth in many invertebrates which sometimes is modified to assist in food collecting; the portion of the oral disc in cnidarians directly surrounding the mouth

## peritoneum

the mesodermally-derived membrane that lines the coelom and covers the coelomic viscera

## peritoneum

a membrane lining the body cavity (coelomic cavity) and covering the viscera

## permeable

having pores or openings that permit liquids or gasses to pass through

## perradial canal

one of four branched ciliated canals that originates directly from the stomach of scyphozoan medusae and moves partially digested food materials from the ring canal to the stomach

### personal communication

unpublished information communicated to the author verbally

### perturbation

a disturbance or abnormality

### petabyte

a measure of data size. One petabyte is equivalent to 1,000 terabytes

### petaloid

describes a form that is similar to a flower petal

### petaloid septa

primary septa which have a tapered or curved shape because they are enclosed by other septa

### petrel

seabirds in the bird order Procellariiformes. They occur in four families within that group, which also includes the Albatross family, Diomedidae. The family Procellariidae is the main radiation of medium-sized 'true petrels', characterised by united nostrils with medium septum, and a long outer functional primary. It is dominant in the Southern Oceans, but not so in the Northern Hemisphere

### petrochemical

a chemical derived from petroleum or natural gas

### pH

the logarithm of the reciprocal of hydrogen-ion concentration in gram atoms per liter; provides a measure on a scale from 0 to 14 of the acidity or alkalinity of a solution (where 7 is neutral and <7 is acidic and >7 is basic)

### phaceloid coral

a coral that has corallites of uniform height which are adjoined toward their base

### phage

a virus that infects bacteria; also called a bacteriophage

### phagocyte

a cell that engulfs and digests debris and invading microorganisms

## phagocytosis

"cell eating." A process in which phagocytes engulf and digest microorganisms and cellular debris; an important defense against infection

## pharmaceutical

refers to man-made and natural drugs used to treat diseases, disorders, and illnesses

## pharmaco-

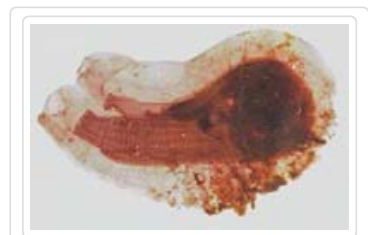
pertaining to drugs

## pharyngeal arch

one of several columns of mesenchyme found in the neck region of the developing vertebrate embryo. In lower vertebrates, blood vessels formed here become part of the gills; in higher vertebrates derivatives include portions of the jaw and middle ear; also known as branchial arches, gill arches, or visceral arches

## pharyngeal basket

a feeding structure in tunicates (sea squirts) which is a type of pharyngeal gill formed into a mesh-like basket. Cilia on the gill draw water into the mouth, through the basket mesh, and out the excurrent siphon



Water entering this sea squirt carries particulate matter which is filtered as water passes through openings in the pharyngeal basket. Food particles are carried to the bottom in mucus and enter the digestive tract. Water that has passed through basket is expelled via the excurrent siphon opening, on right in this illustration. The anus opens at the excurrent siphon so fecal material is carried away. (Photo: Houseman at U. Ottawa; BIODIDAC)

## pharyngeal teeth

in fishes, teeth located on the bones in the pharynx, which is the posterior part of the oral cavity

## pharyngeal teeth

in fishes, teeth located behind the gills and before the esophagus, and anchored in bone or gill arches. Fishes may use their pharyngeal teeth for sound production

## pharynx

the part of the digestive system of many animals immediately behind the mouth and in front of the esophagus; the throat

## phenetic classification

classification based on degree of overall similarity

## phenetic species

a concept of species in which a species is a set of organisms that are phenotypically similar to one another

## phenetics

classification based on grouping by overall similarity, not recency of common descent

## phenocopy

an organism whose phenotype (but not genotype) has been changed by the environment to resemble the phenotype usually associated with a mutant organism; a phenotypic variation in an organism that has an environmental rather than a genetic cause, and is not inherited

## phenology

the science dealing with the relationships between climate and periodic biological phenomena that are related to or caused by climatic conditions, such as the seasonal budding of trees and migration of birds

## phenotype

the total characteristics of an individual, i.e., its appearance, resulting from interaction between its genotype (genetic constitution) and its environment

## phenotypic plasticity

an alteration of phenotype as an organism adapts from one micro-environment to another and as the local environment changes; when an organism activates different phenotypes in response to its environment. Phenotypic plasticity may cause some organisms to look different from each other even though they are genetically identical

## pheromone

a hormone-like substance that is secreted by an organism into the environment as a specific signal to another organism, usually of the same species

## phospho-diester bond

a bond in which a phosphate group joins adjacent carbons through ester linkages

## phosphorylation

the addition of a phosphate group to a compound

## photic zone

the vertical zone in the ocean extending from the surface to that depth permitting photosynthetic activity

## photo-quadrat

a quadrat that is photographed for purposes of later analysis and permanent record for species monitoring or measurement

## photocyte

a light-producing cell

## photogenesis

light production

## photometer

an instrument for measuring light intensity

## photometric

of or relating to photometry; a more precise measurement of the brightness (intensity) of light, which can be digitized and calibrated

## photometry

the quantitative measurement of visible radiation, primarily intensity (brightness), from light sources

## photomosaic

an assemblage of photographs, each of which shows part of a region, and put together in such a way that each point in the region appears once and only once in the assemblage, and scale variation is minimized



Photomosaic of St. John, U.S. Virgin Islands. Images such as these are valuable in studying and managing coral reefs and other habitats. (Courtesy of NOAA National Ocean Service)



## photophile

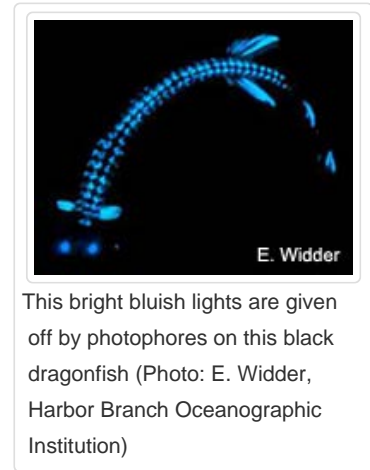
an organism which grows or thrives in lighted conditions

## photophilous

thriving in conditions of strong light

## photophore

a light-producing organ, found especially in marine fishes and cephalopods. Photophores emit light from intrinsic structures, or derive light extrinsically from symbiotic luminescent bacteria



This bright bluish lights are given off by photophores on this black dragonfish (Photo: E. Widder, Harbor Branch Oceanographic Institution)

## photoreceptor

a nerve ending, cell, or group of cells specialized to sense or receive light

## photosynthesis

process by which autotrophic chlorophyll-containing organisms manufacture their own energy sources (simple sugars) from the intracellular chemical reaction of carbon dioxide and water in the presence of sunlight and chlorophyll. Oxygen is a photochemical byproduct of photosynthesis

## photosynthetic capacity

the maximum photosynthetic rate per unit of biomass

## photosynthetic pigment

a pigment that efficiently absorbs light within the 400-700 nm range and is essential for photosynthesis

## photosynthetically active radiation (PAR)

those wavelengths of light that can be absorbed by chlorophyll or other light harvesting pigments

## phototropism

the response of an organism to light, usually expressed as movement of a part of an organism toward or away from the light stimulus, as when plants grow toward sunlight

### phototype

in taxonomy, a photograph of the type or a photograph serving as the type

### phreatic water

water below the level at which all voids in the rock are completely filled with water

### phycocyanin

a blue, water soluble pigment found in red algae and cyanobacteria

### phycoerythrin

a red, water soluble pigment found in red algae and cyanobacteria

### phycology

the scientific study of algae

### phylliform

leaf-shaped

### phyllopod

any of various branchiopod crustaceans having swimming and respiratory appendages that resemble leaves

### phylogenetics

the field of biology that deals with the relationships among organisms

### phylogeny

the evolutionary relationships among organisms

### phylum

a major division of a biological kingdom, consisting of closely- related classes; represents a basic fundamental pattern of organization and, presumably, a common descent

### physiology

the branch of biology that is concerned with the study of functions of particular structures or organs of organisms

## physoclistous

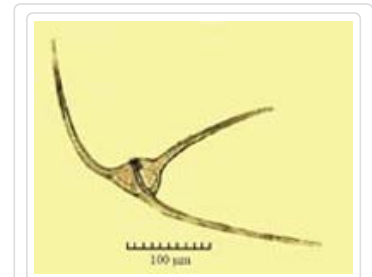
in fishes having the swim bladder closed, with no connection to the gut

## physostomous

in fishes having the swim bladder connected by a tube to the gut

## phytoplankton

microscopic green plant component of the plankton which is responsible for most of the photosynthetic activity in the ocean



A phytoplankton species of the genus *Ceratium*.

## phytotoxin

a substance similar in its properties to an extracellular bacterial toxin

## picotiter plate

a flat plate that is honeycombed with multiple wells. It is used in DNA sequencing and other laboratory analytical techniques

## picture element

in a digitized image, this is the area on the ground represented by each digital value. Because the analogue signal from the detector of a scanner may be sampled at any desired interval, the picture element may be smaller than the ground resolution cell of the detector. It is commonly abbreviated as pixel

## piebald

with two colors irregularly arranged, usually black and white

## piezometer

an instrument for measuring pressure or compressibility

## pigment

any substance whose presence in plant or animal tissues produces a characteristic color; a compound produced by a living organisms that has a color resulting from wavelength-selective absorption

## pileated

having a cap or crest

## pileiform

umbrella-shaped

## piliform

hair-shaped

## pinacocyte

a cell type which forms the surface layer (pinacoderm or epidermis) of a sponge. Pinacocytes are capable of synthesising collagen

## pinacoderm

the external surface of a sponge, lined with pinacocytes in a single cellular layer

## ping

a single output pulse of a sonar system

## pingo

a mound of earth-covered ice found in the Arctic and subarctic that can reach up to 70 meters (230 ft) in height and up to 600 meters (2,000 ft) in diameter

## pingo-like-feature

a bathymetric feature formed by gas-driven sediments derived from decomposing gas-hydrate associated with Holocene sea level rise. It is a unique habitat arising more than 15m off the sea floor, with a small diameter of about 80-90m

## pinna

a small lateral branchlet on a tentacle of an octocorallian (soft coral); the most visible portion of the outer ear of mammals

## pinnacle reef

a nearly cylindrical reef with vertical sides; may be up to 200 m diameter and 50 m in height

## pinnate

having side branches

## pinnule

a side branch structure on the tentacle of soft corals, giving them a feathery appearance

## pisciform

having the shape of a fish

## pisciform

fish-shaped

## piscivore

an animal that feeds on fishes

## pixel

abbreviation of picture element

## placode

a thickened or plate-like region within an epithelium

## Placozoa

a phylum of extremely simple and cryptic marine animals, for which only two species have been described, *Trichoplax adhaerens* and *Treptoplax reptans*. These tiny animals were discovered in Europe in the late 1800's living on the glass walls of an aquarium. Since then, most of what has been learned about their biology has come from studying cultures kept in various laboratories around the world. Their bodies are made up of only a few thousand cells of just four types. They also have the smallest amount of DNA measured for any type of animal. They lack tissues, organs and organ systems. They reproduce asexually, but it is not known if they can also reproduce sexually. Practically nothing is known about them in nature. Some scientists believe they emerged early in metazoan evolution, either before or just after the sponges (Porifera). However, recent DNA studies lead others to believe they emerged after the Cnidaria. Of the two species described, *Treptoplax reptans* has never been seen since its description in 1896, causing some to doubt its existence. However *Trichoplax adhaerens* has been reported from the Mediterranean and many tropical and subtropical locations around the world. It may be that *Trichoplax adhaerens* actually consists of more than a single species

## plague (white plague disease)

a coral disease characterized by a sharp line between apparently healthy coral tissue and freshly exposed coral skeleton.-There is no obvious microbial band present.-The infective pathogen is a bacterium. Plague is currently epidemic throughout the Caribbean, and affects stony corals. For more information and illustrations, see: [http://www.coral.noaa.gov/coral\\_disease/white\\_plague.shtml](http://www.coral.noaa.gov/coral_disease/white_plague.shtml)



White plague disease. (Photo: Dr.

## plain

uniformly colored or unadorned with structures or other features

## planktivore

an organism that feed on plankton; also called "planktonivore" or "planktonophage"

## planktivorous

feeding on planktonic organisms

## plankton

the passively floating or weakly motile aquatic plants (phytoplankton) and animals (zooplankton)



This large copepod (*Neocalanus sp.*) is part of the Arctic marine plankton community.

## planktonophage

a term that usually refers to fishes that feed on plankton

## planogamete

a ciliated or flagellated motile gamete

## Plantae

the kingdom of immobile multicellular eukaryotes that obtain energy through photosynthesis, and have cells encased in cell walls composed of cellulose



Green plants in a Hawaiian intertidal community.

### planula

a planktonic larval form produced by some anthozoans

### plasmid

an autonomous (self-replicating) circular piece of DNA found outside the chromosome in bacteria. Plasmids carry information that give the bacteria resistance to antibiotics. They are often used in genetic engineering as cloning vectors to carry desired genes into organisms



A super coiled plasmid is the predominant *in vivo* form in which the plasmid is coiled around histone-like proteins. Supporting proteins are stripped away during extraction from the bacterial cell, causing the plasmid molecule to supercoil around itself *in vitro*. (Photo: Stanley Maloy, Ph.D., Director, Center for Microbial Sciences, San Diego State University)

## plasmogamy

a process of fusion of the cytoplasm of two sex cells or gametes; the first step in syngamy (fertilization)

## plastid

a membrane-bound organelle in plant cells that functions in storage (of food or pigments) or food production. Chloroplasts contain the pigments for photosynthesis

## plate like

resembling thin, flat sheets of uniform thickness

## plate tectonics

the theory that the Earth's lithosphere consists of large, rigid plates that move horizontally in response to the flow of the asthenosphere beneath them, and that interactions among the plates at their borders cause most major geologic activity, including the creation of oceans, continents, mountains, volcanoes, and earthquakes

## platform reef

a large reef of variable shape lacking a lagoon, seaward of a fringing reef and/or a barrier reef, for which the width is more than half its length

## Platyhelminthes

an animal phylum containing four classes of flatworms. Three are parasitic (tapeworms, flukes) and one, the Turbellaria, is free-living and contains coral reef inhabiting species



A free-living polyclad flatworm.

## Pleistocene epoch

an interval of the Quaternary period, from 1.8 million years before present to 10 thousand years before present

## plenary power

in taxonomy, power of the International Commission on Zoological Nomenclature to suspend articles of the Code to settle particular cases

## plenary powers

in taxonomy, the International Commission on Zoological Nomenclature (Commission) is empowered by use of its Plenary Powers to prevent the application of a rule of the International Code of Zoological Nomenclature (Code) where such application in a particular case would disturb the stability or universality or cause confusion in zoological nomenclature



## pleomorphic

variable in size and shape

## pleopod

one of the five paired abdominal appendages used for swimming by shrimps; used for attachment of eggs by female shrimps, lobsters and crabs; also called a swimmeret

## plesiotype

of the same sex as the holotype

## pleurite

one of the external lateral processes of a somite (body segment) of a crustacean; also called a 'pleuron'

## pleurodont

teeth implanted in the side of a bone, e.g. in parrotfishes and triggerfishes

## plexus

a group or network of intersecting nerves and/or blood vessels

## plica

a small fold in the skin

## plicate

having plicae or a series of folds, grooves or wrinkles in the skin; plaited

## plication

a fold

## Pliocene epoch

an interval of the late Neogene period, from 5.3 to 1.8 million years before present

## plocoid colony

a coral colony which has conical corallites with their own walls

## plug-in

a small piece of software that adds features to a larger piece of software

## pluripotent

ability of a single stem cell to develop into many different cell types of the body of an organism

## pluteus larva

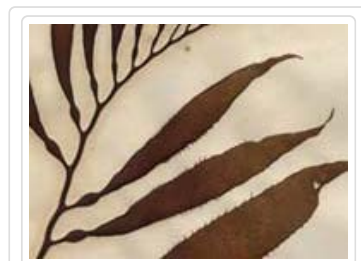
a free-swimming, bilaterally symmetrical, ciliated larva of some echinoderms, such as sea urchins and brittlestars



Pluteus larva of an Australian sea urchin. (Photo: Ellen Popodi and Rudolf A. Raff)

## pneumatocyst

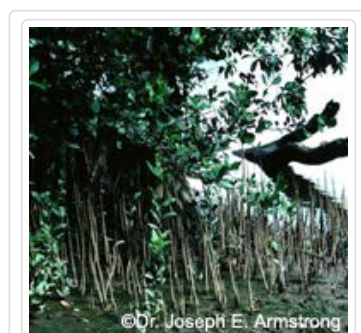
one of many gas-filled bladders found in some algae that act as a buoys. In some large brown algae, such as kelp, they act to raise the blades closer to the surface where photosynthesis can occur. Pneumatocysts keep the brown alga, *Sargassum*, afloat in the Sargasso Sea



The pneumatocysts are the swellings at the bases of the blades in this kelp. (Photo: Monterey Bay Aquarium Research Institute)

## pneumatophore

a modified aerial root rising above ground that may function as a respiratory organ in plant species such as mangroves, which are subjected to inundation or soil saturation. Such evolutionary adaptations enable trees to obtain oxygen directly from the air and also helps consolidate swamp sediments. They have special air channels (lenticels) for gas exchange in the atmosphere and there is an internal pathway for getting oxygen into the root and to supply submerged roots. The aerial loop of a mangrove root is sometimes called a "knee" or "peg root"



Mangrove pneumatophores emerging from the sediments. These structures, also known as

rhizophores, have bark rich in lenticels to function in gas exchange for roots that are constantly in water-saturated soil. (Photo: Copyright Dr. Joseph E. Armstrong, Illinois State University)

## poacher

a person who hunts or fishes illegally; a family (Agonidae) of small bottom-dwelling cold-water marine fishes

## poaching

Illegal hunting, fishing or trapping

## pod

a group of aquatic mammals

## point intercept transect

a linear transect protocol where a tape is secured at each end of the transect with the tape draped over the reef in between. Observations are collected on each species and substrate component at specified points along the line

## point mutation

a mutation in which a single nucleotide in a DNA sequence is substituted by another nucleotide

## point source pollution

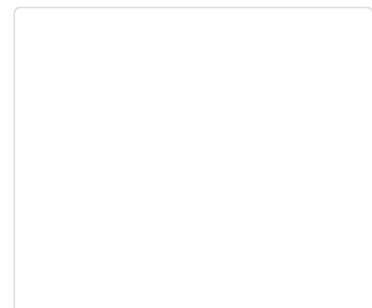
origin of a pollutant discharge from a discrete conveyance, such as an effluent from the end of a pipe

## PointCount

PointCount for Coral Reefs is a Windows/Win95-based program developed to utilize the random point count method to accurately estimate percent coverage of corals, sponges, and associated substrate from frame grabbed underwater video imagery

## poisonous

an organism that contains poison in its tissues that can be harmful if the organism is ingested





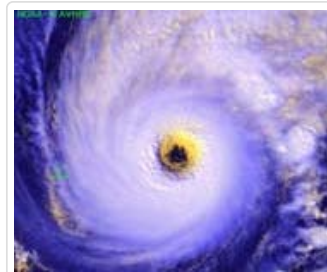
The liver, gonads, intestines, and skin of puffer fish (and other related and unrelated animals) contain high concentrations of tetrodotoxin, a powerful neurotoxin that can cause respiratory paralysis and death, in approximately 60% of persons who ingest it. (Photo: NOAA)

## Poisson distribution

a probability distribution of random occurrences in which one occurrence has no influence on any other occurrence. The variance of a poisson distribution is equal to its mean and therefore the standard deviation is equal to the square root of the mean of the distribution

## polar-orbiting satellite

a satellite traveling in a near-polar orbit around the globe; civilian satellite program managed and operated by NESDIS



Polar-orbiting satellite data was used to derive this image of Hurricane Erin, September 2001.

## polarimeter

an instrument for measuring polarized light

## Polaris

see North Star

## polariscope

an instrument for detecting polarized light

## polarized light

light waves which vibrate in one plane only as opposed to the multi-directional vibrations of normal rays

## polyadenylation

the process by which the 3' ends of most eukaryotic mRNAs are formed; the covalent modification of a macromolecule (e.g., mRNA) by the formation of a polyadenyl moiety covalent linked to the macromolecule; post-transcriptional addition of a polyadenylic acid tail to the 3' end of eukaryotic mRNAs; also called 'poly-(A) tailing'

## polyadenylic acid

a polymer of adenylic acid that is sometimes attached to eukaryotic mRNA (messenger RNA) and stabilizes the molecule before transport from the nucleus into the cytoplasm

## polyandry

a female mating with more than one male

## polycentric distribution

the establishment of a population, species or other taxonomic unit in several widely separated geographic places

## Polychaeta

a class of the segmented worm phylum Anellida. There are approximately 8,000 species of polychaetes which include errant (free-moving) forms and sedentary ones that live in stabilized burrows, galleries or tubes of various degrees of complexity. Some burrow into coral. Many species are common inhabitants of coral reefs, such as the Christmas tree worms, feather duster worms, fanworms, fireworms, scaleworms, threadworms, and others



A marine polychaete worm grazing on the surface of a coral head.  
(Photo: Dr. Anthony Picciolo)

## polyclad flatworm

a free-living flatworm belonging to the order Polycladida (Class Turbellaria; Phylum Platyhelminthes). Many species are coral reef inhabitants

## polyculture

the cultivation of more than one species of organism in an aquaculture system

## polycyclic aromatic hydrocarbon (PAH)

a class of stable organic molecules made up of only carbon and hydrogen. These molecules are highly carcinogenic, but also very common in the environment. PAHs are formed during the incomplete burning of coal, oil and gas, garbage, and other organic substances, such as tobacco or even charcoal broiled meat. PAHs enter water through discharges from industrial and wastewater treatment plants or through the release of boat engine exhausts. Ultraviolet light (UV) transforms the PAHs into toxic forms that kill crustaceans, polychaetes, and coral larvae

## polygamy

both sexes mating with more than one other individual

## polygene

one of many genes of small effect that influence the development of a quantitative trait; results in continuous variation and in quantitative inheritance

## polygenic trait

a phenotype controlled by many genes of small effect (polygenes)

## polygyny

the mating of a single male with several females

## polymer

a compound of high molecular weight consisting of up to millions of repeated linked light and simple molecules

## polymerase

a general term for enzymes that carry out the synthesis of nucleic acids

## polymerase chain reaction (PCR)

a method of creating copies of specific fragments of DNA. PCR rapidly amplifies a single DNA molecule into many billions of molecules

## polymorphic species

species which have a variety of morphological types

## Polynesia

scattered islands of the central and southern Pacific Ocean roughly between New Zealand in the southwest, Hawaii in the north, and Easter Island in the southeast. The larger islands are volcanic, the smaller ones are generally coral formations



The island of Bora Bora in French Polynesia. (Photo: Anthony R. Picciolo, NOAA)

## polyp

an individual of a solitary cnidarian or one member of a cnidarian colony



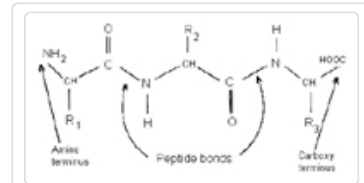
Cnidarian polyp.

## polyp bail-out

the dissociation and dispersal of coral polyps from adult colonies

## polypeptide

a long chain of amino acids joined by peptide bonds



Amino acids in proteins (or polypeptides) are joined together by peptide bonds.

## polyphenism

phenotypic variations arising from a single genotype. The phenotypic variations are due to environmental conditions, such as seasonal temperature differences; phenotypic plasticity

## polyphydont

a type of dentition where the teeth are continuously replaced

## polyphyletic group

a group of species that resemble each other but are evolved from different ancestors. A polyphyletic group is composed of members that originated, independently, from more than one evolutionary line

## polyploid

cells or organisms having more than twice the haploid number of chromosomes

## polysaccharide

any of a class of carbohydrates whose molecules contain chains of monosaccharide molecules -

## polytypic

a taxon including several subordinate taxa, e.g. a polytypic genus is one containing several species

## pony bottle

a small, but independent alternate air supply for scuba divers, to be used in case of main air failure. It is a small scuba tank with an attached regulator



A pony bottle attached to the main size cylinder. (Photo: Aqua Explorers)

## population

a group of individuals of the same species living in the same area at the same time and sharing a common gene pool; a group of potentially interbreeding organisms in a geographic area

## population (statistics)

any entire collection of animals, plants, people, or things from which we may draw a sample and collect data. It is the entire group we are interested in, which we wish to describe or draw conclusions about. In order to make any generalizations about a population, a sample, that is meant to be representative of the population, is often studied. For each population there are many possible samples. A sample statistic gives information about a corresponding population parameter. For example, the sample mean for a set of data would give information about the overall population mean

## population crash

sudden decline in the number of individuals found in a population because of a scarcity of required



environmental resources

## population density

the number of organisms per unit area or volume

## population dynamics

the study of the factors that affect the growth, stability, and decline of populations, as well as the interactions of those factors

## population explosion

sudden increase in the number of individuals found in a population because of an abundance of useable environmental resources

## population viability

the concept of a minimal number of individuals representing the threshold between survival versus extinction

## pore water

water between the grains of a sediment; also called interstitial water

## Porifera

an animal phylum that contains the sponges. They are the most primitive of the multicellular animals. Sponges assume many sessile body forms, such as finger, branching, bushy, spherical, tubular, vase and tube-like, encrusting, amorphous and massive. Some bore into coral and mollusk shells. Many of the 5,000 species are colorful and prominent inhabitants of coral reefs



A barrel sponge (Porifera). (Photo: Dr. Anthony Picciolo)

## Porites

an important and dominant genus of hermatypic coral. Porites brood or release live young rather than sperm and egg packets like most corals

## porocyte

in sponges, a cell surrounding a pore (ostium)

## porphyrous

purple color

## port

the left side of a vessel to someone facing the bow or front

## portable document format (pdf)

a file format created by Adobe, initially to provide a standard form for storing and editing printed publishable documents. Because documents in .pdf format can easily be seen and printed by users on a variety of computer and platform types, they are very common on the World Wide Web

## portunid crab

any member of the crab family Portunidae (order Decapoda, class Malacostraca). In these crabs, the hindmost pair of legs (5th pair) are flattened into paddles for swimming. The family includes the blue crab (*Callinectes sapidus*), an edible crab of the Atlantic coast of North America; the velvet crab, *Portunus* sp of the Atlantic and Pacific oceans and the Mediterranean Sea; and *Scylla serrata* (mangrove crab) of the Indo-Pacific region; also called swimming crab

## posterior

morphologically, toward the rear or back end of an individual, or distal portion of a bodily part



The prehensile tail at the posterior end of the seahorse's body allows it to hold on to aquatic plants

## posting

a single message entered into a network communications system

## postlarva

in fishes, a larva following the yolk sac stage; the term is applied only when the post larva's morphology continues to be strikingly different from that of the juvenile

## postulate

a statement accepted without proof; a fundamental assumption

## potable water

water that is safe for drinking by humans. Specifically, freshwater that generally meets the standards in quality as established in the U.S. Environmental Protection Agency (EPA) Drinking Water Standards

## potential coral reef bleaching episode

potential for coral bleaching occurs when the sea surface temperature is at least 1 degree C above the maximum expected summertime temperature

## potentiation

the effect of an initial stimulus in evoking a stronger response the next time it is received; the synergistic effect of two drugs given simultaneously; the ability of one chemical to increase the effect of another chemical

## Pourtales Terrace

a segment of the continental shelf in the Straits of Florida extending for 115 nautical miles along the base of the Florida Keys with a maximum width of 17 miles

## PowerPoint:

a program in the Microsoft Office suite which allows users to create presentations and handouts. By creating PowerPoint "slides," users can add color, images, sounds, and movies to their text presentations

## precautionary approach

measures intended to reduce risk to a biological resource and its environment

## precious coral

the common name given to the coral, *Corallium rubrum*, and related species. These species are red and pink in color and have been used, primarily in the Mediterranean, to make jewelry. Other precious corals are found in the deep waters of the western Pacific and parts of the eastern Atlantic

## precision

the ability of an instrument to measure a variable and to repeatedly obtain the same result

## prehensile

capable of or adapted for grasping, such as the prehensile tail of a seahorse



This seahorse keeps its position by anchoring itself with its prehensile

## preprint

an article printed especially for private distribution in advance of the actual publication

## prevailing winds

the typical winds for a particular region and time of year

## prevalence

the number of disease cases within a population over a given period of time

## prialt

an analgesic drug made from the venom of a species of cone shell snail, *Conus magus*. The particular analgesic substance in the venom is a conopeptide, one of the first pharmaceuticals that demonstrate the promise of "drugs from the sea"

## Primary male or female

a male or female that is genetically determined at birth or hatching and is not the result of sex change

## primary polyp

in colonial octocorals, e.g., sea pens, one polyp grows very large and loses its tentacles, forming the central supporting axis. This is the primary polyp. The base of this primary polyp forms a bulb, which anchors it to the substratum. Branching off this primary polyp are various secondary polyps. Some are specialized for feeding (autozooids). Others (siphonozooids) serve as intakes for water, which circulates within the colony and help keep it upright

## primary production

a synonym of primary productivity

## primary productivity

the rate at which new plant biomass is formed by photosynthesis. Gross primary productivity is the total rate of photosynthetic production of biomass; net primary productivity is gross primary productivity minus the respiration rate

## primary septum

full plates/partitions that separate two sets of mesenterial pairs

## prime meridian

an imaginary line running from north to south through Greenwich, England, used as the reference point for longitude

## primer

in genomics, a short pre-existing single-stranded polynucleotide chain to which new deoxyribonucleotides can be added by DNA polymerase. It anneals to a nucleic acid template and promotes copying of the template starting from the primer site; a single-stranded nucleic acid that can "prime" replication of a template; a strand of nucleic acid that serves as a starting point for DNA replication. The enzymes (DNA polymerases) that catalyze DNA replication can only add new nucleotides to an existing strand of DNA

## primeval soup

Soviet biologist, Aleksandr Ivanovich Oparin, in 1924, put forward a theory of life on Earth developing in the oceans through gradual chemical evolution of carbon-based molecules in a rich organic broth or "primeval soup." He hypothesized that the early oceans were rich in organic compounds

## primitive character

in evolution, an attribute of taxonomic group which all members of the group possess, i.e., the more common shared characters of a given group of organisms. Primitive characters are also called 'plesiomorphies'

## priority

in taxonomy, the seniority of a taxonomic name fixed by the date of publication; the earliest published name has priority

## pristine

an area having its original purity, not contaminated or corrupted by human intervention; the original or pure condition or state of something; unspoiled

## probability

a quantitative description of the likely occurrence of a particular event. Probability is conventionally expressed on a scale from 0 to 1; a rare event has a probability close to 0; a very common event has a probability close to 1

## probe

in genetics, a DNA or RNA sequence that is labelled or marked with a radioactive isotope. It is used to detect the presence of a complementary sequence by hybridization with a nucleic acid sample

## probiotics

living endosymbiotic microorganisms, which when administered in adequate amounts, contributes a health benefit to the host animal. Lactic acid bacteria (LAB) and bifidobacteria are the most common types of microorganism used as probiotics; dietary supplements containing protective bacteria (such as *Lactobacillus acidophilus*)

## proboscis

an elongated tubular organ of varying use and form, usually associated with the oral region of many invertebrates

## producers

the first level in a food pyramid; usually consist of photosynthetic organisms that generate the food used by all other organisms in the ecosystem

## Professional Association of Diving Instructors (PADI)

the world's largest scuba diving certification agency

## progenitor

an ancestor or precursor

## proglottid

one of the segments of a tapeworm, containing both male and female reproductive organs



Gravid proglottid of the tapeworm *Taenia saginata*. The dark branched structure is the uterus. Note the mid-lateral genital pore. (Photo: U.S. Center for Disease Control)

## prokaryote

an organism whose chromosomes are not enclosed within a nuclear membrane, e.g., a bacterium or cyanobacterium

## prokaryotic

descriptive of organisms with cells possessing no distinct nucleus. Prokaryotes include bacteria and cyanobacteria

## proliferation

to reproduce or increase rapidly and repeatedly

## promoter

a DNA sequence that is located in front of a gene and controls gene expression. Promoters are required for binding of RNA polymerase to initiate transcription

## prop root

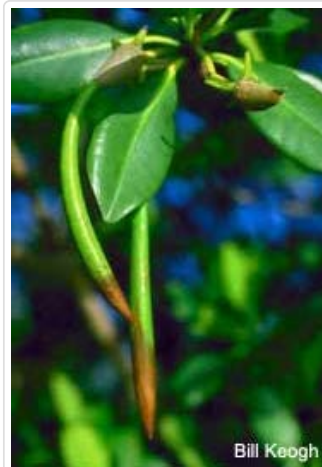
an adventitious root that grows from and supports the trunk above the ground in plants, such as mangroves



The intertidal understory of a mangrove forest shows the muddy soil, the fairly high density of stems, and the tangle of prop and drop roots. (Photo: Copyright Dr. Joseph E. Armstrong, Illinois State University)

## propagule

a structure for mangrove reproduction. After a mangrove is pollinated, it produces a propagule, which grows on a parent plant and requires carbon dioxide and water from the parent, but produces its own sugars from photosynthesis. After a while, it separates from the parent tree and falls into the water where it can be transported great distances. Propagules can resist dessication and survive for long periods of time until they root in a suitable environment.



Cigar-shaped propagule of the red mangrove, *Rhizophora mangle*. It may reach 15 cm in length. (Photo: Bill Keogh)

## proprioceptor

a specialized sensory nerve ending that monitors internal changes in the body brought about by movement and muscular activity. Proprioceptors are located in muscles, tendons, and joint capsules and when stimulated, transmit information concerning movements and position of the body; also called "proprioceptor"

## prosopinacocyte

in sponges, an endopinacocyte lining an incurrent canal

## prosopinacoderm

in sponges, a surface lined with prosopinacocytes

## prosopyle

the opening into the excurrent canal in sponges

## prostomium

the anteriormost, presegmental region of the body of an annelid worm, sometimes bearing eyes and antennae; the portion of the head in annelids that is situated anterior to the mouth

## prostrate

lying horizontally or flat on the substrate

## prostrate colony

a coral colony which sprawls horizontally over the substrate

## protandry

a state in hermaphroditic systems characterized by the development of male reproductive organs, or maturation of their gametes, before the appearance of the corresponding female product, thus insuring against self-fertilization

## protease

an enzyme that hydrolyzes proteins, cleaving the peptide bonds that link amino acids in protein molecules

## protected area

a legally established land or water area under either public or private ownership that is regulated and managed to achieve specific conservation objectives



This brilliant sea anemone is from the protected Gulf of the Farallones National Marine Sanctuary.

## protected species

species which are protected by federal legislation such as the Endangered Species Act, Mammal Protection Act, and Migratory Bird Treaty Act



## protein

a large complex molecule made up of one or more chains of amino acids. A typical protein contains 200-300 amino acids but some are much smaller and some much larger, e.g., titin, a protein found in skeletal muscle contains approximately 27,000 amino acids in a single chain. Proteins perform a wide variety of essential activities in cells: they largely form the physical structure of cells and cellular matrices; catalysts for all biochemical reactions are enzymes, which contain protein; the transport of materials in body fluids depends of proteins; the receptors for hormones and other signaling molecules are proteins; motion and locomotion of cells and organisms depends on contractile proteins; the transcription factors that turn genes on and off are proteins; proteins are an essential nutrient for heterotrophs; and many more - the activities of cells and organisms are largely reflections of the activities of their proteins

## protein family

a group of evolutionarily related proteins

## Protein Information Resource (PIR)

a protein sequence database of classified and functionally annotated protein sequences that grew out of the Atlas of Protein Sequence and Structure (1965-1978)

## protein sequencing

the process of determining the amino acid sequence of a protein, or its component polypeptides

## protein synthesis

the creation of proteins from their constituent amino acids, in accordance with the genetic information carried in the DNA of the chromosomes

## proteinaceous

any structure composed of proteins

## proteome

all of the proteins produced from all the genes of a genome

## proteomics

the branch of genetics that studies the full set of proteins encoded by a genome. Research in proteomics aims to identify, quantify, and classify the function of proteins produced by given genomes

## Protista

earliest evolved eukaryotic kingdom. It includes the protozoans, the slime molds, the unicellular algae, and the multicellular algae. However, some consider the multicellular marine algae (seaweeds) as belonging to the kingdom Plantae

## protocols

the selections of methods and how they are used to gain data and information at a site

## protogynous

pertains to a sequential hermaphrodite in which the organism first functions as a female and later as a male

## protogyny

a state in hermaphroditic systems characterized by the development of female reproductive organs, or maturation of their gametes, before the appearance of the corresponding male product, thus insuring against self-fertilization

## protonephridium

a simple type of excretory organ of simple invertebrates, such as flatworms and rotifers. It is also called a 'flame bulb.' Protonephridia are primarily concerned with removing excess water from the animal

## protoplasm

the complex colloidal substance which constitutes the living matter of cells and performs the life process functions. The protoplasm found between the cell (plasma) membrane and the nuclear membrane is termed the cytoplasm; the protoplasm within the nucleus and separated from the cytoplasm by the nuclear membrane is termed the nucleoplasm

## protostome

an evolutionary line of coelomates that include mollusks, annelids, and arthropods. They develop their embryo by spiral cleavage, and the blastopore of the gastrula develops into the mouth. The group exhibits bilateral symmetry

## Protozoa

heterotrophic eukaryotic unicellular organisms that belong to the kingdom Protista

## protractile

capable of being protruded or thrust out

## protrusible

capable of being protruded, extended or thrust out, e.g., the tongue or the jaws in some fishes

## proximal

the direction towards center of the body; opposite of distal

## proxy signal

paleoclimatic evidence that can be used to indirectly infer or estimate some aspect of the paleoenvironment, such as precipitation or temperature. Temperature proxies such as tree ring widths and ice core layering are used by paleoclimatologists to create a past temperature record. Tree ring widths can also be used to infer precipitation changes. Isotopic variations in ice cores can be used to infer temperature changes and ice sheet volume. Beryllium 10 variations can be used to infer past solar irradiance

## psammon

organisms growing on, in, or moving through sand; interstitial organisms

## pseudocoelom

a closed fluid-filled cavity that acts as a hydrostatic skeleton to maintain body shape, circulate nutrients, and hold the major organs in roundworms, rotifers, spiny-headed worms, and horsehair worms

## pseudocoelomate

any of a group of triploblastic invertebrates that has a fluid-filled body cavity, the pseudocoelom, lying between the endoderm and the mesoderm. The pseudocoelom is contrasted with the coelom of mollusks, annelid worms, and the more complex animals, including vertebrates, by lacking an endothelial lining. Pseudocoelomates lack a circulatory system, using the pseudocoelom to transport nutrients. The hydrostatic pressure of the pseudocoelom gives the body a supportive framework that acts as a skeleton. Nematodes (roundworms), rotifers, acanthocephalans (spiny-headed worms), kinorhynchans, and nematomorphs (horsehair worms) are pseudocoelomate groups



Spiny-headed worms (Acanthocephala) attached to the intestinal lining of a fish. This parasitic pseudocoelomate uses a spiny attachment organ to secure itself to the intestine. (Photo: Maine Department of Inland Fisheries and Wildlife)

## pseudopodium (pseudopod)

a protoplasmic filament or irregular process that can project from any unicellular organism. Formation of pseudopodia (or pseudopods) assist in feeding and locomotion



An amoeba thrusting out pseudopodia (false feet). (Photo: NASA)

## psi (pounds per square inch)

a unit of air or water pressure expressed as pounds per square inch (psi)

## pterygiophore

in fishes, one of several bones or cartilage with which the base of the rays of the median fins articulate

## ptychocyst

a special type of nematocyte found on burrowing (tube) anemones, which help create the tube in which the animal lives

## published name

in taxonomy, any name which is printed and circulated, i.e., meets the criteria of publication as stated by the International Code of Zoological Nomenclature; it may be available, unavailable, valid or invalid

## puffer

any species of marine bony fishes belonging to the families Tetraodontidae (puffers, blowfishes), or Diodontidae (burrfishes, porcupinefishes, spiny puffers). These fishes are able to inflate their bodies with water or air to form a globe as a protection against predation. The flesh and organs of some blowfishes contain an extremely potent toxin which can be fatal to humans when ingested

## Pulley Ridge

the deepest known reef off the continental United States, Pulley Reef is a 100+ km-long series of North-South trending, drowned, barrier islands located in the Southeastern Gulf of Mexico, near the edge of the Florida Continental Shelf. The reef is located approximately 150 miles southwest of Naples Florida and 60 miles northwest of the Dry Tortugas Ecological Reserve. It lies approximately 84 m below the ocean surface. The shallowest parts of the ridge are about 60 m deep. Even at these depths, there are many species of zooxanthellate scleractinian corals, green, red and brown macro algae, and shallow and deep water reef fishes

## pulse amplitude modulation (PAM) fluorometer

a portable submersible fluorometer. Fluorometers that use the PAM technique work by rapidly sending brief pulses of light to a plant or other organism. A healthy organism responds to this light very quickly (within microseconds) by re-emitting some of the light

## pulse exposure

with reference to oil spills, to simulate a spill-type release in a flow-through laboratory setting, an initial and relatively high concentration of a contaminant is allowed to dissipate under continuous water flow

## pulse-chase isotope labeling experiment

In this protocol, a cell sample is exposed to a radio-labeled compound for only a brief period of time (the 'pulse'), then it is washed with a buffer solution to remove the isotope, and finally incubated with a non-labeled form of compound (the 'chase').

## punctate

describes a surface stippled with tiny pores

## punctuated equilibrium

an evolutionary model in which change occurs in relatively rapid bursts, followed by little or no discernible change in a lineage (stasis)

## punctule

a minute dot, pit or aperture

## pungent

sharp, biting or acrid sensation, especially in taste or smell

## pure line

a genetically uniform strain in which all members have descended by self-fertilization or close inbreeding

## pure tone

a sound which consists of one single frequency

## purine

a nitrogen-containing, double-ring, basic compound that occurs in nucleic acids. The purines in DNA and RNA are adenine and guanine

## purse seine

a fishing net used to encircle surface schooling fish. During retrieval the bottom of the net is closed or pursed by drawing a purse line through a series of rings to prevent the fish from escaping. The catch is deposited on the fishing boat. The purse seine is operated by two boats, a large boat that surrounds the catch with the net and a smaller boat which anchors the net. Purse seines may be of up to 1 km length and 300 m depth

## pustule

a pimple- or wart-like projection; a bump or raised knob on the outside surface of a mollusk shell

## putative

purported; assumed or accepted as true on inconclusive grounds; accepted by supposition rather than as a result of proof

## pycnogonid

pycnogonids, or sea spiders, are benthic, marine arthropods, with a superficial



resemblance to true spiders, to which they are probably only distantly related. They are carnivores and use a muscular pharynx to suck soft food into the gut. The mouth is at the end of a large proboscis. Digestion is intracellular and most feed on sponges, cnidarians, or bryozoans from which they suck fluids. There are no excretory organs, respiratory organs, or body cavity (coelom)



The pycnogonid *Anoplodactylus evansi* is a predator of small marine gastropods as well as other soft bodied invertebrates. (Photo: Dr. Bill Rudman)

### pygmy goby

the pygmy goby, *Eviota sigillata*, has the shortest life span of any known vertebrate on Earth, with a maximum life expectancy of 59 days. *Eviota sigillata* is a small cryptic coral reef fish distributed in the Indo-West Pacific: Seychelles to the Great Barrier Reef and Micronesia, north to the Ogasawara Islands

### pyloric caecum

in fishes, a finger-like pouch connected with the pyloric stomach of the digestive canal. Pyloric caecae may have a digestive and/or absorptive function. They range in number from two or three in some species to thousands in others

### pynknosis

degeneration of a cell in which the nucleus shrinks in size and the chromatin condenses to a solid, structureless mass

### pyramid of biomass

in ecology, the total biomass of all organisms at each trophic level in a food chain; typically biomass declines with successively higher trophic levels

### pyramid of energy

in ecology, the total energy content of all organisms at each trophic level in a food chain; the energy content declines at successively higher trophic levels

### pyramid of numbers

in ecology, the number of organisms supported at each trophic level in a food chain; typically, fewer organisms are supported at successively higher trophic levels

## pyranometer

an instrument that measures the amount of radiation.

## pyrenoid

a proteinaceous structure associated with algal chloroplasts that often forms polysaccharide storage compounds

## pyriform

pear-shaped

## pyrimidine

a nitrogen-containing, double-ring, basic compound that occurs in nucleic acids. The pyrimidines in DNA are cytosine and thymine. The pyrimidines in RNA are cytosine and uracil

## pyrosome

a large barrel-shaped colony of colonial pelagic tunicates belonging to the genus *Pyrosoma*. The colony propels itself through the water by means of cilia that pump water through the individual tunicates. It responds to mechanical, chemical, and light stimuli by moving and by spectacular blue-green bioluminescent displays

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## Q-methodology

a research method used in social sciences to study people's "subjectivity" - i.e., their viewpoint. Q-methodology has been used as a research tool in a wide variety of disciplines including psychology, veterinary medicine, public health, rural sociology, and transportation

## q. v.

which see (*quod vide*)

## q.e.

which is (*quod est*)

## quadrat

a square or rectangular sampling unit of known area (e.g., 1 m<sup>2</sup>) within which organisms are counted or measured. Quadrats can be used to estimate the percent cover of each species or other reef components and obtain information about density, abundance, colony size, and biodiversity



Scientist conducting a quadrat survey.

## quadrate

square-shaped

## qualitative analysis

the analysis of a phenomenon to determine its qualitative characteristics versus its quantitative characteristics, i.e., characteristics for which precise numerical characterization is not appropriate

## quanta meter

an instrument used to measure the number of photons

## quantitative analysis

the analysis of a phenomenon that uses environmental variables represented by numbers or ranges, often accomplished by numerical modelling or statistical analysis

## quantitative inheritance

inheritance of measurable traits (height, weight, color intensity, etc.) that depend on the cumulative action of many genes.

## quasi

as if; seemingly; in a manner

## Quaternary period

the second period of the Cenozoic era containing the Pleistocene epoch and the Holocene epoch, and dating from 1.8 million years to the present

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## Røst Reef

the world's largest known deep-water *Lophelia* coral complex. It lies in depths between 300-400m west of R+st Island in the Lofoten archipelago, Norway. It covers an area approximately 40 km long and 3 km wide

## race

a distinguishable group of organisms of a particular species that is geographically, ecologically, physiologically, physically, and/or genetically distinct from other members of the species

## race

a population differing from others; refers to a unit below the subspecies level which is not given a taxonomic name



## racemization

the change in the three-dimensional structure of amino acids from one form to a mirror image over time

## radial cleavage

a type of cleavage characteristic of deuterostomes. When changing from a four-cell stage to an eight-cell stage embryo, the cells divide such that each cell in the top four cell plane is directly over one other cell in the bottom plane

## radial corallite

a corallite on a side of a branch as opposed to an axial corallite on the tip of the branch

## radial symmetry

a basic morphological plan of organisms that have their body parts arranged around a central axis. Such organisms tend to be circular or cylindrical in shape, e.g., a coral polyp, or have projections around a central disc, e.g., starfish



Radial symmetry, illustrated by this starfish (Echinodermata).

## radial velocity

component of motion toward or away from a given location

## radiant energy

energy traveling in the form of electromagnetic waves; energy emitted by the sun, typically in photons and waves

## radiant flux

the rate of flow of radiant energy (electromagnetic waves)

## radiation

energy that comes from a source and travels through some material or through space. Light, heat and sound are types of radiation

## radii

inconspicuous septal elements which connect septa with the columella

## radioactive decay

natural decay of the nucleus of an atom where alpha or beta and/or gamma rays are released at a fixed rate

## radioactive isotope

an unstable isotope of an element that decays or disintegrates spontaneously, emitting radiation

## radioactivity

the spontaneous decay of the nucleus of an element. It involves the change in the number of protons in the nucleus and therefore creates an atom of a new element

## radiocarbon age

the age of plant or animal remains, determined by measuring the remaining activity of the  $^{14}\text{C}$  atoms in the sample:  $A=A_0 e^{-t}$  where  $A$  is the measured activity,  $A_0$  is the initial activity,  $e$  is the decay constant, and  $t$  is the sample age

## radiocarbon dating

a dating method used to determine the age of samples containing carbon. The method measures the disintegration of the  $^{14}\text{C}$  atom.  $^{14}\text{C}$  is produced in the atmosphere by cosmic ray bombardment, and has a half-life of 5,570 years, making it useful for dating samples in the range of 0-40,000 years

## radiocarbon time

regular known rates of radiocarbon decay that are used to determine the exact ages of carbon-based life

## radiometer

an instrument used to measure radiant energy

## radiometer

an instrument for measuring radiation energy

## radiometry

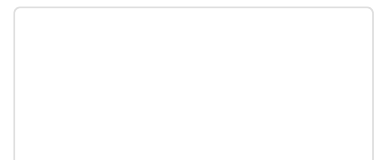
the science of the measurement of radiant energy

## radionuclide

any radioactive isotope

## radula

a scraping organ for mastication in certain mollusks, such as snails. In many gastropods the radula consists of a variable number of chitinous teeth, of different shape and size, located in the anterior portion of the pharynx. In the



cone shell family it has been reduced to a sharp and grooved tooth, fit to harpoon and inject prey with a powerful venom, which is also potentially fatal to humans



A stained section of a snail radula. The numerous chitinous teeth on this ribbon-like membrane are used to scrape, pierce, tear or cut off small pieces of food that are then directed in a continuous stream toward the digestive tract by conveyor belt like movements of the membrane. (Photo: Rick Gillis, Ph.D., Biology Dept., University of Wisconsin-La Crosse)

## ramet

an asexually-produced member of a clone

## ramifying

branching, dividing

## rampart

a narrow ridge, 1-2 m high, built by waves along the seaward edge of a reef flat. It consists of boulders, shingle, gravel or reef rubble, commonly capped by dune sand

## ramus

a branch

## random sample

a sample in which each individual in a population has the same chance of being selected as any other

## random sampling

a sampling technique where a group of subjects (a sample) is selected for study from a larger group (a population). Each individual is chosen entirely by chance and each member of the population has a known,

but possibly non-equal, chance of being included in the sample. By using random sampling, the likelihood of bias is reduced

### random variable

a variable that takes different real values as a result of the outcomes of a random event or experiment; A quantity whose values are random and to which a probability distribution is assigned, such as the possible outcomes of a roll of a dice

### range

the range of a set of numbers is the largest value in the set minus the smallest value in the set. It is a single number

### range

the geographical area inhabited by a species or other group; may be continuous or discontinuous

### rank

in taxonomy, the level, for nomenclatural purposes, of a taxon in a taxonomic hierarchy (e.g. all families are for nomenclatural purposes at the same rank, which lies between superfamily and subfamily)

### ranked data

data for which the observations have been replaced by their numerical ranks from lowest to highest

### rapacious

grasping, predatory

### Rapid Amplification of cDNA Ends (RACE)

a technique used to obtain the 3' and 5' end of a cDNA. The technique involves three sequential enzymatic steps: reverse transcription, addition of homopolymeric tails, and polymerase chain reaction (PCR)

### Rapid Ecological Assessment (REA)

a method for gathering data pertaining to ecologically significant biological components of a reef habitat over small spatial scales. Because the method provides a quick "snapshot" of major reef biota during a single dive or snorkel survey, it is particularly useful in assessing remote areas that are only rarely visited and where little time can be spent. REA is usefully employed by Coral Reef Ecosystem Division (CRED) at the NMFS Pacific Island Fisheries Science Center. During research cruises to these remote areas, teams of CRED divers survey the reef communities in a comprehensive manner, recording species abundance, diversity, and spatial distribution simultaneously for four key components of the ecosystem: fishes, corals, other invertebrates, and algae. Specific protocols are followed for field work and subsequent laboratory analyses

### rare

a classification used for populations or species that are neither endangered nor vulnerable, but may be at risk

because of low populations and low densities

## raster

an abstraction of the real world where spatial data is expressed as a matrix of cells or pixels, with spatial position implicit in the ordering of the pixels. With the raster data model, spatial data is not continuous but divided into discrete units. This makes raster data particularly suitable for certain types of spatial operation. The term may also refer to the region of a CRT (cathode-ray tube) or LCD (liquid crystal display) monitor that is capable of rendering images

## raster map

a map or chart encoded in the form of a regular array of cells

## rastrate

rake-like

## raw sewage

untreated domestic or commercial waste water

## reach

an arm of the ocean extending into the land

## real time

time in which reporting of events or recording of events is simultaneous with the event

## real-time data

data collected by automated instrumentation and telemetered and analyzed quickly enough to influence a decision that affects the monitored system



Seakeys stations transmit real-time data. (Photo: NOAA)

## rearing habitat

an area where larval and juvenile fish find food and shelter

## receiving waters

water bodies that receive treated or untreated waste waters

## recent

extant; still in existence

## recombinant DNA

a new DNA sequence formed by the joining, usually *in vitro*, of two non-homologous (from different sources) DNA molecules, using recombinant DNA technologies

## recombinant DNA technology

procedures used to join together DNA segments in a cell-free system. Under appropriate conditions, a recombinant DNA molecule can enter a cell and replicate there, either autonomously, or after it has become integrated into a cellular chromosome

## recombinant organism

an organism which carries short fragments of another organism's genome (by means of recombinant DNA technology)

## recombination

in genetics, the process by which offspring derive a combination of genes different from that of either parent. In higher organisms, this can occur by crossing over

## recruitment

the influx of new members into a population by reproduction or immigration

## rectilinear

straight-lined

## red algae

red algae belong to the Division Rhodophycota. Most of the over 4000 species are marine. They range in complexity from simple unicellular organisms to unbranched and branched filaments to complex multiaxial uprights and crusts. Their pigments include chlorophyll a and the phycobiliproteins, red phycoerythrin (often the dominant pigment) and blue phycocyanin, as well as carotenes, lutein, zeaxanthin. Most red algae have a complex life history with three phases: tetrasporophyte, gametophyte and carposporophyte



Red algae. (Photo: Dept. Natural Resources and Parks, Water and Land Resources Division, Kings

## Red list species

a species identified as 'Extinct', 'Extinct in the wild', 'Critically endangered', 'Endangered', 'Vulnerable', 'Lower risk', 'Data deficient' or 'Not evaluated' according to criteria laid down in the IUCN Red List Categories (International Union for the C

## red tide

discoloration of surface waters, most frequently in coastal areas, caused by large concentrations of microorganisms, such as algae or cyanobacteria



Image of red tide taken from the NOAA vessel *Ron Brown*, April 5, 2001 during the Aerosols Characterization Experiments (see <http://www.ogp.noaa.gov/ace-asia/index.htm>.) (Photo: NOAA)

## red-band disease

a disease of corals manifested by a narrow band of filamentous cyanobacteria that advances slowly across the surface of a coral, killing tissue as it progresses. The band is reddish to maroon in color



Red-band disease on a sea fan.  
(Photo: Dr. A. Bruckner)

## redox potential (Eh)

a measure of a systems capacity to oxidize material; the energy gained by transferring 1 mole of electrons from an oxidant to H<sub>2</sub>. It is measured in volts relative to a hydrogen electrode which is at zero

## reef ball

an artificial reef module made from concrete poured into a fiberglass mold

## reef base

the area below the consolidated slope extending up to 1 km but no deeper than 50 m. A synonym of talus slope

## reef block

a large, isolated rock section that has been displaced from the reef platform, reef margin, reef front zones or the non-calcium carbonate bedrock, usually resulting from storm waves

## Reef Check

a volunteer, community-based monitoring protocol designed to measure the health of coral reefs on a global scale. Reef Check is active in over 60 countries and territories throughout the tropics



Reef Check divers surveying an Indonesian coral reef. (Photo: Reef Check)

## reef complex

the entire reef structure, including reef surface lagoon deposits and off-reef deposits

## reef crest

the sharp break in slope at seaward margin or edge of reef flat

## Reef Environmental Education Foundation (REEF)

REEF is a grass-roots, non-profit organization of recreational divers who regularly conduct fish biodiversity and abundance surveys during their dives

## reef flat

the shallow area between the shoreline intertidal zone and the reef crest of a fringing reef



Reef flat, Palau Archipelago, Micronesia, containing various species of branching coral (*Acropora*). (Photo: Jerry



### reef front

a synonym of reef slope

### reef mining

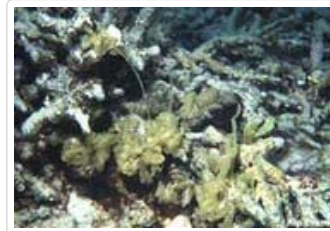
the large-scale removal of living reef corals and fossilized limestone from shallow reef environments for domestic use as building materials, lime production and aggregate

### reef mound

a structure that lacks reef characteristics, such as diversification and domination stages

### reef rubble

dead, unstable coral pieces often colonized with macroalgae. This habitat often occurs landward of well-developed reef formations in the reef crest or back reef zone



Coral reef rubble from storm damage. (Photo: Kip Evans)

### reef slope

the portion of a reef seaward of reef crest



Reef slope covered with live corals.

### reef system

a cluster of reefs

### reef top

the area comprising the reef flat and reef crest

## ReefBase

ReefBase is a global online information system ([www.reefbase.org](http://www.reefbase.org)) on coral reefs. It provides information services to coral reef professionals involved in management, research, monitoring, conservation and education. ReefBase's online geographic information system (GIS) allows the display of coral reef related data and information on interactive maps. One can zoom in to a particular area of interest, switch various data layers on and off, and save or bookmark the map for later viewing, printing or use in presentations/documents

## Reference Sequences (RefSeq)

a curated, non-redundant database that includes genomic DNA, transcript (RNA), and protein products, for major organisms. The nucleotide sequence data are derived from GenBank primary data, and the annotation is computational, from published literature, or from domain experts

## referral

in taxonomy, the transfer of a subordinate taxon from one taxon to another, e.g., species removed from one genus and referred to another

## reflexed

bent or turned backwards

## refractometer

an instrument for measuring radiation energy

## regenerate

to replace a lost or damaged organ or part through formation of new tissues

## regime shift

the rapid reorganization of an ecosystem's organizational structure and dynamics from one relatively stable state to another. In the oceans, regimes may last for several decades. Shifts often appear to be associated with changes in climate

## regression

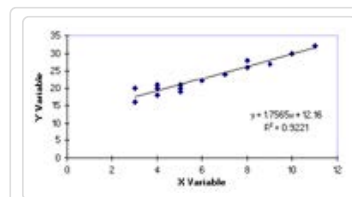
a statistical technique used to establish the relationship of a dependent variable and one or more independent variables

## regression analysis

a statistical technique applied to data to determine the degree of correlation of a dependent variable with one or more independent variables, in other words, to see if there is a strong or weak cause and effect relationship between things; a statistical process for fitting a line through a set of data points. It gives the intercept and slope(s) of the "best fitting" line. It tells how much one variable (the dependent variable) will change when other variables (the independent variables) change

## regression line

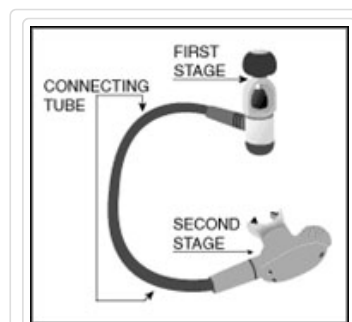
a line fit to a set of data points (scatterplot) using least-squares regression; a graph of the mathematical relationship between two variables



An example scatter plot data set with a regression line fit to the data.

## regulator

a regulator is a piece of scuba equipment that reduces the high pressure of air in a scuba air tank to a pressure level that is usable by the diver. It delivers air to the diver only during inhalation. The modern scuba regulator is a very simple and reliable device with only a few moving parts. Regulators have two stages: a first stage that attaches to the scuba tank, and a second stage that has a mouthpiece. Air under high-pressure from the scuba tank is reduced sequentially in each stage. The first stage reduces the high tank pressure to an intermediate pressure of 100 to 150 psi above the surrounding water pressure. The second stage reduces the intermediate pressure to that needed for comfortable breathing



Regulators have two stages: a first stage that attaches to the scuba tank, and a second stage that has a mouthpiece.

## regulatory gene

a gene that acts to control the protein-synthesizing activity of other genes; also called a 'regulator gene'

## rehabilitation

the recovery of specific ecosystem components in a degraded ecosystem or habitat

## reintroduction

introducing a native species back into its original habitat

## reject

in taxonomy, to set aside the name of a taxon in favor of another name

## rejected name

in taxonomy, a name which, under the provisions of the International Code of Zoological Nomenclature, cannot be used as a valid name and which is set aside in favor of another name

## relational database

a method of structuring data as collections of tables that are logically associated to each other by shared

attributes. Any data element can be found in a relation by knowing the name of the table, the attribute (column) name, and the value of the primary key

## relational database management system (RDBMS)

a database management system with the ability to access data organized in tabular files that can be related to each other by a common field (item). An RDBMS has the capability to recombine the data items from different files, providing powerful tools for data usage

## relative frequency

the number of items of a certain type divided by the number of all the numbers being considered

## releaser pheromone

a chemical produced by one organism that triggers an immediate behavior in another organism

## relict

a persistent remnant of an otherwise extinct taxon; a biological or geological feature that has survived in a considerably changed environment

## remote sensing

the collection of information about an object or event without being in physical contact with the object or event. Remote sensing is restricted to methods that record the electromagnetic radiation reflected or radiated from an object, which excludes magnetic and gravity surveys that record force fields



This remote sensing (SeaWiFS) image shows sediment stirred up along the North Carolina coast by Hurricane Floyd, September 1999.

## remote sensing tool

an instrument used in remote sensing often combined with a geographic information system to provide synoptic and objective views and data of the environment

## renaturation

the conversion of denatured protein or DNA to its native configuration. This is rare for proteins. However, if DNA is denatured by heating, the two strands separate. If the heat-denatured DNA is then cooled slowly, the double stranded helix reforms

## renewable resource

a resource or substance that can be replenished through natural or artificial means

## reniform

kidney or bean-shaped

## repetitive dive

any dive within a certain time frame after a previous dive. Some dive tables consider any dive within 12 hours of a previous dive as repetitive

## replacement name

in taxonomy, a new taxonomic name expressly proposed for an already established one

## replication

reproduction or duplication; in genetics, the synthesis of duplex (double-stranded) DNA by copying from a single-stranded template, i.e., the synthesis of an informationally identical macromolecule from a template molecule

## repressor

a protein that binds to an operator adjacent to a structural gene, inhibiting transcription of that gene

## repressor gene

a gene that prevents a nonallele from being transcribed

## reproductive guild

a group of unrelated fishes with a similar form of reproduction

## reproductive isolating mechanism

a mechanism that prevents reproduction from occurring between two populations. Pre-zygotic reproductive isolating mechanisms (which take effect before fertilization) include environmental, temporal, behavioral, mechanical, and physiological barriers that prevent individuals of different populations from producing viable progeny. Post-zygotic reproductive isolating mechanisms (which take effect after fertilization) include gamete incompatibility, hybrid inviability, and hybrid sterility

## reproductive isolation

a species is an interbreeding natural population that is reproductively isolated from other such groups. Species are usually separated by discontinuities, which constitute barriers that prevent, or at least inhibit, an interspecific gene flow and gene exchange. Establishment of reproductive isolation is essential for development of a new species

## resident

a permanent, non-migratory inhabitant

## residual nitrogen time (RNT)

a theoretical mathematical representation of the amount of nitrogen absorbed in body tissues after a scuba dive. It is expressed on dive tables in minutes which are added to the no-decompression limit for a repetitive dive, i.e., the time it would take to off-gas any extra nitrogen remaining after a dive

## resilience

the ability of a community or ecosystem to recover from disturbances and maintain a desired condition of diversity, integrity, and ecological processes

## resilient

resumes the original shape after deformation; elastic

## resolution

the ability to distinguish closely spaced objects on an image or photograph. It is commonly expressed as the spacing, in line-pairs per unit distance, of the most closely spaced lines that can be distinguished

## resonator

a structure that fills with sound and acts as a natural amplifier

## respiration

a biochemical process by which living organisms take up oxygen from the environment and consume organic matter, releasing both carbon dioxide and heat energy

## respiratory tree

a respiratory organ of sea cucumbers (Holothuroidea-Echinodermata)

## restoration

the return of an ecosystem or habitat to its original community structure, natural complement of species, and natural function



A diver prepares to reattach an elkhorn coral fragment in a Mona Island, PR, reef as part of restoration work performed after the 1997 grounding of the *Fortuna*

## restoration ecology

activities undertaken by humans to repair ecological damage, such as establishing vegetation on degraded habitat, increasing the populations of endangered species, and decreasing the threatened area of an ecosystem

## restriction endonuclease

a class of endonucleases that cleaves DNA after recognizing a specific sequence

## restriction enzyme

an enzyme that cleaves double-stranded DNA; an endonuclease that recognizes specific nucleotide sequences and cleaves DNA at these highly specific locations. In genetic engineering, new genes can be inserted into these gaps

## restriction fragment length polymorphism (RFLP)

variation in DNA sequence between individuals that is detectable by variation in the length of DNA fragments generated by digestion with restriction endonucleases

## restriction fragment

a fragment of DNA produced by cleaving (digesting, cutting) a DNA molecule with one or more restriction endonucleases

## reticulate

net-like

## reticulate

resembling or forming a network

## retractable

capable of being drawn or pulled back

## retractor

a muscle that withdraws an eversible or protrusible body part

## retro-

backwards

## retronym

a word or phrase created because an existing term that was once used alone needs to be distinguished from a term referring to a new development; a modification of an existing word occasioned by a discovery or a new concept; as Atlantic herring in contrast to Pacific herring, acoustic guitar in contrast to electric guitar or analog watch in contrast to digital watch

## retorse

bent or turned backward or downward

## retrose

turned backwards

## retrovirus

a virus that contains the enzyme, reverse transcriptase. This enzyme converts the viral RNA into double-stranded DNA copies of their genome, (by using reverse transcription), which can combine with the DNA of the host cell and produce more viral particles. Many naturally occurring cancers of vertebrates are caused by retroviruses

## reverse transcriptase

an enzyme that is able to synthesize DNA from information in RNA. It requires an RNA template and a DNA or RNA primer

## reverse transcription

the synthesis of DNA on a template of RNA, accomplished by the enzyme, reverse transcriptase

## revision

in taxonomy, a critical re-appraisal of a taxon

## rheokinesis

movement in relation to water currents

## rheotaxis

orientation to water currents. An animal may face into the current (positive rheotaxis) or face downstream of the current (negative rheotaxis)

## rhizophoral sheath

in sea slugs, the upstanding flange from the antero-lateral part of the mantle into which a rhinophore can be contracted



## rhinophore

paired, tentacle-like chemical sensory apparatus found on the anterior end or "head" of nudibranchs. They act as olfactory/taste organs. To protect them from damage, most are able to be withdrawn into a pocket beneath the skin. Often there is a raised collar or sheath around each pocket which can be clamped shut when the sea slug is disturbed

## rhizobenthos

organisms rooted in the substratum

## rhizome

a horizontal stem

## rhomboid

diamond-shaped

## rhopalium

one of the sensory receptors in some jellyfish (Scyphozoa), located on the margin of the bell. Rhopalia contain statocysts for equilibrium, and ocelli, which are photosensitive cells which allow the animal to respond to light stimulation

## ribbed

describes a surface with a series of ridges

## ribbon reef

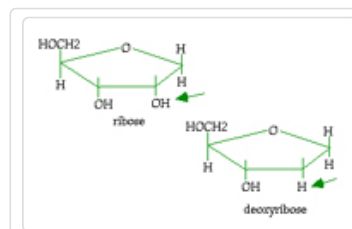
a large offshore linear reef, seaward of a fringing reef, which is linear but does not form a barrier to the land. A synonym of shelf-edge reef and sill reef

## ribonucleic acid

see "RNA"

## ribose

a monosaccharide containing five carbon atoms per sugar molecule,  $C_5H_{10}O_5$ . Ribose is a major component of ribonucleic acid (RNA)



A nitrogenous base is combined with a five-carbon sugar, either ribose (for RNA) or deoxyribose (for DNA). The arrows point to the

single structural difference  
between ribose and deoxyribose.  
(Graphic: San Diego State  
University)

## ribosomal RNA (rRNA)

together with proteins, ribosomal RNA forms the ribosomes, which play a structural role and also a role in ribosomal binding of messenger RNA (mRNA) and transfer RNA (tRNA). The function of ribosomal RNA is to provide a mechanism for decoding mRNA into amino acids and to interact with the tRNAs during translation by providing peptidyl transferase activity. The tRNA then brings the necessary amino acids corresponding to the appropriate mRNA codon

## ribosome

ribosomes are small cellular organelles composed of ribonucleic acid (RNA) and proteins. They are found free in the cytoplasm or attached to the endoplasmic reticulum. Ribosomes are involved in the synthesis of proteins by attaching to messenger RNA (mRNA) and moving down it one codon at a time and then stop until transfer RNA (tRNA) brings the required amino acid; when it reaches a stop codon it falls apart and releases the completed protein molecule for use by the cell

## ribotype

the type of RNA in an organism, usually referring to the type of ribosomal RNA. Ribotyping is a technique used to determine genetic and evolutionary relationships between organisms

## Rickettsia

a rod-shaped gram-negative infectious bacterium that can reproduce only inside a living cell; a genus within the bacterial family Rickettsiaceae

## ring canal

a part of the water vascular system of echinoderms. Specifically, a circumoral ring around the esophagus with connecting radial canals each leading to an ambulacrum .It connects to the madreporite via the stone canal; also, the part of the distributive portion of the digestive system of scyphozoan medusae that is located in the margin of the bell. The ring canal communicates with the radial and adradial canals

## ring species

a gene flow situation in which two reproductively isolated populations occupying the same region are genetically connected by a geographic ring of populations that can interbreed

## riparian

having to do with living or being located on the edges or banks of streams or rivers



This healthy riparian habitat includes undercut banks, woody debris in the water, and a clean stream bottom.

### ritualized behavior

a behavior that once served its own purpose but has come to act as a signal about that purpose. For example, agonistic behaviors that substitute for physical contact and fighting, such as the erection of fins by fishes during displays, the yawn of baboons, the baring of teeth in dogs and wolves, the raising of fur in cats, and birds raising their feathers

### riverine

associated with a river and the area adjacent to it; includes all wetlands and deepwater habitats contained within a stream channel

### riverine environment

an environment created along permanent and semi-permanent streams because of the increase in soil moisture

### riverine habitat

a habitat occurring along a river

### rivulated

marked by irregular streaks

### RNA (Ribonucleic acid)

a single-stranded nucleic acid found in the nucleus and cytoplasm of a cell. It is a polymer of the sugar ribose, phosphate, purine and pyrimidine bases. RNA is very similar to DNA, but substitutes the nucleotide, uracil, for thymine. It acts as a "middle-man", converting genetic information from DNA to proteins. There are three types of RNA: mRNA (messenger RNA), which contains the specific sequence of nucleotides necessary to dictate

amino acid sequence in proteins; tRNA (transfer RNA), which serves as the "adaptor" to position the appropriate amino acid next to a growing polypeptide chain during protein synthesis; and rRNA (ribosomal RNA), which is the RNA component of ribosomes. In some viruses, RNA is the genetic material

## RNA polymerase

an enzyme that catalyzes the bonding reaction between nucleotides of DNA and RNA. Organisms use RNA polymerase to accelerate the process of copying DNA strands during cell reproduction

## RNA-mediated interference (RNAi)

a technology based on the silencing of specific genes by double stranded RNA (dsRNA). RNAi has great potential for treating many diseases, including ocular, viral diseases and cancers by silencing RNA messages, thereby preventing the production of disease causing proteins

## RNA-Seq

refers to the use of high-throughput sequencing technologies to sequence complementary DNA (cDNA) in order to get information about a sample's RNA content; also called "whole transcriptome shotgun sequencing" (WTSS)

## roe

fish eggs or egg-filled ovary; the egg mass or spawn of certain crustaceans, such as lobsters



## roentgen

unit of x-radiation or gamma radiation

## rookery

a breeding ground for gregarious birds or mammals

## rosette

rose-shaped in appearance; arranged in a fashion resembling a rose flower

## rostral

towards or relating to the snout or rostrum

## rostrum

an elongate or extended snout



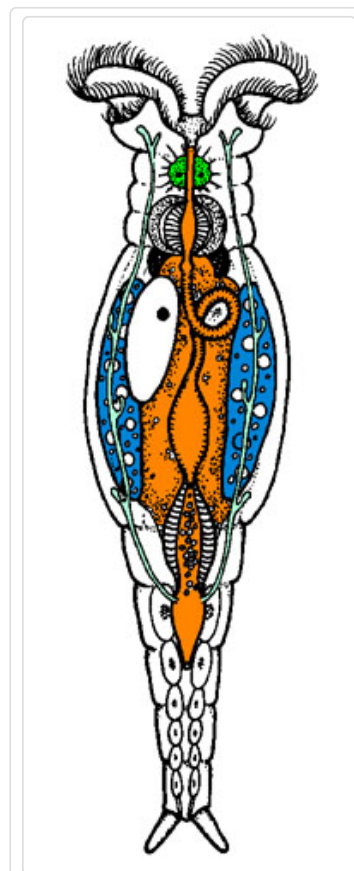
Most dolphins have an elongated beak called a rostrum. (Photo: Copyright Corel Corp.)

## rotenone

a very potent general use pesticide found in the roots and stems of several tropical plants. Jewel vine (*Derris* spp.), Lacedod (*Lonchocarpus* spp.), and hoary pea (*Tephrosia* spp.) are the more common plants from which rotenone is derived. It used in some countries to kill predatory fishes prior to introducing parent fish for natural spawning or newly hatched fry. As an effective fish biocide, rotenone is also used for collecting fish specimens, and in some areas for fishing, where it is added to the water and the dead and dying fishes are collected as they float to the surface. In fishes, rotenone impedes circulation to the gills, causing asphyxiation

## rotifer

rotifers are small invertebrates in the Phylum Rotifera. They range in size from 100 to 2500 microns, with approximately 2000 described species. Rotifers are found in aquatic and semi-aquatic habitats, but are predominantly freshwater inhabitants. Most species are free-living herbivores, bacterivores or predators, and possess a ciliated, wheel-like organ for feeding and locomotion. Rotifers move by swimming or crawling. Some sessile species are permanently attached to freshwater plants



Internal anatomy of a rotifer. The major systems have been highlighted in color. (Graphic: Livingstone, BIODIDAC)

## Roving Diver Technique (RDT)

a visual survey method specifically designed for REEF volunteer data. During RDT surveys, divers swim freely throughout a dive site and record every observed fish species that can be positively identified. The search for fishes begins as soon as the diver enters the water. The goal is to find as many species as possible so divers are encouraged to look under ledges and up in the water column. At the conclusion of each survey, each recorded species is assigned one of four abundance categories based on about how many were seen throughout the dive [single (1); few (2-10), many (11-100), and abundant (>100)]

## RSS feed

RSS (Really Simple Syndication or Rich Site Summary) is a family of web feed formats used to publish frequently updated materials. An RSS document (which is called a "feed",) includes full or summarized text, plus metadata. An RSS feed is a source of RSS updates for a given website, such as the NOAA Coral Reef Information System (CoRIS)

## rubbery

a tough, resilient mass

## rumble zone

the shallowest part of a reef crest landward of the palmata zone. It consists of broken pieces of coral washed back by storms

## rugose

having a rough or ridged surface

## rugose corals

an extinct group of non-scleractinian corals

## rugosity

an important coral reef parameter that describes the amount of "wrinkling" or roughness of the reef profile. It is an index of substrate complexity. Areas of high complexity are likely to provide more cover for reef fishes and more places of attachment for algae, corals and various sessile invertebrates



A coral reef with a high degree of rugosity.

## runoff

water that has been on land and moves seaward as a result of rain, flooding, irrigation or flushing . Runoff is frequently high in nutrients and suspended sediments, as well as toxicants



Urban runoff or 'storm drain pollution' is one of the leading causes of water pollution in this country. (Photo: NOAA/NOS/Monterey Bay National Marine Sanctuary)

## rural area

an area in which most residents depend on agriculture or the harvesting of natural resources for their livelihood

## russet

reddish brown color

## rusticle

a structure consisting of up to 35% iron compounds (iron oxides, iron carbonates, and iron hydroxides) that forms under water when wrought iron rusts. In appearance, it resembles an icicle or stalactite. The remainder of the structure is a complex community of symbiotic or mutualistic microorganisms, including bacteria and fungi, that use the rusting metal as a source of energy, collectively producing the mineral compounds as waste products and hence forming the rusticle. Structurally, the rusticle contains channels to allow water to flow through. They are very delicate, and easily disintegrate into a fine powder if disturbed. The outer surface of a rusticle is red in appearance while the core is bright orange

## rutherford

unit of radioactive decay equal to 1 million disintegrations per second

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#) | [N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#) |

## S phase

the cell cycle phase during which the DNA doubles with replication of the chromosomes

## sabellid worm

a marine polychaete worm in the family Sabellidae which lives in flexible tubes constructed of sand grains

embedded in mucus

## saccate

sac-like

## safety stop

on ascending from a dive, a safety stop is a specified time spent by a scuba diver at a specific depth, for nitrogen off-gassing. While not mandatory during a no-decompression dive, it is a sound safety practice. A safety stop may be 3-5 minutes at 10-15 ft below the surface

## sagittal

relating to the sagittal plane, which extends through the midline of a bilateral animal, dividing it into two equal halves

## sagittal section

a section sliced parallel to the longitudinal axis of the animal or structure examined

## sagittiform

arrow-shaped

## Saharan dust

large quantities of dust, originating in the Sahara desert of Africa, are blown across the Atlantic Ocean each summer, and may be a contributing factor for the declining health of Caribbean coral reefs. The dust may modify clouds and rainfall both in Africa and across the tropical North Atlantic as far away as Barbados. Other studies suggest that the dust may play a role in determining the frequency and intensity of hurricanes formed in the eastern Atlantic Ocean

## salinity

a measure of the salt concentration of water

## salt marsh

a marsh periodically flooded by marine water



A salt marsh. (Photo: NOAA)

## sampling



the probabilistic, systematic, or judgmental selection of a sub-element from a larger population, with the aim of approximating a representative picture of the whole

## sampling bias

the tendency of a sample to exclude some members of the sampling universe and over-represent others

## sampling error

the variability of a statistic from sample to sample due to chance

## sampling unit

the sub-element of the total population selected for sampling

## sampling universe

the largest entity to be described, of which the sample is a part

## sand

coarse sediment typically found in areas exposed to currents and wave energy



Tidal current patterns in the sand and sea grass at low tide.

## sand flat

sandy areas found in depressions and gullies in a coral reef, or between patch reefs, or in deeper areas below or beyond the reef. Seemingly near barren during the day, at night sand flats teem with biological activity; also a sandy tidal flat barren of vegetation. A tidal flat is an extensive, nearly horizontal, marshy or barren tract of land that is alternately covered and uncovered by the tide. It consists of unconsolidated sediment (mostly mud and sand)



A patch reef surrounded by sand flats. (Photo: <http://www.biosbcc.net>)

## sandflat

a flat expanse of sand on the coast or in an estuary

## sanguivore

an animal that obtains its nourishment primarily as blood

## sanguivore

an organism feeding principally on blood

## saprophyte

any plant that lives and feeds on dead organic matter

## saprotroph

an organism which feeds on dead and decaying organisms, allowing the nutrients to be recycled into the ecosystem. Fungi and bacteria are two groups with saprophytic members

## sasi

a generic name for an indigenous and historic family of Indonesian cultures, institutions, laws, and ritual practices that regulate access to natural resources, including coral reefs and other ecological systems. During recent years, a movement has developed to support indigenous Indonesian cultural communities, Indonesian NGOs, and the Ministry of the Environment by promoting sasi as an environmental institution and body of customary law promoting sustainable development, conservation, and social equity.

## satellite

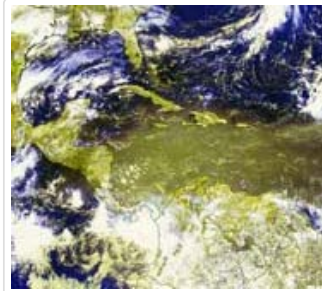
a small celestial body orbiting a larger one; a man-made object designed to orbit a celestial body

## satellite colony

a colony that develops within the tissue of a parent colony and which has its own unattached skeleton

## satellite imagery

a representation of the measurement of energy emitted or reflected by the Earth in a variety of wavelengths. Earth observation imagery takes a number of forms, of which the most traditional are optical and near-infrared radiation, from about 0.4 (blue) to 2.0 (IR) micrometers. Apart from visual and near-infrared, other bands of the spectrum commonly used include thermal infrared (heat) and microwave (radar). Each of these has its own applications



GOES-8 (May 1999) image of airborne dust over the Caribbean Sea. This dust originated in the Sahara Desert where it was carried off the coast by strong winds.

## satellite mapping

digital maps derived from satellite images

## saturation

in diving, the degree to which a gas is dissolved in the blood or other tissues. Full saturation occurs when the pressure of gas dissolved in the blood or tissues is the same as the ambient pressure of that gas

## saturation diving

the situation where a diver is at a depth or pressure for a long enough period of time (12 hours or longer) to have the partial pressures of the dissolved gases in the body at equilibrium with the partial pressure of the gases in the surrounding environment. Scientists are able to live in and work around underwater habitats for extended periods without the risk of developing decompression sickness (the bends). Divers breathe compressed air mixed with light, inert gases, such as helium. When the diver's blood becomes saturated with helium, the time required for decompression, even if the diver returns to the surface after a period of weeks, is no greater than that required after a dive lasting just a few hours

## saxitoxin

a powerful biotoxin produced by bacteria in certain marine dinoflagellates. Saxitoxin may be concentrated in the tissues of filter feeding shellfish, and results in shellfish poisoning when ingested by humans; also known as mytilotoxin

## scale

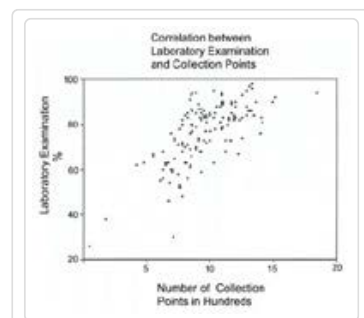
the degree of resolution at which ecological processes, structures, and changes across space and time are observed and measured

## scale-like corallites

corallites that form a pattern which resembles fish scales

## scatter diagram

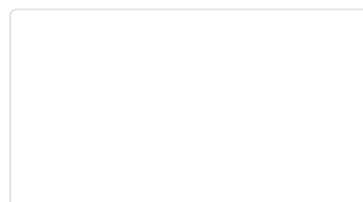
a two-dimensional histogram showing the joint probability density of two variables within a data sample; it is used to interpret data by graphically displaying the relationship between two variables



A scatter diagram.

## scavenger

an animal that feeds on dead or decaying organic matter





A scavenger feeding on a dead aquatic animal.

## schizocoelous

the mesoderm and coelom initially develop from a solid block of mesodermal tissue in an embryo that subsequently develops a split down the middle. The cavity thus formed is the coelom. Schizocoelous development of the coelom occurs in protostomes

## school

a social group of fishes (and some other aquatic animals), usually of the same species, which tends to orient and move in the same direction



A school of smallmouth grunt with elkhorn coral in the background.  
(Photo: Paige Gill, Florida Keys NMS)

## schreckreaktion

an alarm response in some fishes as a result of an alarm substance (schreckstoff), or alarm pheromone being introduced into the water via rupture of specialized dermal club cells. Presumably a fish attacked by a predator releases schreckstoff into the water, resulting in the conspecifics making a variety of coordinated escape or fright actions

## schreckstoff

a chemical alarm substance (a pheromone) produced by the skin of some groups of fishes when injured. It stimulates conspecifics and perhaps some other fishes to exhibit fright and escape movements

## science

a method of learning about the physical universe by applying the principles of the scientific method, which includes making empirical observations, proposing hypotheses to explain those observations, and testing

those hypotheses in valid and reliable ways; also refers to the organized body of knowledge that results from scientific study

## scientific law

a statement of a scientific fact or phenomenon that is invariable under given conditions. A law may be either quantitative (including measurement) or qualitative (general characteristics). It must describe evidence that has been gathered using acceptable scientific standards of reproducibility. Examples of scientific laws: Faraday's Law of electromagnetic induction, Coulomb's Law of electrostatic attraction, Dalton's Law of partial pressures, and Boyle's Gas Law

## scientific name

the Linnaean binomial. A name of a species composed of two words: the genus (or generic) name and the species (or trivial) name, e.g., *Acropora palmata*. The scientific name is always written in italics. The first letter of the generic name is always capitalized; that of the species name is never capitalized

## sciophilous

thriving in conditions of low light intensity

## Scleractinia

an order of Cnidaria, usually producing calcareous skeletons with hexameral symmetry



## sclerite

a skeletal element in octocorals. Sclerites are composed of calcite spicules; also, a hard plate or element of the exoskeleton of some arthropods

## scleroblast

a cell that produces a sclerite

## sclerocyte

a cell in sponges that produces spongin or spicules

## sclerodermite

the basic unit of coral skeletal microstructure. A center of calcification from which bundles of acicular aragonite crystals radiate outward; the hard integument of Crustacea.

## scleroseptum

one of many radiating calcareous partitions in the skeletal cup (corallite) of stony corals

## scolex

the knoblike anterior end of a tapeworm, having suckers and/or hooklets that, in the adult stage, serve as organs of attachment to the host organism



The scolex of the tapeworm, *Taenia solium*. (Photo: Center for Disease Control)

## scorpionfish

any of about nearly 400 species of bony fishes in the family Scorpaenidae. Scorpionfishes have large, heavily ridged and spined heads. They possess venomous spines on their dorsal fins, each with a groove and venom sac. Scorpionfishes are well camouflaged to blend in with their environment with fleshy projections and background coloration. Some can change their color to better match their surroundings. The most venomous fish in the world, the reef stonefish (*Synanceia verrucosa*), is disguised to look like an encrusted rock or lump of coral. This species is widely distributed throughout tropical, marine waters of the Indo-Pacific. Most species of scorpionfishes are demersal, living on or near the bottom. They are carnivorous ambush predators feeding on crustaceans, cephalopods and fishes

## scotoscope

an instrument for detecting objects in darkness

## SCUBA (Self-Contained Underwater Breathing Apparatus)

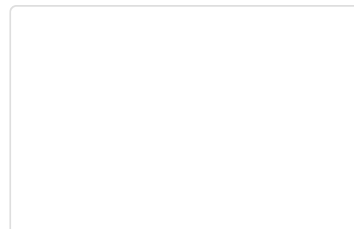
a diving mode independent of surface air supply in which the diver uses open circuit self-contained underwater breathing apparatus which supplies air or breathing gases at ambient pressure

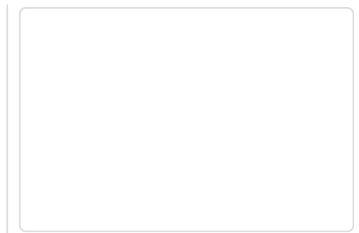


Diver training with a full face mask and underwater communications.

## scute

an external horny, chitinous or bony plate or scale, such as those on the shell of a turtle





Sea turtle with shell comprised of hard, platelike scutes.

## scutiform

shield-shaped

## sea

a subdivision of an ocean

## sea cow

a large, herbivorous aquatic mammal of the order Sirenia that contains two Recent families: Dugongidae for the genera *Dugong* (dugong, one species) and *Hydrodamalis* (Steller's sea cow, one species hunted to extinction); and Trichechidae for the single genus *Trichechus* (manatees, three species). The dugong inhabits coastal regions in the tropical parts of the Old World, and some individuals go into estuaries and rivers. Steller's sea cow inhabited the Bering Sea, and was the only Recent member of this order adapted to cold waters. Manatees live along the coast and in coastal rivers in the southeastern United States, Central America, the West Indies, northern South America, and western Africa



The West Indian Manatee, *Trichechus manatus*, in Florida bay. (Photo: Copyright Laurel Canty-Ehrlich, NOAA)

## sea cucumber

an echinoderm in the class Holothuroidea. Sea cucumbers possess a flexible, elongated body and leathery skin, and tentacles surrounding the mouth. Although they don't superficially resemble other members of the phylum Echinodermata, they retain pentamerous (five-rayed) symmetry, with five rows of tube feet running from the mouth down along the sides of the body. Sea cucumbers are an abundant and diverse group that are found in nearly every marine environment, but are most diverse on tropical, shallow-water coral reefs. They are economically important in two main ways. They produce chemical compounds that are of interest to pharmaceutical firms, and as a food item in Asia, they form the basis of a multimillion-dollar industry that processes the body wall for sale as beche-de-mer or trepang

## sea pansy

a soft coral in the order Pennatulacea and subclass Alcyonaria. A sea pansy is a colony of polyps having different forms and functions. A single, leaf-like, giant primary polyp up to two inches in diameter forms the anchoring stem (peduncle). This peduncle can be distended to better anchor the colony in the substrate. The primary polyp possesses secondary polyps, autozooids (feeding polyps) and siphonozooids (serve as intakes for water, which circulates within the colony and helps keep it upright) on the upper surface. The sea pansy is bioluminescent when disturbed, due to Green Fluorescent Protein.

## sea pen

a soft coral in the order Pennatulacea and subclass Alcyonaria. Sea pens are colonial octocorals which exhibits polyp dimorphism. One polyp grows very large, loses its tentacles and forms a central axis. The base of this primary polyp forms a bulb which may be expanded or contracted. The bulb is used to anchor the colony. Branching off this primary polyp are various secondary polyps. Some, called autozooids, are typical feeding polyps. Others, called siphonozooids, serve as intakes for water, which circulates within the colony and helps keep it upright. Calcareous spicules and frequently a central axial rod of calcium carbonate also provide support. One group of sea pens have secondary polyps grouped into "polyp leaves," giving these species a feather-like appearance, from which we get the common name as they look something like old-fashioned quill pens. Most species, however, do not have polyp leaves, and look more like clubs, umbrellas, or pinwheels

## sea snake

a member of the family Hydrophiidae. Sea snakes are common in the Indo-Pacific. Related to cobras, these live-bearing reptiles are highly venomous but not aggressive by nature



This sea snake was photographed and released during a 1998 cruise of the NOAA ship *McARTHUR* to South America.

## sea star

an echinoderm characterized by radial symmetry, and usually with five arms (rays) radiating from a central body. Minute pincer-like structures on the arms, called pedicellaria, ensure that the surface of the arms stay free from algae. There are a few sea stars that have 6 or 7 arms, and some with even more. Injuries will also cause more arms to grow. The majority of sea stars are carnivorous and feed on sponges, bryozoans, ascidians and mollusks. Other are detritus feeders or scavengers. Some sea stars, for example the crown-of-thorns that feeds on coral polyps, are specialized feeders; also called "starfish"

## sea state

a description of the sea surface with regard to wave action



Fishing vessel battles through rough conditions (sea state).  
(Photo: NOAA/National Weather Service/Ocean Prediction Center)

## Sea Surface Temperature (SST)



the temperature of the layer of seawater (approximately 0.5 m deep) nearest the atmosphere

## sea urchin

sea urchins are echinoderms in the class Echinoidea, that possess a hard calcareous shell (test) armed with spines, which may be long and pointed, or short and pointed, or dull. The spines are used for locomotion (along with tube feet), protection, and for trapping drifting food particulates, such as algae. Most sea urchins are algal grazers but some feed on sponges, ectoprocts and ascidians, and others on detritus. Sea urchins help to keep corals free of overgrowing algae

## seabed

the ocean floor

## Seaflower Biosphere Reserve

This reserve is located at the Archipelago of San Andrés, Providencia and Santa Catalina, at the southwestern Caribbean, off the East coast of Nicaragua, halfway between Colombia and Jamaica. As a marine biosphere reserve, it covers approximately 10% of the Caribbean sea, with three main islands, surrounded by coastal mangroves swamps and highly intact and productive associated coral reef ecosystems. The old Providence barrier reef alone is 32 km long and covers an area of 255 Km<sup>2</sup> making it one of the largest coral reefs in the Americas. It is identified as a major site of coral and fish diversity and is considered a biodiversity "hotspot"

## seagrass

a flowering plant, complete with leaves, a rhizome (an underground, usually horizontally-oriented stem) and a root system. They are found in marine or estuarine waters. Most seagrass species are located in soft sediments. However, some species are attached directly to rocks with root hair adhesion. Seagrasses tend to develop extensive underwater meadows



## SeaGrass Net

a worldwide monitoring program that investigates and documents the status of seagrass resources and the threats to this important and imperiled marine ecosystem. The program started in 2001 in the Western Pacific and now includes 110 sites in 30 countries with a global monitoring protocol and web-based data reporting system

## Seagrass Watch

a community-based monitoring program developed by Queensland's Department of Primary Industries and Fisheries (QDPI&F) in conjunction with community groups. Seagrass-Watch collects data about the condition and trend of near-shore seagrasses throughout Queensland and provides an early warning of major changes in seagrass abundance, distribution and species composition

## SEAKEYS

NOAA and the Florida Institute of Oceanography (FIO) supply daily and historical enhanced Coastal-Marine Automated Network (C-MAN) data via the SEAKEYS program. Since 1992, SEAKEYS has provided hourly data from up to seven meteorological and oceanographic monitoring stations situated throughout the Florida Keys National Marine Sanctuary and Florida Bay. These stations measure the usual C-MAN meteorological parameters, such as wind speed, gusts and barometric pressure, but are enhanced with oceanographic instruments measuring salinity, sea temperature, fluorometry and turbidity. These data are collected and presented via email and the Web daily, and are supplied through a historical database on the Web. Unique software developed for SEAKEYS data operates in near real-time and provides alerts as to conditions conducive to natural events such as coral bleaching (Coral Reef Early Warning System [CREWS]), larval conch survival, and in the future, harmful algal blooms.



Coastal-Marine Automated Network (C-MAN) Station.

## seamount

a submarine mountain, usually conical in shape and volcanic in origin, that rises 1000 meters or more above the sea floor. Some definitions of seamounts do not include the height criterion.

## seasonal monogamy

a pair-bond normally maintained throughout one breeding season.

## seawall

a massive structure built along the shore to prevent erosion and damage by wave action.

## seaward slope

the area of a barrier reef or atoll from the reef crest. It includes spurs, grooves, terraces, reef walls, etc.

## SeaWiFS

Sea-viewing Wide Field-of-view Sensor carried on the SeaStar satellite.

## Secchi depth

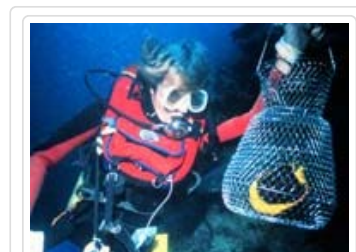
the depth at which a Secchi disk disappears from view as it is lowered in water. Secchi disk: a white disk 20-30 cm in diameter, used as a qualitative way of measuring water clarity. It is lowered from a vessel and viewed from above the surface in full solar illumination to estimate the light attenuation in the water column. This is done empirically by relating the depth at which the disk disappears to the attenuation of light.

## Second Law of Thermodynamics

each time energy is converted from one form to another, some of the energy is always degraded to a lower-quality, more dispersed, less useful form; no system can convert energy from one form to another useful form with 100 percent efficiency; energy cannot be transferred spontaneously from a cold body to a hot body. As a result of this fact, natural processes that involve energy transfer must have one direction, and all natural processes are irreversible. This law also predicts that the entropy of an isolated system always increases with time

## second stage regulator

in scuba breathing equipment, the second stage regulator, which is attached to the mouthpiece, reduces the intermediate pressure from the first stage regulator (attached to the air tank) to that needed for comfortable breathing at depth



The second stage regulator is contained in this NOAA diver's mouthpiece. (Photo: NOAA/National Undersea Research Program)

## secondary male

a male derived through sex change from a protogynous female in which there is a regression of the ovaries and a proliferation of testicular tissues

## secondary male or female

a male or female that is the result of sex change. A secondary male would be derived from a protogynous female, while a secondary female would be derived from a protandrous male

## secondary polyp

polymorphic polyps which grow as branches from the supporting primary polyp in colonial octocorals. These secondary polyps are specialized for feeding or water circulation within the colony

## secondary production

the production of living material per unit area (or volume) per unit time by herbivores. It is usually expressed as grams carbon per meter square per year

## secondary septum

partial plates/partitions that separate mesenteries within a mesenterial pair

## secretion

the passage of a molecule from the inside of a cell through the cell membrane into the periplasmic or interstitial space, or the extracellular medium; the organic process of synthesizing and releasing some substance from the body of an organism

## secretory product

a functionally specialized substance, not a waste product, released from a gland or cell. Hormones, for example, are secretory products

## section

see "microscopic section"

## sedentary

not moving. Many organisms, both plants and animals, spend the majority of their lives in one place

## sediments

soil, sand, and minerals washed from land into water, usually after rain. They pile up in reservoirs, rivers, harbors, and coastal areas destroying habitats, and clouding the water so that sunlight cannot reach aquatic plants. Careless farming, mining, and building activities expose sediment materials, allowing them to wash off the land after rainfall

## seep

a small area where water that may be of a different temperature and density flows from below the seafloor and rises slowly into the ocean; a spot where water that is flowing below the earth's surface slowly oozes out to form a small pool or a spring above

## seepage

the movement of water through a porous medium

## segmentation

in many animals, the body is divided into repeated subunits called segments, such as those in centipedes, insects, and annelid worms. Segmentation is the state of having or developing this type of body plan

## seine

a fish net that hangs vertically, with floats at the top and weights at the bottom

## selective pressure

forces acting on populations that determine that some individuals are more reproductively successful or genetically fit than others, and contribute more descendants (or genes) to subsequent generations

## self-fertilization

when a sperm cell and ovum from the same organism fuse and form a zygote

## semelparity

the reproductive condition where individuals reproduce only once during their lifetime

## seminal receptacle

a sac that stores spermatozoa (sperm cells) prior to fertilization of an egg

## semipermeable membrane

a thin membranous barrier that permits passage of particles up to a certain size or of a special nature; also referred to as a 'differentially permeable membrane'

## senior homonym

in taxonomy, the older, or earliest established taxonomic name

## senior synonym

in taxonomy, the older name of two synonyms

## sens. lat.

in the broad sense (*sensu lato*)

## sensor

a device that receives electromagnetic radiation and converts it into a signal that can be recorded and displayed as numerical data or as an image

## sensory receptor

a neurological structure specialized to respond to stimuli and changes in the internal or external environment of an organism. Sensory receptors consist of neuron endings and specialized cells in close contact with neurons

## septate shell

a shell divided into smaller chambers, as in the chambered nautilus (Cephalopoda-Mollusca)

## septocosta

when corallite walls are absent or indistinct, the distinction between septae and costae is lost and they become known as septocostae

## septum

a thin partition

## septum (pl. septa)

the skeletal plate that projects into the calyx from the theca. Septa may be subdivided into primary, secondary, and tertiary structures



Skeleton of a coral polyp. Notice the septa radially arranged around a central axis.

## sequencing

analytical procedures for the determination of the sequential order of amino acids in a polypeptide chain or nucleotides in a DNA or RNA molecule

## sequential hermaphrodite

a form of hermaphroditism where individuals can change sex, but the sexes are separate

## sequestration

segregation; the act of removing, separating, segregating or sequestering

## sere

the series of communities that follow one another in a natural succession, as in the change from a bare field to a mature forest

## serial homology

representative or repetitive relation in the segments of the same organism, as in the lobster, where the parts follow each other in a linear series; repeated structures within an organism that have similar developmental origins

## serial spawning

spawning more than once in a season

## series

in taxonomy, the sample available for study

## serosa

a serous membrane

## serous membrane

an epithelial and connective tissue membrane that lines body cavities and covers visceral organs within these cavities. Epithelial cells constituting this membrane secrete a fluid (serous fluid) to the membrane's surface, which keeps the membrane moistened; also called "serosa"

## serpulid worm

a marine polychaete worm in the family Serpulidae which secretes and lives in a rigid calcareous tube

## serrate

saw-like; notched

## server

a computer which is designed to be accessed by many other computers. Servers can be attached to local area networks and/or be hooked up to the internet. With the proper software and connections, servers can control the distribution of email, store World Wide Web documents, and provide access to files that are shared by many users

## sesquiterpene isocyanides

a class of toxic chemicals which act as defensive chemical secretions in some sea slugs

## sessile

describes an immobile organism because of its attachment to a substrate. The term has also been applied to organisms, such as anemones, that move very slowly



A sessile colonial anemone (*Epizoanthus americanus*) living in Gray's Reef off Sapelo Island, GA.

## seston

minute particulate material moving in water that is composed of both living organisms, such as plankton, and non-living matter such as plant debris and suspended soil particles

## set

in mathematics, a collection of things without regard to their order

## seta

a cuticular hair arising from the outside of the exoskeleton of an invertebrate

## setiform

bristle-like; brush-like

## setose

bearing setae

## sewage

the total of organic waste and waste water generated by residential and commercial establishments

## sex chromosome

a heteromorphic chromosome that plays a role in sex determination, such as the X and Y chromosomes, whose distribution in a zygote determines the sex of the organism; a chromosome whose DNA determines sexual characteristics in females (X)-and males (Y)

## sex inversion

change of sex naturally or after steroid hormone application; also called "sex reversal"

## sex ratio

the relative number of males and females in a population.

## sex-linked gene

a gene coded on a sex chromosome, such as the X-chromosome-linked genes

## sexual dichromatism

pertaining to differences in color and color pattern between the sexes of a particular species



Sexual dichromatism in the freshwater southeast Asian dwarf gourami, *Colisa lalia*. The male is to the left of the female.

## sexual dimorphism

pertains to systematic differences between males and females. The two sexes are markedly dissimilar in appearance





Female (above) and male (below) sockeye salmon (*Oncorhynchus nerka*) show extreme sexual dimorphism (color, male hump).

## shallows

the marine environment located close to the surface where the influences of waves, wind, tides, sun and cooling are most pronounced

## shearwater

any of about 25 species of medium-sized, long-winged seabirds in the family Procellariidae. Those in the genus Procellaria are usually called 'petrel'

## sheen

a very thin layer of oil (less than 0.0003mm in thickness) floating on the water surface

## shelf break

nearshore bathymetry characterized by rapid and substantial increases in depth that are continuous with the deeper parts of the ocean

## shelf escarpment

the edge of the bank/shelf where depth increases rapidly into deep oceanic water

## shelf reef

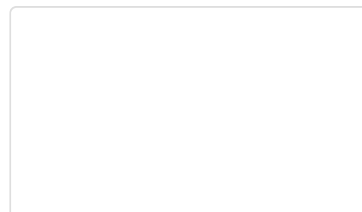
a reef that forms on the continental shelf of large land masses

## shelf-edge reef

a synonym of ribbon reef

## shellfish

a term that includes both molluscs, such as clams and oysters, and crustaceans, such as lobsters and shrimp





Edible crabs, shrimp, lobsters, crayfish, clams, mussels, scallops, and oysters are considered shellfish.

## Sherwood Forest Reef

a unique coral reef within the Dry Tortugas Ecological Reserve between 60 to 130 feet deep. Sherwood forest reef, estimated to be over 9,000 years old, is an important nursery ground and spawning site for aggregating species of fishes. The reef has extensive and abundant fungiform coral colonies

## shikimate pathway

the biochemical sequence employed by plants and microorganisms to generate the aromatic amino acids: phenylalanine, tyrosine, and tryptophan, and other aromatic metabolites. The pathway is thought to play a role in how algae protect itself and corals from ultraviolet (UV) radiation

## shoal

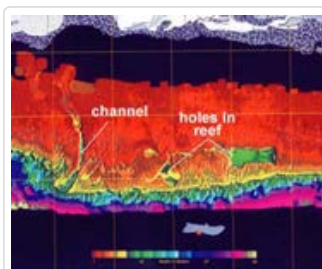
a submerged expanse of coral reef, surrounded by deep water, which does not form a part of a barrier or fringing reef

## shoal (biol.)

a social group of fishes of the same species that are not always similar in size or equal in social status. The shoal does not usually move in a highly coordinated fashion, as does a school. Shoals are typically found in shallow water or at the surface. Some consider shoals to be schools in shallow water

## SHOALS (Scanning Hydrographic Operational Airborne Lidar Survey)

SHOALS is a laser-based scanning LIDAR bathymeter which collects high-resolution bathymetric data in shallow, offshore areas. Map products provide a view of sea-floor topography. In areas with coral reefs, this includes not only the top surface of the reef but also associated channels and sand flats



SHOALS imagery of the South Moloka'i reef tract shows the position of a distinctive channel that crosses the reef and a large hole in the reef. The large hole is shown below in oblique view. The origin of features such as this one

is being investigated by USGS scientists. (Photo: U.S. Geological Survey)

### shore bird

any of various species of bird, such as the sandpiper, plover, or snipe, that frequents the shores of coastal or inland waters

### shore reef

a synonym of fringing reef

### shore species

marine fishes that are always found near the shore

### shoreline

the line separating land and water. It fluctuates as water rises and falls



Shoreline of Fanning Island in the South Pacific.

### shoreline

the intersection of the land, including man-made waterfront structures, with the water surface. The shoreline depicted on NOS maps and charts represents the line of contact between the land and a selected water elevation. In areas affected by tidal fluctuations, the shoreline is the interpreted mean high water line. In confined coastal water of diminished tidal influence, the mean water level line may be used. In non-tidal waters, the line represents the land/water interface at the time of survey. In areas where the land is obscured by marsh grass, cypress or similar marine vegetation, the actual shoreline can not be accurately represented. Instead, the outer limit line of the vegetation area is delineated (where it would appear to the mariner as the shoreline) and is referred to as the apparent shoreline

### short interfering RNA (siRNA)

a 21-23 nucleotide-long RNA that mediates messenger RNA (mRNA) catalysis; used in gene suppression

### short tandem repeats (str)

repetitive segments of DNA of a pattern of length from 2 to 10 bp, scattered throughout the genome in the non-coding regions between genes or within genes (introns), often used as markers for linkage analysis because of

high variability in repeat number between individuals. These regions are inherently unstable and susceptible to mutations

## shotgun sequencing

a DNA sequencing technique in which a large number of small fragments of a long DNA strand are generated at random, sequenced, and computationally reassembled to form a sequence of the original strand; also known as "shotgun cloning"

## shower

precipitation that is intermittent in time, space or intensity

## sibling species

closely-related species that are nearly morphologically indistinguishable

## sic

thus

## side scan sonar

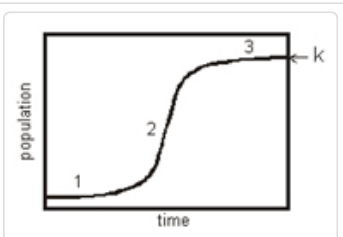
sonar designed to look sideways and at a downward angle from both sides of a towed unit, called a towfish. The bottom and any objects in the water above the bottom reflect sound waves back to the towed array. An image is produced from this information



Deployment of the side scan sonar tow vehicle, also called a 'fish'.  
(Photo: NOAA)

## sigmoid growth

a growth rate trend characterized by an elongated S-shaped, or sigmoid curve. It is typical of population growth rate trends which begin rapidly at an exponential rate but slow as limiting factors are encountered until a limit is approached asymptotically



This sigmoid (or s-shaped) curve is characteristic of many growth situations.

## sign

in pathology, an indication of the existence of something pathological; any objective evidence of a disease

## sign stimulus

the effective part of an action or object that triggers a highly stereotyped innate behavior (or fixed action pattern) in an animal by means of a hypothetical neural pathway called the innate releasing mechanism (IRM)

## signal-to-noise ratio

the difference between the source level of a sound signal from a source and the source level of the background noise

## signalment

in pathology, identification of the organism whose health is being examined, by describing distinguishing peculiar, appropriate, or characteristic physical marks or signs (e.g., species name, age or stage in development, size, coloration, gross lesions) and collection site and date collected. The basic signalment is aided by including collection site information, the specific samples collected from the specimen for investigation, and other observations on the history of the specimen's condition, to the extent known

## signature sound

a unique sound that is associated with a specific sound source

## significance level (level of significance)

in statistics, the probability of a false rejection of the null hypothesis in a statistical test

## Sikes Act

passed in 1960, and amended several times, the Sikes Act authorizes the Secretary of Defense to develop cooperative plans for conservation and rehabilitation programs on military reservations and to establish outdoor recreation facilities. The Act also provides for the Secretaries of Agriculture and the Interior to develop cooperative plans for conservation and rehabilitation programs on public lands under their jurisdiction. Some coral reefs are affected by this Act

## siliceous

composed of silicon or primarily of silicon

## sill

the lowest point on a submarine ridge or saddle at a relatively shallow depth, separating a basin from an adjacent sea or another basin

## sill reef

a synonym of ribbon reef

## silt

sediment deposited by water

## simple

not divided or branched

## simultaneous hermaphrodite

a form of hermaphroditism where individuals simultaneously possess functional testes and ovaries, and can release either male or female gametes during spawning

## sine

without

## single nucleotide polymorphism (SNP)

a SNP (pronounced "snip") is a small genetic change, or variation, that can occur within an organism's DNA sequence. The genetic code is specified by the four nucleotides: adenine, cytosine, thymine, and guanine. SNP variation occurs when a single nucleotide, such as adenine, replaces one of the other three nucleotides. SNPs found within a coding sequence are of particular interest to researchers because they are more likely to alter the biological function of a protein. Because of the recent advances in technology, coupled with the unique ability of these genetic variations to facilitate gene identification, there has been a heightened activities of SNP discovery and detection

## single-stranded

a term used to describe nucleic acid molecules consisting of only one polynucleotide chain. The genomes of certain phages are single-stranded DNA molecules; rRNA, mRNA and tRNA are all single-stranded nucleic acids

## single-stranded DNA

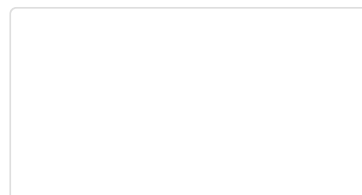
a single chain of deoxyribonucleotides that occurs in some bacteria and viruses. It usually exists as a covalently closed circle

## sinistral

left, as opposed to dextral, or right

## sink

a process or place that acts to absorb or remove energy or a substance from a system. The ocean, for example, is a sink for carbon dioxide





The marine environment is a sink for many nutrients. (Photo: copyright Digital Vision Ltd.)

## sink population or species

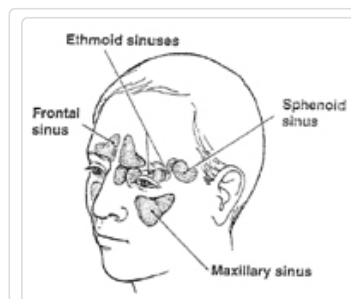
a population or species that cannot reproduce fast enough to replace themselves. Sink populations or species are present only because immigrants compensate for excess deaths in the area. Eventually, sink species will disappear from isolated areas

## sinkhole

a depression formed in an area either by dissolving of the surface limestone or by collapse of underlying cavities

## sinus

one of several air spaces within the skull that are in contact with ambient pressure through nasal passage openings in the posterior pharynx; a sac-like space



The sinuses are a group of 4 pairs of air filled spaces in the head. They are called the ethmoid, maxillary, sphenoid, and frontal sinuses. They warm and humidify the air as one breathes. They also trap and filter organic and non-organic particles from the air, such as bacteria, spores, and dust. (Graphic: Cystic Fibrosis Center at Stanford University)

## siphon

an opening in molluscs or in urochordates (tunicates) which draws water into the body cavity. In many molluscs, such as octopods and squids, the siphon may be used to forcibly expel water, providing a means of propulsion



An octopus rapidly swimming by forcibly expelling water through the tubular siphon projecting from the head. (Photo: Jeff Jeffords)

## siphonoglyph

a groove in the pharynx of some cnidarians that is lined with cilia which pump water into the animal's gastrovascular cavity. This water current inflates the body, circulates fluids, and provides a volume of water to act as a hydrostatic skeleton

## siphonophore

siphonophores are "colonial jellyfish" which have swimming bells at the top, and tentacles with stinging cells below that help them to catch their prey. Each individual of the colony is specialized for a different function, such as swimming, feeding and reproduction. Some siphonophores can be more than 10 meters long. They are in the phylum Cnidaria, class Hydrozoa and order Siphonophora

## siphonozoid

a specialized polyp found in colonial soft corals, such as sea pens and sea pansies, which functions as an intake for water, which circulates within the colony and helps keep it upright

## siphuncle

a tubelike structure in the body of a shelled cephalopod, such as the chambered nautilus, extending through the partitions of each chamber of the septate shell; the term is also used to describe tubular structures that direct water flow, or as a feeding siphon of several different kinds of invertebrates

## Sipuncula

an animal phylum that contains the peanut or starworms. They are small, non-segmented benthic animals (they are not worms), some of which live in coral crevices, empty mollusk shells or marine worm tubes. Several species bore into coralline rock

## sister group

a taxon thought to be the closest relative of a given taxon, exclusive of the ancestral species of both taxa

## sister taxa

two taxa that are more closely related to each other than either is to a third taxon



## sixteen S rRNA (16S rRNA)

a large polynucleotide (about 1500 bases) which functions as a part of the small subunit of the ribosome of prokaryotes and from whose sequence evolutionary information can be obtained; the eukaryotic counterpart is 18S rRNA.

## skeletal density

certain massive coral species (e.g. *Porites*) exhibit annual variations in the density of their calcium carbonate (CaCO<sub>3</sub>) skeleton, similar to tree rings. The annual density bands are revealed when slices of coral skeleton are X-rayed

## skeletogenesis

the process of skeleton formation in vertebrates and invertebrates

## skeleton

a supportive or protective structure or framework of an animal, a plant, or part of an animal or plant. In animals it is an external (exoskeleton) or internal (endoskeleton) support structure, against which the force of muscles acts. Vertebrates have a skeleton of bone or cartilage; arthropods have one made of chitin; corals have one of calcium carbonate: sponges have a mass of spicules; many other invertebrates use a hydrostatic skeleton, which is an incompressible fluid-filled region of their body. In plants, the skeleton may be a rigid protective covering, as in the shell of a diatom, or the vascular system of a vascular plant; in scleractinian corals, the structurally supporting matrix of aragonite crystals formed on the outside of the polyp, technically an exoskeleton, or the structural support for an octocoral

## skeleton eroding band disease (SEB)

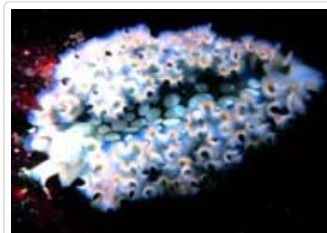
a coral disease that appears similar to black-band disease but is caused by the folliculinid ciliate protozoan, *Halofolliculina corallasia*

## skerry

a low-lying rocky island or reef, often without terrestrial vegetation, and frequently swept by waves

## slug

a pulmonate or opisthobranch gastropod in which the shell is absent, or reduced and buried within the mantle



Lettuce sea slug (*Tridachia crispata*) from the Florida Keys National Marine Sanctuary.

## smooth

describes a surface without projections; glabrous

## snapper

any species of bony fishes in the family Lutjanidae. Snappers are found in the tropical and subtropical regions of the Atlantic, Pacific, and Indian oceans. A few are estuarine to entirely freshwater. Many species are popular food and game fishes. Some ha

## sneaky male

a small, non-dominant male fish which attempts to fertilize eggs by darting suddenly onto the nest site; also called "sneaker"

## snorkel

a breathing device that allows a swimmer to breathe while face down in the water. It consists of a bent plastic or rubber tube fitting into a swimmer's mouth and extending above the surface



This swimmer is breathing through a snorkel. (Photo: Courtesy of Cayman Islands Department of Tourism)

## snout

the portion of the head that is just anterior to the eyes



Measuring the snout length of a fish.

## social behavior

any kind of interaction between two or more animals, usually between animals of the same species

## social rank

in animal behavior, the position an animal holds in a social group of the same species

## social resilience

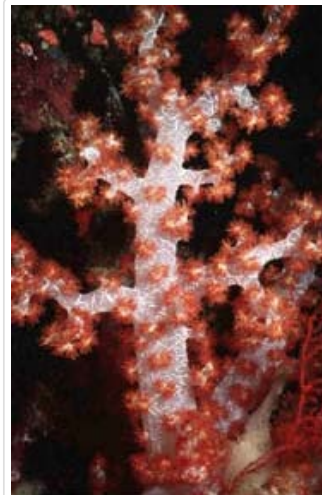
the resilience of communities to adapt to and withstand institutional, environmental and economic changes in their particular geography

## socioeconomics

a branch of economics that considers the relationships of social factors and the market place. For example, coral reef management decisions should identify how these essentially ecological decisions effect the coral reef dependent community

## soft coral

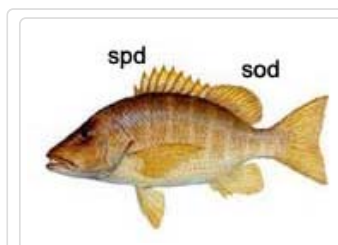
common name for species of the anthozoan order Alcyonacea of the subclass Octocorallia. In contrast to the hard or stony corals, most soft corals do not possess a massive external skeleton



Beautiful specimen of soft coral

## soft dorsal

a dorsal fin containing only soft rays, or the soft-rayed hind part of the dorsal fin, if both spines and soft rays are present (as in squirrelfish)



The spiny dorsal (spd) and soft dorsal (sod) fin of a schoolmaster snapper. (Photo: Fishing-Florida.com)

## sol

a liquid colloidal dispersion; a cytoplasmic phase (the other phase is a gel)

## solar energy

electromagnetic energy from the Sun

## solar radiation

the amount of radiation or energy received from the sun at any given point

## solar year

the time it takes the Earth to make one orbit around the Sun; approximately 365.2422 days

## soleiform

slipper-shaped

## solenium

in octocorals, a small canal lined with gastrodermis penetrating the coenenchyme, forming a network, and fusing with the larger gastrovascular canals to interconnect the gastrovascular cavities of the polyps

## solitary coral

coral polyps can be solitary or colonial. Solitary forms remain as a single individual polyp and one corallite

## solstice

either of the two times of the year when the sun is the greatest distance from the celestial equator, occurring about June 22 and December 22

## solute

the chemical substances dissolved in a solution, such as salts in seawater

## solution

a liquid mixture in which the minor component, the solute, is uniformly distributed within the major component, the solvent

## solvent

the liquid in which a solute is dissolved to form a solution

## somatic mutation

a change in the genetic structure that can occur in any of the cells of the body except the reproductive cells, and therefore is neither inherited nor passed to offspring. Also called an 'acquired mutation'

## somite

a segmental mass of mesoderm in the vertebrate embryo, occurring in pairs along the notochord, and developing into skeletal muscles and vertebrae; in some invertebrates, the term "somite" refers to a metamere

## sonar

SONAR is an acronym for "sound navigation and ranging." Active sonar describes an apparatus that transmits high frequency sound waves in water and registers the vibrations reflected back from an object. Passive sonars listen without transmitting. They are usually military (although a few are scientific). Some marine animals, such as whales and dolphins, use echolocation systems similar to active sonar to locate predators and prey



Mother and juvenile bottlenose dolphins (*Tursiops truncatus*). Dolphins and whales can use echolocation to help navigate.

## sonic muscle

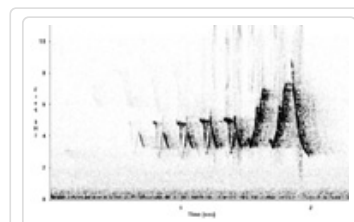
in fishes, a muscle(s) associated with the swimbladder, which when contracted against the swimbladder wall, produces sounds associated with territorial and reproductive behavior

## soniferous

sound producing

## sonograph

a hard copy display of sound data generated either in real time or from recorded data. Also known as a sonogram



Sonograph of a crested warbler. Time is on the x-axis and frequency (pitch) is on the y-axis. The sonograph shows discrete pulses of sound over time. Loudness (amplitude) is indicated by the darkness of the pulse.

## sorus

a group or cluster of sporangia

## sound

a longitudinal pressure wave produced by the vibration of molecules in an elastic medium, which can be a liquid, solid, or gas. As the molecules are set in motion, they radiate outwards, colliding into other molecules (compression), then move apart farther than their equilibrium distance (rarefaction), travelling in this manner

until they stimulate a sound receptor organ, such as an ear or tactile organ. The receptor translates the mechanical energy of the pressure wave to electrochemical energy of a nervous system, which stimulates a hearing or tactile sensation in the receiving organism; a body of water that is usually broad, elongate, and parallel to the shore between the mainland and one or more islands, e.g., Long Island Sound

### source DNA

the DNA from an organism that contains a target gene. This DNA is used as starting material in a cloning experiment

### source species

a species whose births exceed deaths in an area. Source species can provide individuals to populate other areas

### Southern Cross

a small conspicuous constellation in the southern hemisphere in the Milky Way near Centaurus

### Southern Oscillation

a large-scale atmospheric and hydrospheric fluctuation centered in the equatorial Pacific Ocean. It exhibits a nearly annual pressure anomaly, alternatively high over the Indian Ocean and high over the South Pacific. Its period is slightly variable, averaging 2.33 years. The variation in pressure is accompanied by variations in wind strengths, ocean currents, sea-surface temperatures, and precipitation in the surrounding areas. El Niño occurrences are associated with the phenomenon

### sp richness

species richness; also "sp. richness" and "sprichness" (very rare)

### spat

tiny single corallites that form immediately after the metamorphosis of planula larvae

### spathiform

resembling a rounded pole in form

### spatial data

information about the location and shape of, and relationships among, geographic features, usually stored as coordinates and topology

### spatial index

the ratio of reef surface contour to linear distance. As part of a monitoring program employing a chain transect protocol, the spatial index provides a way to quantify changes in the topographical complexity of the reef

## spatial index

as pertaining to coral reef ecosystems, the ratio of reef surface contour distance to linear distance. A high index indicates a surface of high rugosity

## spatiotemporal

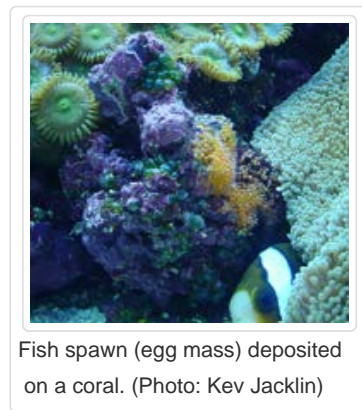
of, concerning, or existing in both space and time

## spatulate

spoon or broadly blade-shaped

## spawn

to produce or deposit eggs; the eggs of aquatic animals; the mass of eggs deposited by fishes, amphibians or mollusks; offspring in great numbers or masses; to give forth young in large numbers



## spawning

in corals, the release of gametes into the water

## Spearman's Rank Correlation Test

a statistical test for correlation (statistical dependence) between a sequence of pairs of values. Using ranks eliminates the sensitivity of the correlation test to the function linking the pairs of values. It assesses how well the relationship between two variables can be described using a monotonic function (a function that either never decreases or never increases as its independent variable increases). It is a non-parametric alternative to correlation and it is used when the data do not meet the assumptions about normality, linearity and homoscedasticity

## specialist

an organism which has adopted a lifestyle or niche specific to a particular set of conditions

## specialist species

species that have a relatively narrow ecological niche

## speciation

the evolutionary process that gives rise to a new species

## species

in sexually reproducing organisms, a species is a group of genetically related organisms, usually similar in physical appearance, that actually or potentially interbreed and are reproductively isolated from other groups. In microbiology, a species is a collection of closely related strains of organisms sufficiently different from all other strains to be recognized as a distinct unit

## species aggregate

a group of species that are morphologically similar and therefore difficult to identify

## species diversity

the number of different species in an area and their relative abundance

## species group

a group of species considered together, often because they are difficult to differentiate without detailed examination, e.g., very similar species; a group of closely related species; a superspecies

## species list

a list of species encountered in an area

## species recovery plan

a plan for restoration of an endangered species through protection, habitat management, captive breeding, disease control, or other techniques that increase populations and encourage survival

## species richness

the number of species in an area or biological collection

## species-area curve (SAR)

there exists a relationship between the area of a habitat and the number of species found within that area. The species-area curve plots the number of species as a function of habitat area, the size of which correlates strongly with the number of plant and animal species found in that area

## specific action potential

instinctive behavior, triggered by internal chemico-physiological factors that builds to a certain level, and allows the behavior to take place. This build up is called the specific action potential. It is responsible for an animal performing one behavior in preference to other behaviors

## specific epithet



the label (or designation) of a particular species in the binomial system of nomenclature . For example, "palmata" is the specific epithet of the elkhorn coral, *Acropora palmata*

### specific name

the second name in a binomen and in a trinomen

### speciose

having many species

### spectrometer

an instrument for measuring wavelengths of light of a spectrum

### spectrophotometer

an instrument for measuring speed of different parts of light spectrum

### spectroradiometer

a radiometer that measures radiant energy as a function of wavelength

### speleothem

a secondary mineral deposited in a cave by the evaporation of mineral-rich water. Stalactites, stalagmites, pillars, and columns are kinds of speleothems. Most common speleothems are composed of calcite, aragonite (calcium carbonate) or gypsum (calcium sulphate)

### spermary

an organ in which male gametes are developed. In cnidarians, spermaries are located within the mesoglea of mesenteries

### spermatangium

the male gamete-producing reproductive organ in certain algae

### spermatium

a non-motile male gamete produced by a spermatangium in red algae

### spermatocyte

a male gametocyte that develops into spermatozoa

### spermatogenesis

the process of sperm cell (spermatozoa) development in male animals, in which the diploid number of

chromosomes is reduced by half to the haploid number in the spermatozoa

## spermatophore

a packet containing sperm cells which is produced by the male genital system for transfer to the female. This method of sperm transfer is found in some vertebrates (salamanders) as well as invertebrates

## spermatozoan

a sperm cell; the male reproductive cell; the male gamete

## spicule

one of the numerous small to minute calcareous or siliceous bodies occurring in and serving to stiffen and support the tissues of various invertebrates, as in the majority of sponges, alcyonarians, and many radiolarians, holothurians and compound ascidians

## spicule

minute, hard, needle-like or sharp-pointed processes or projections

## spillover

with reference to a marine protected area, adults and juvenile animals may swim out of the MPA into adjacent areas, and planktonic stages and eggs can drift out from the MPA into the surrounding waters

## spinate

spine-like or composed of spines

## spine

a sharp hard bony structure on the skeleton or skin. Body spines serve as predator deterrents; a usually stiff, sharp, dermal rod which supports a fin in fishes

## spiniform

spine-shaped

## spiny lobster

a crustacean of the Family Palinuridae; it lacks large claws and has a flexible, leathery tail fan



Spiny lobsters in a seagrass bed.

## spiracle

one of the external openings communicating with the air tubes (tracheae) or book lungs of certain arthropods; a tubular opening, formed from the modified first gill cleft, communicating with the gill cavity of certain ganoid (e.g., gar pike, bowfin) and all elasmobranch fishes

## spiral cleavage

a developing embryo has spiral cleavage if, as it undergoes cleavage and changes from a four-cell embryo to an eight-cell embryo, the cells divide at slight angles to one another, so that the none of the four cells in one plane of the eight-cell stage is directly over a cell in the other plane. Spiral cleavage is characteristic of protostomes

## spirocyst

a type of nematocyst (stinging cell) limited to the tentacles and oral disc of cnidarians

## spirocyte

a cell that produces the spirocyst in anthozoans

## spit

a stretch of sand, attached to the land at one end, and extending out into the sea

## splicing

the removal of introns and joining of exons to form a continuous coding sequence in RNA

## split spawning

spawning occurring over consecutive nights or consecutive lunar cycles within a reef

## splitter

refers to a taxonomist who focuses more on small differences among taxa, emphasizing minor variation among individuals, and who tends to recognize more taxa

## sponge

a multicellular animal (metazoa) below the tissue grade of construction. Sponges belong to the phylum Porifera. There are approximately 5,000 living species classified in three distinct groups, the Hexactinellida (glass sponges), the Demospongia, and the Calcarea (calcareous sponges). They are important components of a coral reef ecosystem



Tube sponges (Phylum Porifera)with sea fans (gorgonia) in background.

## sponge

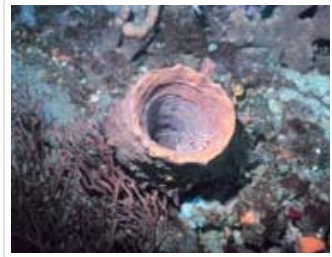
the egg mass of a female crab, which she carries attached to long "hairs" on her pleopods

## spongin

a fibrous horny protein that forms the skeletal framework of some sponges

## spongocoel

the central body cavity of sponges, which opens to the outside by way of the osculum.



The central cavity of this sponge is the spongocoel. Note the banded shrimp in the spongocoel. (Photo: Dr. Anthony Picciolo)

## spongocyte

a cell that secretes spongin fibers in sponges

## sporangium

an organ containing or producing spores in some algae and fungi

## spore

a small reproductive cell produced by certain bacteria, algae, fungi and nonflowering plants. Spores contain at least one genome and are highly resistant to heat excess and dehydration

## sporophyll

a fertile blade in attached brown algae

## spot

a circular area of pigment



This female three-spotted gourami, *Trichogaster trichopterus*, gets its

common name from the conspicuous spots on its flank and caudal peduncle. The third "spot" is the eye. (Photo: Miguel Pais)

## spur and groove

a system of shallow ridges (spurs) separated by deep channels (grooves) oriented perpendicular to the reef crest and extending down the upper seaward slope

## squall

a brief sudden and violent wind storm, often accompanied by rain or snow

## squall line

any nonfrontal line or band of active thunderstorms

## squamous epithelium

an epithelium consisting of one or more cell layers, the most superficial of which is composed of flat, scalelike or platelike cells

## squeeze

pain or discomfort in an enclosed space (sinuses, middle ears, inside a face mask) experienced by scuba divers on descent and ascent, caused by barotrauma to the affected area

## squirrelfish

a bony fish in the family Holocentridae. Squirrelfishes are small, brightly colored spiny-finned fishes, commonly found living on coral reefs. Most squirrelfishes are reddish in color mixed with silver and white. All species have large eyes. During the day they are usually found hiding in crevices or beneath ledges. They are crepuscular species, most active at low light levels and at night

## stability

in ecological terms, a dynamic equilibrium among the physical and biological factors in an ecosystem or a community; relative homeostasis; unchanging with time. This can be a static state, where nothing changes or a steady state where resource flows occur

## stable isotope

an isotope of a chemical element which is not spontaneously radioactive. Elements can exist in both stable and unstable (radioactive) forms. Most elements of biological interest (including C, H, O, N, and S) have two or more stable isotopes, with the lightest of these present in much greater abundance than the others. Among stable isotopes the most useful as biological tracers are the heavy isotopes of carbon and nitrogen. These two elements are found in the earth, the atmosphere, and all organisms

## stakeholder

an individual or group with an interest in the success of an organization in delivering intended results and maintaining the viability of the organization's products and services. Stakeholders influence programs, products, and services

## stalked eye

an eye carried on the end of a stalk or peduncle

## standard deviation

a measure of the spread or dispersion of a set of data. It is calculated by taking the square root of the variance

## starboard

the right side of a vessel to someone facing the bow or front

## start codon

the set of three nucleotides in an mRNA molecule with which the ribosome starts the process of translation. The start codon sets the reading frame for translation. The most commonly used start codon is AUG, which is decoded as methionine in eukaryotes, and as *N*-formylmethionine in prokaryotes; also called 'initiator codon'

## statistic

an estimate based on a sample or samples of a population, providing an indication of the true population parameter

## statistical analysis

the application of probability theory to quantified descriptive data

## statocyst

a sensory organ possessed by many invertebrates for the perception of gravity, thus body orientation and balance. Statocysts are found in many invertebrates. Each one has a cavity lined with sensory cells and contains a statolith

## statolith

a sand grain or a calcium carbonate granule or other hard secreted substance, found in the cavity of a statocyst. Under the influence of gravity, a statolith makes contact with the lining of the cavity, thereby stimulating sensory cells that line it

## status and trends analysis

a monitoring program designed to evaluate the current condition of physical and biological features found in an ecosystem and to detect changes that may occur over time.

## stellate

star-shaped



The diver is holding a stellate-shaped starfish. (Photo: Copyright Corel Corp.)

## stem cell

an embryonic cell that can give rise to any type of differentiated cell. They can be derived from two sources: the inner cell mass from a blastocyst or the primordial germ cells (eggs and sperm) of an older embryo

## stenohaline

pertaining to an aquatic organism that can withstand a narrow salinity range

## stenoky, stenokous

adapted for only a few specific ecological niches

## stenothermal

pertaining to an aquatic organism that can withstand a narrow temperature range

## stereoblastula

a solid blastula, lacking a blastocoel

## stereocilium

a specialized microvillus that superficially resembles a cilium and projects from the surface of certain cells, such as the auditory hair cells

## stereogastrula

a solid gastrula, lacking a gastrocoel

## stereotypical behavior

in animal behavior, any behavior that an animal repeats in the same way

## stern

the rear (back) end of a vessel

## sternite

the ventral plate (or sclerite) of each segment of the body of an arthropod

## stewardship

related to the environment, the concept of responsible caretaking, based on the premise that we do not own resources, but are managers and are responsible to future generations for their condition; the science, art and skill of responsible and accountable management of resources

## stipe

stalk or erect portion, as in some brown algae

## stipitate

body mass supported by a long stalk or stipe

## stochastic

random; exhibiting variability due to random events

## stolon

a type of stalk that lies in contact with the substrate; in corals, a horizontal polyp outgrowth from which daughter polyps are budded

## stoma

any of various small openings or pores in an animal body, especially an opening resembling a mouth in many invertebrates; also a minute pore in the epidermis of the leaf or stem of a plant; plural is 'stomata'

## stomodaeum

the pharynx in anthozoans; foregut of higher animals; the anterior or oral portion of the alimentary canal of an embryo

## stony coral

a synonym of hard coral



## stop codon

a codon in mRNA for which there is no corresponding tRNA molecule to insert an amino acid into the polypeptide chain. Protein synthesis is terminated and the completed polypeptide is released from the ribosome. Three stop codons are known: UAA, UAG, and UGA. Mutations which generate any of these three codons in a position which normally contains a codon specifying an amino acid are known as 'nonsense mutations'; also called 'nonsense codons.' A stop codon signals the end of the amino acid chain in protein synthesis

## storm surge

a rise above normal water level on the open coast due to the action of wind stress on the water surface



Storm surge swamps a house.  
(Photo: NOAA)

## strain

a group of individuals within a species having a common origin

## strand

the flat area of land that borders a body of water, such as an ocean, a sea, a lake or a river bank

## strategic plan

a document used by an organization to align its organization and budget structure with organizational priorities, missions, and objectives. A strategic plan should include a mission statement, a description of the agency's long-term goals and objectives, and strategies or means the agency plans to use to achieve these general goals and objectives

## stratified random sample

in statistics, a sample drawn from a population divided into tiers or strata specifically relating to the study being undertaken; a sample derived by dividing the data population into a number of nonoverlapping classes or categories from which cases are selected at random, the number of cases selected from each category being proportional to the number therein

## stratigraphy

the branch of geology that deals with the origin, composition, distribution and succession of strata

## stream bed

the stream bottom or surface over which a stream flows

## stress

how an organism, population, community or ecosystem reacts to a stressor (a stimulus that causes stress). Acute stressors have a short term effect; chronic stressors have an effect over the longer term. Environmental stress refers to physical, chemical, and biological restraints affecting the ecosystem. Stress may be caused by natural environmental factors, such as volcanic eruptions, severe storms, climate change, biological interactions, disease, etc, or by human activities which contribute to the degradation of the environment

## stressor

a physical, chemical or biological factor that adversely affects organisms; an agent, condition or similar stimulus that causes stress to an organism

## striated

marked with lines or grooves

## stridulation

the process in which a biological sound is produced when one body part rubs against another

## stridulation

to produce a sound by rubbing two body parts together. Some fishes make sounds by rubbing together bodily structures, especially skeletal parts

## stripe

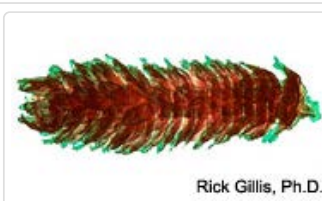
a straight line of pigment that can vary in width, and which can be oriented vertically, horizontally, or obliquely on the head, body, or fins of an organism



Distinctive striping of the Moorish Idol (*Zanclus canescens*). (Photo: Dr. James P. McVey, NOAA)

## strobila

a stage in the jellyfish life cycle. Free-swimming scyphozoan (true jellyfishes) medusae produce gametes which give rise to small polyps called scyphistomae. After a period of growth, a scyphistoma divides transversely to become a strobila that resembles a stack of discs. Each of the "discs" becomes an ephyra larva, detaches from the strobila and swims freely in the plankton. The ephyra larva will eventually grow into an adult medusa



The late strobila stage of the jellyfish *Aurelia*. This sessile stage contains numerous discs stacked on top of one another. Eventually, each of these discs will break free

from the stack as free-swimming ephyra larvae. (Photo: Rick Gillis, Ph.D., Biology Dept., University of Wisconsin-La Crosse)

## stromatolite

a layered, fossilized deposit, mainly of limestone, formed by photosynthesizing colonial cyanobacteria and other microbes. They are the oldest known fossils, dating back more than 3 billion years. Stromatolites are prokaryotes that thrived in warm aquatic environments and built reefs much the same way as coral does today. They were common in Precambrian time (i.e., more than 540 million years ago). Although stromatolites continue to form in certain areas of the world today, they grow in greatest abundance in Shark Bay in western Australia

## stromatoporoid

a fossil calcareous sponge

## structural complexity

as pertaining to coral reef ecosystems, a measure of the amount of coral surface area in relation to linear area. For example, branching coral reef habitats will have a higher structural complexity than encrusting coral reef habitats

## structural gene

a DNA sequence that forms the blueprint for the synthesis of a polypeptide, such as an enzyme

## structure-forming deep-sea sponge

any species of sponge generally occurring at depths below 50 m that provides vertical structure above the sea floor and can occur at a population density such that they promote the development of associated communities

## Structured Query Language (SQL)

a specialized language for sending queries to databases

## stygobite

a species generally restricted to subterranean groundwater

## styliform

having the shape of a pointed rod

## subadult

an individual similar to the adult in appearance but not yet capable of reproducing

### subclass

a taxonomic group that is below a class and above an order

### subduction

the process in which one lithospheric plate collides with, and is forced down under another plate

### subequal

nearly, but not quite equal

### subfamily

a taxonomic group that is below a family but above a genus

### subgenus

a taxonomic group that is between a genus and a species

### subgular

below the throat

### subkingdom

a taxonomic group comprising a major division of a kingdom

### sublethal

a toxic or genetic effect that does not cause death, but impairs the organism in various ways

### submarine groove

a troughlike depression with vertical to overhanging walls which cut across the reef front at right angles

### submersible

a small underwater vessel (submarine) which requires a support ship to transport it to and from the diving area. It is used primarily for oceanographic research. There are also some commercial submersibles that carry tourists below scuba diving depths to view coral reef walls

### suborbicular

nearly circular

## suborbital

an area below the eye

## suborder

a taxonomic group that is a subdivision of an order

## subordinate

in taxonomy, belonging to a lower or inferior taxonomic rank. For example, a genus is subordinate to the family to which it belongs

## subordinate taxon

in taxonomy, a taxon at a lower rank than the taxon of the same coordinate group with which it is compared

## subphylum

a taxonomic group ranking that is between a phylum and a class

## subpopulation

a well-defined set of interacting individuals that compose a proportion of a larger, interbreeding population

## subradular organ

a sensory organ in chitons (Polyplacophora-Mollusca) which can be protruded and pressed against the substrate in the search for food

## subset

in mathematics, a subset of a given set is a collection of things that belong to the original set

## subsidence

a gradual sinking of land with respect to its previous level; the slow sinking of air, usually associated with high-pressure areas

## subspecies

a taxonomic group that is a division of a species. It usually evolves as a consequence of reproductive isolation of one or more populations within a species

## subspecific name

the third term of the trinomen, a subspecies

## substrate

the material making up the base upon which an organism lives or to which it is attached

## subterminal

located some distance away from the end

## subumbrella

the lower or oral surface of a medusa or jellyfish

## sucker

any organ which has an adhesive action

## sucking disk

a disk-like structure used by some fishes to attach itself to rocks or vegetation

## Suess effect

dilution of the atmospheric concentrations of heavy isotopes of carbon ( $^{13}\text{C}$  and  $^{14}\text{C}$ ) by the admixture of large amounts of fossil fuel-derived  $\text{CO}_2$ , which is depleted in  $^{13}\text{CO}_2$  and contains no  $^{14}\text{CO}_2$ . The Suess effect has been used in studies of climate change

## Sula Reef

a deep water *Lophelia* reef located on the Sula Ridge on the Mid-Norwegian shelf at depths of 200 - 300 m. A very large deep water coral reef, it is about 13 km long, 700 m wide, and up to 35 m high

## Sundarbans

the world's largest mangrove forest located in Bangladesh at the edge of the delta where the Ganges, Brahmaputra and Meghna Rivers come together

## superclass

a taxonomic group that is below a phylum and above a class

## superfamily

a taxonomic group that is below an order but above a family

## superficial cleavage

a type of cleavage, typical of centrolecithal eggs found in most arthropods, in which karyokinesis (nuclear division) occurs without cytokinesis (cytoplasmic division), resulting in a syncytium. Cleavage furrows form to separate the nuclei

## supergene

a group of neighboring genes on a chromosome that tend to be inherited together and sometimes are functionally related

## superior

the anatomical term for "above" (e.g., the head is superior to the shoulder)

## supermale

a male which does not change sex and is the principal spawner

## supernatant

the soluble liquid fraction of a sample after centrifugation or precipitation of insoluble solids

## supernumerary

superfluous or extra

## superorder

a taxonomic group that is above an order and below a class or subclass

## supersucker

a mechanical suction device developed by the Hawai'i Marine Algae Group to remove the invasive algae Gorilla Ogo (*Gracilaria salicornia*) on reefs.

## supporting cell

in cnidarians, a columnar epithelial cell in the epidermis or gastrodermis which may have apical specializations of microvilli, cilia or flagellae

## suppressor gene

a gene that can reverse the effect of a mutation in other genes, i.e., a gene that suppresses the phenotypic expression of another gene, especially of a mutant gene

## supraesophageal ganglia

a nerve plexus above the esophagus in the head of malacostracan crustaceans

## supraorbital

an area above the eye

## suprapsammon

organisms which swim just above sand and are dependent upon it as a food source

## surf

a collective term for "breakers"; the wave activity in the area between the shore line and the outermost limit of breakers. In literature, surf usually refers to the breaking waves on shore and on reefs

## surface feeder

an organism, usually a fish, that takes its food from the air/water interface, or feeds just below the water surface, e.g., a needlefish

## surface interval

the length of time that a scuba diver spends on the surface between two consecutive dives

## surface ocean $^{13}\text{C}$ Suess effect

the annual decrease in  $^{13}\text{C}$  caused by the addition of anthropogenic  $\text{CO}_2$  to the atmosphere

## surface water

an open body of water, such as a stream, lake, reservoir or wetland

## surge channel

a deep channel in the windward side of a coral reef through which water moves in and out of the reef

## surgeonfish

any species of brightly colored reef-dwelling bony fishes in the family Acanthuridae which have laterally compressed bodies and possess one or more sharp erectile spines near the base of the tail; also called "tang" and "doctorfish"

## surrogate species

small number of species whose distributions and abundances are well known; used in conservation planning; assumed to reflect the distribution and abundance of the regional biota; subsumes indicators and umbrella species; also called "focal species"

## survey (biology)

the systematic and usually standardized collection or inventorying, processing, and analysis of representative portions of a biological community or defined site with its habitats, to determine the community structure and function

## susceptibility



the state of being susceptible; easily influenced or affected; in epidemiology, a susceptible individual is one which is at risk of becoming infected by a disease if the individual is exposed to the infectious agent

## suspended organic matter

floating organic particles derived from the decomposition of dead organisms

## suspension feeder

an organism that feeds by capturing particles suspended in the water column.  
A synonym of filter feeder



Suspension-feeding sponge among corals.

## sustainability science

a multi-disciplinary approach to science that recognizes the limitations of traditional scientific inquiry in dealing with the complex reality of social institutions interacting with natural phenomena. Sustainability science seeks to improve on the substantial but limited understanding of nature-society interactions gained in recent decades. This has been achieved through work in the environmental sciences estimating and evaluating human impacts, and evidence from social and development studies that takes into account environmental influences on human well-being. Urgently needed is a better understanding of the complex dynamic interactions between society and nature so that the trend towards increasing vulnerability is reversed

## sustainable development

those efforts to guide economic growth in an environmentally sound manner with an emphasis on natural resource conservation

## sustainable yield

the number or weight of organisms in a population that can be harvested without reducing the population biomass from year to year, assuming that environmental conditions remain the same

## sustained monogamy

a pair-bond normally maintained longer than one breeding season

## suture

the line of union of two bones or plates

## swamp

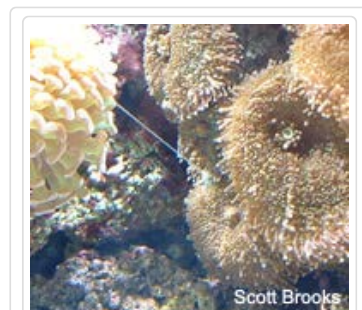
a type of wetland that is dominated by woody vegetation. When it does not, it is usually termed a marsh. Swamps may be fresh or salt water and tidal or non-tidal

## sweeper polyp

a polyp that acts in an aggressive manner by stinging neighboring corals and sessile invertebrates

## sweeper tentacle

A coral polyp tentacle that has an increased number of nematocysts and elongates in order to 'sting' neighboring corals and sessile invertebrates. A tool in the competition for space and resources



A hammer coral (right) thrusts out a sweeper tentacle towards a mushroom anemone (left). (Photo: Scott Brooks)

## swell

the persistence of a wind-formed wave after the wind ceases



An ocean swell

## swimmeret

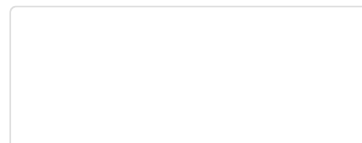
one of several flat, fringed, and usually bilobed, paired appendages on the ventral surface of the abdominal somites of decapod crustaceans, used for swimming and reproduction



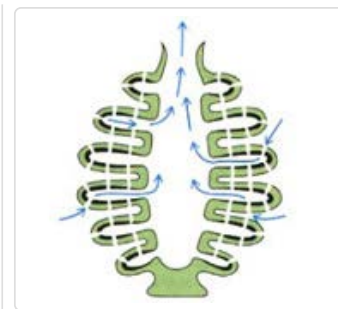
The arrow points to a swimmeret of a juvenile lobster. (Graphic: NOAA)

## syconoid

a body form of medium complexity in sponges where the body wall has become folded and the choanocytes (flagellated collar cells) are not located along the



spongocoel, but along radial canals. Water enters the sponge through a series of incurrent canals and passes through internal pores called prosopyles into the radial canals, which are lined with flagellated choanocytes.- It is the action of these choanocytes that keeps water moving through the sponge. From the radial canals, water then enters the central spongocoel through pores called apopyles, to exit to the environment through a single opening, the osculum.



Anterior end of a syconoid sponge in which the body wall has been folded into a series of internal and external canals.-1= osculum; 2= spongocoel; 3= ostium; 4= radial canal; 5= incurrent canal; 6= apopyle. (Photo: Rick Gillis, Ph.D., Biology Dept., University of Wisconsin-La Crosse)

## symbiont

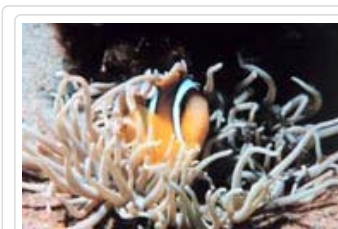
a symbiotic organism; either of two organisms participating in a symbiotic relationship



These clownfish exist in a symbiotic relationship with the sea anemone; the anemone provides protection and the clownfish feed and clean the anemone. Different clownfish species choose particular anemone species for their hosts. (Photo: Copyright Corel Corp.)

## symbiosis

a relationship between two species of organisms in which both members benefit from the association (mutualism), or where only one member benefits but the other is not harmed (commensalism), or where one member benefits at the expense of the well-being of the other (parasitism)



A clownfish has a symbiotic relationship with a sea anemone, finding protection within the clump of stinging cell-bearing tentacles.

## sympatric species

different species that live in the same area but are prevented from successfully reproducing by a reproductive isolating mechanism

## symplesiomorphy

in evolution, a shared primitive character

## synapomorphy

in evolution, a shared derived character

## synapse

the site where neurons communicate with each other. A synapse is a small gap that physically separates neurons. Axon terminals of a neuron sending a nervous impulse (the presynaptic neuron) release neurotransmitters into the synapse. The neurotransmitters diffuse to the other side (the postsynaptic side) where they bind to receptors on the postsynaptic neurons, thereby relaying the nervous impulse

## synchronous

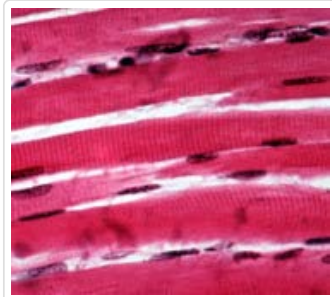
occurring at the same time

## synchrony

the relation that exists when things occur at the same time

## syncytium

a mass of cytoplasm containing several nuclei and enclosed in a membrane, but having no internal cell boundaries, e.g., skeletal muscle cells



Skeletal muscle cells are a multinucleate syncytium. The dark stained bodies are nuclei. (Photo: General College, University of Minnesota)

## syndrome

a group of symptoms or signs that are characteristic of a disease; a pattern of symptoms indicative of some disease

## synecology

the branch of ecology that deals with whole communities and the interactions of the organisms within them

## syngamy

the process of union of two gametes, also called fertilization. It encompasses both plasmogamy and karyogamy.

## synomone

a chemical substance produced by one organism that is beneficial to both itself and a member of another species

## synonym

in taxonomy, one of two or more scientific names that are spelled differently, but refer to the same organism

## synonymy

in taxonomy, the relationships between different names applied to the same taxon; a chronological list of taxonomic names which have been applied to a single taxon, including authors and dates

## synopsis

in taxonomy, a brief description of the main characters of a taxon

## syntrophy

the relationship between the individuals of different species (especially bacterial species) in which one or both benefit nutritionally from the presence of the other. The different species may combine their nutritional metabolic capabilities to utilize, for nutrition, a substance not capable of being utilized by either one alone

## syntype

in taxonomy, each specimen of a type series from which neither a holotype nor a lectotype has been designated. The syntypes collectively constitute the name-bearing type

## systemic

a condition or process that affects the body as a whole, not localized to one area or system

[A](#) | [B](#) | [C](#) | [D](#) | [E](#) | [F](#) | [G](#) | [H](#) | [I](#) | [J](#) | [K](#) | [L](#) | [M](#) | [N](#) | [O](#) | [P](#) | [Q](#) | [R](#) | [S](#) | [T](#) | [U](#) | [V](#) | [W](#) | [X](#) | [Y](#) | [Z](#) |

## t-test

a statistical procedure for testing the difference between two or more means. It is used for estimating the probability that the means have been drawn from the same or different populations

## t.

according to; on the evidence of (*teste*)

## t. c.

in the volume cited (*tomus citate*)

## table reef

an isolated flat-topped coral reef which reaches the surface but lacks a lagoon

## tabulate

having a flat surface



Coral (*Acropora*) having a tabulate shape.

## tactile

pertaining to information, interpretations, and behavior derived from the sense of touch

## taeniform

ribbon-like; elongate, compressed and deep-bodied

## tagging

an identification system involving various methods (fin clipping, coloring, biotelemetry, radioactive markers, tattooing, branding, tagging, etc.), used for individual identification and for studies on movement, growth and other biological activities; also called "marking"

## talus slope

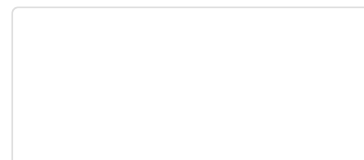
a synonym of reef base

## tandem repeats

in molecular genetics, multiple copies of the same nucleotide base sequences lying in series

## tank

a hollow steel or aluminum cylinder, used to contain compressed air or other breathing gas mixtures used by scuba divers for an air supply; also called a cylinder or bottle





A NOAA diver breathing compressed air from the steel scuba tank (or cylinder) attached to his BCD (buoyancy control device). The diver is entering the water using the giant step technique. (Photo: NOAA National Undersea Research Program)

## taphonomy

the study of everything that happens to an organism's body after it dies; includes probable cause and manner of death, movement of the body, chemical and physical alteration, burial, decomposition, diagenesis and fossilization

## tar ball

a dense, black sticky sphere of hydrocarbons formed from weathered oil

## target

in genomics, the DNA or RNA being hybridized to a microarray; for diagnostic tests, the molecule or nucleic acid sequence that is being sought in a sample

## tau

the third charged lepton (in order of increasing mass), with electric charge -1

## tautonymy

in taxonomy, the use of the same word for the name of a genus-group taxon and for one of its included species or subspecies

## tawny

brownish yellow color

## taxis

an innate behavioral response to a directional stimulus (a stimulus from a particular direction) whereby the organism either moves toward (positive taxis) or away (negative taxis) from the stimulus

## taxocene

a taxonomically related set of species within a community that have similar ecological functions

## taxon

a taxonomic group or entity

## taxonomic group

a taxon with all its subordinate taxa and their individuals; e.g. the taxonomic group Crustacea consists of all crustaceans and their taxa

## taxonomic group

a taxon with all its subordinate taxa and their individuals; e.g., the taxonomic group Crustacea consists of all crustaceans and their taxa

## taxonomic key

a tabulation of diagnostic characters of taxa in dichotomous couplets to facilitate rapid identification

## taxonomy

the science and methodology of classifying organisms based on physical and other similarities. Taxonomists classify all organisms into a hierarchy, and give them standardized Latin or Latinized names. There are seven main levels of classification in the hierarchy. They are, from most to least inclusive: Kingdom; Phylum (or Division for algae, fungi, and plants); Class; Order; Family; Genus; and Species. Taxonomists describe new species, classify organisms, and study speciation, the evolution of new species

## teal

greenish blue color

## technology

the creation of products and processes for the purpose of improving human chances for survival, comfort level, and quality of life

## tectal

pertaining to the roof of a structure, e.g. the top of the head or brain

## teleost



a large group of fishes (infraclass Teleostei) which contains most of the bony fishes

## telepresence

the use of telecommunications technology to give the appearance of an individual being present at a location other than the actual location of that individual

## telolecithal

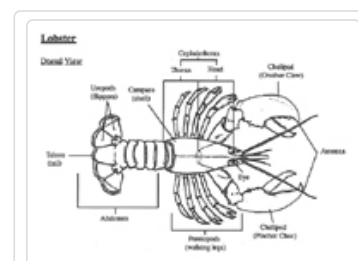
an egg cell in which the yolk is not evenly distributed throughout the cytoplasm, but is concentrated in one location, and cleavage is incomplete, e.g., a bird egg

## telomere

the terminal part of a eukaryotic chromosome. These specialised structures are involved in the replication and stability of linear DNA molecules. In vertebrate cells, each telomere consists of thousands of repetitive copies of the same DNA sequence. Telomeres shorten each time a cell divides; when one or more telomeres reaches a minimum critical length, cell division stops, signaling cell senescence. This mechanism limits the number of times a cell can divide

## telson

the terminal joint or movable piece at the end of the abdomen of crustaceans; middle piece of the tail fan



The telson, flanked by uropods, is the central part of the tail fan.

(Graphic: Maine Department of Marine Resources)

## temperate

region in which the climate undergoes seasonal change in temperature and moisture. Temperate regions of the earth lie primarily between 30 and 60 degrees latitude in both hemispheres

## template

a molecule that serves as the pattern for synthesizing another molecule ; in the process of replication or transcription, the strand of DNA that serves as the source of information

## temporary threshold shift

in mammals, a temporary increase in the threshold of hearing (minimum intensity need to hear a sound) at a specific frequency that returns to its pre-exposure level over time

## tendrill

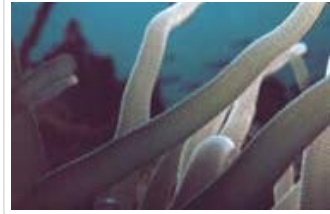
a slender elongated thread-like organ which may cling to objects for support

## tendrilliform

having the form or shape of a tendrill

## tentacle

a finger-like evagination of the body wall. Tentacles surround the mouths of coral polyps, anemones and other invertebrates. They are used for capturing prey, defense, reproduction, gas exchange, and light absorption



Tentacles of a sea anemone. Each tentacle contains stinging cells (nematocysts) used for defense and food capture. (Photo: Dr. Anthony Picciolo)

## tentacle-tube-foot suspension feeder

a suspension feeder that traps particles on distinct tentacles or tube feet (in echinoderms)

## tentacular lobe

a lobe at the point of insertion (beginning) of a septum

## tentacular sheath

one of the two cavities in the sides of the body of ctenophores (comb jellies) into which the tentacles can be withdrawn

## terabyte

a measure of data size. A terabyte of data is equivalent to 1,000 gigabytes of data or 1,000,000 megabytes of data. One petabyte equals 1,000 terabytes

## teratogen

a chemical or other factor that specifically causes abnormalities during embryonic growth and development

## terete

round in cross-section and tapering

## tergite

a hard plate (sclerite) forming one of the constituents of the dorsal exoskeleton (tergum) of an animal, such as an arthropod

## tergum

the back of an animal

## terminal

at the end position

## terminal male

in fishes, a supermale; the dominant male

## termination codon

a codon whose function is to stop polypeptide assembly

## terminator

a sequence of DNA bases that stops RNA polymerase from synthesizing RNA

## terminus

the end

## ternary name

in taxonomy, the trinomen

## terpenoid

a class of organic compound produced by soft corals for defense and for aggressive colonization of new substrates

## territoriality

the defense of a given area

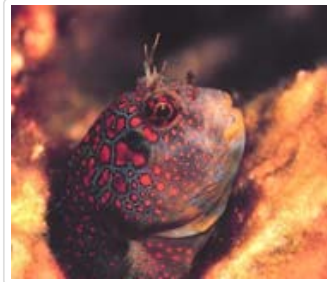
## territory

an area over which an animal establishes jurisdiction. The area is defended and no other individuals of the same species, and often of other species, are allowed inside, except for prospective breeding partners during a reproductive bout

## tessellated

a checkered appearance





A tessellated blenny. (Photo: NOAA)

## tetraspore

a haploid spore in the red algae life cycle which is the meiotic product of the tetrasporangium of a diploid tetrasporophyte. The tetraspores are released, settle, and grow into gametophytes

## tetrasporophyte

diploid phase in the life cycle of red algae which produces haploid tetraspores. The tetrasporophyte is the site of meiosis, more specifically, the tetrasporangia where haploid tetraspores are produced. These tetraspores are released, settle, and grow into the gametophyte, completing the basic red algal life history

## tetraxon

in sponges, a spicule with four rays

## tetrodotoxin (TTX)

tetrodotoxin (TTX) is an especially potent marine neurotoxin, named after the order of fish from which it is most commonly associated, the Tetraodontiformes (includes the puffers, porcupine fish, blowfish, cowfish, boxfish). The toxin appears in high concentrations in the gonads, liver, intestines and skin of pufferfish. The fatality rate when injected may be as high as 60 percent. Tetrodotoxin is more than 10,000 times deadlier than cyanide. Other marine and terrestrial organisms have been found to store TTX, for example, the Australian blue-ringed octopus, parrotfish, triggerfish, gobies, angelfish, ocean sunfish, globefish, seastars, starfish, xanthid and other crabs, a horseshoe crab, a number of marine snails, flatworms, tunicates, ribbonworms, mollusks and marine algae (*Jania spp.*) Terrestrial organisms include the Harlequin frogs (*Atelopus spp.*), three species of California newt and other eastern salamanders



A specially licensed Japanese chef prepares fugu, the ever-so-slightly tainted fillet of the extremely poisonous blowfish, whose internal organs contain tetrodotoxin.

## thallus

the vegetative body of a plant or alga that is not differentiated into organs, such as roots, stems and leaves

## thanatocoenosis

an assemblage of organisms or their parts brought together after their deaths, as for example, by flowing

water; 'death assemblage'

## theca

the calcareous wall of the corallite

## thelytoky, thelytokous

parthenogenetic production of females from unfertilized eggs; reproduction that is exclusively female with no male contribution to the young

## theoretical probability

the chances of events happening as determined by calculating results that would occur under ideal circumstances

## theory

a comprehensive explanation of a given set of data that has been repeatedly confirmed by observation and experimentation and has gained general acceptance within the scientific community

## thermal stress anomaly (TSA)

an area of the ocean surface which is experiencing warmer sea surface temperatures (SSTs) than the typical maximum temperature reached at that location. The typical maximum temperature, which generally occurs in late summer, is important because this is the highest temperature to which corals in a particular location are accustomed. So, when the SST exceeds this by some threshold (typically one degree C) corals are in danger of bleaching. Many factors such as salinity, insolation, winds, and local currents play a role in coral reef bleaching, but clearly extreme SSTs are a critical factor; also called "hotspots"

## thermocline

the region below the surface layer of the ocean or lake, where the temperature gradient increases abruptly (i.e. where temperature decreases rapidly with increasing depth). A thermocline may reach the surface and become a front. It is usually an ecological barrier and its oscillations have significant consequences on population distribution and ocean productivity

## thermohaline circulation

the density-driven convective circulation system of the world's oceans. Warm Atlantic water moves northward along the axis of the Gulf Stream, and evaporation increases water density while releasing heat to the colder atmosphere in the North Atlantic. Once significantly dense, the water sinks into the deep ocean, forming a downward limb of a giant conveyor-like circulation that extends around the world's oceans

## thermoreceptor

a neurological receptor that detects changes in temperature

## thigmotactic

responding to touch or outer surface contact

## Third Party Annotation (TPA) Sequence

a database designed to capture experimental or inferential results that support submitter-provided annotation for nucleotide sequence data that the submitter did not directly determine but derived from GenBank primary data

## thirtyS (30S)

30S is the smaller subunit of the 70S ribosome of prokaryotes. It is a complex of ribosomal RNA and ribonucleoproteins which functions in messenger RNA (mRNA) translation. It includes the subunit 16S, which is composed entirely of ribosomal RNA

## thoracic

pertaining to the chest area

## thorax

the central region of a crustacean body

## thymine

one of the four bases in DNA that make up the letters ATGC, thymine is the "T". The others are adenine, guanine, and cytosine. Thymine always pairs with adenine

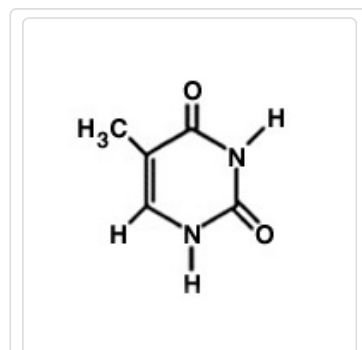


Diagram of the chemical structure of thymine, one of the four nitrogenous bases in DNA.

## tidal channel

a channel that dissects the tidal flat surface. It is formed and maintained by tidal currents

## tidal current

a horizontal movement of the water caused by gravitational interactions between the Sun, Moon, and Earth

## tidal delta

a delta formed at both sides of a tidal inlet

## tidal flat

a marsh or sandy or muddy coastal flatland which is covered and uncovered by the rise and fall of the tide

## tidal inlet

a waterway from the open ocean into a lagoon

## tidal pool

an area in the littoral zone that retains sea water at a low tide because of a depression or arrangement of rocky substrate

## tide

the periodic rising and falling of the water that results from the gravitational attraction of the moon and sun acting on the rotating earth



High tide combined with a storm threaten a pier. (Photo: Mary Hollinger)

## tide gauge

a device for measuring the height (rise and fall) of the tide; especially an instrument for automatically making a continuous graphic record of tide height versus time

## tide tables

tables which give daily predictions of the times and heights of high and low waters. These predictions are usually supplemented by tidal differences and constants through which predictions can be obtained for numerous other locations

## tidelands

the zone between the mean high water and mean low water lines. It is identical with intertidal zone (technical definition) when the type of tide is semi-diurnal or diurnal

## TIFF (Tag Image File Format)

a common format for exchanging raster graphics (bitmap) images between application programs, including those used for scanner images

## tinctorial

of or relating to staining or coloring

## Tisler Reef

a deep water *Lophelia* reef located in the Skagerrak, the submarine border between Norway and Sweden, at depths of 74 to 155 m. It has the world's only known yellow *Lophelia pertusa* corals

## tissue

a group of cells with a specific function in the body of an organism. Tissues are composed of nearly identical cells and their products, and are organized into larger units called organs

## tom.

volume (*tomus*)

## tombolo

a land form such as a spit or bar which forms an isthmus between an island and a mainland shore, or between two islands

## topodeme

a deme (a local interbreeding population) occupying any specified geographical area

## topographic map

a map containing contours indicating lines of equal surface elevation (relief)

## topotype

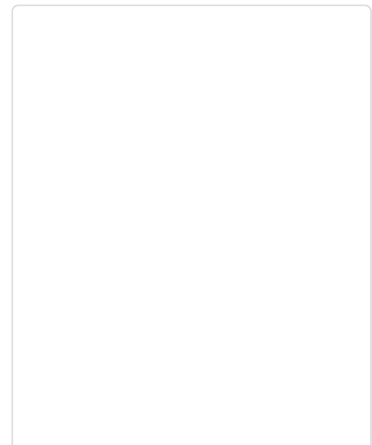
in taxonomy, a specimen collected at the type locality

## topotypical population

in taxonomy, a population occurring at the type locality

## tornaria larva

a ciliated, free-swimming pelagic larva of a hemichordate







Young tornaria of *Balanoglossus biminiensis*. (Photo: University of Saskatchewan Archives)

## torpor

a dormant state

## torsion

twisting of the body during development so that the posterior of the body takes an anterior position over the head

## total dissolved solids (TDS)

the amount of dissolved substances, such as salts or minerals, in water remaining after evaporating the water and weighing the residue

## Towed Optical Assessment Device (TOAD)

a device employing videography used chiefly at night on the NOWRAMP cruises to the Northwestern Hawaiian Islands. TOAD consists of a video camera and lights on a frame designed to be towed just above the substrate. The video is used to certify or ground truth acoustic habitat sensing. Specifically, the TOAD videos show the composition of the bottom in a few locations, such as sand, rubble, sea grass, coral, etc. It allows interpretation of broad area acoustic data by comparing it to the video information

## towfish

an instrument, e.g., a side scan sonar, towed behind a ship

## ToxiBan Â® Suspension Activated Charcoal

a brand of activated charcoal used in the treatment of poisoning by most organic chemicals

## toxicant

any substance which is potentially toxic

## trabeculum

in corallites, one of many rods or axial structures composed of fibrous tufts (sclerodermites), which form teeth along the upper septal margin

## trade winds

a system of relatively constant low level winds that occur in the tropics. The trade winds blow from the northeast to the equator in the Northern Hemisphere and from the southeast to the equator in the Southern Hemisphere

## trait

a genetic feature or characteristic that may be passed down from one generation to the next

## transcription

the process by which the genetic information encoded in a linear sequence of nucleotides in one strand of DNA is copied into an exactly complementary sequence of mRNA (messenger RNA). The mRNA then carries this information to the cytoplasm of the cell, where it serves as the blueprint for the manufacture of a specific protein

## transcription unit

a stretch of DNA transcribed into an RNA molecule

## transcriptome

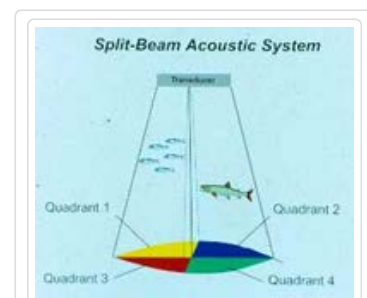
the set of all RNA molecules, including messenger RNA (mRNA), ribosomal RNA (rRNA), transfer RNA (tRNA), and non-coding RNA produced in one or a population of cells; a collection of all the transcripts present in a given cell

## transcriptomics

the discipline of molecular biology that is concerned with the study of messenger RNA (mRNA) molecules produced in an individual or population of a particular cell type

## transducer

the electromechanical component of a sonar system that is mounted underwater and converts electrical energy to sound energy and vice versa



Split beam transducer receives echoes with four different

quadrants (Graphic: American Fisheries Society)

## transduction

transfer of genetic material from one cell to another by means of a virus or phage vector

## transect

a line used to survey the distribution of organisms or substrate across a given area. Sample plots or points are established along the transect for collecting data



NOAA divers collect data along a transect line.

## transfection

infection of a cell with nucleic acid from a virus, resulting in replication of the complete virus; gene transfer into eukaryotic cells

## transfer RNA (tRNA)

short-chain RNA molecules present in the cell, in at least 20 varieties. Each variety is capable of combining with a specific amino acid, and attaches the correct amino acid to the protein chain that is being synthesized at the ribosome of the cell, according to instructions coded in the mRNA

## transforming gene

a gene that causes normal cells to change into cancerous tumor cells; also called an 'oncogene'

## transgenic

having genetic material (DNA) from another species. This term can be applied to an organism that has genes from another organism

## translation

in genetics, the process whereby genetic information coded in mRNA (messenger RNA) directs the formation of a specific protein at a ribosome in the cytoplasm

## translocation

a conservation technique whereby individuals or populations are moved to another area with similar habitat

## transmissometer

an instrument for measuring transmission of light through a fluid

## transposon

a DNA sequence of nucleotides that can insert itself at a new site in the genome

## transverse

crosswise

## trauma

any sudden physical injury or damage to an organism caused by an external force or violence. Trauma is also used to describe severe emotional or psychological shock or distress

## traumagenic device

any part of an organism which is concerned with the causation of physical injury to another, such as teeth, spines, darts, rasping organs, beak bites, etc

## trawler

a fishing vessel that tows an open-mouthed fishing net drawn along the sea bottom or in the water column

## tree of life

the tree-like representation of the evolutionary history of all living and extinct organisms

## trematodiasis

an infestation or infection with trematodes, a class within the phylum Platyhelminthes (Trematoda), that contains parasitic flatworms commonly referred to as "flukes".

## trend analysis

the analysis of changes in numerical data over time in order to study any pattern or trend represented in them

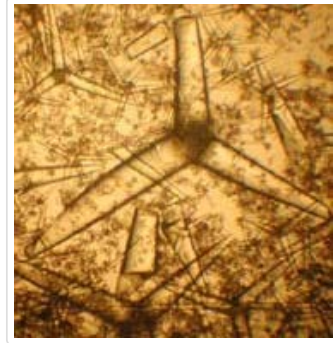
## trial and error learning

a form of associative learning. Trial and error learning occurs when an animal connects its own behavior with a particular environmental response. If the response has a positive reinforcement, or it is favorable to the animal, the animal will repeat the behavior in order to receive the same response again, possibly to receive a reward. If the response is unfavorable, such as causing pain, the animal will avoid the behavior

## triaxon



in sponges, a spicule with three rays



Microscopic triaxon spicules in a sponge. (Photo: NOAA)

## tribe

a taxonomic group that is between a genus and a subfamily

## trichocyst

a stinging or grasping organelle in the outer cytoplasm of protists, especially ciliates. It consisting of a hair-like filament that can be discharged suddenly from a minute capsule

## trichogyne

receptive elongation of the carpogonium (female reproductive structure) in red algae where male gametes become attached

## trifurcate

dividing into three parts

## triggerfish

any of several species of tropical coral reef fishes in the order Tetraodontiformes, family Balistidae, with laterally compressed bodies, heavy scales, and tough skins. Triggerfishes are named for the mechanism of the three spines of their first dorsal fin. When the fish is alarmed the first of these spines is locked upright by the second and drops only when the latter is pressed like a trigger. The function of this reaction is to lock the fish firmly in a mass of coral when attacked. Triggerfishes have powerful, chisel-like teeth adapted for cracking the coral and mollusks upon which they feed

## triglyceride

a complex molecule which is the main component of dietary and body fat. It is made up of a combination of glycerol and three fatty acids

## trihedral

with three surfaces, e.g. the body of a trunkfish

## trimix

a breathing gas mixture of helium, oxygen, and nitrogen. By using trimix, it is possible for divers to descend to hundreds of feet without suffering from toxic partial pressures of oxygen (which increases with depth), and also reduces the effect of nitrogen narcosis



Marine scientists breathing trimix working on a transect line in order to collect sponge and water samples at a depth of approximately 60 m (200 ft). (Photo: NOAA National Undersea Research Program)

## trinomen

in taxonomy, the combination of a generic name, a specific name, and a subspecific name, that together constitute a scientific name subspecies

## triplet

in genetics, a sequence of three nucleotides of DNA which specifies an amino acid.

## tripton

the nonliving particulate matter in bodies of water

## tritoniid

a member of a family of nudibranchs (Tritoniidae) which feed on soft corals, gorgonians, and other anthozoans. A characteristic common to the tritoniids are the dorsilateral branched cerata, used as gills and located in the edges of the dorsal surface

## triturate

to grind or masticate

## trochophore larva

the ciliated planktonic larva of many invertebrates, including polychaete worms, mollusks, and rotifers



The trochophore larva of a marine worm. (Photo: University of Saskatchewan Archives)

## troglobite

an obligate cave dweller

## trolling

a fishing method where lures or baits attached to lines are towed behind a slowly moving boat



Fishing vessel trolling for tuna.  
(Graphic: NOAA)

## trophic

related to or functioning in nutrition

## trophic dynamics

the complex biological processes whereby energy and matter are passed up to successive levels of food webs

## trophic group

a group of organisms consuming resources from a similar level in the energy cycle

## trophic level

a classification system of organisms according to their means of obtaining nutrition. A segment of the food chain in which all organisms obtain food and energy in basically the same manner (e.g., photosynthesis, herbivory, or carnivory) and in which all organisms are the same number of links from the photosynthetic segment

## tropical

region in which the climate undergoes little seasonal change in either temperature or rainfall. Tropical regions of the earth lie primarily between 30 degrees north and south of the equator

## tropical depression

a mass of thunderstorms and clouds generally with a cyclonic wind circulation of between 20 and 34 knots

## tropical disturbance

an organized mass of thunderstorms with a slight cyclonic wind circulation of less than 20 knots

## Tropical Ocean Coral Bleaching Indices

indices of selected coral reef sites/regions (maintained by NOAA/NESDIS) that present satellite-obtained measurements of relevance to coral reef ecosystems

## tropical storm

a tropical cyclone with maximum winds less than 34 m/sec (75 mile per hour)

## trumpetfish

any of a family of tropical reef fishes (Aulostomidae), recognised by its long body, tubular snout with minute teeth, its chin barbel, and a series of short dorsal spines. A carnivore, It often approaches its prey vertically, darting down from above and sucking the prey into its long snout

## truncate

having the end squared off

## trunkfish

any fish species in the family Ostraciidae (order Tetraodontiformes). Trunkfishes are encased in an triangular inflexible bony carapace which protects them from predators. Only the jaw, eyes, the bases of the fins, and the caudal fin protrude from this carapace. They are slow swimmers that move primarily by sculling with their dorsal and anal fins and use their caudal fin for sudden bursts of speed. They are also known as boxfishes or cowfishes

## tsunami

a long-period gravity wave generated by a submarine earthquake or volcanic event

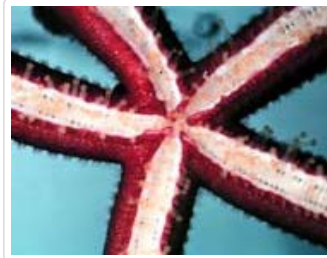


Tsunami damage at Seward, Alaska, following 1964 Good Friday Earthquake. (Photo: NOAA)

## tube feet

extensions of the water-vascular system of echinoderms, protruding from the body and often ending in suckers. They may be used for locomotion and/or for maintaining a tight grip on prey or on the substrate





The ventral side of a Pacific starfish shows its tube feet.

### tube worm

a marine worm in the phylum Annelida, class Polychaeta, that lives within tubular cases made of mineral or chitinous secretions or of aggregated grit. Other worm-like invertebrates in the phyla Pogonophora and Phoronida have also been referred to as tubeworms

### tubercle

any small, usually hard, knobby excrescence or lump. In pycnogonids and some cheliceramorph arthropods, the central eyes are carried on a tubercle

### tubicolous

inhabiting a tube or tubular structure; tube dwelling, such as some marine polychaete worms

### tubiform

a shape resembling a tube



The trumpetfish has a snout which is tubiform or tubular in shape. (Photo: Copyright Digital Stock Corp.)

### tubules of Cuvier

eversible toxic or sticky tubules associated with the bases of the respiratory trees of some sea cucumbers (Holothuroidea-Echinodermata)

### tubulin

the principal protein component of cellular microtubules (narrow, hollow tubes inside a cell), which are involved in cell division and cell movement

## tumid

swollen, inflated.

## tumor

a mass of new tissue, with no useful physiological function, growing independently of its surroundings

## tunic

the outer covering of a tunicate (Urochordata). The tunic is mostly composed of a protein and carbohydrates



Orange colonial tunicate at Gray's Reef National Marine Sanctuary. Each of the individual tunicate's body is covered by the tunic.  
(Photo: NOAA)

## turbidimeter

an instrument for measuring turbidity of liquids

## turbidity

cloudy water, usually caused by the suspension of fine particles in the water column. The particles may be inorganic, such as silt, or organic, such as high densities of single-celled organisms

## turbidity current

a current of rapidly moving, sediment-rich water moving down a submarine slope until it loses its energy. The current moves because it has a higher density and turbidity than the water through which it flows

## turbinate

resembling an inverted cone

## turquoise

blue green color

## turriiform

tower-shaped

## tusk

an enlarged tooth

## twilight

the time immediately before sunrise and after sunset when the sky remains illuminated

## twilight zone

the term, "twilight zone" represents a transition from a region that receives sunlight during the daylight hours, to a region that remains in perpetual darkness. The coral-reef twilight zone is roughly defined as coral-reef habitat at depths between about 200 feet (60 meters) and 500 feet (150 meters). The upper limit represents the approximate maximum depth to which stony corals tend to dominate the reef structure, and the lower limit represents the maximum depth at which significant photosynthesis occurs (the maximum depth to which the living coral reef extends)

## tympaniform

drum-shaped

## type

in taxonomy, the standard of reference for determining the precise application of a name. Each taxon has, actually or potentially, a type: type of a nominal species is a specimen (type specimen or holotype); type of a nominal genus is the nominal species (type species); type of a nominal family is the nominal genus (type genus)

## type collection

in taxonomy, a collection of type specimens

## Type I error

the error of rejecting the null hypothesis when it is true

## Type II error

the error of not rejecting the null hypothesis when it is false

## type locality

in taxonomy, the geographical (and, where relevant, stratigraphical) location of the occurrence of the population from which the type specimen (i.e. holotype, lectotype or neotype) was taken

## type material

in taxonomy, a collective term for all type specimens

## type series

in taxonomy, the series of specimens which either constitutes the name-bearing type (syntypes) of a nominal species or subspecies or from which the name-bearing type has been or may be designated

## type species

in taxonomy, the nominal species that is the name-bearing type of a nominal genus or subgenus

## type specimen

in taxonomy, any specimen of the type series

## typhoon

a hurricane that forms in the western Pacific Ocean

## typological species

a species defined on the characters of the type specimen

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## U.S. coral reef jurisdictions

fifteen US coral jurisdictions are found across the US and Pacific Freely Associated States. From East to West, the six Atlantic/Caribbean/Gulf of Mexico jurisdictions are the U.S. Virgin Islands (USVI), Puerto Rico, Navassa Island, Southeast Florida, the Florida Keys, and the Flower Garden Banks National Marine Sanctuary, and other banks of the northwestern Gulf of Mexico. In the Pacific, the nine jurisdictions are the Main Hawaiian Islands (MHI), the Northwestern Hawaiian Islands (NWHI), American Samoa, the Pacific Remote Island Areas (PRIAs), the Republic of the Marshall Islands (RMI), the Federated States of Micronesia (FSM), the Commonwealth of the Northern Mariana Islands (CNMI), Guam, and the Republic of Palau

## U.S. Coral Reef Task Force (USCRTF)

established by President Clinton in June, 1998, through Executive Order 13089 on Coral Reef Protection, to lead the U.S. response to this growing global environmental crisis. Chaired by the Secretary of the Interior and the Secretary of Commerce, the USCRTF is composed of the heads of 11 federal agencies and the Governors of 7 states, territories or commonwealths with responsibilities for coral reefs. The USCRTF is responsible for overseeing implementation of the Executive Order, and developing and implementing coordinated efforts to: map and monitor U.S. coral reefs; research the causes and solutions to coral reef degradation; reduce and mitigate coral reef degradation from pollution, overfishing and other causes; and implement strategies to promote conservation and sustainable use of coral reefs internationally

## U.S. Pacific Remote Insular Area (PRIAs)

PRIAs consist of the following islands and coral reefs appurtenant to such island, reef or atoll, as applicable: Baker Island, Howland Island, Jarvis Island, Johnston Atoll, Kingman Reef, Wake Island, and Palmyra atoll

## ubiquitous

having a worldwide distribution; common to abundant in a given area

## ulcer

an open lesion on the skin or an internal mucous surface resulting in necrosis of tissue

## ulceration

the development of an ulcer

## ultimate

last or farthest

## ultramarine

deep blue color

## ultrasonic

sound waves that have frequencies higher than what humans can hear, usually greater than 20,000 Hz. Some animals such as bats, a species of cave bird, and cetaceans use these high frequency ultrasonic sounds for communication and navigation

## ultraviolet radiation (UV)

the region of the electromagnetic spectrum consisting of wavelengths from 1 to 400 nm

## umbo

the earliest part of a bivalve or brachiopod shell; in bivalves, it is the most dorsal section of the shell, while in brachiopods, it is the most posterior



A bivalve shell: 1 = umbo; 2 = periostracum (the pigmented outermost layer of the shell).  
(Photo: Rick Gillis, Ph.D., Biology Dept., University of Wisconsin-La Crosse)

## umbraculiform

umbrella-shaped

## umbrella

describes the body of a jellyfish or medusa



The transparent umbrella of this jellyfish makes it less obvious to predators.

## umbrella species

in conservation biology, species with large area requirements. Conservation of these species should automatically conserve a host of other species

## unavailable name

in taxonomy, a name which does not meet all mandatory provisions of the International Code of Zoological Nomenclature and thus has no status in nomenclature. Unavailable names include: *nomen oblitum*, *nomen negatum*, *nomen nudum*, *nomen nullum*, *nomen vetitum*

## uncinate

hooked at the tip

## undercurrent

a current below another current, or beneath the surface

## underwater dB

the unit used to measure the intensity of an underwater sound. Underwater dB refers to "decibels referenced to 1 microPascal," which is abbreviated as "dB re 1  $\mu$ Pa." Sound intensity given in underwater dB is not directly comparable to sound intensity give

## undulating

moving in waves

## undulipodium

a long or short hair-like extension of the cell membrane of a eukaryote cell used for locomotion or propelling fluids over the surface of the cell body; undulipodia is a collective term for flagella and cilia

## unique-event polymorphism (UEP)

an allele for which all copies are derived from a single genic mutational event. It is probable that all individuals who share the mutation will have inherited it from the same common ancestor, and the same single mutational

event

## uniramous appendage

a type of appendage that is characteristic of insects and other members of the arthropod subphylum Uniramia. It consists of an unbranched series of segments

## unite

in taxonomy, to combine or join two or more taxa

## univalve

an animal which has a shell composed of a single piece (snails, limpets), as opposed to a bivalve, which has a shell composed of two pieces (clams, oysters, scallops)

## unpublished name

in taxonomy, any name which has not been printed and circulated to meet the criteria of publication as stated by the International Code of Zoological Nomenclature

## unused name

in taxonomy, an available senior synonym that is not known to have been used as a valid name in the past 50 years

## unzip

a method for uncompressing files on a PC after downloading them from the Internet. Many files are stored on servers in a compressed format, making them take up less disk space, and reducing the time it takes to download them. These files must be decompressed to make them usable by your computer. WinZip and pkunzip are popular free software programs that will uncompress files

## upload

transferring data (usually a file) from the computer you are using to another computer. The opposite of "download"

## upstream

toward the source or upper part of a stream or current; against the current

## upwelling

the process by which warm, less-dense surface water is drawn away from a shore by offshore currents and replaced by cold, denser water brought up from the subsurface

## uracil



one of the four bases in RNA. The others are adenine, guanine, and cytosine. Uracil replaces thymine, which is the fourth base in DNA. Like thymine, uracil always pairs with adenine

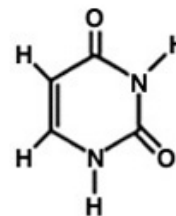


Diagram of the chemical structure of uracil, one of the four nitrogenous bases in RNA.

## urban area

an area in which a majority of the people are not directly dependent on natural resource-based occupations

## urea

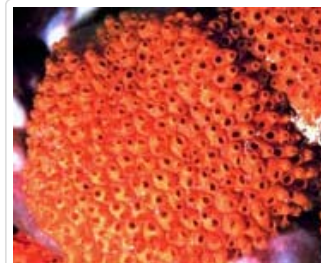
a waste product of metabolism eliminated via the kidneys. In elasmobranchs (sharks, rays, skates), urea is found in the blood where it helps to maintain osmotic balance

## URL (Universal Resource Locator)

a website address, such as: [www.coris.noaa.gov](http://www.coris.noaa.gov)

## Urochordata (Tunicata)

a subphylum of the animal phylum Chordata that contains the ascideans (sea squirts). Most adults are sessile and bear little resemblance to the other chordates. They are common inhabitants of coral reefs and mangrove roots



Orange colonial tunicates (Urochordata) at Gray's Reef National Marine Sanctuary.

## uropod

fan-shaped, paired posterior abdominal appendage in certain crustaceans, e.g., lobsters or shrimp, that are used for swimming



Ventral view of crayfish. (Photo: Copyright LTTM 2003)



## uvelloid

resembling a small cluster of grapes

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## v. et.

see also (*vide etiam*)

## vaccine

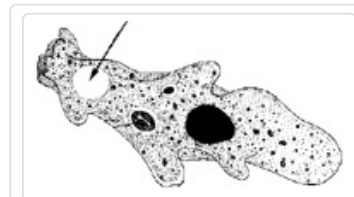
a preparation that contains an antigen, consisting of dead or weakened whole or parts of disease-causing organisms, that is used to confer immunity against the disease that the organisms cause. Vaccine preparations can be natural, synthetic or derived by recombinant DNA technology

## vacuolated

possessing vacuoles

## vacuole

a membrane-bounded vesicle in eukaryotic cells that has a secretory, endocytotic, phagocytotic or storage function



A water vacuole in an ameba.  
(Graphic: Wappingers Schools)

## vacuolization

formation or multiplication of vacuoles

## vagile

freely motile; wandering; mobile

## vagility

the capacity of an organism or population to change its location or distribution with time; ability to migrate

## vagrant

a species that has strayed beyond its natural range but has not established reproducing populations

## valence

the chemical combining capacity of an element or ion; the number of electrons that are used by an atom to form a compound. A valence electron is in the outer or next outer shell of an atom

## valid name

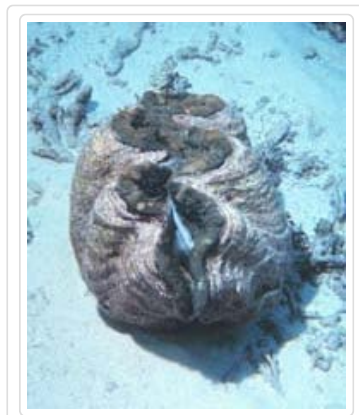
in taxonomy, the correct name for a given taxon, which may have several available names, one of which (usually the oldest) is chosen as the valid name. The valid name is always an available name, but an available name is not always a valid name

## validated name

in taxonomy, a formerly invalid or unavailable name that has been made valid or available by the International Code of Zoological Nomenclature, e.g. by annulment or suppression of senior homonyms or synonyms

## valve

the shell or shells of certain organisms, such as clams, oysters, and snails



A giant *Tridacna* clam with its two valves open.

## variable

a quantity that can assume any of a set of values

## variance

the population variance of a random variable is a non-negative number which gives an idea of how widely spread the values of the random variable are likely to be; the larger the variance, the more scattered the observations on average. It is a measure of the 'spread' of a distribution about its average value

## variant

any individual or group that deviates from the typical anatomy or behavior; in genetics, an organism that is genetically different from the wild type organism

## variegated color pattern

an irregular pattern of small, dark and light markings, with many of the dark marks connected

## vascular plant

any plant containing a system of vessels which transport water and nutrients between different parts of the plant (e.g., from the roots to the leaves)

## vector

an abstraction of the real world where positional data is represented in the form of coordinates. In vector data, the basic units of spatial information are points, lines and polygons. Each of these units is composed simply as a series of one or more coordinate points. For example, a line is a collection of related points, and a polygon is a collection of related lines. Vector images are defined mathematically as a series of points joined by lines. Vector-based drawings are resolution independent. This means that they appear at the maximum resolution of the output device, such as a printer or monitor. Each object is self-contained, with properties such as color, shape, outline, size, and position on the screen

## vector

an organism which carries or transmits a pathogen; a vehicle that transfers genetic material into a host cell or organism. Typically, vectors are of two types: viral- or DNA-based. DNA vectors are autonomously replicating, circular macromolecules that can be easily manipulated to carry genetic information and are transferred into cells by standard laboratory techniques. These vectors include plasmids, cosmids, and yeast artificial chromosomes (YACs). Recombinant viruses that have been bioengineered to be harmless can also carry new genetic information for transfer into cells, or into an entire host organism (an example of gene therapy)

## vegetal coloration

a resemblance to vegetation which allows organisms to conceal themselves from predators or prey

## vegetal hemisphere

the half of an oocyte or egg with more yolk, or the corresponding half of an early embryo with the slower dividing yolk-laden cells

## vegetal pole

the portion of an oocyte or egg that is opposite the animal pole and contains most of the yolk granules. See "**animal pole**"

## vegetative reproduction

asexual reproduction, such as budding or fragmentation, and therefore does not involve a recombination of genetic material

## velarium

a structure that resembles a hydrozoan velum In scyphozoan medusae, but has a different embryonic origin

## veliger

a molluskan larva in which the foot, mantle and shell first make their appearance

## velocity

the rate of change of position over time, calculated by dividing distance by time

## velum

a circular shelf of tissue attached to the underside of the umbrella in a hydrozoan mesusa. It functions in locomotion

## veneer reef

a reef with very little calcium carbonate accretion. A non-reef coral community

## venomous

pertaining to an organism that has a venom, usually secreted by a gland, that is injected through hollow spines or teeth



A venomous cone shell. When close to its prey, usually another gastropod mollusk, it expands its long proboscis exploring for soft parts. A radular dart, bearing venom, is injected into the prey; death quickly results. (Photo: Dr. James P. McVey, NOAA Sea Grant Program)

## vent

the posterior opening of the intestine, gonads, and kidney ducts. The vent is located just anterior to the anal fin in fishes

## ventral

pertaining to, or situated near, the belly, or underside, of an animal

## ventral disk

a "sucking disc " formed by the uniting of the pelvic fins in some fishes; for example, clingfishes



A clingfish's ventral disk allows it to hold onto rocks in strong currents

or when waves crash over tide pools.

### ventral fin

a synonym for pelvic fin

### vermatid tube

the "tube" of the worm-shell snail

### vermetid reef

a reef composed of vermetid gastropods (a family of marine snails) built on some substrate such as coralline algae or bivalve shells. These filter-feeding shelled snails, called worm-shells, are gregarious colonial animals which develop massive structures. A vermetid reef may be seen in southwestern Florida, south of Fort Meyers in the Ten Thousand Islands area

### vermiculation

a worm-like marking

### vermiform

worm-shaped

### vermilion

bright red color

### vermivore

an animal which feeds upon worms and worm-like animals

### vernacular name

the colloquial or common name of a taxon, i.e., in any language or form other than that of biological nomenclature. Vernacular names have no status in nomenclature

### verruca

a wart-like projection; a small cylindrical projection arising from the corallum that contain calices

### verrucose

having a warty appearance

## versus

against; in contrast to

## vertebra

one of the bony segments of the vertebral column of vertebrate animals; in brittlestars (Echinodermata-Ophiuroidea), a vertebra is one of the many articulated ossicles that join together along the length of the arms. They occupy most of the interior of each arm, and have sockets by which they connect to each other

## vertebrate

an animal that possesses a vertebral column (back bone), such as fishes, amphibians, reptiles, birds and mammals



Vertebrate animals of the fish class Osteichthyes. (Photo: Dr. Anthony Picciolo)

## vertical classification

classification which stresses common descent and tends to unite ancestral and descendant groups of a phyletic line in a single higher taxon, separating them from contemporaneous taxa having reached a similar grade of evolutionary change

## vertical fin

the unpaired dorsal, caudal and anal fins. Vertical fins are also called median fins

## VertNet

a taxon-based, distributed database networks of natural history vertebrate collection data. Each network has a separate search portal that is designed to query the participating institutions and return results in a standardized format. Specimen collection data may be searched as well as map specimens that have latitude and longitude coordinates

## vesiculate

thin and bladder-like

## vestigial structure

an incompletely or ineffectively developed structure which is greatly reduced from the original ancestral form and is no longer functional

## viable

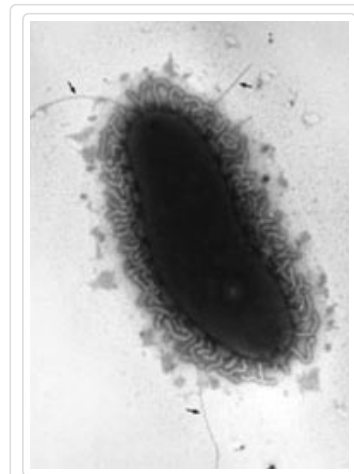
having the capacity to live, grow, germinate or develop; capable of life or normal growth and development

## vibraculum

a bryozoan heterozoid that possesses long setae, or bristles, and may function in cleaning the colony

## Vibrio

a genus of motile, gram-negative, rod-shaped bacteria characterized by short, slightly sinuous filaments and an undulatory motion. Some species in this genus cause cholera in humans and other diseases in other animals, including corals



*Vibrio vulnificus pili*, a bacterium normally found in temperate estuarine waters, and as a colonizer of molluscan shellfish, such as oysters. (Photo: NOAA Northwest Fisheries Science Center)

## vicariant event

an unexpected or abnormal event

## vicariant speciation

speciation when a single, widespread population is divided by (1) the emergence of an extrinsic barrier, (2) extinction of intervening populations, or (3) migration of some individuals into a separate region

## vice

in place of; rather than

## video transect

a nondestructive, repeatable procedure for assessing and monitoring diurnally active fishes and other macroscopic marine organisms. Videotaping along a linear transect reduces the variance in error inherent with visual observations made by a diver or snorkeler, and allows virtually unlimited time for study of the images by many individuals

## villiform

taking the form of villi (finger-like projections); in fishes, pertains to teeth which are slender and crowded closely together in bands

## villus

a small, fingerlike or hairlike projection of the small intestinal wall that contains connective tissue, blood vessels, and a lymphatic vessel, and which functions in the absorption of nutrients

## violaceous

violet color

## violet

bluish purple color

## viral DNA

DNA (deoxyribonucleic acid) that makes up the genetic material of viruses

## virion

a complete infectious viral particle, existing outside of a host cell, with nucleic acid and capsid, and in some types, an outer lipid envelope

## viroid

an infectious particle similar to a virus, but smaller. It consists only of a strand of nucleic acid without the protein coat (capsid) characteristic of a virus

## virology

the study of viruses

## virtual library

virtual libraries provide online access to specialized collections of information resources. Normally they include bibliographic citations with links to full text documents and other online resources such as video or photos. Virtual Libraries can also serve as gateways to information and resources on science, management, and policy for researchers, scientists, resource managers, policymakers, stakeholders, and the general public. Restoration, Marine Protected Areas, and Coral Reefs are examples of three NOAA virtual libraries in such areas

## virulence

the ability to infect or cause disease

## virulence



the disease-producing ability of a microorganism

## virus

a sub-microscopic, obligate intracellular parasite that replicates itself only within cells of living hosts; many are pathogenic; the structure of a virus is basically a strand of nucleic acid (DNA or RNA) wrapped in a thin protein shell. A virus is not a cell, and is "lifelike" only when replicating itself at the expense of the host cell

## viscera

the internal organs, collectively, of an coelomate organism, especially those located within the abdominal cavity, but also to the organs within the thoracic and mediastinal cavities

## visceral hump

the main body of a mollusk, which contains most of the organs, including a complete digestive and excretory tract as well as the reproductive organs. The visceral hump also includes the mantle, which consists of two external flaps of tissue that secretes the material that forms the shell on some species, and it protects the mantle cavity. The mantle cavity contains the gills, which excrete waste and circulate oxygen. Most mollusks have a shell, which sits on the visceral hump and a protects the main body from predators

## viscid egg

an adhesive egg that is deposited on sand, gravel, plants, etc. to which it sticks by means of the egg's sticky surface

## viscosity

a measure of resistance to flow in a liquid

## visible radiation

energy at wavelengths from 400 - 700 nm that is detectable by the human eye

## visible wavelengths

wavelengths approximately 400 to 700 nm

## Visual\_HEA

a software program distributed by the National Coral Reef Institute that uses the Habitat Equivalency Analysis (HEA) method and provides an efficient means of calculating the amount of compensation required to provide services that are equivalent to the interim loss of natural resource services following injury. The program accepts input of parameters necessary to determine long-term service loss from the injury (injured area size and degree; times of injury, functional shape, and equilibrium; post-injury recovery); parameters to determine long-term service gain from compensatory restoration actions (times of restoration beginning and equilibrium; maximum service level; service gain function shape); and general program parameters (relative value of lost and gained services, baseline level of lost and gained services, discount rate). More information can be found at [www.nova.edu/ocean/visual\\_hea](http://www.nova.edu/ocean/visual_hea)

## visualization tool

a method of visually displaying data, such as a visualization theater, computer display, and map and chart

## vitamin

a chemical substance, required in trace concentrations, which acts as a cofactor with an enzyme in catalyzing a biochemical reaction

## vitamin B complex

a large group of water soluble vitamins that function as co-enzymes

## Vitareef program

a program that was established in order to provide a standardized method of characterizing the conditions of reef corals. It can and has been used by both researchers and non-scientists to document observations of reefs at specific points in time, which can be followed up in subsequent observations to assess changes in the state of individual coral colonies, selected coral species, or a reef as a whole

## vitellaria larva

a ciliated larva of echinoderms, such as sea lillies (Crinoidea), some sea cucumbers (Holothuroidea), and brittle stars (Ophiuroidea)

## viviparity

a form of reproduction where the offspring are nourished in the reproductive tract of the female (other than by a yolk sac) and then expelled from the mother as free-swimming young. Mangrove reproduction by means of propagules is also a form of viviparity in plants

## vocalization

a sound intentionally produced by an animal

## volatile

evaporating readily at normal temperatures and pressures; volatility is the property of changing readily from a solid or liquid phase to a vapor phase

## volatile organic compound (VOC)

a carbon (organic) compound that vaporizes readily at room temperature

## volcanism

the set of geological processes that result in the expulsion of lava, pyroclastics, and gases at the Earth's surface

## voucher specimen

any specimen that serves as a basis of study and is retained as a reference. It should be in a publicly accessible scientific reference collection. A type specimen is a particular voucher specimen which serves as a basis for the taxonomic description of a species

## vulnerable species

a species that is particularly at risk because of low or declining numbers, a small range, or for some other reason, but is not threatened or endangered

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## wake

waves generated in the water by a moving vessel

## wall

the reef slope, which may suddenly drop off into deeper water, forming a nearly vertical wall

## wash zone

the depth zone in which sediments are disturbed by wave action near the shoreline

## waste water

water that is a mixture of water and dissolved or suspended solids carrying wastes from homes, businesses and industries

## wastewater treatment plant

a facility containing a series of tanks, screens, filters and other processes by which pollutants are removed from water

## water

pure water consists of hydrogen and oxygen, H<sub>2</sub>O. It is a binary compound that occurs at room temperature as a colorless, odorless, tasteless, transparent liquid which is very slightly compressible. It freezes at 0 degrees C and boils at 100 degrees C. It is the most important natural solvent, and frequently contains impurities, which are mostly removed by distillation



Wave sweeps toward a coastline.  
(Photo: Copyright Digital Vision Ltd.)

## water column

the water mass between the surface and the bottom

## water mass

a large body of water whose density characteristics are distinct from the surrounding aquatic environment because of inherent temperature or salinity differences

## water pressure

the force per unit area exerted by the weight of water. Each 33 feet of sea water exerts a pressure equivalent to one atmosphere, or 14.7 psi

## water table

the level or depth below the ground that is saturated with water

## water table

the level below the earth's surface at which the ground becomes saturated with water. The water table is set where hydrostatic pressure equals atmospheric pressure; the surface between phreatic water which completely fills voids in the rock and ground air which partially fills higher voids

## water vascular system

in echinoderms, a system of internal canals and appendages that are water-filled and functions as a means of locomotion

## watershed

an area of land that drains downslope to the lowest point. The water moves through a network of subterranean and surface drainage pathways which converge into streams and rivers, eventually reaching an estuary and finally the ocean. Because water moves downstream, any activity that affects the water quality, quantity, or rate of movement at one location can affect locations downstream to the ocean and out to coral reefs



Angel Falls, Venezuela. This great waterfall contributes to the Orinoco River watershed. Nutrients and minerals from the rainforests and savannas of the Orinoco River basin are transported with the Orinoco current and may effect coral reefs in the southeastern Caribbean. (Photo: Copyright Dr. Anthony R. Picciolo, NOAA)

### wave crest

the top of a wave

### wave height

the vertical distance between the crest and adjacent trough of a wave

### wave length

the distance between two successive wave crests or troughs

### wave trough

the low spot between two successive waves

## WCMC Global Coral Disease Database

the World Conservation Monitoring Centre (WCMC) and NOAA maintain the Global Coral Disease Database which is populated with over 2000 records of coral diseases from approximately 155 sources. The occurrence of a disease on a coral species (or genus) was recorded for each location and date on which it was observed. A unique combination of coral species, disease, date, and location therefore constitutes a single record

### weather

temperature, precipitation, and wind speed and direction that occur on a daily basis

### weathering

the mechanical or chemical decomposition of rocks due to weather

### weathering of oil

changes in the physical and chemical properties of oil due to natural processes, including evaporation, emulsification, dissolution, photo-oxidation, and biodegradation

## Web Reef Advisory System (WRAS)

the Web Reef Advisory System (WRAS) was developed by ReefBase and Reef Check, in collaboration with the Coastal Resources Center at the University of Rhode Island and the Department of Biological Sciences at the University of Southern California, as "an online application to input, view, and analyze Reef Check survey data. It calculates indicators of how good or bad a shape a particular reef is in, and what the underlying causes may be, based on Reef Check surveys." WRAS allows users to view, analyze, and add data. The file location is: [www.reefcheck.org/datamanagement/](http://www.reefcheck.org/datamanagement/)

## Weberian apparatus

the four anterior vertebrae and associated tissues in some fishes (catfishes, loaches, minnows, suckers) that connect the gas bladder to the inner ear, conveying pressure changes and sound

### wedge shaped

a form that is thick at one edge and tapered to a thin edge at the other

### weight belt

a belt worn during scuba diving that contains lead weights, either solid masses or as shot in pouches. The weight belt allows a diver to descend in the water column against the forces buoying the diver upwards

### wellbore

a hole drilled into the earth for the purpose of exploration or extraction of natural resources such as oil, gas or water. It may have casing in it, usually a metal pipe, or it may be open, or some combination of casing and no casing

### wet collection

a museum collection of specimens that are stored in ethanol, isopropanol, formalin or other liquid preservatives

### wetland

an area that, at least periodically, has waterlogged soils or is covered with a relatively shallow layer of water. Bogs, freshwater and saltwater marshes, and freshwater and saltwater swamps are examples of wetlands



Wetlands provide for valuable nursery areas for many organisms.

### white hole

an area along the spur and groove system (zone) where the sand channel widens considerably



A scientist stands in a sand channel within a reef spur-and-groove zone.

## white pox disease

a coral disease characterized by circular lesions with coral tissue degradation on the Caribbean elkhorn coral, *Acropora palmata*. The pathogen is a bacterium, *Serratia marcescens*.



White pox disease is characterized by white circular lesions on the surface of infected colonies (Photo: Dr. A. Bruckner, NOAA)

## white skeleton

the exposed white calcium carbonate skeleton of a coral colony

## white-band disease

a coral disease characterized by complete coral tissue degradation of Caribbean acroporid corals.-Two species of Acroporidae are affected, the elkhorn coral, *Acropora palmata*, and the staghorn coral, *A. cervicornis*. The disease exhibits a sharp demarcation between apparently healthy coral tissue and exposed coral skeleton.- These signs are identical to plague, except that white band is acroporid specific (and plague has not been found on acroporids).- Tissue loss usually proceeds- from the base of the colony branch to the tip, although it can begin in the middle of a branch in *A. cervicornis*. White band disease affects acroporid corals throughout the Caribbean and has decimated populations at a regional scale.The infective agent has not yet been isolated. For more information and illustrations, see:  
[http://www.coral.noaa.gov/coral\\_disease/white\\_band.shtml](http://www.coral.noaa.gov/coral_disease/white_band.shtml)



Elkhorn coral populations have suffered widespread declines from white-band disease (Photo: Dr. A. Bruckner, NOAA)

## wild

living in a natural state; living in nature

## wild live rock

live rock other than aquacultured live rock

## wild type

the form of an organism that occurs most frequently in nature

## wind vane

an instrument used to determine wind direction

## windlass

a winch used to raise a ship's anchor

## windward

refers to the side of an island or reef that faces the prevailing wind

## Withering Syndrome (WS)

a bacterial disease of abalone caused by a Rickettsia-like organism, WS-RLO, resulting in significant losses of black abalone in central and southern California, including San Nicolas Island

## work (taxonomy)

in the International Code of Zoological Nomenclature, any text whether published, unpublished, or carrying a disclaimer containing a name or other information bearing on nomenclature

## work of an animal

results of the activity but not part of the animal itself, e.g., tracks, trails, worm-tubes, borings (but excludes some fossil evidence such as internal molds, external impressions and replacements)

## worm reef

a massive structure composed of clusters of oval, table-like mounds constructed by marine polychaete worms in the family Sabellariide. They consist of all sorts of sediments consolidated by a mucoprotein cement produced by the worm. This reef may start in the intertidal zone and extend into the subtidal zone. Some are in deeper water. Unlike the colorful and ornate coral reefs, worm reefs are drab, monotonous and rounded clusters, mounds and platforms that grow upward and outward from the durable substrate from which their colonies develop. Worm reefs offer several ecological benefits. They provide feeding and browsing grounds for a diverse community of marine organisms and an ideal home for attaching plants, sponges and shelter-seeking animals. Also, unlike coral reefs, worm reefs are not restricted to the tropics

## worm shell

a snail in the gastropod family Vermetidae. Worm shells are gregarious species forming an intertwining mass of long, white, worm-like tubes, often sunken into a reef substrate. They get their common name of "worm shell" because their shells superficially resemble the shells of some tube-building marine polychaete worms. After a short motile existence, they cement their shell to a hard substrate, and as they grow, the shells may coil or meander over the substrate producing a tube that looks quite like a tube worm. Worm shells are filter-feeders which spin a mucus net to trap floating food particles, such as plankton

## wrasse

a large family (Labridae) of brightly-colored bony fishes which are common inhabitants of coral reefs. Many have spiny fins, thick lips, and strong teeth. They range in size from about three inches to three meters. Some species of small wrasses are "cleaners," which regularly remove ectoparasites from the skin and gills of larger fishes

## WW2BW (White Water to Blue Water Initiative)





the White Water to Blue Water (WW2BW) Initiative was formulated in 2002 during the World Summit on Sustainable Development. WW2BW responds to the World Summit's "Oceans" agenda with an integrated approach to sustainable use of water resources. In an effort to address water pollution and scarcity, United States government agencies, including the State Department, NOAA, USAID, as well as the United Nations, governments of the Wider Caribbean Region, and a number of non-governmental organizations have come together to plan and implement programs which will lead to the conservation and sustainable management of both freshwater and coastal marine resources in the Caribbean. WW2BW stimulates partnerships to promote integrated watershed and marine-based ecosystems management in support of sustainable development. Four thematic areas are supported: integrated watershed management, marine ecosystem-based management, sustainable tourism, and environmentally sound marine transportation. The outcome of the WW2BW partnership in the Wider Caribbean may serve as the blueprint for future programs on watershed and marine ecosystem-based management in Africa and the South Pacific



This photograph, used in a poster for WW2BW, suggests the relationships between the forested land, fresh water, the human community, and the sea. The photograph highlights the pitons of St. Lucia in the Caribbean Sea. (Photo: Dr. Anthony R. Picciolo, NOAA)

A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |

## X-organ

groups of neurosecretory cells in the eyestalks of crustaceans that secrete a molt-inhibiting hormone

## xantho-

a prefix meaning yellow

## xanthochromic

yellow or golden color



A yellow tang, *Zebrasoma flavescens*. (Photo: Jim McVey, NOAA)

## xanthophore

a chromatophore which produces yellow pigments in the form of carotenoids

## xenobiotic

a chemical which is not a natural component of the organism exposed to it; a chemical or other stressor that does not occur naturally in the environment. Xenobiotics occur as a result of anthropogenic activities such as the application of pesticides and the discharge of industrial chemicals to the environment; a synthetic chemical believed to be resistant to environmental degradation. A branch of biotechnology called 'bioremediation' seeks

to develop biological methods to degrade such compounds

## xenoecic

pertains to an organism that inhabits the empty living space or shell of another organism

## xenophyophore

a giant protozoan protist (*Syringammina fragilissima*), up to 25 cm in diameter, that inhabits deep-sea habitats. Large aggregations of xenophyophores appear on the Darwin Mounds



A xenophyophore photographed on the Blake Ridge. They construct complex, golf-ball-sized tests from sand and sediment grains. (NOAA photo)

## xiphoid

sword-shaped

## xylem

tissue in vascular plants that carries water and nutrients from the roots to the shoot and leaves. The xylem contains tracheids, vessels, fiber cells and parenchyma. It also provides structural support

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## Y-organ

a gland situated near the external adductor muscles of the mandible of some crustaceans that secretes the molting hormone

## yearling

a one-year-old individual in its second year of life

## yeast

a single-celled fungus that reproduces by budding

## yeast artificial chromosome (YAC)

a vector used to clone DNA fragments from 300 kb to one megabase (unit of length for DNA fragments equal to one million nucleotides) in length. These clones can span large portions of the genome rapidly, but can be

highly unstable

## yellow-band disease

a coral disease characterized large rings or patches of bleached, yellow tissue on Caribbean stony corals, although tissue loss is minimal (cm/yr). It affects the star corals, *Montastraea annularis* and *M. faveolata* and is widespread throughout the Caribbean region. No pathogen has been isolated. For more information and illustrations, see: [http://www.coral.noaa.gov/coral\\_disease/yellow\\_band.shtml](http://www.coral.noaa.gov/coral_disease/yellow_band.shtml)

## yolk cell

in a telolecithal egg (an egg in which the yolk is not distributed evenly, but concentrated in one region), the yolk cells are the cells formed when cleavage reaches the yolk region

## yolk sac

a vascularized extra-embryonic membrane of amniote embryos that forms around the yolk of the egg cell in birds and reptiles. In mammals, the yolk sac membrane grows out around the empty blastocoel (blastula cavity) formed within the inner cell mass in the cleaving embryo. The blastocoel is renamed the yolk sac. In birds and reptiles, the blood vessels in its walls transport yolk nutrients to the embryo. In mammals, these vessels still form even though they don't supply nutrients to the embryo. They remain to form blood vessels in the digestive tract

## yolk-sac larva

a fish larva which has already hatched from the egg but has not yet started feeding and still absorbs the yolk in the ventrally-attached yolk sac

## young-of-the-year (YOY)

fish that are less than one year old; hatched during the spawning season

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## zeitgeber

a periodic environmental signal that entrains a biological rhythm. For example, a cycle for a circadian rhythm, but may also be a temperature or even social cycle

## zenith

the point of the celestial sphere which is directly overhead

## zip

a compressed file format (.zip); to compress a file using a zip utility. Compression is generally used to speed up the transport of large or multiple files. After the file has been downloaded, a decompression application is needed to "unzip" it

## zoanthid

an anemone of the family Zoanthidae, usually found in intertidal areas and coral reefs . In some species the polyps separate from each other almost completely after budding, while in other species, the polyps are all interconnected by a common mat of tissue

## zoarium

the form of a bryozoan colony

## zoea

a free-swimming larval stage of various crustaceans



A zoea larva. (Photo: Marine Ecology Laboratory, Shimoda Marine Research Center, University of Tsukuba)

## zonate

divided by parallel planes, e.g., zonate tetraspores, found in certain species of red algae

## zonation

the occurrence of single species or groups of species in recognizable bands that might delineate a range of water depth or a range of height in the intertidal zone

## zone

a large-scale physical feature within the ecosystem. Reef zones are determined by currents, wave surge, exposure to sunlight and water depth, and may be comprised of a number of habitats

## zoochory

the dispersal of plant seeds or spores by animals. Endozoochory is zoochory within the animal's body. Exozoochory is zoochory where the seeds are attached to the outside of the animal's body

## zooecium

the skeleton of a bryozoan zooid

## zoogamete

a motile gamete; also "planogamete"

## zooid

of the distinct individuals forming a colonial invertebrate animal, such as a hydrozoan

## zooidal

pertaining to a zooid, as for example, a zooidal form

## zoology

the scientific study of animal life. Zoological sciences include the studies of evolution, systematics, cell biology, biochemistry, micro and macro anatomy, development, genetics, physiology, ecology, biogeography, biodiversity, behavior and sociobiology

## zoonose

a disease of non-human animals that may be transmitted to humans, or may be transmitted from humans to non-human animals

## zoophyte

an invertebrate which resembles a plant in appearance or mode of growth, as for example, hard corals, sea fans, and other soft corals, sea anemones, hydroids, bryozoans, sponges, etc., especially any of those that form compound colonies having a tree-like form

## zooplankton

animal component of the plankton community

## zoospore

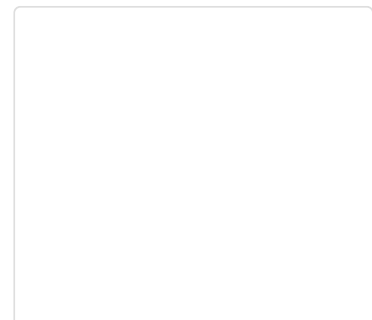
a motile, flagellated spore

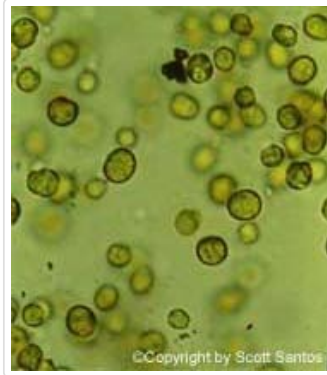
## zootoxin

any poisonous or venomous substance produced by an animal

## zooxanthellae

a group of dinoflagellates living endosymbiotically in association with one of a variety of invertebrate groups (e.g., corals). In corals, they provide carbohydrates through photosynthesis, which are used as one source of energy for the coral polyps. They also provide coloration for the corals





Zooxanthellae. (Photo: Scott Santos)

### zooxanthellate coral

a coral that has zooxanthellae in its tissues

### zygote

a fertilized egg with the diploid number of chromosomes formed by the union of the nuclei of male and female gametes

### zymogen

an inactive precursor of an enzyme that is converted into an active enzyme by action of an acid or another enzyme or by other means; a proenzyme

### zymogen cell

a cell that secretes zymogens

WHAT ARE CORAL REEFS?

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Appearing as solitary forms in the fossil record more than 400 million years ago, corals are extremely ancient animals that evolved into modern reef-building forms over the last 25 million years.

[Continue Reading â†’](#)

#### CORAL REEF CONSERVATION PROGRAM

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The NOAA Coral Reef Conservation Program (CRCP) is a partnership between the NOAA Line Offices that work on coral reef issues: the National Ocean Service, the National Marine Fisheries Service, the Office of Oceanic and Atmospheric Research, and the National Environmental Satellite, Data and Information Service. The CRCP brings together expertise from across NOAA for a multidisciplinary approach to managing and understanding coral reef ecosystems.

[Contact CRCP â†’](#)

#### GET IN TOUCH

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