



**A band** The region of a striated muscle fibre that contains both thick (myosin) and thin (actin) filaments. It is visible as a dark band with a lighter central zone (*see* H ZONE) in the middle of a \*sarcomere.

**ABC model** A model to explain the genetic control of floral organ determination during flower development. It proposes that the four principal organs - sepals, petals, stamens, and carpels - are specified by genes belonging to three classes: A, B, and C. The organs are arranged in four concentric whorls, and their identity is determined according to which combinations of genes are expressed in each whorl. Class A genes alone specify the outermost whorl of sepals; the formation of petals depends on activation of both class A and B genes; stamens are specified by class B and C genes acting together; and the innermost whorl of carpels is determined by class C genes alone. The model was based on observations of mutant flowers in the thale cress (*\*Arabidopsis thaliana*). Mutations in these genes cause the transformation of one flower organ into another (i.e. homeosis); for example, a class B mutation causes sepals to develop instead of petals, and carpels instead of stamens. The genes corresponding to these homeotic mutations are now known to be \*MADS box genes that encode transcription factors, capable of activating different target genes depending on what other transcription factors act with them.

**abdomen** The posterior region of the body trunk of animals. In verte-

brates it contains the stomach and intestines and the organs of excretion and reproduction. It is particularly well defined in mammals, being separated from the \*thorax by the \*diaphragm. In many arthropods, such as insects and spiders, it may be segmented.

**abductor (levator)** A type of muscle whose function is to move a limb away from the body. Abductors work antagonistically with \*adductors.

**abiogenesis** The origin of living from nonliving matter, as by \*biopoiesis. *See also* SPONTANEOUS GENERATION.

**abiotic factor** Any of the nonliving factors that make up the **abiotic environment** in which living organisms occur. They include \*edaphic factors and all the aspects of \*climate, geology, and atmosphere that may affect the biotic environment. *Compare* BIOTIC FACTOR.

**abomasum** The fourth and final chamber of the stomach of ruminants. It fills from the \*omasum and empties into the small intestine. The abomasum is referred to as the 'true stomach' as it is in this chamber that protein digestion occurs, in acidic conditions. *See* RUMINANTIA.

**ABO system** One of the most important human \*blood group systems. The system is based on the presence or absence of \*antigens A and B on the surface of red blood cells and \*antibodies against these in blood serum. A person whose blood contains either or both of these antibodies cannot receive a transfusion

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Group	Antigens on red cell surface	Antibodies in serum	Blood group of people donor can receive blood from	Blood group of people donor can give blood to
A	A	anti-B	A, O	A, AB
B	B	anti-A	B, O	B, AB
AB	A and B	none	A, B, AB, O	AB
O	neither A nor B	anti-A and anti-B	O	A, B, AB, O

The ABO blood group system

of blood containing the corresponding antigens as this would cause the red cells to clump (*see* AGGLUTINATION). The table illustrates the basis of the system: people of blood group O are described as 'universal donors' as they can give blood to those of any of the other groups. *See also* IMMUNITY.

**abscisic acid (ABA)** A naturally occurring \*plant hormone that appears to be involved primarily in seed maturation, stress responses, and in regulating closure of leaf pores (stomata). In seeds, it promotes the synthesis of storage protein and prevents premature germination. In leaves, abscisic acid is produced in large amounts when the plant lacks sufficient water, promoting closure of stomata and hence reducing further water losses. Levels of abscisic acid increase suddenly in response to various forms of stress, including heating, waterlogging, and chilling. It was formerly believed to play a central role in \*abscission, hence the name.

**abscission** The separation of a leaf, fruit, or other part from the body of a plant. It involves the formation of an **abscission zone**, at the base of the part, within which a layer of cells (**abscission layer**) breaks down. This process is suppressed so long as sufficient amounts of \*auxin, a plant hormone, flow from the part through

the abscission zone. However, if the auxin flow declines, for example due to injury or ageing, abscission is activated and the part becomes separated. \*Ethylene acts as the primary trigger for abscission, inducing cells in the abscission zone to produce cellulase enzymes that degrade cell walls.

**absolute refractory period** *See* REFRACTORY PERIOD.

**absorbed dose** *See* DOSE.

**absorption** The movement of fluid or a dissolved substance across a plasma membrane. In many animals, for example, soluble food material is absorbed into cells lining the alimentary canal and thence into the blood. In plants, water and mineral salts are absorbed from the soil by the \*roots. *See* OSMOSIS; TRANSPORT PROTEIN.

**absorption spectrum** *See* SPECTRUM.

**abyssal zone** The lower depths of the ocean (below approximately 2000 metres), where there is effectively no light penetration. Abyssal organisms are adapted for living under high pressures in cold dark conditions. *See also* APHOTIC ZONE.

**Acarina** An order of small arthropods belonging to the class \*Arachnida and comprising the mites and ticks. There are over 30 000 described species, with perhaps 20 times this number still unknown, distributed

worldwide in a wide variety of terrestrial and aquatic habitats. Many are free-living in soil or on vegetation, feeding on organic matter or preying on other small arthropods, while a significant number are parasites of plants and animals, including domesticated animals and humans. The adult body is generally globular or ovoid, with four pairs of legs. Unlike spiders, there is no 'waist', the abdomen being fused to the more anterior prosoma. At the front of the body the capitulum bears the mouthparts, variously adapted for cutting, crushing, or piercing. The eggs hatch into a three-legged larva, which subsequently moults to a nymph resembling the adult. Ticks (up to 3 cm long) are ectoparasites of vertebrates, feeding on blood drawn through the skin of their host. They transmit a wide range of diseases, including certain forms of encephalitis and Lyme disease. Mites are much smaller (up to 4 mm long) and are parasitic or free-living. They tend to feed on feathers, hair, skin secretions, or skin debris, causing, for example, scabies in humans and mange in domesticated animals. The house-dust mite (*Dermatophagoides*) can provoke allergies or dermatitis. Spider mites are damaging parasites of plants and may infest some arable and greenhouse crops.

 **SEE WEB LINKS**

- More information about mites and ticks, including news, publications, and societies

**acceleration** A form of \*heterochrony in which, during the course of evolution, the rate of development of an organism is speeded up and new stages are added to the end of the ancestral developmental sequence without prolonging the total development time. The morphological outcome is an example of \*para-

morphosis, and the developmental sequence (ontogeny) conforms to the theory of \*recapitulation.

**acceptor** **1.** (in chemistry) A compound, molecule, ion, etc., to which electrons are donated in the formation of a coordinate bond. **2.** (in biochemistry) A receptor that binds a hormone without any apparent biological response.

**accessory bud** A bud that is situated at the side of or above an axillary bud (see *AXIL*).

**accessory chromosome (B chromosome; supernumerary chromosome)** Any chromosome that is additional to the regular \*karyotype of a species. Such chromosomes vary in size and composition and may or may not affect the phenotype. In humans, about one person in every 1500 carries an accessory chromosome, and some of these are associated with mental or physical abnormalities. For example, cat-eye syndrome occurs in people who carry an extra chromosome that partly duplicates chromosome 22. It is characterized by enlarged pupils, skin malformations, cardiac and urinary defects, and, sometimes, mental handicap.

**accessory pigment** A \*photosynthetic pigment that traps light energy and channels it to chlorophyll *a*, the primary pigment, which initiates the reactions of photosynthesis. Accessory pigments include the \*carotenoids, \*phycobiliproteins, and chlorophylls *b*, *c*, and *d*.

**acclimation** The physiological changes occurring in an organism in response to a change in a particular environmental factor (e.g. temperature), especially under laboratory conditions. Thermal acclimation studies reveal how such properties as metabolic rate, muscle contractility,

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nerve conduction, and heart rate differ between cold- and warm-acclimated members of the same species. These changes occur naturally during \*acclimatization and equip the organism for living in, say, cold or warm conditions. Metabolic acclimation is explained mainly by changes in concentration and/or activity of crucial enzymes. Changes in composition of membrane lipids, particularly their degree of saturation, also occur, helping to maintain membrane stability in changing conditions. \*Heat-shock proteins help to protect and repair proteins damaged by thermal stress, and their expression increases under such conditions.

**acclimatization 1.** The progressive adaptation of an organism to any change in its natural environment that subjects it to physiological stress. *See also* ACCLIMATION. **2.** The overall sum of processes by which an organism attempts to compensate for conditions that would substantially reduce the amount of oxygen delivered to its cells.

**accommodation 1.** (in animal physiology) Focusing: the process by which the focal length of the \*lens of the eye is changed so that clear images of objects at a range of distances are displayed on the retina. In humans and some other mammals accommodation is achieved by reflex adjustments in the shape of the lens brought about by relaxation and contraction of muscles within the \*ciliary body. **2.** (in animal behaviour) Adjustments made by an animal's nervous or sensory systems in response to continuously changing environmental conditions.

**acellular** Describing tissues or organisms that are not made up of separate cells but often have more than one nucleus (*see* SYNCYTIUM). Exam-

ples of acellular structures are muscle fibres. *Compare* UNICELLULAR.

**acentric** Describing an aberrant chromosome fragment that lacks a centromere. Such fragments are normally lost because they are unable to orientate properly during cell division.

**acetabulum (cotyloid cavity)** The semicircular cavity in the \*pelvic girdle that houses the ball-shaped head of the \*femur.

**acetate (ethanoate)** A salt or ester of acetic acid.

**acetic acid (ethanoic acid)** A carboxylic acid,  $\text{CH}_3\text{COOH}$ , that is used as a carbon source by certain green algae. Combined with coenzyme A (*see* ACETYL COENZYME A), it plays a crucial role in the energy metabolism of all organisms.

**acetone** *See* KETONE; KETONE BODY.

**acetylation** The introduction of an acetyl group ( $\text{CH}_3\text{CO}-$ ) into a compound. The acetylation of \*coenzyme A to acetyl coenzyme A is an important stage in the \*Krebs cycle: the acetyl group is derived from pyruvate after the removal of a molecule of carbon dioxide and two hydrogen atoms. Acetylation of histone proteins in chromosomes tends to activate genes. *See* CHROMATIN SILENCING.

**acetylcholine (ACh)** One of the main \*neurotransmitters of the vertebrate nervous system. It is released at certain (**cholinergic**) nerve endings and may be excitatory or inhibitory; it initiates muscular contraction at \*neuromuscular junctions. Acetylcholine receptors (**cholinoceptors**) fall into two main classes: \*muscarinic and \*nicotinic receptors. Once acetylcholine has been released it has only a transitory effect because it is

rapidly broken down by the enzyme \*cholinesterase.

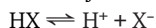
**acetylcholinesterase** See CHOLINESTERASE.

**acetyl coenzyme A (acetyl CoA)** A compound formed in the mitochondria when an acetyl group (CH<sub>3</sub>CO-), derived from the breakdown of fats, proteins, or carbohydrates (via \*glycolysis), combines with the thiol group (-SH) of \*coenzyme A. Acetyl CoA feeds into the energy generating the \*Krebs cycle and also plays a role in the synthesis and oxidation of fatty acids.

**achene** A dry indehiscent fruit formed from a single carpel and containing a single seed. An example is the feathery achene of clematis. Variants of the achene include the \*caryopsis, \*cypsela, \*nut, and \*samara. See also ETAERIO.

**aciclovir** See ACYCLOVIR.

**acid** A type of compound that contains hydrogen and dissociates in water to produce positive hydrogen ions. The reaction, for an acid HX, is commonly written:



In fact, the hydrogen ion (the proton) is hydrated, and the complete reaction is:



The ion H<sub>3</sub>O<sup>+</sup> is the **hydroxonium ion**. The strength of an acid depends on the extent to which it dissociates:

**strong acids** (e.g. sulphuric acid and hydrochloric acid) are almost completely dissociated in water; **weak acids** (e.g. carbonic acid) are only partially dissociated. See also BUFFER; PH SCALE. Compare BASE.

**acid-base balance** The regulation of the concentrations of acids and bases in blood and other body fluids so that the pH remains within a

physiologically acceptable range (see PH SCALE). This is achieved by the presence of natural \*buffer systems, such as the haemoglobin, hydrogen-carbonate ions, and carbonic acid in mammalian blood. By acting in conjunction, these effectively mop up excess acids and bases and therefore prevent any large shifts in blood pH. The acid-base balance is also influenced by the selective removal of certain ions by the kidneys and the rate of removal of carbon dioxide from the lungs.

**acid growth theory** A theory, originally proposed in 1970 by R. Cleland, A. Hager, and co-workers, that describes how auxins stimulate cell expansion in certain plant tissues, notably in coleoptiles of cereals and other grasses, such as oat (*Avena*). It asserts that the auxins induce acidification of the immediate cell-wall environment, thereby activating enzymes that loosen load-bearing bonds within the cell wall. This permits expansion of the walls by the cell's internal turgor pressure, and thus enlargement of the cell. It is thought that the auxin binds with \*auxin-binding proteins in the plasma membrane and stimulates \*proton pumps (also in the cell's plasma membrane) to excrete protons (H<sup>+</sup>) into the cell wall from the cytoplasm. The consequent lowered cell-wall pH activates the wall enzymes.

**acidic stains** See STAINING.

**acidosis** A condition in which the body fluids become more acidic, i.e. the pH is less than 7.4, and the capacity of the body to \*buffer hydrogen ions is diminished. A decrease in the elimination of carbon dioxide from the body gives rise to **respiratory acidosis**, while a deficiency of hydrogen-carbonate results in **metabolic acidosis**.

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**acid protease** A protein-digesting enzyme (see PROTEASE) that exhibits maximum activity and stability in acid conditions (pH 2.0–5.0) and is inactivated at pH values above 6.0. Acid proteases have a low \*isoelectric point and are low in basic amino acids. Two types are widely used in the food and beverage industries: those from *Aspergillus*, which resemble pepsin; and those from *Mucor*, which resemble rennin.

**acid rain** Precipitation having a pH value of less than about 5.0, which has adverse effects on the fauna and flora on which it falls. Rainwater typically has a pH value of 5.6, due to the presence of dissolved carbon dioxide (forming carbonic acid). Acid rain results from the emission into the atmosphere of various pollutant gases, in particular sulphur dioxide and various oxides of nitrogen, which originate from the burning of fossil fuels and from car exhaust fumes, respectively. These gases dissolve in atmospheric water to form sulphuric and nitric acids in rain, snow, or hail (**wet deposition**). Alternatively, the pollutants are deposited as gases or minute particles (**dry deposition**). Both types of acid deposition affect plant growth – by damaging the leaves and impairing photosynthesis and by increasing the acidity of the soil, which results in the leaching of essential nutrients. This acid pollution of the soil also leads to acidification of water draining from the soil into lakes and rivers, which become unable to support fish life. Lichens are particularly sensitive to changes in pH and can be used as indicators of acid pollution (see INDICATOR SPECIES).

**acinus (acini)** The smallest unit of a multilobular gland, such as the pancreas. Each acinus in the pancreas is made up of a hollow cluster of **acinar**

**cells**, which produce the digestive enzymes secreted in pancreatic juice. Minute ducts from the pancreatic acini eventually drain into the pancreatic duct.

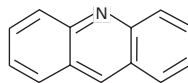
**acoelomate** Describing any bilaterally symmetrical animal of the subkingdom Eumetazoa that does not possess a \*coelom (see also BODY CAVITY). Examples of acoelomate animals are the platyhelminths.

**acquired characteristics** Features that are developed during the lifetime of an individual, e.g. the enlarged arm muscles of a tennis player. Such characteristics are not genetically controlled and cannot be passed on to the next generation. See also BALDWIN EFFECT; LAMARCKISM; NEO-LAMARCKISM.

**acquired immune deficiency syndrome** See AIDS.

**acquired immunity** See IMMUNITY.

**acridine** A chemical (see formula) that is capable of causing \*frameshift mutations in the DNA sequence. Several derivatives of acridine (such as acridine orange) are used as dyes or biological stains.



Acridine

**acrocentric** See CENTROMERE.

**acromegaly** A chronic condition developing in adulthood due to overproduction of (or oversensitivity to) \*growth hormone, usually caused by a tumour in the pituitary gland. This leads to a gradual enlargement of the bones, causing characteristic coarsening of the facial features and large hands and feet.

**acrosome** A membranous sac at or

near the front of a sperm that assists in penetration of the egg. The acrosome contains enzymes, which are released when the sperm contacts the egg prior to fertilization. The enzymes break down the outer layers of the egg to permit entry of the sperm. In some invertebrate sperms the acrosome contains actin filaments, which elongate to help gain entrance to the egg.

**ACTH (adrenocorticotrophic hormone; corticotrophin)** A hormone produced by the anterior \*pituitary gland that controls secretion of certain hormones (the \*corticosteroids) by the adrenal glands. Its secretion, controlled by corticotrophin-releasing hormone, occurs in short bursts every few hours and is increased by stress. An analogue of ACTH, **tetracosactide**, is given by injection to test adrenal function.

**actin** A contractile protein found in muscle tissue, in which it occurs in the form of filaments (called thin filaments). Each thin filament consists of two chains of globular actin molecules, around which is twisted a strand of \*tropomyosin and interspersed \*troponin. Units of muscle fibre (see SARCOMERE) consist of actin and \*myosin filaments, which interact to bring about muscle contraction (see also SLIDING FILAMENT THEORY). Actin is also found in the \*microfilaments that form part of the \*cytoskeleton of all cells.

**Actinobacteria (Actinomycetes; Actinomycota)** A phylum of Gram-positive mostly anaerobic nonmotile bacteria. Many species are fungus-like, with filamentous cells producing reproductive spores on aerial branches similar to the spores of certain moulds. The phylum includes bacteria of the genera *Actinomyces*, some species of which cause disease in animals (including humans); and

*Streptomyces*, which are a source of many important antibiotics (including streptomycin).

**actinomorphy** See RADIAL SYMMETRY.

**Actinomycetes** See ACTINOBACTERIA.

**action potential** The change in electrical potential that occurs across a plasma membrane during the passage of a nerve \*impulse. As an impulse travels in a wavelike manner along the \*axon of a nerve, it causes a localized and transient switch in electric potential across the membrane from  $-60$  mV (millivolts; the \*resting potential) to  $+45$  mV. The change in electric potential is caused by an influx of sodium ions. Nervous stimulation of a muscle fibre has a similar effect.

**action spectrum** A graphical plot of the efficiency of electromagnetic radiation in producing a photochemical reaction against the wavelength of the radiation used. For example, the action spectrum for photosynthesis using light shows a peak in the region 670–700 nm. This corresponds to a maximum absorption in the absorption \*spectrum of chlorophylls in this region.

**activated sludge process** A \*sewage and waste-water treatment. The sludge produced after primary treatment is pumped into aeration tanks, where it is continuously stirred and aerated, resulting in the formation of small aggregates of suspended colloidal organic matter called **floc**. Floc contains numerous slime-forming and nitrifying bacteria, as well as protozoans, which decompose organic substances in the sludge. Agitation or air injection maintains high levels of dissolved oxygen, which helps to reduce the \*biochemical oxygen demand.

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Roughly half the sewage in Britain is treated using this method.

**activation energy** Symbol  $E_a$ . The minimum energy required for a chemical reaction to take place. In a reaction, the reactant molecules come together and chemical bonds are stretched, broken, and formed in producing the products. During this process the energy of the system increases to a maximum, then decreases to the energy of the products. The activation energy is the difference between the maximum energy and the energy of the reactants; i.e. it is the energy barrier that has to be overcome for the reaction to proceed. The activation energy determines the way in which the rate of the reaction varies with temperature. It is usual to express activation energies in joules per mole of reactants.

**activator 1.** A type of \*transcription factor involved in assembling proteins to form an initiation complex at the \*promoter of a gene in readiness for transcription. Activators can bind to an \*enhancer site some distance upstream of the coding region and also to a promoter element near the start site, causing the DNA to form a loop. Some activators also direct remodelling of chromatin by catalysing the acetylation of histones required for unwinding of DNA. This provides access to other transcription factors as a prelude to transcription. *Compare* REPRESSOR.

**2.** A substance that – by binding to an \*allosteric site on an enzyme – enables the active site of the enzyme to bind to the substrate. **3.** Any compound that potentiates the activity of a drug or other foreign substance in the body.

**active immunity** \*Immunity acquired due to the body's response to a foreign antigen.

**active site (active centre)** The site on the surface of an \*enzyme molecule that binds and acts on the substrate molecule. The properties of an active site are determined by the three-dimensional arrangement of the polypeptide chains of the enzyme and their constituent amino acids. These govern the nature of the interaction that takes place and hence the degree of substrate specificity and susceptibility to \*inhibition.

**active transport** The movement of substances through membranes in living cells, often against a \*concentration gradient: a process requiring metabolic energy. Organic molecules and inorganic ions are transported into and out of both cells and their organelles. The substance binds to a \*transport protein embedded in the membrane, which carries it through the membrane and releases it on the opposite side. **Primary active transport** uses energy from the hydrolysis of ATP directly, as in the sodium/potassium ATPase \*sodium pump. **Secondary active transport** is driven by the movement of ions down a pre-existing concentration gradient established by a separate energy-consuming mechanism, as in \*antiporters and \*symporters. Active transport serves chiefly to maintain the normal balance of ions in cells, especially the concentration gradients of sodium and potassium ions crucial to the activity of nerve and muscle cells. *Compare* FACILITATED DIFFUSION.

**active zone** A relatively dense and thickened region of presynaptic membrane within a \*synapse where synaptic vesicles fuse with the membrane to release neurotransmitter from the neuron into the synaptic cleft. Active zones contain specific proteins (*see* SNARE), are highly struc-

tured, and appear darker than neighbouring regions on electron microscopy.

**actomyosin** The complex formed from the interaction of the proteins \*actin and \*myosin during the process of muscle contraction. *See also* SLIDING FILAMENT THEORY.

**acute-phase response** A mechanism of innate immunity in which the liver markedly increases its synthesis of certain immune proteins, the **acute-phase proteins**, in response to infection. This change in protein output by liver cells is triggered by tumour necrosis factor  $\alpha$  (TNF- $\alpha$ ), interleukin-1 (IL-1), and IL-6, which are released by macrophages following their activation as a result of contact with bacteria or other pathogens. The main acute-phase proteins are \*C-reactive protein and \*mannose-binding lectin. These behave like antibodies but are nonspecific and bind to a much broader range of targets. Their binding sites attach to surface components of bacteria and fungi, making them more susceptible to ingestion by phagocytic cells (*see* OPSONIZATION); they also activate the \*complement system of immune proteins, which initiates destruction of the targeted cell.

**acyclovir (acidovir; acycloguanosine)** A drug used to treat cold sores, shingles, genital blisters, or other lesions caused by herpesvirus infection. It is an analogue of the base guanine and acts by interfering with DNA replication of the virus.

**adaptation 1.** (in evolution) Any change in the structure or functioning of successive generations of a population that makes it better suited to its environment. \*Natural selection of heritable adaptations ultimately leads to the development of new species. Increasing adaptation of

a species to a particular environment tends to diminish its ability to adapt to any sudden change in that environment. **2.** (in physiology) The alteration in the degree of sensitivity (either an increase or a decrease) of a sense organ to suit conditions more extreme than normally encountered. An example is the adjustment of the eye to vision in very bright or very dim light.

**adaptive immunity** *See* IMMUNITY.

**adaptive radiation (divergent evolution)** The evolution from one species of animals or plants of a number of different forms. As the original population increases in size it spreads out from its centre of origin to exploit new habitats and food sources. In time this results in a number of populations each adapted to its particular habitat: eventually these populations will differ from each other sufficiently to become new species. A good example of this process is the evolution of the Australian marsupials into species adapted as carnivores, herbivores, burrowers, fliers, etc. On a smaller scale, the adaptive radiation of the Galapagos finches provided Darwin with crucial evidence for his theory of evolution (*see* DARWIN'S FINCHES).

**adaptive thermogenesis** *See* THERMOGENESIS.

**adaptor protein** A protein that takes part in intracellular signalling pathways by recruiting specific components of the pathway in response to activation of the pathway's receptor molecule. Thus, a particular pathway may have its own specific adaptor(s), designed for key members of that pathway. In general, adaptors lack enzymatic activity themselves but possess at least two types of binding site: one type to bind to the cytoplasmic region of the activated

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receptor, and others to bind to specific intracellular molecules in such a way that they become activated, for example, through phosphorylation by tyrosine kinases associated with the receptor. *See* SIGNAL TRANSDUCTION.

**adductor (depressor)** A type of muscle whose function is to pull a limb inwards, towards the body of an animal. *Compare* ABDUCTOR.

**adenine** A \*purine derivative. It is one of the major component bases of \*nucleotides and the nucleic acids \*DNA and \*RNA.

**adenohypophysis** *See* PITUITARY GLAND.

**adenosine** A nucleoside comprising one adenine molecule linked to a D-ribose sugar molecule. The phosphate-ester derivatives of adenosine, AMP, ADP, and \*ATP, are of fundamental biological importance as carriers of chemical energy.

**adenosine diphosphate (ADP)** *See* ATP.

**adenosine monophosphate (AMP)** *See* ATP; CYCLIC AMP.

**adenosine triphosphate** *See* ATP.

**adenovirus** One of a group of DNA-containing viruses found in rodents, fowl, cattle, monkeys, and humans. In humans they produce acute respiratory-tract infections with symptoms resembling those of the common cold. They are also implicated in the formation of tumours (*see* ONCOGENIC).

**adenylate** **1.** Any anion of adenylic acid (i.e. the phosphoric acid ester of adenosine). **2.** Any salt or ester of adenylic acid, especially either of the nucleotides \*ATP or ADP.

**adenylate cyclase** The enzyme that catalyses the formation of

\*cyclic AMP. It is bound to the inner surface of the plasma membrane. Many hormones and other chemical messengers exert their physiological effects by increased synthesis of cyclic AMP through the activation of adenylyl cyclase. The hormone binds to a receptor on the outer surface of the plasma membrane, which then activates adenylyl cyclase on the inner surface via a \*G protein or \*calmodulin.

**ADH** *See* ANTIDIURETIC HORMONE.

**adherens junction (zonula adherens)** A type of cell junction, found especially in epithelial cells, that forms a strengthening and interlocking belt encircling the exterior of adjacent cells. It consists of a band of cadherin molecules (*see* CELL ADHESION MOLECULE) on the outside of the transverse cell surface, which are linked through the plasma membrane to a circumferential belt of actin microfilaments inside the cell. The cadherin bands of neighbouring cells are interlocked, thus contributing to the stability and integrity of the cell layer. *Compare* TIGHT JUNCTION.

**adipocyte** *See* FAT CELL.

**adipose tissue** A body tissue comprising cells containing \*fat and oil. It is found chiefly below the skin (*see* SUBCUTANEOUS TISSUE) and around major organs (such as the kidneys and heart), acting as an energy reserve, providing insulation and protection, and generating heat. Secretion of the hormone \*leptin by adipose tissue regulates the amount of adipose tissue and adjusts the body's energy balance. *See* BROWN FAT; THERMOGENESIS.

**adjuvant** A nonantigenic substance (such as aluminium hydroxide) that, in combination with an antigen, enhances antibody production by in-