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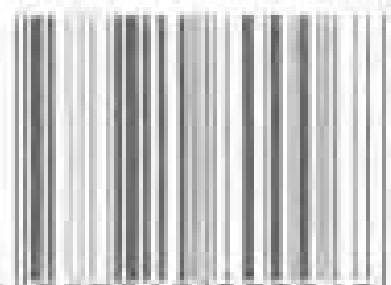
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Oxford Dictionary of

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MACHAEL ALLABY



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MACHAEL ALLABY

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From the Preface to the First Edition

This dictionary aims to address the needs of students as well as those of anyone whose profession or interest exposes him or her to books, articles, or scientific and technical papers on environmental topics.

The dictionary is not a textbook and does not pretend to be one. The first decision the editor of a dictionary must make involves defining the word 'dictionary' itself. The book might contain a limited number of fairly long entries, making it rather like an encyclopaedia. Alternatively, it might contain a much larger number of much shorter entries consisting only of definitions. A third approach, which has been adopted here, amounts to a compromise between the two extremes. This dictionary contains many very short entries, sometimes of only two or three words. Other entries are longer, going beyond the simple definition to describe complex biological processes as succinctly as is practicable. The result of the compromise is that the book is able to compress into one volume explanations of well over 5000 terms. These are drawn from ecology, Earth sciences, Earth history, evolution, genetics, plant physiology, biochemistry, cytology, and biogeography. There are brief biographical notes on individuals who have made outstanding contributions to the disciplines relevant to botany, and almost one-third of the entries describe taxonomic groups of seed plants, ferns, algae, mosses, and liverworts, and also fungi, bacteria, and slime moulds.

Entries are fairly extensively cross-referenced to words or expressions that have entries of their own or sometimes, for simplicity, to another part of speech (an adjective cross-referenced to its noun, for example) where the entry is easily recognizable. The cross-references use the customary *see* and *compare* within or at the end of entries, and asterisks before expressions that have entries of their own (e.g. *glycolysis). The cross-references should carry the reader from one entry to another, but, of course, the system involved another compromise. Too many cross-references interrupt the flow of the text, making it more difficult to follow rather than easier. Terms are cross-referenced, therefore, only where the cross-reference may be helpful.

MICHAEL ALLABY
Wadebridge, Cornwall

Preface to the Second Edition

Five years have now elapsed since the first edition of this dictionary was published. During that time, popular interest in the conservation of the countryside has remained intense. Indeed, it has increased to the extent that young people have taken to occupying tree-houses and tunnels in areas they seek to protect from development. Obviously, environmental activists have a keen awareness of plant life and will find explanations of botanical terms helpful.

In revising the dictionary, I have been helped greatly by Robin Allaby, who has scrutinized my revisions and made many of his own. This edition contains many new entries. Some of these are technical terms used by botanists. Others are from molecular biology, the discipline that is now doing so much to illuminate the evolutionary history of plants and their taxonomic relationships.

Each of the entries in the first edition has been examined afresh. Many have been modified, often in only small ways, in order to clarify them or bring them up to date. We have also taken the opportunity to change the title of the dictionary. We believe *A Dictionary of Plant Sciences* is a more accurate description of the book, reflecting the broad approach we have adopted to what is, in truth, a group of interrelated disciplines rather than a single self-contained one.

The revisions do not disguise the fact that the original compilation was the work of a team and would have been impossible without the enthusiastic support and hard work of Mike Kent, Diana Sainsbury, Tim Whitmore, and Robin Allaby. Their work is retained, and if mistakes or omissions have survived, the fault is mine, not theirs.

MICHAEL ALLABY
Wadebridge, Cornwall

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A

Aapa mires String bogs of circumpolar distribution, found particularly in Fennoscandinavia. They are *soligenous mires with ridges, morainic in origin, arranged roughly normal to the slope of the terrain. Water occupies the linear depressions between the ridges.

abacá (Manila hemp) The strongest of the hard, natural fibres. It is extracted from the pseudostems of *Musa textilis* (see *MUSA*), a relative of the edible bananas. Grown mainly in the Philippines, and native to that region, it is used to make ropes that are resistant to humidity, salt water, and fresh water, and to make special, strong papers (e.g. for tea-bags)

abaxial Of a surface, directed away from the axis. Compare *ADAXIAL*.

Abies (fir; family *Pinaceae) A genus of coniferous trees in which the leaves are crowded on the twigs, often approximately in 2 rows; they are needle-like and single, leaving a round, flat scar when they fall, thus producing a smooth twig. The female cones are borne erect; they shatter at maturity, but the woody axis persists. Many fine ornamental species are now widely cultivated for their lofty, deeply pyramidal, *monopodial crowns; but they require a moist climate and are sensitive to atmospheric pollution. There are 40-50 species, widespread throughout the northern hemisphere, especially on mountains.

abiogenesis The development of living organisms from non-living matter, as in the supposed origin of life on Earth, or in the concept of spontaneous generation which was once held to account for the origin of life but which modern understanding of evolutionary processes has rendered outdated

abiotic Non-living; devoid of life. See *BIOTIC*.

abscisic acid (abscisin II, dormin) A terpenoid (see *TERPENE*) compound that is

one of the five major *plant hormones. Although it is synthesized principally in the *chloroplasts, it occurs throughout the plant body and is particularly concentrated in the leaves, fruits, and seeds. It has powerful growth-inhibiting properties generally and also promotes leaf *abscission and the *senescence of plants and/or their organs, and induces the closing of *stomata and dormancy in seeds and buds. Its effect is antagonistic to the plant *growth hormones, and is thought to act by inhibiting the synthesis of *protein and *nucleic acids.

abscisin II See *ABSCISIC ACID*.

abscission The rejection of plant organs, e.g. of leaves in autumn. This occurs at an abscission zone, where *hydrolytic *enzymes reduce cell adhesion. The process can be promoted by *abscisic acid and inhibited by respiratory poisons, and is controlled in nature by the proportion and gradients of *auxin and *ethylene. Other *hormones may be involved.

absent rings See *TREE-RING*.

absolute pollen frequency (APF) The expression of *pollen data from sediments in terms of the absolute numbers (for each species, genus, or family) per unit volume of sediment and, where deposition rates are known, per unit time. In certain circumstances this approach gives clearer information than does the traditional expression as *relative pollen frequencies (RPFs). APFs are particularly useful in site comparisons in which one or more high-pollen producers vary. For example, when trees first appear in the regional pollen rain their prolific pollen may, in an RPF method, give the impression of declining herbaceous species, whereas examination by an APF method will show constant values for herb species.

absorption The uptake of substances, usually nutrients, water, or light, by cells or *tissues.

absorption spectrum A graph that shows the percentage of each wavelength of light absorbed by a pigment (e.g. *chlorophyll, which absorbs mainly in the red and blue parts of the spectrum).

abstriction The detachment and release of a *spore by the constriction of the tissue by which it is attached.

Abutilon (family *Malvaceae) A genus of trees and shrubs, native to tropical and warm temperate climates, whose members have hairy leaves and branches, and bright, lantern-like flowers, mainly orange or red. The fruit is a *schizocarp and the stigmas (see CARPEL) are usually apical. There are more than 100 species. The genus includes *A. theophrasti* (China jute).

Acacia (family *Leguminosae, subfamily *Mimosoideae) A genus of plants, most of which are trees (wattles), although a few are climbers. Typically the leaves are *bipinnate, with numerous tiny leaflets, or phyllodic (see PHYLLODY). Acacias are important for timber, fuel wood, tannin, gum arabic (especially *A. senegal*), perfumes (*A. farnesiana*), and florists' 'mimosa' (usually *A. dealbata*). There are about 1200 species, most of them in the seasonal tropics and subtropics.

Acaena (family *Rosaceae, subfamily Rosoideae, *tribe Sanguisorbeae) A genus of wind-pollinated, mat-forming plants that occur mainly in the subtropics and temperate regions. There are about 100 species; 90 species are known in S. America, 14 in New Zealand, 2 in Australia, and others in New Guinea, S. Africa, and California.

Acalypha (family *Euphorbiaceae) A genus of shrubs and small trees in which the flowers are unisexual and apetalous, males having elongate, twisted *antherlobes, and females much-branched stigmas (see CARPEL); some species bear *catkins (e.g. the ornamental *A. hispida*, 'cat's tail'). *A. wilkesiana* and others have colourful foliage. There are no close relatives in the family; the resemblance to *Urticaceae is only superficial. There are about 430 species, found in the tropics and subtropics.

Acanthaceae A family, mainly of shrubs, in which the leaves are simple, *opposite, and *decussate. The flowers are bisexual and *zygomorphic, and the *bracts are often showy. There are 4 or 5 fused *sepals and *petals; 2-4 *epipetalous *stamens; a *superior, *bilocular *ovary; and numerous, axile (see PLACENTATION) *ovules. The fruit is a *capsule. There are several ornamentals (e.g. *Acanthus*, *Aphelandra*, and *Thunbergia*). There are 357 genera, comprising about 4350 species, most of them tropical, but with temperate outliers.

Acanthus (family *Acanthaceae) A genus of shrubs and perennial *herbs, most of which are *xeromorphic and have spiny leaves. Some species are cultivated as ornamentals. The upper lip of the *corolla is lacking. The pattern for the decoration on Corinthian column capitals is supposedly based on the leaves of *A. spinosus*. There are 30 known species, found in southern Europe (*A. mollis* is bear's breech), Asia, and Africa (*A. illicifolius* grows in mangrove swamps).

accessory cell See SUBSIDIARY CELL.

accessory pigments In *photosynthesis, pigments that can absorb light energy and pass the electrons they emit to *primary pigments.

accidental species One of five classes of fidelity used by the *Braun-Blanquet school of phytosociology in the description and classification of plant communities. Accidentals are rare species in the community present either as chance invaders from another community or as *relics from a previous community. Compare EXCLUSIVE SPECIES; INDIFFERENT SPECIES; PREFERENTIAL SPECIES; and SELECTIVE SPECIES.

acclimatization (acclimation, hardening) The changes involving the synthesis of *proteins, *membranes, and *metabolites that occur in a plant in response to chilling or freezing temperatures, which protect *tissues or confer tolerance to the cold. The term may also be applied to a range of physiological adjustments which occur in a plant when it is subjected to unusual environmental conditions.

accumulated temperature A surplus or deficit of temperature with respect to a defined mean value and expressed as an accumulation over a given period, e.g. month, season, or year. For example, a datum value of 6°C is used as a critical temperature for sustained vegetation growth.

accumulator A term used in plant succession studies to describe a pioneer species whose activities are claimed to enrich the abiotic environment with nutrients.

-aceae A standardized suffix used to indicate a family of plants in the recognized codes of classification (e.g. Rosaceae, the rose family).

acellular slime moulds See MYXOMYCETES.

acentric Applied to a fragment of a chromosome, formed during cell division, that lacks a centromere. The fragment will be unable to follow the rest of the chromosomes in migration towards one or other pole as it has lost its point of attachment to the spindle.

Acer (family Aceraceae) A genus of trees in which the leaves are without stipules, opposite, and entire, or often palmately lobed (but pinnate in *A. negundo*, box elder). Regular, pentamerous flowers are borne in racemes, corymbs, or umbels. The fruit is a samara. These trees are important for timber, many small Japanese species and varieties are ornamentals, and in N. America maple syrup is obtained mainly from *A. saccharum*. Field maple (*A. campestre*) is wild in Britain; sycamore (*A. pseudoplatanus*), from southern Europe, is naturalized in Britain. There are 111 known species, mainly northern temperate, and a few in tropical mountains. China has most native species.

Aceraceae A small family of 2 genera of trees, *Acer* and *Dipteronia* (which comprises 2 species found only in China). The family is related to Hippocastanaceae and Sapindaceae.

acervulus An asexual, conidia-bearing structure that is formed by certain fungi parasitic in plants. It consists of a mat of

fungal tissue which bears a layer of conidiophores; initially formed within the plant tissues, it later breaks through to the surface to release conidia.

Acetabularia (mermaid's cup, mermaid's wineglass) A genus of dasycladalean algae in which the mature thallus consists of a single axis or 'stalk' with a whorl of gametangial sacs at the top. Found in warm regions in shallow, sheltered seas, attached to rocks, shells, etc. Fossil *Acetabularia* dating from the Tertiary have been found.

acetic acid bacterium A bacterium that produces acetic acid from ethanol (ethyl alcohol).

Acetobacter (family Acetobacteraceae) A genus of Gram-negative, aerobic bacteria. Cells are ovoid or rod-shaped, motile or non-motile. Most strains can oxidize ethanol (ethyl alcohol) to carbon dioxide, forming acetic acid as an intermediate. Some species are used in the manufacture of vinegar. They are found on fruits and vegetables, in alcoholic beverages (in which they can cause spoilage), etc.

Acetobacteraceae A family of aerobic, chemo-organotrophic, Gram-negative bacteria which, typically, can oxidize ethanol to acetic acid.

achene A small, usually single-seeded, dry, indehiscent fruit.

achira See CANNA.

Acholeplasma See ACHOLEPLASMATACEAE.

Acholeplasmataceae (order Mycoplasmatales) A family of Gram-negative, chemo-organotrophic bacteria that do not require the presence of sterols (see STEROID) for growth. Cells are spherical, pleomorphic, or filamentous. They are found as parasites in a variety of mammals and birds. There is 1 genus (*Acholeplasma*).

Achras (family Sapotaceae) A genus of plants that includes *A. zapota* (*Manilkara zapota*) which yields the delicious fruit chiku, or saponilla plum, for which it is now widely cultivated, and chicle,

formerly the elastic component of chewing gum. There are 4 species, found in northern tropical America.

A-chromosome See B-CHROMOSOME.

acicular Pointed or needle-shaped.

acid According to the Brønsted-Lowry theory, a substance that in solution liberates hydrogen ions or protons. The Lewis theory states that it is a substance that acts as an electron-pair acceptor. An acid reacts with a base to give a salt and water (neutralization), and has a *pH of less than 7.

acid-fast bacteria Certain *bacteria of the order *Actinomycetales, including **Mycobacterium* species, which, after being treated with certain dyes, are not decolorized on subsequent treatment with a mineral acid.

acidic dye A dye which consists of an organic *anion that combines with and stains positively charged *macromolecules. It is used particularly for staining *cytoplasm. Compare BASIC DYE.

acidic grassland A grassland that occurs on *acidic soils: it is usually derived from former woodland as a consequence of centuries of grazing and, to a lesser extent, burning. In Britain and much of north-western Europe the dominant grasses are species of **Agrostis* (bent) and **Festuca* (fescue). This type of vegetation is most extensive in upland areas, but the associated plant species tend to be different, and the name 'grass heath' is considered more appropriate.

acidophilic 1. Refers to the propensity of a cell, its components, or its products to become stained by an *acidic dye. 2. See ACIDOPHILOUS.

acidophilous (acidophilic) Applied to 'acid-loving' organisms, i.e. organisms that grow best in acidic habitats.

acid soil A soil having a *pH less than 7.0. Degrees of soil acidity are recognized. Soil is regarded as 'very acid' when the reaction is less than pH 5.0. The *USDA lists five standard ranges of soil acidity (less than pH 4.5, extremely acid; 4.5-5.0, very strongly acid; 5.1-5.5, strongly

acid; 5.6-6.0, medium acid; and 6.1-6.5, slightly acid). Surface soil horizons of acid brown earths have a reaction of pH 5.0 or less.

Acoelorrhaphe (formerly *Paurotis*; family *Palmae) A *monotypic palm genus (*A. wrightii*) which is a low, clump-forming, *monoecious, fan palm with greyish leaves, native to the Florida Everglades, and widely cultivated.

Acorus (family *Araceae) A genus of 2 species of warm temperate Asia and N. America. *A. calamus* (sweet flag), a marsh plant, is widely cultivated for its fragrant leaves and *rhizomes which have medicinal properties. The rhizomes are *sympodial, the flowers bisexual.

acquired characteristics The characteristics that are acquired in the lifetime of an organism, according to early evolutionary theorists such as *Lamarck. Lamarck further suggested that traits acquired in one generation in response to environmental stimuli would be transmitted to the *gametes and inherited by the next generation. Thus, over several generations a particular type of organism would become better adapted to its environment. The kinds of acquisition envisaged by Lamarck and their heritability are now discredited, although there has been a recent revival of some aspects of the theory in modified form.

acrasin A chemotactic substance involved in the aggregation response of *cellular slime moulds (order Acrasiales). It is now known to be cyclic AMP (adenosine monophosphate).

Acrasiomycetes (division *Myxomycota) A class of *slime moulds in which the feeding stage generally consists of individual amoeboid cells (*myxamoebae). *Fruiting bodies are formed by aggregation of myxamoebae and differentiation of the resulting *pseudoplasmodium. Acrasiomycetes are found in soil, decomposing plant material, etc.

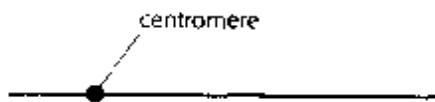
acre A unit of area, the British statute acre being equal to 0.4047 hectare (4840 square yards or 10 square *chains). In Britain, historically a woodland acre varied from forest to forest, but was always

larger than the statute measure *Assarts were surveyed at the statute measure.

Acromonium (class *Hyphomycetes) A *form-genus of *fungi which form *septate *mycelia and which produce *conidia in *phialids. Some species produce *antibiotics called cephalosporins. (The form genus includes fungi formerly called *Cephalosporium*.)

acrocarpous moss A type of moss in which the *archegonia, and hence the *capsules, are borne at the tips of stems or branches. Acrocarpous mosses usually show little or no branching and typically grow in erect tufts. Compare PLEUROCARPOUS MOSS.

acrocentric Applied to a *chromosome with a *centromere located nearer one end than the other. During the *anaphase stage of cell division, movement of an acrocentric chromosome towards one pole results in the chromosome being shaped like a 'J', as opposed to the normal 'V' shape of a *metacentric chromosome (in which the centromere is in the middle).



Acrocentric

acropetal Growing or developing upwards from the base or point of attachment, so that the oldest parts are at the base and the youngest are at the tip. Compare BASIPETAL.

acropetal movement The movement of substances within the plant toward its *root and *shoot apices. Compare BASIPETAL MOVEMENT.

acrostichoid See ACROSTICHUM

Acrostichum (family *Pteridaceae) A genus of ferns in which the *rhizome is creeping, the leaves are *pinnate, and the upper pinnae are reduced and covered below by *sporangia (the 'acrostichoid' condition, which also evolved independently in other ferns). There are 3 species in mangrove forests throughout the tropics (*A. aureum* is the commonest). Its young leaves are edible.

actino- A prefix that means 'radiating', derived from the Greek *aktis-inos*, meaning 'ray'.

actinomorphic Radially symmetrical, as is a *daisy flower.

Actinomycetales An order of (usually) *Gram-positive *bacteria, many of which form branching filaments or *mycelia. They are *chemo-organotrophic, and most are *aerobic. Most species are *saprotrophic, but a few are *pathogenic in plants or animals.

actinomycete 1. A *mycelium-forming *bacterium of the order *Actinomycetales. **2.** Any bacterium of the Actinomycetales.

actinomycosis Any disease of humans or other animals in which the causal agent is an *actinomycete.

actinorrhiza See ROOT NODULE.

actinostele A *monostele type of *protostele in which the cross-section of the *xylem is star-shaped or lobed. Compare HYPOPHLOIC HAPLOSTELE, HAPLOSTELE, and SOLENOSTELE.

Actinostrobus (subdivision *Gymnospermae, family *Cupressaceae) A genus of 2 species, endemic to south-western Australia, of trees found as *emergents on heaths and sands in the south and west. *A. pyramidalis* (swamp cypress) is a pyramidal conifer up to 4 m tall, with dense, bright-green foliage reaching to the ground. It is cultivated.

Actinotus (family *Umbelliferae) A genus that is thought to link the evolution of endemic Australian genera of Umbelliferae to cosmopolitan genera. Known as 'flannel flowers', most members of the genus are *biennial herbs found in areas of low fertility and in some arid regions. There are 17 species found in Australia, with 1 in New Zealand.

action spectrum A graph of the efficiency of different wavelengths of light in promoting a given photoresponse, as in *photosynthesis or *phototropism.

activation energy (energy of activation) The energy that must be delivered to a system in order to increase the incidence

within it of reactive molecules, thus initiating a reaction. It is an important feature of *enzymes that they greatly lower the activation energy of many metabolic reactions.

activator A metal ion that functions in conjunction with either an *enzyme or its *substrate in order to bring about a reaction

active chamaephyte See CHAMAEPHYTE.

active dispersal See DISPERSAL.

active layer A seasonally thawed surface soil layer, between a few centimetres and about 3 m thick, that lies above the permanently frozen *horizon in a periglacial environment. It may be subject to considerable expansion on freezing, especially if *silt-sized particles dominate, and during the melt it may become very mobile. See also MOLLISOIS.

active pool The part of a *biogeochemical cycle in which the nutrient element under consideration exchanges rapidly between the *biotic and *abiotic components. Usually it is smaller than the *reservoir pool, and is sometimes referred to as the 'exchange' or 'cycling' pool.

active site The part of an *enzyme molecule that binds it to the *substrate or substrates to form an enzyme-substrate complex. The conformation is not absolute and may alter according to reaction conditions.

active transport The transport of substances across a membrane against a concentration gradient. Such processes use energy, the source often being the hydrolysis of *ATP.

actual evapotranspiration (AE) The amount of water that evaporates from the surface and is transpired by plants if the total amount of water is limited. Compare POTENTIAL EVAPOTRANSPIRATION

aculeate Prickly, pointed; the word is derived from the Latin *aculeatus*, meaning sting, from *acus*, needle.

acuminate Tapering to a point.

Adanson, Michel (1727–1806) A French botanist and plant collector, who worked as a clerk to a trading mission in Senegal, where he discovered many plants that were previously unknown. In the 1750s he returned to France with a large collection of plants and seeds. He was the first European to describe the baobab, which he observed in West Africa, although specimens were later found to be more widely distributed. He estimated the age of the tree he saw as about 5000 years; *radiocarbon dating has confirmed an age of 1000 years for some specimens and less precise methods have estimated greater ages for others. The baobab genus (**Adansonia*) is named for him.

Adansonia (family **Bombacaceae*) A genus of trees, several species of which are pollinated by ants that inhabit modified spines. Baobab (*A. digitata*) is famous for its hugely swollen trunk, commonly 15 m in girth, and reaching 35 m in height. Other species swell, but less so. Baobab provides human and animal food and medicines. There are 9 species, occurring in the seasonal tropics of Africa, Madagascar, and north-western Australia.

adaptation That which fits an organism both generally and specifically to exploit a given environmental zone.

adaptive breakthrough An evolutionary change by the acquisition of a distinctive *adaptation that permits a population or *taxon to move from one *adaptive zone to another. At the most extreme such moves might be from water to land, or from land to air.

adaptive enzyme See INDUCIBLE ENZYME.

adaptive pathway A series of small adaptive steps, rather than a single large one, which leads from one *adaptive zone across an environmental and adaptive threshold into another adaptive zone. In effect, small changes accumulate so that the organism is virtually pre-adapted to enter the new zone.

adaptive peaks and valleys A symbolic contour map showing the *Darwinian fitness or *adaptive value of genotypic

combinations will usually display adaptive peaks and valleys; these occur at points at which the fitness is respectively strong or weak. The distribution of the population of a given species will therefore coincide with that of the adaptive peaks.

adaptive radiation **1.** A burst of *evolution, with rapid *divergence from a single ancestral form, resulting in the exploitation of an array of *habitats. The term is applied at many taxonomic levels. **2.** A term used as a synonym for *cladogenesis by some authors.

adaptive value (Darwinian fitness, fitness, selective value) The balance of genetic advantages and disadvantages that determines the ability of an individual organism (or *genotype) to survive and reproduce in a given environment. The environment, and the competition or struggle for survival within it, determine which individuals are fittest to achieve this, the 'fittest' being the individual (or genotype) that produces the largest number of offspring that later reach reproductive maturity. Such *natural selection has been described as the 'survival of the fittest'. See also SELECTION

adaptive zone A taxon, together with its associated environmental regime or regimes, *habitat, or *niche. The adaptive specialization that fits the taxon to its environment may be narrow, as with the giant panda, which eats only certain types of bamboo shoots, or broad, as with the brown bear, which is *omnivorous. In dietary terms, therefore, these two mammals occupy narrow and broad adaptive zones respectively.

adaxial Of a surface, directed towards the axis. Compare ABAXIAL.

adder's tongue See OPHIOGLOSSUM.

additive genetic variance See HERITABILITY.

adelphoparasite A parasite (see PARASITISM) that has as its host a species closely related to itself, often within the same family or genus.

Adenanthera (family *Leguminosae,

subfamily *Mimosoideae) A genus of trees, several of them common as shade trees. *A. pavonina* has hard, scarlet seeds, used for centuries in India and Sri Lanka as units in one of the oldest weight systems known, for weighing gold, etc. There are 4 species, occurring from southern China to the Pacific islands.

adenine A *purine base which occurs in both *DNA and *RNA.

adenosine The *nucleoside formed when adenine is linked to ribose sugar.

adenosine diphosphate (ADP) High-energy phosphoric *ester (i.e. *nucleotide) of the *nucleoside adenosine. It can undergo *hydrolysis to adenosine monophosphate and inorganic phosphate, the reaction releasing 34 kJ/mol of energy at *pH 7.

adenosine triphosphate (ATP) High-energy phosphoric *ester (i.e. *nucleotide) of the *nucleoside adenosine, which functions as the principal energy-carrying compound in the cells of all living organisms. Its *hydrolysis to ADP (*adenosine diphosphate) and inorganic phosphate is accompanied by the release of a relatively large amount of free energy (34 kJ/mol at *pH 7) which is used to drive many metabolic functions.

Adiantaceae A family of ferns in which *sori are borne on the undersides of the veins of the *pinnules, without *indusia. Their distribution is cosmopolitan but they occur most abundantly in the moist tropics. There are about 56 genera and 1100 species.

Adiantum (maidenhair ferns; family *Adiantaceae) A genus of ferns in which all the *fronds are alike, usually with black, glossy *petioles and wide, fan-shaped leaflets. *Rhizomes are scaly. *Sori are borne near the vein ends on the reflexed tips of the leaflets. Some are cultivated as ornamentals. There are about 200 species. Most occur in the moist tropics and warm temperate regions, as far as the southern British Isles.

adnate **1.** Applied to the *gill of an *agaric that is attached to the *stipe by