

The Oxford Dictionary of Natural History



Edited by Michael Allaby
Foreword by David Attenborough

THE OXFORD
DICTIONARY OF
NATURAL
HISTORY

EDITED BY
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FOREWORD

THE first time I travelled in the forests of Borneo, I knew no Malay. My guide, a Dyak hunter who, with his blowpipe, regularly collected birds for the local museum, knew no English. So, to begin with, we had some difficulty—to put it mildly—in sorting out where we should go and what we should do. On our first day out together, we were paddling up a river in a canoe, when I heard a sonorous *tok-tok-tok-tok* call echoing through the trees. It was a sound that later I came to know well, but at that time I had no idea what creature made it. I cupped my hand round my ear and raised my eyebrows towards my guide. He then, for the very first time in our acquaintance, spoke words that I precisely understood. '*Caprimulgus macrurus*', he said and I knew immediately that I was listening to the voice of the long-tailed nightjar. It was a nice demonstration that those cumbersome Latin names, sometimes mocked by the ignorant as pretentious obfuscations invented by scientists to prevent others understanding what they are talking about, do indeed constitute a truly international lingua franca.

Such scientific terms, of course, are valuable not only because they transcend linguistic barriers but because they are exceedingly precise. *Caprimulgus macrurus* can be expanded, with the right reference book to hand, into an exact description of a particular bird with its own characteristic colour, shape, distribution, diet—and call. Nor are such words needed only for the classification of organisms. Processes and periods, concepts and characters, anatomies and activities all have to be given names if they are to be discussed and referred to in a way that is both precise and succinct. So there is no escaping from it: scientific language has to be tackled and mastered if scientific thought is to be followed.

That language, of course, may present problems to full-time scientists themselves on occasion. Even working within their own particular disciplines, they may occasionally be baffled, for new terms are continually being coined to enable workers to investigate and discuss new discoveries and perceptions. It is commonly said that these days science is becoming so highly specialized that individual workers tend to know more and more about less and less. That may be so in some areas, but in natural history the trend is in the other direction. These days, we are recognizing with increasing clarity that plants and birds, insects and flowers, soil and rainfall, all form one intricately connected web. It is significant that the very term needed to describe this unity—ecosystem—was coined only 50 years ago and very properly appears in this dictionary. But this widening of scope increases the problems of vocabulary. An amateur naturalist may know that *Caprimulgus* is a nightjar, but it is less likely that a professional botanist will. Once, that might not have mattered very much. Now, in these ecologically conscious times, it may well be of some consequence for him to do so.

But if the situation is becoming troublesome for the professional how much more difficult it now is for the amateur. Not so long ago the very word 'naturalist'

was applied only to amateurs and used in a somewhat condescending not to say dismissive way. It suggested someone who patiently amassed meaningless and trivial facts about butterflies, birds' eggs, and wild flowers. But once, of course, everyone had to be a naturalist. Hunters, like my Dyak guide, had to have expert knowledge of the natural world if they were to catch their quarry. Housewives had to be able to recognize plants and know which was edible and which poisonous. Those skills are no longer required of most of us. We live in cities and even those who provide us with our foods and medicines no longer gather them from the wild. But many of us, nonetheless, still depend upon the wild, finding it a matchless source of wonder, fascination, and solace. Our delight in it, however, is greatly heightened if we are able to share in the discoveries and debates of scientists who spend their whole lives investigating it. And since natural history does indeed rest ultimately on the recording of a mass of tiny observations, we can even make our own small contributions. So happily, today, the name 'naturalist' is one of which anyone can be proud. But being a competent one now requires, once again, an understanding of the language.

Some of us, perhaps, with just the vaguest recollection of our schoolboy Latin or Greek may be able to deduce meanings of a proportion of such words without recourse to a glossary. That ability, for me, has been the only abiding benefit of those numberless, mind-numbing hours spent chanting in unison the conjugations and declinations of classical verbs and nouns. Today, such subjects are no longer taught in schools as a matter of course, and I, for one, do not greatly regret the change. But even with those hazy memories, deducing the meaning of scientific terms is not easy. They might have led me to guess that *Caprimulgus* meant 'goat-sucker' and from that I might have remembered that in ancient times that name was given to the nightjar in the mistaken belief that it stole milk from goats. But the deduction would have been a circuitous one and arguably might demand a greater knowledge of natural history than would have been needed to recognize the name in the first place.

But with this book to hand, you no longer have any need to attempt such etymological puzzles. Here, for each of many thousands of scientific terms, are those few words of definition that will enable you, whether scientist, naturalist, or both, to understand the word and the sentence in which it is embedded. The entries have been assembled and defined by over fifty experts from a dozen different disciplines. I know of no other compilation that is so up-to-date and so comprehensive. Maybe, in some laboratory or library somewhere, there sits some scientific polymath who, alone and unaided, knows the meaning of each and every one of these words. I am not he. I am delighted—and relieved—to have at last a volume at my elbow that will illuminate my way through the fascinating literature of natural history, no matter where it may lead me.

DAVID ATTENBOROUGH

PREFACE

OUR century has seen an expansion of scientific research without parallel in history, and the rate of expansion shows no sign of abating. Schoolchildren today receive instruction in disciplines that did not even exist when the older among us were at school, and new information technologies have been pressed into the service of storing and disseminating information, which accumulates faster than it, far less all of its implications, can be absorbed by a merely human brain.

This creates a linguistic problem. Workers within each discipline coin technical words and expressions to describe their findings and ideas, and with each new discovery and each new theory specialist vocabularies grow. While scientists remained confined within the bounds of particular disciplines, this was a problem for them alone, and manageable; but disciplinary boundaries are drawn less precisely today than once they were. All of us, professional or amateur students of the natural world, must master vocabularies, and the concepts underlying them, derived from several disciplines if we are to understand fully the literature pertaining to any one of those disciplines.

This is especially true in the area of study loosely called 'natural history', and it is important. Almost the whole of science has become the preserve of the professional, but in observational astronomy and in the observation of plants and animals—and possibly nowhere else—the amateur may still contribute to the store of useful information. Networks of observers and recorders play a vital role in the mapping of the distributions of species, and many rare species and valuable habitats can be maintained within nature reserves only because local naturalists are willing to devote time and physical effort to the management of the reserves. Without such dedicated amateurs these tasks would be far too costly to be performed at all, and we would be the poorer. Yet the amateur who wishes to read and so advance from a general to a more specialized knowledge of the subject must acquire some familiarity with expressions used in a formidable range of disciplines that must at first seem peripheral. The student, at school or in higher education, must become even more familiar with those disciplines.

There is a need, then, for an aid to communication, and it is this need that the present *Dictionary* aims to meet. It is intended for students, for amateur naturalists, and indeed for all those who would pursue their interest in natural history beyond the level of the more popular books, articles, and television programmes.

The area is vast, and space within a single book is limited. In compiling the *Dictionary*, therefore, it was necessary to make entirely arbitrary decisions. We began by deciding the overall size of the book and the total number of entries it might contain. I listed the disciplines that seemed relevant (and added a few more at a later stage), allotted a priority to each, then converted those priorities into numbers of entries for each discipline. Thus space was allocated to the earth sciences (geology, geomorphology, pedology, and mineralogy), the

atmospheric sciences, genetics, cell structure and function, biochemistry, parasitology, and other disciplines. The *Dictionary* cannot claim to be fully comprehensive, but if there are major omissions the blame must rest with me.

Since the broad subject is natural history, clearly the *Dictionary* had to list many taxa of plants and animals. My aim in selecting such entries was to provide as complete a listing as was practicable down to the family level, and to include any lower taxa of particular interest. Coverage in all disciplines aimed to be global. The decisions were mine, but they were more flexible than it may seem since the division of the overall subject served merely as a rough guide to contributors, some of whom departed from it, usually by exceeding the number of entries allocated to them.

Abbreviations have been kept to a minimum, and I hope they are self-explanatory: 'geol.' stands for 'geology', 'geomorph.' for 'geomorphology', 'bot.' for 'botany', etc. 'Compare' has been used rather than 'cf.', and 'q.v.' has not been used at all because it would interrupt the flow of entries, making them more difficult to understand, while contributing little of value. In most cases technical terms used within entries are defined within the entry, or by themselves, or within another entry to which the reader is directed.

Plants and animals have been described under their scientific names, with their common names in parenthesis and in cross references to the main entry. In most cases the entry describes organisms at one of the higher taxonomic levels and for this reason the common name may appear in the plural. Members of the family Meleagrididae, for example, are turkeys, but there are two distinct species so the use of the plural is more accurate. For consistency the plural is also used in the cross reference. If a common name does not appear in its correct alphabetical position in the singular form, therefore, it may be because it appears in the plural.

I pretend no great expertise in any scientific discipline. My contribution consisted mainly in administering the project, editing the entries I received, and assembling them in the form of computer files. In that task I received invaluable assistance from my wife, Ailsa, who devised an efficient filing system, as well as typing many of the early entries, helping to check them, and contributing some herself. Although I wrote a number of the entries, most were written by our team of contributors, recruited from the relevant disciplines, and reviewed by independent consultants, as well as by my colleagues at the Oxford University Press.

I am deeply grateful to Neil Curtis, who first suggested that I might compile this book, and to Nicholas Wilson and Christopher Riches of the Oxford University Press whose friendship, support, and practical help have been invaluable, and whose patience as deadlines came, went, and vanished into the remote past has been remarkable. I thank all the contributors for undertaking the task so cheerfully and for pursuing it so conscientiously. I congratulate those among them who became parents during the years it has taken to compile the *Dictionary*.

I must also express my sorrow at the death of Donald Street, the herpetologist, who was among the very first to agree to contribute to the book. He is missed.

Wadebridge
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A

aa See lava.

Aapa mires String bogs of circumpolar distribution, particularly in Fenno-Scandia. They are soligenous mires (i.e. they receive water from rain and slope run-off), with ridges, which are morainic in origin, arranged roughly normal to the slope of the terrain. Water occupies the linear depressions between the ridges.

aardvark (ant bear, *Orycteropus afer*) See *Orycteropodidae*.

aardwolf (*Proteles cristatus*) See *Hyaenidae*.

abacá (Manila hemp) The strongest of the hard, natural fibres. It is extracted from the pseudostems of *Musa textilis*, 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 and to salt water and fresh water, and to make specialist strong papers (e.g. for tea bags).

abdomen 1 In vertebrates, the region of the body that contains the internal organs other than the heart and lungs. In Mammalia it is bounded anteriorly by the diaphragm. **2** In most arthropods, the hind region (tagma) of the body, which contains most of the digestive tract, the gonads, and the genital openings. In Crustacea, the abdomen bears limbs which are to a greater or lesser extent segmentally arranged and the abdomen is not homologous with that of arachnids and insects. The abdomen usually shows at least some trace of segmentation, though in the course of evolution this has been lost in all but one family of spiders. **3** In insects, the segments of the body that lie posterior to the thorax. The abdominal segments carry no limbs, although there are appendages (associated with reproduction) on the terminal segments. In the primitive state the abdomen consists of eleven segments, but this number may be very much reduced in advanced insects.

abdominal fins In fish, pelvic fins located far back on the belly of a fish, rather than in the thoracic or jugular position. The term may also be applied to ventral fins found on the abdominal (or belly) side of the body of a fish.

Abies (fir; family Pinaceae) Genus of coniferous trees. The leaves are crowded on the twigs, often approximately in two rows; they are needle-like and single, leaving a round, flat scar when they fall, so giving 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 crown; 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 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.

ablation 1 Removal of snow and ice by melting and direct alteration from the solid to gaseous phase (sublimation). The rate of loss is controlled chiefly by air temperature, wind velocity, humidity, rainfall, and solar radiation. Ablation on snowfields is also influenced by aspect, depth of snow, and nature of the underlying surface. Ablation till (flow till) is the glacial debris that may be released. The ablation zone of a glacier is that area in which losses, including calving, exceed additions. **2** Removal of rock material, especially by wind action.

ablation till (flow till) See ablation; and till.

ablation zone See ablation.

abomasum In Ruminantia, the fourth and final region of the specialized stomach. It is the zone of digestion.

aboral Away from the mouth; on the opposite side of the body from the mouth.

abrasion The erosive action that occurs when rock particles of varying size are dragged over or hurled against a surface. Some common agents of abrasion are the bedloads of streams, rock debris embedded in the bases of glaciers, and sand and shingle carried by wind or waves.

Abrocomidae (rat chinchillas; order Rodentia, suborder Hystricomorpha) Family of medium-sized, rat-like rodents, with stiff hairs projecting over the nails of the three central digits of the hind feet. The skull is massive and narrow in the facial region; the braincase is rounded, with low occipital crests and short paroccipital processes; and the cheek teeth are hypsodont. Rat chinchillas live in colonies in burrows or crevices, and can climb trees. They are found only in the Andes from S. Peru to N. Argentina. There are two species in a single genus, *Abrocoma*.

abscisic acid A terpenoid 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.

2 ABSCISSION

In its effects it is antagonistic to the plant growth hormones, and is thought to act by inhibiting the synthesis of protein and nucleic acids.

abscission 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 inhibited by respiratory poisons, and is controlled in nature by the proportion and gradients of auxin and ethene. Other hormones may be involved.

absent rings See tree ring.

absolute humidity See humidity.

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 (RPF). 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 Uptake of substances, usually nutrients, water, or light, by cells or tissues.

Abutilon (family Malvaceae, tribe Abutileae) Genus of trees and shrubs, native to all arid zones of the world. It includes Chinese lanterns, grown as ornamentals. They have hairy leaves and branches, and bright, lantern-like flowers, mainly orange or red. The fruit is a schizocarp and the stigmas are usually apical. There are 30 species, all in N. Australia. The genus includes *A. avicennae* (China jute).

Abutilon avicennae (China jute) See *Abutilon*.

abyssal fish Fish living in the abyssal zone of the ocean. Many abyssal species have a prominent snout; a tapering, rat-tailed body, consisting of flabby, watery tissue; and a lightweight skeleton.

abyssal hills Relatively small topographical features of a dominantly flat deep-ocean floor, commonly 50–250 m in height and a few kilometres in width. They are most typical of the Pacific Ocean floor at depths of 3000–6000 m.

abyssal plain Smooth, almost level area of the deep-ocean floor in which the gradient is likely to be as low as 1 : 10 000. The covering sediments are usually thin deposits of a pelagic ooze or distal turbidite.

abyssal zone Zone of greatest ocean depth—that is, below a depth of 2000 m. This zone lies seaward of, and deeper than, the bathyal zone, and covers approximately 75% of the total ocean floor. It is the most extensive Earth environment, cold, dark, and still, supporting fauna that typically are black or grey, delicately structured, and not streamlined.

Abyssinian roller (*Coracias abyssinica*) See *Coracias*.

Acacia (family Leguminosae, subfamily Mimosoideae) Genus of plants, most of which are trees (wattles), although some are climbers. Typically the leaves are bipinnate, with numerous tiny leaflets, or phyllodic. They are important for timber, fuelwood, tannin, gum arabic (especially *A. senegal*), perfumes (*A. farnesiana*), and florists' 'mimosa' (usually *A. dealbata*). There are 750–800 species, most of them seasonal in the tropics and subtropics.

Acaena (family Rosaceae, subfamily Rosoideae, tribe Sanguisorbeae) Genus of wind-pollinated, mat-forming plants occurring mainly in the subtropics and temperate regions. There are rather more than 100 species; 90 species are found in S. America, 14 in New Zealand, two in Australia, and others in New Guinea, S. Africa, and California.

Acalypha (family Euphorbiaceae) Genus of shrubs and small trees. The flowers are unisexual and apetalous, males having elongate, twisted antherlobes, and females much-branched stigmas; some species bear catkins, as in 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 450 species, found in the tropics and subtropics.

Acanthaceae 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 four or five fused sepals and petals; 2–4 epipetalous stamens; a superior, bilocular ovary; and numerous, axile ovules. The fruit is a capsule. There are several ornamentals, e.g. *Acanthus*, *Aphelandra*, *Thunbergia*. There are about 250 genera, comprising about 2000 species, most of them tropical, but with temperate outliers.

Acanthisittidae (New Zealand wrens) See *Xenicidae*.

acanthite See argenteite.

Acanthiza (thornbills; family Acanthizidae) Genus of warblers, sometimes placed in the Sylvioidae or Maluridae. They are small, active, insectivorous birds, usually found in small parties feeding in or close to trees and bushes. They are mainly brown with differing rump colours, and are best distinguished by their calls and behaviour. The sexes are similar. There are 11 species, found only in Australia.

Acanthizidae (bristlebirds, scrub wrens, fairy warblers, thornbills, whitefaces; order Passeriformes) Family of birds with thin, pointed bills with basal bristles, all of which build domed nests. They are insectivorous and vary from strictly arboreal (fairy warblers) to ground-feeding (scrub wrens). The sexes are usually similar. There are 17 genera, comprising 63 species. They are found mainly in Australia and New Guinea.

Acanthobdellida (phylum Annelida, class Hirudinea) Order of parasitic annelid worms that lack an

anterior sucker. Bristles occur in the anterior region. There is one genus, *Acanthobdella*, that occurs only on salmon.

Acanthocephala Phylum of bilaterally symmetrical, worm-like organisms with elongate bodies which may show poor segmentation. Most do not have an excretory system, and all lack a gut. A retractable proboscis is present. They are all endoparasitic, living in two or three marine or terrestrial vertebrates during their development. The phylum contains about 600 species.

Acanthochitonina (class Amphineura, subclass Polyplacophora, order Neoloricata) A suborder which contains the largest of all polyplacophorans, but small members also occur. Posterior valves may not be present. The girdle may envelop the valves totally. They first appeared in the Oligocene.

Acanthoclinidae (class Osteichthyes, subclass Actinopterygii, order Perciformes) Family of small (8 cm), agile fish inhabiting tropical waters of the Indo-Pacific region. They have pelvic fins reduced to one spine and two soft rays.

Acanthodii Class of primitive, fossil fish, characterized by the presence of a true bony skeleton, a heterocercal tail fin, a persistent notochord, ganoid scales, and stout spines in front of the fins. The Acanthodians lived from the Silurian to the Permian Period and may be related to ancestors of the more modern bony fish.

Acanthopagrus latus (Japanese silver bream) See Sparidae.

Acanthophtalmus kuhlii (kuhli loach) See Cobiidae.

Acanthopterygii Superorder of bony fish including all spiny-finned fish (e.g. Perciformes and Beryciformes).

acanthosoma See postlarva.

Acanthuridae (surgeonfish, doctorfish; class Osteichthyes, subclass Actinopterygii, order Perciformes) Large family of slab-sided fish with a sharp spine on each side of the tailbase (hence the name 'surgeonfish'). The spine is retractable in some species. Many species exhibit striking colour patterns. There are about 80 species, found in all tropical seas, often feeding on organisms covering the surface of rocks, or on seagrasses.

Acanthus (family Acanthaceae) Genus of shrubs, most of which are xeromorphic and have spiny leaves. The upper lip of one corolla is lacking. The pattern for the decoration on Corinthian column capitals is supposedly based on the leaves of *A. spinosus*. There are 50 species, found in S. Europe (*A. mollis* is bear's breeches), Asia, and Africa (*A. ilicifolius* grows in mangrove swamps).

acari mites See Acarina.

Acarina (acari mites, ticks; class Arachnida) Order of small or very small arachnids that have a short, unsegmented abdomen. The body comprises three tagmata: the gnathosoma, the propodosoma (these two sometimes jointly called the protosoma), and the hysterosoma. The respiratory organs are

tracheae. Many species are parasites of medical and veterinary importance, and many are agricultural pests. The Acarina are regarded by many zoologists as an unnatural, polyphyletic group comprising elements derived independently from different arachnid stocks. There are 20 000 known species, 2800 of which are aquatic, including some that are marine.

acarinum A small pouch in the abdomen of Old World carpenter bees of the genus *Xylocopa* (subgenus *Koptortosoma*), which provide protection for symbiotic mites of the genus *Dinogamasus*.

accentors See Prunellidae.

accessory genitalia (secondary genitalia) Organ of intromission, present only in the males of the order Odonata. It is situated on the sternites of the second and third abdominal segments. It has no homologues in the animal kingdom.

accessory respiratory organ A system of air chambers formed by outgrowths from the mouth or gill region of fish that occasionally leave their aquatic environment. The uptake of oxygen from the air is facilitated by a dense network of tiny blood vessels in the skin that lines these air chambers. Possession of these organs enables such fish as labyrinthfish (Anabantidae), snakeheads (Channidae), or air-breathing catfish (Clariidae) to survive outside water for some considerable time. The swimbladder also may serve as an accessory respiratory organ. See also air breathing in fish.

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.

Accipiter (sparrowhawks, goshawks; family Accipitridae) The largest genus of birds of prey, comprising small to medium-sized hawks. Broad wings and long tails enable them to pursue prey through the woodland in which they live, and where they feed on mammals, birds, reptiles, and insects. The females are often larger than the males. There are 47 species, whose distribution is cosmopolitan.

Accipitridae (hawks, eagles, buzzards, kites, Old World vultures; order Falconiformes) The largest family of birds of prey, with many genera cosmopolitan in their distribution, especially *Accipiter*, *Buteo*, *Circus*, *Elanus*, and *Haliaeetus*, which make up nearly half the family. Other genera are more restricted in range, and more than half are monotypic. They are generally carnivorous, preying on snails, insects, fish, mammals, reptiles, and birds; but one species, *Gypohierax angolensis* (palm-nut vulture), feeds on oil-palm husks. There are 63 genera, with more than 200 species.

acclimation Response by an animal that enables it to tolerate a change in a single factor (e.g. temperature) in its environment. Applied most commonly to animals used in laboratory experiments. See acclimatization.

4 ACCLIMATIZATION

acclimatization 1 Reversible, adaptive response that enables animals to tolerate environmental change (e.g. seasonal climatic change). The response is physiological, but may affect behaviour (e.g. when an animal responds physiologically to falling temperature in ways that make hibernation possible, and behaviourally by seeking a nesting site, nesting materials, and food). 2 (acclimation, hardening) 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.

accumulated temperature 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 Term used in plant-succession studies to describe a pioneer species whose activities are claimed to enrich the abiotic environment with nutrients.

-aceae Standardized suffix used to indicate a ranking of plants at the family level in the recognized code of classification, e.g. in 'Rosaceae', the rose family.

acellular slime moulds Slime moulds in which the feeding stage is a true plasmodium.

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 chromosome in migration towards one or other pole as it has lost its point of attachment to the spindle.

Acer (family Aceraceae) Genus of trees in which the leaves are without stipules, opposite, and entire or often palmately lobed, but rarely pinnate (e.g. they are 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 are ornamentals; and maple syrup is obtained mainly from *A. saccharum*. Field maple (*A. campestre*) is wild in Britain; sycamore (*A. pseudoplatanus*), from S. Europe, is naturalized in Britain. There are about 200 species, mainly northern temperate, and a few in tropical mountains. China has 100–150 species.

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

acervulus 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 wine-glass; family Dasycladaceae, order Dasycladales) Genus of algae in which the mature thallus consists of a single axis or 'stalk' with a gametangial disc 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.

acetabulum Socket in the pelvis into which the head of the femur fits.

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

Acetobacter Genus of Gram-negative, aerobic bacteria not included in any taxonomic family. Cells are ovoid or rod-shaped, motile or non-motile. Certain species 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, etc.

acetylcholine (ACh) The acetylated form of choline involved in synaptic transmission between nerve cells. It is released from vesicles by the presynaptic neurone and diffuses across the synaptic cleft where it interacts with specific receptors to produce a local depolarization of the post-synaptic membrane, thus enabling the transmission of nerve impulses.

acetylcholine esterase Enzyme present within the synaptic cleft that hydrolyses acetylcholine to choline and acetic acid, thus preparing the synapse for the passage of a new impulse.

acetyl coenzyme A Important intermediate in the citric-acid cycle, and in fatty-acid and amino-acid metabolism.

ACh See acetylcholine.

achene Small, single-seeded, dry, indehiscent fruit.

Acherontia atropos (death's head hawkmoth; order Lepidoptera, family Sphingidae) Very large moth whose common name is derived from the skull-like pattern on the thorax. It robs beehives of honey. The moth squeaks by forcibly expelling air through its proboscis. The larva is very large, green or purple, and feeds on Solanaceae. The species is found in Africa, Europe, and N. Asia.

Acheulean See *Homo erectus*.

achira (*Canna edulis*) See *Canna*.

Acholeplasma See Acholeplasmataceae.

Acholeplasmataceae (class Mollicutes) Family of Gram-negative, prokaryotic, chemo-organotrophic organisms that do not require the presence of sterols for growth. Cells are spherical, pleomorphic, or filamentous. They are found as parasites in a variety of mammals and birds. There is one genus (*Acholeplasma*), containing five species.

Achras (family Sapotaceae) Genus of plants. *A. zapota* (*Mamilkara zapota*) yields the delicious fruit chiku, or sapodilla plum, for which it is now widely cultivated; and chicle, formerly the elastic component of chewing gum. There are four species, found in northern tropical America.

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*, which, after being treated with certain dyes, are not decolorized on subsequent treatment with a mineral acid.

acidic grassland 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 NW 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.

acidopore See Formicinae.

acid rock Igneous rock containing more than about 60% silica by weight, most of the silica being in the form of silicate minerals, but with the excess of about 10% as free quartz. Typical acid rocks are granites, granodiorites, and rhyolites. The limits are somewhat arbitrary and there are a number of schemes.

acid soil 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.

Acinonyx jubatus (cheetah) See Felidae.

Acipenseridae (sturgeons; class Osteichthyes, subclass Actinopterygii, order Acipenseriformes) Family of large, fairly sluggish, bottom-feeding fish with a low-slung mouth, toothless jaws, four barbels in front of the upper jaw, and rows of large plates along the body. Found in Europe and N. America. The majority of the 26 species are marine but ascend rivers to spawn. A few species, e.g. the sterlet (*Acipenser ruthenus*), live in fresh water, never reaching the sea. Sturgeons are very fertile, large females of the common sturgeon (*Acipenser sturio*) producing up to 6 000 000 eggs per year. The roe of ripe females after processing is renowned as caviar.

Acipenseriformes (class Osteichthyes, subclass Actinopterygii, superorder Chondrostei) Order of rather primitive fish characterized by a cartilaginous skeleton, a heterocercal tail-fin, and the head showing a pointy, protruding rostrum with a ventrally located mouth. Extant members of the order either have a naked skin or possess five rows of large, rhomboid, bony scales along the body; a spiral valve is found in the intestinal tract. Apart

from the sturgeon and the paddlefish the order includes a number of fossil representatives dating back to the Carboniferous Period.

Acochliidae (phylum Mollusca, class Gastropoda) Order of opisthobranch gastropods in which individuals are very small and benthic, living between sand grains. The visceral sac is thin and spiculate, and is often much longer than the foot and markedly separate from it. There is no shell. These gastropods are deposit feeders. According to some authorities the order contains three families; others include only one.

Acoela 1 (class Turbellaria, subclass Archoophora) Order of plathelminth worms that have no gut cavity or pharynx. **2** (phylum Mollusca, class Gastropoda) Order of opisthobranch gastropods that possess no shell, mantle cavity, or gills. Respiration is carried out by branchiae. Dorsal outgrowths are quite common, and all have undergone complete detorsion. Benthic and planktonic forms occur. There is only one fossil family recorded, which appeared in the Eocene. According to some authorities, the taxonomic use of 'Acoela' as a molluscan order is little accepted and should be discouraged. It represents an attempt to unite the Notaspidea and Nudibranchia.

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

aconite See *Eranthis*.

acoutium In Anthozoa, an extension of the mesentery-bearing nematocysts which lies in the gastric cavity but which can be protruded through the mouth in order to capture prey.

acorn barnacle See *Balanus balanoides*; and Balanidae.

acorn worms See Hemichordata.

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

acoustico-lateralis system Generally found in aquatic lower vertebrates (e.g. lampreys, sharks, bony fish, and one or two amphibians), it consists of the inner-ear region and the lateral-line organs located in the skin. Essentially a sensory system, it conveys environmental information to the brain of the vertebrate. Whereas the lateral-line organs respond to changes in water pressure and displacement, the inner ear responds to sound and gravity. See lateral line.

acquired characteristics 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 inherited by the next generation. Thus over several generations a particular type of organism would become better adapted to its