



TWELFTH EDITION

# HENDERSON'S DICTIONARY OF BIOLOGICAL TERMS

亨氏生物术语词汇 第12版

EDITED BY  
ELEANOR LAWRENCE



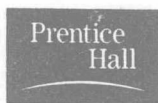
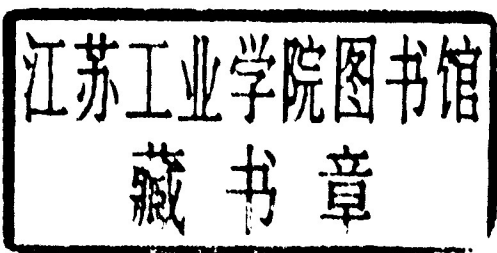
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HENDERSON'S DICTIONARY OF  
Biological Terms

*Twelfth Edition*

Eleanor Lawrence



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# PREFACE TO THE TWELFTH EDITION

Since the publication of the Eleventh Edition of *Henderson's Dictionary of Biological Terms* new words have entered the biological vocabulary and old ones have acquired new and more precise meanings. Progress in genetics, cell biology and biotechnology continues to be rapid, driven by the genome sequencing programmes, the use of gene manipulation and advances in experimental cell biology.

The classification of the living world followed in this edition reflects the recent division of all living things into three domains or superkingdoms. Entries in the body of the dictionary are given for all the main phyla, divisions and classes of plants, fungi, animals, protists and prokaryotes (Bacteria and Archaea), with some orders being included for groups such as the insects, birds, mammals and flowering plants. There are also entries under many common names of organisms. The appendices at the back give a fuller outline of the various kingdoms. Viruses are covered by entries for the main groups and in an appendix.

Terms are arranged in strict alphabetical order, disregarding hyphenation and spaces between words, with abbreviations and acronyms included in their appropriate place within the body of the dictionary. Numbers, Greek letters, and configurational letters at the beginning of chemical names are ignored for alphabetization purposes. Within an entry, different meanings of a term are numbered and separated by semicolons. The abbreviations (*bot.*), (*zool.*), etc. have been used in some cases to indicate more clearly which subject area a definition refers to. Almost all the technical terms that may be used as part of a definition are defined within the dictionary; to avoid complicating the text with excessive cross-referencing, such terms are not generally indicated by (*q.v.*) within the body of an entry.

Common suffixes and prefixes derived from Latin and Greek are entered in the body of the dictionary, along with their usual meanings, and Appendix 8 gives etymological origins of some common word elements.

I should like to thank the staff of Longmans for their help and encouragement throughout the project. Comments concerning errors or omissions in this edition will be greatly appreciated, so that they may be rectified in future reprints or editions.

Eleanor Lawrence  
London, 1999

# ABBREVIATIONS

*a.* adjective  
*adv.* adverb  
*alt.* alternative (synonym)  
*anat.* anatomy  
*appl.* applies or applied to  
*biochem.* biochemistry  
*bot.* botany  
*ca.* circa (approximately)  
*cf.* compare  
*dev. biol.* developmental biology  
EC Enzyme Commission number  
    (1978)  
e.g. for example  
esp. especially  
et al. and others  
etc. and so forth  
*evol.* evolution-  
*genet.* genetics  
Gk Greek  
i.e. that is  
*immunol.* immunology

L. Latin  
*microbiol.* microbiology  
*mol. biol.* molecular biology  
*mycol.* mycology  
*n.* noun  
*n* haploid no. of chromosomes  
*neurobiol.* neurobiology  
*pert.* pertaining to  
*plu.* plural  
p.p.m. parts per million  
*q.v.* see  
*r.n.* Enzyme Commission  
    recommended name, where it differs  
    from that used as the headword  
*sing.* singular  
sp. species (*sing.*)  
spp. species (*plu.*)  
*v.* verb  
*virol.* virology  
*zool.* zoology

# UNITS AND CONVERSIONS

## *Basic SI units*

ampere, A (electric current)  
candela, cd (luminous intensity)  
kelvin, K (temperature)  
kilogram, kg (mass)  
metre, m (length)  
mole, mol (amount of substance)  
second, s (time)

## Units and conversions

### *Some common derived SI units*

joule, J (energy)	$\text{kg m}^2 \text{s}^{-2}$
molar, M (concentration)	$\text{mol dm}^{-3}$ ( $\text{mol l}^{-1}$ )
newton, N (force)	$\text{kg m s}^{-2}$
pascal, Pa (pressure)	$\text{kg m}^{-1} \text{s}^{-2}$
volt, V (electrical potential)	
watt, W (power)	$\text{kg m}^2 \text{s}^{-3}$

### *Conversions from SI or metric*

centimetre, cm ( $10^{-2}$ m)	0.394 inches (in.)
degree Celsius (centigrade), °C*	(9/5) °F
gram, g ( $10^{-3}$ kg)	0.035 ounces (oz.)
hectare, ha ( $10^4$ m <sup>2</sup> )	2.471 acres
joule, J ( $\text{kg m}^2 \text{s}^{-2}$ )	0.239 calories (cal.)
kilogram, kg	2.20 pounds (lb)
litre, l ( $\text{dm}^3$ )	1.76 pints (pt)
metre	39.37 in.
millimetre, mm ( $10^{-3}$ m)	0.039 in.
tonne (metric ton), t (1 Mg)	0.984 tons

### *Conversions to SI or metric*

acre (4840 sq. yd)	4046.86 m <sup>2</sup>
ångström unit, Å	$10^{-10}$ m
atmosphere, standard, atm (14.72 p.s.i.)	101,325 Pa
bar	$10^5$ Pa
British thermal unit, Btu	1.055 kJ
British thermal unit/hour, Btu h <sup>-1</sup>	0.293 W
bushel, bu	$0.0364 \text{ m}^3$
bushel (US), bu	$0.0352 \text{ m}^3$
calorie, thermochemical	4.184 J
cubic foot, cu. ft, ft <sup>3</sup>	$0.0283 \text{ m}^3$
cubic inch, cu. in., in <sup>3</sup>	$16.387 \text{ cm}^3$
cubic yard, cu. yd, yd <sup>3</sup>	$0.7645 \text{ m}^3$
degree Fahrenheit, °F*	(5/9) °C
dram (avoirdupois), dr	1.772 g
fathom (6 ft)	1.829 m
fluid ounce, fl. oz	$28.413 \text{ cm}^3$
foot, ft	0.3048 m
gallon, gal	$4.546 \text{ dm}^3$
gallon (US), US gal	$3.785 \text{ dm}^3$
grain, gr	64.799 mg
hundredweight, cwt	50.802 kg
inch, in.	25.4 mm
kilocalorie/h, kcal h <sup>-1</sup>	1.163 W
mile	1.6093 km
millibar, mbar	100 Pa
millimetre of mercury, mm Hg	13.332 Pa

millimetre of water	9.807 Pa
ounce (avoirdupois), oz	0.0283 kg
pint, pt	0.568 dm <sup>3</sup>
pound (avoirdupois), lb	0.4536 kg
square foot, sq. ft, ft <sup>2</sup>	0.0929 m <sup>2</sup>
square inch, sq. in., in <sup>2</sup>	645.16 m <sup>2</sup>
square mile, sq. mile (640 acres)	2.590 km <sup>2</sup>
square yd, sq. yd, yd <sup>2</sup>	0.836 m <sup>2</sup>
ton (long) (2240 lb)	1016.05 kg
yard, yd	0.9144 m

\* To convert temperature in °C to °F, multiply by 9/5 and add 32; to convert °F to °C subtract 32, then multiply by 5/9.

## SI PREFIXES

The following prefixes may be used to construct decimal multiples of units.

<i>Multiple</i>	<i>Prefix</i>	<i>Symbol</i>	<i>Multiple</i>	<i>Prefix</i>	<i>Symbol</i>
10 <sup>-1</sup>	deci	d	10	deca	da
10 <sup>-2</sup>	centi	c	10 <sup>2</sup>	hecto	h
10 <sup>-3</sup>	milli	m	10 <sup>3</sup>	kilo	k
10 <sup>-6</sup>	micro	μ	10 <sup>6</sup>	mega	M
10 <sup>-9</sup>	nano	n	10 <sup>9</sup>	giga	G
10 <sup>-12</sup>	pico	p	10 <sup>12</sup>	tera	T
10 <sup>-15</sup>	femto	f			
10 <sup>-18</sup>	atto	a			

## GREEK ALPHABET

<i>Name</i>	<i>Greek letter</i>	<i>English equivalent</i>	<i>Name</i>	<i>Greek letter</i>	<i>English equivalent</i>
alpha	A α	a	nu	N ν	n
beta	B β	b	xi	Ξ ξ	x
gamma	Γ γ	g	omicron	O ο	o
delta	Δ δ	d	pi	Π π	p
epsilon	E ε	e	rho	Ρ ρ	r
zeta	Z ζ	z	sigma	Σ σ	s
eta	H η	e	tau	T τ	t
theta	Θ θ	th	upsilon	Υ υ	u
iota	I ι	i	phi	Φ φ	ph
kappa	K κ	k	chi	X χ	ch
lambda	Λ λ	l	psi	Ψ ψ	ps
mu	M μ	m	omega	Ω ω	o



## COMMON LATIN AND GREEK NOUN ENDINGS\*

*sing.*

-a

-a

-is

-on

-um

-us

*plu.*

-ae (L.)

-ata (Gk)

-es (L.)

-a (Gk)

-a (L.)

-i (L.)

\* Some familiar exceptions to these rules include genus (*sing.*), genera (*plu.*) and opus (*sing.*), opera (*plu.*).

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# A

**$\alpha$ -** for headwords with prefix  $\alpha$ - refer also to alpha or to headword itself.

**a-** prefix denoting lacking, without. Derived from Gk *a*, not.

**A** (1) absorbance *q.v.*; (2) adenine *q.v.*; (3) alanine *q.v.*

**Å** Ångström *q.v.*

**AAV** adeno-associated virus *q.v.*

**ab-** prefix derived from Gk *ab*, from.

**Ab** antibody *q.v.*

**ABA** abscisic acid *q.v.*

**abactinal** *a.* situated on the part of the echinoderm body not bearing tube-feet. *alt.* **abambulacral**.

**A-band** dark band seen in longitudinal sections of striated muscle myofibrils, repeating alternately with light bands (I-bands), and representing thick filaments interdigitating with thin filaments at their ends. *see* Fig. 28 (p. 398).

**abapical** *a.* (1) *pert.* or situated at lower pole; (2) away from the apex.

**abaxial** *a. pert.* that surface of any structure which is furthest from, or turned away from, the axis. *cf.* *adaxial*.

**abbreviated** *a.* (1) shortened; (2) curtailed.

**abcauline** *a.* outwards from, or not close to, the stem.

**abdomen** *n.* (1) in vertebrates, the lower part of the body cavity, containing the digestive organs, reproductive organs, kidneys and liver. In mammals it is separated from the thorax by the diaphragm; (2) in arthropods and certain polychaete worms, the posterior part of the body, behind the head and thoracic regions; (3) in tunicates, the section of the body containing stomach and intestines. *a.* **abdominal**.

**abdominal histoblast nests** *see* histoblast nests.

**abdominal pores** single or paired openings leading from coelom to exterior, in certain fishes.

**abdominal reflex** contraction of abdominal wall muscles when skin over the side of the abdomen is stimulated.

**abdominal regions nine** regions into which the human abdomen is divided by two horizontal and two vertical imaginary lines, comprising hypochondriac (two regions), lumbar (two), inguinal (two), epigastric, umbilical, hypogastric.

**abdominal ribs** bony structures occurring in fibrous tissue in abdominal region between skin and muscles in certain reptiles.

**abdominal ring** one of two openings in the connective tissue sheath of the abdominal muscles, through which passes the spermatic cord in males and the round ligament in females.

**abducens** *n.* sixth cranial nerve, supplying the rectus externus muscle of the eyeball.

**abduction** *n.* movement away from the median axis. *cf.* *adduction*.

**abductor** *n.* muscle that draws a limb or part outwards.

**abequose** *n.* 3,6-dideoxyhexose sugar found in lipopolysaccharide in outer membrane of some enteric bacteria.

**aberrant** *a.* with characteristics not in accordance with type, *appl.* species, etc.

**abhymenial** *a.* on or *pert.* the side of the gill opposite that of the hymenium in agaric fungi.

**abience** *n.* (1) retraction from stimulus; (2) avoiding reaction. *a.* **abient**.

**abiocoen** *n.* non-living parts of the environment in total.

**abiogenesis** *n.* production of living from non-living matter, as in the origin of life.

## abiology

Also sometimes refers to the theory of spontaneous generation, held in the 19th century and before, which stated that micro-organisms or higher organisms could arise directly from non-living material.

**abiology** *n.* study of non-living things in a biological context.

**abioseston** *n.* non-living material floating in the plankton.

**abiosis** *n.* apparent suspension of life.

**abiotic** *a.* non-living.

**abiotic environment** that part of an organism's environment consisting of non-biological factors such as topography, geology, climate, and inorganic nutrients.

**abjection** *n.* shedding of spores, as from sporophores, usually with some force.

**abjunction** *n.* delimitation of fungal spores by septa at tip of a hypha.

**ablactation** *n.* (1) cessation of milk secretion; (2) weaning.

**ablation** *n.* destruction or removal of a particular structure, piece of tissue or individual cell.

**Ab-MLV** Abelson murine leukaemia virus.

**abomasum** *n.* in ruminants, the fourth chamber of the stomach, into which acid and digestive enzymes are secreted, and in which the final stages of digestion take place.

**aboral** *a.* away from, or opposite to, the mouth.

**abortion** *n.* (1) premature birth of a dead foetus. Technically in humans expulsion of a foetus from the time of fertilization to 3 months gestation; (2) arrest of development of an organ (in plants and animals). *v.* to abort.

**abortive infection** virus infection in which no new infectious viral particles are produced.

**abortive transduction** failure of a transduced gene to be incorporated into the bacterial chromosome.

**ABO system** the main human blood group system used for matching blood for transfusion. It gives four blood groups (A, B, AB and O) due to the presence or absence of either or both of two antigens (A or B) on the red blood cells and the presence of naturally occurring antibodies against the absent antigen(s) in the serum (e.g. anti-A in B individuals and anti-B in A

individuals). This results in agglutination of red blood cells and "transfusion shock" if blood is given to an individual of an incompatible blood group. AB individuals possess A and B antigens and are therefore universal recipients, being able to receive A, B, AB or O blood. O individuals lack either antigen on their red cells and therefore can only receive O blood, but are universal donors.

**abranchiate** *n.* without gills.

**abrin** *n.* lectin isolated from *Abrus precatorius*, specific for D-galactose.

**abrupt** *a.* appearing as if broken, or cut off, at extremity, *appl.* e.g. leaves.

**abrupt speciation** formation of a species as a result of a sudden change in chromosome number or constitution.

**abruptly-acuminate** *a.* having a broad extremity from which a point arises, *appl.* leaf.

**abscise** *v.* (1) to become separated; (2) to fall off, as leaves or fruit.

**abscisic acid (ABA)** sesquiterpene plant hormone first discovered through its promotion of leaf senescence and leaf fall, but whose major functions are in adaptation of plants to environmental stresses such as drought. It induces stomatal closure and synthesis of proteins that protect against the effects of desiccation. It is also involved in the maintenance of dormancy in seeds and buds.

**abscission** *n.* separation of a part from the rest of the plant.

**abscission zone** region at the base of a leaf, flower, fruit, or other part of the plant. It consists of an abscission layer of weak cells whose breakdown separates the part from the rest of the plant, and a protective layer of corky cells formed over the wound when the part falls.

**absenteeism** *n.* practice of certain animals of nesting away from their offspring and visiting them from time to time to provide them with food and a minimum of care.

**absolute age** age of a rock, fossil or archaeological specimen in years before present (BP).

**absolute configuration** the arbitrary designation D- or L-, which denotes the handedness of a structural isomer and is based on the atomic configuration around

the asymmetric carbon atom. It applies to molecules that contain a centre of asymmetry and occur in mirror-image structural isomers, e.g. many sugars and amino acids.

**absolute refractory phase** *see* refractory phase.

**absorbance (A)** *n.* a spectrophotometric measurement of the absorption of light at a particular wavelength by a substance in solution. It can be used to determine the concentration of a substance and to follow conversion of substrate to product in enzyme reactions. *alt.* extinction, optical density.

**absorption** *n.* (1) uptake of fluid and solutes by living cells and tissues; (2) passage of nutritive material through living cells; (3) of light, when neither reflected nor transmitted by a substance.

**absorption spectrum** the characteristic plot of wavelength versus intensity of electromagnetic radiation that has been absorbed by a given substance.

**abstriction** *n.* detachment of spores or conidia from a fungal hypha by rounding off and constriction of the tip.

**abterminal** *a.* going from the end inwards.

**abundance** *n.* (1) the total number of individuals of a species or type present in a given area; (2) of mRNA, the average number of molecules of a particular mRNA per cell.

**abundant mRNA** class of cellular mRNA consisting of large numbers of copies of relatively few different sequences.

**abyssal** *a.* (1) *appl.* or *pert.* the deep sea below 2000 m and to the organisms and material found there; (2) *appl.* the depths of a lake where light does not penetrate.

**abyssobenthic** *a. pert.* or found on the ocean floor in the depths of the ocean, in the abyssal zone.

**abyssopelagic** *a. pert.* or inhabiting the ocean depths of the abyssal zone, but floating, not on the ocean floor.

**abzyme** *n.* antibody with enzymatic activity.

**acanaceous** *a.* bearing prickles.

**acanthaceous** *a.* bearing thorns or prickles.

**acanthion** *n.* the most prominent point on the nasal spine.

**acanthocarpous** *a.* having fruit covered in spines or prickles.

**Acanthocephala** *n.* phylum of pseudocoelomate animals, commonly called thorny-headed worms. As adults they are intestinal parasites of vertebrates and as larvae have an arthropod host.

**acanthocephalous** *a.* with a hooked proboscis.

**acanthocladius** *a.* having spiny branches.

**acanthocyst** *n.* sac containing lateral or reserve stylets in nemertine worms.

**Acanthodii** *n.* extinct group of cartilaginous fishes, first present in the Silurian. They are the first known jawed vertebrates. *alt.* spiny sharks.

**acanthoid** *a.* resembling a spine or prickle.

**Acanthopterygii, acanthopterygians** *n., n.plu.* large group of teleost fishes, having spiny fins and spiny scales, and including perch, mackerel and plaice.

**acanthosis** *n.* thickening of the inner layer of cells of the epidermis.

**acanthozoid** *n.* tail part of prosclex of cestodes (tapeworms).

**acapnia** *n.* condition of low carbon dioxide level in blood.

**Acari, Acarina** *n.* very large and varied order of arachnids, commonly called mites and ticks. The adults usually have a rounded body carrying four pairs of legs. Ticks are relatively large and parasitic, living as ectoparasites on mammals and sucking their blood. They are vectors of several serious diseases, including Rocky Mountain spotted fever and tick-borne encephalitis. Mites are smaller, inhabiting both plants and animals and are common in soil. They include both parasites and non-parasites, and are the vectors of scrub typhus in humans.

**acaricide** *n.* chemical compound used to kill ticks and mites (Acarina).

**acarocleidum** *n.* plant gall caused by gall mites.

**acarology** *n.* study of mites and ticks.

**acarophily** *n.* symbiosis of plants and mites.

**acarpous** *a.* not fruiting.

**acaryote, acaryotic** *see* akaryote, akaryotic.

**acaudate** *a.* lacking a tail.

**acaulous** *a.* having a shortened stem.

**acauline, acalous** *a.* having no stem or stipe.

**accelerator** *n.* muscle or nerve that increases rate of activity.

## accepted name

**accepted name** the name adopted as the correct name for a taxon.

**acceptor** *n.* substance that receives and unites with another substance in a chemical reaction, as in oxidation-reduction processes where the oxygen acceptor is the substance oxidized, the hydrogen acceptor the substance reduced.

**acceptor splice region** a site in the primary RNA transcript at the 3' end of an intron and the adjacent 5' end of the exon at which splicing takes place. *cf.* donor splice region.

**accessorius** *n.* (1) muscle aiding in the action of another; (2) accessory nerve *q.v.*

**accessory bud** (1) additional axillary bud; (2) bud formed on a leaf.

**accessory cell** (1) (*bot.*) subsidiary cell; (2) in the immune system, macrophages and other non-lymphoid cells which are involved in immune responses.

**accessory chromosomes** supernumerary chromosomes *q.v.*

**accessory nerve** 11th cranial nerve, supplying muscle of soft palate and pharynx and the sternomastoid and trapezius muscles.

**accessory pigment** photosynthetic pigment that captures light energy and transfers it to chlorophyll *a*, e.g. chlorophyll *b*, carotenoids and phycobilins.

**accessory pulsatory organs** sac-like structures in insects, variously situated, pulsating independently of the heart.

**accessory species** in plant ecology, a species that is found in a quarter to a half of the area of a stand. *cf.* accidental species.

**accidental species** in plant ecology, a species that is found in less than a quarter of a stand. *cf.* accessory species.

**accipiters** *n.plu.* hawks, medium-sized birds of prey with rounded wings and long tails, part of the family Accipitridae.

**acclimation** *n.* physiological habituation of an organism to a change in a particular environmental factor, for example the onset of winter. *cf.* acclimatization, adaptation.

**acclimatization** *n.* physiological and/or behavioural habituation of an organism to a different climate or environment. *cf.* acclimation, adaptation.

**accommodation** *n.* in the eye, the rapid change in the shape of the lens and thus in its focal length that enables the eye to receive clear images of objects at different distances away.

**accrescence** *n.* (1) growth through addition of similar tissues; (2) continued growth after flowering. *a. accrescent.*

**accrete** *a.* (1) grown or joined together; (2) formed by accretion.

**accretion** *n.* growth by external addition of new matter.

**accumbent** *a. appl.* embryo having cotyledons with edges turned towards radicle, as in dicot plants of the family Cruciferae.

**accumulator** *n.* plant that accumulates relatively high concentrations of certain chemical elements, such as heavy metals, in its tissues.

**A cell**  $\alpha$ -cell of islets of Langerhans in the pancreas, which secretes the hormone glucagon.

**ACE** angiotensin-converting enzyme *q.v.*

**acellular** *a.* not divided into cells.

**acellular slime moulds** Myxomycota *q.v.*

**acelomate** acelomate *q.v.*

**acelous** aceulous *q.v.*

**acentric** *a. appl.* chromosome or chromosome fragment lacking a centromere and which therefore does not segregate correctly at mitosis or meiosis.

**acentrous** *a.* with no vertebral centra, but with a persistent notochord, as in some fishes.

**acephalocyst** *n.* hydatid stage of some tapeworms.

**acephalous** *a.* having no structure comparable to a head, *appl.* some molluscs, *appl.* larvae of certain Diptera, *appl.* ovary without terminal stigma.

**Acerales** Sapindales *q.v.*

**acerate** *a.* (1) needle-shaped; (2) pointed at one end.

**acerose** *a.* narrow and slender, with sharp point, as leaf of pine.

**acerous** *a.* (1) hornless; (2) without antennae; (3) without tentacles.

**acervate** *a.* (1) heaped together; (2) clustered.

**acervuline** *a.* irregularly heaped together, *appl.* shape of foraminiferal tests.

**acervulus** *n.* small cluster of spore-bearing hyphae. *a. acervulate.*

**Acetabularia** genus of large unicellular green algae of which *A. mediterranea* has been used for experiments in developmental biology.

**acetabulum** *n.* (1) cup-shaped socket in pelvic girdle for head of femur, forming the hip joint in tetrapod vertebrates; (2) in insects, thoracic cavity in which leg is inserted; (3) socket of coxa in arachnids; (4) sucker used for attachment to host in flukes, tapeworms and leeches; (5) sucker on arm of cephalopod. *a.* **acetabular**.

**acetic acid bacteria** bacteria (e.g. *Acetobacter*, *Acetomonas*) that partially oxidize ethyl alcohol to produce acetic acid, a reaction used in manufacturing vinegar. *alt.* acetobacters.

**acetoacetate** *n.* ketone body, produced in liver, which is an important energy source esp. for heart muscle and renal cortex, and for brain during starvation.

**acetobacters** acetic acid bacteria *q.v.*

**acetotrophic** *a. appl.* methanogenic bacteria that break down acetate into methane and carbon dioxide.

**acetyl** chemical group,  $-\text{COCH}_3$ , formed by removal of  $-\text{OH}$  from acetic acid.

**acetyl-CoA pathway** pathway of autotrophic carbon dioxide fixation found in obligate anaerobic bacteria such as methanogens and sulphate-reducing bacteria.

**acetyl-coenzyme A (acetyl-CoA)** acetyl thioester of coenzyme A, produced during the aerobic breakdown of carbohydrates in cells. It is formed in mitochondria from pyruvate and coenzyme A and the acetyl group is subsequently oxidized to  $\text{CO}_2$  in the tricarboxylic acid cycle. Also formed during the breakdown of some amino acids and esp. in fatty acid oxidation. It is an important carrier of activated acetyl groups in metabolic reactions.

**acetylase** *see* acetyltransferase.

**acetylation** *n.* addition of an acetyl group to a molecule.

**acetylcholine (ACh)** *n.* neurotransmitter secreted by motor neurons that stimulate skeletal muscle, where it acts as an excitatory transmitter, and by certain neurons in the peripheral nervous system and within the brain. It acts as an inhibitory transmitter between the vagus nerve and heart muscle. Neurons secreting acetylcholine

are known as cholinergic. It acts at several different types of receptor.

**acetylcholine receptor** cell-surface protein that binds and is activated by the neurotransmitter acetylcholine. There are two main types, each with several subtypes. The nicotinic receptor (nAChR) is an ion channel and is found on the postsynaptic terminals of neurons and on skeletal muscle at neuromuscular junctions. The muscarinic acetylcholine receptor (mAChR) is a G protein-coupled receptor and is mainly present on neurons, heart muscle and in the gastrointestinal tract.

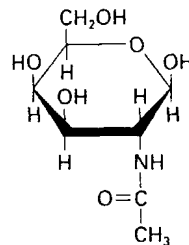
**acetylcholinesterase (AChE)** cholinesterase *q.v.*

**acetylene reduction assay** assay for the enzyme nitrogenase, in which acetylene is substituted for its normal substrate  $\text{N}_2$  and is reduced to ethylene or ethane.

**N-acetylgalactosamine (GalNAc)** *n.* acetyl derivative of the amino sugar galactosamine, with the acetyl group carried on the amino N. It is a common constituent of glycoproteins, certain heteropolysaccharides (e.g. chondroitin) and glycolipids. *see* Fig. 1.

**N-acetylglucosamine (GlcNAc)** *n.* acetyl derivative of the amino sugar glucosamine, with the acetyl group carried on the amino N. It is a common constituent of glycoproteins, certain heteropolysaccharides (e.g. hyaluronic acid) and glycolipids. It is also the subunit of the polysaccharide chitin.

**N-acetylmuramic acid (NAM)** monosaccharide present in the peptidoglycans of bacterial cell walls, comprising N-acetylglucosamine condensed with lactic acid.



**Fig. 1** *N*-acetylgalactosamine.

## **N-acetylneuraminic acid (NANA)**

**N-acetylneuraminic acid (NANA)** nine-carbon sugar acid, a component of gangliosides and of the carbohydrate side chains of some glycoproteins. *alt.* sialic acid.

**acetylsalicylic acid** aspirin, a compound with analgesic and anti-inflammatory properties, the latter being due to its inhibition of prostaglandin synthesis.

**acetyltransferase** *n.* any of a group of enzymes catalysing the transfer of acetyl groups, usually from acetyl-CoA (included in EC 2.3.1). *alt.* transacetylase.

**ACh** acetylcholine *q.v.*

**achaetous** *a.* without chaetae.

**AChE** acetylcholinesterase *q.v.*

**acheilary** *a.* having undeveloped labellum, as some orchids.

**achelate** *a.* without claws or chelae.

**achene** *n.* one-seeded, dry, indehiscent fruit formed from one carpel, with the seed usually not fused to the fruit wall.

**achiasmate, achiasmatic** *a.* lacking chiasma in meiosis, as some Diptera (e.g. in spermatogenesis in male *Drosophila*).

**Achilles tendon** the tendon of the heel, the united strong tendon of the gastrocnemius and soleus muscles. *alt.* tendo calcaneus.

**achlamydate** *a.* lacking a mantle, as some gastropods.

**achlamydeous** *a.* without calyx or corolla. *alt.* gymnanthous.

**achlorophyllous** *a.* lacking chlorophyll.

**acholeplasma** *n.* mycoplasma-like micro-organism.

**achondroplasia** *n.* dominantly inherited form of dwarfism characterized by disturbance of ossification of the long bones of the limbs and of certain facial bones during development.

**AChR** (1) acetylcholine receptor *q.v.*; (2) **mAChR** muscarinic acetylcholine receptor; (3) **nAChR** nicotinic acetylcholine receptor.

**achroglobin** *n.* colourless respiratory pigment found in some molluscs and tunicates.

**achroic** *a.* colourless.

**achromasie** *n.* emission of chromatin from nucleus.

**achromatic** *a.* (1) colourless; (2) *appl.* threshold, the minimal stimulus inducing sensation of luminosity or brightness.

**achromatopsia** *n.* lack of colour vision but not black-and-white vision.

**achromatous, achromic** *a.* colourless, unpigmented.

**A chromosomes** the normal chromosomes of a diploid set, as opposed to the B or supernumerary chromosomes.

**acicle** *n.* small needle-like bristle, spine or crystal. *alt.* **acicula**. *plu.* **aciculae**.

**aciculate** *a.* having acicles.

**aciculilignosa** *n.* evergreen forest and bush made up of needle-leaved coniferous trees and shrubs.

**aciculum** *n.* thick central bristle (chaeta) in tuft of chaetae on parapodia of polychaete worms. *plu.* **acicula**.

**acid** *n.* substance that releases H<sup>+</sup> ions (protons) in solution and thus causes a rise in proton concentration in the solution. Acid solutions have a pH < 7. *cf.* base.

**acidaemia** *n.* abnormally high acidity (low pH) of the blood.

**acid-alcohol fast** remaining stained with aniline dyes after treatment with acid-alcohol.

**acid-base balance** the correct ratio of acids to bases in blood for maintaining a suitable pH.

**acid deposition** rain (acid rain) or other form of precipitation, or dry deposition, which contains acids and acid-forming compounds and has a pH < 5.6. It can cause acidification of lakes, with harmful effects on the aquatic flora and fauna, and damage to terrestrial vegetation. Acid deposition is caused mainly by atmospheric sulphur dioxide produced by the burning of coal and other fossil fuels, which is precipitated as sulphuric acid and sulphates, and by nitrogen oxides emitted from fossil fuel burning and vehicle exhausts, which form nitric acid and nitrogen dioxide.

**acid-fast** *a.* remaining stained with aniline dyes on treatment with acid.

**acid gland** (1) acid-secreting gland of ants, bees and wasps; (2) acid-secreting oxyntic cells of mammalian stomach.

**acid hydrolase** any of a range of hydrolytic enzymes active at acid pH (around pH 5), found esp. in lysosomes and including proteinases, phosphatases, nucleases, glycosidases, lipases, phospholipases and sulphatases.

**acidic** *a.* (1) having the properties of an acid; (2) *appl.* stains such as eosin that react



- with basic components of protoplasm such as cytoplasm and collagen.
- acidophile** *n.* (1) plant that grows best on acid soils; (2) microorganism that grows best in acidic ( $\text{pH} < 5$ ) conditions, and can be isolated on acidic media. *a.* **acidophilic, acidophilous.**
- acidophobic** *a.* unable to tolerate acid conditions.
- acidosis** *n.* abnormally high acidity of body tissues and fluids due to failure of normal regulation of acid-base balance.
- acid phosphatase** enzyme, found esp. in lysosomes, that catalyses the hydrolysis of an orthophosphate monoester to an alcohol and orthophosphate at acid pH. EC 3.1.3.2.
- acid precipitation** see acid deposition.
- acid proteases, acid proteinases** proteolytic enzymes that require relatively acid pH to be active.
- acid rain** see acid deposition.
- acid shock** the biological disruption due to rapid acidification of aquatic ecosystems.
- acid tide** transient increase in acidity of body fluids that follows the decrease in acidity (alkaline tide) after eating.
- aciduria** *n.* condition in which pH of urine is lowered.
- aciduric** *a.* tolerating acid conditions.
- aciform** *a.* needle-shaped.
- acinaciform** *a.* shaped like a sabre or scimitar, *appl.* leaf.
- acinar** *a. pert.* acinus.
- acinar cell** pancreatic secretory cell, characterized by sac-like terminations.
- acinariou** *a.* having globose vesicles, as some algae.
- aciniform** *a.* grape- or berry-shaped.
- acinus** *n.* (1) cluster of cells forming the inner secretory region of a gland, usually a branched or compound gland. *alt.* alveolus. *plu.* **acini**; (2) (*bot.*) drupel *q.v.*
- acleidian** *a.* with clavicles vestigial or absent.
- acoelomate** *a. appl.* animals not having a true coelom (i.e. sponges, sea anemones and corals, nematodes, rotifers, platyhelminths, and nemertean worms). *alt.* acoelous.
- acoelous** *a.* (1) acoelomate *q.v.*; (2) *appl.* vertebrae with flattened centra.
- acondylous** *a.* without nodes or joints.
- acone** *a. appl.* insect compound eye without crystalline or liquid secretion from cone cells.
- aconitase** *n.* see aconitic acid. EC 4.2.1.3, *r.n.* aconitate hydratase.
- aconitic acid, aconitate** *n.* six-carbon intermediate (as *cis*-aconitate) in the tricarboxylic acid cycle, formed from citrate and converted into isocitrate by the enzyme aconitase.
- acantium** *n.* thread-like process armed with stinging cells, borne on the mesenteries of some sea anemones. *plu.* **acontia.**
- acorn worms** Enteropneusta *q.v.*
- acotyledonous** *a.* lacking cotyledons.
- acoustic** *a. pert.* organs or sense of hearing, *appl.* e.g. nerve.
- acoustic reflex** adjustment of the muscles that regulate the positions of the ossicles in the mammalian ear. It is a protective mechanism against damage by too loud a noise.
- acoustico-lateralis system** sensory system concerned with movement detection and avoidance of obstacles in fish and amphibians. It consists of vibration-sensitive hair cells located in the ear and/or on the external surface (the lateral line system in fishes), which detect vibrations in the surrounding liquid.
- ACP** acyl carrier protein *q.v.*
- acquired behaviour** behaviour brought on by conditioning or learning.
- acquired character** modification or permanent structural change brought on during the lifetime of an individual by use or disuse of a particular organ, disease, trauma or other environmental influence, and which is not heritable.
- acquired immune deficiency syndrome (AIDS)** fatal T-cell deficiency disease caused by infection with the human immunodeficiency virus (HIV), a retrovirus, which results in severe depletion of a particular class of T lymphocytes and consequent immunodeficiency. The immunodeficient patient is susceptible to infection by opportunistic pathogens (e.g. *Candida*, *Pneumocystis*) and to the development of unusual cancers (Kaposi's sarcoma). HIV is transmitted sexually or by infected blood and blood products, and can be transmitted from mother to child at birth or by breast feeding.
- acquired immunity** immunity to infection produced by previous exposure to a