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Introduction to Biological Latin and Greek

Fourth Edition, Revised and Enlarged

by

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Introduction to Biological Latin and Greek

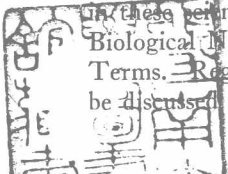
INTRODUCTION

The first scientific study of nature was undertaken by the Greek philosophers, especially Aristotle, who has justly been called the "Father of Biology." His treatises, "On the Nature of Animals" and others, are the earliest examples of a specifically biological literature, and his classification of animals remained in vogue until the time of Linnaeus. Hence the science of biology started off with a distinctly Grecian terminology.

This work was continued, more particularly in the field of medicine, by the Roman physicians, such as Galen, who gave to many of the original Greek terms a Latin form and added many more purely Latin words to the vocabulary of biology. During the Middle Ages the works of Aristotle were translated into Latin and much of his terminology was retained in a Latin dress. At that time also and on down into modern times Latin was the language of the schools and all scientific works were written in that language. After Latin was abandoned as the medium of instruction, biologists were still educated along classical lines and, consequently, described their discoveries in terms borrowed from the classical languages. Moreover, Latin provided a universally understandable medium for expressing ideas, especially for the naming of plants and animals which do not terminology was securely fixed by the "Systema Naturae" of Carl conform to man-made national boundaries. This last use of Graeco-Latin von Linné, better known under his Latin name, Linnaeus.

Thus it has come about that most of the terms used in biology and medicine today are derived from Latin or Greek, those from the latter usually having been changed into a Latin form. This Graeco-Latin vocabulary, which proved so helpful in an earlier day, has, with the decline of classical education, proved rather a stumbling-block to students of biology. For, today, very few study Latin (or, at least, enough to be of any help) and practically none, Greek, therefore the terminology of science is mostly a meaningless jargon. Every term has to be learned parrot-fashion and is soon forgotten.

In an effort to remedy this situation the author has prepared this briefest adequate summary of the main facts and forms of the Latin and Greek languages which will be useful for students of the biological sciences in the hope that it will give them a linguistic foundation for better work in these sciences. The work is divided into four sections: Latin; Greek; Biological Nomenclature; and Some Common Latin and Greek Roots and Terms. Regarding the first two, while the two languages must necessarily be discussed separately, however, since most Greek words have come to us



through the Latin, no attempt will be made to distinguish them as to origin in these parts and examples from both languages will be used indiscriminately.

LATIN

1. THE ALPHABET. The Latin alphabet is the same as the English, except that it does not contain the letters *j*, *v*, and *w*. *K* occurs in a few words, having been largely substituted for by *C*. *Z* is found only in words from the Greek. *I* and *U* were used both as vowels and consonants. When used as consonants they are written and printed *J* and *V* in modern scientific words, e.g. *major*, *vermis*.

2. PRONUNCIATION. Scholars are not agreed on all the details of the Roman pronunciation of Latin, hence almost every nationality has its own way of pronouncing this language. It is beyond the scope of this work to discuss pronunciation in detail. Suffice it to say that in scientific circles among the English-speaking peoples an "English" pronunciation of Latin and latinized Greek has become widespread. For details of this "English Method" consult Muldoon, *Lessons in Pharmaceutical Latin and Prescription Writing and Interpretation* (New York, 1937). The following are the main points.

1) The vowels *a*, *e*, *i*, *y*, *o*, and *u* are usually pronounced long when stressed or final, e.g., *cāva*, *sērum*, *mēdiastīnum*, *cŷanīdum*, *rōsa*, *ūterus* and *bacillī*. But when they stand before two consonants they are pronounced short, e.g., *extrāctum*, *ascēndens*, *intērnus*, *ōssis*, *colūmna*, unless one of the two consonants is *l*, *r* or *h*, in which case they may be long, e.g., *citrīcum*. They may also be short when they end an accented syllable, e.g., *gelā'tinum*.

2) The diphthongs *ae* and *oe*, and also the *ie* of words of the fifth declension, are pronounced like *ee*, e.g., *tunicae* (tunisee), *coecum* (seecum), *species* (speeshees). The diphthong *au* is sounded like awe, e.g., *cauda* (cawda). The diphthong *eu* of Greek words is pronounced as long *u*, e.g., *Euchordata* (ūcordata).

3) Consonants are pronounced as in English. For instance, *c* and *g* are hard before *a*, *o*, *u*, the diphthong *au* and all consonants, e.g., *cava*, *corona*, *cutis*, *cauda*, *cloaca* and *galea*, *Gordius*, *gubernaculum*, *gaudium*, *glans*. They are pronounced soft before *e*, *i*, *y*, and the diphthongs *ae*, *oe*, and *eu*, e.g., *cervix*, *circum*, *cyanidum*, *caecum*, or *coecum*, *pharmaceuticum* and *genu*, *gingiva*, *gyrus*.

Final *s* is often pronounced like *z*, e.g., *pars* (parz); and *es* like ease, e.g., *fomes* (foamease).

Ch is pronounced *K*, e.g. *chara* (kara), *branchia* (brankia)

4) A Latin word has as many syllables as it contains vowels or diphthongs and generally every syllable is pronounced, e.g., *mediale* (mee-dee-ā'lee). However, there are many exceptions, as *species* above.

5) Most Latin words used in biology have the accent on the penult or next to the last syllable, e.g., *ascen'dens*, *exter'nus*. But, *mī'nimus* and *-is'simus*.

3. WORD FORMATION. Latin words are composed of two parts: 1) an invariable *root* or *stem*; and 2) a variable *ending*. The variations in the latter indicate the different functional uses and meanings of the word as to gender, number, and case. Thus the word *rosa* (rose) has the stem *ros-* and the endings: singular, *a, ae, ae, am, a, a*; and plural, *ae, arum, is, as, ae, is*. However, for the biologist, only one or, at most, two endings are important.

4. DECLENSIONS. Latin nouns are divided into five *declensions* according to the kind of endings they have. Each declension has six *cases* in both singular and plural: Nominative, Genitive, Dative, Accusative, Vocative, and Ablative. However, only two of these are needed by the biologist: the Nominative which is equivalent to the subjective case in English and merely names the thing; and the Genitive which signifies possession and corresponds to the possessive case in English and is translated by the preposition "of" or the apostrophe 's.

Attention must be called to the fact that the stem is not always contained in the Nominative. Sometimes, too, the Nominative varies in the same declension. This is signified in the table below by "var." The endings of the Nominative and Genitive singular and plural of the five declensions with examples and some uses of the Genitive of words occurring in biology are given in the following table. Some declensions have more than one form; these are indicated by subdivisions. The stem and ending are separated by a hyphen and separated endings are preceded by a hyphen. The English plural is placed in parenthesis after the singular.

5. *Diminutives*. Many biological names are diminutives signifying smaller size than that of the primitive. In Latin diminutives end in *-olus, -ulus, -ellus, and -culus*. They are of the same gender as their primitives. They are anglicized into *-ole, -ule, -elle, -cule, and -cle*. They usually follow these rules:

1) Diminutives in *-olus, -ulus, and -ellus* are formed from primitives of the first and second declensions in the following manner:

a) When the stem of the primitive ends in a vowel, the ending *-olus* is added to it, e.g., *nucle-olus, besti-ola*. English forms: *arteriole, centriole*.

b) When the stem of the primitive ends in a consonant, the ending *-ulus* is added to it, e.g., *hort-ulus, lun-ula, capit-ulum*. English forms: *venule, plumule*.

c) When the stem of the primitive ends in *l, n, or r* it is generally contracted, and then the ending *-ellus* is added to it, e.g., *oc-ellus* (from *ocul-us*), *as-ellus* (from *asin-us*). English form: *organelle*.

2) Diminutives in *-culus* are formed from primitives of the third and fourth declensions, as follows:

a) When the stem ends in *r*, the ending *-culus* is added to the nominative, e.g., *flos-culus, mulier-cula*.

b) When the stem does not end in *r*, the ending *-culus* is added to it by means of the connective vowel *i*, e.g., *fasc-i-culus, fun-i-culus, nav-i-cula, ret-i-culum*. English forms: *fascicle, reticule*.

Declension		Endings		Examples and Uses of Genitive	
		Singular	Plural		
I.	Nom.	-a	-ae	ros-a, -ae; rose (s)	
	Gen.	-ae	-arum	ros-ae, -arum; of the rose(s) <i>levator scapulae</i> —levator of the shoulder <i>levatores costarum</i> —levators of the ribs	
II. 1.	Nom.	-us	-i	bacill-us, -i; little rod(s)	
	Gen.	-i	-orum	bacill-i, -orum; of the little rod(s) <i>abductor digiti</i> —abductor of the finger <i>flexor digitorum</i> —flexor of the fingers	
	2. Nom.	-um	-a	cili-um, -a; eyelid(s)	
		Gen.	-i	-orum	cili-i, -orum; of the eyelid(s) <i>ampulla recti</i> —ampulla of the rectum <i>commissura labiorum</i> —commissure of the lips
	III. 1.	Nom.	var.	-es	homo, homin-es; man (men) dens, dent-es; tooth (teeth)
		Gen.	-is	-um	homin-is, -um; of the man (men) or the man's (men's)
-is			-ium	dent-is, -ium; of the tooth (teeth) <i>cavum dentis</i> —socket of the tooth <i>juncturae tendinum</i> —junctions of tendons	
2. Nom.		var.	-a	caput, capit-a; head(s)	
		-ia	animal, animal-ia; living thing(s)		
	Gen.	-is	-um	capit-is, -um; of the head(s)	
		-is	-ium	animal-is, -ium; of the living thing(s) <i>semispinalis capitis</i> —semispinal muscle of the head <i>Historia Animalium</i> —The History of Living Things	
IV. 1.	Nom.	-us	-us	sin-us, -us; bay(s)	
	Gen.	-us	-uum	sin-us, -uum; of the bay(s) <i>valvula sinus coronarii</i> —valve of the coronary sinus <i>confluens sinuum</i> —confluence of sinuses	
	2. Nom.	-u	-ua	gen-u, -ua; knee(s)	
		Gen.	-us	-uum	gen-us, -uum; of the knee(s) <i>articulatio genus</i> —the knee joint <i>bulbi cornuum</i> —bulbs of the horns
	V.	Nom.	-es	-es	faci-es, -es; face(s)
		Gen.	-ei	-erum	faci-ei, -erum; of the face(s) <i>nervus faciei</i> —nerve of the face <i>origo specierum</i> —origin of species

c) Primitives in *es* generally drop *s* and add *-cula*, e.g., *vulpe-cula* (from *vulp-es*), *mole-cula* (from *mol-es*). English form: *molecule*.

d) Primitives in *o* change the stem syllables *on* and *in* into *un*, e.g., *homun-culus* (from *homo*, *homin-is*), *virgun-cula* (from *virgo*, *virgin-is*)

3) No fixed rule: *cat-ellus* (from *catul-us*), *Dorid-ella* and *Doridunculus* (from *Doris*), *furun-culus* (from *fur*), *Ranun-culus* (from *Rana*), *vas-culum* (from *vas*), *cor-olla* and *coron-ella* (from *corona*).

6. AGREEMENT OF ADJECTIVES. Many biological terms, especially the specific names of organisms and the names of bones, muscles, etc., are often adjectives expressing some characteristic of the organism or part. There are three groups of adjectives in Latin, namely, those having:

1) *Three endings* distinct for masculine, feminine, and neuter genders which may be either: *-us*, *-a*, *-um*, e.g., *bon-us*, *bon-a*, *bon-um*; or *-er*, *-is*, *-e*, e.g., *ac-er*, *acr-is*, *acr-e*.

2) *Two endings*, one for the masculine and feminine and the other for the neuter, namely, *-is* and *-e*, e.g. *grav-is*, *grav-e*.

3) *One ending* for all genders, usually *ns* or *x*, e.g., *sapiens*, *simplex*.

Adjectives must agree in gender, number, and case with the nouns they modify, consequently the specific name of an organism must have the same gender as the generic name (they are usually singular nominatives). Thus the common house cat belongs to the genus *Felis* which is a feminine noun. Therefore the adjective used as the specific name must be feminine, namely, *domestica* (from *domus*—house). On the other hand the dog belongs to the genus *Canis* which is masculine, hence the specific names of the various species of dogs must be masculine adjectives, e.g. *C. rufus*—the red wolf; *C. familiaris*—the domesticated dog; *C. latrans*—the coyote. The genus *Paramecium* is neuter, therefore all species of paramecium should be neuter adjectives, e.g., *P. caudatum*, *P. multimicronucleatum* (not *multimicronucleat*, as some authors call it).

The Latin word for bone is *os* (*ossa*), a neuter noun. Therefore, adjectives used as the names of specific bones should be in the neuter, e.g., *os innominatum* (*ossa innominata*). However, many bones are named from the part of the body where they are found. In that case the specific name is in the genitive case of the part where they are located, e.g., *os cordis*—the bone of the heart (*cor*, *cord-is*). *Ligamentum* (*ligamenta*)—ligament(s) is similar, e.g., *ligamentum latum*, *ligamenta flava*, *ligamentum nuchae*.

The word for muscle is *musculus* (*musculi*), a masculine word of the second declension. Adjectives used as the names of muscles must be masculine and in the singular or plural, according as one or more than one muscle is referred to, e.g., *musculus interosseus* (*musculi interossei*)—the muscle(s) between the bones of the fingers. In most cases the word *musculus* is omitted or abbreviated to *m.*, and the adjective alone used as the name of the muscle, e.g., *flexor communis* (*flexores communes*). *Nervus* (*nervi*)—nerve (s) follows the same rule, e.g., *nervus splanchnicus*, *nervus radialis*.

The words for artery and vein, *arteria* and *vena*, are feminine words of the first declension. Adjectives used as the names of arteries and veins must be feminine singular or plural as the case may be, e.g., *arteria iliaca externa*, *vena cava*, *arteriolae rectae*, *venae stellatae*. Again the words *arteria* and *vena* are often omitted and the adjectives alone used, e.g., *carotis interna*.

7. *Comparison of Adjectives*. In some cases the comparative or superlative degree of adjectives is used to signify greater or lesser size or importance. The comparative degree is formed by adding the endings *-ior* (*iores*) for the masculine and feminine, and *-ius* (*iora*) for the neuter to the stem of the positive, e.g., *m. carpi radialis brevior* (from *brev-is*), *ligamentum cruciatum posterius* (from *posterus*, *-a*, *-um*).

However, in many cases the irregular comparatives *major* (*-es*), masculine and feminine, and *majus* (*majora*), neuter (from *magnus*, *-a*, *-um*) and *minor* (*-es*) or *minus* (*minora*), are added to the noun, e.g., *m. pectoralis major* and *minor*, *os multangulum majus* and *minus*.

The superlative degree is formed by adding *-issimus*, *-a*, *-um* or *-imus*, *-a*, *-um* to the positive, e.g., *m. latissimus* (from *latus*) *dorsi*. Sometimes the irregular superlative forms *maximus*, *-a*, *-um* (from *magnus*) and *minimus*, *-a*, *-um* (from *parvus*), are added to the noun, e.g., *m. gluteus maximus*, *nervus splanchnicus minimus*, *venae cordis minimae*.

8. NUMERALS may be *cardinals* (one, two, three), *ordinals* (first, second, third), *distributives* (one by one, two by two, three by three), or *adverbials* (once, twice, thrice). With the exception of the first three cardinals and all of the ordinals and distributives, numerals are indeclinable adjectives. The first twelve, hundred, and thousand are of most frequent occurrence.

	Cardinals	Ordinals	Distributives	Adverbials
I	unus, -a, -um	primus, -a, -um	singuli, -ae, -a	semel
II	duo, duae, duo	secundus	bini	bis
III	tres, tria	tertius	terni	ter
IV	quattuor	quartus	quaterni	quater
V	quinque	quintus	quini	quinquies
VI	sex	sextus	seni	sexies
VII	septem	septimus	septeni	septies
VIII	octo	octavus	octoni	octies
IX	novem	nonus	noveni	novies
X	decem	decimus	deni	decies
XI	undecim	undecimus	undeni	undecies
XII	duodecim	duodecimus	duodeni	duodecies
C	centum	centesimus	centeni	centies
M	mille, -ia	millesimus	singula	millies
			millia	

GREEK

1. ALPHABET. The letters of the Greek alphabet have about the same sounds as those of Latin but are named and written somewhat differently. Scientific words from Greek are usually in Latin form but since

THE GREEK ALPHABET

<i>Form</i>	<i>Sound</i>	<i>Name</i>
A α	a in far	ἄλφα alpha
B β	b	βῆτα beta
Γ γ	g in go	γάμμα gamma
Δ δ	d	δέλτα delta
E ε	ě in met	εἶ, εἰ ψῖλόν epsilon
Z ζ	dz	ζῆτα zeta
H η	ey in obey	ἦτα eta
Θ θ	th in thin	θῆτα theta
I ι	i in machine	ἰῶτα iota
K κ	k	κάππα kappa
Λ λ	l	λάμβδα lambda
M μ	m	μῦ mu
N ν	n	νῦ nu
Ξ ξ	ks, x in flax	ξεῖ, ξῖ xi
O ο	ō in renovate	οῦ, ὄ μικρόν omicron
Π π	p	πεῖ, πῖ pi
P ρ	r	ῥῶ rho
Σ σ s	s in see	σίγμα sigma
T τ	t in to	ταῦ tau
Υ υ	French u, Germ. u	ῦ, ὕ ψῖλόν upsilon
Φ φ	ph in physics	φεῖ, φῖ phi
X χ	German ch	χεῖ, χῖ chi
Ψ ψ	ps	ψεῖ, ψῖ psi
Ω ω	ō in no	ῶ, ῷ μέγα omega

The initial sound of the name (last column) gives the sound of the letter.

Greek letters are often used to designate formulae and divisions they are herewith transcribed with their names, sounds, and English equivalents.

2. PRONUNCIATION. The same may be said of Greek as was said of Latin pronunciation. The "English Method" is usually followed in scientific circles.

3. WORD FORMATION. Similar to Latin.

4. DECLENSIONS. There are three declensions in Greek which correspond roughly with the I, II, and III declensions of Latin, some of whose endings are substituted for those of the Greek in scientific terminology

Declension	Endings		Examples and Uses
	Singular	Plural	
I.	Nom. -a	-ai (ae)	cardi-a; -ai; heart(s)— <i>cardiac</i>
	-e (a)	-ai (ae)	cephal-e, -ai; head(s)— <i>cephalic</i>
	Gen. -as (ae)	-on (arum)	cardi-as, -on; of the heart(s)
	-es (ae)	-on (arum)	cephal-es; -on; of the head(s)
II. 1.	Nom. -os (us)	-oi (i)	bi-os, -oi; life (lives)— <i>biology</i>
	Gen. -ou (i)	-on (orum)	bi-ou, -on; of the life (lives)
	2. Nom. -on (um)	-a	gangli-on, -a; swelling(s)
	Gen. -ou (i)	-on (orum)	gangli-ou (i), -on (orum); of the swelling(s)
			<i>Radices ganglii ciliaris</i>
III. 1.	Nom. -ps	-es	phleps, phleb-es; vein(s)— <i>phlebitis</i>
	-x	-es	pharynx, pharyng-es; throat(s)
	-is	-es	epididymis, epididymid-es
			physis, -es (eis); growth(s)
	-as	-es	gigas, gigant-es; giant(s)— <i>gigantism</i>
	-on	-es	geron, geront-es; old man (men)
	Gen. -os (is)	-on (um)	phleb-os, -on; of the vein(s)
	-os (is)	-on (um)	pharyng-os (is), -on (um); of the throat(s)
			— <i>Raphe pharyngis</i>
	-os (is)	-on (um)	epididymid-os (is), -on (um)— <i>Ligamentum epididymidis</i> ; <i>Decussatio pyramidum</i>
	-os (is)	-on (um)	phys-eos (is), -on (ium)— <i>Fossa hypophyseos</i> , <i>Facies symphyseos</i>
	2. Nom. -a	-a	chiasma, chiasmat-a; crossing(s)
	-ar	-a	hepar, hepat-a; liver(s)— <i>hepatic</i>
	-as	-a	keras, kerat-a; horn(s)— <i>keratin</i>
	Gen. -os (is)	-on (um)	chiasmat-os (is); -on (um)— <i>Cisterna chiasmatis</i>
	-os (is)	-on (um)	hepat-os (is), -on (um)— <i>Porta hepatis</i>
	3. Nom. -er	-es	ther, ther-es; beast(s)— <i>therapsida</i>
			gaster, gastr-es; belly(ies)— <i>gastric</i>
			aner, andr-es; man (men)— <i>androgen</i>
	-is	-es	rhis, rhin-es; nose(s)— <i>rhinoceros</i>
			ornis, ornith-es; bird(s)— <i>ornithology</i>
	-on	-es	axon, axon-es; axle(s)— <i>axonal</i>
	Gen. -os (is)	-on (um)	ther-os, -on; of the beast(s)
	-os (is)	-on (um)	gastr-os, -on; of the belly(ies)
	-os (is)	-on (um)	andr-os, -on; of the man (men)
	-os (is)	-on (um)	rhin-os, -on; of the nose(s)
	-os (is)	-on (um)	axon-os, -on; of the axle(s)
4.	Nom. -ys	-es	ichthys, ichthy-es; fish(es)
	Gen. -os	-on	ichthy-os, -on; of the fish(es)— <i>Ichthyology</i>

(indicated below in parentheses). Each declension has several forms but only the more common ones occurring in scientific words are transliterated here with examples and some uses of the genitives. The nominative singular, especially in the III declension, often does not show the stem.

There are a number of words which do not fit into any of the above forms. A few of biological significance are given here.

odous, odont-es; tooth (teeth)—odontology
 pous, pod-es; foot (feet)—podagra, podiatry, pseudopod
 ous, ot-a; ear(s)—otic, otology
 cheir, cheir-es; hand(s)—chiroprapist, Chiroptera
 phos, phot-es; light(s)—phosphorescence, phototropism
 thrix, trich-es; hair(s)—Ulothrix, trichocyst
 coccyx, coccyg-es; cuckoo(s)—coccyx, coccygeal

5. NUMERALS in Greek are divided into *cardinals*, *ordinals*, and *adverbials*. The first four cardinals and the ordinals are declinable. Most of the cardinals are expressed by the letters of the alphabet.

Cardinals	Ordinals	Adverbials
1 heis, mia, hen	protos, e, on	hapax
2 duo	deuteros, a, on	dis
3 treis, tria	tritros, e, on	tris
4 tettares, -a	tetartos	tetrakis
5 pente	pemptos	pentakis
6 hex	hektos	hexakis
7 hepta	hebdomos	heptakis
8 okto	ogdoös	oktakis
9 ennea	enatos	enakis
10 deka	dekatos	dekakis
11 hendeka	hendekatos	hendekakis
12 dodeka	dodekatos	dodekakis
100 hekaton	hekatostos	hekatontakis
1000 chilioi, -ai, -a	chiliostos	chiliakis
10000 murioi, -ai, -a (also taken as any large number, hence <i>myriad</i>)		

BIOLOGICAL NOMENCLATURE

Linnaeus was the founder of our modern system of classification of plants and animals. He classified them according to four categories: *Class*, *Order*, *Genus*, and *Species*. Since his time two other principal categories have been added, the *Phylum* and the *Family*, and several sub-categories. Linnaeus also introduced the *binomial system* of nomenclature, according to which every plant and animal is given two names, the *generic*, beginning with a capital letter, and the *specific*, usually beginning with a small letter.

PLANTS

1. PHYLA OR SUBKINGDOMS. There are only four. Their names are compound words, the first part expressing the characteristic of the phylum and the second, the plural of the Greek noun for plants, *phyta*. Thus

Thallophyta, *Bryophyta*, *Pteridophyta*, *Spermatophyta*. *Phyta* is often anglicized to "phytes" and the plants referred to as *Thallophytes*, etc.

2. CLASSES AND SUBCLASSES. Their names usually have the plural ending of the Latin first declension, *ae*, e.g., *Angiospermae* and *Dicotyledoneae*. But there are exceptions, e.g., *Schizomycetes*, *Musci*.

3. ORDERS. Adjectives ending in *ales* usually from the name of the principal genus, e.g., *Rosales* from *Rosa*.

4. FAMILIES. Adjectives ending in *ae* (usually—*aceae*) from either the name of the principal genus, e.g., *Rosaceae* from *Rosa*, or some characteristic of most of the genera, e.g., *Leguminosae*, possessing legumes or pods.

5. GENERA. 1) Nouns, often the original Greek or Latin names, e.g., *Pinus*, *Rosa*, *Triticum*.

2) Descriptive adjectives, e.g., *Trifolium*.

3) Personal names in adjective form, ending in *ia*, e.g. *Rickettsia*, from Ricketts who discovered these organisms.

6. SPECIES. 1) Adjectives signifying some characteristic feature like color (*albus*, *-a*, *-um*; *niger*, *-ra*, *-rum*), size (*giganteus*, *-a*, *-um*; *nanus*, *-a*, *-um*), incidence (*communis*, *-e*; *vulgaris*, *-e*), edibility (*sativus*, *-a*, *-um*), miscellaneous (*mirabilis*, *tenax*). The specific name usually agrees in gender and number with the generic. Most species of trees have names ending in *a* regardless of the ending of the genus because tree in Latin is feminine, e.g., *Quercus alba*, *Pinus resinosa*. But, *Pinus strobus*.

2) Nouns in apposition, e.g., *Oenothera gigas*, *Nicotiana tabacum*.

3) Genitive endings of latinized personal or other names, e.g., *Prunus besseyi* from the botanist Bessey; *Puccinia graminis*, a parasite of grasses (gramen, graminis).

ANIMALS

1. PHYLA AND SUBPHYLA. Usually neuter plurals of Greek or Latin nouns and adjectives ending in *ata* (Cf. Word List), e.g., *Protozoa*, *Chordata*, *Vertebrata*. Exceptions are some phyla of worms whose names end in *helminthes* (G. worms), e.g., *Platyhelminthes*.

2. CLASSES AND SUBCLASSES. Usually neuter plurals of nouns or adjectives ending in *a*, *ea* or *ina*, e.g., *Mastigophora*, *Arachnoidea*, *Volvocina*. But, *Elasmobranchii*, *Pisces*, *Aves*.

3. ORDERS AND SUBORDERS. 1) Neuter plural adjectives in *a* or *ina*, e.g., *Diptera*, *Amoebina*. 2) Masculine plural nouns of the second declension ending in *i*, e.g., *Chirondrostei*. 3) Feminine plural nouns of the first declension, ending in *ae*, e.g., *Hydromedusae*. 4) Birds and some fishes: the name of the principal genus ending with *i* plus "formes", e.g., *Passeriformes*, *Cypriniformes*.

4. FAMILIES. Usually feminine adjective plural forms of generic names ending in *idae*, e.g., *Canidae*, *Felidae*.

5. GENERA AND SPECIES. Named like those of plants.

SOME COMMON LATIN AND GREEK ROOTS AND TERMS

Many biological terms are compound words made up of two or more Latin or Greek words or roots. In this composition, frequently changes in letters are made for the sake of euphony. Thus, sometimes, there is elision of a vowel when the first component ends in a vowel and the second begins with a vowel or diphthong, e.g., *Parophthalmia* from *para* and *ophthalmia*. A final consonant of the first component often undergoes changes. For example, the *n* of *con* (*cum*) becomes *l* when followed by *l*, e.g., *collusion*; it becomes *m* before *b*, *m*, *f*, *ph*, and *ps*, e.g., *commissure*; and it becomes *r* before *r*, e.g., *correlative*.

In the following list, unless the original Greek or Latin word is commonly used as such, only the combining form is given, followed by a dash when it is the first component of a compound word or a prefix, and preceded by a dash when it is the second component or suffix. In some cases it is used in both ways. Separated endings are also preceded by a dash. (G) or (L) signifies Greek or Latin origin.

- a-, an-** (G)—not, without—abiogenesis, anamniote
- a-, ab-, abs-** (L)—away from—aversion, abductor, abstract
- acinus, -i** (L)—berry, grape—acinous, aciniform
- acro-** (G)—at the end or top—acrocarpous, acrodont, acromion
- actin-** (G)—ray—actinic, Actinomyces
- acanth-** (G)—thorn—acantha, Acanthias, acantho-
- ad** (L)—to, towards—adductor. When used as a prefix the *d* is sometimes changed to the first consonant of the following word, e.g., acclimate, afferent, assimilate. As a suffix it means towards the part of the body indicated by the word to which it is suffixed, e.g., cephalad, towards the head; caudad, towards the tail.
- aden** (G)—gland—adenase, adenin, adeno-, adenoid
- adip-** (L)—fat—adipose, adiposo-
- aer** (G)—air—aerobe, anaerobic, anaerobiosis
- agogue** (G)—carrying away, drive out—chologogue, chloragogue
- ala** (L)—wing—alar, alate, aliform, alisphenoid
- albus, -a, -um** (L)—white—linea alba, corpus albicans, tunica albuginea
- alg-** (G)—pain—algnesia, neuralgia, analgesic
- all-** (G)—other—allergy, allometric
- allant-** (G)—sausage—allantois, allanto-, allantoin
- allelon-** (G)—of one another—allele, allelomorphic, parallel
- alveolus, -i** (L) little tub or belly—alveolar, alveolo-
- amb-** (L)—both, on both sides—ambivalent, amboceptor
- amph-** (G)—same as amb—amphiaster, amphibian, amphoteric
- ampulla, -ae** (L)—little flask—a. chyli, aa. of Lorenzini, ampule
- amyl-** (G)—starch—amylase, amylopsin, paramylum
- ana** (G)—up, back, anew, again—anabolism, anaphase
- andr-** (G)—man—androgen, gynander
- angi-** (G)—vessel—angioblast, angiocarpous, angiosperm
- ankyl-** (G)—curved—ankylosis, Ankylostoma
- annulus, -i** (L)—ring—a. abdominalis, annular, Annelida

- ans** (L present participial ending of first conjugation) —ing—*Canis latrans* (barking), *Lactroedectus mactans* (killing)
- ansa, -ae** (L)—bundle—a. *vitellina*, a. *capitis*, ansate, ansiform
- ante** (L)—before, in front of *antebrachium*
- anterior, -ius-** (L)—fore, going before—*vena cava anterior*, *antero-*
- anth-** (G)—flower—*anther*, *Anthozoa*, *Helianthus*
- anthrop-** (G)—man—*anthropology*, *anthropoid*, *Pithecanthropus*
- anti** (G)—opposite, against—*antiseptic*, *antigen*, *antibody*
- anticus** (L)—same as *anterior*—*tibialis anticus*
- antrum, -a** (L)—cavity—a. *auris*, *antral*, *antro-*
- apex, apic-** (L)—tip, point—*apical*
- apo-** (G)—from, off from—*aponeurosis*, *apochromatic*
- aqu-** (L)—water—*aquarium*, *aquatic*, *aqueous humor*
- arachn-** (G)—spider—*Arachnida*, *arachnoid*, *Arachnoidea*
- arbor** (L)—tree—*Arbor Vitae*, *arboreal*, *arboretum*
- arc-** (L)—bow, bent—*arciform*, *Arcoptera*, *arcuate*
- arch-** (G)—beginning, primitive, ancient—*archenteron*, *Archeopteryx*
- area** (L)—open space—a. *opaca*, *areolar*, *areola*, *areatus*
- argent-** (L)—silver—*argentaffin*, *argentine*, *argentation*
- argyr-** (G)—silver—*argyrol*, *argyrophil*, *argyria*
- aria** (L)—suffix denoting “like” or “connected with”—*Utricularia*
- arium** (L)—suffix denoting place of a thing—*aquarium*, *herbarium*
- arrheno** (G)—male—*arrhenoblastoma*, *arrhenotocia*
- arthron** (G)—joint—*Arthropod*, *arthritis*, *arthrodial*, *arthrosis*
- articul-** (L)—connect—*articular*, *articulate*, *articulatio*, *articulus*
- artio-** (G)—even number—*artiodactyla*
- aryten** (G)—ladle—*arytenoid cartilage*
- asc-** (G)—bottle, bag, bladder—*Ascidian*, *ascon*, *Ascomycetes*, *ascus*
- ascendens** (L)—going up—*aorta ascendens*
- ase** (uncertain, possibly G. *-asis*)—suffix to word denoting substrate and signifying an enzyme acting on that substrate, e.g., *zymase*, *sucrase*
- aster, astr-** (G)—star—*amphiaster*, *Asterias*, *astrocyte*
- ata** (L)—neuter plural ending of perfect participle used as suffix to name of some structure and signifying a group of organisms characterized by that structure, e.g., *Chordata*, *Vertebrata*
- ate** —English form of above, e.g., *Chordate*, *Vertebrate*. Also used as an adjective—*septate*, *punctate*
- atel-** (G. a—not tele—end)—imperfect, incomplete—*atelia*, *atelosis*, *atelocardia*
- atres-, atret-** (G. a—not tresis—hole)—*atresia*, *atretic*
- atrium, -a** (L)—entrance, room—*atrial*, *atriopore*
- audi-** (L)—hear—*audition*, *auditory*
- aur-** (L)—1) air—*auroduct*, *Aurophysa*; 2) ear—*auripuncture*; 3) gold—*aureus*, *Aurococcus*
- auricul-** (L)—dim. of *auris*—ear—*auricle*, *auricular*
- auto-** (G)—self—*autonomic*, *auto-intoxication*
- ax-** (L)—combining form signifying aggressive, e.g., *audax*, *pugnax*
- aux-** (G)—growth, increase—*auxin*, *auxospore*
- avis, -es** (L)—bird—*avian*, *aviary*
- axis** (L)—axle-tree—*axial*, *epaxial*, *hypaxial*
- axon** (G)—same—*axocyte*, *axonal*
- bacill- and bacul-** (L)—staff, rod—*bacillus* (i), *Bacularia*

bacter-, bactr- (G)—same—bacterium (a), Bactridium
baro- (G)—weight—barometer, barotropism
basidi- (G)—pedestal—basidium, Basidiomycetes, basidiospore
basil- (G)—king, royal, important—basilic, Basiliscus
basis, -es (G)—base, bottom—basilar, basipodite
bath-, bathy- (G)—depth or height—Bathornis, bathysphere
bio- (G)—life—bioblast, biology, Dermatobia
bis, bi-, bin- (L)—double, twice—bisiliac, bilateral, binocular
blast- (G)—bud, sprout, germ—blastoderm, osteoblast
blephar- (G)—eyelid—blepharal, Blepharisma, blepharoplast
brachium, -a (L)—arm—brachial, brachio-
brachy- (G)—short—brachydactyly, brachycephalic
brady- (G)—slow—bradycardia
branch- (G)—gill—branchia, branchial, Lamellibranch, branchio-
bronchus, -i (G)—air tubes—bronchial, bronchoscope
brevis, -e (L)—short—caput breve, breviflex, breviradiate
bryo- (G)—moss—bryology, Bryophyta, Bryozoa
bucca, -ae (L)—cheek—buccal, buccinator, bucco-
bull, -ae (L)—bubble—bulla tympanica, bullate
bursa, -ae (L)—pouch—b. omentalis, bursate, bursitis
butyr- (G)—butter—butyrate, butyrim, butyro-
cac- (G)—bad—cachexia, cacophony
cad- (L)—fall—cadaver, caducous
caecum (L) also cecum—blind—foramen caecum
caen- (G)—recent—caenozoic. See **cene**. Also spelled **kaen, ken**
calor (L)—heat—calory, calorific, calorimeter
calx, calc- (L)—chalk, the heel—calcaneo-, calcaneus, calcar, calcium
calyx, calyc- (G)—cup—calycine, calyculus
capill- (L)—hair—capillary
caput, capit- (L)—head—caput longum m. bicipitis, capitulum, capitellum; in combination shortened to **ceps, cip-** biceps (bicipites), triceps, quadriceps
carpus, -i (L)—wrist—carpal, carpectomy, carpo-
caryo- (G)—nut, nucleus—caryophag, Caryophyllaceae, caryopsis, acaryocyte
cata (G)—down—catabolism, catalyst. Also spelled **kata**
cecum same as **caecum** above—c. vestibulare, cecal, ceco-
cel- or coel- (G)—hollow, belly—celiac, celio- celitis
cele (G)—tumor, hernia—celosomia, hydrocele
celi- (G)—belly—celiac, celiotomy, Also **coel**
cella, -ae (L)—small chamber—c. media, cell, cellula, cellulose-
cen- (G)—empty, void—cenosis. Also **ken**—kenophobia
cene (G)—same as **caen**—cenogenesis, pliocene. Also **kene**
centrum (G)—center—centrifuge, centroacinar, centriole
cephale (G)—head—cephalic, encephalon
cept- (L)—received—receptor, exteroceptive
cera (L)—wax—cerumen, ceruminous
cerat- (G same as kerat)—horn—ceratin, cerato-, Ceratophyllus
cerebrum (L)—brain—cerebral, cerebro-
cervix, cervic- (L)—neck—c. uteri, cervical, cervico-
chaete (G)—hair, bristle—Chaetognatha, Oligochaeta
chalaza (G)—sty—chalazion, chalazium(a)

- chil-** (G)—lip—chilognathus, Chilomastix
chilo- (G)—lip—chilognathouranoschisis, Chilomastix
chir- (G)—hand—chiroprapist, surgeon, Chiroptera
chit- (G)—coat—chitin, chitoneme, chitonitis
chlamys, chlamyd- (G)—mantle—Chlamys, Chlamydobacteria, Chlamydomonas, chlymidospore
chlor- (G)—green—chlorophyl, chloragogue
chrom-, chromat- (G)—color—chromosome, chromatin, achromatic
-cide (L)—kill—germicide
cilium, -a (L)—eyelid—m. ciliaris, Ciliata, ciliary
circum (L)—around—circumcise, circumoesophageal
cis- (L)—cut—excise, incision
coel- (G)—same as **celo**—hollow—coelom, Coelenterata
com- (L cum)—with, together—commissura, commissure, commensal
communis, -e (L)—common—m. flexor communis
con- (L cum)—with—connection
contra (L)—against—contralateral
cornu, -a (L)—horn—c. ammonis, cornea, corneum, cornucopia
corona (L)—crown—coronary, corolla, c. capitis, c. radiata, coronal, coronella
corpus, corpora (L)—body—c. luteum, corpora quadrigemina, corpse, corpulence, corpusculum, corpuscle
cortex, cortic- (L)—bark—c. ceribri, cortical, cortico-
crypt- (G)—hidden—crypt, cryptic, cryptogam
curr- (L)—run—current, curriculum, recurrens
cyst (G)—bladder—cystectomy, cysticircus, cysto-
cyt- (G)—hollow, cell—leucocyte, cyton, cytoplasm
de (L)—from—deferens; in privitive sense—decomposition
decid- (L)—fall—decidua, deciduous
demi (F. from L. dimidius)—half—demilune, deminatured
dendron (G)—tree—dendraxo, dendrite, dendriform, dendrology
dens, dent- (L)—tooth—dental, dentine, dentinal
deorsum (L)—downward—deorsumduction, deorsumversion
derm-, derinat- (G)—skin—dermal, dermis, dermatome, pachyderm
descendens (L)—going down—aorta descendens
deutero- (G)—second—deutencephalon, deuterooplasm, deutrium
dexter, dextra, dextrum (L)—right—destral, dextrin, dextro-
dia (G)—through—dialysis, diaphragm, diarrhea
diplo- (G)—double—diploid, diploblastic
dis-, di- (G)—two, double—districhiasis, digastric
dis-, di- (L)—apart from, asunder—dissect, diverge
dorsum (L)—back—dorsal, dorsalis(e), dorso-
drilus, -i (G)—worm, lizard—combining form of names of worms, e.g., Megadrili, Microdrili. Also Crocodilus.
duc- duct- (L)—lead—abducens, adductor, duct, reduction
durus, -a, -um (L)—hard—dura mater, dural, duro-, induration
dyn- (G)—power—dyne, dynamic, dynamo
dys (G)—difficult, painful, ill—dyspnea, dysgenic, dysfunction
e (L)—from, out—educt; also in privitive sense—enervate
ec (G)—out of—ecdysis, ectopic; also for oec
echin- (G)—hedgehog, spiny—Echinodermata, echinous
ecto (G)—out, outside—ectoderm, ectoplasm

- edaph-** (G)—soil—edaphic, edaphology, edaphon, Edaphosaurus
ego (L)—I—egocentric, egomania
-ella (L) diminutive—*Doridella* from *Doris*
em (G)—in—empyema, embryo, embolus
emys (G)—tortoise—prefix and suffix of names, e.g., *Emysuchus*, *Graptemys*
en (G)—in—encapsulate, encysted, encephalon, enzyme
enchyma (G)—infusion—enchymatous, parenchyma
endo (G)—in, inside—endoderm, endoplasm, endocrine
-ens, -iens (L) present participial ending of second and third conjugation)—
 ing—rubens (reddening), flavens (yellowing), ambiens (going around)
ent- (G)—within—ental, enteron, dysentery, entero-
eo- (G)—dawn—*Eoanthropus*, eocene, eolith
epi (G)—upon, on top of—epidermis, epinephrin, epistasis
erg- (G)—work—erg, ergasia, ergastoplasm, energy
erythro- (G)—red—erythrocyte, erythrophyl, erythrophage
eso (G) 1) within—esethmoid, esogastitis
 2) for oeso from oiso—I shall carry—esophagus
esthes- (G)—feeling—anesthesia, esthetic
ether (G)—pure, upper air—ethereal
ethm- (G)—sieve, strainer—ethmo-, ethmoid
ethn- (G)—people, race—ethnic, ethnology
etio- (G)—cause—etiology, etiotropic
eu (G)—well, very, exceedingly—*Eutheria*, eugenic
ex (G and L)—from, out—exostosis, excurrent
exo (G)—outside, on outside—exocrine, exoskeleton
externus, -a, -um (L)—on outside—*m. obliquus externus*, *iliaca externa*, *os externum*
extra (L)—outside—extracellular
extremus, -a, -um (L)—last—extremitas, extremity
fac- (L)—make, do—factor, facultative
facies (L)—face—*f. anterior*, facet, facio-, superficial
fascia, -ae (L)—band, fillet—*f. lata*, fasciculus (i), *Fasciola*
fect- (L)—made, done—affect, defect, effector, infect
fer- (L)—carry—afferens, afferent, efferens, efferent, vas deferens
fibra, -ae (L)—fiber—*f. auriculae*, *ff. arciformes*, fibril, fibrilla, fibrillate, fibrin, fibro-, fibroid
fin- (L)—end—affinity, define, infinite
fiss- (L)—cleave—fission, *Fissipedia*, fissure
flagellum -a, (L)—whip—*Flagellate*, flagello-
flavus, -a, -um (L)—yellow—*Flavobacterium*, flavescent, *ligamenta flava*, riboflavin
flect-, flex- (L)—bend—reflect, flexion, flexor (es), flexura
flor (L)—flower—flora, floret, florid, efflorescence
flu- flux- (L)—flow—fluid, effluent, diffluence, fluxus
folium, -a (L)—leaf—*f. vermis*, foliaceous, foliate, *Trifolium*
foramen, foramina (L)—opening—*f. magnum*, *ff. alveolaria*, *Foraminifera*
-form (L)—shape—vermiform
-formes (L)—suffix or order names of birds and some fishes—*Passeriformes*, *Cypriniformes*
fract- (L)—break—fracture, refract
-fuge (L)—drive away—vermifuge



- fundus, -i** (L)—bottom—f. oculi, fundal, fundic
funis, funic- (L)—cord—f. argenteus, funiform, funiculus (i)
fus- (L)—pour out—fusion, infusoria, perfuse
fusus (L)—spindle—Fusarium, fusiform, Fusobacterium fusiformis
-gale (G)—weasel, martin, cat—suffix of names of cat-like animals—Spiloga-
 gale, Boreogale; also Galeodes
gam- (G)—marriage—gamete, gametophyte, cryptogam, monogamy
gaster, gastr- (G)—belly—gasterangiemphraxis, gastro-, gastrula
ge- (G)—earth—geology, geotropism
gen-, geno-, -geny, genesis (G)—bring to life, create, make—gene, genetics,
 genotype, parthenogenesis, sporogenous, zymogen
genus, genera (L)—kind, race, one of the Linnaean categories (Cf. Biological
 Nomenclature), generic
gest- (L)—carry—gestation, ingest, digest
glia (G)—glue—glial, gliadin, fibroglia, myoglia, neuroglia
gluc- or glyc- (G)—sweet—glucose, glycemia, glycerin
gon- (G)—angle—goniometer, trigone
gone- (G)—seed, offspring—gonad, gonepoiesis, eugonic
gram- (G)—writing—diagram, electrocardiogram
gress- (L)—advance—egress, ingress, progress
graph, -y (G)—writing—kymograph
gymn- (G)—naked—Gymnamoebida, gymnema, gymnosperm
gyn-, gynec- (G)—woman—gynander, gynecology
gyrus, -i (G)—circle—g. centralis, gyro-, Spirogyra
haem- see hem-
hal- (G)—salt—halide, halogen
hal- (L)—breathe—exhale, inhale, halitosis
ham- (L)—hook—os hamatum, hamulus, hamular
haplo- (G)—single, simple—haploid
hapt- (G)—bind, fasten—haptén, haptophore
haust- (L)—drinking—haustorium, haustum (a), haustral
hebe (G)—youth, puberty—hebecarpous, hebin,
hecto- (G from hekatón)—hundred—hectogram, hectoliter
helix, helic- (G)—coil—Helix, helicine, helicotrema
helminth- (G)—worm—Platyhelminthes, helminthology
hem- (for haem-G)—blood—hemacytometer, hemal, hematoxylin, hemoglo-
 bin, anemia, hemelytrometra
hemi- (G)—half, incomplete—Hemichordata, hemiazygos, Hemiptera
hepat- (G)—liver—hepatic, hepatectomy
hetero- (G)—other, different—heterosis, heterozygote, heterodont
hex- (G)—six—hexagon, hexose
herp- (G)—creep—Herpes, herpetic, herpetology, Herpetomonas
hiatus, -us (L. English plural—hiatuses)—aperture—h. aorticus
hilum, -a or hilus, -i (L)—small bit or tuft—h. lienalis, hilitis
histo- (G)—web, tissue—histology, histocyte, (also histiocyte,) histogenesis
hole- (G)—all, entire, whole—holoblastic, holophytic, holozoic, holism
homeo- (G)—like—homeopath
homo- (G)—alike—homology, homogenize, homozygote, Homoptera
hormon- (G)—arouse—hormone, homonic, hormono- and hormo-
humor (L)—fluid—aqueous humor, humoral
hyal- (G)—glass—hyaline