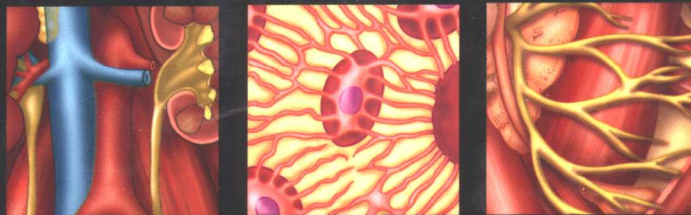


DORLAND'S ILLUSTRATED MEDICAL 30th EDITION DICTIONARY



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DORLAND'S

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EDITION

DICTIONARY

SAUNDERS
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The Curtis Center
Independence Square West
Philadelphia, PA 19106

Dorland's illustrated medical dictionary.

Philadelphia: Saunders

v.: ill.; 27 cm.

Irregular.

Began publication with 23rd ed.

Description based on: 26th ed.

Continues: American illustrated medical dictionary.

1. Medicine—Dictionaries. I. Dorland, W.A. Newman
(William Alexander Newman), 1864–1956.

[DNLM: 1. Dictionaries, Medical. 2. Reference Books,
Medical]

R121.D73

610'.3'21—dc19

0-6383

AACR 2 MARC-S

Library of Congress

{8607r85}rev6

Chief Lexicographer: Douglas M. Anderson, MA

Senior Lexicographer: Patricia D. Novak, PhD

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Listed here are the latest translated editions of this book together with the languages for the translations and the publishers.

Chinese (28th Edition)—Xi'an World Publishing Corp., Xi'an, China

Indonesian (26th Edition)—E.G.C. Medical Publishers, Jakarta, Indonesia

Italian (28th Edition)—Edizioni Scientifiche Internazionali (ESI), Milan, Italy

Japanese (28th Edition)—Hirokawa Publishing Company, Tokyo, Japan

Portuguese (28th Edition)—Editora Manole Ltda., São Paulo, Brazil

Spanish (28th Edition) (Adaption)—McGraw-Hill-Interamericana de España, Madrid, Spain

Dorland's Illustrated Medical Dictionary

ISBN 0-7216-0146-4 (Standard)

0-7216-0281-9 (Deluxe)

0-7216-0414-5 (Trade)

0-8089-2288-2 (International)

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Library of Congress catalog card number 78-50050

Last digit is the print number: 9 8 7 6 5 4 3 2 1

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PREFACE

A New Look for an Old Friend

For over 100 years and now 30 editions, *Dorland's Illustrated Medical Dictionary* has been the premier reference for the vocabulary of medicine. During that century, several generations of lexicographers have dedicated their work to reviewing, selecting, and incorporating into the Dictionary vast amounts of vocabulary used to describe the ever-expanding and rapidly changing body of medical and related scientific knowledge. To their efforts in balancing the need to include this growing vocabulary against the requirement of keeping the book to a convenient size, presently incorporating over 118,000 entries defining more than 122,000 terms, is owed the primary place that *Dorland's* holds among medical dictionaries.

The present edition, while continuing the *Dorland's* tradition of excellence, has a very different look from previous editions, owing to the use of color to enhance not only the appearance but also the usefulness of the book. Illustrations (over 1100 in all) are nearly all presented in full color. A large number of illustrations have been added to the vocabulary; and all of the illustrations have been carefully chosen to complement and clarify the definitions that they accompany. Color has also been added to the text, the headwords for each entry being dark red, a change that especially helps to bring out the subentries. The long lists of subentries (such as the lists at *disease* and *nerve*) have been further enhanced by the use of colored boxes. The purpose in all of this has been to create a book that is not only clean and modern in appearance but also easy to use, without the distraction of awkward clutter.

In addition to the usual extensive work in revising the vocabulary, the 30th edition of *Dorland's* features the inclusion of over 600 terms from the field of Complementary and Alternative Medicine. Where the theory behind the terms lies outside traditional biomedicine, we have aimed at defining them in terms of their own theories; while some are admittedly controversial, interest in this field is widespread and growing, and such terms are more and more likely to be encountered.

Not only have appendices been updated, but five new ones have been added. The list of Greek and Latin stems, which has appeared in the front of the book for over 50 years, has been moved to the appendices in response to user feedback that it would be more useful there. The appendices have been redesigned in order to make them easier to use, again using color enhancements. Tables also have been redesigned in the same way. The plates, which in previous editions were combinations of single- and two-color drawings, now appear in full color. As in the past, they appear with the terms that they illustrate, rather than being gathered into a hard-to-find section elsewhere in the book.

An exciting complement to the book is the new Dorlands.com website (<http://www.dorlands.com>), which contains features of interest to users of *Dorland's Illustrated Medical Dictionary* and its companion products.

In the preparation of this edition, our consultants have performed a great deal of invaluable work in reviewing the entries, and we gratefully acknowledge the generous lending of their expertise. We are indebted to them for their assistance not only in revising existing entries, but also in selecting new terms for inclusion and deleting obsolete terms. The appendices again include the "Reference Intervals for the Interpretation of Laboratory Tests"; we are grateful to William Z. Borer, MD, for graciously allowing us to use it once more.

As in past editions, we have used a number of official and standard nomenclatures as guides: for anatomy, the *Terminologia Anatomica* as approved by the Federative Committee on Anatomical Terminology; for enzyme nomenclature, the Recommendations of the Nomenclature Committee of the International Union of Biochemistry and Molecular Biology on the Nomenclature and Classification of Enzymes; for bacteriology, *Bergey's Manual of Systematic Bacteriology* and the ninth edition of *Bergey's Manual of Determinative Bacteriology*; for virology, *Virus Taxonomy: Sixth Report of the International Committee on Taxonomy of Viruses*, together with the proposals approved at the Jerusalem (1996) and Strasburg (1997) ICTV meetings; for psychiatric terms, the *Diagnostic and Statistical Manual of Mental Disorders*, 4th Edition (DSM-IV), published by the American Psychiatric Association. Drugs are identified as being included in the twenty-fourth edition of the *United States Pharmacopeia* (USP 24) or the nineteenth edition of the *National Formulary* (NF 19), both official from January 1, 2000. The Medical Subject Headings provided are created, maintained, and provided by the U.S. National Library of Medicine. We gratefully acknowledge our indebtedness to the compilers, editors, and publishers of these works, and we emphasize that any inaccuracies that may have arisen from our transcription or interpretation of this material are our sole responsibility.

We also thank the users who, over the years, have provided us with information, opinions, and innumerable suggestions. To them we owe a debt of gratitude; their ongoing interest in the book has helped to maintain *Dorland's* position as the preeminent, most authoritative, and best-selling medical dictionary.

Douglas M. Anderson
Chief Lexicographer
Elsevier

NOTES ON THE USE OF THIS DICTIONARY

Main Entries and Subentries

Main entries appear in boldface type, with bullets indicating syllabication. Terms consisting of two or more words are ordinarily given as subentries under the noun, as is traditional in medical dictionaries; subentries are also set in boldface type, and each is set on a new line. Although this arrangement may be confusing at first to those accustomed to general dictionaries, it has the advantage of allowing related terms to be grouped together (for example, all the *lymphocyte* entries appear under the main entry *lymphocyte*).

According to this scheme, *Howell-Jolly bodies*, *ketone bodies*, and *pineal body* are all to be found under the main entry *body*, and *carotid pulse*, *dicrotic pulse*, and *paradoxical pulse* are to be found under the main entry *pulse*. It is important for the user to bear in mind that it is impossible to provide entries for every variation of every term, so that a phrase that is not found under one main entry should be sought under a synonymous main entry. For example, the same entity may be described as a disease or a syndrome (as *Fabry's disease*—*Fabry's syndrome*, which is to be found under *disease*) or as a sign or a phenomenon (as *Gowers' sign*—*Gowers' phenomenon*, which appears under *sign*). In such cases, the main entry should be consulted for references to synonymous terms under which the desired phrase may be found.

Example:

treatment . . . the management and care of a patient for the purpose of combating disease or disorder. See also under *care*, *maneuver*, *method*, *technique*, *test*, and *therapy*.

In subentries, the main entry word is represented only by the initial letter, e.g., *cogwheel r.* under *respiration*, unless it occurs in the plural form. Regular English plurals are represented by the initial letter followed by 's, as *b's* for *bones* under *bone*. Irregular plurals, such as *teeth* under *tooth*, and Latin plurals, such as *foramina* under *foramen*, are spelled out in full.

Chemical Compounds

Exceptions to the use of subentries are made for specific acids and for enzymes and enzyme deficiencies. Names of specific acids will be found as main entries under the first word of the name, e.g., *sulfuric acid* under *S*, as will enzyme names, e.g., *alkaline phosphatase* under *A*. Enzyme deficiencies will be found as main entries immediately following the entry for the enzyme in question, e.g., *carbamoyl phosphate synthetase deficiency* after *carbamoyl phosphate synthetase*.

Chemical compounds embodying the name of an element will be found as subentries under the element; for example, *aluminum acetate*, *aluminum hydroxide*, and *aluminum sulfate* are all located under *aluminum*. Chemical

compounds that begin with the adjectival form denoting valence will be found under the salt or ester, e.g., *ferric citrate* under *citrate*.

Drug Names

Drugs are to be found under the active moiety, if that is a main entry. For example, *prednisolone acetate*, *prednisolone hemisuccinate*, and *prednisolone sodium phosphate* all appear under *prednisolone*. If the active moiety is not itself a main entry, then the entire drug name appears as a main entry, e.g., *methadone hydrochloride* under *M*.

Syllabication

Acceptable word divisions are indicated for main entries by the use of bullets within the entry word; syllabication is based on pronunciation. Not all syllable breaks are given; for example, the separation of a single vowel from the beginning or end of a word is not allowed and is not shown. Likewise, single letters should not be separated from the word elements to which they belong in compound words. In many cases a word may be broken at places other than the ones indicated; for example, different pronunciations imply different sets of breaks, so that *melanocyte* could be divided *mel•a•no•cyte* or *me•lano•cyte*, depending on which syllable, the first or second, is stressed. In any case, breaks that could confuse a reader as to the meaning of a word are to be avoided.

Sequence of Entries

Main Entries

Main entries will be found alphabetized on the sequence of letters, regardless of spaces or hyphens that may occur between them. (Special rules govern terms that begin with proper names, which are mainly eponyms; see below.) Thus the following sequences will be found:

formboard	heart
form-class	heartbeat
forme	heart block
form-family	heartburn

Subentries

Subentries, like main entries, are alphabetized letter by letter. The main entry word, whether it is represented by the initial letter, the initial plus 's, or a spelled-out plural, is ignored in alphabetizing subentries, as are prepositions, conjunctions, and articles. Inflected forms, such as genitives and plurals of Latin words, are treated as if they were nominative singular. (For what is meant by "inflected forms," see "Presentation of Plurals and Other Inflections," page xix.) The following forms, all from *os craniale* "cranial bone," are considered equivalent for

purposes of alphabetization: *os craniale*, *ossis cranialis*, *ossa cranialia*, and *ossium cranialium*.

In accordance with the above rules, the following sequences of subentries are found under *ganglion* and *prolapse*:

ganglion

Andersch's ganglia
ganglia aorticorenalia
auditory g.
Auerbach's g.
g. autonomicum

prolapse

anal p.
p. of anus
p. of the cord
frank p.
p. of the iris

A special case is that of what may be called inverted subentries, in which the initial word or words are moved to the end of the entry, set off by a comma. This is done in order to allow related terms to fall together in the subentry list; such inversions are especially common in the anatomical vocabulary for anterior/posterior structures and the like. These terms are alphabetized as usual up to the comma marking the inversion; words following the comma, however, are not counted except within the group of repeated entries:

lobe

inferior l., left
inferior l., right
inferior l. of left lung
inferior l. of right lung

Proper Names

A number of main entries are included for terms beginning with a proper name, usually eponymic terms; these give information about the term's origin (most often a bit of biographical information) and cross references to entries where definitions may be found. These cross references can be helpful in giving an indication of where to look for an entry that may go by more than one name (such as disease or syndrome). Entries of this sort are alphabetized as entries for the proper name only, following this set of rules:

- (1) The 's, if one occurs, is never counted for alphabetization. *Addison's planes* precedes *addisonian*.
- (2) Words following the name are not counted for alphabetical order unless the names are the same. Thus, *Addison's disease* precedes *Addison's planes*.
- (3) Only the first name in a term containing more than one proper name is counted for alphabetization unless the entries are the same in all other respects. *Babinski's reflex*, *Babinski-Fröhlich syndrome*, *Babinski-Nageotte syndrome*, *Babinski-Vaquez syndrome* appear in that order.
- (4) Umlauts (ö, ü) are ignored for purposes of alphabetization. *Löwe's ring*, *Lowe's syndrome*, *Lowe-Terry-MacLachlan syndrome*, *Löwenberg's canal*, *Löwenthal's tract*, *Lower's rings* appear in that order.
- (5) Names beginning *Mac* or *Mc* are alphabetized as if spelled *Mac*.

Subentries that begin with a proper name also follow the above rules for sequencing.

Proper nouns (or capitalized entries) appear before common nouns (or lower case entries). Thus *Bacillus* precedes *bacillus*.

Chemical Terms

In the alphabetization of chemical names, italic prefixes (e.g., *o-*, *p-*, *m-*, *trans-*, *cis-*) are ignored, as are numbers, Greek letters, and the prefixes *D-*, *L-*, *d-*, *l-*, *(+)-*, and *(-)-*. When a prefix is spelled out, however, the term is to be found under the fully spelled out form, for example, *levodopa* under *L*, *orthocresol* under *O*, and *beta-naphtholsulfonic acid* under *B*.

Indication of Pronunciation

A phonetic spelling of a term appears in parentheses after the boldface entry word. The pronunciation is given for all main entries; it is generally not given for subentries but does appear in some subentries that are foreign phrases. As a rule, the most common pronunciation is given, with no effort to list the variants, although exceptions to this do occur. The phonetic spelling is kept as simple as possible, with few diacritical marks; the only special character used is ə, the schwa, used to represent the unstressed vowel sound heard at the end of *sofa*. The schwa is also used in combination with *r* to represent the sound heard in *fur* and the second syllable of *other*. This combination may be found in both stressed and unstressed syllables.

There are four basic rules:

- (1) An unmarked vowel ending a syllable (an "open" syllable) is long. Thus *ma* represents the pronunciation of *may*.
- (2) An unmarked vowel in a syllable ending in a consonant (a "closed" syllable) is short. Thus *not* represents the pronunciation of *knot*.
- (3) A long vowel in a closed syllable is indicated by a macron. Thus *māt* represents the pronunciation of *mate*.
- (4) A short vowel that ends or itself constitutes a syllable is indicated by a breve. Thus *ī-mūn'* represents the pronunciation of *immune*.

Primary (') and secondary (") stresses are shown in polysyllabic words, with unstressed syllables followed by hyphens, as in *rep''lī-kū'shən*. Monosyllables, even when part of a compound term, have no stress mark, as in *bens jōnz*. Primary stresses are also given as part of the boldface subentries for foreign phrases.

It is impossible with *Dorland's* simplified phonetics to represent the native pronunciations of many foreign words and proper names. These are shown as closely as possible in English phonetics.

Pronunciation Guide**Vowels**

(For the use of breves and macrons, see the four rules above.)

ə	sofa	ö	got
ā	mate	ū	fuel
ă	bat	ŭ	but
ē	beam	aw	all
ě	met	oi	boil
ī	bite	ōō	boom
ī	bit	ōō	book
ō	home	ou	fowl

Consonants

b	book	s	sigh
d	dog	t	tin
f	fog	w	wood
g	get	z	size, phase
h	heat	ch	chin
j	jewel, gem	ks	six
k	cart, pick	kw	quote
l	look	ng	sing
m	mouse	sh	should
n	new	th	thin, than
p	park	zh	measure
r	rat		

Etymology

Information on the origin of a word appears in brackets after the phonetic spelling or a plural form of the entry when that is given. The information is necessarily brief, and the reader must often reason from the etymon, the original word from which other words are derived, to the meaning. For example, for the main entry *dualism* the etymological section reads [L. *duo* two]. L. stands for Latin (languages are either abbreviated or spelled out; see "Abbreviations Used in This Dictionary," p. xxi). The word *duo* is the etymon, and "two" is the English translation of the etymon, not of the entry. The reader proceeds from *duo* to *dual* to *dualism*. Furthermore, space limitations preclude the listing of all the stages in the passage from the etymon to the modern derivative (i.e., the entry). For example, the etymological part of the entry for *vein* is simply [L. *vena*]; in full, it would be [Middle English *veine*, from Old Fr., from L. *vena*].

For those foreign words or phrases taken into English entire, only the language is given, with a translation given within quotation marks.

Example:

déjà vu [Fr. "already seen"] . . .

If the meaning of the foreign word or phrase is the same as that of the entry word, no translation is given.

There are four further additions:

- (1) As a guide to related vocabulary, especially for anatomical terms, the main entry may be followed in brackets by its Greek or Latin equivalent (or both).

Example:

kid·ney . . . [L. *ren*; Gr. *nephros*]

- (2) Many technical terms of Greek or Latin derivation are listed twice as main entries (and both times with meaning and cross references), first as an independent word (with an etymology), then as a combining form (without an etymology), e.g., *ectomy* and *-ectomy*.
- (3) There is an essay, "Fundamentals of Medical Etymology" (see p. xxiii), which explains the basic rules for the derivation and composition of Greek, Latin, and Greco-Latin terms in medicine. Appendix 1 is an analytical word list of Greek and Latin roots, prefixes, and combining forms; the list is an aid for the analysis of existing medical terms and the creation of new ones.
- (4) The prefixes (e.g., *hyper-*, *hypo-*), suffixes (e.g., *-ia*, *-oid*), and combining forms (e.g., *action-*, *-emia*) from the analytical word list are also listed as main entries in the vocabulary.

Official Publications

Certain terms listed in official publications are identified by an abbreviation in brackets. In main entries, these abbreviations usually appear after the etymology (or after the phonetic spelling if no etymology is given). In subentries, they appear immediately after the boldface subentry word. When a term has more than one meaning, the abbreviation is placed at the beginning of the

Presentation of Plurals and Other Inflections

In main entries for foreign (nearly always Greek or Latin) nouns, the original and anglicized plurals are given after the phonetic spelling; irregular plurals of English nouns are also given.

Example:

sto·ma (sto'mə) pl. *stomas* or *sto'mata* . . .

tooth (tooth) pl. *teeth* . . .

The original foreign plural is often given a separate boldface listing in its proper alphabetical place in the vocabulary.

Example:

sto·ma·ta (sto'mə-tə) [Gr.] plural of *stoma*.

Latin is used, especially in anatomy, to form phrases of the type "the X of Y," for example, *arcus aortae*, "the arch of the aorta." The prepositional phrase introduced by "of" corresponds to the Latin genitive case (*aortae* "of the aorta," from *aorta*). For this reason, the genitive case (= English "of") for Latin nouns is also frequently given, introduced by the abbreviation *gen*.

Examples:

pa·pil·la . . . gen. and pl. *papil'lae* . . .

os¹ . . . gen. *o'ris*, pl. *o'ra* . . .

os² . . . gen. *os'sis*, pl. *os'sa* . . .

Latin and Greek (and a number of other languages, such as German and Russian, for that matter) are said to be inflected, that is, words change form to show how they are related to other words in a sentence. An example of this is the "aortae" phrase given above, where the change in the ending of the word corresponds to the use of the English preposition "of." Other Latin inflected forms are found in subentries; these forms will be the objects in a prepositional phrase. For example, under the main entry *fissura*, there is the subentry *f. in ano*; *ano* is the object of the preposition *in* and is one of the half-dozen or so different inflected forms of *anus*, which is a main entry in the Dictionary and has listed with it the genitive and plural form *ani*. As in all subentries, differences in singular and plural forms do not count for alphabetizing, nor do prepositions or conjunctions (e.g., *et* "and," *in* "in"); thus under the main entry *fissura*, the subentry *f. in ano* precedes *f. antitragohelicina*.

definition to which it applies. The following abbreviations are used:

- [DSM-IV] *Diagnostic and Statistical Manual of Mental Disorders* of the American Psychiatric Association, 4th Edition, 1994
- [EC] Enzyme Commission number (e.g., citrate (*sr*)-synthase...[EC 4.1.3.7]) from the Recommendations of the Nomenclature Committee of the International Union of Biochemistry and Molecular Biology on the Nomenclature and Classification of Enzymes published in *Enzyme Nomenclature* (1992)
- [TA] *Terminologia Anatomica* (1998)
- [NF] *The National Formulary*, 19th edition (2000)
- [USP] *The United States Pharmacopeia*, 25th edition (2002)

Medical Subject Headings

Medical Subject Headings (MeSH) and tree numbers are given for a number of terms. In some cases, the Medical Subject Heading is also given on synonyms for such terms; in the interest of conserving space, these are generally confined to MeSH synonyms.

Placement of Definitions and Cross References

With few exceptions, a definition is given in only one place for two or more synonymous terms. Entries for the synonyms provide cross references to the term where the definition is to be found. Such cross references are in place of a definition and are set in roman type:

mas-to-plas-ty (mas'to-plas'te) mammoplasty.

The definition will be found at *mammoplasty*. In many cases, a list of synonyms is given at the end of the entry where the definition appears. This list is introduced by the phrase "called also" and the synonyms are set in italic type.

Cross references from one subentry to another subentry under the same main heading use the abbreviated form of the main entry:

syndrome

hypersomnia-bulimia s., Kleine-Levin s.

Cross-referencing has also been used for earlier terms that have been supplanted and for variant spellings of a term. In such instances, the definition is attached to the term that is currently the preferred term. A word of warning is, however, warranted here. In some instances, preference for one term over another may be slight or even nonexistent, while in others, different spellings or terms may be preferred by different authorities, by different specialties, or in different regions. In such cases, the practice of defining words only at one place has been adhered to as a means of keeping down the size of the Dictionary by avoiding duplication of definitions, and the user should remember that the appearance of a cross reference or definition does not always indicate a preference for one form or synonym over another.

Related Entries

Cross references to related entries or to entries where additional information may be found are also given. They are identified by "see also," "cf.," and "q.v." (or "qq. v."). (For the abbreviations, see "Abbreviations Used in This Dictionary," page xxi.) Cross references introduced by "see also" or "cf." are set in italic type.

Official Terminology

In general, when a term is included in one of the official publications listed in the preceding section ("Official Publications"), its definition appears at the official term. Thus the definition for "pelvic bone" is found at *os coxae*; a cross reference to the official term is found at the subentry under *bone*. Exceptions have been made in a few cases where the nonofficial term is so common or important that it makes the most sense to put the definition on the unofficial term (for example, *heart* is defined, not *cor*).

Entries Containing a Proper Name

Entries containing a proper name are generally entered twice. The definition for the entity is given in a subentry under the appropriate main entry, as *Down syndrome* under *syndrome*. Biographical, geographical, or other information attached to the proper name is given in a main entry (see "Proper Names" in the section "Sequence of Entries," p. xvii.) A cross reference is given from the main entry for the proper name to the subentry where the term is defined. For example:

Down syndrome (disease) (down) [John Langdon Haydon *Down*, English physician, 1828–1896] see under *syndrome*.

Form of Eponyms

The use of the possessive form ending in 's for eponyms is becoming progressively less common, and the entries for eponymic terms in this Dictionary reflect this ongoing change in usage. The Dictionary therefore presents an inconsistent mixture of forms. The user should be aware that although the use of the nonpossessive form is increasingly common, it is by no means universal. (The user should also be aware that some terms, such as *Apgar score*, have never had an 's and that for some terms, such as *Christmas disease* and *Down syndrome*, the nonpossessive form is actually preferred.) The variation in forms seen in the Dictionary is thus only a reflection of change and *not* a prescription for the use of possessive and nonpossessive forms.

Symbols and Abbreviations

Symbols, abbreviations, and acronyms are included as main entries; definitions consist of the term for which the symbol or the abbreviation stands, with a translation if the term is in a foreign language. These terms will usually be found at the appropriate places in the vocabulary; some terms, however, are self-explanatory and have no entry, such as the names of organizations and phrases like the following:

q.h. abbreviation for *L. quodque ho'ra*, every hour.

In a few cases, the definition is placed at the abbreviation or acronym instead of at the term for which it stands, e.g., *ELISA*; in such cases, the abbreviation, not the term, is what is actually in use.

Abbreviations appear both with and without periods. This should not be taken to denote proper usage, since abbreviations may appear either way; at the present the trend is away from the use of the period for most abbreviations.

A list of selected abbreviations also appears in Appendix 2.

Abbreviations Used in This Dictionary

a.	artery (L. <i>arteria</i>); agar
aa.	arteries (L. <i>arteriae</i>)
ant.	anterior
Ar.	Arabic
A.S.	Anglo-Saxon
c.	about (L. <i>circa</i>)
cf.	compare (L. <i>confer</i>)
def.	definition
dim.	diminutive
EC	Enzyme Commission
e.g.	for example (L. <i>exempli gratia</i>)
Fr.	French
gen.	genitive
Ger.	German

Gr.	Greek
i.e.	that is (L. <i>id est</i>)
inf.	inferior
It.	Italian
L.	Latin
l.	ligament (L. <i>ligamentum</i>)
ligg.	ligaments (L. <i>ligamenta</i>)
lat.	lateral
m.	muscle (L. <i>musculus</i>)
med.	medial; median
mm.	muscles (L. <i>musculi</i>)
n.	nerve (L. <i>nervus</i>)
neg.	negative
NF	National Formulary
nn.	nerves (L. <i>nervi</i>)
obs.	obsolete
pl.	plural
Port.	Portuguese
post.	posterior
qq. v.	which (things) see (L. <i>quae vide</i>)
q.v.	which see (L. <i>quod vide</i>)
sing.	singular
Sp.	Spanish
sup.	superior
TA	Terminologia Anatomica
USAN	United States Adopted Names
USP	United States Pharmacopeia
v.	vein (L. <i>vena</i>)
vv.	veins (L. <i>venae</i>)

FUNDAMENTALS OF MEDICAL ETYMOLOGY

By Joseph M. Patwell, PhD

Twenty-six hundred years ago the Asiatic Greeks of Ionia and the Italian Greeks in Magna Graecia began the speculative and investigational sciences, pushing the then Greek to its limits, pushing beyond those limits, riveting new meanings onto old words, smithing new words for new ideas and discoveries—*philosophia*, “the love of wisdom,” was supposedly first used by Pythagoras.

The sciences still go their robust way, iconoclastic but also indebted to and respectful of their ancient tradition. In anatomy, surgery, clinical medicine, and laboratory medicine, Greek, Latin, and Greco-Latin have always formed well over ninety per cent of the technical terms. Knowing the fundamentals of Greek and Latin word formation is immensely helpful in learning the vocabulary of modern medicine or of any modern science and is absolutely necessary for anyone coining a word for a new hypothesis, theory, process, or entity. The purpose of this introduction is to present those fundamentals in as practical and concise a form as possible; any statements contrary to historical and comparative linguistic fact that are made in the following pages are deliberate in keeping with this purpose.

Alphabet and Pronunciation

The Latin alphabet is a modification of one of the many Greek alphabets. The order and shape of the Latin letters are the same as in ours except that the Classical Latin alphabet has no *j*, *u*, or *w*, which are improvements dating from the Middle Ages.

The consonants of the Latin alphabet have about the same values as the English except that *c*, *ch*, *g*, *s*, *t*, and *v* are pronounced as in *cold*, *chrome*, *get*, *so*, *tin*, and *wine*, and not as in *cent*, *chill*, *gem*, *rose*, *mention*, and *vine*. *Ph* and *th* may be pronounced as in *philosophy* the *theology*.

Latin vowels may be long or short. The short vowels are pronounced very much like the American *wander*, *bed*, *it*, *hope*, and *put*; short *y* sounds like the *ü* in German *dünn*. The long vowels are pronounced as in *father*, *hay*, *marine*, *stove*, and *rude*; long *y* is pronounced like the *ü* in the German *über*.

Words are stressed on the next-to-last syllable, called the penult, if that syllable contains a long vowel or diphthong or is followed by two or more consonants, otherwise on the syllable before the penult.

The Greek alphabet used today is based on that used in Athens by the end of the fifth century B.C. The accompanying table shows one modern English pronunciation of each ancient Greek character in terms of English.

Capital	Small Letter	Sound	Name	Transcription
A	α	archaic	alpha	a
B	β	barbarism	beta	b
Γ	γ	grammar	gamma	g
Δ	δ	dogma	delta	d
E	ε	elephant	epsilon	e
Z	ζ	zoology	zeta	z
H	η	air	eta	ē
Θ	θ, θ	theist	theta	th
I	ι	machine	iota	i
K	κ	skeleton	kappa	c (Latin), k (Dorland's)
Λ	λ	lithograph	lambda	l
M	μ	music	mu	m
N	ν	neolithic	nu	n
Ξ	ξ	exegesis	xi	x
O	ο	obelisk	omicron	o
Π	π	spasm	pi	p
P	ρ	arachnid	rho	r
Σ	σ, ς	symbol	sigma	s
T	τ	stadium	tau	t
Υ	υ	ü, über (German)	upsilon	y
Φ	φ	photo	phi	ph
X	χ	Bach (German)	chi	ch
Ψ	ψ	dipsomania	psi	ps
Ω	ω	ocher, Shaw	omega	ō

The vowels are α, ε, η, ι, ο, υ, ω, most of which may be followed by ι or υ to form diphthongs, the most common of which are shown below.

Diphthong	Sound	Transcription
αι	aisle	ae, e, or ai
αυ	out	au
ει	eight	i or ei
ευ	euphony	eu
οι	poison	oe, e, or oi
ου	ghoul	ou or u
υι	suite	ui, lui (French)

Transliteration

The Romans transliterated kappa with *c*, not *k*, and chi with *ch*, not *kh*; thus *character*, not *kharakter*. This Dictionary transliterates kappa with *k* in its etymologies in order to make immediately clear the nature of the underlying Greek sound: Spelling *cystis* for *kystis*, cyst, could cause doubt whether the sound was “kystis” or “systis.” Similar difficulties with chi are less likely, and therefore Dorland's retains the traditional *ch*; hence our etymological spelling is *charakter*.

Classical Greek *ei* was pronounced as in *skein*, but by the end of the fourth century B.C. it was pronounced as in *seize*; thus the city that Alexander the Great founded in Egypt, *Alexandria*, became Alexandria in Latin. English generally prefers the Latin transliteration, but the use of *ei* for *ei* is growing. This Dictionary transliterates *ei* with *ei* in its etymologies.

The Romans transliterated Greek *αι* and *οι* with their own *ae* and *oe*, which had nearly the same pronunciation. By late antiquity the Greek and Latin diphthongs had become simple vowels, having gone through the regular progression *aisle* to *air* to *aim*, and the spelling wavered between the old diphthongs and the new pronunciation. This vacillation persists in English: the British prefer the diphthongs (*oedema*, *haemorrhage*); the Americans, the simple vowel (*edema*, *hemorrhage*). In official nomenclature, e.g., the *Terminologia Anatomica*, the *Index nominum genericorum* (*plantarum*), and the *International Code of Nomenclature of Bacteria*, the official orthography fluctuates from edition to edition, swinging from *oesophagus* to *esophagus* and *Haemophilus* to *Hemophilus* and back again. In the etymologies of this Dictionary Greek *αι* and *οι* are transliterated by *ai* and *oi*, and Latin *ae* and *oe* retained, for clarity's sake.

The Greeks especially but also the Romans had the same troubles with aitch (*h*) that Cockneys do, dropping it where it belonged and adding it where it did not. In Greek, initial *h*- ordinarily remained in simple words (*haima*, blood) but would either assimilate with or disappear before a prefix. For assimilation, *hypo* and *haima* make *hyp(h)aimos*, suffused with blood (first appearing in Hippocrates); for disappearance, *a-*, *an-*, and *haima* make *ana(h)aimia*, anemia (first appearing in Aristotle), not *ahaimia* and *ahemia*.

Latin usually preserved initial *h*- even after prefixes (*homo habilis*, *habilitas*; *honor*, *honestus*, *inhonestus*), but very much of our Latin has come through French with inconsistent (to say the least) spellings and pronunciations: *able*, *ability*, and *inability*, not *hable*, *hability*, and *inhability*; *honor* and *honest*, not *onor* and *onest*.

Speakers of American English generally have no difficulty with *h*- and treat it as a full consonant when adding prefixes; thus we have *inharmonious*, not *anarmonious*; *ahaptoglobinemia*, not *anaptoglobinemia*; and *anhydride*, not *anydride* or *ahydride*.

Greek words are written with several accents that now indicate the stressed syllable. Words beginning with a vowel, diphthong, or rho (*ρ*) are written with a so-called breathing mark over the initial vowel or rho or over the second element of the diphthong (*ἑτεροδοξία*, *heterodoxia*; *αἰσθητικός*, *aisthētikos*; *ρυθμός*, *rhythmos*). The rough breathing mark (´) indicates that the syllable begins with an aspiration (aitch) as in *heterodoxia*, above, and words beginning with the rough breathing are usually transcribed into English with an initial *h*. Words beginning with a rho or an upsilon always have a rough breathing (*ῥῆμα*, *hyper*; *ῥεῦμα*, *rheuma*). The smooth breathing (¨) shows the absence of aspiration and so has no effect on pronunciation (*ἀρωματικός*, *aromatikos*; *αὐτογράφος*, *autographos*).

The other conventions for transliterations from Greek are as follows: Gamma (*γ*), which before gamma (*γ*), kappa (*κ*), chi (*χ*), or xi (*ξ*) has the sound of *n* as in *finger*, is

transcribed as *n*.* Initial *rho* and its rough breathing (*ρ*) are transcribed as *rh*, not *hr*, as *rheuma*, above; double *rho* (*ρρ*) is transcribed as *rrh* (*διάρροια*, *diarrhoea*, *diarrhea*). Upsilon (*υ*) is transcribed as *y* (*ῥυθμός*, *rhythmos*) except in diphthongs, where it is reproduced by *u* (*ρεῦμα*, *rheuma*).

A few Greek words have come into English unchanged (*σκελετόν*, *skeleton*; *αὐτόματον*, *automaton*); most Greek words have passed into English through Latin, undergoing slight change (Greek *στέρνον*, *sternon*; Latin *sternum*); and some Greek words have passed through a secondary intermediary language, such as French, with still further change (Greek *χειρουργία*, *cheirourgia*; Latin *chirurgia*; French *chirurgie*; English *surgery*). Other changes are accounted for by our tendency to drop Greek and Latin inflectional endings (*ἀξίωμα*, *axioma*, becomes *axiom*; *δorsalis* becomes *dorsal*) or replace them with a final mute *e* as if the words had come into English through French (*γονοφόρος*, *gonophoros*, becomes *gonophore*; *spina* becomes *spine*).

Word Formation

The most frequent, the most important, and the seemingly most capricious changes in Greek or Latin words (or in English words, for that matter) arise not when the words pass from Greek or Latin into English, but when these words are first formed in the original language.

Many words in English and nearly all words in the Classical languages are combinations of roots and affixes. The root of a word contains the basic, lexical meaning, and the affixes give the root its shape as a word. (Affixes for the most part are prefixes and suffixes, including the inflections, added before or after the root, respectively.)

For example, in the English *love*, *loves*, *lover*, *lovers*, *loving*, *loved*, *lovingly*, *unloved*, and *unlovable*, the root is *love*, and the various prefixes (*un-*) and suffixes (*-s*, *-r*, *-r-s*, *-ing*, *-ing-ly*, etc.) form the root into a word and modify that word for use in an utterance.

In English a root may very often function as an independent word, as *love*, *hate*, *smile*, *frown*, *milk*; these "root words" are extremely rare in the Classical languages. Nearly always in Latin and Greek, and usually in English, a word is a complex consisting of a form of a root and one or more affixes, which are not independent words themselves but may be used only to modify the root in some way (as *un-*, *-er*, *-ed*); such words are called "derived words."

When the root remains unchanged from derived word to derived word (a "regular" or "weak" root) and the affixes remain unaffected in their surroundings, the entire system of derived words has a transparent, instantly comprehended simplicity, as in *love* and its forms. So in Latin and Greek: there is a systematic clarity to derivations of the Latin root *laud-* (praise)—the nouns *laudis* and *laudatory* (praise, praiser); the principal parts of the regular verb, *laudo* (I praise), *laudare* (to praise); and the adjectives

*During World War II, *Ancistrodon* (from *ἄγκιστρον*, fishhook, and *ὄδοντ-*, tooth) was reformed to *Agkistrodon*, which is the official spelling. *Ancistrodon* and *Ankistrodon* are both correct, but not *Agkistrodon*: Greek *ἄγγελος* (messenger) becomes *angelus* in Latin and *angel* in English, not *aggelus* and *aggel*.

laudabilis and *laudatorius* (laudable, laudatory). There is also a regular system in the Greek root *pau-* (stop): the nouns *pausis* (pause) and *paustēr* (reliever, calmer); the regular principal parts of the verb *pauō* (I stop), *pausō* (I shall stop); and the adjectives *pausteon* (to be ended) and *paustērios* (relieving, calming).

Difficulties arise in English, Latin, and Greek with roots that change from word to word ("irregular" or "strong" roots) as in the English *sing*, *sang*, *sung*, *song*; and one says *singer*, not *songer*; *unsung*, not *unsing*; and *unsingable*, not *unsungable*. One example will suffice. The root *ten-* (stretch) appears in Latin and Greek (and also in English in *thin*). In Latin the root is as regular as the English *talk*, and the derivations are obvious: *tendo* (tendon), *tensio* (tension), *tenius* (tenuous, thin), *extenuatus* (stretched out, thinned out, weakened). In Greek, however, the same root appears as *ten-*, *tein-*, *ton-*, *ta-*, *tan-*, and *tain-*. Indeed, the rules for ancient Greek word formation would make a heavy book, and therefore, for efficiency's sake, the analytical word list, which follows this essay, gives examples of which affixes are attached to which forms of the root, for both the methodical Latin and the exuberant Greek.

In the Latin system there is an inconsistency affecting many common Latin and therefore English words: Latin roots with short vowels will have the normal, strong vowel in simple, unprefixing words but a reduced, weakened vowel in prefixed words.

Consider the Latin root *fāc-* (do, make). The normal *ā* remains in unprefixing words; hence the principal parts of the verb are:

<i>fācio</i>	I make
<i>fācere</i>	to make
<i>fāctus</i>	made

Other unprefixing derivatives are:

<i>facies</i>	thing made or formed, face, "facies"
<i>factor</i>	factor
<i>factura</i>	as in <i>manufacture</i>
<i>faction-</i>	faction
<i>factiosus</i>	factionous
<i>facil-</i>	doable, feasible, easy

From *facil-* are derived in turn:

<i>facultat-</i>	faculty
<i>facilitat-</i>	facility

Now let us add the prefix *ex-* to the root *fac-*. *Ex* assimilates to *ef-* before *f* and changes the meaning of *fac-* to "complete." This or any prefix will cause a short *ā* to become a short *i* before one consonant and a short *e* before two consonants. Note the changes in the principal parts of the prefixed verb:

<i>efficio</i>	from	<i>exfacio</i>
<i>efficere</i>	from	<i>exfacere</i>
<i>effectus</i>	from	<i>exfactus</i>

It is from words like *efficio* that one can most clearly understand the derivations of Latin words. One forms the present participle by dropping the final *-re* from the present active infinitive, which is the form used in the etymologies of *Dorland's*, and adding *-nt* (verbs like *efficio* drop the final *-ere* and add *-ient*). The present

participle of *efficio*, *efficere* is *efficient-* (efficient). And from the present participle is derived the noun *efficientia* (efficiency).

From the last principal part, *effectus*, one forms derivatives by dropping the *-us* and adding other suffixes. Thus from *effect-* one derives

<i>effectum</i>	effect
<i>effector</i>	effector
<i>effectivus</i>	effective

Occasionally the Romans would recombine a prefixed form according to the unprefixing norm. The most common example, and perfect for medical use, is *calefacio*, I warm, not *caleficio*, and therefore *calefacient-*, not *caleficient-*.

Alas, there are exceptions. *Tenant* comes to English not directly from the Latin *tenēre*, to hold, which would give us *tenent*, but through the French *tenir*, and in French all verbs form their present participles in *-ant*, therefore *tenant*; a *locum tenens* is a *lieu tenant*.

Assimilation may affect the consonants between roots and affixes. In English the *v* in *drive* and *thrive* becomes voiceless and changes to *f* before the voiceless suffix *-t* that forms the nouns *drift* and *thrift*. In Latin, assimilation is usually minimal and obvious: *scribo* ("I write") and *scriba* ("writer, scribe") alternate with *scripsi* ("I wrote") and *scriptura* ("writing, scripture"). Occasionally the assimilation between Latin roots, prefixes, and suffixes may cause enough distortion to result in confusion. Below are listed some common Latin prefixes (most of them are also used as prepositions) showing the assimilation of the prefix to the following element. Note that the prefix *in-* has two sources and hence two uses: as a spatial prefix meaning *in*, *on*, or *into* (*inscribe*, *imbibe*, *illuminate*, *irradiate*) and the antonymous prefix (*insensitive*, *immature*, *illegible*, *irreverent*).

Consonant Changes	English
<i>ad-</i> before <i>c</i> becomes <i>ac-</i>	<i>accelerate</i>
<i>ad-</i> before <i>f</i> becomes <i>af-</i>	<i>affinity</i>
<i>ad-</i> before <i>g</i> becomes <i>ag-</i>	<i>agglutinant</i>
<i>ad-</i> before <i>p</i> becomes <i>ap-</i>	<i>appendix</i>
<i>ad-</i> before <i>s</i> becomes <i>as-</i>	<i>assimilate</i>
<i>ad-</i> before <i>t</i> becomes <i>at-</i>	<i>attrition</i>
<i>ex-</i> before <i>f</i> becomes <i>ef-</i>	<i>effusion</i>
<i>in-</i> before <i>l</i> becomes <i>il-</i>	<i>illiniton</i>
<i>in-</i> before <i>m</i> becomes <i>im-</i>	<i>immersion</i>
<i>in-</i> before <i>r</i> becomes <i>ir-</i>	<i>irradiation</i>
<i>ob-</i> before <i>c</i> becomes <i>oc-</i>	<i>occlusion</i>
<i>sub-</i> before <i>f</i> becomes <i>suf-</i>	<i>suffocate</i>
<i>sub-</i> before <i>p</i> becomes <i>sup-</i>	<i>suppository</i>
<i>trans-</i> before <i>s</i> becomes <i>tran-</i>	<i>transpiration</i>

In Greek, assimilation may cause drastic changes to a word, and the phonetic laws governing these assimilations are far beyond the limits of this Dictionary. Fortunately, however, Greek prefixes are fairly regular. Like Latin prefixes, they may also function as prepositions of motion or location. Most Greek prefixes end in a vowel, which is maintained when the following element begins with a consonant and is lost (elided) when that element begins with a vowel: for example, the *iota* in *epi* ("on, upon") is unchanged in *epidemic* and is elided before *o* in *eponychium* ("cuticle"). When a Greek prefix ends in a

consonant and the following element begins with a consonant, assimilation takes place with results as in Latin: the nu (*n*) of *syn* ("with") changes in *sympatheia* and *sylogismos* (sympathy and syllogism). Note that the prevocalic prefix *an-* has two sources and therefore two uses: it is the spatial preposition *ana* ("up, back"), as in *anabolism* and *anode*; and it is the antonymous prefix *a-*, *an-*, as in *atheist* and *anodyne*, coming from the same source as Latin and English antonymous prefixes *in-* and *un-*.

Below are listed some common Greek prefixes with examples of elision and assimilation.

Preposition	Combining Forms	English
amphi	amphi-	<i>amphicrania</i>
	amph-	<i>amphoclexis</i>
ana	ana-	<i>anabolism</i>
	an-	<i>anode</i>
anti	anti-	<i>antigen</i>
	ant-	<i>anthelminthic</i>
apo	apo-	<i>apophysis</i>
	ap-	<i>apandria</i>
dia	dia-	<i>diathermy</i>
	di-	<i>diuretic</i>
ek	ek-	<i>ectopia</i>
ex	ex-	<i>exosmosis</i>
en	en-	<i>enostosis</i>
	em-	<i>embolus</i>
epi	epi-	<i>epinephrine</i>
	ep-	<i>eparterial</i>
hyper	hyper-	<i>hypertrophy</i>
hypo	hypo-	<i>hypodermic</i>
	hyp-	<i>hypaxial</i>
kata	kata-	<i>catalepsy</i>
	kat-	<i>cation</i>
meta	meta-	<i>metamorphosis</i>
	met-	<i>metencephalon</i>
para	para-	<i>paramastoid</i>
	par-	<i>parotid</i>
peri	peri-	<i>peritoneum</i>
pro	pro-	<i>prognosis</i>
syn	syn-	<i>synthesis</i>
	sym-	<i>symphysis</i>
	syl-	<i>sytlepsis</i>
	sy-	<i>systole</i>

Many Latin suffixes have been naturalized in English for centuries, and little comment is needed on their morphology and use. Some common suffixes of particular use in medicine are listed below with their English derivatives. Note that the suffixes *-abilis* and *-alis/-aris* are attached to verb stems of the first conjugation (the infinitives end in *-āre*, as in *laudāre* to praise); and *-ibilis* and *-ilis* are used with the other conjugations (*vidēre*, *visibilis*; *legēre*, *legibilis*; *audire*, *audibilis*).

Latin components	English
<i>avis</i> + <i>-arium</i>	<i>aviary</i>
<i>dormio</i> (<i>dormitus</i>) + <i>-orium</i>	<i>dormitory</i>
<i>nutrio</i> (<i>nutritus</i>) + <i>-io</i>	<i>nutrition</i>
<i>moveo</i> (<i>motus</i>) + <i>-or</i>	<i>motor</i>
<i>porosus</i> + <i>-tas</i>	<i>porosity</i>
<i>frio</i> + <i>-abilis</i>	<i>friable</i>
<i>edo</i> + <i>-ibilis</i>	<i>edible</i>
<i>corpus</i> (<i>corporis</i>) + <i>-alis</i>	<i>corporal</i>

<i>febris</i> + <i>-ilis</i>	<i>febrile</i>
<i>oculus</i> + <i>-aris</i>	<i>ocular</i>
<i>cilium</i> + <i>-arius</i>	<i>ciliary</i>
<i>sensus</i> + <i>-orius</i>	<i>sensory</i>
<i>reticulum</i> + <i>-atus</i>	<i>reticulate</i>
<i>morbus</i> + <i>-idus</i>	<i>morbid</i>
<i>aborior</i> (<i>abortus</i>) + <i>-ivus</i>	<i>abortive</i>
<i>squama</i> + <i>-osus</i>	<i>squamous</i>
<i>adepts</i> (<i>adipis</i>) + <i>-osus</i>	<i>adipose</i>
<i>prae</i> + <i>caveo</i> (<i>cautus</i>) + <i>-io</i> + <i>-arius</i>	<i>precautionary</i>

Greek suffixes in general have not been naturalized in English as the Latin have, with spectacular exception of the family of suffixes represented by verbs in *-izō* (*-ize*), agent nouns in *-istēs* (*-ist*), and verbal nouns in *-ismos* (*-ism*).

So far we have examined the various forms of roots, root words, and derived words; only compound words remain. A compound word is one formed from two (or more) independent words, the first word modifying, dependent upon, or being object of the next. In English, *housewife*, *kidney transplant*, *salesman*, *schoolboy*, *store-bought*, *backbreaking*, and *anteater* are compound words. In English the individual elements undergo little if any change from their basic, lexical forms but remain isolated, as it were, and receive their new meaning solely from juxtaposition (an example is the difference between *house guest* and *guest house*).

The conditions are vastly different in Latin and Greek; in the Classical languages one must use so-called combining forms of substantives (i.e., nouns and adjectives including past participles) that are often considerably different from the lexical forms.

In Latin all native compound words ordinarily will consist of the stem of the first word; then the connecting vowel, usually *-i-*, sometimes *-u-*; then the stem of the second word; then the inflection: *magn-i-ficient-ia*, *magnificentia*, magnificence. In science there are many compounds like *dorsoradial* and *frenosecretory* with Latin words and Greek connecting vowels; the true Latin forms for such compounds would be *dorsiradialis* and *frenisecretorius*.

In Greek the rules for forming compound words are much more complicated. If the first substantive of a Greek compound ends in *-a* (but not *-ma*) or *-ē*, one nearly always changes that vowel to *-o-*:

glōssa, tongue + *ptōsis*, fall = *glossoptosis*
phōnē, voice, sound + *logos*, word, reason, study = *phōnologia*, phonology

Substantives ending in *-on*, *-os*, or *-ys* usually drop the final consonant and leave the vowel unchanged:

osteon, bone + *arthritis*, gout (first appears in Hippocrates) = *osteoarthritis*
myelos, marrow + *poiēsis*, production = *myelopoiesis*
pachys, thick + *derma*, skin = *pachydermia* (first appears in Hippocrates)

If the second element begins with a vowel, one merely drops the final *-a* or *-ē* from the first element without adding *-o-*:

archē, beginning, chief, rule + *enteron*, intestine = *archenteron*

bradys, slow, dull + *akusis*, hearing = bradyacousia

There are exceptions:

idea, idea + *logos* = ideology is regular,
but

genea, family, lineage + *logos* = *genealogia*, genealogy is
irregular, as are

architektōn not *archotektōn*, architect

archetypos not *archotypos*, archetype

Indeed the regular *archo-* is extremely rare compared with
arche- and *archi-* and is therefore “irregular.”

Forming compounds from other substantives is complicated by the fact that one cannot generally predict the combining form of a substantive from the lexical entry, and in fact one usually predicts the lexical entry from the combining form, not vice versa.

In Greek, substantives ending in *-ma* have a stem or combining form in *-mat-*; so *haima* (blood), *haimat-* and

poiēsis (making, “poesy”) make *haimatopoiēsis*, hematopoiesis. But Hippocrates himself uses *haimorrhagia*, hemorrhage, not *haimatorrhagia*. And no one could predict from the nominative *gynē* (woman), which looks like a regular noun, a combining form *gynaik-*, whence gynecology; or from *gala* (milk), *galakt-*, whence galactophorous.

Latin is not so irregular, but even so *lac* (milk) has a combining stem *lact-* (lactacidemia); *cor* (heart), one in *cord-* (cordial); *miles* (soldier), *milit-* (military); *rex* (king), *reg-* (regicide); *nomen* (name), *nomin-* (nominate). The combining form of *homo* (human being, man) is *homin-* (hominoid ape), but Cicero himself uses *homicida* (murderer, homicide), not *hominicida*.

Stems Used in Medical Etymology

For a list of Greek and Latin stems in medical terminology, see Appendix 1 on page 2083.

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