

GREEK and
LATIN in

Scientific
Terminology

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Iowa State College Press, Ames, Iowa

Library of Congress Catalog Card Number: 59-5992.

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P R E F A C E

... Nobis parienda sunt imponendaque nova rebus novis nomina. Quod quidem nemo mediocriter doctus mirabitur, cogitans in omni arte cuius usus vulgaris communisque non sit multam novitatem nominum esse cum constituentur earum rerum vocabula quae in quaque arte versentur. (Cicero, *De Finibus* III, 3)

"We are obliged to create a vocabulary and to find names to attach to new discoveries. This will not cause surprise to any moderately well-informed person, when he reflects that in every branch of knowledge lying outside the most elementary ones there must be a large measure of "newness" about its vocabulary. This "newness" grows out of the necessity for each area of knowledge to express the particular concepts with which it deals."

When Marcus Tullius Cicero, the Roman statesman, orator, and man of letters, in the year 45 B. C. wrote the Latin words quoted above, he revealed that the problem of finding suitable names for things and ideas was already recognized in his day. But even as he reflected on the problem and wrote those words so many centuries ago, Cicero could have had only a faint idea of how many names (*nomina*) would be required for identifying the enormous number of "new things" (*res novae*) yet to be discovered. Pride and faith in his own country and in its language encouraged Cicero to believe that the Latin tongue would long be the chief vehicle of communication and the main source of names for new phenomena and concepts. Cicero was justified in that belief, as subsequent history has proved. And yet it is doubtful that even the intellectual Cicero could have predicted the great significance of the role, both direct and indirect, which his native Latin and the antecedent Greek were to have in the formation of languages and words to be used by mankind for the communication of knowledge.

This book, in its broader aspect, deals with the subject of communication in science. In its narrower aspect, and most particularly, however, the book deals with the role of the Greek and Latin languages

in the construction of the technical terms, names, and specific epithets used in the medical and biological sciences. Some consideration is given to a few of the more common linguistic and practical factors that relate to the structure, meaning, and pronunciation of scientific terms. The scope and arrangement of its contents are such that the book may be used for supplementary work in courses in language or in science, or it may be used as a textbook for a special course in the derivation of technical terms of science and medicine.

I wish to express my sincere gratitude to The State University of Iowa for granting me, through its Research Professorships Program, a semester's leave from teaching duties in order to complete this work; to the Graduate College of The State University of Iowa and to the Iowa State College Press through whose special efforts the publication of this material has been made possible; and to Norma D. Young, Associate Professor of Physical Education at The State University of Iowa, who read the manuscript and offered many valuable suggestions.

Iowa City, Iowa

August, 1958

SOME SUGGESTED INSTRUCTIONAL PROCEDURES

For those who may wish to use this book as a basic text for a special course in the nomenclature of science and medicine, the following suggestions may be of some value:

1. Major attention should be given to the lists of Latin and Greek words and the scientific terms derived from them. Only by learning the meanings of more and more word-elements and by constant practice in the recognition of those word-elements as they appear in varying combinations in compound terms can the student acquire the ability to compute the meanings of technical words by observing their structure. The student's efforts in this direction should be systematic and persistent throughout the course.

A good starting point for a systematic study of the word lists is the list of Latin prefixes. Latin prefixes not only are the most frequently appearing Latin elements in compound scientific terms, but many of them are likely to be familiar to the student already. After a period of special attention to the prefixes, the student should proceed systematically through the rest of the word lists, learning all or most of the words which are marked with asterisks. The same procedure should then be followed in studying the Greek word lists. If desired, the Greek word lists may be studied before the Latin lists.

2. The number of words to be assigned at one time must be adjusted to the achievement level of the students and to the length of the course. For this reason, the more important words in the General Vocabulary lists have been identified by asterisks. In most situations, better results will be obtained if words from the General Vocabulary lists are assigned in several selective "rounds" rather than in an unaltered sequence as they appear in the lists. This means that only the most extensively used words of those marked with asterisks are selected for study the first time through the list, and that the rest of the words so marked are left for the second "round." When the students have learned all the words marked with asterisks, a third "round," or even a fourth, may include as many of the other words in the list

as time and class ability warrant. Such procedure will insure the giving of maximum attention to the most valuable words, will obviate any feeling of tedium that the learner may develop at facing an "unending" list of words, and will enable the instructor better to gauge the number of words that a class can effectively learn in the time available. No omissions should be permitted in the lists of prefixes and suffixes.

3. When studying the derivatives under a Latin or a Greek entry-word, the student should concentrate his first attention on those derivatives with which he is already familiar; after that, he should take special note of those terms which incorporate word-elements that have been studied or which will be included in the first (and second) "round"; and finally, he should study the remaining derivatives under the entry-word. Such progression through the lists will enable the student to encounter as early as possible those constructive units which he already knows or which he can most quickly and easily learn. Those more easily learned units will then become valuable keys in the analysis of other words. In the beginning stages when he has yet learned only a few basic words, the student may need considerable assistance from the instructor in analyzing the derivative words, but the amount of such assistance should gradually decrease as he acquires a larger vocabulary and as his analytic ability increases with practice. The student cannot normally be expected to analyze and define all the derivatives under the entry-words selected, especially in cases where the derivatives are very numerous and range over several scientific areas. Apportionment of the derivatives, especially of the less familiar ones, among several students will often be advisable.

4. Sufficient derivatives are given in the word lists to allow the instructor to draw on them for periodic examination material. Items on written examinations may be such as require: (a) the dissecting of compound words into their component parts and stating the basic meaning of each component, (b) matching scrambled terms and definitions and (c) selecting the correct definition of a particular scientific word from among several suggested definitions of it.

5. The student should keep a notebook in which he records the exact definitions of a few derivatives under each entry-word. The

notebook may also be used for gathering historical and linguistic information about some of the source words and their derivatives.

6. Webster's Unabridged Dictionary and a recent comprehensive medical dictionary should be made easily available for use by the students. Other valuable books for reference are The Oxford English Dictionary, specialized scientific dictionaries, International Codes of Nomenclature, elementary Greek and Latin texts, and a standard text on the history of medicine. These, and other reference sources, are listed in the Bibliography of this text.

7. Concurrent with work on the word lists should be assignments and discussions on the linguistic and practical factors treated in Chapters I, II, III, and V. Occasionally the origin, history, form, and meaning of single words (e.g., eponyms from classical myth, legend, or history) or a group of related words can provide the basis for valuable oral or written reports.

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CHAPTER I

Introduction and Definitions

Introduction

Not all the difficulties encountered in the study of a science are inherent in the subject matter; many are due to the terminology used. In some areas of science the student may spend a year or more in becoming acquainted with the terminology. In medicine the student must become familiar with the terminology of several branches of science, such as anatomy, bacteriology, chemistry, microscopy, botany, psychiatry, and psychology. In zoology several hundreds of thousands of separate animals have been identified and named, and every year some two thousand new generic and ten thousand new specific names of insects are added. Between five hundred thousand and a million species of plants have been named and described. When to this host of names are added those of diseases, drugs, and minerals, the number of names and technical words currently required in scientific speech runs into the millions.¹ A vocabulary already so extensive and still growing rapidly constitutes a problem of considerable magnitude in some scientific areas and a burden of no mean proportions for the present-day student of science.

The purpose of this book is to furnish information and material which will aid in reducing the vocabulary burden for the student of biology and medicine. Its twofold objective is (1) to increase the student's facility in determining the meaning of scientific words by analyzing their structure, and (2) to encourage the student to establish sound nomenclatural criteria for himself and his profession.

The nature and the scope of the book's contents have been largely

1. *Jour. Amer. Med. Assn.* CXII, 1939, 1843. Edmund Andrews, *A History of Scientific English*, pp. 6 and 312. L. H. Bailey, "Problems in Taxonomy," *Amer. Jour. Botany* XXXVI, 1949, 22.

determined by the fact that the ancient Greek and Latin languages underlie both the structure and the meaning of most of the technical names and terms used in biology and medicine. Moreover, all scientific names of plants, bacteria, and animals have been latinized and are therefore, in effect, Latin words whose structure, inflection, and syntax are governed by the rules of classical Latin. For these reasons, only Greek and Latin words and scientific names and terms derived from them have been included in the word lists and, with few exceptions, the words used for illustrative purposes throughout the book are words of Greek or Latin origin. Of the numerous principles of word formation and inflection in the Greek and Latin languages, however, only those have been outlined in this text which have had the most direct and extensive application to the construction and the form of modern biological names and terms.

In order to attain its primary objective, and in order to meet the student's most immediate and practical need, this book seeks above all else to provide in ample quantity the kind of material necessary for learning those Greek and Latin roots, stems, and affixes which recur most often in the technical terms of medicine and biology. These essential working materials are furnished in several word lists which contain the Greek and Latin source words and samples of modern scientific names and terms derived from them. In seeking to achieve its secondary objective, the book contains discussions on certain aspects of biological nomenclature which relate directly or indirectly to the origin and the structure of technical terms. Some of the affiliated topics discussed are synonymy, hybrid terms, international codes of nomenclature, eponyms, and pronunciation.

If students at an early stage in their studies acquire an awareness of past and present usages in scientific nomenclature and an appreciation of what are desirable and what are undesirable practices in the formation of scientific terms, it can reasonably be hoped that in time there will be general agreement among scientists about what constitutes sound onomatological practices. The happy result will be that word coinages will rarely result in haphazard terms to add weight to an already heavy burden, but will instead be distinguished memorials to scientists who believed that the name applied to a disease, treatment, drug, plant, or animal should be a help rather than a hindrance to clear and effective communication of ideas.

Definitions of Some Frequently Used Terms

Throughout the discussions in this book certain terms are used repeatedly. In order that these terms may be fully understood whenever they appear, the following definitions and illustrations of them are given:

1. ROOT

A **ROOT** is that primitive and fundamental verbal element which expresses the basic meaning or suggestion that is common to all the words of a related group; it is the core from which several differentiated words (e.g., nouns, verbs, adjectives, and adverbs) spring up by the addition of formative elements such as prefixes, infixes, and suffixes. For example:

Gen- (Gk. *gignesthai*; Lat. *gignere*): beget, come into being, be born, become.

autogeny	genealogy	genus	oxygen
exogenous	generation	indigenous	progenitor
gene	genesis	ingenious	

Sta- (Gk. *histanai*; Lat. *stare*): stand, set.

amyostasia	stable	stamen	stature
ypostasis	stagnant	static	status
instability			

Spec- (Lat. *spectare* or *-specere*): see, look at, spy.

introspection	specialist	specific	spectrum
perspective	species	specimen	speculum

2. STEM

The **STEM** is that part of a word to which inflectional endings are attached. Because of morphological and phonetic changes, (e.g., elision, assimilation) that take place when inflectional endings are added, the stem of a Greek or Latin word is not always apparent in the form of the word that is first presented by a dictionary or textbook.

WORD AND MEANING	STEM	WORD AND MEANING	STEM
<i>alga</i> , seaweed	<i>alga-</i>	<i>soma</i> , body	<i>somat-</i>
<i>fungus</i> , fungus	<i>fungo-</i>	<i>helmins</i> , worm	<i>helminth-</i>

<i>radix</i> , root	<i>radic-</i>	<i>genos</i> , birth, race	<i>genes-</i>
<i>lithos</i> , stone	<i>litho-</i>	<i>gero</i> , bear, carry	<i>gere-</i> <i>gest-</i>

Some stems are **SEPARABLE**; that is, they may be used alone or in combination with other stems, prefixes, or suffixes. For example:

<i>askos</i> (stem, <i>asko-</i>), bag, sack:	<i>ascus</i> ; <i>ascocarp</i>
<i>ergon</i> (stem, <i>ergo-</i>), work:	<i>erg</i> ; <i>asynergia</i>

Some stems are **INSEPARABLE**; that is, they always appear in combination with other stems and are never used alone, even though they may have independent meanings. For example:

<i>algos</i> (stem, <i>alg(es)-</i>), pain:	<i>algesthesia</i> , <i>cardialgia</i> ; but not "algus" alone
<i>-jectum</i> (stem, <i>jecto-</i>), throw:	<i>injection</i> , <i>trajection</i> ; but not "jection" alone

3. BASE

The terms **BASE** and **STEM** are often used synonymously. Linguistically, however, only **STEM** has validity. But **BASE** is a convenient designation for that part of an inflected word which remains unchanged so that, even though it has no scientific linguistic value, **BASE** does have a practical value in simplifying explanations of word construction. In the examples below, it will be noted that the **BASE** and the **STEM** of a word may be alike but that more often they differ in that the **STEM** ends in a vowel and the **BASE** ends in a consonant.

GREEK OR LATIN WORD	STEM	BASE	DERIVATIVES USING BASE
<i>mensa, mensae</i> , table	<i>mensa-</i>	<i>mens-</i>	<i>mensal</i> , <i>commensal</i> , <i>commensalism</i>
<i>lac, lactis</i> , milk	<i>lact-</i>	<i>lact-</i>	<i>lactary</i> , <i>lactiferous</i> , <i>ablactation</i>
<i>kyklos, kyklou</i> , circle	<i>kyko-</i>	<i>kykl-</i>	<i>cyclostomate</i> , <i>heterocyclic</i>
<i>sarx, sarkos</i> , flesh	<i>sark-</i>	<i>sark-</i>	<i>entosarc</i> , <i>sarcohydrocele</i>
<i>scribere, scriptum</i> , write	<i>scribe-</i> <i>scripto-</i>	<i>scrib-</i> <i>script-</i>	<i>prescribe</i> , <i>nondescript</i> , <i>superscription</i>
<i>facere, factum</i> , make, do	<i>face-</i> <i>facto-</i>	<i>facie-</i> <i>fact-</i>	<i>calorificient</i> , <i>factor</i>

4. PREFIX

A **PREFIX** is an element attached to the beginning of a root, stem, or base. Its function is to elaborate, qualify, or intensify the meaning of a word. It consists of one or more syllables and is generally derived from a preposition or an adverb. For example:

PREFIX

trans, across
per, through
hyper, over
ento, within

IN COMPOUND WORD

transocular (*oculus*, eye)
 permeate (*meare*, to go)
 hypertrophy (*trophe*, nourishment)
 entophyte (*phyton*, plant)

The term **PREFIX** should not be applied to noun, verb, or adjective stems which are used as the first component of compound words; in "laterocervical" (*latus*, *lateris*, side), for example, *latero-* is not a **PREFIX** even though it is "prefixed" to another word.

5. SUFFIX

A **SUFFIX** is an element of one or more syllables attached to the end of a root, stem, or base. In addition to contributing its own particular meaning to a word, a suffix may also indicate part of speech, gender, case, number, person, tense, mood, or voice.

STEM OR BASE

flex- (bend) ~
sanat- (heal)
steno- (narrow)
enter- (intestine)

SUFFIX

-or (that which)
-orium (place where)
-sis (condition of)
-itis (inflammation)

WORD

flexor
 sanatorium
 stenosis
 enteritis

6. COMBINING VOWEL AND COMBINING FORM

A **COMBINING VOWEL** is used between two constructive units of a compound word in order to join them euphoniously. The vowels most commonly used are *o* and *i*, although the other vowels also occur. For example:

hydr- (water) plus *phob-* (fear) = hydrophobia.
anthrop- (man) plus *metr-* (measure) = anthropometry.
arch- (chief, main) plus *blast-* (germ cell) = archiblast.

sudor- (sweat) plus *fic* (make) = *sudorific*.

cervic- (neck) plus *faci-* (face) = *cervicofacial*.

flav- (yellow) plus *bacteri-* (bacteria) = *Flavobacterium*.

A COMBINING VOWEL is ordinarily not used when the second constructive member of a compound word begins with a vowel or a diphthong. For example:

mes- (middle) plus *enter-* (intestine) = *mesenteron*.

plus *odont-* (tooth) = *mesodont*.

noct- (night) plus *ambulat-* (stroll) = *noctambulation*.

In some words, however, a COMBINING VOWEL has been used even if the second member begins with a vowel. For example:

gastr- (stomach) plus *enter-* (intestine) = *gastroenteritis*.

dextr- (right) plus *ocul-* (eye) = *dextraocular*.

A COMBINING FORM is a base plus the combining vowel. In the examples used above, the combining forms are: *hydro-*, *anthropo-*, *archi-*, *sudori-*, *cervico-*, *flavo-*, *meso-*, *gastro-*, and *dextra-*.

7. VOWEL GRADATION (ABLAUT)

VOWEL GRADATION, or ABLAUT, are terms applied to changes in the root vowel of closely related words. Such changes can be observed in groups of English words like *sit*, *sat*, *seat*, *set*, *tell*, *told*, *tale*; *sing*, *sang*, *sung*, *song*; *ride*, *rode*, *ridden*; *spring*, *sprang*, *sprung*. The same sort of change occurred also in closely related Greek and Latin words and is reflected in their English derivatives. For example:

annus (year); *perennius* (perennial): *annual*, *perennial*.

facere (to do); *deficere* (to fail to do): *factual*, *deficient*.

pherein (to carry); *phoros* (a carrying): *periphery*, *phosphorus*.

8. ELISION

ELISION is the omission or the suppression of a vowel when one word element ending in a vowel is prefixed to another element

beginning with a vowel. The first element usually loses its final vowel. For example:

magno- (large) plus *animus* (mind) = magnanimous.

epi- (upon) plus *arteria* (artery) = eparterial.

9. TRANSLITERATION

TRANSLITERATION is the transposition of a word from one language into another. For example:

GREEK	LATIN	ENGLISH
ἀμύβη	<i>amoeba</i>	ameba
κόκκος	<i>coccus</i>	coccus

10. LOAN WORDS

LOAN WORDS are foreign words which have been adopted into English (or another language) without any change in spelling. Some familiar examples are apex, antenna, fistula, cancer, serum, genesis, basis, onyx, cosmos, zone, calyx.

11. DERIVATIVES AND COINED WORDS (NEOLOGISMS)

DERIVATIVES are words obtained from other languages by slightly modifying the spelling of the original word, or by combining several foreign word elements into new words. COINED WORDS, or NEOLOGISMS, are words which did not exist in the parent languages from which their elements were drawn. Most derivatives in modern scientific terminology are NEOLOGISMS. For example:

FOREIGN WORDS OR WORD-ELEMENTS

ocularis (pertaining to the eye)

habitus (condition of body)

konos (cone)

strept- (twisted); *cocc-* (berry)

koin- (common); *trop-* (turn)

olig- (few); *erythr-* (red); *cyt-* (cell); *h(a)em-* (blood); *-ia* (state or condition)

DERIVATIVES

ocular

habit

cone

streptococcus

koinotropic (or coenotropic)

oligoerythrocythemia