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## ORTHOGRAPHY OF NAMES AND EPITHETS: STEMS AND COMPOUND WORDS

Dan H. Nicolson\* and Robert A. Brooks\*\*

*Hoc opusculum in memoriam clarissimi Conradi Mortonii dedicavimus.*

### Summary

Criteria are given for determination of stems of regularly declined nouns and adjectives in Greek or Latin based on knowledge of the nominative and genitive singular forms. Rules and examples are given for regular derivation of the compounding forms from the stems. Revisions are proposed for Article 73 and Recommendation 73G of the *International Code of Botanical Nomenclature*. A section is included on simple composition of botanical names.

### 1. Introduction

Under the present *International Code of Botanical Nomenclature* (Stafleu et al., 1972), it appears that Article 73, paragraph 1, obliges taxonomists to use the original spelling of names and epithets, except for correction of typographic and orthographic errors. To put it in logical terms, taxonomists are obliged to use orthographically correct spellings of names and epithets, irrespective of the original spelling.

In practice, most taxonomists are not using the orthographically correct spellings of generic and family names but are using the original spellings and regarding all alternative spellings (whether orthographically correct or not) as orthographic variants. For example, *Lespedeza* is evidently a typographic error for *Cespedeza* but is cited among "Examples of retention of original spelling" (Article 73 of the *Code*, Stafleu et al., 1972). *Lysi-o-sepalum* is an orthographic error for *Lysi-sepalum* (in Greek *-o-* was never used with the stem *lysi-*, from *lysis*, a loosening) but no one is accepting this correction. In a future paper a proposal will be made directed toward insuring that the present practice of using original spellings will continue, except when later spellings are explicitly conserved.

At the specific level, present usage is mixed with respect to correct vs. original spelling. Most workers seem to prefer original spellings of epithets. Verdcourt and Trump (1969, p. 13) specifically state that they have adopted correct spellings of epithets based on personal names and have corrected wrongly used connecting vowels in compound words. Our paper deals with the latter problem.

Article 73, paragraph 6 of the *Code* (Stafleu et al., 1972) states "the use of a wrong connecting vowel or vowels (or the omission of a connecting vowel) in a name or epithet is treated as an orthographic error (see Rec. 73G)." One might expect that study of Recommendation 73G would

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enable the average taxonomist to determine correct connecting vowels in new or existing compound words. However, applying the present Recommendation 73G requires determination of stems or word elements in a compound word.

Use of the examples cited in Recommendation 73G does not help one understand how to determine a stem. Several examples use irregular compounding forms (not true stems) such as *Hydro-* and *Meli-*. Indeed, stems are not cited, only the compounding forms derived from the stems. Other standard works on scientific terminology and grammar, such as Brown (1956), Nybakken (1959) and Stearn (1966), were either minimally helpful or misleading to one trying to determine stems.

The junior author, with his training and experience in the classics, has worked with the senior author to clarify the problem of how to determine the stems of Greek and Latin words. It seems appropriate to make the results of our study available to those taxonomists who know "small Latin and less Greek."

## 2. The nature of stems

Before dealing with the problems of determining stems one should review some basic grammar concerning stems in inflected languages like Greek and Latin. The stem provides (with modifications) an operating base to which case endings are attached. There are, in each language, several systems of case endings known as declensions. If one knows the case endings, one automatically knows to which declension the noun or adjective belongs. If one knows the declension of the noun or adjective, one also automatically knows the case endings. Each declension has its own stem or stems and, if the stem is known, the declension is automatically known. However, when the stem is not known it is necessary to know some of the case endings (usually only the genitive singular but also sometimes the nominative singular and, rarely, the genitive plural) in order to determine the stem.

In Latin there are five declensions, each with a distinctive stem ending (two in Third Declension) and distinctive case endings in genitive singular and plural. These may be seen in the following table:

TABLE 1  
Latin Declensions with Associated Stem Endings and Certain Case Endings  
(from Stearn, p. 68, 1966)

Declension	I	II		III		IV		V
Stems in	-a	-o		consonant	-i	-u		-e
Gender	<i>f.m.</i>	<i>m.</i>	<i>n.</i>	<i>m.f.n.</i>		<i>m.</i>	<i>n.</i>	<i>m.f.</i>
Nom. Sing.	-a	-us,er	-um	various		-us	-u	-es
Gen. Sing.	-ae	-i		-is		-us		-ei
Gen. Pl.	-arum	-orum		-um	-ium	-uum		-erum

Study of this table reveals that one can predict the ending of a Latin stem if one knows the genitive singular of the word (except in Third Declension where a stem may end in a consonant or -i).

A similar table for Greek words would be as follows:

TABLE 2

Greek Declensions with Associated Stem Endings and Certain Case Endings

Declension	I		II	III			diphthong		
	-a	-ē	-ō	consonant	-i	-y	-au	-ēu	-ōu
Nom. Sing.	-a,as	-e,ēs	-ōs,ōn	various	-is	-y,ys	-aus	-ēus	-ōus
Gen. Sing.	-as,ēs,ōu -ōs*,aōs*	-ēs,ōu -ōus* -ēōs*	-ōōs* -ōu -ōus*	-ōs	-ēōs	-yōs,ēōs -ōōs	-ēōs	-ōōs	

\*indicates case endings associated with stems originally ending in consonants but compounded as if belonging to the vowel stems in which they appear to fall.

This table indicates that the matter is more complicated in Greek than in Latin, but one might suspect (correctly) that one can predict the stem ending if the nominative and genitive singular forms of a word are known.

In Table 2 some conventions for transliterating Greek into the English alphabet are introduced. It is necessary to distinguish in Greek between the long  $\bar{o}$  (ōmēga) and the short  $\delta$  (ōmicrōn), as well as the long  $\bar{e}$  (ēta) and the short  $\epsilon$  (ēpsilōn) when determining stems.

Theoretically, removing the case endings from a Greek or Latin word should leave the stem. Practically, it does not, because the original case endings commonly interacted in various ways with the true stem endings to yield the case endings we learn today (Tables 1 and 2). For example, in Latin

TABLE 3

Examples from Latin of Evolution of Stems and Case Endings

(Letters in italics underwent vowel change (ai→ae;o→u;oi→u) or elision)

Declension	I	II	III		IV	V
Stem	lancea-	equo-	sectio-	cauli-	manu-	specie-
Nom. Sing.	lancea	equo-s	sectio-s	cauli-s	manu-s	specie-s
Gen. Sing.	lancea- <i>i</i>	equo- <i>i</i>	sectio-is	caul <i>i</i> -is	manu- <i>o</i> us	specie-i
Gen. Plur.	lancea-rum	equo-rum	sectio-um	cauli-um	manu-um	specie-rum

(and became)

Nom. Sing.	lancea	equus	sectio	caulis	manus	species
Gen. Sing.	lanceae	equi	sectionis	caulis	manus	speciei
Gen. Plur.	lancearum	equorum	sectionum	caulium	manuum	specierum
Translation	spear	horse	section	stem	hand	species

the case ending for masculine nominative singular in Second Declension is *-s*. The form *equo-s*, however, became *equus* by vowel change. In the genitive singular, *equo-i* became *equi* by contraction. In both cases the original stem vowel *-o* is obscured. The genitive plural always gives a good indication of the stem in Latin but not in Greek.

In addition to the interaction between original case and stem endings, the stems themselves were subject to well-known linguistic processes such as syncope, elision and contraction, particularly in the most frequently used case, nominative singular. The result was that the original stem was sometimes drastically abbreviated in nominative singular, although it is usually intact in the other cases. Third Declension is particularly prone to stem abbreviation, such as: Greek “light” *phōs* (nom. sing.) *phōtōs* (gen. sing.); Latin “flower” *flos* (nom. sing.) *floris* (gen. sing.); Greek “hair” *thrix* (nom. sing.) *trichōs* (gen. sing.); Latin “barberry” *berberis* (nom. sing.) *berberidis* (gen. sing.). In forming compound words the original long stem is usually used. Thus, one needs to know both nominative and genitive singular to determine a stem accurately.

With this background on the nature of stems and case endings and an appreciation of the complexities of their evolution in classical usage, we are better prepared to analyze how to determine a stem.

### 3. Determination of genitive singular

The following tables and keys assume knowledge of nominative and genitive singular of any noun (or adjective in masculine gender) in Greek and Latin. This means knowing one’s way around in Greek and Latin dictionaries. Those who haven’t learned the Greek alphabet will need to keep a work like Stearn’s (1966, p. 260-281) chapter on “Greek words in botanical Latin” close at hand to help with transliteration. *Cassell’s Latin*

TABLE 4  
Greek Nominative Singular Endings with the Regular Genitive Singular  
Endings often Omitted in Dictionaries

Gender	Nom. Sing. Ending	Gen. Sing. Ending	Stem in	Examples in Greek		Transliterated		Translated
				Nom. Sing.	Gen. Sing.	Nom. Sing.	Gen. Sing.	
	-a (α)	-as (ας)	-a (α)	καρδια	καρδιας	cardia	cardias	heart
	-ē (η)	-ēs (ης)	-ē (η)	βοτανη	βοτανης	bōtanē	bōtanēs	pasture
m. (δ)	-ōs (ος)	-ōu (ου)	-ō (ο)	ηλιος	ηλιου	hēliōs	hēliōu	sun
n. (το)	-ōs (ος)	-ēōs (εος)	-ēs (ες)	ευρος	ευρεος	eurōs	eurēōs	breadth
	-ōn (ον)	-ōu (ου)	-ō (ο)	δικτυον	δικτυου	dictyōn	dictyōu	net

*Dictionary* (Marchant and Charles, 1956) has been adequate in terms of completeness and in giving the critical genitive singular form or ending. An unabridged Greek dictionary will be complete; however, the *Abridgement of Liddell and Scott’s Greek-English Lexicon* (Liddell and Scott, 1871, but reprinted) often omits the vital genitive singular form for regularly declined nouns. To help those faced with this omission, the above table is included.

#### 4. Determination of noun/adjective stems

Greek has nouns and adjectives with stems ending in consonants and vowels. Distinguishing consonant stems from vowel stems and identifying the different vowel stems requires knowledge of nominative and genitive singular (in masculine gender, for adjectives). The following criteria apply to nouns/adjectives which have regular declensions.

##### Criteria for determination of Greek stems

1. Any noun/adjective with genitive singular ending in *-ōs* preceded by a consonant has a consonant stem. To find the stem remove the *-ōs* ending from the genitive singular.

2. All other forms of genitive singular indicate a vowel stem. All five vowels and three diphthongs are used in Greek stems. To find the stem go to the nominative singular: if it ends in a vowel (*-a, ē, y*), that is the stem; if it ends in a consonant (*n: -ōn*; or *s: -as, ēs, ōs, is, ys, aus, ēus, ōus*), remove the consonant and you have the stem.

NOTE: The only exceptions to the above criteria are certain consonant stems originally ending in *-as* or *-ēs* in which the final *-s* has been lost, causing them to appear to be vowel stems. They compound like the vowel stems (*a-, ē-* and *ō-* stems) into which they fall by the above criteria and, for purposes of compounding, need not be distinguished.

Latin is similar to Greek in having consonant and vowel stems which require knowledge of the nominative and genitive singular (in masculine gender for adjectives) to differentiate. There are only five vowel stems, and one of them, the *i*-stem, has effectively almost been lost and can most easily be distinguished in genitive plural from the consonant stem declension (Third Declension) into which it falls. Stems ending in *-i* are treated here as part of the consonant stems, since they compound like the consonant stems into which they fall by the following criteria.

##### Criteria for determining Latin stems

1. Any noun/adjective with genitive singular ending in *-is* has a consonant stem. To find the stem remove the *-is* from the genitive singular.

2. All other forms of genitive singular indicate a vowel stem. If the genitive singular ends in *-ae* or *-us*, then delete the final letter to find the stem (*a-* or *u-* stem). If the genitive singular ends in *-i*, then look to the nominative singular: if it ends in *-es*, then delete the final *-s* to find the stem (*e*-stem); if it ends in *-er, -ir, -um* or *-us*, then return to the genitive singular, delete the final *-i* and add *-o* to find the stem (*o*-stem).

##### Dichotomous Key to Stem Endings of Nouns/Adjectives in Latin

1. Genitive singular ending in a consonant (*-is* or *-us*).
  2. Genitive singular ending in *-is* . . . . . *consonant-stem*
  2. Genitive singular ending in *-us* . . . . . *u-stem*
1. Genitive singular ending in a vowel (*-ae, -i*).
  3. Genitive singular ending in *ae* . . . . . *a-stem*
  3. Genitive singular ending in *-i*.
    4. Nominative singular ending in *-es* . . . . . *e-stem*
    4. Nominative singular ending in *-us, -er, -ir, or -um* . . . . . *o-stem*

#### 5. Modification of stems to compounding forms

The rules for modification of stems into compounding forms vary by the language and stem. Even the compounding forms may vary depending on whether the following element begins with a consonant or a vowel. The following tables for Greek (Table 5) and Latin (Table 6) give the compounding rules alphabetically by the stem endings; the examples give

English, Greek (or Latin) nominative and genitive singular, the stem, and compounds, which are shown as they should be before following vowels or consonants. The reader is encouraged to check the derivation of stems against the criteria for determining stems and the modifications of the stems against the rules for modification of stems to compounding forms.

TABLE 5

Greek Nouns/Adjectives Arranged by Stems, With Rules for Modification into Compounding Forms and Examples

1. consonant stems (Third Declension)

Compounding rules: before vowel use unmodified stem; before consonant add connecting vowel -o- to stem.

English	Nom.	Gen. Sing.	Stem	Compounding Forms	
	Sing.			Before Consonant	Before Vowel
milk	gala	galactōs	galact-	Galact-o-phora	Galact-ites
lion	lēōn	lēōntōs	lēōnt-	Leont-o-podium	Leont-ice
bird	ōrnīs	ōrnithōs	ōrnith-	Ornith-o-galum	Ornith-idium
nose	rhis	rhinōs	rhin-	Rhin-o-ptyryx	Rhin-anthus
hair	thrix	trichōs	trich-	Trich-o-manes	Trich-antha

2. a-stems (First Declension)

Compounding rules: before vowel delete -a from stem; before consonant replace -a with -o-.

English	Nom.	Gen. Sing.	Stem	Compounding Forms	
	Sing.			Before Consonant	Before Vowel
thorn	acantha	acanthēs	acantha-	Acantho-panax	Acanth-ella
anther	anthēra	anthēras	anthēra-	Anthero-toma	Anther-icum
north	bōrēas	bōrēōu	bōrēa-	Boreo-dromia	bore-alis
heart	cardia	cardias	cardia-	Cardio-spermum	Cardi-andra
flesh	crēas	crēōs	crēas-*	Creo-chiton	cre-agra
old age	gēras	gēraōs(-ōs)	gēra.-*	gero-trophos	

\*as-stems in which final -s has been lost, but compounded as if stem were crēa- or gēra-.

### 3. ē-stems (First Declension)

Compounding rules: before vowel delete ē from stem; before consonant replace ē with ǝ but for certain words preserve ē.

English	Nom.	Gen. Sing.	Stem	Compounding Forms	
	Sing.			Before Consonant	Before Vowel
healthy	hygiēs	hygiōs(ǝs)	hygiēs-*	hygio-logy	hygi-ene
club	corynē	corynēs	corynē-	Coryne-phorus	Coryn-andra
lake	limnē	limnēs	limnē-	Limno-charis	Limn-anthes
sailor	nautēs	nautō	nautē-	Nauto-chilus	Naut-ilus

\*ēs-stem in which final s has been lost, but compounded as if stem were hygiē-.

### 4. i-stems (Third Declension)

Compounding rules: before vowel preserve i of stem; before consonant preserve i and for certain words add connecting vowel ǝ.

English	Nom.	Gen. Sing.	Stem	Compounding Forms	
	Sing.			Before Consonant	Before Vowel
loosening	lysis	lysēōs	lysi-	Lysi-machia	Lisi-anthus(sic)
snake	ōphis	ōphēōs	ōphi-	Ophi-o-glossum	Ophi-urus

### 5. ō-stems (Second Declension)

Compounding rules: before vowel delete ō of stem; before consonant preserve ǝ.

English	Nom.	Gen. Sing.	Stem	Compounding Forms	
	Sing.			Before Consonant	Before Vowel
flower	anthōs	anthēōs(ōs)	anthēs-*	Antho-spermum	Anth-urium
circle	cyclōs	cyclō	cyclō-	Cyclo-sorus	Cycl-anthus
net	dictyōn	dictyō	dictyō-	Dictyo-loma	Dicty-andra
race	gēnōs	gēnēōs(ōs)	gēnēs-*	Geno-plegium	gen-arches
sun	hēliōs	hēliō	hēliō-	Helio-tropium	Heli-anthus
mountain	ōrōs	ōrēōs	ōrēs-*	Oro-xylon	Or-ites

\*ēs-stems in which final s has been lost, but compounded as if stems were anthō-, gēnō-, and ōrō-; ē is often preserved in ōrēs, yielding combinations of Ore-o-panax and Ore-anthes.

6. y-stems (Third Declension)

Compounding rules: before vowel preserve -y of stem; before consonant preserve -y of stem and sometimes add connecting vowel -ŏ-.

English	Nom.	Gen. Sing.	Stem	Compounding Forms	
	Sing.			Before Consonant	Before Vowel
city	asty	astěōs(ěōs)	asty-	Asty-damia	Asty-anax
fish	ichthys	ichthyōs	ichthy-	Ichthy-o-there	Ichthy-osma
thick	pachys	pachěōs	pachy-	Pachy-phytum	Pachy-anthus

7. au-, ēu-, ōu- (diphthong) stems (Third Declension)

Compounding rules: before vowel or consonant, stem ending preserved or contracted to -ō; -ēu sometimes becomes -ěō.

English	Nom.	Gen. Sing.	Stem	Compounding Forms	
	Sing.			Before Consonant	Before Vowel
ox	bōus	bōōs	bōu-*	Bou-cerosia	Bo-opis
ship	naus	něōs	nau-	Nau-clea	nau-agia
mule	ōrēus	ōrěōs	ōrēu-	oreo-comus	
king	basilēus	basilěōs	basilēu-	Basilo-xylon	

\*bōu- is often reduced to bu- (Bu-tomus, Bu-chloe, Bu-pleurum).

TABLE 6

Latin Noun/Adjectives Arranged by Stems With Rules for Modification  
into Compounding Forms and Examples

1. consonant (and i-) stems (Third Declension)

Compounding rules: before vowel use stem; before consonant add connecting vowel -i-.

English	Nom.	Gen. Sing.	Stem	Compounding Forms	
	Sing.			Before Consonant	Before Vowel
tree	arbor	arboris	arbor-	arbor-i-culture	arbor-aceous
barberry	berberis	berberidis	berberid-	berberid-i-folia	Berberid-aceae
heart	cor	cordis	cord-	cord-i-folia	cord-atus
mountain	mons	montis	monti-*	monti-cola	mont-ana

\*true i-stem with montium as genitive plural but compounded as if stem were mont-.

2. a-stems (First Declension)

Compounding rules: before vowel -a is deleted; before consonant -a changed to -i-.

English	Nom.	Gen. Sing.	Stem	Compounding Forms	
	Sing.			Before Consonant	Before Vowel
lance	lancea	lanceae	lancea-	lancei-folia*	lance-olatus
magnolia	magnolia	magnoliae	magnolia-	magnolii-flora	Magnoli-aceae
star	stella	stellae	stella	stelli-fera	stell-ula

\*by botanical usage lanceifolia has become lancifolia.

3. e-stems (Fifth Declension)

Compounding rules: -e is deleted unless stem is monosyllabic.

English	Nom.	Gen. Sing.	Stem	Compounding Forms	
	Sing.			Before Consonant	Before Vowel
thing	res	rei	re-	re-culus	re-al
species	species	speciei	specie-	speci-men	speci-al

4. o-stems (Second Declension)

Compounding rules: before vowel o of stem is deleted; before consonant o is replaced by i.

English	Nom.		Stem	Compounding Forms	
	Sing.	Gen. Sing.		Before Consonant	Before Vowel
field	ager	agri	agro-	agri-culture	agr-arian
middle	centrum	centri	centro-	centri-petal	Centr-anthus
thistle	cirsium	cirsii	cirsio-	cirsii-folium	cirsi-aceous
wart-cress	coronopus	coronopi	coronopo-	coronopi-folia	coronop-aceous
wedge	cuneus	cunei	cuneo-	cunei-folia	cune-ate
lily	lilium	lilii	lilio-	lilii-florum	Lili-aceae

5. u-stems (Fourth Declension)

Compounding rules: before vowel u of stem is usually deleted (not in gradu-ate, sinu-ate); before consonant u is usually replaced by i (not in manu-facture, cornu-copia).

English	Nom.		Stem	Compounding Forms	
	Sing.	Gen. Sing.		Before Consonant	Before Vowel
horn	cornu	cornus	cornu-	corni-fer	Corn-aceae
oak	quercus	quercus	quercu-	querci-folia	querc-etum

6. *Short-cut to compounding forms*

The preceding pages outline the classical grammatical procedure for proceeding stepwise from the nominative and genitive forms to the true stems and from the true stems to the compounding forms. There is an easier way, but it has exceptions. It requires use of a grammatically unrecognized concept called the “operating base” by Nybakken. The operating base usually ends in a consonant and is the same as the true stem in the case of consonant stems and, in the case of vowel stems, is usually the vowel stem with the vowel removed.

In Latin the operating base concept is quite efficient in terms of ease of determination and application. Essentially all one does is remove the case ending from the genitive singular to determine the operating base. In forming compounds one simply uses the operating base before a vowel or adds *-i-* before a consonant. The exceptions, with exceptions to exceptions, happen when the operating base ends in *-e*.

In Greek the “operating base” concept is more complex because one must work in both genitive and nominative singular and deal with three different systems of operating bases. First, if the genitive singular ends in *-ōs* preceded

TABLE 7

Derivation of Latin Operating Bases and Their Application (\*exception)

Declension	Nominative	Genitive	Operating Base	Compounding Forms	
	Singular	Singular		Before Vowel	Before Consonant
1	lance-a	lance-ae	lance-	lance-olate	lanci-folius*
1	Tili-a	Tili-ae	tili-	Tili-aceae	tili-i-folius
1	Adox-a	Adox-ae	adox-	Adox-aceae	adox-i-folius
2	Ar-um	Ar-i	ar-	Ar-aceae	ar-i-folius
2	Api-um	Api-i	api-	Api-aceae	api-i-folius
2	cune-us	cune-i	cune-	cune-atus	cune-i-folius
3	Pteris	Pterid-is	pterid-	Pterid-aceae	pterid-i-folius
3	Borago	Boragin-is	boragin-	Boragin-aceae	boragin-i-folius
3	Abies	Abiet-is	abiet-	abiet-aceous	abiet-i-folius
4	Corn-us	Corn-us	corn-	Corn-aceae	corn-i-folius
5	specie-s	specie-i	specie-	speci-al*	speci-men*
5	die-s	die-i	die-	di-urnal*	di-manche*

by a consonant (Third Declension consonant stems), the operating base (and true stem) is found by dropping the *-ōs* genitive case ending. All other forms of genitive singular require shifting to the nominative singular to find the operating base. Second, if the nominative singular ends in *-a*, *-as*, *-ē*, *-ēs*, *-ōs*, or *-ōn* (First and Second Declension), one removes that nominative case ending to obtain the operating base. Third, if the nominative singular ends in *-is*, *-y*, *-ys*, *-aus*, *-ōus*, or *-ēus* (Third Declension vowel stems), one removes the final *-s*, if any, to find the operating base (also the true stem). This third group is replete with exceptions. It is easier to determine the true stems and modify them into compounding forms as outlined in the text than it is to apply the "operating base" concept in Greek.

### 7. Pseudocompounding vs. compounding words

Pseudocompounds are noun or adjectival phrases which are treated as a single compound word. The non-final element of a pseudocompound carries its case ending with it, unlike true compounds, in which the non-final element appears as a modified stem without a case ending. Although there is precedent for pseudocompounding (Romans built "aquaeductūs" rather than "aquiductūs"), linguistic scholars are unanimous in denouncing the practice. Nybakken (1959, p. 268) discusses it under "Malformations," Brown (1956, p. 41) says "use of the connective *-ae-* is not recommended," and Stearn (1966, p. 286-7), after explaining the origin of this misusage in botany, points out that under the *Code* ". . . use of a wrong connecting vowel

or vowels in a name or epithet is to be treated as an orthographic error to be corrected.”

Although some workers have argued that pseudocompounds are incorrect because they use incorrect connecting vowels, technically they are incorrect because they are incorrectly compounded. Thus, *opuntiaeflorus* should be corrected to *opuntiaiflorus* (example cited in Article 73), *lanceaefolius* should be *lancifolius* (by standard of botanical usage but *lanceifolius* by classical compounding), *erucaefolius* should be *erucifolius*, *tiliaefolius* should be *tiliifolius*, etc.

However, the use of the genitive in pseudocompounds can be justified, as Recommendation 73G points out, on etymological grounds when it is necessary to distinguish between words that have the same compounding forms. The same compounding form, *carici-*, can be derived from the word for papaya (*carica*, *caricae*, stem *carica-*) and sedge (*carex*, *caricis*, stem *caric-*). The genitive and pseudocompounding should be used for papaya-leaved (*caricaefolius*) to distinguish it from the regularly formed compound for sedge-leaved (*caricifolius*). Another example is *tubi-*, which can be derived from trumpet (*tuba*, *tubae*, stem *tuba-*) or tube (*tubus*, *tubi*, stem *tubo-*). Pseudocompounding should be used to discriminate between words like trumpet-flowered (*tubaeflorus*) and tubular-flowered (*tubiflorus*).

Pseudocompounds using nominative case should not be corrected but neither should they be used as precedents. Linnaeus used noun phrases for some of his species which botanists, by convention, hyphenate into pseudocompounds, such as *nidus-avis* (nest of bird), *bursa-pastoris* (purse of shepherd), *speculum-veneris* (mirror of Venus), *herba-venti* (herb of wind).

Pseudocompounds apparently using ablative case did develop in Late Latin, according to Kretschmer (see Stearn, 1966, p. 287); for example: *atropurpureus* (purple with black), *albomarginatus* (margined with white). These may be ablative pseudocompounds but they also may have evolved by analogy with Greek compounds (formed with *-o-* instead of *-i-*), or as use of the unmodified stem (*ater*, *atri*, stem *atro-*; *albus*, *albi*, stem *albo-*). This construction is only recommended in botanical Latin for *albo-* and *atro-*, but regular compounding (*albiflorus*, *atriceps*) should be considered.

## 8. Proposals for revision of the Code

Various difficulties with the present Code pertaining to compounding words provoked this paper. The following proposals are intended to eliminate those difficulties without, it is hoped, adding further ones.

### Proposal 21. Replace Rec. 73G

This proposal is made to remove some minor errors, to eliminate some irregular examples, to clarify the procedure of determining compounding forms from stems, and to emphasize compounding rather than pseudocompounding.

Delete present Recommendation 73G and substitute:

“A compound name or an epithet which combines elements derived from two or more Greek or Latin words should be formed, as far as practicable, in accordance with classical usage. This may be stated as follows:

1. In a true compound, a noun or adjective in non-final position appears as a stem without case ending with one of the following modifications to derive its compounding forms:

(a) If the stem ends in a consonant, a connecting vowel (*-o-* in Greek, *-i-* in Latin) is

inserted before a following consonant (*Leont-o-podium*, stem *leont-*; *cord-i-folius*, stem *cord-*). Before a following vowel the connecting vowel is omitted (*Leont-ice*; *cord-atus*).

(b) If the stem ends, or appears to end, in the vowels *-a*, *-e*, *-o* or *-u*, this stem vowel is normally elided before a following consonant. For Greek words, *-o* is substituted (*Acantho-panax*, stem *acantha-*; *Limno-charis*, stem *limne-*; *Cyclo-sorus*, stem *cyclo-*). For Latin words, *-i* is substituted (*magnolii-florus*, stem *magnolia-*; *lilii-florus*, stem *lilio-*; *querci-folius*, stem *quercu-*), except for the rare *e*-stems (*speci-men*, stem *specie-*). Before a following vowel the above stem vowels are elided and the Greek *-o* and Latin *-i* are not substituted (*Acanth-ella*, *Limn-anthes*, *Cycl-anthus*, *Magnoli-aceae*, *Lili-ales*, *querc-etum*). In certain words the stem vowel may be preserved; this can only be determined by comparison with existing classical compounds (*Coryne-phorus*, stem *coryne-*; *re-culus*, *re-al*, stem *re-*).

(c) If the stem ends in the vowels *-y*, *-i* or the rare diphthongs *-au*, *-eu*, or *-ou*, the stem vowel is normally preserved (*Pachy-phytum*, *Pachy-anthus*, stem *pachy-*; *Lysi-machia*, *Lisi-anthus*, stem *lysi-*; *Nau-clea*, stem *nau-*). For certain stems, such as those of Greek nouns ending in *-y* or sometimes *-i*, the connecting vowel *-o-* is added before a consonant (*Ichthy-othere*, stem *ichthy-*; *Ophi-o-glossum*, stem *ophi-*). The Greek diphthong stem endings are normally preserved but often undergo contraction or vowel change (*Bo-opis*; stem *bow-*; *oreo-comus*, stem *oreu-*; *Basilo-xylon*, stem *basileu-*).

2. A pseudocompound is a noun or adjectival phrase treated as if it were a single compound word. In a pseudocompound, a noun or adjective in a non-final position appears as a word with a case ending, not as a modified stem. Examples are: *nidus-avis* (nest of bird), *Myos-otis* (ear of mouse) *cannae-folius* (leaf of canna), *albo-marginatus* (margined with white), etc. Some irregular forms have been developed on the analogy of pseudocompounds, such as *atro-purpureus* (purple with black, where the correct phrasing would have been *purpureus cum atro*). Others have been deliberately introduced to reveal etymological differences when different word elements have the same compounding forms, such as *tubi-* from tube (*tubus*, *tubi*, stem *tubo-*) or from trumpet (*tuba*, *tubae*, stem *tuba-*) where *tubaeflorus* can only mean trumpet-flowered; also *carici-* is the compounding form from both papaya (*carica*, *caricae*, stem *carica-*) and sedge (*carex*, *caricis*, stem *caric-*) where *caricaefolius* can only mean papaya-leaved. The latter use of genitive singular of First Declension for pseudocompounding is an error to be corrected unless it makes an etymological distinction.

3. Some common irregular forms in compounds are not derived from a noun or adjective stem, but have been developed specifically for compounding. Examples are *hydro-* and *hydr-* (*Hydro-phyllum*) where the regular noun stem is *hydat-*; *calli-* (*Calli-stemon*) where the regular adjective stem is *calo-*; and *meli-* (*Meli-osma*, *Meli-lotus*) where the regular noun stem is *melit-*."

#### *Proposal 22. Replace Paragraph 6 of Article 73.*

The present Article 73, paragraph 6 states that "The use of a wrong connecting vowel or vowels (or the omission of a connecting vowel in a name or epithet is treated as an orthographic error (see Rec. 73G)." It is felt that the emphasis should be on correct compounding forms rather than on connecting vowels. The following proposal is more accurate. Also, if conservation is the accepted method for dealing with taxa above the specific level, it is appropriate to remove "names" (of genera and families) from this paragraph.

Delete present Article 73, paragraph 6 and substitute:

"The use of an incorrect compounding form in an epithet is treated as an orthographic error (see Rec. 73G)."

### *9. Simple composition of botanical names*

The previous part of this paper was concerned with preparation for compounding a word by determining the correct compounding forms from

nouns and adjectives. This section discusses other steps in composing the compound, namely, choice of language of elements, sequence of elements and gender of the product. These can be complex problems.

Workers baptizing new taxa should review a reference on word composition, e.g., Brown (1956, p. 38-49), Nybakken (1959, p. 231-242) or Stearn (1966, p. 282-299). Brown's book is useful for composing compounds because it is alphabetically arranged by English words; for example, if you wished to combine aspects of "love" and "tree," you would find 40 entries in Greek, Latin, Anglo-Saxon and Old High German under "love" and 10 entries under "tree," all with examples of existing compounds, and seven cross-references to similar terms. Nybakken's book is useful in analyzing existing compounds because it is arranged alphabetically in Greek (transliterated) and Latin vocabularies with examples of existing compounds. Stearn combines the approaches of both Brown and Nybakken, although not in their depth, and includes botanical neo-Latin elements not found in usual classical sources.

Workers interested in practical "how-to-do-it" information on botanical Latin, including composition of scientific names, diagnoses and descriptions, as well as an abstract of basic Latin grammar, should consult Baranov (1969) or Stearn (1966).

In composing compound names and epithets, adherence to a few simple practices will enable one to avoid confusing complexities and obvious errors of word composition. The following should be viewed as guidelines to simple composition and should not be used to "correct" existing compounds.

1. Composition is simplest if one element is a noun and the other element is subordinate. A subordinate element clarifies (by answering an interrogative pronoun, viz., who, where, what, how, when, which, why) or modifies the controlling element.

2. The noun element should be last, unless it is being modified by a suffix.

3. Greek elements should be used for generic names. Latin elements should be used for specific epithets. Elements from different languages should not be mixed (hybrid compounds).

4. In Greek compounds use the letter — o — as a connecting vowel or, as appropriate, as a substitute for the final vowel of a stem. In Latin compounds use — i — as the connecting or substitute vowel.

5. Generic names must be substantive or, if not, treated as substantive. Gender is normally that of the last noun element. However, use of a suffix in forming a generic name often creates an adjective of optional gender which should agree in gender with the word qualified. These should be treated as feminine on the grounds that the omitted word being qualified is *planta* (f.), *arbor* (f.), or *herba* (f.); for example, better *Cirsiola* (f.), than *Cirsiolus* (m.) or *Cirsiolum* (n.).

6. Epithets (specific or infraspecific) should be adjectival and agree in gender with the generic name. For example, in *Arum longispathum* the compound *longispathum* is given the neuter termination *-um* because it is adjectival ("long-spathed"). It must agree in gender with *Arum*, which is neuter, even though the last noun element of the compound, *spatha*, is feminine.

7. The form of each element in the proposed compound should be compared against existing compounds using the same element to determine if further requirements or exceptions should be considered.

8. The etymology of the new or newly applied compound should be stated. As a minimum, the language, dictionary form, and translation of each element should be given. Further information, as appropriate, might include the genitive singular, stem, gender, and part of speech for each element.

## 10. Epilogue

Impatience with orthography is sometimes expressed by busy taxonomists. However, one thought is worth remembering: there is no substitute for quality. Brown (1956, p. 49) expresses this and we close with his statement.

“Objection to the creation of words without benefit of orthodox derivation has greatly diminished in recent years with the decline in classical instruction. Apparently the trend is parallel with the pragmatic Shakespearean conclusion that “a rose by any other name would smell as sweet.” Thus, also, it is commonly understood that the technical names of plants, animals, minerals, and other objects of scientific study, are merely convenient, verbal handles for labelling purposes. Why, then, be fussy about their creation? Why be concerned as to whether or not they are apt, legitimately derived, and appropriately spelled? To ask these questions is to answer them by putting another: Does the Shakespearean realist not demand that handles, wherever attached, be of good material, well-constructed, and harmonious with their best use?”

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### Postscript

G. Steyskal (U.S.D.A. entomologist at the Smithsonian Institution) kindly pointed out that some of the examples used in this paper are not compound words (using elements that can stand alone) but are derivative words (using suffixes that cannot stand alone), such as *cord-atus*, *speci-men*, *Lili-aceae*, *re-culus*, etc. The initial combining forms are the same whether used to form compound or derivative words.