

Min-nesota	Min-ne-sota
Ni-jmegen	Nij-me-gen
Noethe-rian	Noe-ther-ian
No-ord-wi-jk-er-hout	Noord-wijker-hout
Novem-ber	No-vem-ber
Poincare	Poin-care
Po-ten-tial-gle-ichung	Po-ten-tial-glei-chung
rathskeller	raths-kel-ler
Rie-man-nian	Rie-mann-ian
Ry-d-berg	Ryd-berg
schot-tis-che	schot-tische
Schrodinger	Schro-ding-er
Schwabacher	Schwa-ba-cher
Schwarzschild	Schwarz-schild
Septem-ber	Sep-tem-ber
Stokess-che	Stokes-sche
Susque-hanna	Sus-que-han-na
tech-nis-che	tech-ni-sche
Ten-nessee	Ten-nes-see
ve-r-all-ge-mein-erte	ver-all-ge-mein-erte
Verteilun-gen	Ver-tei-lun-gen
Wahrschein-lichkeit-s-the-o-rie	Wahr-schein-lich-keits-the-o-rie
Werthe-rian	Wer-ther-ian
Winch-ester	Win-ches-ter
Ying-yong Shuxue Jisuan Zeitschrift	Ying-yong Shu-xue Ji-suan Zeit-schrift

Literate Programming

**Errata: Literate Programming,
A Practitioner's View**
TUGboat 13, no. 3, pp. 261–268

Bart Childs

The address `lyman.pppl.princeton.edu` should have read `lyman.pppl.gov` (a careless error on my part). The address `csseq.cs.tamu.edu` no longer permits anonymous ftp. Due to some network breakins from different places, extensive local network changes are being done and relevant sources will be placed on `ftp.cs.tamu.edu` no later than January 1993. The author will e-mail any desired sources in the meantime.

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Philology

Hyphenation patterns for ancient Greek and Latin

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The amount of compound words in ancient Greek makes its hyphenation by computer a quite difficult task; it is impossible to predict all combinations of words. To be efficient, a set of patterns must be accessible to the final user; a scholar must be able to add patterns, according to new words he/she encounters. Use of T_EX's `\hyphenation` primitive is not appropriate since most Greek words are declinable: for each word one would have to add a dozen hyphenation exceptions.

After a short introduction to the concept of hyphenation by T_EX the author presents a method for hyphenation of ancient Greek. Using this method, he compiled a list of patterns out of a dictionary [Bai] of 50,000 words. These patterns are presented in a comprehensible format, in a way that scholars can easily determine the patterns that have to be added, to solve specific hyphenation problems.

The same approach is applied to Latin. A list of patterns has been compiled out of a dictionary [B–C]. The size of this list is very small compared to the one of ancient Greek patterns, although Latin also uses compound words.

Finally examples of hyphenated classical texts are given.

1 What do I have to know about hyphenation?

When T_EX creates a format like Plain or L_AT_EX it also reads information from a file called `hyphen.tex` (or `USHyphen.tex`, or `FRHyphen.tex` and so forth) which contains the *hyphenation patterns* for a specific language. These are clusters consisting of letters separated by digits, like `x1y2z`. The idea is the following:

- if your set of patterns is empty, there is no hyphenation at all.
- if you have a pattern `x1y` then on every occurrence of the cluster “xy”, hyphenation “x-y” will be possible. If the pattern is `x1yzw`, then the pair of letters “xy” will be hyphenated only when followed by “zw”.

- if there is a pattern $x1y$ and a pattern $x2yabc$, then the pair “xy” will be hyphenated, except when it is followed by “abc”. So the digit 2 indicates an exception to the rule “*separate x and y*”.
- the same holds for greater numbers: 3 will be an exception of patterns with number 2, and so on. You can now read [DEK], pp. 449–451, for more details on T_EX’s hyphenation algorithm.
- a dot in front of (or behind) a pattern specifies that the latter is valid only at the beginning (or the end) of a word. In this way, for example, $.xy2z.$ will be applied *only* to the word ‘xyz’.

Despite the existence of some fundamental rules, hyphenation of a particular language can be very complicated, especially when it depends on etymological criteria. There are two ways to handle this complexity: one can investigate the hidden mechanisms of hyphenation and make patterns correspond to the analytical steps of manual hyphenation; or one can use a “pattern generator” like PATGEN on a sufficiently representative set of already hyphenated words. The choice of the method depends on the nature of the language and on the size of the available set of hyphenated words: theoretically one could create a file containing *all* words of a particular language in hyphenated form; the pattern generator would then give an *exhaustive* set of patterns. Since it is more probable to have partial sets of words, the “pattern generator” will only produce more or less good approximations. For ancient Greek and Latin, the author has chosen the first method.

2 Why is hyphenation of ancient Greek so difficult for a computer?

As mentioned in TUGboat 11, no. 1, since 1990 patterns have existed for modern Greek (made by the author). What then makes hyphenation of ancient Greek so different? Why is it so difficult?

First of all, because of compound words. The difficulty lies in the fact that components are often altered when composed: ἐπι and αἰνῶ gives ἐπαινῶ (not ἐπιαινῶ) while ἐπι composed with βάλλω produces ἐπιβάλλω. Could we hence hyphenate always ἐπ-α and ἐπι-? well, actually not, because there is also the case of ἐπι + ἰάλλω = ἐπιιάλλω which is hyphenated ἐπ-ιάλλω. Then perhaps we could produce patterns for *roots*, like -αἰν-, to insure hyphenation of ἐπ-αἰνος, κατ-αἰνεσις, φευδ-αἰνῶ and so forth? No, because this would produce wrong hyphenation of ἀ-σθμαί-νω, ση-μαί-νω, ὑ-φαί-νω...

A second problem is declension and diacritics. While the latter are provided to facilitate

comprehension of a word, they rather obstruct the work of the computer. Because for the computer α, ά, à, ã, á, â, etc., are *distinct* entities. So ἐπεῖ and ἐπέι are to be treated as entirely distinct words. In most languages declension affects only endings of words: здание, здания, зданию, зданию, зданием, зданию and so forth. In Greek, the root of the word remains mostly the same (except in cases such as ὁ ἀνήρ, τοῦ ἀνδρός) but the accent migrates: ὁ ἄνθρωπος, τοῦ ἀνθρώπου. It follows that when creating patterns, one must consider all possible diacritics and their positions.

To illustrate this, here is an example of two words which look very similar but are hyphenated in two different ways:

ἄψ-ορρος (from ἄψ and ὄρνυμι)

and

ἄφο-ρρος (or ἄφόρρους, from ἄψ and ῥέω).

We will decline them and try to extract the necessary patterns so that T_EX can correctly hyphenate them, in all cases¹:

ὁ	ἄψορρος	ὁ	ἄφόρρους
τοῦ	ἄφόρρου	τοῦ	ἄφορρούου
τῶ	ἄφόρρω	τῶ	ἄφορρώω
τὸν	ἄψορρον	τὸν	ἄφόρροον
ῶ	ἄψορρε	ῶ	ἄφόρροε
οἱ	ἄψορροι	οἱ	ἄφόρροοι
τῶν	ἄφόρρων	τῶν	ἄφορρώων
τοῖς	ἄφόρροις	τοῖς	ἄφορρώοις
τοῦς	ἄφόρρους	τοῦς	ἄφορρώους
ῶ	ἄψορροι	ῶ	ἄφόρροοι

For the word ἄψορρος it would be enough to introduce patterns ἄψ-ορρ and ἄψ-όρρ. In this case, the word ἄφόρρους would be wrongly hyphenated. To distinguish this word we must include an o at the end of the pattern, and hence introduce the pattern ἄψό-ρρο. This would again change the hyphenation of the genitive case of ἄψορρος, namely ἄψόρρου. For this reason we will rather use the pattern ἄψό-ρροο. This has the advantage of not interfering with the hyphenation of ἄψορρος, but cannot be applied to the vocative case of ἄφόρρους. For this, we need a second pattern ἄψό-ρροε, which is actually the whole word. In the remaining cases of ἄφόρρους, the accent is on the penultimate syllable ρρο. But the word ἄψορρος is never accented on that syllable, so that an unaccented pattern like ἄψο-ρρ would apply *only*

¹ The reader should excuse the unusual order of cases: nominative, genitive, dative, accusative, vocative. This order is used in education and scholarly literature, in Greece.

to the genitive, dative and plural accusative cases of ἀφόρροος.

Using this method, we found five patterns:

ἄφ-ορρ, ἄφ-όρρ, ἄφ-ό-ρροο, ἄφ-ό-ρροε, ἄφ-ο-ρρ

The reader can verify that with these, all cases of both words are correctly hyphenated.

The example illustrates another fact: when writing down new patterns, one must constantly compare the newly hyphenated words with the ones which produced the previous patterns, so that conflicts can be avoided.

Finally there are some rare cases where identical words have different meanings and different hyphenations: ἄ-νοστος from ἄ and νόστος, ἄν-οστος from ἄν and ὄζω; ἐν-ετὸς from verb ἐν-ίημι and ἐ-νετὸς (Venitian).

3 The fundamental rules of ancient Greek hyphenation, and the corresponding patterns

The Chicago Manual of Style ([Chi], 9.130) asserts that: IN [ancient] GREEK, WORD DIVISION FOLLOWS RULES THAT ARE STRAIGHTFORWARD AND FAIRLY EASY TO APPLY.

Here are the rules following this quotation in [Chi], and the necessary patterns ($v_n, n \geq 1$ will be vowels and $c_n, n \geq 1$ consonants):

1. WHEN A SINGLE CONSONANT OCCURS BETWEEN TWO VOWELS, DIVIDE BEFORE THE CONSONANT: v_1-cv_2 . The necessary patterns will be $\alpha 1\beta$, $\alpha 1\gamma$, $\alpha 1\delta$, ... $\omega 1\phi$ where vowels are taken with all possible combinations of accents, spirits, diæresis and subscript iota. These patterns cover also the case of a vowel followed by more than one consonant; this feature will be useful in rule 4.
2. IF A CONSONANT IS DOUBLED, OR IF A MUTE IS FOLLOWED BY ITS CORRESPONDING ASPIRATE, DIVIDE AFTER THE FIRST CONSONANT: $v_1c_1-c_2v_2$ for $c_1 = c_2$, or $(c_1, c_2) \in \{(\pi, \phi), (\tau, \theta), (\chi, \chi), (\gamma, \chi)\}$. The patterns will be $2\beta 1\beta$, $2\gamma 1\gamma$... $2\phi 1\phi$ for the first part of the rule, and $2\pi 1\phi$, $2\tau 1\theta$, $2\chi 1\gamma$, $2\gamma 1\chi$ for the second. For grammatical reasons, it would be best to exclude $2\rho 1\rho$ (and $2\rho 1\acute{\rho}$) from these patterns.
3. IF THE COMBINATION OF TWO OR MORE CONSONANTS BEGINS WITH A LIQUID OR A NASAL, DIVIDE AFTER THE LIQUID OR NASAL [although not stated in the rule, it follows from the examples given in [Chi] that two consecutive nasals should not be separated]: $v_1c_1-c_2 \dots c_nv_2$, for $c_1 \in \{\lambda, \rho, \mu, \nu\}$ but $v_1-c_1 \dots c_nv_2$ if $(c_1, c_2) =$

(μ, ν) . The required patterns are $2\lambda 1\beta$, $2\lambda 1\gamma$... $2\nu 1\phi$ (except of course $2\lambda 1\lambda$, $2\rho 1\rho$, $2\mu 1\mu$, $2\nu 1\nu$ which have been taken into account in rule 2), and $2\mu 1\nu$.

4. THE DIVISION COMES BEFORE ALL OTHER COMBINATIONS OF TWO OR MORE CONSONANTS. We do not need any additional patterns to handle this rule; for example in the word ἄστρον, the cluster ἄσ will be hyphenated because of rule 1, and clusters στ, τρ, ρο will not be hyphenated, because they do not appear in any previous pattern list. Theoretically, a problem could occur in the case of a combination of 3 or more consonants *containing* a cluster mentioned in rules 2 or 3. But this is highly improbable and should be taken as an exception.
5. COMPOUND WORDS ARE DIVIDED INTO THEIR ORIGINAL PARTS; WITHIN EACH PART THE FOREGOING RULES APPLY. The patterns needed to fulfill this rule will be discussed in next section.

It might be interesting to point out that the rules specified by the *Academy of Athens* in 1939 ([Aca], "Ἐγκλισις τόνου καὶ συλλαβισμὸς") are slightly different from the ones above. According to this set of rules, compound words are separated, except when an eclipse has occurred: παρέχω is hyphenated as if it was a simple word: πα-ρέ-χω, instead of παρ-έχω as suggested in [Chi]. Following the rules of the Academy of Athens would result in a completely different set of patterns, since the eclipse phenomenon occurs very often.

The patterns we have introduced thus far are not sufficient for fundamental hyphenation. We still must introduce two families of patterns:

- Pairs of vowels are to be separated, except in the case of diphthongs. This leads to patterns $\alpha 1\alpha$, $\alpha 1\epsilon$, $\alpha 1\eta$, $\alpha 1\iota$... $\omega 1\omega$ including all diacritized vowels.
- In Greek, the smallest part of a word remaining on a line is a syllable. This may shock a T_EX user, but hyphenations like ἄ-προσάρμοστος and ἐπιδεικνύ-ω are allowed, and can frequently be found in books. The problem is that by setting \leftthyphenmin and \rightthyphenmin equal to 1, one can eventually separate single consonants, which do not form syllables: δῶρο-ν is T_EXnically allowed, since \rightthyphenmin=1, but should be avoided. For this we just have to introduce patterns 2β ., 2δ 2ϕ . [or even 6β ., 6δ 6ϕ . to be sure that no forthcoming exception will affect them].

What remains now are patterns concerning separation of compound words, according to rule 5. These are described in the following section.

4 Hyphenation of ancient Greek compound words

No puede combinar unos caracteres dhcm-rlchtdj que la divina Biblioteca no haya previsto y que en alguna de sus lenguas secretas no encierren un terrible sentido...

writes J. L. Borges in the “Biblioteca de Babel”; the situation is similar for ancient (or modern) Greek compound words. By combining words one can easily exceed Mark Twain’s

“Mekkamuselmanenmassenmenchenmördermohrenmuttermarmormentenmachen”,

given in [DEK], p. 451. As already pointed out, one could make patterns out of all possible roots, so that any possible combination of them is correctly hyphenated. The problem is, though, that the combinations of letters forming these roots can also occur inside single words, and only by their meaning can one decide if a particular root is present in a word: πεντήρης is formed by πεντ- and -ηρ- (from ἄρω). The words τριήρης, μονήρης, τειχίρης, all contain the same root -ηρ-. But introducing a pattern 3η4φ3 would cause tremendous problems, since thousands of words contain the cluster ηρ, hyphenated as η-ρ: τεκμήριον, στήριγμα, πηρόω and so forth. The fact is that such patterns should be avoided, or introduced only after extensive investigation.

The author has chosen a different method. Instead of introducing patterns for roots of words, only *beginnings of words* are taken into account. In this way, when writing for example .ē4ν3 one can be sure that only words beginning with the prefix ἐν will be affected. Exceptions to this rule can easily be found by consulting the dictionary. This method is very effective in hyphenating the most frequent words, but fails when new compound words are to be hyphenated: ἐπ-αινῶ and κατ-αινῶ will be correctly hyphenated (since patterns ἐπ- and κατ-αι are included in the list) but not an eventual κατ-επ-αινῶ, unless of course the user adds a new pattern κατ-επ- to the list in section 5.

Another advantage of this method is the fact that, contrary to most pattern lists, such a list is easily comprehensible, and hence can be completed easily by the final user himself (who does not have to be a T_EX-guru). This comes from the fact that — except for the fundamental patterns explained in the previous section — all patterns are beginnings of

words. By checking in the list, one can instantly verify why a specific word is hyphenated in a particular way; once this is understood, one can add the necessary pattern(s) to remedy to the situation. This is highly inadvisable for a pattern file created by a “pattern generator”, where a simple change can have very strange and obscure results (until now pattern files always started with the most categorical phrase [NOT TO BE CHANGED IN ANY WAY!]).

To facilitate even more the comprehension of this list of patterns, the author has chosen to present it in a very special format. Here is a sample excerpt of the pattern list which the reader can find in next section:

αὐτό-σσ(υτος), αὐτο-σσ(ύτου)
 ἄφ-, ἄφ-
 ◆ ἄ-φαλ(ος), ἄ-φάλ(ου)
 ◆ ἄφ-άλλ(ομαι)
 ◆ ἄ-φάν(εια), ἄ-φαν(ής)
 ◆ ἄφ-ανδ(άνω)

The words αὐτό-σσ(υτος) and αὐτο-σσ(ύτου) constitute one entry. In both cases, the patterns themselves are given in straight characters: αὐτό-σσ and αὐτο-σσ. The slanted endings between parentheses are *just possible examples*, which justify the existence of these patterns. It is important that the reader realizes that *these examples are not unique* but just indicative. So only what is written in straight letters will appear as a pattern.

The entry ἄφ-, ἄφ- is called a *rule*. Because of its frequency, the author has preferred not to give any example, and to present it “as a general rule”. The symbol ◆ introduces exceptions, and exceptions to exceptions. The difference is shown by indentation. In this case, ἄ-φάλ is an exception to ἄφ-, and ἀφάλου (genitive case of ἄφαλος) is an example of a word starting with this cluster. ἄφ-άλλ is an exception to ἄ-φάλ, and ἀφάλλομαι a possible example. Same thing for ἄφ-, ἄ-φάν, ἄφ-ανδ.

Let’s take a look to the concrete realization of these patterns: since ἄφ- is an exception to the fundamental hyphenation rules, the pattern can for example be .ἄ2φ1; the exception ἄ-φάλ could be expressed as “if ἄφ is followed by άλ, do not cut between φ and ἄ, but do cut between ἄ and φ”. This leads us to the pattern .ἄ3φ2άλ. The reader can verify that the further exception ἄφ-άλλ requires a pattern like .ἄ4φ3άλλ.

In the next section, the complete list of patterns extracted from [Bai] is presented, in the format explained above.

5 Patterns for ancient Greek compound words

ἄγαπ-ήν(ωρ), ἄγαπ-ην(όρων)
 ἄγελ-άρ(χης), ἄγελ-αρ(χῶν)
 ἄγρ-υ(πνος), ἄγρ-ύ(πνου)
 ἄγχ-ώ(μαλος), ἄγχ-ω(μάλου)
 ἄγων-ά(ρχης), ἄγων-α(ρχῶν)
 αἰχμ-άλ(ωτος), αἰχμ-αλ(ώτου)
 ἄκρ-ών(υχος), ἄκρ-ων(ύχου)
 ἄκρ-ώρ(εια), ἄκρ-ωρ(είας)
 ἀλέξ-αν(δρος), ἀλέξ-άν(δρου), ἀλέξ-αν(δρινός)
 ἄμ-α(ξια), ἄμ-ά(ξης), ἄμ-α(ξῶν)
 ἄμβλ-ω(πός)
 ἄμπ-έχ(ω), ἄμπ-έξ(ω)
 ◆ ἄμ-πε-χό(νη)
 ἄμπ-ι(σχω), ἄμπ-ι(σχνέομαι)
 ἄμφ-αγ(απάξω)
 ἄμφ-αρ(αβέω)
 ἄμφ-έπ(ω)
 ἄμφέρχ(ομαι)
 ἄμφ-ή(κης), ἄμφ-η(κῶν)
 ἄμφ-ιάχ(ω)
 ἄμφ-ιζά(νω)
 ἄμφισ-β(αινα), ἄμφισ-β(ατέω)
 ἄμφ-ιστ(ημι), ἄμφ-ιστ(ήσω)
 ◆ ἄμφι-στο(μος), ἄμφι-στό(μου)
 ἄμφ-ου(δισ), ἄμφ-ού(δεις)
 ἄμφ-ωτ(ος), ἄμφ-ώτ(ου), ἄμφ-ωτ(ίς)
 ἄν-αγνο(ς), ἄν-αγνε, ἄν-άγνο(υ), ἄν-άγνω
 ἄν-αγο(ρεύω)
 ἄν-άγω, ἄν-αγώ(γιον), ἄν-αγω(γή)
 ἄν-άδελ(φος), ἄν-αδέλ(φου)
 ἄν-αεί(ρω)
 ἄν-αθρέ(ω)
 ◆ ἄνα-θρέψ(ω)
 ἄν-αι(μος), ἄν-αι(νομαι), ἄν-αἰ(σσω), ἄν-αι(μωτι)
 ἄν-άκαν(θος), ἄν-ακάν(θου), ἄν-ακαν(θίνου)
 ἄν-ακέο(μαι), ἄν-ακέε(σαι)
 ἄν-ακο(ῦμαι)
 ἄν-ακωχ(ή)
 ἄν-αλαλ(άζω)
 ἄν-άλγ(ητος), ἄν-αλγ(ής)
 ἄν-αλήθ(ης), ἄν-αλήθ(ες)
 ἄν-αλί(σχω)
 ἄν-αλκ(ις), ἄν-άλκ(ιδος), ἄν-αλκ(εία)
 ἄν-αλλ(οίωτος)
 ἄν-αλμ(ος), ἄν-άλμ(ου)
 ἄν-αλό(ω)
 ◆ ἄνα-λόγ(ως)
 ἄν-αλτ(ος), ἄν-άλτ(ου), ἄν-αλτ(έστερος)
 ἄν-άλω(τος), ἄν-αλώ(του)
 ἄν-αμάξ(ευτος), ἄν-αμαξ(εύτου)
 ἄν-αμάρ(τητος), ἄν-αμαρ(τήτου)
 ἄν-άμβ(ατος), ἄν-αμβ(άτου)
 ἄν-αμφ(ίλογος)
 ἄν-ανδ(ρος), ἄν-άνδ(ρου), ἄν-ανδ(ρία)
 ἄν-αντ(ίρρητος)
 ἄν-αντ(α), ἄν-άντ(ης)

ἄν-άξι(ος), ἄν-αξι(ου), ἄν-αξι(ότερος)
 ἄν-απλό(ω)
 ἄν-αποδε(ικτως)
 ἄν-απόδρ(αστος), ἄν-αποδρ(άστου)
 ἄν-άποι(νος), ἄν-αποί(νου)
 ἄν-απόλα(υστος), ἄν-απολα(ύστου)
 ἄν-απόσ(ατος), ἄν-αποσ(άτου)
 ἄν-άπτ(ω), ἄν-άψ(ω)
 ἄν-αρ(θρος), ἄν-άρ(θρου), ἄν-αρ(ίθμητος)
 ἄν-άσκη(τος), ἄν-ασκή(του)
 ἄν-ατο(ς), ἄν-άτο(υ), ἄν-άτω(ν)
 ◆ ἄνα-τολ(ή)
 ἄν-αυ(δος), ἄν-αύ(γητος), ἄν-αυ(γήτου)
 ◆ ἄ-ναυς
 ἄν-αφρόδ(ιτος), ἄν-αφροδ(ίτου)
 ἄνδρ-άγ(ρια), ἄνδρ-αγ(αθέω)
 ἄνδρ-αχ(θής)
 ἄνδρ-εἰκ(ελος), ἄνδρ-εικ(έλου)
 ἄνδρ-ηλ(άτης)
 ἄν-ε, ἄν-έ, ἄν-ε
 ◆ ἄ-νευ
 ◆ ἄ-νέφε(λος), ἄ-νεφέ(λου)
 ◆ ἄ-νεψ(ιά)
 ἄν-η, ἄν-ή, ἄν-ῆ, ἄν-η
 ◆ ἄ-νήρ, ἄ-νήρ
 ἄνθ-
 ◆ ἄν-θ(ησις)
 ◆ ἄν-θεμ(ον), ἄν-θέμ(ιον), ἄν-θεμ(ιζομαι)
 ◆ ἄν-θέω, ἄν-θέε(ις), ἄν-θέο(μεν)
 ◆ ἄν-θῶ(μεν), ἄν-θει(τε), ἄν-θοῦ(σι)
 ◆ ἄν-θήσ(εως), ἄν-θηρ(ός)
 ◆ ἄν-θι(ζω), ἄν-θι(νός)
 ◆ ἄνθό-(χροκος), ἄνθο-(κρόκου)
 ◆ ἄνθ-ομ(ολογοῦμαι)
 ◆ ἄνθ-οπ(λίζω)
 ◆ ἄνθ-ορ(μέω)
 ◆ ἄνθ-οσ(μία)
 ◆ ἄν-θρ(ακεύς)
 ἄν-ι, ἄν-ί, ἄν-ι
 ◆ ἄ-νίκη(τος), ἄ-νική(του)
 ◆ ἄ-νιπτό(πους)
 ◆ ἄ-νιπ(τος), ἄ-νίπτο(υ), ἄ-νίπτω(ν)
 ἄν-ο, ἄν-ό, ἄν-ο
 ἄ-νόη(τος), ἄ-νοή(του)
 ◆ ἄ-νομο(ς), ἄ-νόμο(υς), ἄ-νόμω(ν)
 ◆ ἄ-νοο(ς), ἄ-νόο(υ)
 ◆ ἄ-νοσ(ος), ἄ-νόσ(ου)
 ◆ ἄν-όσι(ος), ἄν-οσί(ου)
 ◆ ἄ-νουθ(έτητος)
 ἄντ-ά, ἄντ-α
 ἄντ-έ, ἄντ-ε
 ◆ ἄν-τείν(ω)
 ◆ ἄν-τέλλ(ω)
 ἄντ-ή, ἄντ-η
 ἄντ-ισό(ω)
 ἄντ-ισχ(υρίζομαι)
 ἄντ-ο, ἄντ-υ, ἄντ-ω
 ἄν-υ, ἄν-ύ, ἄν-υ
 ◆ ἄ-νυμφ(ος), ἄ-νύμφ(ευτος), ἄ-νυμφ(εύτου)

◆ ά-νύω, ά-νύο(υν), ά-νύε(ις)
 άν-ώ, άν-ω
 ◆ άνω-φερ(ής)
 άπ-ά, άπ-α
 ◆ ά-παγή(ς), ά-παγή(ς), ά-παγο(ύς), ά-παγῶ(ν)
 ◆ ά-παγέ(ς), ά-παγέ(ς), ά-παγε(ι), ά-παγῆ
 ◆ ά-πάθ(εια), ά-παθ(είας)
 ◆ άπ-αθα(νατίζω)
 ◆ ά-πάλα(μνος), ά-παλά(μνου)
 ◆ ά-πάρο(θενος), ά-παρο(θένου)
 ◆ άπ-αρί(θμητος), άπ-αρι(θμέω)
 ◆ άπ-αρκ(έω)
 ◆ άπ-αρν(έομαι)
 ◆ άπ-αρτ(άω)
 ◆ άπ-αρού(τω)
 ◆ άπ-άρχ(ω)
 ◆ ά-πάτω(ρ), ά-πάτο(ρος)
 άπ-έδο(μαι), άπ-εδό(μεθα), άπ-έδε(ισθε)
 άπ-εθί(ζω)
 άπ-εικ(άζω)
 άπ-είλ(ημα), άπ-ειλ(έω)
 άπ-ει
 ◆ ά-πειρ(ος)
 άπ-είπ(ομεν), άπ-εί(πον)
 άπ-είργ(ω), άπ-ειργ(άθω)
 άπ-έχ(δυνον), άπ-εχ(δύνω)
 άπ-έλ(αυνον), άπ-ελ(αύνω)
 ◆ ά-πέλε(θρος)
 άπ-έμ(εσσα), άπ-εμ(έω)
 άπ-έν(επον), άπ-εν(έπω)
 ◆ ά-πένθ(ητος), ά-πενθ(ής)
 άπ-έο(ικα)
 άπ-έρασ(ις), άπ-εράσ(ειως)
 άπ-έργ(ω), άπ-εργ(άζομαι)
 άπ-έρδ(ω)
 άπερ-εί, άπερ-ει
 άπ-ερε(ίδω)
 άπ-ερού(κω), άπ-ερυ(θριάω)
 άπ-έρχ(ομαι), άπ-ερχ(όμεθα)
 άπ-έρω(τος), άπ-ερώ(του), άπ-ερω(έω)
 άπ-εσθ(έομαι)
 άπ-ευθύ(νω)
 άπ-ευν(άζω)
 άπ-εύχ(ομαι), άπ-ευχ(όμεθα)
 άπ-ευω(νίζω)
 άπ-εφ(θος), άπ-έφ(θου), άπ-εφ(θέστερος)
 άπ-έχ(θομαι), άπ-εχ(θαίρω)
 άπ-ήγγ(γελον)
 άπ-ηλ(εγέως)
 άπ-ήω(ρος), άπ-ηώ(ρου)
 άπ-ιά(λλω)
 άπ-ιπ(πόω)
 άπ-ισ(όω)
 ◆ ά-πιστ(έω)
 άπ-ίστ(ημι)
 άπ-ίσχ(ω), άπ-ισχ(υρίζομαι)
 άπ-οικ(ος), άπ-οίκ(ου), άπ-οικ(έω)
 άπ-οιμ(ώζω)
 άπ-όλλυ(μι), άπ-ολλύ(ω)

άπ-ολοφ(ύρομαι)
 άπ-ομόρ(γνυμι)
 άπ-ονίν(ημι)
 άπ-ονυχ(ίζω)
 άπ-οξύν(ω)
 άπ-οπτ(ος), άπ-όπτ(ου)
 ◆ άπό-πτολ(ις)
 άπ-ορ, άπ-όρ, άπ-ορ
 ◆ ά-πόρθ(ητος), ά-πορθ(ήτου)
 ◆ άπό-ρρ(ευσις), άπό-ρ(ρέυσις), άπο-ρρ(αθυμέω),
 άπο-ρ(ράθυμέω)
 ◆ ά-πόρφυ(ρος), ά-πορφύ(ρου)
 άπ-οσιό(ομαι), άπ-οσιο(ύμαι)
 άπ-ου, άπ-ού, άπ-ου
 ◆ ά-πους, ά-που
 άπ-οχετ(εύω)
 άπ-οχυρ(όω)
 άπ-οψι(ς), άπ-όφε(ως)
 άπ-ω(δέω)
 άργυρ-ώ(νητος), άργυρ-ω(νήτου)
 άρμ-άμ(αξα), άρμ-αμ(άξης)
 άρχ-ηγέτ(ης), άρχ-ηγετ(ών)
 άρχ-ηγό(ς), άρχ-ηγό(ς), άρχ-ηγο(ύ)
 άρχ-ηγέ, άρχ-ηγέ, άρχ-ηγῶ(ν)
 άρχ-ιε(ρεύς)
 ά-στεργ-άν(ωρ), ά-στεργ-αν(όρων)
 αὐθ-
 ◆ αὐθι-(γενής)
 αὐτ-, αὐτ-
 ◆ αὐτί-κα
 ◆ αὐτό-(βουλος), αὐτο-(βοει)
 ◆ αὐτ-όπτ(ης)
 ◆ αὐτ-όρο(φος), αὐτ-ορό(φου)
 αὐτό-σσ(υτος), αὐτο-σσ(ύτου)
 άφ-, άφ-
 ◆ ά-φαλ(ος), ά-φάλ(ου)
 ◆ άφ-άλλ(ομαι)
 ◆ ά-φάν(εια), ά-φαν(ής)
 ◆ άφ-ανδ(άνω)
 ◆ ά-φαρ, ά-φάρ(μακτος), ά-φαρ(μάκτου)
 ◆ άφ-αρπ(άζω)
 ◆ ά-φατ(ος), ά-φάτ(ου)
 ◆ ά-φε(ρτος), ά-φέ(ρτου), ά-φε(γγής)
 ◆ άφ-ει(ργω)
 ◆ άφ-έλ(κω)
 ◆ ά-φθ(ιτος), ά-φθ(ίτου)
 ◆ ά-φιλ(ως), ά-φιλ(όκαλος)
 ◆ ά-φλ(οιος), ά-φλ(έγμαντος)
 ◆ ά-φοβ(ος), ά-φόβ(ητος), ά-φοβ(ήτου)
 ◆ ά-φόρ(ητος), ά-φορ(ήτου)
 ◆ ά-φορο(ς), ά-φόρο(υ), ά-φόρω(ν)
 ◆ ά-φρ(ουρος), ά-φρ(άσμων)
 ◆ ά-φυ(κτος), ά-φύ(λακτος), ά-φυ(ής)
 ◆ άφ-υβ(ρίζω)
 ◆ άφ-υπ(νίζω)
 άψ-ορρ(ος), άψ-ορ(ρός), άψ-όρρ(ου), άψ-όρ(ρού)
 ◆ άψό-ρροο(ς), άψό-ρροε, άψο-ρρό(ου)
 ◆ άψό-ρρόο(ς), άψό-ρρόε, άψο-ρρό(ου)
 βαλαν-ά(γρρα), βαλαν-α(γρῶν)

βαλλ-α(χράδα)
 βητ-ά(ρμων), βητ-α(ρμώνων)
 βλοσυρ-ώ(πιδος), βλοσυρ-ῶ(πις), βλοσυρ-ω(πίδων)
 βοιωτ-ά(ρχης), βοιωτ-α(ρχία)
 βόσ-π(ορος), βος-π(όρου)
 βούλ-α(ρχος), βουλ-ά(ρχου)
 γαμφ-(ῶνυξ)
 γεροντ-αγ(ωγέω)
 γιγαντ-ολ(έτης)
 γλαυκ-ώπ(ιδος), γλαυκ-ῶπ(ις), γλαυκ-ωπ(ός)
 γονυκαμφ-επ(ικυρτος)
 γονυκαλυσ-ά(γρυπνα)
 γοργ-ώ(πιδος), γοργ-ῶ(πις), γοργ-ω(πός)
 δεισ-ή(νωρ), δεισ-η(νόρων)
 δευτερ-αγ(ωνιστής)
 δεχ-ή(μερος), δεχ-η(μέρου)
 δημ-αγ(ωγός)
 δήμ-αρ(χος), δημ-άρ(χου), δημ-αρ(χικός)
 δημ-ωφ(ελής)
 δισ-θ(ανής)
 δισ-ά(ρχαι), δισ-α(ρχῶν)
 δισ-ύπ(ατος), δισ-υπ(άτου)
 δισ-χ(ίλιοι)
 δουρ-η(νεκής)
 δύσ-, δυσ-
 ◆ δύ-σις, δύ-σε(ως), δύ-σιν
 δωδεκάδ-αρ(χος), δωδεκαδ-άρ(χου)
 δωδέκ-αρ(χος), δωδεκ-άρ(χου), δωδεκ-έ(της)
 εικόσ-ο(ρος), είκοσ-ό(ρου)
 ειλ-άρ(χης), ειλ-αρ(χῶν)
 εἶσ-, εἶσ-
 ◆ εἶ-σω
 ἐκ-εχ(ειρία)
 ἐλικ-ω(ψ), ἐλικ-ώ(πιδος), ἐλικ-ῶ(πις), ἐλικ-ω(πίδω)
 ἔν-, ἐν-
 ◆ ἐντεῦθ(εν), ἐντευθ(εν`)
 ◆ ἐνταῦθ(α), ἐνταυθ(οἶ)
 ἐξ-
 ἔπ-, ἐπ-
 ◆ ἔ-παθο(ν), ἔ-παθα(ς), ἔ-παθε(ς)
 ◆ ἐ-πάθο(μεν), ἐ)πάθα(τε)
 ◆ ἔπι-, ἐπί-, ἐπι-
 ◆ ἐπ-ιάλλ(ω)
 ◆ ἐπ-ιάύ(ω)
 ◆ ἐπ-ιάχ(ω)
 ◆ ἐπ-ίη(μι)
 ◆ ἐπ-ιθύν(ω)
 ◆ ἐπ-ιλλ(ίζω)
 ◆ ἐπ-ίσταμ(αι), ἐπ-ίστασ(αι), ἐπ-ίστατ(αι)
 ◆ ἐπ-ιστάμ(εθα), ἐπ-ισταν(ται)
 ◆ ἐπ-ίσι(ος), ἐπ-ιστί(ου)
 ◆ ἐπ-ιωγ(ή)
 ἐρμ-αφ(ρόδιτος)
 ἐρ-ράπ(τω)
 ἐρ-ρυθ(μος), ἐρ-ρύθ(μου)
 ἐρυσ-άρ(ματος), ἐρυσ-αρ(μάτου)
 ἐσ-
 ἔτερ-α(λκῆς)
 ἔτερ-ή(μερος)

ἔτερ-όφθ(αλμος), ἔτερ-οφθ(άλμου)
 ἔφ-, ἐφ-
 ζευγ-η(λάτης)
 ἦν-οφ, ἦν-οπ(ος)
 θέσ-φ(ατος), θεσ-φ(άτου)
 θιασ-ά(ρχης)
 θυμ-α(λγῆς)
 θυμ-η(δῆς)
 θυσο-κό(ος)
 θυρ-επ(ανοίκτης)
 ἱερ-ών(υμος), ἱερ-ων(ύμου)
 ἱμαντ-ελ(ικτης)
 ἱππ-αγ(ρέτης)
 ἱππ-αλ(εκτρύων)
 ἱππ-αρ(χος), ἱππ-άρ(χης), ἱππ-αρ(μοστής)
 ἱππ-ερ(αστής)
 ἱππ-ήλ(ατος), ἱππ-ηλ(άτης)
 ἱππ-ημ(ολγός)
 ἱππ-ου(ρις), ἱππ-ού(ριδος)
 ἰσ-ά(νεμος), ἰσ-α(νέμου)
 ἰσ-ή(λικος), ἰσ-ῆ(λιξ), ἰσ-η(μερία)
 ἰσ-όνε(ιρος), ἰσ-ονε(ίρου)
 ἰσχ-αι(μος), ἰσχ-αί(μου)
 καθ-
 κακ-άγ(γελος), κακ-αγ(γέλου)
 κακ-αν(θρία)
 καρ-ρέ(ζουσα), καρ-ρε(ζούσης)
 κατ-αγγ(έλω)
 κατ-αγι(ζω), κατ-αγι(νέω)
 κατ-άγν(υμι), κατ-αγν(ύω)
 ◆ κατα-γνυπ(όω)
 κατ-αγο(ρεύω)
 κατ-άγω, κατ-άγε(ις), κατ-άγο(μεν)
 κατ-αγω(γή)
 κατ-ά(δω)
 κατ-αθυμ(έω)
 ◆ κατα-θυμί(ου)
 κατ-αι
 κατ-ακον(τίζω)
 κατ-ακού(ω)
 κατ-άκρας
 κατ-αλείφ(ω)
 κατ-αλέω, κατ-αλέε(ις), κατ-αλέο(μεν)
 κατ-αλλ(άσσω)
 κατ-αλοά(ω)
 κατ-αμά(ομαι), κατ-αμῶ(μεθα), κατ-αμῶ(μαι),
 κατ-αμε(ἴσαι)
 κατ-αμελ(έω)
 κατ-αμπ(έχω)
 κατ-αμύν(ομαι), κατ-αμυν(όμεθα)
 κατ-αμύσ(σω), κατ-αμυσ(σόμεθα)
 κατ-αμύτ(τω), κατ-αμυτ(τόμεθα)
 κατ-αναλ(ίσκω)
 κατ-ανασκ(ύλλω)
 κατ-ανθ(ρακῶω)
 κατ-άν, κατ-αν
 ◆ κατα-νω(τίζομαι)
 κατ-άξι(ος), κατ-αξι(ου)
 κατ-απειλ(έω)

κατ-άπτομ(αι)
κατ-άρ, κατ-αρ
◆ κατα-ριγ(ηλός)
◆ κατάρ-ρρ, κατα-ρρ
κατ-ασβ(έννυμι)
κατ-ασθ(μαίνω)
κατ-ασκέ(ω), κατ-ασκῶ, κατ-ασκεί(ς), κατ-ασκο(ῦν)
κατ-ασπάζ(ομαι)
κατ-αστερ(ίζω)
κατ-αυ
κατ-εγγ(υάω)
κατ-έδ(ω)
◆ κατέ-δρ(αθον)
κατ-εἰ(βω), κατ-ει(κάζω)
κατ-εἰ(πα)
◆ κα-τεῖδ(ον), κα-τείναι
κατ-ελ(αύνω)
κατ-εμ(έω)
κατ-εν(αίρω)
κατ-εξ(ανίσταμαι)
κατ-επ(αγγέλλομαι)
κατ-ερ(γάζομαι)
κατ-εσ(θίω)
κατ-ευ(ημερεύω)
κατ-εφ(άλλομαι)
κατ-έχ(ω)
κατ-ή, κατ-η
κατ-ί, κατ-ι
κάτ-ο, κατ-ό, κατ-ο
κατ-ύ, κατ-υ
κατ-ωμ(άδιος)
κατ-ωχ(ριάω)
καχ-ε(ξία)
κεν-α(γής)
κεντρ-ην(εκής)
κέρκ-ου(ρος)
κερ-οί(αξ), κερ-οι(άκων)
κεφαλ-αλ(γός)
κεφαλ-ηγ(ερέτης)
κλασ-αυ(χενεύομαι)
κοιλ-ωπ(ός)
κορυθ-ά(ιξ), κορυθ-α(ίκων)
κυαν-ώ(πιδος), κυαν-ῶ(πις)
κύκλ-ωψ, κύκλ-ωπ(ος), κυκλ-ώπ(ων)
κυν-αλ(ώπηξ)
κυν-όδ(ους), κυν-οδ(όντων)
κυν-ώπ(ης), κυν-ῶπ(ις), κυν-ωπ(ίδων)
κωλ-α(κρέτης)
κωμ-άρ(χης), κωμ-αρ(χίου)
κωμ-ω(δός)
κωμ-ηλ(άτης)
κωπ-ήρ(ης)
λαβρ-α(γόρης)
λευκ-ανθ(ής)
λεύκ-ασ(πις), λευκ-άσ(πιδος), λευκ-ασ(πίδων)
λευκ-ήμ(ρετμος), λευκ-η(ρέτμου)
λεύκ-ι(ππος), λευκ-ι(ππου)
λευκ-ώ(λενος), λευκ-ω(λένου)
λευχ-ε(μιονέω)

λοχ-αγ(ός)
λυκ-αυ(γής)
λυκ-ου(ρία)
λύσ-αν(δρος), λυσ-άν(δρου)
μακρ-αί(ων), μακρ-αι(ώνων)
μακρ-η(γορέω)
μεγάλ-α(υχος), μεγαλ-ά(δικος), μεγαλ-α(δίκου)
μεγαλ-ή(τωρ), μεγαλ-η(γόρος)
μεγαλ-ώ(νυμος), μεγαλ-ω(νύμου)
μεγ-αυ(χής)
μέθ-, μεθ-
◆ μέ-θυ, με-θύ(ω), με-θυ(μναίος)
◆ μεθ-ύστ(ερος), μεθ-υστ(έρου)
μελάν-α(ιγίς), μελαν-α(ιγιδος)
μελαν-ε(ίμων)
μελαν-ύ(δρος)
μελ-ω(δός)
μεσ-άγ(κυλον), μεσ-αγ(κύλου)
μέσ-ακ(τος), μεσ-ακ(του)
μέσ-αυ(λος), μεσ-αύ(λου)
μεσ-εγ(γυάω)
μεσ-ημ(βρία)
μεσ-ή(ρης), μεσ-ῆ(ρες)
μεσ-ιδ(ιος), μεσ-ιδ(ίου)
μεσό-δμ(η), μεσο-δμ(ών)
μέσσο-αυ(λος), μεσσο-αύ(λου)
μεσσο-ή(ρης), μεσο-ῆ(ρες)
μετ-άγγ(ελος), μετ-αγγ(έλου)
μετ-άγω, μετ-άγε(ις), μετ-άγο(μεν)
μετ-αί(ρω), μετ-αί(σσω), μετ-αι(τέω)
μετ-αλλά(σσω)
μετ-αμπ(έχω)
μετ-αμύ(νω)
μετ-αμφ(ιάζω)
μετ-αμώ(νιος), μετ-αμω(νίου)
μετ-ανίστ(ημι)
μετ-αῦ(θις), μετ-αυ(δάω)
μέτ-ε, μετ-έ, μετ-ε
μετ-ί(στημι)
μέτ-ο, μετ-ό, μετ-ο
μέτ-ω, μετ-ώ, μετ-ω
μηδ-α(μά)
μηδ-έτ(ερος), μηδ-ετ(έρου)
μηθ-(εις)
μήλ-ωψ, μήλ-οπ(ος), μήλ-όπ(ων)
μητρ-α(γύρτης)
μικρ-α(δικητής)
μιμ-ω(δός)
μιξ-α(ρχαγέτας)
μισ-ά(δελφος), μισ-α(δέλφου)
μισγ-ά(γγεια), μισγ-α(γγείας)
μισ-έλ(λην), μισ-ελ(λήνων)
μογισ-αφ-ε(δάφα)
μοιχ-άγ(ρια), μοιχ-αγ(ρίας)
μον-άμ(πυξ), μον-αμ(πύκων)
μόν-αρ(χος), μον-άρ(χου), μον-αρ(χικός)
μον-αυ(λέω)
μον-ήμ(ερος), μον-ημ(έρου)
μον-ήρ(ης), μον-ῆρ(εις)

μόν-ιπ(πος), μον-ίπ(που)
 μον-όδ(ους), μον-οδ(όντων)
 μον-ω(δέω)
 μον-ώψ, μον-ώψ, μον-ώπ(ος), μον-ώπ(ων)
 μυθ-ιάμ(βος), μυθ-ιάμ(βου)
 μυρ-αλ(οιφία)
 μυρ-ε(ψός)
 μυστ-αγ(ωγέω)
 νεκρ-άγ(γέλιος), νεκρ-αγ(γέλιου)
 νεφελ-ηγ(ερέτης)
 νεκρ-ακ(αδημία)
 νουν-εχ(όντως)
 νυκτ-εγ(ερέτω)
 νυκτ-ηγ(ορέω)
 νυκτ-ηρ(εφής)
 νυκτ-ού(ρων), νυκτ-ού(ρος)
 ξεν-αγ(ωγός)
 ξεν-απ(άτης)
 ξεν-ηλ(ατέω)
 ὀδ-η(γός)
 ὀθ-οῦ(νεκα), ὀθ-ού(νεκα)
 οἰκ-ουρ(ός)
 οἰκ-ώφ(ελία)
 οἶν-άνθ(η), οἶν-ανθ(ῶν)
 οἶν-ερ(αστής)
 οἶν-οψ, οἶν-οπ(ος), οἶν-όπ(ων)
 οἶον-εἰ, οἶον-εἰ
 οἶος-περ, οἶος-τε
 ὀκτακισ-(χιλίοι)
 ὀκτ-ήρ(ης), ὀκτ-ῆρ(ες)
 ὀκτωκαιδεκ-έ(της)
 ὀλιγ-αν(δρία)
 ὀλιγ-άρ(χης), ὀλιγ-αρ(ιστία)
 ὀλιγ-ότε(ρος), ὀλιγ-οτέ(ρου)
 ὀλίγ-ωρ(ος), ὀλιγ-ώρ(ου)
 ὀμ-αι(μος), ὀμ-αί(μου)
 ὀμ-άλ(ικος), ὀμ-ἄλ(ιξ)
 ὀμ-αυ(λος), ὀμ-αύ(λου)
 ὀμ-ευ(νος), ὀμ-εύ(νου), ὀμ-ευ(νέτης)
 ὀμ-η(ρος), ὀμ-ή(ρου), ὀμ-η(γερός)
 ὀμ-ι(λος), ὀμ-ι(λου), ὀμ-ι(λία)
 ὀμ-ο(ρος), ὀμ-όρ(ου), ὀμ-ορ(όφιος)
 ὀμ-ουρ(ος), ὀμ-ούρ(ου)
 ὀμ-ών(υμος), ὀμ-ων(ύμος)
 ὀμ-ώρ(οφος), ὀμ-ωρ(όφιος)
 ὄν-ηλ(άτης)
 ὄξ-άλ(μη)
 ὄπωσ-οῦν, ὄπωσ-τι(οῦν)
 ὄρκ-ωμό(σιον), ὄρκ-ωμο(σίου)
 ὄσ-ημ(έραι)
 ὄσ-τε
 ὄσ-τις
 ὄτ-αν
 οὔδ-οπωσ-τι(οῦν), οὔδ-οσ(τισοῦν)
 οὔθ-αμ(ῶς)
 οὔκ-(οὐν), οὔκ-(οῦν)
 ♦ οὔ-κω(ν)
 ὀψ-ώ(νιον), ὀψ-ω(νίου)
 παιδ-ολ(έτειρα)

παλαι-χθ(ων), παλαι-χθ(ώνων)
 παλίν-, παλιν-
 παλ-ίω(ξίς), παλ-ιώ(ξέως)
 πάν-, παν-
 ♦ πα-νός, πα-νός, πα-νί, πα-νί, πά-να
 ♦ πά-νυ
 παρ-άγ(ω), παρ-αγ(γέλλω)
 ♦ παρα-γε(ύω)
 ♦ παρα-γη(ράω)
 ♦ παρα-γί(γνομαι), παρα-γί(γνόμεθα)
 ♦ παρά-γρ(αμμα), παρα-γρ(αφή)
 ♦ παρα-γυ(μνός)
 παρ-αι(ίδω)
 παρ-αί(σιος), παρ-αί(σσω), παρ-αι(νέω), παρ-αί(σσύμεθα)
 παρ-ακμ(άζω)
 παρ-ακολ(ουθέω)
 παρ-ακον(άω)
 παρ-άκο(υσμα), παρ-ακο(ύω)
 πάρ-αλ(ος), παρ-άλ(ου), παρ-άλ(ια)
 ♦ παρα-λά(μπα), παρα-λα(μβάνω)
 ♦ παρα-λέγ(ω)
 ♦ παρά-λει(φίς), παρα-λεί(πω), παρα-λει(πτέον)
 ♦ παρα-λείφ(ω)
 ♦ παρά-λιμ(νος), παρα-λίμ(νου)
 ♦ παρά-λογ(ος), παρα-λόγ(ου), παρα-λογ(ίζομαι)
 ♦ παρά-λυ(σις), παρα-λύ(σεως), παρα-λυ(πέω)
 παρ-αμα(ρτάνω)
 παρ-αμβ(λύνω)
 παρ-αμε(ίβω)
 ♦ παρα-μέν(ω)
 ♦ παρα-μετ(ρέω)
 παρ-αμπ(έχω)
 παρ-ανα(γιγνώσκω)
 ♦ παρα-ναι(ετάω)
 παρ-ανί(ημι), παρ-ανι(σχόμεθα)
 ♦ παρα-νικ(άω)
 παρ-ανοίγ(ω)
 πάρ-αντα
 παρ-άο(ρος), παρ-αό(ρου)
 παρ-απατ(άω)
 παρ-απαφ(ίσκω)
 παρ-άπτ(ω)
 παρ-άρ(θησις), παρ-αρ(θρήσεως)
 ♦ παρά-ρρ(υμα), παρα-ρρ(ύματος)
 πάρ-αυ(λος), παρ-αύ(λου), παρ-αυ(δάω)
 πάρ-ε(δρος), παρ-έ(δρου), παρ-ε(γγράπτου)
 ♦ πα-ρέω, πα-ρέε(ις)
 πάρ-η(μαι), παρ-ή(γορος), παρ-ῆ(λιξ), παρ-η(βάω)
 πάρ-ι(σος), παρ-ί(σου), παρ-ι(ππεύω)
 πάρ-ο(δος), παρ-ό(δου), παρ-ο(δεύω)
 ♦ πά-ρος
 ♦ παρ-όν(τος)
 παρ-ρη(σία)
 παρ-ύ(φαινον), παρ-υ(φαίνω)
 πάρ-ω(χρος), παρ-ώ(χρου), παρ-ω(νυμία)
 ♦ πα-ρών, πα-ρὼν
 πατρ-άγ(αθος), πατρ-αγ(αθία)
 πατρ-αλ(οίας)
 πατρ-ωνύ(μιος), πατρ-ωνυ(μίου)

παυσ-άνε(μος), παυσ-ανέ(μου)
 πεδ-αί(χμιος), πεδ-αι(χμίου)
 πεδ-άο(ρος), πεδ-αό(ρου)
 πεδ-άρ(σιος), πεδ-αρ(σίου)
 πέζ-αρ(χος), πέζ-άρ(χου)
 πεζ-έτ(αιρος), πεζ-ετ(αίρου)
 πειθ-ά(νωρ), πειθ-α(νάγκη)
 πειθ-ή(νιος), πειθ-η(νίου)
 πέλ-οψ, πελ-όπ(ειος), πελ-οπ(όννησος)
 πεμπάδ-α(ρχος), πεμπαδ-ά(ρχου)
 πεμπ-ώ(βολον), πεμπ-ω(βόλου)
 πενθ-ήμε(ρος), πενθ-ημέ(ρου), πενθ-ημε(ρία)
 πενθ-ημι(ποδιαίσιος)
 πέντ-αθ(λον), πεντ-άθ(λου)
 πεντ-ήρ(ης), πεντ-ήρ(ες)
 πλεον-έ(κτημα), πλεον-ε(κτέω)
 πληξ-ιπ(πος), πληξ-ιπ(που)
 πλησ-ίσ(τιος), πλησ-ισ(τίου)
 πλουθ-υ(γίεια)
 πλούτ-αρ(χος), πλουτ-άρ(χου)
 ποδ-άβ(ρός)
 ποδ-άγ(ρα), ποδ-αγ(ρῶ)
 ποδ-έν(δυτος), ποδ-εν(δύτου)
 ποδ-ήρ(ης), ποδ-ήρ(ες), ποδ-ηγ(ός)
 ποιμ-ά(νωρ), ποιμ-α(νώρων)
 ποσσ-ή(μαρος), ποσσ-ή(μαρ), ποσσ-η(μάρων)
 πρόσ-, προσ-
 ◆ προ-σταυ(ρόω)
 ◆ προ-στέλλ(ω)
 ◆ προ-στέν(ω), προ-στέν(άζω)
 ◆ πρό-στερν(ος), προ-στέρν(ου), προ-στερν(ίδιον)
 ◆ πρό-στω(ον), προ-στώ(ου), προ-στώ(ον)
 ◆ προ-συ(γγίγνωμαι)
 ◆ προσ-υπ(ερβάλλω)
 ◆ πρό-σφαγ(μα), προ-σφάγ(ματος)
 πρωθ-ή(βη)
 πρωτ-αγ(ωνιστής)
 πυγ-άρ(γος)
 πυθ-αγ(όρας)
 πυλ-αγ(όρος)
 πυλ-άρ(της), πυλ-αρ(τῶν)
 πυλ-ωρ(ός)
 πυρ-άγ(ρα), πυρ-αγ(ρῶν)
 πυρ-ακ(τέω)
 ραψ-ω(δός)
 ριζ-ωρ(υχέω)
 ρίψ-ασ(πις), ρίψ-άσ(πιδος)
 ρίψ-οπ(λος), ρίψ-όπ(λου)
 σιτ-αγ(ωγός)
 σκληρ-α(γαγγέω)
 σκυθρ-ωπ(ός)
 σπεύσ-ιπ(πος), σπευσ-ιπ(που)
 σπονδ-αρ(χία)
 στέγ-αρ(χος), στεγ-άρ(χου)
 στεροπ-ηγ(ερέτης)
 στρατ-ηγ(ός)
 στρατ-ηλ(άτης)
 σύν-, συν-
 σωμ-ασ(κέω)

τέθρ-ιπ(πος), τεθρ-ίπ(που), τεθρ-ιπ(ποβάτης)
 τειχ-ή(ρης), τειχ-ή(ρες)
 τεχν-ολ(έτειρα)
 τερψί-μ(βροτος), τερψι-μ(βρότου)
 τεσσαρεσ-(καίδεκα), τεσσερεσ-(καίδεκα)
 τετρ-άρχ(ης), τετρ-αρχ(ῶν)
 τετρ-ήρ(ης), τετρ-ήρ(ες)
 τετρ-ώρο(φος), τετρ-ωρό(φου)
 τηλ-ουρ(ός)
 τηλ-ωπ(ός)
 την-άλ(λως)
 τιμ-αλφ(ής)
 τοιχ-ωρ(ύχος)
 τόξ-αρ(χος), τοξ-άρ(χου)
 τοξ-ή(ρης), τοξ-ή(ρες)
 τραγ-έλ(αφος), τραγ-ελ(άφου)
 τραγ-ω(δός)
 τραπ-έμπ(αλιν)
 τρεις-καί(δεκα)
 τρισ-άθ(λιος), τρισ-αθ(λίου)
 τρισ-άρ(ιθμος), τρισ-αρ(ιθμου)
 τρισ-άσ(μενος), τρισ-ασ(μένου)
 τρισ-έ(ωλος), τρισ-ε(υδαίμων)
 τρισ-μα(κάριος)
 τρισ-μύ(ριοι), τρισ-μυ(ρίων)
 τρισ-χ(ίλιοι)
 τροχ-ήλ(ατος), τροχ-ηλ(άτης)
 τυμβ-α(ύλης), τυμβ-ή(ρης), τυμβ-ή(ρες), τυμβ-ω(ρύχος)
 ύμν-ω(δία)
 ύπ-α(ιθρος), ύπ-ά(γω), ύπ-α(γορεύω)
 ◆ ύπ-παιθα, ύπ-παί, ύπ-παί
 ◆ ύπ-παρ
 ύπ-ε(ιμι), ύπ-έ(γγυος), ύπ-ε(γείρω)
 ◆ ύπ-πειρ, ύπ-πειρ
 ύπερ-, ύπέρ-, ύπερ-
 ◆ ύπ-ερεθ(ίζω)
 ◆ ύπ-ερεί(δω)
 ◆ ύπερή-φα(νος), ύπερη-φά(νου), ύπερη-φα(νία)
 ◆ ύπ-έρυθ(ρος), ύπ-ερύθ(ρου), ύπ-ερυθ(ριῶ)
 ◆ ύπ-έρχ(ομαι), ύπ-ερχ(όμην)
 ύπ-ημ(ύω)
 ύπ-ήν(εμος), ύπ-ην(έμιος)
 ύπ-ηο(ίος)
 ύπ-ηρ(έτης)
 ύπ-ηχ(έω)
 ύπ-ι(ημι), ύπ-ι(σχνέω)
 ύπ-οι(δέω)
 ύπ-ού(λως), ύπ-ου(δαίσιος)
 ◆ ύπούρ-γ(ημα), ύπουρ-γ(έω)
 ύπ-ώπ(ιον), ύπ-ωπ(ιου)
 ύπ-ώρ(εα), ύπ-ωρ(όφιος)
 ύφ-, ύφ-
 ◆ ύφ-ορβ(ός)
 ύφ-α(γόρας)
 ύφ-ε(ρεφής)
 ύφ-η(γόρος)
 ύφ-όρ(σφος), ύφ-ορ(όφου)
 φερ-έγ(γυος), φερ-εγ(γύου)
 φερ-ώνυ(μος), φερ-ωνύ(μου)

φθιν-όπ(ωρον), φθιν-οπ(ώρου)
 φθισ-ή(νωρ), φθισ-η(νώρων)
 φίλ-, φιλ-
 ♦ φι-λέω, φι-λῶ(μεν), φιλέε(ις), φιλεί(ς), φι-λέο(μεν)
 φί-λι(ος), φι-λί(α), φι-λι(χός)
 ♦ φιλ-ιατ(ρέω)
 ♦ φίλ-ιππ(ος), φίλ-ίππ(ου), φίλ-ιππ(ιχός)
 φρεν-ήρ(ης), φρεν-ήρ(ες)
 φρούρ-αρ(χος), φρουρ-άρ(χου)
 φυγ-αίχ(μης)
 φύλ-αρ(χος), φυλ-άρ(χου)
 φύλ-οπ(ις), φυλ-όπ(ιδος), φυλ-οπ(ιδων)
 φωτ-αγ(ωγός)
 χαλ-αργ(ός)
 χαλιν-αγ(ωγέω)
 χάλκ-ασ(πις), χάλκ-άσ(πιδος), χάλκ-ασ(πίδων)
 χάλκ-έμ(βολος), χάλκ-εμ(βόλου)
 χάλκ-ήλ(ατος), χάλκ-ηλ(άτου)
 χάλκ-ήρ(ης), χάλκ-ήρ(ες)
 χαμ-εύ(νιον), χαμ-ευ(νίου)
 χειρ-αγ(ωγός)
 χειρ-απ(τάζω)
 χειρ-αψ(ία)
 χεν-όσ(ιρις)
 χην-αλ(ώπηξ)
 χορ-α(γός)
 χορ-η(γός)
 χρυσ-α(ιετος), χρυσ-ά(μπτυξ)
 χρυσ-ελ(εφαντήλετρος)
 χρυσ-έν(δετος), χρυσ-εν(δέτου)
 χρυσ-ερ(αστής)
 χρυσ-ήλ(ατος), χρυσ-ηλ(άκατος)
 χρυσ-ήρ(ες)
 χρυσ-όρο(φος), χρυσ-ορό(φου)
 χρυσ-ων(έω)
 χρυσ-ώπ(ιδος), χρυσ-ώπ(ις), χρυσ-ωπ(ιδων)
 χρυσ-ωρ(υχέω)
 ψευδ-ά(ττικος), ψευδ-α(λέξανδρος)
 ψευδ-εν(έδρα)
 ψευδ-επ(ιγραφος)
 ψευδ-ηγ(ορέω)
 ψευδ-ηρ(ακλής)
 ψευδ-όρ(κίος), ψευδ-ορ(κίου)
 ψυχρ-ήλ(ατος), ψυχρ-ηλ(άτου)
 ώμ-ησ(τής)
 ώσ-αν-εί, ώσ-αν-ει
 ώσ-αύτως
 ώσ-εί, ώσ-ει
 ώσπερ-εί, ώσπερ-ει

6 The fundamental rules of Latin hyphenation, and the corresponding patterns

Taken from [Chi] (9.56–9.59), here are the rules of Latin hyphenation and the necessary patterns ($v_n, n \geq 1$ will be vowels, including æ and œ , and $c_n, n \geq 1$ consonants):

1. A LATIN WORD HAS AS MANY SYLLABLES AS IT HAS VOWELS OR DIPHTHONGS (æ , au , ei , eu , œ , ui). Concerning word division, this rule should be interpreted as “vowel clusters should be separated, except when they form a diphthong”: v_1v_2 , for $(v_1, v_2) \notin \{(a, e), (a, u), (e, i), (e, u), (o, e), (u, i)\}$. The necessary patterns are a1a , a1æ (since T_EX considers æ as one character) a1i , a1o , a1œ (same remark) e1a , e1æ , e1e , e1o , e1œ , i1a , i1æ , i1e , i1o , i1œ , i1i , i1u , o1a , o1æ , o1i , o1o , o1œ , o1u , u1a , u1æ , u1e , u1o , u1œ , u1u .
2. WHEN A SINGLE CONSONANT OCCURS BETWEEN TWO VOWELS, DIVIDE BEFORE THE CONSONANT: $v_1c_1v_2$. The required patterns will be 1ba , $\text{1bæ} \dots \text{1zu}$.
3. IN THE CASE OF TWO OR MORE CONSONANTS, DIVIDE BEFORE THE LAST CONSONANT EXCEPT IN THE COMBINATIONS: MUTE (p , ph , b , t , th , d , c , ch , g) + LIQUID (l , r), AND qu OR gu . The first part of this rule can be expressed as
 - $v_1c_1 \dots c_{n-3}c_{n-2}c_{n-1}c_nv_2$
if $(c_{n-2}, c_{n-1}) \in \{(p, h), (t, h), (c, h)\}$ and $c_n \in \{l, r\}$,
 - $v_1c_1 \dots c_{n-2}c_{n-1}c_nv_n$
if $c_{n-1} \in \{p, b, t, d, c, g\}$ and $c_n \in \{l, r\}$, and
 - $v_1c_1 \dots c_{n-1}c_nv_2$, otherwise.

The required patterns will be ph21 , $\text{ph2r} \dots \text{ch2r}$, $\text{p21} \dots \text{g2r}$ and p2h , t2h , c2h which is not stated in the rule but seems to be an implicit consequence, especially since “th”, “ph”, “ch” are just transliterations of the Greek letters θ , φ , χ .

The second part of the rule (“and qu or gu ”) is not clear. According to the examples given in [Chi] (“e-quus”, “lin-gua”) the author estimates that the correct interpretation is “consider ‘qu’ and ‘gu’ as single consonants”. It follows from this interpretation, that these two clusters form exceptions to rule 1 and that hyphenations “qu-a”, “gu-a” ... “gu-u” should be prohibited. The required patterns are $\text{qu2a} \dots \text{gu2u}$.

4. COMPOUND WORDS ARE SEPARATED FIRST INTO THEIR COMPONENT ELEMENTS; WITHIN EACH ELEMENT THE FOREGOING RULES APPLY. The patterns needed to fulfill this rule will be discussed in next section.

There is no mention of minimal left and right hyphenations; after comparing several Latin editions, the author considers the traditional values for `\lefthyphenmin` and `\righthyphenmin` to be 2 and 3 (as in English).

7 Hyphenation of Latin compound words

As with ancient Greek, the first idea would be to make patterns out of *roots*: “ab” is such a root, a pattern **ab** would insure hyphenation of “abundare”, “in-ab-undare” and so forth. The problem is again that the cluster “ab” is contained in thousands of other words, where it should be hyphenated as “a-b” (“la-bor”, “pro-ba-bi-lis”, “fa-bu-la”, etc.). Therefore the same method is applied as in ancient Greek: *only beginnings of words are taken into account*. As the reader will see in next section where all patterns are listed, hyphenation **ab-** at the beginning of a word is a general rule, with certain exceptions (“a-bacus”, “a-bitus”, and so forth). To hyphenate correctly the word “abs-cidere”, a pattern “abs-ci” has been introduced; this pattern produces wrong hyphenation of word “ab-scindere”, and so a second pattern “ab-scin” is introduced.

This explains the format of the pattern list in next section: indentation and the symbol **◆** indicate entries, exceptions and exceptions to exceptions. The endings of words placed between parentheses are just examples, THEY ARE NOT TAKEN INTO ACCOUNT IN PATTERN CONSTRUCTION. Entries in boldface are “general rules”. For these, no example is given. The same format has been used in the list of patterns for ancient Greek compound words, in section 5.

8 Patterns for Latin compound words

ab-

- ◆ a-bac(us)
- ◆ a-bit(us)
- ◆ abs-ce(dere)
- ◆ abs-ci(dere)
 - ◆ ab-scin(dere)
- ◆ abs-co(ndere)
- ◆ abs-que
- ◆ abs-te(mius)
- ◆ abs-ti(nere)
- ◆ abs-tr(ahere)

ad-

- a-gnasc(i)
- amb-i(gere)
- antid-ea
- a-sc(endere)
- a-sperg(ere)

- a-spern(ari)
- a-spi(cere)
- a-ste(rnere)
- a-sti(pulari)
- a-stre(pere)
- a-strin(gere)
- a-strue(re)
- a-stup(ere)
- cav-j(dium)

circum-

- cis-al(pinus)
- cis-rh(enanus)

com-

- ◆ co-met(es)
- ◆ co-mi(cus)
- ◆ co-mff(dia)

- de-sc(endere)
- de-sp(icere)
- de-st(inare)
- di-ch(oreus)
- di-gn(oscere)
- dir-im(ere)
- di-scrib(ere)
- di-sperg(ere)
- di-spi(cere)
- di-sta(re)
- di-sting(uere)

ex-

id-eo

in-

- ◆ i-nan(is)
 - ◆ ianim(us)
- ◆ ind-ue(re)
- ◆ ind-ep(tus)
- ◆ ind-ig(es)
- ◆ ind-ip(iscor)
- ◆ ind-ue(re)
- ◆ ini-ti(a)

inter-

- long-jv(us)
- neg-oti(um)

ob-

- ◆ obli-vi(o)
- ◆ oblon-(gus)
- ◆ obff-di(re)

pjn-ins(ula)

per-, post-, prj-

- prod-ir(e)
- prod-es(se)
- prod-ig(ere)
- pro-sc(jnium)
- pro-sp(ectus)
- pro-st(are)
- quinc-un(x)
- quot-an(nis)

re-

- ◆ red-(arguere)
 - ◆ re-don(are)
 - ◆ re-dor(mire)

◆ re-duc(ere)
 sat-ag(ere)
 satis-ac(cipere)
 sem-un(ciarus)
 sem-us(tulatus)
 sesc-en(naris)
 sic-ut(i)
sub-, super-
 su-scr(ibere)
 su-sp(icere)
 ter-un(cius)
 trans-ab-(ire)
trans-
 ◆ tran-sil(ire)
 ◆ tran-su(ere)
 ◆ trans-us(que)
 vel-ut(i)

9 Examples

Follow some examples of hyphenated ancient Greek and Latin texts. The symbol ÷ indicates hyphenation using patterns from sections 5 and 8.

Ἐνταῦθα ἐξ ÷ ε-λαύ-νει σταθ-μοὺς τρεῖς πα-ρα-
 σάγ-γας πεν-τε-καί-δε-κα ἐ-πί τὸν Εὐ-φρά-την πο-τα-
 μόν, ὄν-τα τὸ εὐ-ρος τετ-τά-ρων στα-δί-ων· καὶ πό-λις
 αὐ-τό-θι ὦ-κει-το με-γά-λη καὶ εὐ-δαί-μων Θά-φα-κος
 ὄ-νο-μα. Ἐνταῦθα ἔ-μει-νεν ἡ-μέ-ρας πέν-τε. Καὶ Κύ-
 ρος με-τα-πεμ-φά-με-νος τοὺς στρατ-÷-ηγ-οὺς τῶν Ἑλ-
 λή-νων ἔ-λε-γεν ὅ-τι ἡ ὀ-δοὺς ἔ-σοι-το πρὸς βα-σι-λέ-α
 μέ-γαν εἰς Βα-βυ-λῶ-να· καὶ κε-λεύ-ει αὐ-τοὺς λέ-γειν
 ταῦ-τα τοῖς στρα-τι-ώ-ταις καὶ ἄ-να-πει-θεῖν ἔ-πε-σθαι.
 Οἱ δὲ ποι-ή-σαν-τες ἐκ-κλη-σί-αν ἀπ-÷-ήγ-γε-λον ταῦ-τα·
 οἱ δὲ στρα-τι-ῶ-ται ἐ-χα-λέ-παι-νον τοῖς στρατ-÷-ηγ-οῖς,
 καὶ ἔ-φα-σαν αὐ-τοὺς πά-λαι ταῦτ' εἰ-δό-τας κρύ-πτειν,
 καὶ οὐκ ἔ-φα-σαν ἰ-έ-ναι, ἐ-ὰν μή τις αὐ-τοῖς χρή-μα-τα
 δι-δῶ, ὥ-σπερ τοῖς προ-τέ-ροις με-τὰ Κύ-ρου ἄ-να-βᾶ-σι
 [πα-ρὰ τὸν πα-τέ-ρα τοῦ Κύ-ρου], καὶ ταῦ-τα οὐκ ἐ-πί
 μά-χη-ν ἰ-όν-των, ἀλ-λὰ κα-λοῦν-τος τοῦ πα-τρὸς Κύ-
 ρου. Ταῦ-τα οἱ στρατ-÷-ηγοὶ Κύ-ρω ἀπ-÷-ήγ-γε-λον.
 Ὁ δ' ὑπ-÷-έ-σχε-το ἄν-δρὶ ἐ-κά-στω δῶ-σειν πέν-τε ἄρ-
 γυ-ρί-ου μνᾶς, ἐ-πὰν εἰς Βα-βυ-λῶ-να ἦ-κω-σι, καὶ τὸν
 μι-σθὸν ἐν-τε-λή-μέ-χρι ἄν κα-τα-στή-σῃ τοὺς Ἑλ-λη-
 νας εἰς Ἰ-ω-νί-αν πό-λιν. Τὸ μὲν δὴ πο-λὺ τοῦ Ἑλ-λη-
 νι-κοῦ οὕ-τως ἐ-πει-σθη.

from *Ξενοφῶντος Κύρου Ἀνάβασις*. [Ξεν]

Flu-men est Arar, quod per fi-nes Hæ-du-o-rum
 et Se-qua-no-rum in Rho-da-num in-fluit, in-cre-di-
 bili le-ni-tate, ita ut ocu-lis in ut-ram par-tem fluat
 iu-di-cari non pos-sit. Id He-lu-e-tii ra-ti-bus ac lin-
 tri-bus iunc-tis trans-÷-i-bant. Vbi per ex-plo-ra-to-
 res Cæ-sar cer-tior fac-tus est tres iam par-tes co-
 pia-rum He-lu-e-tios id flu-men tra-du-xisse, quar-
 tam fere par-tem citra flu-men Ara-rim re-li-quam

esse, de ter-tia ui-gi-lia cum le-gi-o-ni-bus tri-bus e
 cast-ris pro-fec-tus ad eam par-tem pe-ru-e-nit quæ
 non-dum flu-men trans-÷-i-e-rat. Eos im-pe-di-tos
 et in-÷-o-pi-nan-tes ad-gres-sus mag-nam par-tem eo-
 rum con-ci-dit: re-li-qui sese fugæ man-da-runt at-
 que in pro-xi-mas si-luas ab-di-de-runt.

from *Cæ-sa-ris Com-men-ta-rii
 de Bello Gal-lico*. [Cæ]

10 Availability

The files *AGRhyphen.tex* and *LAThyphen.tex* con-
 taining hyphenation patterns for ancient Greek and
 Latin (as described in this paper) are part of the
 Scholar \TeX package.

The hyphenation patterns for modern Greek
 mentioned in section 2 (file *GRhyphen.tex*) are in
 the public domain; they are included in Euro-Oz \TeX
 and can also be obtained directly from the author.
 Readers interested in Greek (ancient or modern) are
 invited to join the ELLHNIKA discussion list, by send-
 ing the SUBSCRIBE ELLHNIKA <name> command to
 LISTSERV@DHDURZ1.BITNET.

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