

SEMANTICS, SYNTAX, AND PHONOLOGICAL ORGANIZATION IN GREEK: ASPECTS OF THE THEORY OF METRICAL BRIDGES

A. M. DEVINE and LAURENCE D. STEPHENS

PERHAPS the most challenging and most debated problems in the study of Greek meter are those posed by the bridges. Bridges are locations and environments in the line at which word boundary is excluded or restricted. Not all types of word boundary are equally constrained at bridges: while boundaries between lexical words such as nouns, adjectives, and verbs are rare and often textually suspect, there is ample evidence for boundaries associated with short nonlexical forms, such as articles, conjunctions, negatives, modals, interrogatives, and pronouns, as well as prepositions, numerals, and certain adverbs (the term “appositive” is widely used to refer to these forms), for example, τῆς#συμφορᾶς (*Eur. Supp.* 732), καὶ#δυστυχῇ (*IT* 694), ἀρχειν#γὰρ (*Hel.* 1552), οὐκ#ἄξιῶ (*Andr.* 328), ἐν#δώμασι (*Hel.* 1407), all at Porson’s bridge. Some metrists classify appositive boundary as a minor violation of the bridge, that is, as a category intermediate between full word boundary and no word boundary at all; thus, in his recent handbook, D. Korzeniewski writes: “. . . wiegt der Verstoß nicht schwer.”¹ Other metrists distinguish appositive boundary from full word boundary by classifying the former with the nonviolations: “the ‘bridge’ is not violated [by an appositive boundary],” writes P. Maas.² This latter (binary) classification implies that, so far as the bridge is concerned, the meter is indifferent to the distinction between appositive boundary and no boundary. These two approaches seem to be quite incompatible and mutually contradictory. On the basis of a detailed and systematic analysis of largely neglected gradients of diachronic and stylistic variability, we shall propose a new theory of the bridge designed to resolve the apparent contradiction within the framework of a more comprehensive understanding both of the phonological processing of syntactic structures in the Greek language and of the issues raised by the bridge in the metatheory of Greek meter.

DATA

PORSON’S BRIDGE

Let us begin our analysis with a rather startling fact: there is only one instance of an appositive boundary at Porson’s bridge in the whole of the

1. *Griechische Metrik* (Darmstadt, 1968), pp. 50–51.

2. *Greek Metre*, trans. H. Lloyd-Jones (Oxford, 1966), p. 84.

Medea, a play containing over a thousand trimeters.³ It would, however, be quite wrong to assume that, by itself, this figure proves anything at all about either appositive boundaries or their suitability at Porson's bridge. One would first have to demonstrate statistically that this is not the expected and natural state of affairs; in other words, the significance of the low frequency in the *Medea* has first to be tested against a null hypothesis. The procedure that immediately suggests itself is to calculate the expected frequency of an appositive boundary at Porson's bridge on the basis of factors of language structure and verse composition: this would require one to estimate both the frequency of appositive boundaries in unversified Greek of the tragic style and the relative ease with which they can be located at Porson's bridge in the process of composing a tragic trimeter. It is surely obvious that such a synchronic null hypothesis would involve so many potentially interacting factors that it would require extremely complicated calculations; even if it were possible to carry them out, the intricacy of the model would tend to impair confidence in the resulting estimates, since some factor could easily have been omitted or wrongly modeled.

Fortunately, there are trimeters from different genres and from different periods within the same genre; consequently, in place of the fearfully complex synchronic null hypothesis, one can test for significant diachronic and stylistic variation, a much simpler and more straightforward procedure. Absence of variation through time or between styles would establish nothing, but any significant variation that is revealed is evidence for the existence of an independent rule, the strictness of which varies (provided that the rule is not merely a reflex of covarying factors). If we discover, as indeed we shall, that the rate of appositive boundary at Porson's bridge is $38\frac{1}{2}$ times as great in the *Orestes* as it is in the *Medea*, then, with the above proviso, we will have shown that there is a rule constraining its incidence in the *Medea* that has been relaxed in the later and more permissive *Orestes*. Moreover, the diachronic method has an important additional advantage: it can reveal trends with characteristic growth patterns from earlier to later styles, and these trends with their stylistic correlates can often suggest substantive explanations for the nature of the constraint discovered.

Figure 1 presents the overall incidence per thousand trimeters of appositive boundary at Porson's bridge in the various styles and periods we have examined:⁴ the iambographers,⁵ Euripides' *stilus severior* (ES) excluding *Rhesus* and *Alcestis*, *stilus semiseverus* (ESS), *stilus liber* (EL), *Alcestis* (Alc.), *stilus liberrimus* (ELM), and *Cyclops* (Cycl.). In the earlier styles, appositive boundary is clearly restricted at Porson's bridge, and the restriction is progressively relaxed through time. Because of the small

3. *Med.* 1126 τῶν σῶν ὄπο.

4. Part of the data was published by G. Dottin, "Les composés syntactiques et la loi de Porson," *RPh* 25 (1901): 197–219. See further J. Descroix, *Le trimètre iambique* (Mâcon, 1931), pp. 318–39, who already recognized the developmental trend in the evidence.

5. Archilochus (excluding *Epodes*), Semonides, Solon.

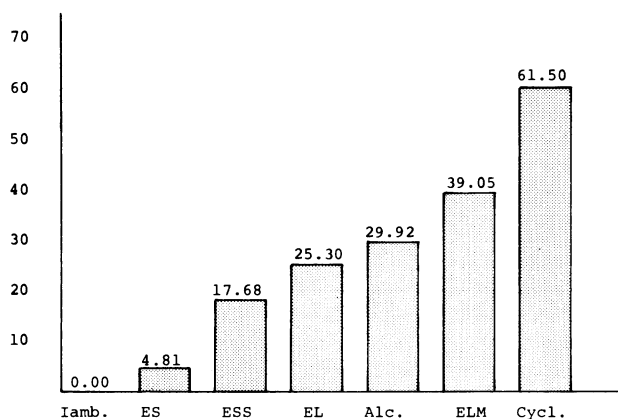


FIG. 1.—Incidence of appositive boundary at Porson's bridge per thousand trimeters

number of extant trimeters from the iambographers, it is not possible to establish the statistical significance of the difference between the iambographers and Euripides *severior* at the usual level of confidence (one chance in twenty); the confidence level in this case is one chance in four of being random. The difference between Euripides *severior* and *liberrimus* is highly significant: the confidence level is one chance in about five million of being random. The high incidence in the *Cyclops* is evidently due to its status as a satyr play, and the relatively high incidence in the *Alceste* (particularly in view of its early date) is a clear indication of its pro-satyr status. The incidence in Aeschylus (16.88) is comparable to that in Euripides *semiseverus*, while the overall incidence in Sophocles (32.65) interestingly falls between that of Euripides *liber* and that of Euripides *liberrimus*. So far as we can tell, the diachronic/stylistic variation in the incidence of appositive boundary cannot be reduced to a reflex effect of other metrical and stylistic factors; it does not covary with factors such as frequency of the article and covaries only minimally with the frequency of final cretic-shaped words.⁶ Consideration of the diachronic/stylistic data of figure 1 leads us to the following revised formulation of Porson's bridge: *word boundary of any sort (including appositive boundary) is severely constrained at long third anceps in stricter styles; the constraint on appositive boundary is progressively relaxed in less strict styles.*⁷

One could illustrate the general rate of growth by a comparison with the growth in frequency of resolutions in words of the fourth paeon shape

6. The rate of final cretics following a short third anceps increases from ES to ELM by 25.34 percent (and falls off slightly in the *Cyclops*). By contrast, appositives at Porson's bridge increase 711.85 percent from ES to ELM and 1178.58 percent from ES to the *Cyclops*.

7. The course of this evolution in Euripides and its chronological and stylistic implications are investigated in our paper, "A New Aspect of the Evolution of the Trimeter in Euripides," *TAPA* 111 (1981): 43–64.

(ŠŠŠŠ), which grow from a frequency of 8.62 per thousand trimeters in Sophocles to 62.06 per thousand trimeters in Euripides *liberrimus*. In both cases, the type of growth involved is exponential, and, in diachronic analysis, exponential growth affords perhaps the clearest proof of the significance of the metrical rule under investigation. It is therefore quite mistaken to claim that the appositive boundary is as acceptable at Porson's bridge as no boundary at all. Rather, there is a clear compositional cost attached to the use of an appositive boundary at Porson's bridge, a cost that is progressively reduced in the less severe styles.

The most widely accepted opinion regarding Porson's bridge in the satyr plays is that genuine violations (not merely appositive boundaries) occur, and indeed violation of Porson's bridge has often been used in the study of the fragments as one metrical criterion of satyr-play status. To be sure, there occur in satyric trimeters structures that would not be allowed in tragedy; however, it is equally true that the incidence of word boundary at Porson's bridge in satyric is more constrained (both quantitatively and, significantly, qualitatively) than in comedy. The relevant examples fall into three clear categories. One category comprises forms that are found, although rarely, in tragedy: οὐδεῖς (*Cyc.* 120, 672; cf. *Alc.* 671), οὐδέν (*Phoen.* 747, frag. 497. 1 Nauck), δεῖ (*Aesch. Isthm.* 7—post-positive; cf. *Or.* 1035—prepositive), χρῆ (*IA* 1026—prepositive), and, for a combination of the two, the phrase οὐδέν δεῖ (*Soph. OC* 1022; *Eur. HF* 1338) and perhaps γ'εὺ σώσομεν (*Cyc.* 202; cf. *Aesch. Cho.* 693). Another category (two instances) involves elision of lexical words: ἐχρήρωσ' Ἑλλάδα before a proper name (*Cyc.* 304) and οὐκ οἶδ' ἐξ ὅτου (*Cyc.* 639). Elided lexical word plus lexical word is not certainly attested in tragedy. Elided lexical plus prepositive (*sic*) is slightly better attested (cf. *Soph. Phil.* 22 and 1277; *Eur. Heracl.* 529, *Or.* 91, *Bacch.* 1286, if not corrupt). The third category is the most instructive and is not comparable to anything found in tragedy: τάχα τις ὑμῶν τῷ ξύλῳ (*Cyc.* 210), ποτέρας τῆς χειρός (*Cyc.* 681), πρὸς αὐτῇ τῇ πέτρα (*Cyc.* 682), αὐτῇ τῇ κλο[πῇ] (*Soph. Ichn.* 333), ἄρ' ὑμᾶς, ὠγαθο[ί] (*Aesch. Isthm.* 23). All examples except the last⁸ show the characteristic structure of nonlexical polysyllabic word followed by a form of the article; this can hardly be a coincidence and may be paralleled by *Oedipus Coloneus* 664. On this particular point, the satyric style is not simply intermediate between tragedy and comedy in a hierarchy of purely metrical strictness. If that were the case, the violations of satyric would be a random assortment of linguistic structures, not excluding, for example, lexical spondee-shaped word + lexical cretic-shaped word. Clearly, for satyric, the boundary between the nonlexical word and the article in structures such as those cited above was classified with the appositive boundary for the purposes of the bridge.

In comedy, lexical boundary and even major constituent boundaries and change of speaker are allowed at Porson's bridge.

8. For which see perhaps Triclinius' emendation of *Phil.* 222 and R. Kühner, *Grammatik der griechischen Sprache*, vol. 1.1³ (Hanover, 1890), p. 591.

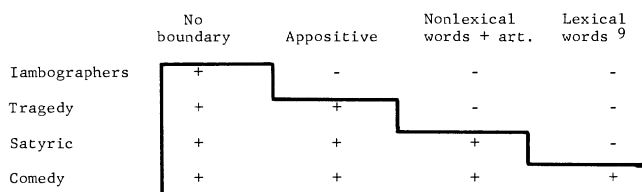


FIG. 2.—Implicational scaling of genres and boundary types at Porson's bridge

Figure 2 shows the implicational relations between the forms permissible at Porson's bridge and the genres in which they occur. The permissibility of any form in any style implies the permissibility of all forms to its left in the hierarchically ordered series. The permissibility of a form in any stricter style implies its permissibility in any freer style (any style lower on the hierarchically ordered list): it also generally implies a higher rate of occurrence per thousand trimeters.

The above analysis of boundaries at Porson's bridge shows that the nonlexical boundary associated with heavy monosyllabic appositives is less acceptable at Porson's bridge than no boundary at all and that the boundary between nonappositive nonlexical words and articular phrases is less acceptable than appositive boundary but more acceptable than lexical boundary. This scaling of linguistic structures according to their metrical acceptability is not random in linguistic terms but intuitively corresponds to the gradation of a linguistic property that seems to increase from word-internal environments to appositive boundary to the boundary after the polysyllabic nonlexical word in structures such as those seen in satyrlic. Our aim in this paper is to discover what this linguistic property is and how and why the meter is sensitive to it.

RESOLUTION AND SUBSTITUTION BRIDGES

Split resolution. It is a basic rule of Greek meter that the two syllables implementing a resolution should not be divided by a word boundary. When third longum is resolved, the only circumstance under which a split resolution is allowed in Euripides is when the first of the two syllables in resolution is a (monosyllabic) prepositive, type *ὁ βίος*—there is one instructive instance of an elided lexical word (*πρόδ'*) at *Orestes* 632. Figure 3 illustrates the growth of resolution split by appositive boundary in this way as a percentage of all resolutions of the third longum. Figure 3 clearly demonstrates that a light monosyllabic prepositive is not as acceptable in resolution as the first syllable of a polysyllabic word, and carries with it some compositional cost.

Figure 4 represents the decrease through time in the proportion of such

9. Monosyllabic lexical words are included here because they too are highly constrained: boundary weakening is attested in tragedy under certain special conditions (primarily in phrases or imperatives) only for a few high frequency monosyllabic lexical words.

split resolutions in which the first syllable of the resolution is a form of the article.¹⁰ Figure 4 indicates that a resolution split by a form of the article carries a lower compositional cost than one split by some other syntactic structure.

Figure 5 represents the decrease through time in the proportion of split resolutions of the third longum involving forms of the article which are just the phrase *τὸν ἐμόν*. On the basis of figure 5 one must conclude that a split resolution involving the phrase *τὸν ἐμόν* carries with it a lower compositional cost than other phrases involving forms of the article.

The above data on split resolution, when taken together, attest to a hierarchy of metrical acceptability ranging from (a) no boundary at all through the following three gradations of appositive boundary: (b) the high frequency syntagm *τὸν ἐμόν*, (c) regularly syntactically generated

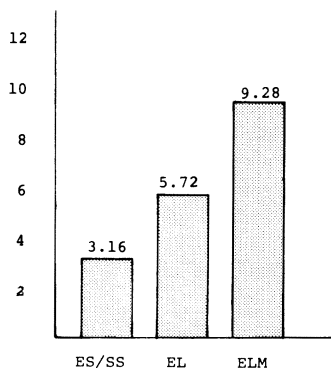


FIG. 3.—Percentage of resolved third longum split by appositive boundary

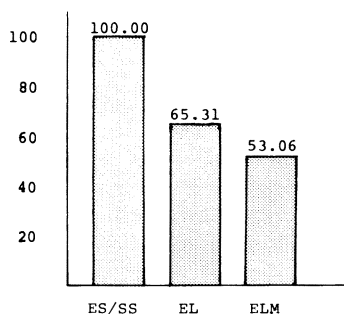


FIG. 4.—Article as a percentage of appositives splitting resolved third longum

10. There is some variation in the overall rate of use of the article in Euripides. Preliminary sampling does not suggest that such variation could account for all or even most of the trends illustrated in figs. 4–6.

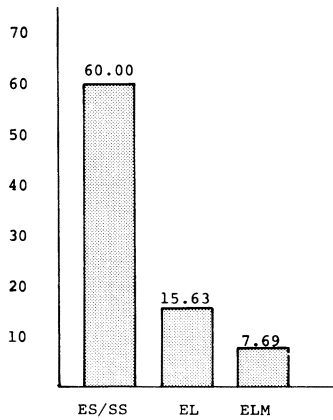


FIG. 5.—The phrase *τὸν ἐμὸν* as a percentage of articular phrases splitting resolved third longum.

articular phrases, (d) structures involving other light appositives of lower individual discourse frequency.

Divided anapests. As early as 1925, Zieliński had analyzed the occurrences of line-initial anapests in Euripides. As is well known, the anapest should be neither split (after the first light syllable) nor divided (after the second light syllable). If a line-initial anapest is divided after a pyrrhic-shaped word, in tragedy the pyrrhic-shaped word is always nonlexical and in Aristophanes overwhelmingly so. In Aristophanes, over twenty percent of these divided anapests consist of imperative verb forms, most of which are semantically bleached to the status of discourse particles; nominal forms also occur, though rarely, and there are even some cases of punctuation. In Menander, the proportion of nominal pyrrhic-shaped words dividing line-initial anapests is almost fifteen percent (as compared with only about 1.5 percent in Aristophanes).

The proportion of all line-initial anapests divided after pyrrhic-shaped nonlexical words increases significantly as one proceeds in tragedy from the stricter to the freer styles and then on to the satyric and comic trimeter. This diachronic/stylistic parameter is illustrated by figure 6.¹¹ Figure 6 demonstrates very clearly that the syntagmatic anapest was not as acceptable as the simplex anapest: division of the anapest even by a nonlexical or verbal imperative carries with it some compositional cost. Figure 7 represents the decrease from Euripides *liber* to Aristophanes in the proportion of anapests divided after pyrrhic-shaped words which involve the structure preposition plus nonlexical object (type *ἐπὶ τοῖσι*—HF 940).

11. The percentages are calculated on the basis of separate data given by T. Zieliński, *Tragodoumenon libri tres* (Krakow, 1925), p. 201; D. F. Sutton, *The Date of Euripides' "Cyclops"* (Ann Arbor, 1974), p. 32; and J. W. White, *The Verse of Greek Comedy* (London, 1912), pp. 44–45. The percentages are calculated on the basis of the total number of line-initial anapests. Developmental trends in other subclasses of line-initial anapests do not significantly affect the trend revealed by fig. 6.

The trend revealed by figure 7 shows that dividing a line-initial anapest with this latter structure incurs a lower compositional cost than division after other pyrrhic-shaped words in other structures.

The above data on line-initial divided anapests, when taken together, attest a hierarchy of metrical acceptability ranging from (a) no boundary at all through the following gradations of nonlexical boundary: (b) the structure governing preposition plus nonlexical word, (c) other structures involving nonlexical pyrrhic-shaped words.

Line-initial split dactyl. A line-initial dactyl is never trochaically split ($\tilde{S}\tilde{S}\#S$) in the extant plays of Aeschylus or Sophocles or in Euripides' *stilus severior*, *semiseverus*, and *liber*. In Euripides' *stilus liberrimus* there are two instances (not followed by a monosyllabic postpositive), both belonging to the class of morphologically complex nonlexical trochee-

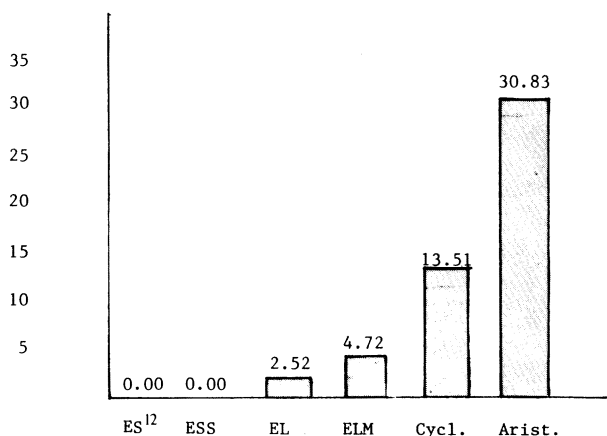


FIG. 6.—Line-initial anapests divided after nonlexical/imperative forms as a percentage of all line-initial anapests.

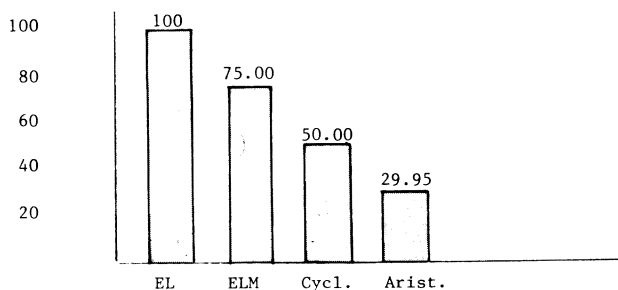


FIG. 7.—Preposition + nonlexical object as a percentage of all divided line-initial anapests

12. *Medea*, *Heracleidae*, *Hippolytus*. In the pro-satyr *Alcestitis*, the syntagmatic anapest represents 12.5 percent of the total (one instance).

shaped words (type οὐδὲ, ὥστε, ὥσπερ, ὅστις, μηδέν, etc.). In Aristophanes, split dactyls (not followed by a postpositive) come predominantly either from this latter class or from that of simplex nonlexicals (αὐτό, ἀλλά, εἴτα, οὗτος, etc.); there are two examples of lexicals: one is followed by the nonlexical (postpositive here?) ἔτι (*Nub.* 1219), the other involves the phrase πολλά κακά (*Eccl.* 436). In Menander, trochee-shaped lexicals are firmly established in initial split dactyls, and major syntactic boundaries are permitted after them (as they are with the divided anapest in Menander). Figure 8 illustrates the growth of nonlexical trochee-shaped words in initial split dactyls.¹³ The steady diachronic and stylistic trend proves that the absence or low incidence of nonlexicals in the stricter styles is not a random effect but rather is due to a linguistically based rule. Figure 9 displays the implicational scaling for the various types of trochee-shaped word.

The above data on line-initial split dactyls attest a hierarchy of metrical acceptability ranging from (a) no boundary at all through the following gradations of nonlexical boundary: (b) complex nonlexicals, (c) simplex nonlexicals.

The data on nonlexical status analyzed so far have been drawn from the prosodic bridges; in the next section we shall turn our attention to the significance of nonlexical status at rhythmical bridges in the trimeter.

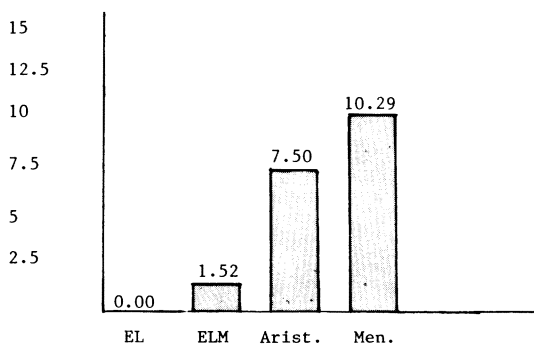


FIG. 8.—Line-initial dactyls split after nonlexical trochee-shaped word without punctuation as a percentage of all line-initial dactyls.

	Complex nonlexical	Simplex nonlexical	Lexical	Punctuation
ES/SS/L	-	-	-	-
ELM	100.00	0.00	0.00	0.00
Aristophanes	45.45	48.48	6.06	0.00
Menander	30.61	34.69	14.29	20.41

FIG. 9.—Implicational scaling of split-dactyl types

13. For the sake of simplicity, we have calculated the percentages on the basis of the total number of line-initial dactyls, a procedure which does not lead to any significant distortion of the real trend.

KNOX'S BRIDGES

The trochee bridge. According to Knox's trochee bridge,¹⁴ a trochee-shaped word may not end with third anceps in the trimeter of the iambographers. Knox himself noted a number of exceptions to this rule, which he explained as due to the fact that the trochee-shaped word either was a prepositive negative such as *οὐδέν* or was preceded by a major syntactic constituent boundary (where, according to Knox's "general law," the pause was supposed to have the effect of weakening a subsequent boundary). More recently, the author of the standard modern reference book on the iambographers has dismissed Knox's trochee bridge, writing that it "is strictly observed . . . nowhere."¹⁵ A decision between these two conflicting positions need certainly not be made at the purely intuitive level. Sound method requires one to examine the list of exceptions carefully. If it is a purely random collection of linguistic structures, then the latter view will be correct; but, if the exceptions comprise a unitary class, characterized by a common linguistic property, then the bridge is a real one and merely needs to be reformulated more precisely. The following are all the exceptions to Knox's trochee bridge in Semonides and Solon: *οὐδέν* *εἰδότες* (Semon. 1. 4), *οἱ μὲν ἡμέρην* (1. 7), *ἀλλὰ μυρίαί* (1. 20), *οὐδ' ἐπ' ἄλγεσιν* (1. 23), *οὐδὲ καλλίων* (7. 31), *οὔτε κόσκινον* (7. 59), *ἀλλὰ τοῦτ' ὄρᾳ* (7. 80), *οὐδ' ἐς οἰκίην* (7. 106), *οἱ δὲ γείτονες* (7. 110), *οὐδὲ πάρδαλιν* (14. 2); *ἄλλον ἐκδίκως* (Solon 36. 9), *οὐκέτ' Ἀττικὴν* (36. 11), *εἰ γὰρ ἦθελον* (36. 22), *οἱ μὲν ἱτρία* (38. 1), *οὔτε πεμμάτων* (38. 3), *οἱ δὲ σίλφιον* (39. 1). To this list add three cases with postpositives: Semonides 7. 8, 7. 22; Solon 36. 15. Even a superficial examination of the list is sufficient to establish a *prima facie* case for its unitary character: none of the examples, neither the trochee-shaped word nor the sequences of two monosyllables, comes from the major syntactic classes of noun, adjective, or verb—all the examples are nonlexical items. However, before we can accept the significance of the property of nonlexicity for the formulation of Knox's trochee bridge, it will be necessary to test it against a null hypothesis designed to control for text frequency and measure the strength of the association between lexical status and location ending in position 9. The simplest way to carry out this test is to compare the respective proportions of lexical and nonlexical trochee-shaped words ending in positions 7 and 9, while carefully restricting our count to syntactic structures that are equally likely to occur in both locations.¹⁶ The results of the test are presented in table 1. Figures are given for tragedy, too, in order to test

14. "The Early Iambus," *Philologus* 87 (1932): 18–39.

15. M. L. West, *Studies in Greek Elegy and Iambus* (Berlin, 1974), p. 113.

16. This latter requirement involves excluding from the test the following categories: (a) trochee-shaped words preceded by any elided word or by a prepositive or appositive combination or forward-linking nonlexical word; trochee-shaped words that are enclitic or backward-linking; (b) trochee-shaped words derived by elision of a dactyl-shaped word or followed by a postpositive or backward-linking nonlexical word. Category (a) is excluded because a lower incidence might simply be due to the normal requirements for a clearly marked caesura; category (b) is excluded as potentially affecting the bridge above and beyond the factor of nonlexicity that is the subject of the test. It was not feasible to apply this test to the sequences of two monosyllables, because of the relative rarity of lexical monosyllables.

TABLE 1

PERCENTAGE OF LEXICAL TROCHEE-SHAPED
WORDS OUT OF ALL TROCHEE-SHAPED WORDS
ENDING IN POSITIONS 7 AND 9

	Position 7	Position 9
Iambographers ^a	67.6	0.00
Tragedy ^b	59.69	16.33

^a Archilochus (incl. *Epodes*), Hipponax, Semonides, Solon.

^b Euripides *Alcestis*, *Medea*, *Heracleidae*, *Hippolytus*, *Helen*, *Orestes*.

whether Knox's trochee bridge holds, even if in a weaker form, in tragedy, as claimed by Knox himself. These results clearly disprove the null hypothesis and confirm the relevance of lexical status. We see that in both the iambographers and in tragedy the majority of the trochee-shaped words ending in position 7 are lexical (in the syntactic structures included in the test), whereas in position 9 the iambographers exclude the lexical trochee-shaped word outright and tragedy avoids it.

Thus it is clearly a mistake to dismiss Knox's trochee bridge as "strictly observed . . . nowhere." We have identified a common feature characteristic of the exceptions to the bridge—nonlexical status—and have established in table 1 that this feature is not a statistical coincidence either in the iambographers or in tragedy; nor is it a reflex of co-occurring syntactic boundary or hephthemimeral caesura.¹⁷ On the basis of the evidence analyzed so far, Knox's trochee bridge in the trimeter may be provisionally reformulated as follows (as it applies to structures not involving monosyllabic appositives): *a trochee-shaped word should not be located so as to end in position 9 unless it is nonlexical*.

In table 2, the changing proportions of each category of trochee-shaped word or syntagm ending in position 9 are traced through three major

17. As noted above, the majority of the trochee-shaped words ending in position 9 in the iambographers stand after a major syntactic boundary (generally orthographically rendered by punctuation) and consequently after hephthemimeral caesura. It was this fact that was exploited by Knox in the theory of post-pausal boundary weakening that he formulated to explain the exceptions to his bridge. Thus, we have to decide whether the factor of nonlexicality just identified is simply a reflex of the syntactic boundary/caesura, whether the latter is a reflex of the former, or whether both are independently contributing factors. Let us consider the hephthemimeral caesura first. Many of the lexical trochee-shaped words ending in position 7 stand after a (syntactically defined) penthemimeral caesura; in the absence of a constraint on lexicality, there would be no reason why an equal proportion of lexical trochee-shaped words should not stand after the hephthemimeral caesura—in fact we do not find any lexicals in this location (see table 1) in the iambographers. Moreover, there is an example of a nonlexical trochee-shaped word ending in position 9 in a line of Solon with penthemimeral caesura. Turning to the syntactic boundary, we find that it is neither a necessary nor a sufficient condition for the occurrence of a trochee-shaped word ending in position 9. It is not a necessary condition because at least one of our examples in Solon is a (nonlexical) trochee-shaped word that is not clause-initial; and it is not a sufficient condition, because, if it were, lexical trochee-shaped words would be freely admitted when clause-initial. Thus, the syntactic boundary factor is insufficient to account for the data. By contrast, the factor of nonlexicality accounts for 100 percent of the data in the iambographers. Consequently, the syntactic boundary is either a secondary factor or a nonsignificant correlate. Indeed, the majority of nonlexical trochee-shaped words in the list are words that tend to stand at the beginning of their clause.

TABLE 2

PERCENTAGE OF TROCHEE-SHAPED WORDS ENDING IN POSITION 9^a

	Nonlexical			Lexical		N
	two monosyllables	disyllable prepositive	postpositive	preceded by lexical	preceded by nonlexical	
Examples	<i>εἰ γάρ</i> (Solon 36. 22)	<i>ἀλλά</i> (Semon. 1. 20)	<i>ὄμμα τοῦμόν</i> (<i>Hipp.</i> 1208)	<i>ῥᾶστος ἀνδρί</i> (<i>Hipp.</i> 1047)	<i>οὐδέν ἔργον</i> (<i>Hipp.</i> 911)	
Semon./Solon ^b	46.66	53.33	0.00	0.00	0.00	16
ES ^c	42.62	32.79	4.92	9.84	9.84	122
EL/LM ^d	37.25	25.49	6.86	12.75	17.65	102

^a Elided dactyl-shaped words are treated as trochee-shaped words. The following categories are comparatively rare and were excluded as not entirely comparable to the categories analyzed in table 2 (they are subject to additional phonological and compositional factors): nonlexical trochee-shaped word preceded by another nonlexical trochee-shaped word or by two monosyllables (type *κεῖθε δ'οὔτε*, Solon 38. 3); trochee-shaped word followed by monosyllabic postpositive.

^b These iambographers are the strictest.

^c *Alcestitis*, *Heracclidae*, *Hippolytus*.

^d *Helen*, *Orestes*.

style groups.¹⁸ Table 2 confirms the significance of nonlexicity by providing diachronic evidence for a progressive growth in the incidence of lexical trochee-shaped word ending in position 9 as one proceeds from the strict style of Semonides and Solon through the intermediate Euripides *severior* to the more permissive Euripides *liber* and *liberrimus*. The differences in columns 4 and 5 are highly significant despite the comparatively small number of extant trimeters in Semonides and Solon: there is only a one in 250 chance ($p = .004$) that the differences in columns 4 and 5 between the latter and Euripides *liber/liberrimus* are random.

The relatively unconstrained occurrence of the structures in column 1 (monosyllabic prepositive + monosyllabic prepositive or postpositive) is readily explained by what we already know from other bridge data. Such structures are allowed even at prosodic bridges, for example, before Porson's bridge in tragedy:¹⁹ evidently the two monosyllabic appositives combine to form a spondee- or trochee-shaped prepositive.²⁰ This interpretation can be generalized to account for the permissibility of the trochee-shaped nonlexical words in column 2 of table 2; and, indeed, there is some evidence that in tragedy and comedy not merely a compound like *οὐδέ* but also a simplex trochee-shaped nonlexical word such as unelided *ἀλλά* could stand at prosodic bridges: *Andromache* 346 (MSS); *Plutus* 1157. An instructive case is *παῖς ἦδε μοι* (Eur. *Suppl.* 1098), where the trochee-shaped nonlexical word *ἦδε* coheres syntactically with the preceding *παῖς*—the violation of Porson's bridge is obviated by the nonlexical status of

18. The subcategories that were previously omitted for the viability of the synchronic test (see n. 16) are now admitted for the diachronic test.

19. For examples, see our article "The Greek Appositives," *CP* 73 (1978): 316.

20. Instances like *οἱ μὲν ἱγρία* (Solon 38. 1) and *οἱ μὲν ἡμέρην* (Sem. 1. 7) are syntactically comparable to the monosyllabic prepositive in *οἱ δ' ἔστρεφον* (Eur. *Suppl.* 678).

ῥδε (a lexical heavy monosyllable by itself [παῖς] is not sufficient to obviate a violation). Thus, a requirement for a nonlexical boundary after²¹ a trochee-shaped word ending in position 9 will account both for the permissibility of columns 1 and 2 and for the constraint on columns 4 and 5. This hypothesis also predicts that nonlexical trochee-shaped words will be constrained if they are syntactically postposed (so that they have the equivalent of lexical word boundaries after them), and indeed the growth pattern observed in column 3 is similar to that in columns 4 and 5 and therefore consistent with the prediction (although the actual differences are not statistically significant due to the small size of the sample). Figure 10 illustrates the growth through time of trochee-shaped words not followed by a nonlexical boundary ending in position 9. The percentages are the sums of columns 3, 4, and 5 in table 2.

The iamb bridge. According to Knox's iamb bridge²² and Wilamowitz's spondee bridge,²³ the last metron of the trimeter may not consist of two disyllabic words in the iambographers. Of course, if the first disyllabic word is preceded by a monosyllabic prepositive, the structure is acceptable: so, for example, Semonides 1. 8 οὐ δοκεῖ βροτῶν, Solon 36. 3 ἐν δίκη χρόνου. At Semonides 7. 79 οὐδέ οἱ γέλως μέλει, οἱ may be taken as cohering to the right despite its orthographic clisis (cf. Aesch. *Supp.* 785). The author of the standard modern reference work on the iambographers has impugned the validity of the law for the majority of the iambographers, writing that it "is strictly observed only in Archilochus."²⁴ However, as in the case of the trochee bridge above, the exceptions in the trimeters of Semonides and Solon all involve nonlexical words:²⁵ ὀκη θέλει

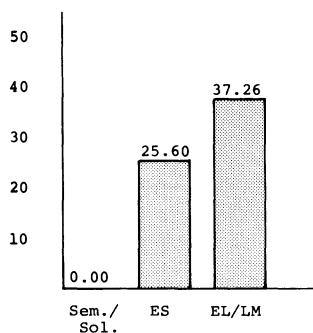


FIG. 10.—Lexical word boundary (or equivalent) as a percentage of all word boundaries after trochee-shaped word ending in position 9.

21. For further details, see our paper "Bridges in the Iambographers," *GRBS* 22 (1981): 305–21.

22. "The Early Iambus," pp. 19–20.

23. *Griechische Verskunst* (Berlin, 1921), p. 289. For an analysis of the relationship between Knox's and Wilamowitz's bridges, see our paper "Bridges in the Iambographers."

24. West, *Studies*, p. 113.

25. The extant fragment of Susarion is too short for us to be sure of the statistical significance of nonlexicality in the two examples (λέγει τάδε, ἀνευ κακοῦ), and the meter is less strict on other counts than that of Semonides and Solon.

(Sem. 1. 2), ὑπὸ χθονός (1. 14), λούται . . . ἄπο ῥύπον (7. 63), κατὰ γλοιού (8). Two of the above four examples simply involve preposition + noun (Sem. 1. 14, 8; cf. Archil. 44 *περὶ στόμα*). At Semonides 7. 63 ἄπο is a preverb in tmesis, which presumably coheres to either the left or the right. The nonlexical boundary occurs to the left of the first disyllabic word in a tetrameter instance (Archil. 114. 4 *καὶ περὶ κνήμας ἰδεῖν*) and after the sequence prepositive + enclitic at Semonides 7. 79 (see above). It is easy to establish the statistical significance of the absence of the structure (lexical disyllable + lexical disyllable). In a sample of four hundred trimeters from Euripides' *Phoenissae* (700–783, 834–955) and *Bacchae* (666–861), this structure was found to occur (excluding proper names and instances following a prepositive) at a rate of 62.5 per thousand trimeters. Consequently, if there were no bridge constraining this structure in Semonides and Solon, we would expect fourteen instances of it in the extant 225 trimeters: but we find zero instances. We would have to have two million samples of the size of the extant corpus of Semonides and Solon before we could expect to find one sample with zero instances due purely to random fluctuations. We can only conclude that the reason for the absence of the sequence of two lexical words is just Knox's and Wilamowitz's bridges. Thus Knox's iamb bridge for Semonides and Solon may be reformulated as follows (as it applies to structures not involving monosyllabic appositives): *the last metron of the trimeter may not consist of two disyllabic words unless one of the two words is a nonlexical cohering with the other*.

Our new formulation of Knox's bridges is corroborated by the evidence of Meyer's second-foot trochee bridge in Callimachus. According to this bridge, in the hexameter a masculine caesura should not be preceded by the structure [trochee-shaped word + iamb-shaped word]. A. Wifstrand lists six exceptions (not involving proper names or appositives/appositive sequences) from the *Hymns* and the *Epigrams*:²⁶ in all six instances, either the trochee-shaped word (*εὔτε, μηδέ, ὅστε, οὐδέ, οὐδέν*) or the iamb-shaped word (*ἑών*) is nonlexical.²⁷

In the case of the split dactyl bridge above, which is a prosodic bridge, nonlexical trochee-shaped words are allowed only in the less strict styles of the trimeter. By contrast, at Knox's trochee bridge, which is rhythmic, even in the strictest style of the trimeter trochee-shaped nonlexical words are admitted. Consequently, the special status of nonlexical words is not merely a manifestation of late or lax versification but is a systematic and fundamental component of bridge rules operative from the strictest styles on, with the admissibility of nonlexicals varying according to the nature of the bridge in question. Further, in contrast with the prosodic bridges, lexical words are admitted, although clearly constrained (see table 2) already in the earliest styles of the tragic trimeter. One interpretation of

26. *Von Kallimachos zu Nonnos* (Lund, 1933), p. 65.

27. For a further possible parallel from the hexameter, this time for spondee-shaped words, see W. S. Allen, *Accent and Rhythm* (Cambridge, 1973), p. 287.

this fact would be that the linguistic property that is relevant for rhythmic bridges can occur at lexical as well as nonlexical boundary.²⁸

THEORY

What has been established in the first part of this paper is not the end of the investigation; quite to the contrary, it is merely a pre-explanatory presentation of the data. In metrics, as indeed in general, the assembly and preliminary classification of philological data (such as lists of appositives) is of quite restricted interest and value as an end in itself—our real goal is always, *pace* Maas,²⁹ to use such data to reach an understanding of more general and fundamental principles. The data we have assembled on nonlexical words in the trimeter immediately confront us with the following questions. First, what are the linguistic properties of nonlexical words that set them apart from lexical words? Second, in what way do these properties interact with the metrical requirements of the prosodic and rhythmic bridges, and why does the interaction vary from style to style? Let us first investigate the former (linguistic) problem; we shall return to the latter (metrical) question at the end of our paper.

SEMANTIC AND SYNTACTIC EVIDENCE

Up to this point, our linguistic definition of the class of words permitted at bridges has been in terms of the property "lexicality," or rather the absence thereof. However, the substantive content of the term "nonlexical" is not immediately obvious because of the great diversity of the class of nonlexicals. Yet despite this *prima facie* heterogeneity, we can recognize certain general semantic and syntactic properties shared by many or all of its members. To a large extent, nonlexical words are grammatical function words which serve to define phrase and sentence structure and the grammatical relationships obtaining between lexical words, whereas lexical words express the referential meaning. Grammatical function words include conjunctions, modal and auxiliary verbs, articles and deictics, anaphoric, relative, and personal pronouns, quantifiers and lower cardinal numbers, negatives, prepositions, adverbs of modality, and interrogatives. Other nonlexical words convey discourse structure above the sentence level (*γάρ*, *γούν*), emphasis (*δή*), the speaker's attitude to the utterance or his interlocutors, and so forth. But the strongest evidence that nonlexical words constitute a meaningful class in the organization of language comes from the typology of their behavior in a variety of syntactic and phonological rules and in speech errors, word games, aphasia, and psycholinguistic word-recognition experiments.

In syntax, nonlexicals are commonly subject to special word-order rules.

28. This assumption is central to the explanation we propose for other rhythmic bridges on p. 22. The significance of lexical boundaries in syntagmatic environments for the prosodic bridges is discussed in our paper, "Towards a New Theory of Greek Prosody: The Suprasyllabic Rules," *TAPA* 112 (1982): 33–64.

29. *Greek Metre*, p. 34.

Rules governing the position of lexicals in the sentence do so with reference to other lexicals (or major constituents); that is, they relate to members of their own class. Rules governing the position of nonlexicals or sequences of nonlexicals in the sentence do so with reference to lexicals; that is, they relate to members of a different class. For instance, in the Hmong language (Southeast Asia) interrogative and negative particles must always occur after the first constituent in the sentence. In Luiseño (Arizona) modal and aspectual particles, negatives, question markers, and pronouns are restricted to sentential second position. In Greek, the word-order constraints discussed by K. J. Dover in his chapter entitled "Lexical and Semantic Determinants" involve almost exclusively nonlexical words.³⁰

M. F. Garrett and M.-L. Kean have reported that in the MIT corpus of speech errors grammatical function words behave like inflectional and derivational morphemes rather than like lexical words.³¹ They hypothesize that the former categories articulate a "surface phrasal planning frame" with slots into which the lexical words are placed (or, in speech errors, misplaced). Similarly, in word games like the Jaberwocky poem, it is the lexical bases that are replaced by nonsense words, while grammatical function words, together with inflectional and derivational endings, survive intact: "*'Twas brillig and the slithy toves. . .*" The nonlexicals have also been shown to constitute a special class in certain psycholinguistic word-recognition experiments.³² In these experiments, subjects were asked to decide whether a written letter sequence was or was not a real English word. For lexical words, the higher the frequency of the word, the more rapid the response; for nonlexical words, however, there was no similar frequency effect—response time was nearly constant. Finally, some fascinating evidence has recently come to light from neurolinguistic studies of the speech disorder called Broca's aphasia, a syndrome most frequently arising from damage to a part of the brain known as Broca's area. In this type of aphasia, "the speaker relies primarily on nouns, although verbs . . . are also present. In particular, grammatical morphemes (function words and inflectional affixes) are usually omitted."³³ There has been considerable discussion as to whether this deficit is to be characterized as semantic-syntactic or as phonological.³⁴ In any case, one could hardly ask for, and rarely finds, either in linguistics or in Greek metrics, more compelling empirical evidence of the reality of a linguistic classification than that it should be reflected in the consequences of specifically localized damage to the brain.

30. *Greek Word Order* (Cambridge, 1960).

31. "Levels of Representation and the Analysis of Speech Errors," *Juncture*, ed. M. Aronoff and M.-L. Kean (Saratoga, Cal., 1980), pp. 79–89.

32. D. Bradley, "Computational Distinctions of Vocabulary Type" (Ph.D. diss., MIT, 1978).

33. D. C. Bradley, M. F. Garrett, and E. B. Zurif, "Syntactic Deficits in Broca's Aphasia," *Biological Studies of Mental Processes*, ed. D. Caplan (Cambridge, Mass., 1980), p. 271.

34. M.-L. Kean, "Grammatical Representations and the Description of Language Processing," *Biological Studies of Mental Processes*, ed. D. Caplan (Cambridge, Mass., 1980), pp. 239–67; "Agrammatism: A Phonological Deficit," *Cognition* 7 (1979): 69–83; J. Klosek, "Two Unargued Linguistic Assumptions in Kean's 'Phonological' Interpretation of Agrammatism," *Cognition* 7 (1979): 61–68.

PHONOLOGICAL EVIDENCE

It is a common diachronic development in languages for nonlexicals to originate from lexical words. In such developments one frequently finds a correlation of semantic bleaching with phonological reduction; compare, for example, the development of the future tense in English, and the further development in Romance from nonlexical to inflectional morpheme. In Greek, there is some direct (i.e., nonmetrical) evidence available from the orthography for phonological reduction in dialectal forms of the article. Contraction tends to occur earlier in the feminine article than in (*ā*-stem) nouns: Thessalian *τ[αν] κοιναουν* (Schwyzer 461. 13), Boeotian *ταν υπεραμεριαων* (Schw. 523. 14), *των φυλεων* (Schw. 701. 14). Correspondingly, from a synchronic perspective, one of the outstanding phonological characteristics found among members of the class of nonlexicals throughout the languages of the world is clisis: nonlexicals tend to form a single accentual domain with a contiguous word. The lack of phonological autonomy that characterizes such nonlexicals can affect not only the accent but also one or more other aspects of pronunciation such as syllabification, co-articulation, and overall durational organization. Typological support for the loss of phonological autonomy among certain (appositive-like) members of the class of nonlexicals is considerable: see the typological parallels in table 3 taken from a sample of eleven different language families from different parts of the world. For each syntactic category, the parallels are compared with two categories of Greek nonlexicals which can appear at various prosodic bridges (resolution, substitution, and Porson's bridge) in different styles of the trimeter: orthographically clitic nonlexicals are given in the second column and other syntactically comparable orthotonoumena appearing at the same bridges are given in column 3.

It is worth remembering that loss of phonological autonomy is also characteristic of fixed phrases, idioms, oaths, and so forth (a category not included in table 3); thus, in English *give me* is commonly reduced to *gimme* in rapid speech, but, for example, *sieve me* is not reduced to **simme* even in the most rapid and colloquial of speech styles. For prima facie split resolutions in fixed phrases, see probably *ἀκούετε λεῶ* (Ar. *Pax* 551), *τᾶδικα λέγων* (Nub. 884; cf. Lat. *maledicere*), *κακὸν ἐργάσασθαι* (Plut. 465—divided anapest).

Thus far, we have assembled a body of metrical data that could be adequately explained on the hypothesis that in the Greek language nonlexical words tend to lose phonological autonomy and to become integrated with other words. We have pointed to a number of general linguistic considerations that motivate such a hypothesis as a reasonable assumption for any language. It remains for us to find Greek evidence that is nonmetrical, that is, independent of the explanandum for which the hypothesis was originally advanced.

In inscriptions, assimilation of the final consonant of a word to the initial consonant of the word immediately following is common when the

TABLE 3

PHONOLOGY OF NONLEXICALS: EVIDENCE FROM PROSODIC BRIDGES AND TYPOLOGY

Category	Greek		Other Languages ^a
	Orthographically clitic	Orthotonoumena metrically permissible at prosodic bridge	Loss of phonological autonomy
Pronouns	μον, μοι, σε, σοι, νιν	σῶ <i>Hel.</i> 978; οὗς <i>Hipp.</i> 1063; ἐμός <i>Lys.</i> 120; ἐμόν <i>Thesm.</i> 1172	Germanic, Romance, Fula, ^b Uto-Aztecans, ^c Madurese, ^d Ilocano, ^e Warramunga ^f
Demonstratives		τόνδ' <i>Hipp.</i> 1151; τόνδε <i>Cyc.</i> 343; τοῦτ' <i>Soph. El.</i> 409; ἦδε <i>E. Supp.</i> 1098	Syrian Arabic, Fula
Articles	ὁ, ἡ, οἱ, αἱ.	τῆς <i>Aj.</i> 90; τῇ <i>Bacch.</i> 1148	Germanic, Romance, Syrian Arabic, Shuswap ^g
Indefinites	τις, τι, πουν, ποτε		Ilocano
Interrogatives		πόθεν <i>Epit.</i> 864; τίς <i>Av.</i> 1021; ποῖ <i>Alc.</i> 943	Hmong, ^h Fula
Numerals		τρεῖς <i>IA</i> 49; ἔν <i>Tro.</i> 425; δέκα <i>Thesm.</i> 741; ἐννέα <i>Thesm.</i> 637	Fula, Italian, Madurese
Conjunctions	εἰ, ὥς, τοι, τε, ἀλλ'	καί <i>Andr.</i> 640; [ἀλλ' <i>Phil.</i> 9]; ἀλλά <i>Andr.</i> 346MS, Sem. 1. 20, <i>Nub.</i> 1221	Spanish, Syrian Arabic, Madurese, Ilocano, Shuswap
Prepositions	ἐν, ἐς, εἰς, ἐκ, ὡς	πρός <i>Phoen.</i> 413; παρά <i>Bacch.</i> 940; ἀπό (ŠŠ) Sem. 7. 63	Spanish, English, Czech, Lithuanian, Syrian Arabic, Ulithian, ⁱ Madurese, Shuswap
Emphasizing particles	γε	πάνν <i>Ar. frag.</i> 55. 12	Shuswap
Modal particles		ἄν <i>Andr.</i> 935	Luiseño, ^j Hmong, Madurese, Shuswap
Negatives	οὐ, μηδ'	μή <i>HF</i> 197	Lithuanian, Hmong, Madurese
Adverbials		δεῦρ' <i>OT</i> 318; δεῦρο πάλιν <i>Ran.</i> 652; εἰτ' <i>Cyc.</i> 563; εἶτα <i>Thesm.</i> 414	English, Tagalog, Madurese
Copula	ἐσσι, εἰσι	[ἔστ' <i>Bacch.</i> 246 prepos.]	English, Czech
Imperatives		δός <i>IT</i> 501; θένε <i>Av.</i> 54	Tagalog

^a Accentual or segmental evidence for optional or obligatory loss of phonological independence by nonlexicals.^b West Africa^c Western North America^d Java^e Philippines^f Australia^g Western North America^h Southeast Asiaⁱ Micronesia^j Western North America

first word is a prepositive (including disyllabic *ὅταν*, etc.) (perhaps the higher frequency of assimilation is only apparent insofar as prepositives might show less resistance to spelling change because they have no prepausal forms). Assimilation is rather less frequent when the second word is a prepositive or *καί* (for *καί* following a bridge, see *τύμπανα καὶ κύφωνες* [*Plut.* 476]) and somewhat infrequent in phrases: *Μεγαρεῶν καὶ* (Collitz-Bechtel 3004), [*τωμ πολιταμ*] *παρεχεται* (3007), *τομ μεγ Χοιρον* (3636. 34), *ον μετα πολυη χρονον* (3340. 55). Examples occur even across the boundaries of major syntactic constituents: *εδικάζομ, μαρτυρίας* (5493b31—Miletus); in such cases the spelling may be due to mechanical extension of a spelling rule or it may be properly phonetic. In Cypriot, consonant assimilations across appositive boundary are extensive and the word-division sign in the syllabary is usually omitted with appositives; however, while word-medial spelling is used before postpositives, for example, *a-u-ta-ra-mi* (not **-re-mi*) = *αυταρ μι*, after prepositives we find word-final spelling, for example, *po-se-to* (not **-so-*) = *πος το*. Cypriot provides an extremely important piece of evidence for prepositives: the phonological process that deletes word-medial, intervocalic *σ* is extended to the final *σ* of prepositives when followed by a word beginning with a vowel (and the word-division sign is omitted in these cases), for example, # *ka-a-ti* # *ta-u-ke-ro-ne* # (Schw. 679) (= *κα αντι τα υχέρων*, gen. sing.); compare the compound *ποεχομενον* < *ποσ-εχομενον* (ibid.). Note also that in Boeotian no distinction is made between absence of boundary (word-medial environment) and prepositive boundary (word-initial after a prepositive) for the sound change **-kw-* > *ππ*, for example, *ἵππος* and *τα ππαματα*; compare *Θιοππαστος*. According to L. Threatte,³⁵ the proportional incidence of elision in Attic prose inscriptions of the fourth century is particularly high in the following categories of words: the disyllabic prepositions (*ἀντί*, *ἀπό*, *κατά*, etc.), the negatives *οὐδέ* and *μηδέ*, the deictic/anaphorics *οἶδε* and *τάδε*, and the lower cardinal numerals. All these categories, of course, are nonlexical (cf. the avoidance of elision with lexicals in Callimachus). Likewise, apocope is well attested for prepositions (but not for lexicals), for example, Boeotian *παρ*, *κατ*, even *επ*, all before consonants.

In prose inscriptions, punctuation is sometimes used to mark syntactic constituents: inscriptions differ among themselves with respect to the size of the constituent so delimited—some punctuating words, others constituents of various larger sizes—and with respect to the consistency with which the punctuation is used. Nevertheless, inscriptions punctuating word boundaries with any degree of consistency do not usually punctuate after prepositives or before postpositives.³⁶ There are some exceptions, and these obviously cannot be spelling mistakes (as would be the case with punctuation in the middle of words), but it is impossible to say whether they reflect some phonological as well as syntactic reality.

35. *The Grammar of Attic Inscriptions* (Berlin, 1980), pp. 419–23.

36. Ibid., p. 80; A. E. Raubitschek and L. H. Jeffery, *Dedications from the Athenian Akropolis* (Cambridge, Mass., 1949), p. 442; K. Meisterhans, *Grammatik der attischen Inschriften* (Berlin, 1900), p. 11.

NONLEXICAL WORDS IN PHONOLOGICAL WORD AND PHRASE FORMATION

In the preceding section, we have substantiated the concept of nonlexicity and cited evidence pointing to the special status of nonlexicals at every level of linguistic structure. Semantically, nonlexicals generally lack referential meaning. Syntactically, their distribution is constrained, and they behave differently from lexicals in speech errors, word games, and aphasia. Phonologically, they are subject to a variety of reduction processes ranging from loss of autonomous accentuation to consonant co-articulation with contiguous words and other sandhi phenomena (which typically affect lexicals to a lesser degree or not at all). All of these phonological reductions arise in the processing of speech into phonological units larger than the lexical word. Nonlexicals are more likely to be organized together with a contiguous word into such higher level phonological units. This fact has two consequences. First, phonological phrase-end is less likely to occur at nonlexical boundary than at lexical boundary. Second, if a phonological rule that has the word as its basic domain of application is extended to apply across word boundary (giving rise to a phonological word),³⁷ that word boundary is more likely to be nonlexical than lexical. Thus, it is the special status of nonlexicals in phonological word and phrase formation that is responsible for their special status at metrical bridges.

The evidence analyzed in our opening paragraphs related to Porson's bridge and to constraints on resolution and anapest substitution. All of these bridges are prosodic bridges. The constraints applying at prosodic bridges are not constraints against phonological boundaries per se, as in the case of rhythmic bridges, but rather are special cases of more general requirements that certain phonological properties be present in certain metrical positions. The term "bridge" is (rather misleadingly) used because final syllables in particular generally lack the metrically required phonological property. For resolution and substitution, the requisite phonological property is that two light syllables form a matrix.³⁸ When a word or syntagm is processed for pronunciation, two light syllables may be grouped into a matrix, in which case they become less independent of each other in their production and their combined duration is reduced; for example, *πεδία* (*Phoen.* 522) can be pronounced ŠŠŠ, where ^ indicates a matrix. It is the existence of the matrix in the language that motivates the metrical phenomena of resolution and substitution. For Porson's bridge, the requisite phonological property is that a heavy syllable be pronounced with durational subordination relative to contiguous

37. It should be clearly realized that the meaning of the term "phonological word" can vary according to the phonological processes considered to provide its definition: the extension of one phonological process across word boundary does not necessarily imply the simultaneous extension of all other processes applying within the word. The limitations of the term "phonological word" are well illustrated by cases in which word-based phonological rules are extended to apply also in phrasal environments; see our paper, "Towards a New Theory of Greek Prosody."

38. For this concept, see W. S. Allen, *Accent and Rhythm*, and our paper, "Towards a New Theory of Greek Prosody."

syllables;³⁹ for example, *προσβῆναι* (*Hel.* 1556) can be pronounced $\tilde{S}\tilde{S}^\circ\tilde{S}$, where the degree mark indicates subordination. It is the process of subordination that linguistically motivates the permissibility of heavy syllables in the metrical arsis. In slow and deliberate speech, both matricization and subordination apply only within the domain of the word and are blocked by almost any syntactic boundary. However, the syntactically defined domains within which these processes apply are not a linguistic constant. They vary considerably according to the style and tempo of utterance. In general, it is true that, as the tempo of speech becomes more fluent and the style more informal, the domains of basically word-level processes are extended. Examples of this may be found in almost any language. To choose just one, in Madurese proclitics “are . . . independent words or, in fast speech, part of a larger word.”⁴⁰ Thus, for example, *ὁ γάμος* (*Phoen.* 425) becomes $\tilde{S}\tilde{S}\tilde{S}$ like *πεδία* (*Phoen.* 522), and *ἄρχειν γάρ* (*Hel.* 1552) becomes $\tilde{S}\tilde{S}^\circ\tilde{S}$ like *προσβῆναι* (*Hel.* 1556).

The hierarchies that repeatedly emerged from the analyses of the data in our opening paragraphs are the direct metrical reflections of the progressive extension to larger syntactic domains of the different phonological processes along the phonostylistic parameter. Thus, to each point on the linguistic hierarchy there corresponds a different point on the phonostylistic parameter, which is the point at which the linguistic structure acquires the metrically relevant phonological property, the phonostyle at which, for example, *ὁ γάμος* becomes $\tilde{S}\tilde{S}\tilde{S}$ and at which *ἄρχειν γάρ* becomes $\tilde{S}\tilde{S}^\circ\tilde{S}$. The hierarchies are evidence of the degree to which any particular syntactic boundary has the property of blocking the phonological processes in question. The lowest position on the hierarchy is always occupied by word-internal position, that is, the absence of any boundary whatsoever. Above that point, the position of a syntactic boundary on the hierarchy is governed by various linguistic factors: the semantic properties and usage frequency of the nonlexical word (or syntagm of which it is a part), its phonological size and shape, and so forth. Thus, in general, nonlexical words having relatively greater semantic and phonological substance (e.g., *ἀλλά*, *εἶτα*, *ταῦτα*, *τάδε*, etc.) have a higher position on the hierarchy and block the phonological processes in question until a more advanced point on the phonostylistic parameter is reached than those nonlexicals that are traditionally recognized as appositives. Or again, a high frequency syntagm like *τὸν ἐμὸν* blocks matricization less than other articular phrases, and the latter in turn less than other syntagmata (see figs. 3, 4, 5). Degree of access to more advanced points on the phonostylistic parameter is determined by the relative formality of the literary style in question and/or by the level of sensitivity assigned to the bridge in any particular metrical style or by any particular author.

The evidence analyzed on pages 10–14 above concerned Knox’s bridges, which are “rhythmic” in character. In the clearest cases, rhythmic bridges

39. For this concept, see our paper, “Towards a New Theory of Greek Prosody.”

40. A. M. Stevens, *Madurese Phonology and Morphology* (New Haven, 1968), p. 69.

are direct constraints against phonological phrase boundary. As a sentence is processed for pronunciation, phonological phrase boundary is assigned to the end of certain syntactic constituents. In verse, phonological phrase boundary is liable to be interpreted as demarcating a *stichos* or *hemistich* and is therefore strongly avoided at Hermann's bridge, Meyer's bridge, and other locations at which false segmentation would be particularly damaging to the integrity of the *stichos*. The likelier any syntactic boundary is to be implemented as phonological phrase boundary (with consequent marked durational increment to the final syllable and potentially also pause), the greater the degree to which it will be avoided at rhythmic bridges. At nonsensitive locations in the line, that is, where there is no bridge constraint, lexical boundaries are unconstrained, since lexical boundaries can perfectly well appear within phonological phrases. In certain cases, lexical boundaries are found at sensitive locations when the surrounding constituent structure reduces the likelihood of phrase end being assigned to the lexical boundary which stands at the bridge. This is what is so significant about Bulloch's bridge in Callimachus.⁴¹ Knox's bridges seem to be of a slightly different type. They are better interpreted as constraints against phonological word boundary (rather than phrase boundary), designed to preclude disruptive podic segmentations of the *stichos* caused by patterned iteration of word boundary. The permissibility of structures involving right-linking nonlexical words suggests that the phonological domain constituted by such structures shared some (but not all) of the phonetic processes that applied in the domain of the phonological word. In the tragic trimeter, Knox's trochee bridge still applies, but the constraint is progressively weakened and some lexical boundaries already appear in the strictest tragic styles (see table 2). This suggests that, if the metrical sensitivity of a location decreases from one metrical style to another, then the degree of insurance required against the possibility of phonological boundary is correspondingly reduced.

METATHEORETICAL CONSIDERATIONS

There are three basic issues in the metatheory of meter that must be confronted in any discussion of bridges. (1) Is metricality evaluated directly in terms of (a) multivalued or (b) binary linguistic features? (2) Is the statistically differentiated occurrence of different linguistic structures in the same metrical environment evidence that (a) at least one of them represents a metrical artificiality or (b) that at least in certain styles of the language their pronunciations agreed in the metrically relevant property? On an (a) answer to the first question, the second question must be reformulated in terms of a quantification of the distance of the different linguistic structures from an ideal metrical value.⁴² (3) Are the differences among the genres and styles in their use of any particular linguistic struc-

41. A. W. Bulloch, "A Callimachean Refinement to the Greek Hexameter," *CQ* 20 (1970): 258-68.

42. For a detailed analysis and criticism of the multivalued approach, see our paper, "Preliminaries to an Explicit Theory of Greek Meter," *TAPA* 107 (1977): 103-29.

ture (a) entirely due to varying degrees of strictness or laxity in the application of the metrical rules or (b) at least partially due to direct literary exploitation of different language styles independently of considerations of metrical strictness?

The two competing answers to question (1) arise from quite different conceptions of the way in which language is treated in meter. The (a) answer is founded on a static or monolithic model of language, the (b) answer on a dynamic or variational model of language. The multivalued approach will concentrate on hierarchical distinctions in surface phonetic properties, whereas the binary approach will concentrate on categorical shift along the phonostylistic parameter. Let us first consider how the two approaches account for the frequency gradients of different structures within a single genre. Figures 3–5 demonstrated that the compositional cost progressively increased as one proceeded from no boundary at all to *τὸν ἑμὸν* to other articular phrases to other prepositives to lexical word boundary. The multivalued approach assumes that there actually was in a single phonostyle of the language a five-point hierarchy of phonetic properties (four different degrees of durational increment over zero, etc.). It further assumes that this quinary phonetic hierarchy is metrically relevant in that each step represents a progressively greater departure from the ideal metrical value and thus entails greater compositional cost. Therefore, higher points on the hierarchy are admitted in inverse proportion to their distance from the ideal value. By contrast, the binary approach assumes that, whatever low-level boundary-marking distinctions are present in the surface phonetic output, the meter is sensitive to a more abstract level of representation in which the metrically relevant phonetic property is either present or absent (just as, *mutatis mutandis*, in the writing system of inscriptions, the word divider—insofar as it is used at all—is inserted or not inserted). The assumption is that matrix formation occurs in slower and more formal styles of speech in the case of the fixed phrase *τὸν ἑμὸν* than in the case of other articular phrases and so forth up the hierarchy. Thus, the metrical statistics represent not a posited difference in phonetic output but rather the point along the phonostylistic parameter at which the boundary is reduced in the various appositive syntagmata.

In our discussion of the linguistic hierarchies in the last section, we adopted the binary approach. This approach provides a simpler and intuitively more credible theory of metricality and is particularly appropriate in situations, such as those forming the subject matter of this paper, in which phonetic properties are closely correlated with syntactic boundaries. For it is boundary-dependent phonetic properties, above all others, that can be expected to be subject to phonostylistic variation in almost any language.

At the beginning of this section, we posed three questions, with two possible answers to each question. Consequently, there are eight different logically possible combinations of answers. If (1)(a) (the multivalued approach) is excluded, four combinations remain; one of these [(1)(b), (2)(a), (3)(b)] can be ruled out of consideration, since the conjunction of (1)(b)

and (2)(a) with (3)(b) is logically inconsistent. Each of the remaining three combinations of answers can be applied to aspects of the data with some degree of likelihood.

Question (2) raises the very interesting issue of the phonetic reality of the pronunciations implied by the occurrence of a linguistic structure in a metrical environment.⁴³ The hierarchies established by the statistical distributions analyzed in the discussion of the data can only be linguistic in character. The problem is that the hierarchies can remain linguistically motivated even when some (or all) of the structures in the hierarchy do not actually receive the metrically implied pronunciation in any speech style or tempo. In the latter case, the hierarchy continues to reflect the degree to which the boundary blocks the metrically relevant phonological process, but now in the sense that there is no correlated phonostyle or at least that the correlated phonostyle is an abstraction rather than a reality. This means that each hierarchy must be divided between actual and nonoccurring pronunciations. If all the pronunciations are occurring, the dividing line will be at the end of the hierarchy; if none is occurring, it will be at the beginning. For the hierarchies discussed in our first section, there are reasonably good typological grounds for assuming, as we did above, that the metrically implied pronunciations were real in the case of all nonlexical boundaries at prosodic bridges, and of nonlexical boundaries under certain conditions at rhythmic bridges. It is fairly clear that *ὁ γάμος* could be pronounced $\tilde{\text{SS}}\tilde{\text{S}}$ with a matrix just like *πεδία*, that the final syllable of *ἄρχειν* could be pronounced subordinated before *γάρ* just like the medial syllable of *προσβῆναι*, and that nonlexical word boundary did not entail phonological word boundary in ordinary discourse. On the other hand, cases such as punctuation after a split dactyl are not linguistically reasonable and must be interpreted as metrical artificialities. The major area of ambiguity is lexical boundary at prosodic bridges.⁴⁴

While question (2) was relevant primarily to the linguist using the hierarchies as a source of evidence for Greek phonology, question (3) is of interest to the philologist and literary critic. It requires that we distinguish the linguistic from the metrical motives for differences in versification among styles and genres. The linguistic and the metrical components are commonly confused, so that differences such as those between the *severior* and *liberrimus* styles of Euripides or those between tragedy and comedy are attributed purely to careful versus lax techniques of versification. Historically, this confusion stems from a general tendency to give (a) answers to questions (1) and (2), that is, to assume that the hierarchies represent different values of a graded linguistic property which increasingly violates the ideal metrical requirements. Such an approach excludes a (b) answer to question (3). Once the possibility of phonostylistic variation and its metrical relevance is admitted, both answers become possible.

43. Insofar as there are competing analyses of the metrical pattern and its associated mapping rules, the substance of the metrically implied pronunciation will differ.

44. See our paper, "Towards a New Theory of Greek Prosody."

Less elevated literary styles and genres tend by and large to be less strict in their metrical rules. Consequently, access to advanced points on the hierarchy can still be interpreted as a manifestation of a relaxation of standards of metrical strictness, the more colloquial pronunciations being admitted *metri gratia*, so to speak. But it is equally the case that less elevated styles naturally tend to have access to less elevated and more colloquial styles of speech for literary reasons quite unconnected with metrical strictness or laxity. Just as the vocabulary and syntax of Aristophanes are more colloquial than those of tragedy, so too are his phonology in general and, in particular, his phonological treatment of syntactic boundaries. Thus, in any particular case, a choice must be made between the two answers to question (3): they make substantively distinct claims and have different implications for a philological and critical evaluation of the text.

*Stanford University
University of North Carolina,
Chapel Hill*