The Greek Phonological Phrase
A. M. Devine and Laurence D. Stephens

Reconstructing the prosodic ‘domains’ of ancient Greek continues to play an important rôle in classical philology. The syntactic components of the appositive group, as well as its accentual and rhythmic properties, have been analyzed in fine detail, primarily because of the value of metrical bridges in textual criticism. The major phrase—that is, the phonological counterpart of the syntactic clause or simple sentence—has also been the object of study, especially for its importance in defining the domain of the avoidance of hiatus and in the stylistic evolution of enjambement. But little or no progress has been made in reconstructing the accent and rhythm of the minor phonological phrase (hereafter simply the ‘phonological phrase’), nor in analyzing its syntactic composition. Almost nothing has been discovered about how the words of even the simplest sentences were joined together into

1 Intuitively, a prosodic domain is the stretch or chunk of language, e.g. syllable, word, word plus enclitic, phrase, on up to paragraph, within which or to which a prosodic process such as lengthening, rhythmic grouping, lowering of pitch, etc., applies. For example in Greek, crasis applies in a domain different from and smaller than the domain in which elision applies.

2 The term appositive group refers to a prosodic structure consisting of a host word, usually lexical, and one or more non-lexical, and not phonologically identical either to the word or to the minor phrase. The class of non-lexical words comprises not only the clitics (the cover term for enclitics and [the traditionally understood] proclitics), but also the Article, Conjunctions, particles, negatives, pronominals, Prepositions, and other ‘little’ words; the class shades off into semilexicals such as the lower cardinal numerals, the Adverb ἐν (e.g. Aesch. Choe. 693), the modal δεῖ (e.g. Eur. Or. 1035), semantically bleached imperatives such as φέρε (e.g. Ar. Eq. 145), ἄγε (e.g. Ar. Eq. 155), etc. Many non-lexical tend to lose the status of autonomous words and to be treated, to varying extents, as part of a contiguous word. Those non-lexical losing their phonological autonomy are termed ‘appositives’. Prepositives are those appositives that cohere with what follows, postpositives those cohering with what precedes. See A. M. Devine and L. D. Stephens, “The Greek Appositives: Toward a Linguistically Adequate Definition of Caesura and Bridge,” CP 73 (1978) 314–28, and “Semantics Syntax, and Phonological Organization in Greek: Aspects of the Theory of Metrical Bridges,” CP 78 (1983) 1–25.
prosodic subunits in ordinary Greek speech. How can we demonstrate that there actually were prosodic domains intermediate between the word or appositive group and the utterance? And if we can, how do we know which sequences of words can make up these phonological phrases and which cannot? Under what circumstances, if any, can a subject be phrased with its Verb? Can a direct object modified by an Adjective be phrased with its Verb? What happens if there is also an indirect object? Is a Prepositional Phrase always a phonological phrase by itself or can it be joined with an adjacent constituent? In addition to discovering its syntactic constituency, we should also like to know what the Greek phonological phrase sounded like; specifically whether, in addition to the temporal demarcation (final lengthening) normally found at the end of phonological phrases, the Greek phonological phrase was also characterized by tonal properties such as the scaling of accentual peaks within the phonological phrase.

It is not that anyone doubts that Greek must have had phonological phrases, just that there seemed to be no really tangible metrical evidence for their definition and analysis. A separate study has shown far more metrical evidence than previously understood, and this clearly confirms the importance of syntactic constituency in the phonological phrasing of


4 Syntactic constituents are groups of words that go together to make grammatical and semantic units of some kind within a clause, e.g. Prepositional Phrase, Noun Phrase, etc. Syntactic constituency is hierarchical; e.g. a Prepositional Phrase may consist of a Preposition plus a Noun Phrase that in turn may consist of an Article plus an Adjective Phrase plus a Noun, and the Adjective Phrase may consist of an Adverb Phrase plus an Noun, and so on. Not just any string of contiguous words forms a constituent: e.g. in a Prepositional Phrase, Preposition plus Article does not form a constituent, since the Article does not belong with the Preposition to the exclusion of the Noun. Conversely, in a language with free word order like Greek, a syntactic constituent, in the sense used here, need not be continuous, i.e., consisting of only contiguous words, but may be discontinuous, interrupted by some other constituent or word belonging to some other constituent. In fact interrupted structures such as Adjective plus Verb plus Noun, where the Adjective and the Noun form a Noun phrase, are common in Greek, e.g. where all three belong to the Verb Phrase, as in καὶ τὸν ἄγγελόν τόπος (Eur. Tho. 55): [Adj V N]yp. For the depth and rich conceptual content of the notion of constituency, see A. Zwicky, “Arguing for Constituents,” Proceedings, 14th Regional Meetings of the Chicago Linguistics Society (Chicago 1978) 505–12; A. Radford, Transformational Grammar (Cambridge 1988) 50ff.
Greek. But the metrical evidence for phrasing remains a veiled and rather imprecise basis for an explicit reconstruction: it establishes principles and tendencies without necessarily leading to an exhaustive phrasing of any particular stretch of text. Fortunately, this lacuna is filled by a substantial body of epigraphical evidence pertaining precisely to the temporal chunking of speech at a level between the appositive group and the major phrase. This evidence consists in the placement of interpuncts in certain punctuating inscriptions.

Whereas one class of these inscriptions, including the well-known Teiae Dirae (SEG XXXI 985), punctuates exclusively or almost exclusively appositive groups, another class punctuates phrases, often with a sufficient degree of consistency to justify detailed study. This latter class includes the following inscriptions chosen as particularly suitable for analysis:

\begin{itemize}
  \item Acrop. = IG I 45
  \item Elis = Meiggs/Lewis 17 (LSAG² 42.6)
  \item Ephesus = I.Ephesos 1 (LSAG² pl. 66.53)
  \item Miletus = LSAM 41 (LSAG² 64.33)
  \item Naup. = IG IX.1² 718 (IGBM IV p.119)
  \item Oeanth. = IG IX.2 717 (LSAG² 15.4)
\end{itemize}

Our object is not the epigraphical-philological one of accounting for all instances of punctuation in all inscriptions of a particular corpus but the linguistic-theoretical one of establishing that phonological phrases existed in the Greek language and analyzing their syntactic composition. Punctuation in metrical inscriptions is a less reliable guide to phrasing, partly because it can also reflect metrical structure. Although inscriptions in which there is a formalized use of punctuation to demarcate the items in a list are excluded from this corpus of texts, Miletus has been included since it is phrase-punctuated throughout and shows how list punctuation originates from consistent phrase punctuation: items in a list, even when they comprise only a single word, are separated from each other by phrase boundary and in many languages are also intonationally demarcated.

Phonological phrasing in any language tends to be quite variable, depending on rate of speech and discourse factors as well as semantic, syntactic, and phonological properties. To cite just one instance, in Tokyo Japanese minor phrases may consist of from one to three words, and the same sentence can have
different pronunciations: the syntagm \textit{takonado tabeta} ("ate octopus, etc.") can be pronounced as two major phrases in unnaturally slow speech, as a single major phrase containing two minor phrases, or, in more rapid speech, as a single minor phrase.\footnote{T. J. Vance, \textit{An Introduction to Japanese Phonology} (Albany 1987); E. Selkirk and K. Tateishi, "Constraints on Minor Phrase Formation in Japanese," \textit{Papers from the 24th Annual Regional Meeting of the Chicago Linguistics Society} I (1988) 316. Other aspects of the syntax and phonology of the Japanese minor phrase are investigated in E. Selkirk, "On the Nature of Prosodic Constituency," in J. Kingston and M. E. Beckman, eds., \textit{Papers in Laboratory Phonology} I (Cambridge 1990) 179; E. Selkirk and K. Tateishi, "Syntax and Downstep in Japanese," \textit{Interdisciplinary Approaches to Language. Essays in Honor of S.-Y. Kuroda}, edd. C. Georgopoulos and R. Ishihara (Dordrecht 1991) 519–44. The results presented in these three papers are referred to hereafter as 'Selkirk'. There is little crosslinguistic uniformity in the terminology used for the phrasal hierarchy: in some, but not all, respects, what is called the phonological phrase in English and what we call the minor phonological phrase in Greek correspond more closely to what is called the major phrase in Japanese.} Greek should not be an exception. Although much apparent variation in inscriptional punctuation is motivated by syntactic constituency or by focus, some instances appear to be random:

\[
\text{ἐξεσεναι θοαν (IG I^3 4b.7)}
\]
\[
\text{ἐξεσεναι : θοαν (IG I^3 4b.12)}
\]

This variability naturally inherent in phonological phrasing is compounded by epigraphical and editorial 'noise': the evidentiary value of any inscriptional instance of punctuation rests on the assumption that it is neither an inscriber's error nor a false transcription. The latter category of error frequently occurs, partly because interpuncts can be difficult to recognize on damaged stone surfaces, and partly because the importance of punctuation for an understanding of Greek phrasing has been generally underestimated. Editorial error can involve omission \textit{(LSAG^2} 3.20, 4.31, 16.4) or addition \textit{(SEG} XXX 1283); but the assumption of widespread inscriber's error is methodologically dangerous. There are apparently absurd word internal punctuations of the type

\[
\text{οι δικαζοντες (LSAM 30.B.5)}
\]

\textit{Ταλειδες ποιες (JHS 52 [1932] 171, pl. VII.2)},

but not even all these are outright errors. Problems with a nail
hole explain the oddity of: τα: ες: Αθαναίας. 

Two other instances seem to involve vacillation between punctuating word end and syllable end in the presence of elision: κοτάλεστονεν ταυτισμενον (Naup. 7), where other factors have been suggested7 (the expected location for the punctuation is after ταυτισμενον), and: μ' ανεθέκε: (LSAG² 55.3). More troublesome is the apparent tendency for some inscriptions to vary between minor phrase punctuation and major phrase punctuation. Oeanth. B seems to begin with word punctuation, proceed to minor phrase punctuation, and end with major phrase punctuation; the length of the punctuated segments also tends to increase towards the end in Ephesus; other inscriptions just lose interest in punctuation as the text proceeds (LSAG² 42.8).

Punctuation is often but not always omitted at the end of the physical line; this feature of inscriptional orthographic practice can be a source of additional indeterminacy.

It is intuitively reasonable to assume that the placement of interpuncts in inscriptions is intended to demarcate phonological domains and not syntactic constituents, an intuition that is confirmed by instances in word punctuating inscriptions where punctuation is placed after a phonological composite structure consisting of two prepositives: 8

και τος: βιεροποις: (IG I 244.C.3)
εν τοι: πολεμοι: (IG I 292.9)
επι τες: τριτης (IG I 261.1);

This makes good phonological sense—such composites can also appear before the caesura in the trimeter (Soph. Αἴ. 1228, OC 280), where single prepositives are strongly avoided—but no syntactic sense at all, since in such cases a Determiner (article or demonstrative) is typically detached from its Noun and attached to a preceding Preposition or Conjunction. Since word punctuation systematically reflects prosodic structure, it is unlikely that phrase punctuation should simply be random, haphazard and linguistically unmotivated. The phrase-punctuating inscriptions form a substantial body of text, so that it is

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8 See supra n.2. An appositive group need not contain a lexical host.
possible, with the above qualifications, to reconstruct at least the outline of an algorithm for the formation of the phonological minor phrase in Greek on the basis of the system of punctuation. It should be noted that in some inscriptions punctuation may be omitted at the end of a major phrase (Naup. 12, Oeanth. 3, LSAG² 71.43/4.19); in others, minor phrases are punctuated by a single row of interpuncts and major phrases by multiple rows (Ephesus; IG¹ 4). Apart from this latter device, the binary nature of inscriptive punctuation precludes representation of any higher level prosodic structure. That the class of phrase-punctuating inscriptions is significantly different from the class of word-punctuating inscriptions is well illustrated by differences in the punctuation of precompiled phraseology:

\[ \eta \text{ τεχνη} : \eta \text{ μηχανη} : (\text{Teiae Dirae A.8}) \]
\[ \text{τεχναι και μοχαναι} : (\text{Naup. 38}) \]
\[ \kappaαι \alphaυτον : \kappaαι \gammaενος : (\text{Teiae Dirae B.38}) \]
\[ \alphaυτον και \tauο \gammaενος : (\text{Naup. 4}). \]

On one interpretation, word punctuation is simply phrase punctuation at a rate of speech at which every appositive group is a separate minor phrase, as it might be in slow dictation.

The first step in the phrasing algorithm is to form phrases from phonologically binarily branching constituents, those that are complex, i.e., have internal structure, then its node branches, each branch connecting it with lower nodes for its subconstituents. Thus a binary branching constituent is one that contains two subconstituents at the next hierarchical level down.
There is no reason to suspect that this premium on binary structures is a mechanical or artificial epigraphical feature: some speakers of Japanese apparently have just such a preference for binary accentual structures, particularly in slower speech (Selkirk). A minor phrase can be formed whether the modifier precedes the head or follows it:

: ε Ναυπακτο αναχορεοντα : (Naup. 19 [PP V])
: καρυζαι εν τάχοραι : (Naup. 20 [V PP]),

but there may be a preference for phrasing prehead modifiers with the head when both a prehead and a posthead modifier are present: in : αι κα ηυτ’ ανακκας απελαονται : ε Ναυπακτο : (Naup. 8) the prehead adjunct is phrased with the head and the posthead complement is orphaned. Proper names having the structure head plus modifier tend to constitute fixed phrases in phrase-punctuating inscriptions:

: τοι Δι Ολυμπιοι : (Elis 6)
: τοι Ζε τολυμπιοι (I. Olymp. 3.4)
: Αθηναιη Πατροηι : (LSCG 113 [Guarducci, EpigrGr IV 13 fig. 5])
: Απολλωνος Δελφινο : (Miletus 12)
: Απολλωνι Δελφινιωι : (LSAG 65.50);

sometimes also in word-punctuating inscriptions: : Ηερμετ Εναγονιοι : (IG I 5.3). Unarticulated forms probably have a stronger tendency to lack internal punctuation.

A nonbranching subject or the head of an interrupted branching subject phrase may be phrased with a verb, at least when the verb is intransitive or when, for whatever reason, its complement is not phrased with the verb:

: δραπετες με εσιει : (Acrop. 4)
: hα δε βολα ποτελατο : (IG IV 554.6)
: και χρεια τα παματοφεισται : (Naup. 40, 44)
: εορτη κηρυσσεται : (Miletus 12).

10 Intuitively, the head of a constituent is the part of speech that gives it its basic syntactic and semantic properties. Thus a noun is the head of a Noun Phrase, a verb is the head of a Verb Phrase. In Greek concord and rection are determined by heads. For a recent review of the notion of head, see R. A. Hudson, "Zwicky on Heads," Journal of Linguistics 23 (1987) 109–32.
These data suggest that the verb is phrased with the subject only by default, at least in the absence of interfering phonological factors. In one case where a subject seems to be phrased with the indirect object in a dedication, the inscriber left space for the missing punctuation (Raubitschek, *DAA* 220). In Korean sentences with fronted objects, the rule of obstruent devoicing indicates that the subject can be phrased with the Verb, but not if the Verb is followed by an Adverb: for instance "[balls] [Cuni catches]," but "[balls] [Cuni] [catches quickly]," where the brackets indicate how the Korean words corresponding to the glosses would be phrased.11

In Cyprian,12 apart from a few instances with phonologically heavy non-lexical (see supra n.1)

\[
\begin{align*}
\text{1} & \quad \text{ἑρεπας τασδε} \quad (I d. 29) \\
\text{1} & \quad \text{α(ν)τι το μισθον} \quad (I d. 5)
\end{align*}
\]

and a few fixed phrases with proper names

\[
\begin{align*}
\text{1} & \quad \text{τα(ν) πτολιν Εδαλιυν} \quad (I d. 1) \\
\text{1} & \quad \text{τον Ονασικυτρον τον γατεραν} \quad (I d. 2) \\
\text{1} & \quad \text{ο Παφο βασιλευς} \quad (I C S 6, cf. 15, contrast 7),
\end{align*}
\]

most of the clear cases of the divider sign punctuating phrases involve a Verb phrased with its subject or complement:

\[
\begin{align*}
\text{1} & \quad \text{κατεφοργου Μοδοι} \quad (I d. 1) \\
\text{1} & \quad \text{ανογου Ονασιλιου} \quad (I d. 2) \\
\text{1} & \quad \text{πεισει Ονασιλιου} \quad (I d. 12, 25) \\
\text{1} & \quad \text{ο Αρμενευς εχε} \quad (I d. 21) \\
\text{1} & \quad \text{ανοσιγα ηοι γενοτο} \quad (I d. 29) \\
\text{1} & \quad \text{οικον ναον} \quad (I C S 306.4).
\end{align*}
\]

The preponderance of verbs in Cyprian punctuated phrases may indicate that in this dialect particularly Verbs lacked prosodic salience. The nonverbal element in the phrase tends to be free of appositives. The high incidence of proper names

could be a focus\textsuperscript{13} related phenomenon or it could be a reflex of the constraint on appositives. In the latter case, it follows that for the easiest and most restrictive type of phrasing, the simple lexical word phrases more readily than the group consisting of lexical word plus appositive(s).

In general, however, it is clear that the minor phrase is based on phonologically branching structure, not on a syntactically branching structure. The phrasing algorithm is largely blind to appositives. Simple two-word constituents can become a phonological phrase:

\begin{quote}
: προσταταν καταστασαι : (Nauρ. 34)  
: διομοσαι ἡρῶν : (Nauρ. 45),
\end{quote}

but so can syntactically much more complex structures, such as branching Prepositional Phrase with articulated Noun and articulated modifier plus any additional appositive material such as a conjunction:

\begin{quote}
: εκ τεσ φυλες τεσ πρυτανευσες : (Acrōp. 16)  
: αι τεσ ἕπο τον νομιον τον επιφοιδον : (Nauρ. 27).
\end{quote}

The importance of syntactic constituency in the phrasing algorithm is illustrated by cases in which a nonbranching constituent is flanked by two branching constituents, for example NP V NP

\begin{quote}
: ταλαντον κραγυρο : αποτινοιαν : τοι Δι Όλυνπιοι : (Elis 5)  
: τοις αυτον νομιοις : χρεσται : κατα πολιν ἐρκαστους :
(Nauρ. 28).
\end{quote}

If in these instances the phrasing had been completely random, constituency relations would not have been reflected by punctuation at a greater than chance rate. If the phrasing had simply paired appositive groups from left to right, the Verb would have been phrased with the first following appositive group of the right-hand Noun Phrase; if the phrasing had simply paired appositive groups from right to left, the Verb would have been

\textsuperscript{13} Focus is the new information that the sentence is intended to convey. Focus can be seen as typically foreground information, including contrastive and counterassertive information, while (unfocused) topic is typically background information, similar to the old notion of "psychological subject." Both focus and topic may be marked in nonneutral utterances. This may be done by word order, particles, or prosodic prominence. Topicalization is the name for the special marking of the utterance topic.
paired with the second element of the left-hand Noun Phrase, again violating constituency. The Verbs are left unpaired because the algorithm, on its first pass, paired appositive groups according to constituency (αυτον is not appositive: cf. Teiae Dirae B.38, Naup. 4). Other instances of phonologically non-branching constituents phrased separately from flanking branching constituents are the second Prepositional Phrase in: αι κα ήντ’ ανακας απελαονται: ε Ναυπακτο: Αοροι τοι Ηυποκναμιδιοι: (Naup. 8) and the phrasing of the modifiers in: οις λευκη: εγκυαρ: λευκωι αναβεβαιμενη: (Miletus 6), where εγκυαρ modifies the Noun Phrase οις λευκη to form a constituent that is itself modified by the following Participial Phrase. Contrast: δυο γυλλοι εστεθμουν: (Miletus 2) with prepositive δυο and nonbranching Participial Phrase.

It should be noted that some of the usual approaches\textsuperscript{14} to phrasing are too directional in character to handle the Greek data. An approach in which phrases are built from the head and material on the nonrecursive side of the head\textsuperscript{15} privileges the nonrecursive side to a degree that appears unwarranted in Greek. An approach that phrases right-branching structures with a left-hand node, or vice versa, but allows a new phrase to start only at the end, or respectively at the beginning, of a constituent, cannot account for data that allow inclusion of non-branching nodes from both the left and the right; for instance, a Verb can be joined to a Prepositional Phrase from either the left or the right.

The limitation of first-pass phrasing to two appositive groups per phrase means that (phonologically) branching constituents can be phrased differently from their nonbranching counterparts:

\textsuperscript{14} M. Nespor and I. Vogel, Prosodic Phonology (Dordrecht 1986); E. O. Selkirk, “On derived domains in sentence phonology,” Phonetic Yearbook 3 (1986) 371. For a recent collection of articles on this and related topics, see Inkelas and Zec (\textit{supra} n.11). The book on this topic by A. M. Zwicky and G. K. Pullum had not appeared at the time of writing.

\textsuperscript{15} The recursive side of the head is the side on which complements or adjuncts may freely be added, e.g. the right side of the Noun Phrase in French and Italian; the nonrecursive side is the side on which only a limited class of items may occur, e.g. the left side of the Noun Phrase in French and Italian.
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: θυειν και λανχαειν : (Naup. 2)
: οσια λανχαειν : και θυειν : (Naup. 3)

: το τες Νεμεσεος αργυρο : (IG 1 248.3)
: το δε αλλο αργυρο : το τες Νεμεσιος : (IG 1 248.9)

: Λοθρον τον Ηυποκναμίδιον : (Naup. 26, 34)
: επιφοικους Λοθρον : τον Ηυποκναμίδιον : (Naup. 5)
: ε Ναυπακτο ανχορεοντα : (Naup. 19)

: εν Ναυπακτοι : καρυξαι εν ταχοραι : (Naup. 20)
: αι τις ἴνπο τον νομιον τον επιφοικον : ανχορεει : (Naup. 27).

Since the first-pass pairs only contiguous items forming a constituent, some sequences of appositive groups will remain unpaired after the initial pass. These may optionally be paired in a second pass through the unpaired material:

τον θορθον εξειμεν : (Naup. 12)
: τον Λοθρον τοπιφοινοι : (Naup. 34)
: αι κα με γενος εν ται ιστιαι : (Naup. 16)
: εκαστον νομος εστι : (Naup. 30).

This phonological pairing in the absence of syntactic motivation is also found in the phrasing of unaccented words in Japanese, where optionally indirect object and direct object may be paired without intervening initial lowering (Selkirk). But there is apparently some resistance to joining either a direct object or an indirect object to its Verb to the exclusion of the other complement:

: τον καλειμενοι : τον δικαιν : δομεν τον αρχον : (Naup. 41)
: αι κα με διδοι : τοι ενκαλειμενοι : τοι δικαιν : (Naup. 43).

The next step is to phrase single appositive groups orphaned by the preceding steps. This may be accomplished by allowing the orphans to stand as autonomous phrases:

: ταλαντον κ’ αργυρο : αποτινοιναν : (Elis 5)
: τοι Δι Ολυνποι : τοι καδαλεμονι : (Elis 6)
: εν υδριαν : τοι ψαφιξει ειμεν : (Naup. 45)
: τεκναι και μαχαι : μεδεμιαι : εθοντας : (Naup. 12)
: τον καλειμενοι : τον δικαιν : (Naup. 41, cf. 43)
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Alternatively, the orphan appositive group may be adjoined to a preceding or following phonological phrase according to its syntactic constituency relations: this solution may have been favored when one of the three appositive groups was phonologically light or lacked appositives:

\[ : \text{επαγεν μετά τριακοντα ξετεα} : (\text{Naup. 13}) \]
\[ : \text{ενορθον τοις επιφοικος εν Ναυπακτον} : (\text{Naup. 11}) \]
\[ : \text{βοπος αριστα και εντελεστα σκευασαι} : (\text{Actrop. 8}) \]
\[ : \text{ειν τοις πρωταί χρυσιν ηνειχθησαν} : (\text{Ephesus 3}) \]
\[ : \text{τα ξενικα ε θαλασας βαγεν} : (\text{Oeanth. 3}) \]
\[ : \text{ερδεται τωτερων ετως τελη} : (\text{SLCG 113}) \]

In the phrasing of Japanese accented words, a ternary branching subject phrase may optionally be treated as a single domain; and in the phrasing of Japanese unaccented words an object Noun following a branching subject phrase is optionally joined to the latter without initial lowering (Selkirk).

In an early fourth-century Boeotian inventory with list punctuation (SEG XXIV 361), simplex numerals are adjoined to a preceding branching phrase:

\[ : \text{λανπτερωχοι σιδαριοι τρις} : (20) \]
\[ : \text{χαλκια πλατεα πεντε} (7) \]

but a complex numeral is phrased separately: \[ \text{φοινοξοια χαλκια : πεντεκαιδεκα} : (13) \]. In particular, a syntactically interrupted structure consisting of three appositive groups can be treated as a single phonological phrase:

\[ \text{Πηδωμι τε ανεθηκεν ωμφιννεω} : (\text{Priene 1}) \]
\[ : \text{ωι τε βασιλευς εδωρω αυγυπτιος} : (\text{Priene 3}) \]
\[ : \text{το παρα τοιον τας διακοσιας δραχιας οφελοσι} : (\text{IG I3 248.5}) \].

The special status of such YXY syntactic structures is confirmed by metrical evidence: in the iambic trimeter of tragedy positional lengthening (-V#CC-) between X and Y or Y and X is permitted to a significantly greater degree in YXY structures than in their flanking counterparts XYY or YYX.\[ ^{16} \]

\[ ^{16} \text{Devine and Stephens (\textit{supra} n.3).} \]
Scope affects phrasing, since scope affects constituency and constituency affects phrasing:

: οσια λανχανειν : και θεειν (Naup. 2);

if the punctuation were after οσια rather than λανχανειν, the phonology would have indicated that οσια was the complement of both verbs. When a phonologically heavy preposition has scope over two conjuncts, there may be some preference for not linking the first conjunct with the preposition to the exclusion of the second conjunct:

: εχθος προζενο και γιδιο ξενο : (Oeanth. 11: και begins a new line)

ονευς : βολαν και ζαμον πλαθυντα (I. Olymp. 3.8).

Although articulated modifiers can follow the basic rules of phrase formation as in various examples already cited, in certain contexts they can also show some degree of prosodic autonomy. A probably branching articulated modifier is phrased separately from its Noun in an example involving a head-interrupted Verb Phrase:

en τεπιαροι κ’ ενεχοιτο : τοι ’νταυ’ εγραμενοι (Elis 10). 18

Two cases have an articulated modifier located between two elements of a Noun Phrase; the articulated modifier is not phrased with either element of the Noun Phrase to the exclusion of the other:

: Χαλειοις : τοις συν Αντιφαται : ξακεταις (Naup. 47)
και Ναφπακτιον : τον οπιοηθον : πλεθοι : (Naup. 40).

The separate phrasing of articulated modifiers can result in a prima facie violation of constituency:

: επιφεικους Λοθρον : τον Ηυποκαμιδιον : (Naup. 5)
: διομοσαι ηωρον : τον νομιον : (Naup. 45).

Scope is the part of a sentence or stretch of words over which the meaning of a word applies. Varying possibilities for scope are the source of well known ambiguities of the type ‘old men and women’, in which if the scope of ‘old’ is wide only old people are included, but if it is narrow, i.e., over ‘men’ only, then young women would also be possible referents.

18 A. Johnson reports that the punctuation is partly worn but clearly visible.
The most likely explanation for the separate phrasing of articulated modifiers is that the Noun is treated as predictable information and the following articulated modifier is highlighted in its function of specifying a subset, which results in its prosodic autonomy. This approach is supported by the parallel phrasing of Noun Phrases followed by resumptive deictics:

: αι δε τηρ τα γραφεα ται καδαλεοτο (Elis 7)
| του αν(υ)δριγα(υ)ταν | το(υ)δε κατεστασε | (ICS 220)
τον α(υ)δρια(υ)ταν [space] τον(υ)ν | εδωκεν [end line]
κασ | ονεθεκεν [space] (ICS 215; phrase end is denoted by space, word end by the divider).

A significant body of prose evidence relating to the word order of postpositive particles and vocatives indicates that topialized and contrastive material in general is phonologically demarcated:19

τους μεν Λακεδαιμονιους, ουκ ου την αιτιασαιμεθα (Thuc. 1.120)
Κλειφώντος τοινυ, ουκ ου Δικασται, ζτερα μεν ου της
έχοι κατηγορησαι (Lys. 30.12)

The likelihood that focused constituents will form a separate minor phrase may explain certain apparent anomalies, but this approach is circular to the extent that the discourse structure assumed cannot be independently motivated. Constituents that are contrastive or focused, particularly at the beginning of a paragraph, tend to appear as phrases consisting of one appositive group only:

: κα τονδε : χα πιεοικα (Naup. 1)
:Λοθρον τουν : Ηύποκναμιδιον (Naup. 1; elsewhere mostly unpunctuated)
: Περθοβριαν : και Μυσοχεον (Naup. 22; unpunctuated in line 27)
: κεν Λοθροις : του(ς) Ηυποκναμιδιοις (Naup. 21; contrastive with εν Ναυπακτοι in line 20).

It is well known that in addition to syntactic constituency, phrasing is also sensitive to the need for phonologically balanced prosodic constituents.\textsuperscript{20} This may explain why in a few cases constituency is disregarded in favor of phonologically balanced phrasing:

: αργυρὰς πεντε : καὶ εἰροσι μνει : (Εφεσος 2)
: χρεματα τοις Ηυποκνωμαδιοις : νομιως χρεσται : (Ναυπ. 24),
or when a numeral is phrased with a Preposition and separated from its Noun:

εντος ἡχσεκοντα : εμερον : (Ἀκρόπ. 12)
μεχρι τριον : οβελον (ΙΓΙ\textsuperscript{3} 4.B12).

This restructuring is another indication that inscriptional punctuation is an orthographic representation of phonological and not syntactic structure.

Conjuncts and disjuncts are regularly phrased together:

: αιτε φετος αιτε φαργον : (Ελις 3)
: τα τ αλα και παρ πολεμο : (Ελις 4)
: κε δαμο κε θυιανον : (Ναυπ. 4)
: τεχναι και μαχαι : (Ναυπ. 38, cf. 12).

Pairing of conjuncts and disjuncts proceeds left to right, so that a third item is phrased separately:

: αιτε φετας αιτε τελεστα : αιτε δαμος : (Ελις 8).

A recurrent feature of the phrasing of conjuncts and disjuncts is disregard for constituency:

: τρετο και δαμενεσθο : ενες Αθηναιον : (ΙΓ ΙV 554.5)
: ε τας Χαλειδος : τον Οιανθεα μεδε τον Χαλειεα : ε τας
: Οιανθιδος : (Οιενθ. 2)
: Ἡποντιον : τε χιλιον : πλεθαι και Νανπακτιον : τον
: επιφοιθον : πλεθαι : (Ναυπ. 39).

It is not clear whether this violation of constituency is due to restructuring or simply to the mechanical application on the part of inscribers of a rule requiring conjuncts to be phrased together.

The Greek Phonological Phrase

Of the three questions we would like to answer about the phonological phrase in Greek—what are its syntactic components? what are its temporal and rhythmical properties? what, if any, are its accentual properties?—the above analysis has provided a fairly complete answer to the first. The answer to the second question follows automatically, at least in broad outline. The mere fact of inscriptionsal phrase punctuation implies some form of temporal demarcation, and this in turn implies a more cohesive domain for rhythmic organization as well as for the application of sandhi processes. 21 Between interpuncts, for instance, Priene consistently applies the rules of connected speech—elision, crasis, assimilation of final nasals, movable nu. It is also reasonable to look for accentual properties specific to the Greek phonological phrase. Recent work on the Japanese pitch accent 22 has revealed that long major phrases can be broken up into more manageable subunits by means of an intermediate raising of the pitch range at the beginning of (often, but not exclusively, syntactically defined) subunits. The result can be interpreted as a hierarchical structuring of phrasal downtrends. Musical records can be used to discover whether something of a similar nature occurred in Greek.

It is necessary to begin with a review of the principal phonological process affecting accentual pitch excursions in the domain of the major phonological phrase, namely catathesis, the name given to the lowering and compression of the intervals of rise to and fall from pitch peaks in alternating High-Tone/Low-Tone structures; catathesis is distinguished from declination, a smaller progressive lowering of pitch from the beginning to the end of the domain. 23 The effects of catathesis are dramatic whether the High-Low structures are tonal, as in Hausa, 24 or

21 Sandhi (from Sanskrit sam + dhā, 'put together') is a term covering the different phonological modifications that words undergo when they come into contact. Such modifications in Greek are traditionally classified as, e.g., elision, aphaeresis, crasis.
24 S. Inkelas and W. R. Leben, "Where Phonology and Phonetics Intersect," in Kingston and Beckman (supra n.6) 17.
accentual, as in Japanese. In Greek catathesis applies to sequences of fully accented words, that is words bearing the acute or circumflex, or appositive groups. Catathesis is very strongly respected in the musical settings of the Delphic hymns. Although sometimes the accentual peak of the second of two successive, fully-accented words is set higher than the peak of the first, both the frequency and the magnitude of pitch falling from the first to the second peak are so great that an overall mean fall from one accentual peak to the next of a semitone occurs. Catathesis is blocked by the grave accent. Since the grave does not have the pitch fall after the accentual peak that triggers catathesis, a word bearing the grave may form a single accentual trajectory with a following, fully-accented word. The result is that in strings of full + grave + full accent the peak of the second full accent may be higher than that of the first. Allowing for the effect of the grave and for local pitch rises due to emphasis, it is typical for a clause or major syntactic phrase to have its highest note on the accentual peak of its first fully accented lexical word, after which the pitches of the peaks and valleys fall all the way to the end. At the beginning of the next clause or major phrase the pitch level is reset upward, but within periodic sentences generally not quite so high as in the preceding clause or major phrase.

Both the relative magnitude of the lowering of accentual peaks and the locations in which the infrequent exceptions to it may occur are regulated by the articulation of the catathesis domain into constituent minor phonological phrases. To avoid circularity in the definition of minor phonological phrases, the analysis will proceed initially in terms of syntactic constituency relations. It will be shown (1) that syntactic constituency imposes very strict constraints on the relative magnitudes of successive peak-to-peak intervals in the musical setting of the Delphic hymns; (2) that the syntactic structures involved in those constraints correspond to minor phonological phrases; and (3) that minor phonological phrase structure not only explains the exception to the syntactically formulated constraints, but also accounts for the variability of the interval


26 E. Pöhlmann, Denkmäler altgriechischer Musik (Nürnberg 1970: hereafter 'DAM') nos. 19f.
relations in syntactic configurations not included in the initial syntactic formulation of the rules.

The unit of analysis is a string of three fully-accented lexical words not interrupted by grave accents. Such a string is the minimal sequence in which two successive peak-to-peak intervals can be observed. Proper names constitute a special class and will be treated separately.\(^\text{27}\) Description of the interval relations is simplified if falling intervals are defined as positive and rising intervals as negative; in other words the interval from D to C is +1 tone, the interval from C to D \(-1\) tone.\(^\text{28}\)

The basic principle is that greater peak-to-peak intervals occur within smaller, more cohesive syntactic constituents, and, conversely, smaller (including rising) intervals occur across such constituents, \textit{i.e.}, within larger, less cohesive stretches of the sentence. This principle can be rendered sufficiently explicit for empirical testing as follows. In any string of three lexical words, \(L_1 \ L_2 \ L_3\), not interrupted by grave accents or non-clitic non-lexicals, \(1.a\) if \(L_1\) does not belong to the smallest constituent containing \(L_2 \ L_3\), then the peak-to-peak interval between \(L_2\) and \(L_3\) is not less than the interval between \(L_1\) and \(L_2\). Conversely, \(2.a\) if \(L_3\) does not belong to the smallest constituent containing \(L_1 \ L_2\), then the interval between \(L_1\) and \(L_2\) is greater than the interval between \(L_2\) and \(L_3\). If the smallest constituent containing \(L_1 \ L_2\) is identical to the smallest constituent containing \(L_2 \ L_3\), then the interval relations are determined by asymmetry in subconstituency between \(L_1\) and \(L_3\). \(1.b\) If \(L_1\) is not a sister of \(L_2\), but belongs to a branching subconstituent \(\text{i.e.},\) has a sister to its left) and \(L_3\) does not, then the interval between \(L_2\) and \(L_3\) is not less than the interval between \(L_1\) and \(L_2\). Conversely, \(2.b\) if \(L_3\) belongs to a branching subconstituent

\(^{27}\) The frequency of interruption by grave accents and non-clitic non-lexicals and damage to the inscriptions reduce the number of such lexical triples, but the settings of enough are preserved to permit a definitive statistical test as given below in the text.

\(^{28}\) The definition has no substantive consequences and in no way prejudices the test results; it merely allows the substitution of ‘greater’ for the periphrasis ‘which falls more / rises less’. If the reverse definition is chosen, then the inequalities in rules 1 and 2 are reversed. Defining falling intervals as positive, however, has the intuitive appeal of according with the progressive lowering of pitch imposed by catathesis. Furthermore, since intervals measured in tones are merely the logarithms of fundamental frequencies \(l_{ij}=\log[f_i/f_j]=\log f_i - \log f_j\), when intervals are calculated in the direction that the notes are sung, if the first is higher than the second the difference \(\log f_i - \log f_j\) is positive, and, conversely, if the second is higher than the first, the difference is negative.
(i.e., has a sister to its right) and \( L_1 \) does not, then the interval between \( L_1 \) and \( L_2 \) is greater than the interval between \( L_2 \) and \( L_3 \).\(^{29}\) If \( L_1, L_2, \) and \( L_3 \) are sisters, or if \( L_1 \) and \( L_3 \) are both immediate constituents of respective branching subconstituents, no prediction is made about the relative magnitudes of the intervals. Rules 1.a–b and 2.a–b can be more readily comprehensible with the help of some shorthand notation. Let \( I_{12} \) and \( I_{23} \) stand for the magnitudes of the intervals between the peaks of the accents of \( L_1 \) and \( L_2 \), and, respectively, between the peaks of \( L_2 \) and \( L_3 \). Let square brackets indicate the constituency relations among \( L_1, L_2, \) and \( L_3 \). Then

\[
\begin{align*}
1.a. & \quad [L_1 \; L_2 \; L_3] \\
1.b. & \quad [X \; L_1 \; L_2 \; L_3] \quad \rightarrow \quad I_{12} \leq I_{23} \\
2.a. & \quad [L_1 \; L_2] \; L_3 \\
2.b. & \quad [L_1 \; L_2 \; [L_3 \; X]] \quad \rightarrow \quad I_{12} > I_{23}
\end{align*}
\]

Rule 1.a applies to a lexical triple such as

\[
\text{DAM 19.14}
\]

\[
\beta\rho\epsilon\mu\nu\; \alpha\; \epsilon\; \omega\; \sigmaio\; \mu[e]\; \lambda;\; \sigmai
\]

since the Adjective and the Noun belong to a Noun Phrase that does not include the Participle on the left. The prediction of the rule is correct, since \( I_{12} = -0.5 \) but \( I_{23} = +0.5 \) tones. Rule 1.b applies to a lexical triple formed by the last three words of a Noun Phrase consisting of a branching Genitive Phrase + Noun + Adjective, e.g.

\[29\] Constituents are sisters if they are at the same hierarchical level; thus a Genitive Phrase consisting of an Adjective and Noun may be the sister of a single Noun that is the head of the Noun Phrase comprising all three words, but the Noun in the Genitive is not itself a sister of the Noun that is the head of the Noun Phrase. The rather involved definition of rules 1.b and 2.b is required because we do not wish to beg the questions of formal syntactic analysis posed by discontinuous constituents in Greek.
since there are no obvious grounds for grouping θύγατρες with either the Genitive Phrase to the exclusion of the Adjective, or vice versa, but the Genitive Phrase branches, so that ἐρυβρόμου has a sister to its left. The prediction of the rule is correct, since $I_{12} = +0.5$ but $I_{23} = +1$ tone. Rule 2.a applies to a lexical triple such as

\[
\begin{align*}
\text{DAM 19.2} \\
\end{align*}
\]

since the Adjective and the Noun belong to a Noun Phrase that does not include the Verb. The prediction of the rule is correct, since $I_{12} = +2$ but $I_{23} = 0$ tones.

Excluded from these rules are head interrupted configurations in which neither of the flanking modifier or complement element branches, for example

\[
\begin{align*}
\mu\text{κατείον ἐφέσων πάγου (DAM 19.8)} \\
\text{νέων μήρα ταύρων (DAM 19.12)}
\end{align*}
\]

and also configurations of two modifiers preceding (or following) their head, for example, οἰνώπα δάφνας (DAM 20.23f). These configurations will be treated separately.

We now provide examples of how rules 1 and 2 regulate the interval relations in different syntactic structures. Rule 1 predicts that in a triple in which the first lexical belongs to a Prepositional Phrase, the second to a Direct Object Phrase, and the third is the Verb, if there is a falling interval and a rising interval, the falling interval will occur between the word of the Direct Object Phrase and the Verb, the rising interval between the word belonging to the Prepositional Phrase and word belonging to the Object Phrase.
Here the falling interval of 1.5 tones occurs between the peak of τις and φέ, but the rising interval of 1.5 tones between the peak of πρῶ and the peak of τεῖ. Rule 1 permits equal intervals in structures such as verb + branching Noun Phrase

with equal intervals of a semitone, and in structures such as the last word of a Noun Phrase + a branching Adjective Phrase

with two zero intervals.

Rule 2 means that in a structure of, for example, branching Genitive Phrase + verbal form, if there are two unequal falling intervals between the accentual peaks, the larger interval will occur within the Genitive Phrase and the smaller between the last word of the Genitive Phrase and the Verb.

Here the larger falling interval of two whole tones occurs between the peak of άξς and λαί within the Genitive Phrase, but the smaller falling interval of only a semitone between λαί and the peak of γό. Similarly in a structure of branching Noun Phrase indirect object + Verb, if there is one falling and one rising interval, the falling interval will occur within the Noun Phrase, the rising interval between the last word of the Noun Phrase and the Verb.
Here the falling interval of 1.5 tones occurs between the peaks of πα and τοις, but the rising interval between the peak of τοις and φαι. Again, in a structure of branching Noun Phrase direct object + Verb, if there are two unequal rising intervals, the smaller rise will occur within the Noun Phrase, the larger rise between the final word of the Noun Phrase and the Verb.

Here the larger rising interval of 1.5 tones occurs from the peak of τεί to that of εί, but the smaller rising interval of a whole tone between τεί and the peak of αι within the Noun Phrase.

The table below presents the results of a statistical test of rules 1 and 2 in the Delphic hymns.

<table>
<thead>
<tr>
<th></th>
<th>( I_{12} &gt; I_{23} )</th>
<th>( I_{12} \leq I_{23} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>([L_1 L_2 L_3]), etc.</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>([L_1 L_2] L_3), etc.</td>
<td>6</td>
<td>1</td>
</tr>
</tbody>
</table>

\( P = .0041 \)

Interval Relations Between Accentual Peaks

The distribution observed is highly significant. Even though there are only thirteen lexical triples that meet the structural descriptions of rules 1 and 2, there is (by the hypergeometric distribution) only a chance of about 1 in 244 that the relations of the interval magnitudes would accord with the syntactic structure as prescribed by the rules purely as a result of chance.

There is only one exception to a perfect, bidirectional implication:

\( \[\text{Kα\-στα\-λι\-δος ε\-ού\-ύ\-δρου νά\-ματ ë\-πι\-νι\-σε\-ται}, \) 

\( \text{DAM} \ 19.6 \)
Here the greater interval of fall occurs between the direct object noun and the verb rather than between the direct object νάματ' and genitive Adjective εὐύδρου of the branching Genitive Phrase that modifies νάματ'. This case, however, is an instructive exception, for it illustrates that pitch relations are regulated directly by minor phonological phrases. Pitch relations can to a high degree of accuracy be expressed in syntactic terms, because the formation of minor phonological phrases is strongly determined by syntactic constituency, but it is not completely so determined. In DAM 19.6 νάματ' could not form a minor phonological phrase with εὐύδρου to the exclusion of the head of the Genitive Phrase, Κασταλίδος. As noted above, minor phonological phrases are preferentially formed from two, rather than three, lexical words or appositive groups, unless they are in a head-interrupted structure. There is a further reason why formation of a single minor phonological phrase spanning the entire Noun Phrase Κασταλίδος εὐύδρου νάματ' is unlikely. In the Delphic hymns, proper names such as Κασταλίδος are treated as emphatic, focused constituents, and given a pitch boost. Not only does emphatic material not form minor phonological phrases with contiguous unemphatic material, but, as we have seen, in inscriptions that punctuate minor phonological phrases, the structure proper name + modifier is punctuated separately, not inclosed with other words inside interpuncts. Thus in the present case νάματ' was undoubtedly orphaned from the minor phonological phrase containing the proper name and its epithet and adjoined to its governing Verb ἐπινισσεται. The pitch relations are now predictable from the structure of the minor phonological phrases: the greater fall occurs within, not across the pair of words belonging to the same minor phonological phrase.

We have seen (supra n.3) that interrupted structures consisting of three appositive groups may be treated as a single minor phonological phrase in inscriptions and in meter. Certainly in the Delphic hymns head-interrupted configurations behave differently from structures that have more strongly differentiated internal constituency. In these head-interrupted configurations there is no constraint on the location of the greater and the smaller peak-to-peak interval. For example in
the greater interval occurs between the second and third words (probably because of the steep drop in pitch resulting from terminal fall\(^{30}\) at the end of a periodic sentence), whereas in

just the opposite relation holds, although in each case the interrupted constituent is a Noun Phrase in the order Adjective, Noun. Since there is no internal differentiation into separate minor phonological phrases, lexical triples in head-interrupted configurations trivially conform to the constraint that the interval within the minor phonological phrase is greater than the interval across minor phonological phrases, whatever the intervals may be. Accordingly, their peak-to-peak pitch relations may be determined wholly by other factors, such as terminal fall or considerations of emphasis that are independent of or not also signalled by the order of the interrupted structure.

The interval relations in the configuration consisting of modifier + modifier + head Noun in

suggest that \(\text{oĩvōs} \text{δάφνος}\) at least forms a minor phonological phrase, probably but not necessarily to the exclusion of \(\text{kλάδον}\). Unfortunately there is no evidence that could indicate a difference between complements and adjuncts.

The syntactically formulated rules 1 and 2 may now be restated in terms of minor phonological phrases. Within minor phonological phrases the pitch of accentual peaks falls more / rises less, than across minor phonological phrases, where pitch falls less / rises more. These rules may be formalized as

\(^{30}\) See Devine and Stephens (\textit{supra} n.23).
A. M. DEVINE AND LAURENCE D. STEPHENS

1'. \( L_1[\varphi L_2L_3 \rightarrow I_{12} \leq I_{23} \)

2'. \( L_1L_2\varphi] L_3 \rightarrow I_{12} > I_{23} \)

where \( \varphi \) indicates that the brackets now refer to the boundaries of minor phonological phrases.

Rules 1' and 2' may be tested against all pairs of uninterrupted fully-accented lexical words in the hymns. This prediction is that the mean interval between accentual peaks will be greater in pairs that are within the same minor phonological phrase, smaller in pairs of words belonging to different minor phonological phrases. The size of the data set for the test is therefore greatly increased beyond that available for the lexical triples above. The results are presented in the table below.

<table>
<thead>
<tr>
<th></th>
<th>Within</th>
<th>Across</th>
</tr>
</thead>
</table>
| \( P_1P_2[\varphi \) | 1.12   | \( P_1\varphi][\varphi P_2 = 0.00 \)
| \( s = 1.00 \)   |        | \( s = 1.11 \)
| \( t = 3.68, df = 46 \) |        | \( p < .005 \)

Mean Interval between Peaks

The parsing into minor phonological phrases was done according to the algorithm deduced from inscription punctuation. The mean fall within minor phonological phrases was found to be just over a whole tone, whereas the mean fall across minor phonological phrases was observed to be zero. The difference between the means is highly significant.\(^31\) The effect of rules 1' and 2' on accentual pitch excursions may be illustrated by a schematic diagram of a major phonological phrase articulated into three minor phonological phrases. Each minor phrase is taken to consist of only two medially-accented lexical polysyllables. Such polysyllables have a Mid-High-Low, rather than a Low-High-Low, pitch pattern.\(^32\) The diagram does not attempt

\(^31\) The parsing into minor phonological phrases employed for the test is not the only one compatible with the algorithm discussed above, but one that minimizes minor phonological phrases of three appositive groups in length. Other parsings will yield somewhat different means, but the mean interval within minor phonological phrases will always be greater than the mean across them.

\(^32\) See Devine and Stephens (supra n.23).
to represent to scale the compression effect of catathesis, only the average lowering of about a tone of successive accentual peaks within minor phrases, and the small pitch boost at the beginning of successive minor phrases that blocks the lowering of the first peak vis-à-vis the last peak of the preceding minor phrase.

The interval relations described by rules 1′ and 2′ are the result of the processing of pitch excursions in minor phonological phrases. There is a major upward reset at the beginning of primary catathesis domains, which are basically coterminous with major phonological phrases. There is also a minor pitch boost, much smaller than initial reset, at the beginning of minor phonological phrases. As a result, the pitch of the first full accent in a minor phonological phrase is not as much lower than the last peak of the preceding minor phonological phrase as is the following pitch peak within a minor phonological phrase. The initial pitch peak may in fact sometimes be higher than the last peak in the preceding minor phonological phrase, but on the average it is about the same, since the mean interval was observed to be 0. It follows that catathesis works in terms of a self-similar hierarchy: (1) the minor phonological phrase that has a minor pitch boost on its first lexical full accent and strong catathesis lowering of the following full accent; (2) the major phonological phrase, or primary catathesis domain, which has a major pitch reset at its beginning and general fall over the minor phonological phrases within it; (3) the periodic sentence, which has an even greater initial pitch level and long-term pitch fall over the primary catathesis domains within it.

Stanford University
University of North Carolina, Chapel Hill
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