

Auxiliary reduction without empty categories: a prosodic account*

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1. Introduction

It is a well-known fact that, although function words in English can reduce in most environments, the reduction is blocked at certain syntactic junctures, whose characterization has proved elusive in the past. In this paper we offer a unified account of those environments in which reduction is blocked. Our approach is to define the relevant contexts in prosodic rather than in syntactic terms, stating reduction conditions on the domain of the phonological phrase. In this we rely on past work in prosodic phonology, in particular that of Selkirk (1978, 1984, 1986) and Nespor and Vogel (1982, 1986).

Rather than describe the environments where reduction is blocked directly in syntactic terms, we instead focus on the syntactic conditions on phonological phrasing. We show that there are two kinds of such conditions: those coming from the general phrasing algorithm, and those imposed by a well-defined class of syntactic constructions. The interaction of these mechanisms provides phonological phrase breaks precisely at the points where no reduction is allowed. The data we account for subsume cases that have been used in the past to argue for the influence on phonology of extraction and deletion sites. We show that reference to empty nodes is not necessary and, moreover, would lead in some cases to incorrect predictions.

We first give an account of the so-called auxiliary reduction, demonstrating the relevance of the domain of the phonological phrase for this phenomenon. After developing a phrasing algorithm which properly generates phonological phrases in English, we then proceed to discuss a small subclass of cases which draw upon an additional source of phrasing. We conclude with a discussion of the relevance, or rather the irrelevance, of empty categories for phonological phrasing.

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2. Content and Function Words

Fundamental to the discussion of reduction in English is the distinction between function and content words. For principled reasons, only the former are subject to the alternations in degree of stress that this paper addresses.

Function words, which include prepositions, auxiliaries, determiners, conjunctions, complementizers, and pronouns, differ systematically from content words — i.e. nouns, verbs, adjectives and adverbs — in a number of ways. First, words in the content class belong to major categories; and second, they can be morphologically complex. In contrast, function words, which subsume all minor category words as well as prepositions, are morphologically simplex.¹

We can capture this difference in the framework of Lexical Phonology, by assuming, with Kiparsky (1982, 1983) and Inkelas (1989), that lexical rules apply only to content words and not to any function words. From this we derive the morphological differences between these two classes: only content words can be morphologically complex, since only those may undergo the lexical processes of affixation and compounding.²

We also derive a crucial phonological distinction: function and content words enter the postlexical component with very different phonological properties. Content words will possess all of the phonological structure assigned in the lexicon, including phonological word status (Inkelas and Zec 1988, Inkelas 1989), whereas function words will have none of these properties. Specifically, they will lack both word stress (Kiparsky 1982) and phonological word status. Because of the Exhaustive Parsing constraint on prosodic structure (Selkirk 1984, 1986), all material, including function words, must eventually be included into phonological words. We thus assume that while content words acquire their phonological word status lexically, function words acquire it by means of the following postlexical mapping process:

¹English prepositions pattern with minor category words with respect to the function/content word distinction, although syntactically they pattern with major categories (see Emonds 1985). In certain other languages, there is a more perfect match between the function/content word distinction and that between minor and major categories; in Irish and Arabic, for example, prepositions can be morphologically complex, as can the other major category words.

²According to Zwicky and Pullum (1983), *n't* is a suffix rather than a clitic. The fact that *n't* occurs on auxiliaries would thus appear to falsify our claim that function words are simplex. However, we take issue with Zwicky and Pullum on this point. Z&P point to words such as *ain't*, which are not derived, as indicating that *n't* affixation does not apply in the same manner to all words, concluding that *n't* is a suffix. However, the fact that *ain't* blocks **amn't* is not actually evidence of the affixal status of *n't*. Although Aronoff's (1976) discussion of blocking is limited to affixational derivation, Kiparsky (1982) and Poser (1992) have shown that blocking may take place between lexical items and phrases (e.g. *pink* vs. *light red*, or *better* vs. *more good*).

We assume that it is either a clitic, which is not added to already negative lexicalized forms such as *ain't*, or that it is part of lexicalized negative auxiliaries in all cases.

- (1) Default Phonological Word Mapping: $X^o \rightarrow [X^o]_\omega$

The above process applies to any syntactic (pre)terminal element and assigns it phonological word status. We crucially assume that this mapping applies in the elsewhere case, assigning prosodic structure only to terminals that lack it. It will fail to apply to content words, which already possess prosodic structure; as we will see later, it will also fail to apply to clitics, which are incorporated into adjacent prosodic structure by other, more specific means.³

The asymmetry in the components in which content and function words acquire phonological word status will prove crucial to the analysis we develop later. It will explain why only function words are able to reduce in certain syntactic contexts; it will also explain why content words can get phrasal stress but function words cannot.

3. Clitics vs. Reduced Forms

Before we can even discuss those syntactic contexts in which reduction and phrasal stress assignment take place, however, we must carve out appropriate subdivisions within the large class of function words. In order to do this, we will need to step back and reinterpret some of the standard data on reduction.

The literature on auxiliary reduction has often failed to draw a sufficient number of distinctions among those words whose phonological realization varies according to position in the utterance. We will claim that a three-way distinction obtains in the language, that between full and reduced forms on the one hand, and clitics on the other. We assume a particular definition of the term ‘clitic,’ viewing the division between clitic and nonclitic elements as primarily phonological (Zwicky 1985, Neijt 1984, Berendsen 1986). Following Inkelas (1989), we further assume that clitics are prosodically dependent allomorphs of the full form (if any), where dependence is encoded lexically, by means of prosodic subcategorization frames⁴ which require them to be incorporated into a phonological word with their host.

The relevant three-way contrast is illustrated by the forms in (2):

³As stated, the algorithm would in principle apply to preterminal nodes dominating no phonological material, i.e., to empty categories. However, an independently needed requirement that prosodic constituents must dominate some phonological material (Inkelas 1989) will block application of Default Phonological Word Mapping in such cases.

⁴Crucially, we are not necessarily assuming any version of cliticization as syntactic adjunction, although this position is taken in Kaisse (1983, 1985), Selkirk (1984).

(2)	Full (=stressed)	Reduced (=unstressed)	Clitic
is	ɪz	ɪz	z
am	ɛm/æm	əm	m
are	ɑr	ər	r
has	hæz	həz	z
have	hæv	həv	əv
will	wɪl	wəl	l
him	hɪm		əm
them	ðɛm		ðəm, əm

One parameter of difference is whether or not forms in these categories can be related derivationally. The full and clitic forms cannot be related by a single rule or, for that matter, by any set of rules known to operate in English (Kaisse 1983, 1985). Therefore both sets of words need to be listed in the lexicon. However, the full and reduced forms *can* be related, by the independently motivated rule of vowel reduction in unstressed syllables; we would not want to list the predictable unstressed counterparts to full forms. Therefore, our lexicon contains only full and clitic forms. Additional evidence supporting the three-way contrast in (2) is that, although identical in syntactic category, no two of these sets of forms have the same distribution. We discuss these facts in section 4 (see also Appendix I).

With a few notable exceptions (e.g. Kaisse 1985, Zwicky 1985),⁵ the literature typically assumes at most a two-way contrast among forms like those in (2).⁶ Some (e.g. Kaisse (1983)) have collapsed the distinction between clitics and reduced forms, assuming that all are lexically listed. Others subsume clitics under what we would call reduced forms, treating them all as derivable by rule from the full forms (e.g. Selkirk 1984, Bresnan 1978a). However, neither of these partitions draws the essential distinction between clitics and reduced forms needed to describe the three-way phonological contrast obtaining in English.

The purpose of this section has been to identify the data that are relevant to this paper. For various reasons, clitics play no direct role in the phenomena to be discussed, and we therefore leave the discussion of their distribution for the Appendix. What is crucial at this juncture is a characterization of the differences in distribution between full, i.e. stressed, and reduced, i.e. unstressed, function words. This is what we now turn to.

⁵Though these authors note a phonological difference between clitics and reduced forms, they do not mention any differences in distribution, nor does anyone else, to our knowledge.

⁶In fact, Hayes (1989) assumes no contrast, referring to all of the forms in (2) as clitics.

4. Stress in Function Words

The alternation between the reduced and unreduced forms of auxiliaries and prepositions is sufficiently regular to be viewed as a rule-governed process. Full forms are grammatical in all contexts, though of course somewhat infelicitous in certain more casual styles of speech. But the distribution of reduced forms is much less free. Of interest to us is the fact that the constraints on the distribution of reduced forms appear to be localized to prepositions and auxiliaries.

In most environments both prepositions and auxiliaries can appear in their reduced form:

- (3)
- | | | |
|----|---------------------------------|-------|
| a. | The day is long. | (ɪz) |
| b. | I am sad. | (əm) |
| c. | He thought of good ideas. | (əv) |
| d. | For once, John arrived on time. | (fər) |

However, reduction systematically fails in final position:

- (4)
- | | | |
|----|---|--------|
| a. | The table's longer than the door is. | (*ɪz) |
| b. | Mary's eaten but I don't know if John has. | (*həz) |
| c. | He argued down more ideas than he thought of. | (*əv) |
| d. | That's the guy we wanna talk to. | (*tə) |

The reduction of prepositions and auxiliaries illustrated in (3) is part of a more general process of vowel reduction in English: vowels of unstressed syllables are subject to vowel reduction rules, while those of stressed syllables are not. This well-known contrast is illustrated by the following minimal pair:

- (5)
- | | |
|----|-------------------------|
| a. | expériment _N |
| b. | expériment _V |

In the noun, the final two syllables are unstressed, and their vowels are taken to \ by vowel reduction. But this process fails to apply to the vowel of the final syllable in the verb, which has secondary stress.

These observations suggest that auxiliaries and prepositions, whose vowels are generally able to reduce, also lack stress. In this respect they pattern with complementizers, pronouns, and determiners — in short, the class of function words, as shown in (6):⁷

⁷The examples in (6) illustrate only the behavior of monosyllabic function words; we will discuss disyllabic function words shortly.

- (6)
- | | |
|--|--------|
| a. ... to Nicaragua | (tə) |
| b. ... for the children | (fər) |
| c. Give them the books | (ðəm) |
| d. Helen is never gonna believe that | (iz) |
| e. Helen must be told about the diversion right away | (məst) |
| f. The missing documents ... | (ðə) |
| g. North said that everyone had approved | (ðət) |

By contrast, monosyllabic words that do not belong to the function word class never reduce:

- (7)
- | | |
|------------------------|---------|
| a. two Nicaraguans | (*tə) |
| b. pat the bunny | (*pət) |
| c. the core problem | (*kər) |
| d. Give Clem the books | (*kləm) |

If lack of stress is what allows function words to reduce, then we have to assume that it is the presence of stress which prevents reduction of their counterparts — content words. The hypothesis that content words carry stress and function words do not is supported by another phenomenon, the assignment of phrasal stress — that is to say, the nuclear stress which, according to the rules of SPE, Liberman and Prince (1977), and others, falls on the last stressed word in the phrase, in neutral intonations (see Rochemont 1986).⁸ Since, as has already been noted (see also Selkirk 1984, Kaisse 1985), monosyllabic function words do not possess *word* stress, they should not be able to carry *phrasal* stress. This is exactly what we find, as shown in (8) and (9):

- (8)
- | |
|--|
| a. The chair she 'bought |
| b. The chair she gave 'Fred |
| c. I don't know where Fred is 'sitting |
- (9)
- | |
|--------------------------------|
| a. The chair she 'sat in |
| b. I don't know where 'Fred is |

In both sets of examples it is the final content word that acquires phrasal stress. Function words in final position are not affected by the nuclear stress rule.

However, prepositions and auxiliaries cannot reduce in final position, as we saw above. Following the logic of our argument, this should be attributed to the presence of stress. But doing so seems to set up a paradox: we require the presence of stress in order

⁸Location of contrastive stress follows different principles; this phenomenon, however, lies outside the scope of the present discussion.

to avoid reduction, yet require its absence in order to block the assignment of phrasal prominence.

The solution lies in recognizing two sources of stress — that assigned to content words in the lexicon, and that obtained by certain function words in the postlexical component. This distinction will correlate naturally with the degree of stress. It turns out that phrasal stress lodges only on those words whose stress was assigned lexically; even though function words may acquire some stress postlexically, as is obvious from the preceding examples, that stress is interpreted at best as secondary prominence.

Word-bounded stress assignment, we argue, is not limited to the lexicon, but takes place postlexically as well. The natural target of this process will be the set of forms that lack stress altogether; as mentioned earlier in section 2, this will correspond to the set of function words, which by that point will have acquired phonological word status.

There is a second piece of evidence in favor of the claim that function words acquire their stress in the postlexical component. This comes from the behavior of disyllabic prepositions. Unlike monosyllabic function words, these bear stress in all contexts: the stress is final if and only if the final syllable is heavy.

- | | | |
|------|--|---|
| (10) | Initial
<i>under</i>
<i>over</i>
<i>after</i>
<i>into</i>
<i>onto</i> | Final
<i>beneath</i>
<i>atop</i>
<i>within</i>
<i>outside</i>
<i>upon</i>
<i>above</i>
<i>amid</i>
<i>amongst</i>
<i>without</i>
<i>around</i>
<i>behind</i>
<i>along</i> |
|------|--|---|

The predictable location of the stress in these forms indicates the application of a word-bounded rule. In the framework we are assuming, function words are not available in the lexicon. Thus, the rule responsible for the stress of the words in (10) must be postlexical; a possible formulation is given in (11), which is fed by Default Phonological Word Mapping.

- (11) Postlexical Footing: Within a stressless phonological word, build an obligatorily binary foot with the right node labeled *s* if and only if it branches.

Note that this rule will not apply if it cannot build a binary foot. Therefore, it leaves the monosyllabic function words unaffected, assigning metrical structure only to the disyllabic ones.⁹

Restricting Postlexical Footing to the phonological word domain correctly predicts its failure to apply to monosyllabic function words even when they occur in sequence, as shown in (12):

- (12) a. 'up 'on the hill
 b. up'on the hill

A virtue of this account is that it can explain why even those function words that are stressed never bear *phrasal* stress:

- (13) a. Who did he 'run after?
 b. What did he 'step over?
 c. What are you 'talking about?

We derive this effect simply by ordering Nuclear Stress assignment before Postlexical Footing.

5. Phonological Phrasing and Postlexical Stress

We have now accounted for the asymmetry in phrasal stress assignment by showing that only content words receive (lexically assigned) word stress.¹⁰ We have further shown that disyllabic function words receive secondary stress assigned postlexically. But little has been said so far about monosyllabic function words, except for the observation that in certain environments they systematically fail to reduce, which is an indicator of a certain degree of stress.

We will refer to this phenomenon as 'reduction failure' and account for it with a postlexical rule which applies to the last phonological word in a prosodic domain (which we will soon characterize). This rule assigns stress to monosyllabic function words. Like Postlexical Footing, this rule applies after the Nuclear Stress rule; as a result, stress assigned by this rule will be interpreted as nonprimary. Ordering this rule after Postlexical Footing allows us to state it in a simple fashion.¹¹

⁹We are treating the final syllable of *under*, *over* and *after* as an *r*-colored \, not as branching.

¹⁰This same idea is found in Kiparsky (1982), as well as Kaisse (1985:31), who points out its relevance to function words.

¹¹Selkirk (1978, 1984) takes the opposite approach with her stress-deleting Monosyllable Rule. But an analysis such as ours, which posits only a single stressing rule, is to be preferred on grounds of simplicity over one such as Selkirk's which must both stress and then destress exactly the same forms.

- (14) Final Stress Rule: Build a foot on a final phonological word that lacks metrical structure.

This is the only rule responsible for the failure of monosyllabic function words to reduce. It applies to all the syntactic categories we have seen so far, with one notable exception: it never applies to pronouns, whose distribution we account for by analyzing them as clitics (see Appendix I).

5.1 The Phonological Phrase

We now turn to the question of the domain of the Final Stress Rule. Our aim is to show that with one minor amendment, the independently motivated phonological phrase provides an apt characterization of the domain of the rule in (14). Various algorithms for generating phonological phrases in English have been proposed in the past; the one developed here shares some insights with those in the literature (e.g., Selkirk 1978, 1986, Nespor and Vogel 1982, 1986) while maintaining the strong claim that the only syntactic information available to the algorithm is the configurational relations of the syntactic constituent structure. This algorithm assigns prosodic structure only to unphrased material; thus, it is purely structure-building in nature.

- (15) Phonological Phrase Algorithm:
 a. Branching Clause: From the bottom up, map a branching node into a phonological phrase.
 b. Default Clause: Map any terminal element left unphrased by the Branching Clause into a phrase of its own.

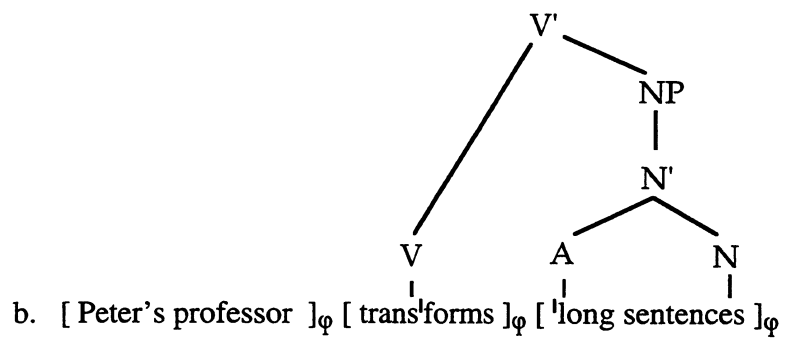
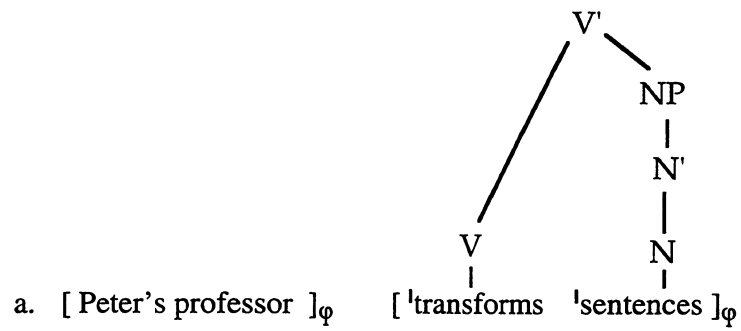
We will now demonstrate the functioning of our algorithm on some sentences whose syntactic structure is relatively uncontroversial. Our test will be the Rhythm Rule (Lieberman and Prince 1977), which has been demonstrated by Selkirk (1978) and Nespor and Vogel (1982) to apply within the phonological phrase. The Rhythm Rule operates on adjacent primary stresses, retracting the first one onto a preceding secondary-stressed syllable, as in (16) and (17):

- (16) thir^lteen ^lmen → ^lthirteen ^lmen

- (17) Annema^lrie's ^lmuffins → ^lAnnemarie's ^lmuffins

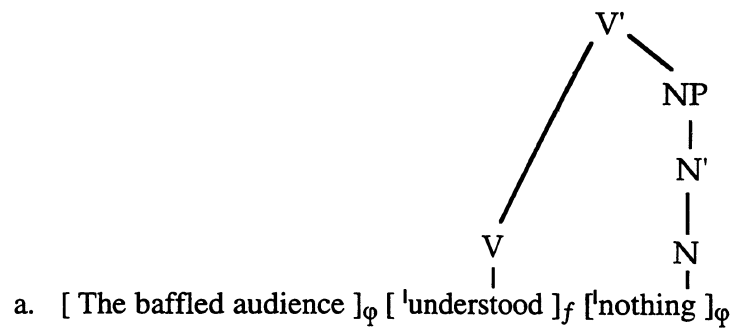
Now consider example (18). (18a) will phrase differently from (18b). The Rhythm Rule applies between the verb and its complement in (18a) but not in (18b), where the complement is branching.

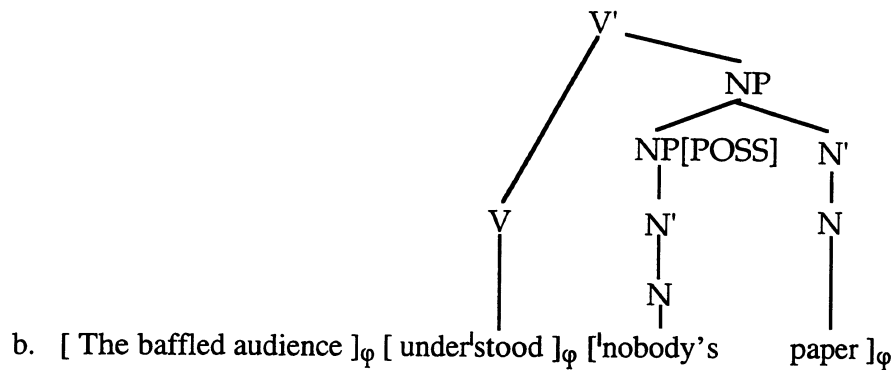
(18)



The same contrast obtains between (19a) and (19b):

(19)





This difference in the phrasing of the verb phrase follows from our algorithm, which is sensitive to the difference between branching and nonbranching nodes. NP and N« are the first branching nodes the algorithm encounters in its bottom-up application to the verb phrases in (18b) and (19b), respectively. Thus in both examples, the complement maps to a phonological phrase, leaving the verb to be phrased separately by the Elsewhere Clause. But in (18a) and (19a), the V« is the first branching node encountered. In these cases, the verb and complement phrase together.

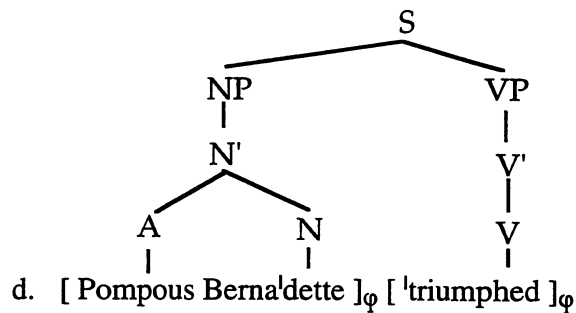
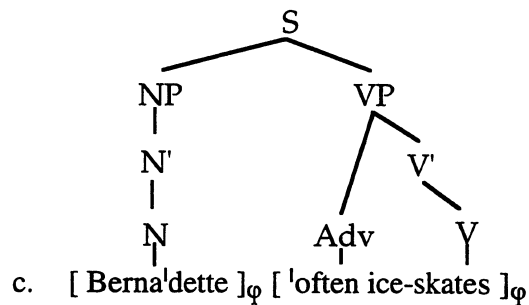
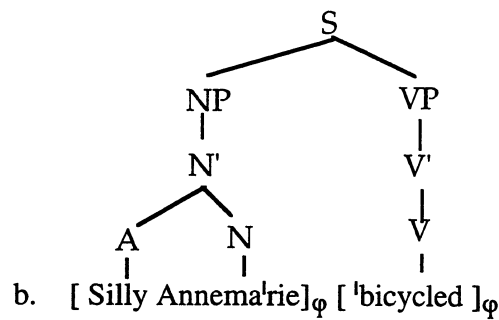
If a sentence has only a single branching node, our algorithm predicts that it should form a single phonological phrase. This is indeed the case, as is shown in (20) where the entire sentence is the domain of the Rhythm Rule.¹²

- (20) a. ['Annemarie 'bicycled]_φ
 b. ['Bernadette 'triumphed]_φ

If either of the two constituents in sentences like these were branching, they would phrase separately, and the Rhythm Rule would not apply across them:

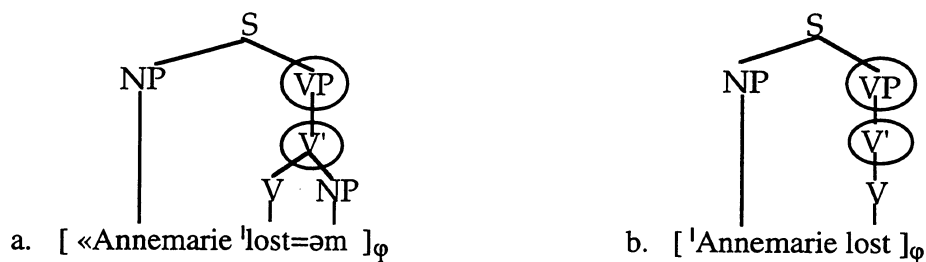
- (21)
-
- The diagram shows a syntax tree for the sentence "[Annema«rie]_φ ['never bicycled]_φ". The root node is S, which branches into NP and VP. NP branches into N', which then branches into N, leading to the word "Annema«rie". VP branches into Adv and V'. Adv branches to the word "never". V' branches into V, leading to the word "bicycled".
- a. [Annema«rie]_φ ['never bicycled]_φ

¹²Selkirk (1978) explicitly claims that the Rhythm Rule does *not* apply between the subject and the following verb, but tests this claim only on sentences where neither element bears the nuclear stress, which seems to play an essential role in the functioning of this rule. In (20) nuclear stress falls on the verb.

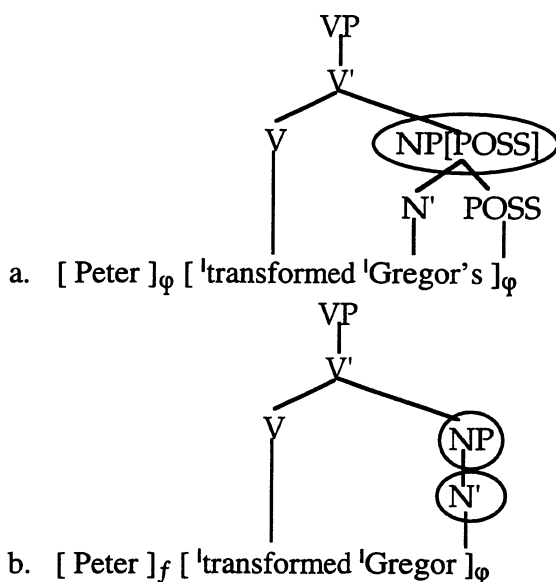


The definition of 'branching' is crucial to our syntax-sensitive algorithm. But it does not yield to any formulation in solely syntactic terms. While, as far as we know, syntactic branching is always necessary, it is not sufficient: in particular, clitics contribute to syntactic branching but are not sufficient to trigger the Branching Clause of the phrasing algorithm. The examples below illustrate XP's which are syntactically branching by virtue only of dominating a clitic. Note that the phrasing algorithm treats these (circled) XP's exactly as it would a nonbranching phrase: it phrases them together with the preceding material. This is demonstrated by the ability of the main stress on the first element of the righthand XP to trigger the Rhythm Rule on the preceding word.

(22)



(23)



We can explain the phrasing of these examples by defining branchingness in prosodic terms. Since clitics are incorporated into the phonological word containing their host, a syntactic constituent dominating only a clitic and host will dominate two syntactic elements — but only one prosodic element.¹³

(24) Syntactic structure Prosodic structure



The Branching Clause may thus be restated as follows:

¹³An ensuing prediction is that a syntactic terminal element which contained two phonological words would count as branching for purposes of phrasing. Such cases do exist in Serbo-Croatian (Zec and Inkelas 1990) but, as far as we know, are unattested in English.

- (25) **Branching Clause:** From the bottom up in a syntactic tree, build an obligatorily branching phonological phrase over adjacent phonological words that correspond to syntactic sisters

We have now motivated the existence of the phonological phrase in English on the basis of Rhythm Rule facts. What remains to be seen is whether this phrase will serve as the appropriate domain for the Final Stressing rule, which prevents function words from reducing. Of course, the account trivially gets the right result for utterance-final function words. Due to the Strict Layer Hypothesis and Exhaustive Parsing constraints of Selkirk (1984, 1986), being at the edge of an utterance entails being at the edge of the phonological phrase (as well as at the edge of any smaller prosodic domain we might define).

More interestingly, the phonological phrase algorithm also predicts that certain sentence-internal function words will be nonfinal in a phonological phrase, and, consequently, that these words will be subject to reduction. The reduced, non-phrase-final auxiliaries and prepositions in (26) bear this prediction out:

- (26)
- | | | |
|----|---|---------|
| a. | [Tom] _φ [ɪz complaining] _φ | (< is) |
| b. | [houses] _φ [fər sale] _φ | (< for) |
| c. | [Sarah] _φ [həz graduated] _φ | (< has) |
| d. | [talks] _φ [ɪn Malta] _φ | (< in) |

However, the algorithm does make one wrong prediction. This arises in cases where an auxiliary or preposition takes a branching complement.¹⁴ As we have seen, the phrasing algorithm will phrase all heads separately from a branching complement, and in the case of content word heads this prediction is supported by their failure to undergo the Rhythm Rule in this context (see e.g. (21a,b)). But the parallel analysis of function word heads leads to the incorrect prediction that function words should fail to reduce just in case their complement is branching. This is because any function word which phrases by itself would have to undergo Final Stressing. Yet, as the examples (27a-d) show, function words with branching complements do not behave in this manner, and in fact reduce quite freely. Because function words are always able to reduce if a sister follows, we analyze them as always phrasing with their sister, regardless of its internal branching, as shown in (27e-h).

¹⁴We are assuming, following Gazdar, Pullum and Sag (1982), and Gazdar et al. (1985), that auxiliaries are under V«, thus parallel structurally to prepositions for purposes of the phrasing algorithm.

- (27)
- | | | |
|----|---|---------|
| a. | Tom ɪz planting millet | (< is) |
| b. | arguments fər revisionist history | (< for) |
| c. | Sarah həz left college | (< has) |
| d. | talk ɪn highest secrecy | (< in) |
| e. | [Tom] _φ [ɪz planting millet] _φ | |
| f. | [arguments] _φ [fər revisionist history] _φ | |
| g. | [Sarah] _φ [həz left college] _φ | |
| h. | [talk] _φ [ɪn highest secrecy] _φ | |

In obligatorily phrasing with complements, function words differ from content words. The phrasing algorithm will therefore need to be made sensitive to the function/content word distinction.

There are several ways in which the necessary amendment could be stated. One possibility is to make the algorithm sensitive to lexical category (see e.g. Nespor and Vogel 1986:168-9). But this not only repeats conditions on what categories fail to undergo lexical rules; it also violates constraints on the range of syntactic information available to phrasing algorithms (Selkirk 1986, Zec and Inkelas 1990). A less direct way of encoding function word status is by means of phonological information. For example, function words lack stress at an early stage in the postlexical component, and this property could serve as the distinguishing mark of function words. A problem, however, with conditions of this sort is that the presence or absence of metrical structure (stress) is derivative from the presence or absence of prosodic structure, since rules assigning the former depend on the presence of the latter. Furthermore, Zec and Inkelas (1990) have proposed that interactions between syntax and phonology should be limited to constraints on syntactic and prosodic constituency, to which metrical structure does not belong. Since presence vs. absence of phonological word structure underlies the stress differences between content and function words, we thus propose to take it as the basic distinction between them for the purposes of the phrasing algorithm. At the stage at which the phrasing algorithm applies, function words lack prosodic constituency.¹⁵ This not only prevents function words from being phrased by the Branching Clause, but also preserves

¹⁵Our claim is consistent with Selkirk's (1984) Principle of the Categorical Invisibility of Function Words (p. 315), where only the content/function word distinction — but not differences in category among the set of function words — is accessible to the phonological component.

their identity for purposes of the needed additional clause, which can be phrased as follows:¹⁶

- (28) Adjunction Clause: phrase a terminal element which lacks phonological word structure together with its immediate sister.

Since the sisterhood condition in (28) is always satisfied for determiners and complementizers, we correctly predict that they always phrase to the right, and are always free to reduce:

- (29) ... NP[ðə poisonous snakes ... (<the)

- (30) ... sː[ðæt poisonous snakes ... (<that)

Similarly, auxiliaries pattern with prepositions in phrasing with a complement to the right, as in the examples we saw earlier:

- (31) ... vp[ɪz planting millet .. (< is)

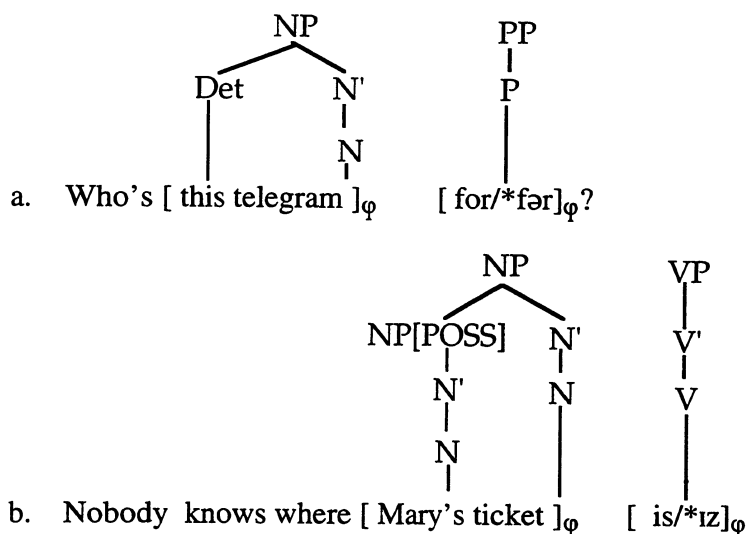
- (32) ... pp[fər health reasons ... (< for)

The Adjunction Clause is inoperable in just one environment, namely in cases where a function word lacks a syntactic sister by virtue of dislocation. In such cases the Elsewhere Clause assigns the function words to their own phrase by default. This is consistent with the failure of these function words to reduce:¹⁷

¹⁶Selkirk (1978), and later Hayes (1989), also propose that function words always phrase with their sister. The phrasing algorithm presented here accounts for the additional case in which no sister node is present.

¹⁷We suppress the structure of the possessive element in (33b), as, due to its clitic status, it does not affect the phrasing algorithm. See Appendix 1 for more discussion of cliticization.

(33)



Because *for* is not a phonological word, the Branching Clause will not group *for* with the material on its left in (33a). The only available means for phrasing the preposition is the default Elsewhere Clause, which maps it into its own phrase. (33b) is phrased in a similar manner.

Below is the final version of the Phonological Phrase Algorithm, followed by Default Phonological Word Mapping, and the Final Stress Rule.¹⁸ Together these constitute our account of function word reduction in English.

¹⁸A few comments are in order as to why we have opted for this configuration-based algorithm over others which exist in the literature. The relation-based algorithm proposed in Nespor and Vogel (1982, 1986) systematically phrases subjects apart from the rest of the sentence. This is an incorrect prediction, but is unavoidable for algorithms that, like Nespor and Vogel's, rely on head-complement relations for phrasing. Such dependence necessarily introduces a subject/nonsubject asymmetry. The end-based algorithm of Selkirk (1986) (see also Selkirk and Shen 1990), which is sensitive only to the borders of constituents of particular bar levels, cannot capture in any intuitive fashion the relevance of branching to phonological phrasing. One option would be to follow Bickmore (1990), and enrich syntactic brackets with the diacritic feature [+branching]. While this proposal will cover the facts, it is a back door means of introducing information about the geometry of the syntactic configuration, to which end-based algorithms are by nature insensitive. Our algorithm overcomes these difficulties by applying in a bottom-up fashion, sensitive to both branchingness and prosodic structure — but not directly to head/complement relations, nor to edges. See Inkelas (1988) for a similar algorithm for Hausa, and Cho (1990) for further discussion of the differences between relation-based, edge-based, and configuration-based algorithms (such as ours).

- (34) Phonological Phrase Algorithm:
- a. Branching Clause: From the bottom up in a syntactic tree, build an obligatorily branching phonological phrase over adjacent phonological words that correspond to syntactic sisters
 - b. Adjunction Clause: phrase a terminal element which lacks phonological word structure together with its immediate sister
 - c. Default Clause: Map any terminal element left unphrased by the other clauses into a phrase of its own.
- (35) Default Phonological Word Mapping: $X^0 \rightarrow [X^0]_{\omega}$
- (36) Postlexical Footing: Within a stressless phonological word, build an obligatorily binary foot with the right node labeled *s* if and only if it branches.
- (37) Final Stress Rule: Build a foot on a final phonological word that lacks metrical structure.

Note the apparent extrinsic ordering of the Phonological Phrase Algorithm and Default Phonological Word Mapping. In fact, (35) and the Default Clause of (34) can be subsumed under a general elsewhere principle whereby prosodic structure will be supplied by default to phonological material that has failed to receive it by more specific means. This scenario might appear to violate the Strict Layer Hypothesis (Selkirk 1984), in that it allows syntactic terminals to be included into a phonological phrase but not a phonological word. However, it is still consistent with a weaker version of the Strict Layer Hypothesis which would require well-formedness only at the end of the derivation, since all terminal elements will eventually be assigned phonological word status by virtue of the postlexical mapping algorithm proposed earlier.¹⁹

In the first half of the paper, we have accounted for the straightforward cases of phrasing and auxiliary reduction in English. We turn now to cases in which failure of auxiliary reduction has been attributed directly to empty categories. These cases can be divided into two types: those which are taken care of by our phrasing algorithm alone, and those requiring some further refinement. We start with cases of the latter type.

¹⁹In fact, Selkirk and Shen (1990) have proposed that the mapping of function words into phonological words in a similar situation in Shanghai is a direct result of the Strict Layer Hypothesis and Exhaustive Parsing. For them, any string which belongs to a phonological phrase but is not parsed into phonological words will automatically be accorded phonological word status if adjacent to a phonological phrase edge. However, their account of Shanghai would have one undesirable consequence if applied to English, which is that any contiguous string of function words included into a single phonological phrase would incorrectly be grouped into a single phonological word. That this is not true in English, and that we need a specific mapping relating syntactic terminals to phonological words, is demonstrated by the behavior of adjacent monosyllabic function words. As we saw earlier in (12), the stress pattern exhibited by two such words differs crucially from the stress pattern of a disyllabic function word in the same context.

6. Special Effects on Phrasing

In any discussion of auxiliary reduction, a particular set of constructions always springs to the forefront: Pseudo-Gapping and comparative constructions.

- (38) a. Tom is planting millet, and Lisa is/**ɪz* ... peanuts
 b. Karen is a better detective than Ken is/**ɪz* ... an archeologist

The failure of auxiliaries to reduce in these cases has consistently been handled by placing a special condition on the auxiliary reduction rule (e.g., Bresnan 1973, 1978a, 1978b, Kaisse 1985). In terms of our analysis, that would translate to a special condition on the Final Stress Rule.

We also acknowledge the special status of these constructions, but handle them in a different manner, attributing their uniqueness not to the Final Stress Rule itself, but rather to the special phonological phrasing they induce. Our argument will be that these constructions all involve syntactic dislocation; and that syntactically dislocated elements have the focus-like property of having to be phrased independently in the phonology.

Our evidence for this treatment of Pseudo-Gapping and comparatives is primarily motivated on syntactic grounds. We will thus begin by arguing for the dislocation analysis on that basis, subsequently demonstrating its relevance for prosodic constituency, and for auxiliary reduction.

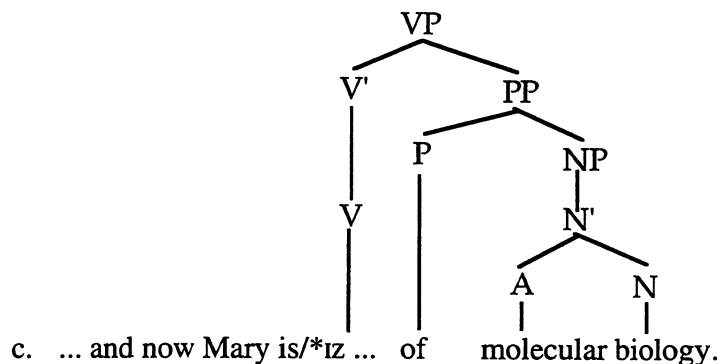
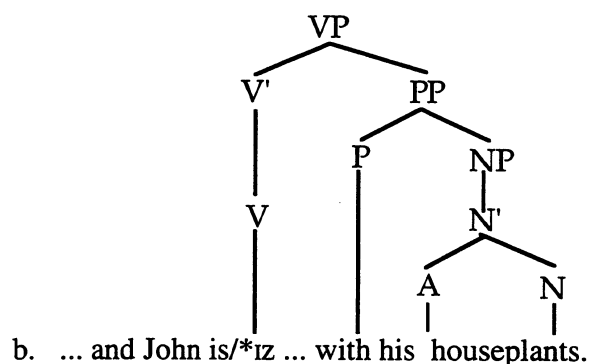
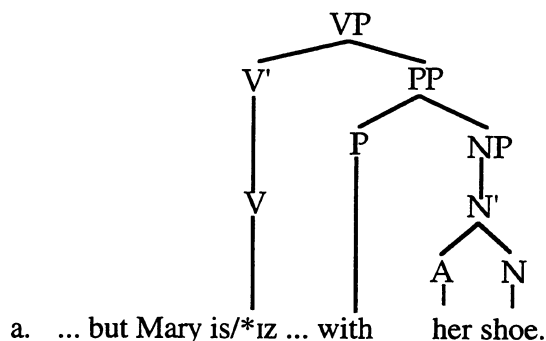
6.1 Pseudo-Gapping

Pseudo-Gapping is the name given to coordinated constructions in which some material is omitted immediately following an auxiliary in the second conjunct (Sag 1976). The relevance of this construction to our analysis is that the ‘stranded’ auxiliary systematically fails to reduce:

- (39) a. John is hammering nails with a tack hammer but Mary is/**ɪz* ... with her shoe.
 b. Mary is happy with her work, and John is/**ɪz* ... with his houseplants.
 c. John was a student of philosophy, and now Mary is/**ɪz* ... of molecular biology.

We propose to handle the cases of Pseudo-Gapping by assuming that the second conjunct contains a constituent which is ‘dislocated’ from its ‘source position’ and represented as a sister of the highest V^1 — that is, as a daughter of the finite VP.

(40)



Such an analysis is a radical departure from standard views which treat Pseudo-Gapping simply as deletion (e.g., Sag 1976, Neijt 1979). We must assume some sort of ellipsis also, of course. Our innovation lies rather in the hypothesis of concomitant dislocation, for which syntactic evidence is readily available. First, note that the 'dislocation path' can potentially include several levels of embedding:

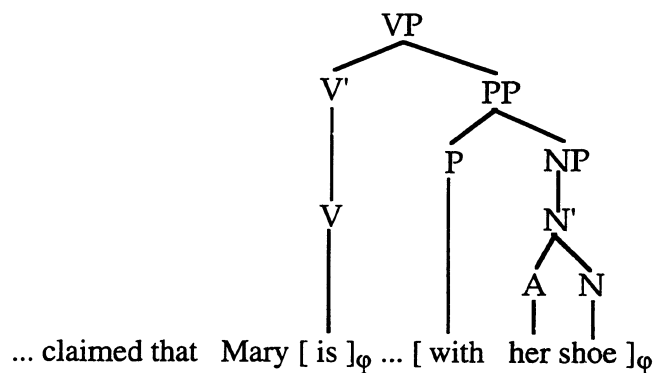
- (41)
- Mary is happy with her work, and we read that John is ... with his houseplants.
 - John is a proponent of deconstructionism, and Bill revealed that Mary is ... of connectionism.

A prediction our analysis makes is that the dislocation should be subject to subjacency constraints. And this is exactly what we find; the sentences in (42) both contain a violation of subjacency (by virtue of the NP dominating the clause containing the omitted material), and are therefore ungrammatical:

- (42) a. *Mary is happy with her work, and we read the report that John is ... with his houseplants.
 b. *John is a proponent of deconstructionism, and Bill revealed the fact that Mary is ... of connectionism.

If we assume that dislocated constituents always begin a new phonological phrase, we can then account for the reduction failure in (39) without making any further statements. An auxiliary preceding such a constituent will always be phrase-final, and will therefore fail to reduce in the usual manner. The structure of the relevant part of (39a) is shown in (43). The Adjunction clause will not apply to the stranded auxiliary because, due to ellipsis and dislocation, it has no sister:

(43)

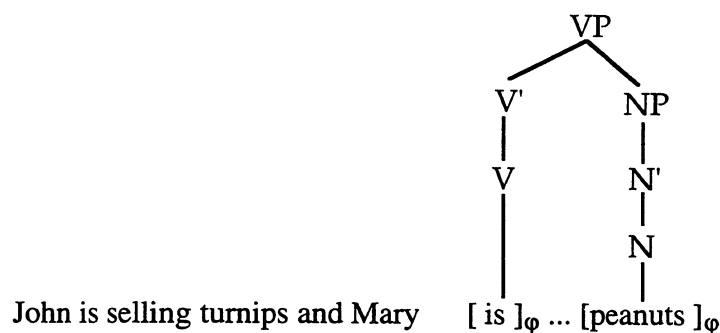


The correlation of dislocation with a phonological phrase break is consistent with cross-linguistic evidence that dislocated constituents generally place special conditions on phonological phrasing. A typical effect is the inducement of an otherwise unexpected phrase boundary, as in Korean (Cho 1990) and Serbo-Croatian (Zec and Inkelas 1990).²⁰

In the case where auxiliaries immediately precede a dislocated constituent, our Phonological Phrase Algorithm actually makes the right prediction, namely that the auxiliary will fail to reduce; since it is not a phrasal sister of the auxiliary, the dislocated constituent will phrase separately, and the auxiliary will end up in phrase-final position.

²⁰Contrastive focus has also been observed to affect phonological phrasing in a number of cases (e.g. Hungarian (Vogel and Kenesei 1987), Chichewa (Kanerva 1990), Shanghai (Selkirk and Shen 1990)). However, we are dealing here only with the prominence associated with dislocation, and avoid the issue of contrastive focus.

(44)



However, the phonological phrasing of this and other examples of Pseudo-Gapping is not sufficient to handle another phonological property that they exhibit, namely the intonational effects in the second conjunct. Both the auxiliary in (44) and the dislocated constituent possess a distinct intonational melody, and the two are set off by pause — suggesting that they form distinct intonational phrases. But nothing we have said so far leads to this result.

One possibility would be to stipulate in some fashion that the dislocated constituent introduces an intonational phrase break. This would be consistent with the auxiliary reduction facts we have observed, since, due to the Strict Layer Hypothesis (Selkirk 1984, see also Selkirk and Shen 1990, Condoravdi 1990), every intonational phrase break corresponds to a phonological phrase break.

We have argued elsewhere that Heavy NP Shift, another dislocation construction in English, requires the dislocated NP to correspond to a single intonational phrase. This captures both the intonational effects associated with Heavy NP shift, and also the requirement that the dislocated NP have branching prosodic structure, that is, that it must include at least two phonological phrases (Zec and Inkelas 1990). This analysis can be extended to Pseudo-Gapping if we associate with the dislocation construction the requirement that the dislocated element correspond to a intonational phrase. (Unlike in Heavy NP shift, however, there is no minimal size requirement on this phrase.)

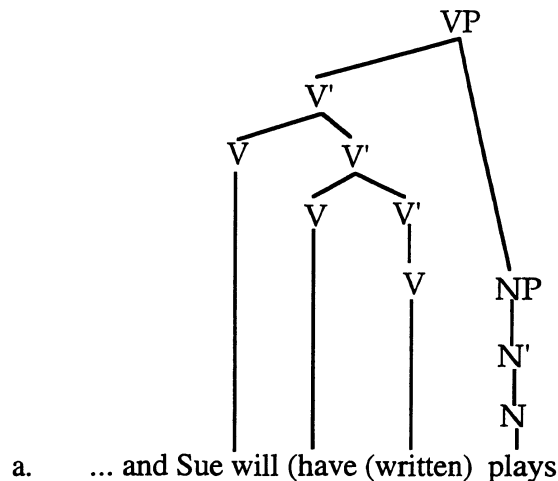
6.2 Dislocation and VP Ellipsis

This general account has a further consequence for the syntactic characterization of gapped constructions in general, including both Gapping and Pseudo-Gapping. Consider the following sentences:

- (45) a. Mary will have written novels, and Sue will have ... plays.
 b. Mary will have written novels, and Sue will plays.

On the assumption that the auxiliary is under VP (Gazdar, Pullum, Sag 1982, Gazdar et al. 1985), the material which can be 'omitted' from the second conjunct obtains a natural characterization: it corresponds to a V«, as shown in (46):

(46)



In other words, our analysis makes it possible to make the well-known phenomenon of VP (or V') deletion solely responsible for the ellipsis in the second conjunct of gapped constructions. Thus our analysis resolves the longstanding puzzle presented by Pseudo-Gapping, namely that the omitted material looks suspiciously like a V' whose final constituent somehow escapes deletion. In past analyses this has led to the characterization of the deleted material in terms of variables with no required constituency (Sag 1976). If our analysis is correct, it will remove the need for this unappealing characterization.²¹

Pseudo-Gapping is closely related to another construction, Gapping. The difference lies in the fact that in Gapping constructions, no auxiliary remains in the second conjunct:

(47) Mary will have written novels, and Sue ... plays.

²¹This general analysis will require some refinement, of course, in order to account for cases in which the elided material corresponds to an AP or an NP, as in the examples below:

- i. Mary is happy with her work, and John is/*^z ... with his houseplants.
- ii. John was a student of American structuralism, and now Mary is/*^z ... of connectionism.

One possible approach is that taken in Gazdar, Pullum, and Sag (1982), where they characterize the predicative character of these constituents by assigning them a V« mother. A slightly different move is made in Gazdar et al. (1985), where the feature [+PRD] is assigned directly to those APs and NPs used predicatively. We do not take a position here as to which alternative is preferable, since both provide a unique characterization of the material subject to ellipsis.

needed phonological phrase break. And in fact, Gapping constructions exhibit the same intonational effects that we find with Pseudo-Gapping (see e.g. Selkirk 1984).

Following the same approach that we took with Pseudo-Gapping, we will thus assume that the constituent to the right of the omitted material in Gapping constructions is also dislocated, and hence belongs to an intonational phrase of its own. By the Strict Layer Hypothesis, the intonational phrase break to the left of the dislocated constituent induces a phonological phrase break, explaining the failure of the Rhythm Rule to apply in (49).²² And the analysis it makes correct syntactic predictions as well. As with Pseudo-Gapping, Gapping constructions exhibit long-distance effects. The following sentences show that the depth of embedding of the interpreted source constituent is in principle unbounded:

- (50) Alphonse wanted to endorse Dukakis, and Annabelle ... Bush.

Island constraints, however, obtain as usual.

- (51) *Alphonse expressed the desire to endorse Dukakis, and Annabelle ... Bush.

We are now able to characterize Gapping and Pseudo-Gapping as exactly the same syntactic phenomenon: both are instances of VP ellipsis. Further, the dislocation analysis provides an explanation for their prosodic properties, which follow directly from the syntactic ones.

6.3 Comparatives

A second construction with special reduction effects is a certain subtype of coordinated comparatives (Napoli 1983). This is the class characterized by Bresnan (1973, 1977) as involving Subdeletion:

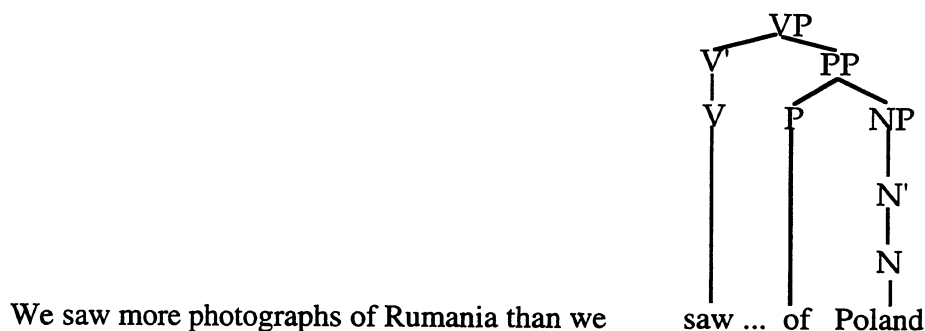
- (52) a. Mary is/iz a better lawyer than Sue is/*iz a doctor.
 b. Bill is/iz shorter than John is/*iz tall.
 c. Mary is/iz as smart as Bill is/*iz devious.
 d. There is/iz more of Mary's couscous than there is/*iz of Bill's egg salad.

²²We have two other options. One is to say that the dislocation construction requires the dislocated element to correspond only to a phonological phrase. This handles the failure of a preceding auxiliary to reduce, but leaves unaccounted for the special intonational effects of Pseudo-Gapping and Gapping. Our other option is to impose a condition not on the dislocation construction itself but on one of the phrasing algorithms (either the phonological phrase or the intonational phrase algorithm), to the effect that any dislocated constituent will be phrased separately. But this would incorrectly predict that all dislocation constructions should have the same prosodic properties. The contrast between Heavy NP Shift, where the dislocated constituent must be prosodically branching, and Pseudo-Gapping and Gapping, where no weight requirements obtain, shows that this is false.

As in the case of Pseudo-Gapping, these sentences are of interest to us because the auxiliary fails to reduce (Bresnan 1973), even though the phrasing algorithm would not place a phonological phrase boundary to its right.

We analyze these comparatives as cases of some type of ellipsis, with concomitant dislocation, thus making them parallel to Pseudo-Gapping:

(53)



Dislocation is supported in the case of comparatives by exactly the same types of arguments that we invoked earlier to motivate the analysis for Pseudo-Gapping. As noted by Bresnan (1977), the compared constituent exhibits long-distance effects:

- (54)
- a. We have dismantled more warheads than they have ... missiles.
 - b. We have dismantled more warheads than the news reported that they have ... missiles.
 - c. We have dismantled more warheads than we expect them to announce that they have ... missiles.

Thus the dislocated constituent *missiles* can be related to a source position whose depth of embedding is practically unbounded. The one restriction on this embedding comes from subadjacency; as shown by Bresnan (1977), embedding the source constituent within a complex NP results in ungrammaticality:²³

- (55) *We have dismantled more warheads than we expect the announcement that they have ... missiles.

Further, by locating the compared constituent as daughter of the finite VP, we obtain a natural characterization of what material may be 'omitted' by the so-called Comparative

²³Our proposal differs from Bresnan's in the structural position of the compared element: while Bresnan leaves this constituent in what we refer to as its source position, we treat it as a dislocated constituent, that is, the daughter of the finite VP.

Deletion: the missing material is always a constituent. In the following examples it is always a V«.

- (56) a. Mary has written more novels than Sue has ... plays.
 b. Mary will have written more novels than Sue will have ... plays.
 c. Mary will have written more novels than Sue will plays.

This analysis correctly excludes the ill-formed sentences in (57), precisely because the missing element is not a (nonterminal) constituent:

- (57) a. *Mary has written more novels than Sue ... written plays.
 b. *Mary has written more novels than Sue plays.

To sum up, we are able to reanalyze an apparent case of non-constituent deletion — precisely the move we made earlier in the case of Pseudo-Gapping. This analysis explains a further similarity between the two constructions, namely the reduction effects. The assumption that, in Comparative Deletion as well as in Pseudo-Gapping, the dislocated element forms its own prosodic constituent is consistent with the inability of the auxiliary on its left to reduce:

- (58) Mary is a better lawyer than Sue [is]_φ ... [a doctor]_φ

In all the above cases the dislocated material immediately follows an auxiliary element, and we used the failure of reduction of this element to diagnose phrasing. But for those cases where there is no auxiliary in the second conjunct, we have another test for phrasing: the Rhythm Rule. Our phrasing account predicts that no word immediately preceding the dislocated constituent will ever be subject to the Rhythm Rule. This turns out to be correct:

- (59) a. John gave Eleanor more pancakes than he gave Annema¹rie/ *¹Annemarie
 [muffins]_φ
 b. The dog buried more bones than the anthropologist un¹earthed/ *¹unearthed
 [treasures]_φ

In our analysis of Pseudo-Gapping and comparatives, dislocation and ellipsis have always gone hand in hand. If their correlation is indeed perfect, a temptation might be to give up the relatively abstract dislocation analysis and try to account for the associated reduction facts (or special phrasing) solely in terms of ellipsis, possibly by making reference to the trace of the omitted material. In fact, however, dislocation and ellipsis are

independent phenomena. The typology in (60) illustrates the four logical possibilities they engender:

(60)	VP Ellipsis	Dislocation <i>Gapping, Pseudo-Gapping</i> <i>Comparative Subdeletion</i> <i>Marked intonation, failure</i> <i>of reduction, failure of</i> <i>Rhythm Rule</i>	No Dislocation <i>VP Deletion</i> <i>Comparative Deletion</i> <i>Function word reduction,</i> <i>Rhythm Rule operate as</i> <i>predicted by the phrasing</i> <i>algorithm</i>
	No VP Ellipsis		

A case where ellipsis, but not dislocation, has taken place would be an example of the well-known construction called VP Deletion:

- (61) Bernard is behaving well, but silly Rosamond isn't

Similarly, Comparative Deletion involves ellipsis of a VP from which no material has been dislocated:

- (62) a. Hannah has peeled more carrots than Brian has
b. Hannah has peeled more carrots than Brian

It is initially more difficult to imagine dislocation without ellipsis, but sentences of the type in (63) seem to be of exactly this sort. At least in certain discourse contexts, the auxiliaries in the following sentences do not reduce, even though they lack contrastive stress; this would follow from the phrasing that goes along with dislocation.

- (63) a. Jerry was always a sloppy housekeeper and now his son is, a neat one.
b. Nadine is overly arrogant, just as Eddie is, overly obsequious.

Note that these sentences exhibit a high degree of parallelism, often correlated with dislocation.

7. Empty Categories and Prosodic Structure

We have just argued in very general terms for our dislocation analysis of Pseudo-Gapping and Comparative constructions. However, examples just like these have been used to argue for the visibility of empty categories to phrase-level phonology. In certain sentence-internal positions we find exactly the reduction pattern that characterizes utterance-final position. This phenomenon has been attributed to the presence of extraction sites (King 1970, Lakoff 1970), or, more recently, to the presence of certain null elements immediately to the right of the unreduced function words (Bresnan 1973,

1978a, Kaisse 1985). For example, in the following sentence, Bresnan (1978a) ascribes the failure of the auxiliary to reduce to the presence of a gap on its right:

- (64) Mary is a better lawyer than Sue is/*IZ \emptyset a doctor.

On our account, which assumes dislocation in constructions like these, the reduction facts could be handled either by reference to gaps, or by attributing special phrasing properties to dislocated elements.

An apparent advantage to the gap account is that it extends to certain other cases of reduction failure. The failure of auxiliary reduction in the following sentence could also be attributed to the adjacent deletion or extraction site:

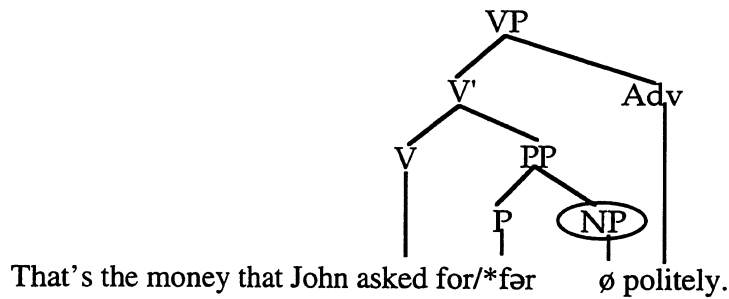
- (65) a. I don't know where the party is \emptyset tonight
b. John is annoyed and Bill is \emptyset too

Though these cases involve no dislocation of the kind that we associate with special phrasing properties, our account does in fact provide a straightforward characterization of them. They follow directly from the existing phrasing algorithm for English — an algorithm which, as we will show, is actually insensitive to empty categories altogether.²⁴

It is true, as far as we know, that in all cases in which a function word is irreducible (i.e. stressed), an empty category has been assumed to follow immediately. However, even these cases do not argue for the relevance of gaps per se in phonology. Consider, for example, the VP in the sentence in (66). The preposition will not be able to phrase with the material to either side. Because it lacks phonological word status, the Branching Clause cannot group it with the preceding verb; because it lacks a phrasal sister, the Adjunction Clause cannot group it with the following adverb. Only the Elsewhere Clause is applicable here. As a consequence, each element in the VP will be mapped into a phrase of its own. This is true independently of the fact that an empty category happens to precede the manner adverb.

²⁴ Selkirk 1984 also proposes to account for the failure of auxiliary reduction in what are assumed to be pre-gap positions without making any reference to empty categories. In her account of phonology-syntax interactions, couched within the framework of metrical grid structure, various degrees of syntactic juncture are represented in terms of metrical grids, subject to constraints on rhythmic well-formedness. Thus, auxiliary reduction is also accounted for in purely metrical terms, with no direct reference to syntactic categories, including the empty ones. Our analysis achieves the same result within the framework of prosodic phonology, with the advantage of accounting for a wider range of phenomena which have been taken to argue for the relevance of empty categories for phonological processes.

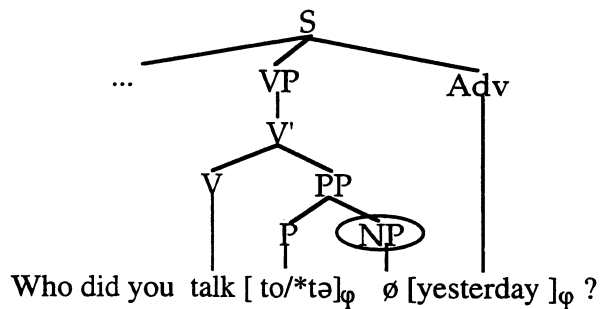
(66)



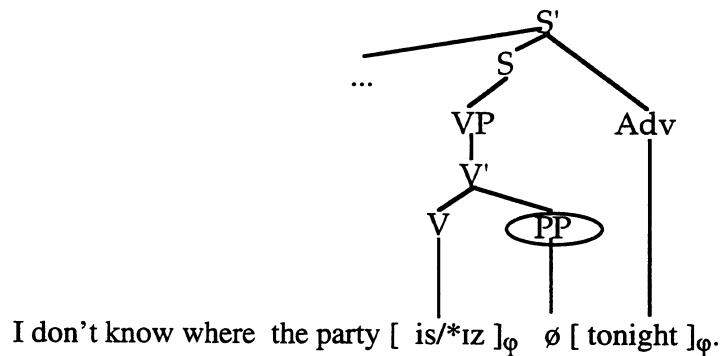
Thus, the failure of the preposition to reduce in (66) follows from the fact that, due to the geometry of the higher syntactic structure, it ends up at the end of a phonological phrase.

The same analysis holds generally for the following cases as well. In each, a function word fails to reduce in the environment of a gap. But in each case, our algorithm will phrase it separately from the following material purely by virtue of the fact that it lacks a (phonologically salient) phrasal sister to the right. The algorithm does not need to see the empty categories in order to produce the right results.²⁵

(67)

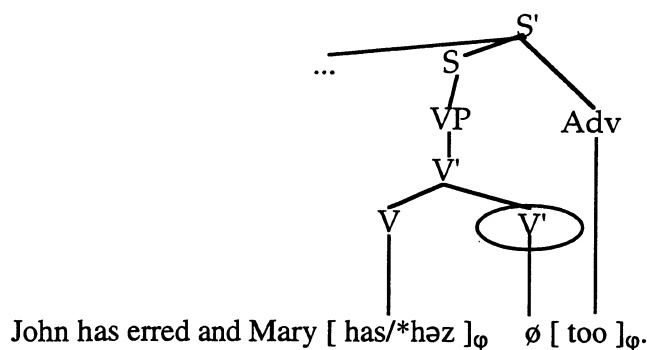


(68)

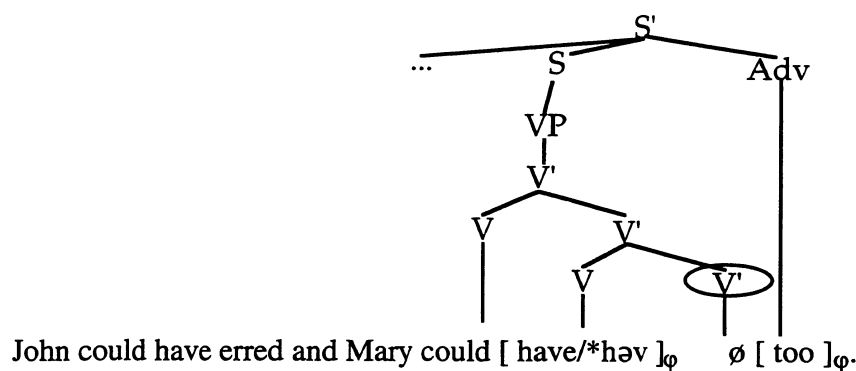


²⁵Note that the syntactic structure of the empty categories does not appear in the examples shown here; for convenience, we are representing only the material which the phrasing algorithm can see.

(69)



(70)



In none of these cases does the function word have a phrasal sister. Thus in (70), the Elsewhere Clause of the algorithm phrases the auxiliary *have* and the adverbial *too* separately. The auxiliary ends up in phrase-final position; and the subsequent application of the Final Stress Rule explains reduction failure in this environment.

Note that in these sentences, we have located the sentential adverb as a daughter of a node higher than S. This is in order to account for why sentential adverbs never phrase with the preceding material. In the cases we have just been examining, the sentence adverb is always preceded by an auxiliary, with which the Adjunction Clause will never phrase it anyway. However, we can tell from cases in which the auxiliary is replaced by a content word that the phrasal isolation of sentential adverbs is a more general phenomenon.

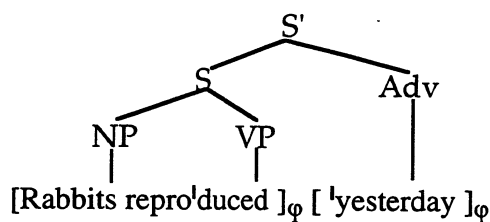
Consider, for example, the sentence in (71). Here, the NP and VP are nonbranching, so that the S dominating them is the first branching node encountered by the algorithm. The S will consequently be mapped into a phonological phrase by the Branching Clause. If the (nonbranching) sentential adverb were also a daughter of S, we would predict it to

phrase with its sisters, the NP and VP; that this is wrong is shown by the failure of the Rhythm Rule to apply between *reproduced* and *yesterday*:²⁶

(71) Rabbits repro«duced «yesterday

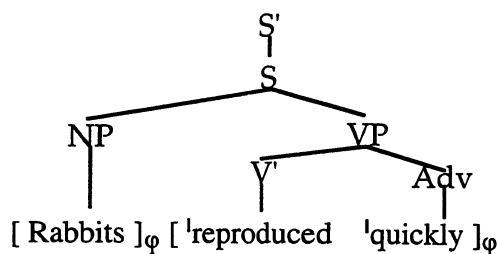
The correct phrasing for this sentence is shown below:

(72)



By contrast, if the sentential adverb *yesterday* were replaced by the VP adverb *quickly*, the two would phrase together by the Branching Clause of the algorithm. This is confirmed by the application of the Rhythm Rule in such contexts:

(73)



Thus, in a sentence consisting of a nonbranching NP, a nonbranching VP, and a sentential adverb, we find the Rhythm Rule applying only between the first two words (e.g. «*Annemarie bicycled yesterday*»), as our algorithm predicts, but never between the second and third. Evidence that this is due to the higher attachment of sentential adverbs, rather than some binary condition on what may be phrased together by the Branching Clause, comes from comparison to double object constructions, where the possibility of

²⁶N. Hornstein points out that sentences such as the following are problematic for this account under the assumption that it is a VP which is being fronted:

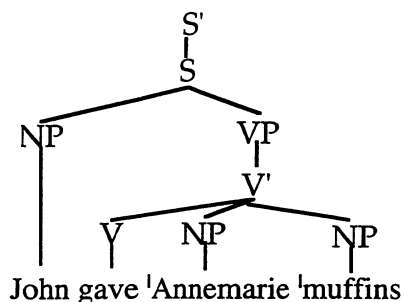
- i. John said he would leave school on Tuesday, and leave school on Tuesday he did

However, the following sentence strongly suggests that something else is going on:

- ii. Next month John says he will retire, and retire next month he will

three nonbranching sisters arises (Gazdar et al., 1985). In such cases, the Rhythm Rule does apply between the second and third word:

(74)



Thus the prediction of our Branching Clause, that any number of nonbranching sisters will phrase together, appears to be correct. The only way to prevent nonbranching sentential adverbials from ever phrasing with the material under S is, therefore, to attach them at a level higher than S. We have assumed for present purposes that the relevant higher node is S«, but leave the question open.

Crucial to our argument that empty categories are not accessed by the phonology is evidence that reduction failure is only partially correlated with the presence of gaps.

Consider the following sentences, each of which contains the by now familiar auxiliary-gap sequence:²⁷

(75) I don't know how much water there is/iz ø left in the tank.

(76) There is/iz ø standing on my foot a 300 pound gorilla.

In (75) the dislocation is due to wh-movement, and in (76) to what is known as Heavy NP Shift.²⁸

In both sentences an auxiliary is immediately followed by a gap, yet is able to reduce, showing that no implication holds between the presence of a gap and the obligatoriness of stress on the word to its left. This is a serious problem for the gap analysis. Cases of this sort are what distinguish the predictions of the gap analysis from those of our phrasing algorithm.

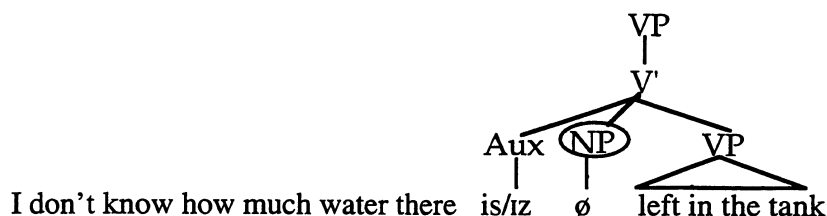
Our phrasing algorithm makes the right predictions for these sentences. Because the auxiliary in each sentence has a phrasal sister, the Adjunction clause of the algorithm is

²⁷We are grateful to Ivan Sag for bringing these examples to our attention.

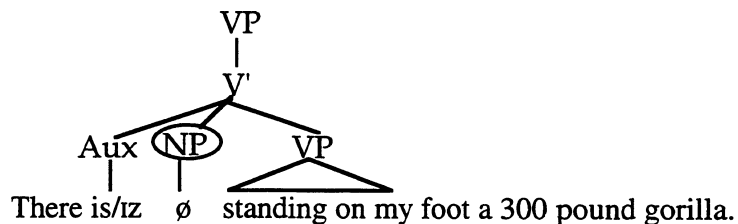
²⁸Note in confirmation that the sentence **There is standing on my foot a gorilla* is ill-formed precisely as a result of insufficient weight of the dislocated NP.

invoked — grouping the auxiliary together with the material on its right. As a consequence it fails to undergo the Final Stress Rule and is able to reduce, despite the presence of a deletion site to its right. The reason our account succeeds here is that it is sensitive not to the *presence* of a gap following a function word, but to the *absence* of a complement to that function word. This subtlety is crucially illustrated by the difference between the sentences in (75)-(76), whose syntactic structures are shown in (77)-(78), and those in (79)-(80). All of these sentences contain auxiliaries followed immediately by a gap. In (79) and (80), the gap corresponds to the only argument of the verb. By contrast, in the sentences in (77)-(78), an argument still remains in the V« containing the gap. Only in (77)-(78) is the Adjunction Clause triggered; only in these sentences is auxiliary reduction possible.

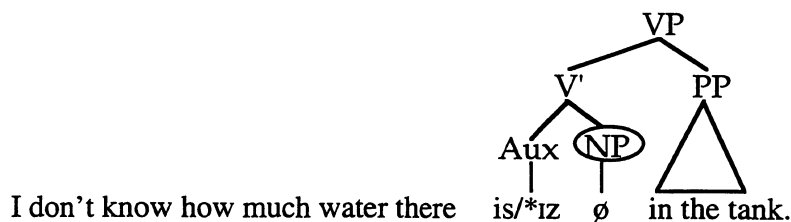
(77)



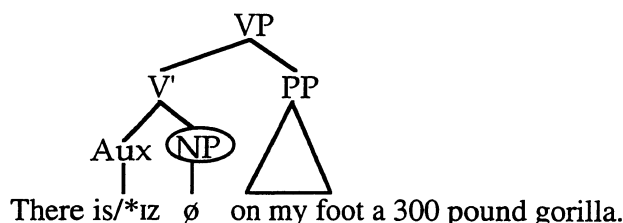
(78)



(79)



(80)

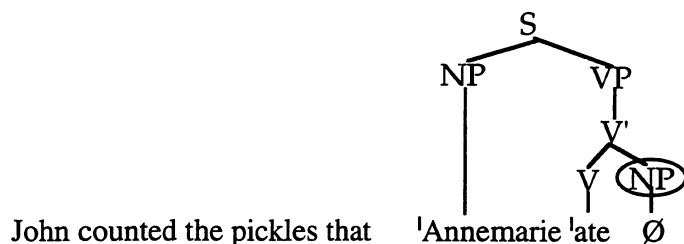


The expression following the auxiliary is an adjunct in the (79)-(80) sentences, and therefore does not form a constituent together with the Aux node. Thus, only in (77)-(78) does the Adjunction Clause find a phrasal sister with which to group the function word.

This discussion suggests a different perspective on the effect of empty categories on prosodic phonology. Simply put, there is no effect of empty categories on prosodic phonology. Empty categories, under the assumption that they are present to begin with, affect phrasing because they pare down the arboreal configuration of structures which the phrasing algorithm operates on. Thus it is not the presence of empty categories that explains effects on phrasing, but rather the absence of prosodically relevant branching they can induce.

This is just the perspective we will argue from. In its account of a number of additional cases, the phrasing algorithm systematically shows itself to be insensitive to gaps — and, in fact, to any higher structure dominating only empty material. For evidence we return once more to the Rhythm Rule. Consider the sentence in (81):

(81)



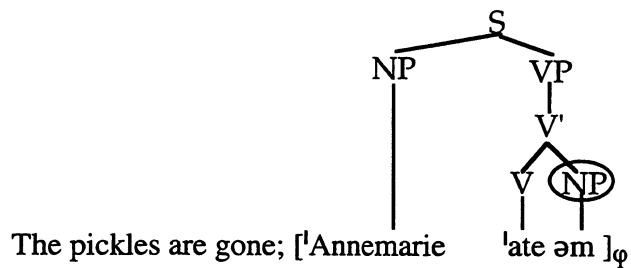
If our phonological phrasing algorithm were sensitive to the gap, it would treat the V« node as branching. *Annemarie* and *ate* would then phrase separately. The fact that they do not is indicated by the application of the Rhythm Rule between these two items. We conclude, therefore, that our algorithm is sensitive only to those syntactic constituents that have representation in prosodic structure (i.e. dominate phonological words); thus, the algorithm treats as branching just those syntactic constituents which correspond to

more than one phonological word.²⁹ The relevant part of (81) will consequently phrase as in (82):

(82) ... the pickles [that 'Annemarie 'ate \emptyset]_φ

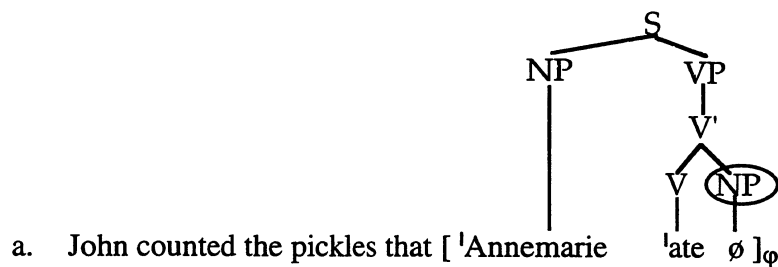
There is another class of syntactic terminal elements, besides gaps, which lack prosodic salience: clitics. Significantly, clitics also fail to figure into the computation of branchingness for purposes of the phrasing algorithm, as seen earlier:

(83)

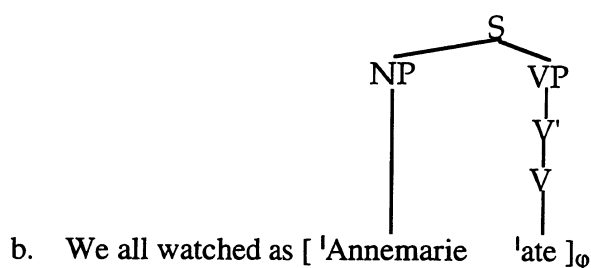


Although the righthand VP in (83) is syntactically branching, the algorithm treats it as parallel to the (prosodically) nonbranching VP's in the examples in (84). Whether the verb has a clitic object, a missing object, or no object at all, the algorithm will systematically phrase it with a nonbranching sister to the left, in these examples the subject:

(84)



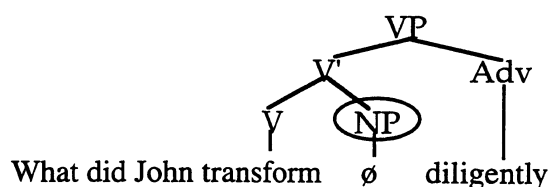
²⁹Analyses of other languages have also suggested that phonological phrasing is insensitive to empty categories; see e.g. McHugh (1987) for Chaga, Bickmore (1990) for Kinyambo, and Halpern (1990) for Hausa.



The fact that clitics pattern with null elements in not contributing to prosodic branching follows from the analysis of clitics in Inkelas (1989), where clitics are treated as prosodically dependent elements which are obligatorily incorporated into an adjacent phonological word.³⁰ This again goes to show that it is not the presence of gaps that is relevant to the phrasing algorithm, but their lack of prosodic structure: this is the only formal property they have in common with clitics, and is the only perspective from which verbs with clitic objects, verbs with null objects, and intransitive verbs form a natural class.

Another example where gaps need to be invisible to phrasing is (85). Here, $V\ll$ is syntactically branching. If our algorithm were sensitive to gaps, it would assign phonological phrase status to the material under $V\ll$. But as in the previous example, this does not occur; the first branching node relevant to the algorithm is VP, as shown by the application of the Rhythm Rule. The phrasing we obtain is that in (86).

(85)

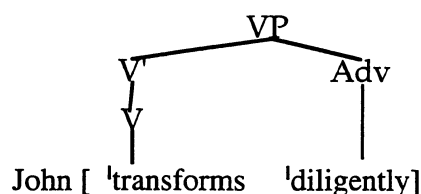


(86) What did John [h transform \emptyset h diligently] $_{\phi}$

³⁰The invisibility of clitics to the phrasing algorithm is also consistent with the proposal of Hayes (1989) (see also Nespor and Vogel 1986) that clitics join with an adjacent word into the Clitic Group, a prosodic category higher than the phonological word but lower than the phonological phrase. On such accounts the branchingness of a phonological phrase would be defined in terms of the Clitic Groups that it dominates. However, we have argued elsewhere against the Clitic Group per se, and in favor of incorporating clitics into a prosodic constituent of the same category as their host — in the case of English, the phonological word (Inkelas 1988, Zec 1988, Inkelas 1989, Zec and Inkelas 1990).

A verb followed only by an empty category in V« patterns with an intransitive verb:³¹

(87)



Here as in all previous cases, prosodically salient, prosodically nonbranching syntactic sisters will be phrased together by the Branching Clause of the phrasing algorithm, regardless of the presence or absence of intervening nonprosodic material.

While it is possible to condition the algorithm such that it systematically overlooks empty categories, another, simpler alternative does come to mind, which is to question the very presence of these entities in the structure. Whether empty categories are filtered out at some surface level, or whether they never get introduced into the structure to begin with (see Steedman 1990), is an issue outside the scope of this paper. However, we hope to have shown that empty categories are dispensable in at least one component of the grammar.

8. Concluding Remarks

The aim of this paper has been twofold: to develop a descriptively adequate account of the range of facts falling under the general rubric of function word (or, auxiliary) reduction in a model in which phonology does not make direct reference to syntax; and to examine the putative relevance of empty categories for this set of phenomena, and for the phonology-syntax interaction in general. Our conclusion is that once the data are properly classified, the complex phenomenon of reduction in English yields itself to a simple account in a highly restrictive model: all syntax-phonology interaction is mediated by configurationally-based constraints on the correspondence between syntactic and prosodic constituency. Empty categories, which necessarily lack prosodic structure, can never influence phonology directly. Thus, they have no direct relevance for the reduction of function words in English.

³¹The dialect being described here does not permit us to use the Rhythm Rule to test whether a verb that has a clitic pronoun object will phrase with a following VP adverb (e.g., *John transformed'em diligently*), since the extra syllable corresponding to the clitic prevents the possibility of a stress clash, and makes the Rhythm Rule inapplicable in any case (cf. *John is trans«forming «diligently*, where again no stress retraction takes place).

Appendix I: Clitics

We now return to a set of data not covered in our analysis. The apparent relevance of clitics to the topic of function word reduction is that they are in fact excluded from most of the environments in which (nonclitic) reduced function words are prohibited. However, this overlap in distribution is only partial, and, therefore, illusory. We will show here that the distribution of clitics is in fact due solely to their lexical properties. Lexical differences among clitics make a rule-governed account of their distribution impossible.

1. Clitics as prosodic dependents

As discussed in the main body of the paper, clitics differ from all other words in being prosodically dependent. This defining property is captured formally in the lexical entry of clitics, in the form of a prosodic subcategorization frame (Inkelas 1989) which specifies the clitic's prosodic host. All English clitics that we discuss here are enclitics, and subcategorize for a phonological word on the left:

(88) [[]_ω CL]_ω

(89)		Full		Clitic	
Object Pronouns	them	[ðɛm]		‘em	[əɪm]
	him	[hɪm]		‘im	[əɪm]
	her	[hər]		‘er	[ər]
Nonfinite Auxiliaries	have	[hæv]		‘ve	[əv]
Finite Auxiliaries	is	[ɪz]		‘s	[z]
	had	[hæd]		‘d	[d]
	has	[hæz]		‘s	[z]
	have	[hæv]		‘ve	[əv]
Prepositions	will	[wɪl]		‘l	[l]
	of	[əv]		o’	[ə]

The lexical requirement that the clitic must incorporate into a phonological word on its left is more specific than, and hence overrides, Default Phonological Word Mapping. We thus account for the absence of enclitics in utterance-initial position, or in fact, following any pause. This is shown in sentences (90)-(93).³²

(90) *’z[^]Ann eating green beans? (< is Ann)

³²In Kaisse (1983), fn.5, sentences like those in (90) are judged grammatical. However, in our informant's speech we can always detect a vowel preceding the ‘s, suggesting that the reduced form is really what is present here, and not the clitic at all.

- (91) *Matt, as you know, 'z[^]eyeing the door. (< is eyeing)
- (92) *John likes ... uh ... 'əm. (< ... them)
- (93) *Elephants could never, you know, 'v[^]endured in Antarctica. (< have endured)

Clitics are prosodically ill-formed, hence ungrammatical, in phrase-initial environments. Of course, reduced nonclitic function words *are* possible phrase-initially, and this is one of the locations where the asymmetry between the distribution of clitics and that of reduced forms is most evident.

A further, equally important difference between clitics and nonclitic function words obtains in the distribution of finite and nonfinite auxiliaries. While the nonclitic finite and nonfinite auxiliaries pattern alike, failing to reduce in phrase-final position, their clitic counterparts diverge. Only finite auxiliary clitics are prohibited phrase-finally.³³

- (94) Nonfinite, nonclitic: Marta might have/*[həv]
 Finite, nonclitic: Marta has/*[əz]
 Nonfinite, clitic: Marta might have/[v]
 Finite, clitic: Marta is/*[z]

The prosodic constraint in (88) is sufficient to account for the distribution of pronominal clitics and nonfinite auxiliary clitics. But it cannot fully account for the distribution of finite auxiliaries and prepositions. These require a further lexical restriction on their syntactic environment: they must be followed by a phrasal sister, as stated in (95).³⁴

- (95) Finite auxiliary and preposition clitics require a phrasal sister (XP) to the right.

This is in the spirit of the proposal made by Klavans (1985) that clitics may additionally place constraints on their syntactic environment, which also has to be listed in their lexical entry. A formalization of the constraints on finite auxiliary and preposition clitics is given in (96):

- (96) Prosodic requirement: [[]_ω __]_ω
 Syntactic requirement: [[__ []_{XP}]_{XP}

³³For some discussion of these facts, see Wood (1979) and Kaisse (1985).

³⁴The sister material must of course be non-null. A restriction to this effect is suggested by Wood (1979), in the form of a prohibition on empty VP nodes (p. 374). We would need no special statements of this sort if empty categories were simply not part of the relevant structure.

The absence of any lexical restriction on the lefthand context of clitics might suggest that clitics are able to attach freely to any non-null material to their left. However, as the literature attests (see e.g. Kaisse (1983), Sells (1983), Kaisse (1985) and the references therein) this is far from true. For examples, while the auxiliary clitic is possible in sentences like (97a), it is ungrammatical (at least in some dialects) in (b):

- (97) a. Which book's he gonna order?
 b. *Speaking tonight's our star reporter

Only auxiliary clitics display this type of sensitivity; pronoun and preposition clitics, as well as reduced function words of all categories, are unaffected by the syntactic environment on the left.

Different accounts of the constraints on the lefthand context of auxiliary clitics have been offered in recent work by Sells (1983) and Kaisse (1985). Kaisse proposes purely syntactic conditions on auxiliary cliticization, while Sells (1983) formulates his account in phonological terms. He attributes the failure of auxiliaries to cliticize leftward to the presence of phonological junctural elements (silent demibeats), which are generated after syntactic constituents bearing a certain degree of focus (Selkirk 1984). Translating Sells's account into prosodic terms, the idea would be that certain syntactic constituents are obligatorily phrased by themselves — something that we have proposed independently in this paper.

Either a syntactic or a phonological account of the leftward sensitivity of auxiliary clitics would in principle be compatible with the analysis of clitics that we have developed so far. However, a version of the account offered by Sells fits quite naturally into our framework. We have already proposed that auxiliary clitics possess a prosodic subcategorization frame encoding its incorporation into a phonological word on the left. If, following Sells, we assume that certain focused syntactic constituents are obligatorily followed by a phonological or intonation phrase boundary, it will follow from our existing representation that auxiliary clitics will be unable to attach to those constituents.

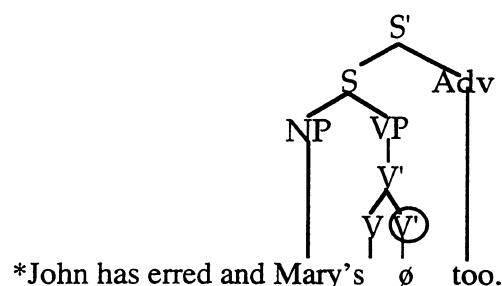
- (98) *[Speaking tonight]_φ + [[]_ω 's]_ω

The phonological phrase break associated with the focused syntactic constituent will be incompatible with the prosodic subcategorization frame for the clitic, which requires its sister to be a phonological word.

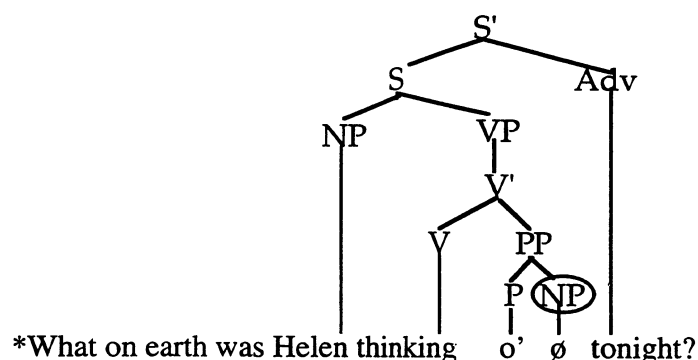
2. Clitics and Empty Categories

The proposal that finite auxiliary and preposition clitics subcategorize for a (syntactic) phrasal sister to the right, while nonfinite auxiliaries and pronouns do not, accounts elegantly for the contrast between (99) and (100) on the one hand, and (101) and (102) on the other. In all these sentences the clitic appears to the left of a gap. However, only the first two are ungrammatical, exactly where we find finite auxiliary and preposition clitics.

(99)

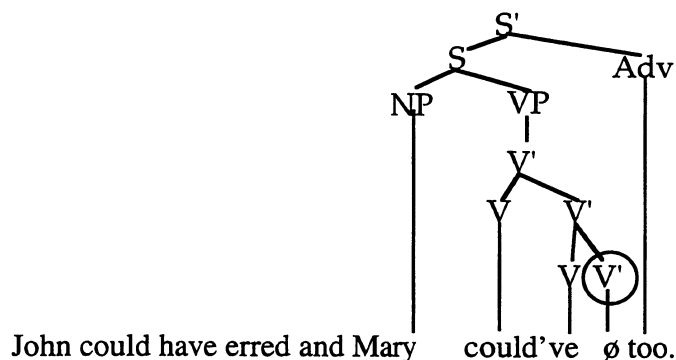


(100)

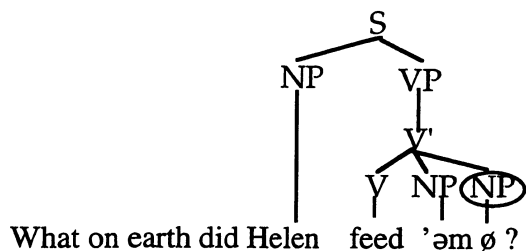


The nonfinite auxiliary and pronoun clitics in (101)-(102) are licensed in the pre-gap environment, as they are not subject to the lexical constraint in (96b).

(101)



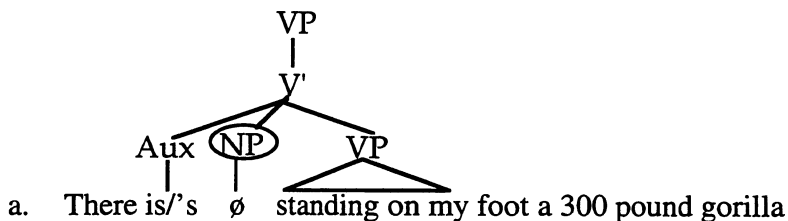
(102)



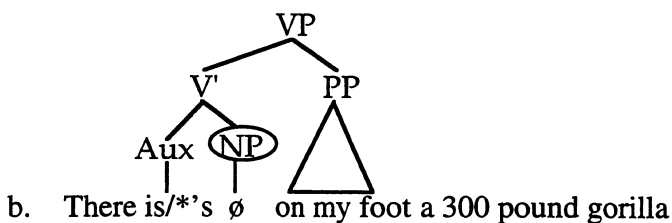
Examples (101) and (102) show that the presence of gaps is not perfectly correlated with the absence of clitics. If cliticization were blocked by gaps, we would expect (101) and (102) to be just as ungrammatical as the sentences in (99) and (100).

Further evidence that it is the absence of a phrasal sister, rather than the presence of a gap, that makes finite auxiliary and preposition clitics ungrammatical comes from the sentences in (103) and (104). Our account correctly predicts that clitics in the (a) examples should be good, while those in the (b) sentences should be bad — even though gaps are present in all four cases.

(103)

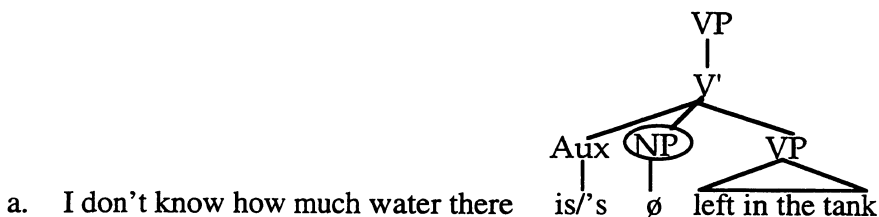


a. There is/'s ø standing on my foot a 300 pound gorilla

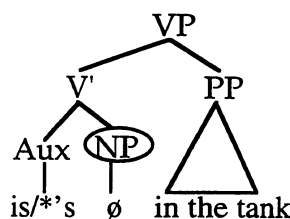


b. There is/*'s ø on my foot a 300 pound gorilla

(104)



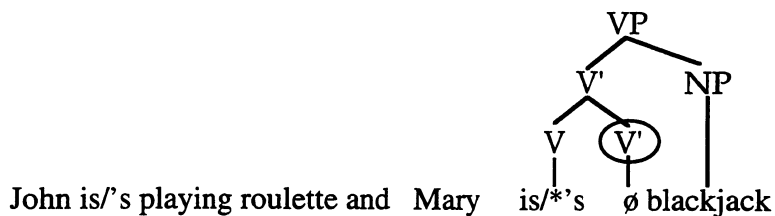
a. I don't know how much water there is/'s ø left in the tank



b. I don't know how much water there is/*'s ø in the tank

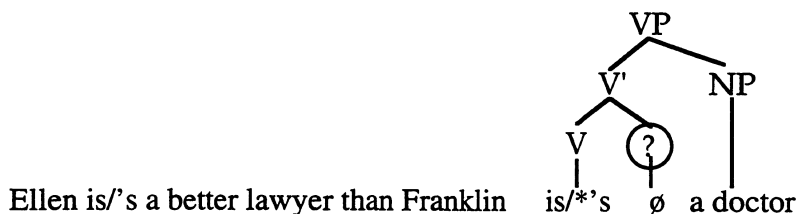
This analysis extends naturally to cases of Pseudo-Gapping and Comparatives, where our dislocation account predicts that finite auxiliaries whose sisters have been dislocated should not be able to appear in clitic form.

(105)



John is/'s playing roulette and Mary is/*'s ø blackjack

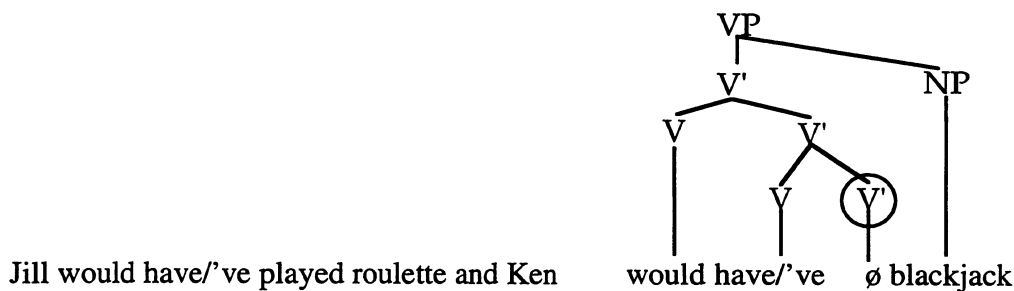
(106)



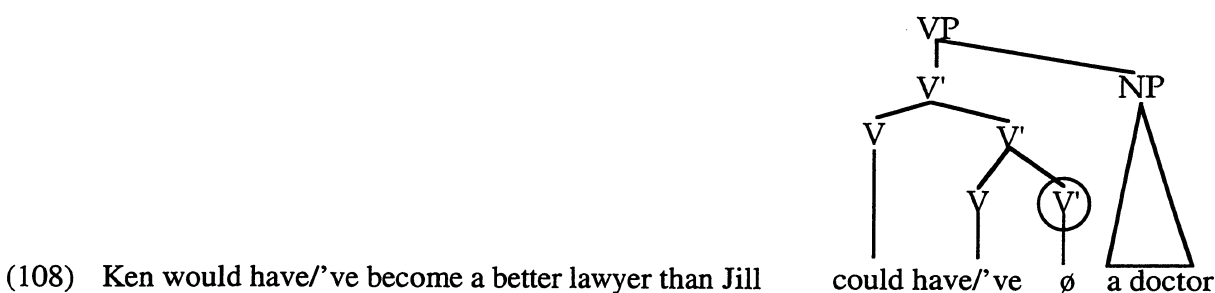
Ellen is/'s a better lawyer than Franklin is/*'s ø a doctor

Nonfinite auxiliary clitics are predicted to be grammatical in these same constructions, as is borne out by the following examples:

(107)



Jill would have/'ve played roulette and Ken would have/'ve ø blackjack



These examples dramatically support our contention that clitic and nonclitic reduced function words differ in their syntactic distribution: the difference between finite and nonfinite auxiliaries is simply irrelevant for nonclitic function words. The sentences in the two preceding examples are equally ungrammatical once the clitics are replaced by reduced function words:

- (109) a. John is/'s playing roulette and Mary is/*^z ø blackjack.
 b. Ellen is/'z a better lawyer than Franklin is/*^z ø a doctor.
 c. John would have/'ve played roulette and Mary would have/*h\v ø blackjack.
 d. Ellen would have/'ve been a better lawyer than Franklin ever could have/*h\v ø a doctor.

It is neither the case that clitics are permitted in a subset of the positions that reduced forms appear in, nor the reverse; therefore, the constraints on the distribution of the two sets of forms are distinct, and deserve distinct accounts. Neither is a special case of the other.

Appendix II

A set of forms that seem not to fit into any of the categories we have described is represented by the small list in (110):

- (110)
- | | |
|--------|---------------|
| wanna | < want to |
| gotta | < got to |
| gonna | < going to |
| hafta | < have to |
| sposta | < supposed to |
| usta | < used to |

These forms have often been assumed to be derived by phonological rules of contraction applying across the complementizer *to* and the preceding verb (see e.g. Lakoff 1970, Baker and Brame 1972); a comprehensive summary of these analyses is found in Postal and Pullum (1982). If these accounts are correct, the utterance-final

occurrence of the reduced function word *to* would seem to falsify the claim that such words are systematically stressed in that position:

- (111) I don't wanna. But I gotta!

Still under the assumption that these forms are complex, containing the infinitival *to*, however, we could alternatively treat *to* as a clitic which, like object pronouns and nonfinite auxiliaries, is able to occur in final position. But this account has its own difficulties; in particular, it sheds no light on the altered form the host takes on in these combinations. Generally, clitics should not be able to affect the shape of their host in the way that *to* appears to do in forms like *wanna* (Zwicky and Pullum 1983). Furthermore, the number of forms with which *to* 'fuses' is small and unpredictable: we find 'to-contraction' with the forms in (110), but not with such phonologically similar forms as *plan* or *intend* (**planna*, **intenna*). In the framework of Lexical Phonology, which we are assuming, phenomena of this sort must be handled lexically (see also Bresnan 1978b) presumably by listing them. (Treating *to* as a suffix subcategorizing for particular (otherwise unused) allomorphs of the stems in (110) would be a more complex lexical alternative.) A lexical account is compatible with the conclusions of Postal and Pullum (1982) that 'to-contraction' takes place only when "either subject-controlled equi (into the immediately lower complement) or subject-to-subject raising is in evidence" (pp. 130-132). This explains why we get 'contraction' in (112a) (or in (111) , but not, as originally pointed out by L. Horn, in sentences like (112b):

- (112) a. John's the man I wanna meet
b. John's the man I want to/*wanna succeed

We will therefore associate the lexical entries of the forms in (110) with a subcategorization frame containing a subject and a controlled complement.

References

- Baker, C. L. and M. Brame. (1972) Global Rules: a Rejoinder. *Language* 48, 51-75.
Berendsen, E. (1986) *The Phonology of Cliticization*. Foris.
Bickmore, L. (1990) Branching Nodes and Prosodic Categories. In S. Inkelas and D. Zec (eds.), *The Phonology-Syntax Connection*. CSLI Publications and the University of Chicago Press.
Bresnan, J. (1973) Comparative Deletion and Constraints on Transformations, *Linguistic Inquiry* 4, 275-344.

- Bresnan, J. (1977) Variables in the theory of transformations. In P. W. Culicover, T. Wasow, and A. Akmajian (eds.), *Formal Syntax*. Academic Press.
- Bresnan, J. (1978a[1971]) Contraction and the Transformational Cycle. Distributed by the Indiana University Linguistics Club: Bloomington.
- Bresnan, J. (1978b) A Realistic Transformational Grammar. In M. Halle, J. Bresnan and G. Miller (eds.), *Linguistic Theory and Psychological Reality*. MIT Press.
- Cho, Y.-m. (1990). Syntax and Phrasing in Korean. In S. Inkelas and D. Zec (eds.), *The Phonology-Syntax Connection*. CSLI Publications and the University of Chicago Press.
- Condoravdi, C. (1990) Sandhi Rules of Greek and Prosodic Theory. In S. Inkelas and D. Zec (eds.), *The Phonology-Syntax Connection*. CSLI Publications and the University of Chicago Press.
- Emonds, J. (1985) *A Unified Theory of Syntactic Categories*. Foris Publications.
- Gazdar, G., G. K. Pullum, and I. Sag. (1982). Auxiliaries and related phenomena in a restricted theory of grammar. *Language* 58, 591-638.
- Gazdar, G. et al. (1985) *Generalized Phrase Structure Grammar*. Cambridge: Harvard University Press.
- Halpern, A. (1990) Phonological Evidence for the Surface (Non)existence of Empty Categories. *Proceedings of the Ninth West Coast Conference on Formal Linguistics*. Stanford Linguistics Association.
- Hayes, B. (1989). The Prosodic Hierarchy and Meter. In P. Kiparsky and G. Youmans (eds.), *Rhythm and Meter*. Academic Press: Orlando.
- Inkelas, S. (1988). Prosodic Effects on Syntax: Hausa *fa*. *Proceedings of the Seventh West Coast Conference on Formal Linguistics*. Stanford Linguistics Association.
- Inkelas, S. (1989). *Prosodic Constituency in the Lexicon*. Doctoral dissertation, Stanford University. Published in (1990) by Garland Publishing Co., New York.
- Inkelas, S. and D. Zec. (1988). Serbo-Croatian Pitch Accent: the Interaction of Tone, Stress, and Intonation. *Language* 64, 227-248.
- Kaisse, E. (1983). The Syntax of Auxiliary Reduction in English, *Language* 59, 93-122.
- Kaisse, E. (1985). *Connected Speech. The Interaction of Syntax and Phonology*. Academic Press.
- Kanerva, J. (1990). *Focus and Phrasing in Chichêwa Phonology*. Doctoral dissertation, Stanford University. Published by Garland Publishing Co., New York.
- King, H. (1970). On blocking the rules of contraction in English. *Linguistic Inquiry* 1, 132-136.

- Kiparsky, P. (1982). Lexical Morphology and Phonology. In I.-S. Yang (ed.), *Linguistics and the Morning Calm*, 3-91. Seoul: Hanshin Publishing Co.
- Kiparsky, P. (1983). Word Formation in the Lexicon. In F. Ingemann (ed.), *Proceedings of the (1982) Mid-America Linguistics Conference*, 3-29. Lawrence: University of Kansas.
- Klavans, J. (1985). The Independence of Syntax and Phonology in Cliticization, *Language* 61, 95-120.
- Lakoff, G. (1970). Global rules. *Language* 46, 623-639.
- Liberman, M. and A. Prince. (1977). On Stress and Linguistic Rhythm. *Linguistic Inquiry* 8, 249-336.
- McHugh, B. (1987). Syntactic Structure, Empty Categories and Phrasal Phonology in Chaga. In D. Odden (ed.), *Current Approaches to African Linguistics*, vol. 4, 247-65. Dordrecht: Foris.
- Napoli, D.J. (1983). Comparative Ellipsis: A Phrase Structure Analysis. *Linguistic Inquiry* 14, 675-694.
- Neijt, A. (1979). *Gapping: A Contribution to Sentence Grammar*. Foris: Dordrecht.
- Neijt, A. (1984). Clitics in Arboreal Phonology. In H. van der Hulst and N. Smith (eds.), *Advances in Nonlinear Phonology*. Foris: Dordrecht.
- Nespor, M. and I. Vogel. (1982). Prosodic Domains of External Sandhi Rules. In H. van der Hulst and N. Smith (eds.), *The Structure of Phonological Representations, Part 1*. Dordrecht: Foris.
- Nespor, M. and I. Vogel. (1986). *Prosodic Phonology*. Dordrecht: Foris.
- Poser, W.J. (1992). Blocking of Phrasal Constructions by Lexical Items. In I. Sag and A. Szabolcsi (eds.), *Lexical Matters*. CSLI Publications.
- Postal, P. and G.K. Pullum. (1982). The contraction debate. *Linguistic Inquiry* 13:122-138.
- Rochemont, M. (1986). *Focus in Generative Grammar*. John Benjamins.
- Sag, I. (1976). *Deletion and Logical Form*. Garland.
- Selkirk, E. (1978). On Prosodic Structure and its Relation to Syntactic Structure. In T. Fretheim (ed.), *Nordic Prosody II*. Trondheim: TAPIR.
- Selkirk, E. (1984). *Phonology and Syntax*. MIT Press.
- Selkirk, E. (1986). On Derived Domains in Sentence Phonology. *Phonology Yearbook* 3, 371-405.

- Selkirk, E. and T. Shen. (1990). Prosodic Domains in Shanghai Chinese. In S. Inkelas and D. Zec (eds.), *The Phonology-Syntax Connection*. CSLI Publications and the University of Chicago Press.
- Sells, P. (1983). Juncture and the Phonology of Auxiliary Reduction in English. *University of Massachusetts Occasional Papers* 8.
- Steedman, M.J. (1990). Gapping as Constituent Coordination. *Linguistics and Philosophy* 13:207 - 263.
- Vogel, I. and I. Kenesei. (1987). The Interface between Phonology and other Components of Grammar: the Case of Hungarian. *Phonology* 4, 243-263.
- Wood, W. J. (1979). Auxiliary reduction in English: A unified account. *CLS* 15.
- Zec, D. (1988). *Sonority Constraints on Prosodic Structure*. Doctoral dissertation, Stanford University.
- Zec, D. and S. Inkelas. (1990). Prosodically Constrained Syntax. In S. Inkelas and D. Zec (eds.), *The Phonology-Syntax Connection*. CSLI Publications and the University of Chicago Press.
- Zwicky, A. and G. K. Pullum. (1983). Cliticization vs. Inflection: English *n't*. *Language* 59, 502-513.
- Zwicky, A. (1985). Clitics and Particles. *Language* 61, 283-305.