

*Intonational phrasing: the case for recursive prosodic structure**

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The past decade has seen a good deal of research on the relation between phonology and syntax, and on the nature of the phonological structures – both intonational and metrical – on to which syntactic structure must be mapped (e.g. Liberman & Prince 1977; Pierrehumbert 1980; Selkirk 1984; Kaisse 1985; Nespor & Vogel 1986). While some of this work breaks genuinely new ground, in at least one respect it relies on a theoretical legacy from work going back at least half a century: the INTONATIONAL PHRASE (IP). The goal of this paper is to examine the properties of the IP as a theoretical construct and to propose a substantially modified approach to intonational phrasing.

I Evidence for hierarchical structure in intonational phonology

I.1 Problems with the traditional IP

Exemplars of the IP include Trager & Smith's 'phonemic clause' (1951; equivalent to Hockett's 1958 'macrosegment'), Halliday's 'tone group' (1967), Lieberman's 'breath group' (1967) and Pierrehumbert's 'intonation phrase' (1980). While there are differences of detail among these constructs, they all share a number of properties, the most important of which, for our discussion, are the following:

- (i) They are the largest phonological chunk into which utterances are divided, extending from one phonetically definable boundary to the next.
- (ii) They have a specifiable intonational structure, including – in most versions of the theory – a single most prominent point (primary stress, tonic, nucleus).
- (iii) They are phonological units which are nevertheless assumed, ideally, to match up in some poorly understood way with elements of syntactic or discourse-level structure.

Probably through the influence of Pierrehumbert (1980), this view seems to have been incorporated wherever relevant into recent work on metrical

and prosodic organisation (e.g. Selkirk 1984; Dell 1986; Nespor & Vogel 1986). In what follows, I will refer to this as the standard theory of intonational phrasing.

The central difficulty with the standard theory, in my view, is the status it assigns to the audible prosodic boundaries that punctuate the stream of speech. It is simply assumed that such boundaries *define the domains over which the phonological structure of intonation is to be specified*. The trouble with this view is that it makes it difficult to maintain both a simple and consistent phonetic definition of boundary and a simple and consistent model of the phonological structure of intonational domains. The problem is easily illustrated.

First compare the prosody of the following pair of examples:¹

- (1) a. My brother lives in Denver.
b. My brother, who is a geologist, lives in Denver.

There is a prosodic break after *brother* (and after *geologist*) in (1b), the like of which does not appear in (1a). Specifically, *brother* in both (1a) and (1b) would normally have a pitch peak late in the first syllable followed by a rapid fall on the second; but in (1b) this would be followed by a quick upturn in pitch, accompanied by a prolongation of the syllable and then followed by a brief silence, while in (1a) there would be no silent interval and the pitch would remain fairly steady through *lives* and *in* until the steep rise to the second peak on *Denver*. A break in (1a) similar to the ones in (1b) would necessarily (in my judgement) be treated as a hesitation or, possibly, as a marker of very emphatic contrast ('... but my brother-in-LAW lives in Toronto'). It seems reasonable, in sum, to treat the breaks in (1b) as IP boundaries and to conclude from all this that (1a) is a single IP.

Now consider the following pair:

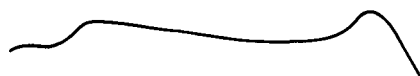
(2)

- a. [Context: How did you decide to take your vacation in Colorado?]



My brother lives in Denver. [equivalent to (1a)]

- b. [Context: Are you going to visit your brother when you're in LA?]



My brother lives in Denver.

Neither of these would normally have a prosodic break of the sort found in (1b), but pitch cues nevertheless impart greater prominence or separateness to *My brother* in (2a) than in (2b) (cf. note 1). In (2b), *brother* is contextually given and decidedly less prominent than *Denver*; the accent on *brother* is merely a rise on the first syllable, followed by a fairly gradual drop in pitch over the next three syllables. In any analysis based on the standard theory, *brother* in (2b) would be a prenuclear accent in an IP whose nucleus is on *Denver*. In (2a), on the other hand, while *brother* is still arguably less prominent than *Denver*, the pitch accents on both words consist of a rise to a peak followed by a rapid fall. Given that *My brother* is a major syntactic constituent, that it is intonationally marked as new to the discourse, and that its pitch accent is similar to that of the uncontroversial nucleus on *Denver*, it is not unreasonable to distinguish (2a) from (2b) by treating (2b) as a single IP and (2a) as a sequence of two IPs, each with its own nucleus. Exactly this analysis has been given to sentences of this sort in many treatments of English intonation.

The contradiction between (1) and (2) is apparent. Relative to (1b), (1a/2a) seems to have no intonational boundary; relative to (2b), it seems to have one after all. Given the theoretical assumptions that IPs have one nucleus apiece and that IPs are separated by prosodic boundaries, we are forced to choose between our observations about sentence (1a/2a). If we decide (on the basis of the comparison with (2b)) that it has two nuclei, then *by definition* it consists of two IPs and hence contains an intervening boundary. If we decide (on the basis of the comparison with (1b)) that it contains no boundary, then *by definition* it consists of only one IP and hence has only one nucleus. But it is the theory – not the observations – that forces us to choose.²

The fact that such a choice is possible at all can be attributed to the looseness of the definitions of ‘boundary’ that are common within the standard theory. For example:

the key characteristic of /↑/... is a terminal *rise* [emphasis in original] in pitch... The T[erminal]C[ontour] /↓/ is distinguished from /↑/ basically by the absence of this terminal rise. Its positive characteristics are a fading-away of the force of articulation, often with a drawling of the last few vowels and consonants... The third TC, /||/, is marked by the absence of the positive features for either /↑/ or /↓/. This TC most often occurs *where the speaker goes right on talking* [emphasis added]... (Hockett 1958: 37).

No source has ever given a satisfactory description of the phonetic nature of the terminals it assumes. The situation with regard to [Trager–Smith] /||/ is particularly bad, since it often defined no more than it would be by saying: ‘end of phrase known not to end in either /||/ [= Hockett /↑/] or /#/ [= Hockett /↓/]’ (Gage 1958: 128).

[Phrase boundary] is realized phonetically in various ways, including pitch change and duration, and is sometimes accompanied by actual cessation of phonation (Downing 1970: 10, cited by Bing 1979: 152).

As a rule of thumb, an intonation phrase boundary... can be taken to occur where there is a nonhesitation pause or where a pause could be felicitously inserted without perturbing the pitch contour (Pierre-humbert 1980: 19).

The term 'breath group', as employed here, is not necessarily related to an actual physiological gesture for taking breath... We rather define the breath group from a functional point of view, in specifying the baseline to a group of words such that the Fo contour is well approximated [by Maeda's model] (Maeda 1976: 67f).³

One might even say that these vague definitions are necessary in order to make the theory function at all. The interdependence of one's definition of boundary and one's model of intonational phonology has been recognised and discussed in earlier works. Crystal seems to regard the circularity involved as a positive virtue:

To analyse English speech into a sequence of non-overlapping tone-units means in effect to define their boundaries... any process of intonation analysis will take simultaneous account of both boundary cues and internal structures (and ultimately external function, i.e. distribution of tone-units as wholes), and any comprehensive definition of the tone-unit must also have recourse to a complementarity of cues (Crystal 1969: 205).

Liberman is more willing to accept that we have not yet found an appropriate way to think about this interaction:

'Intonational phrasing'... is often discussed in terms of the location of 'commas', 'pauses', 'intonation breaks', etc., although not all examples lend themselves very easily to such treatment... We... lack a general theory of what 'intonation breaks' are... [Should intonation breaks] be viewed simply as a kind of marker inserted into phonological strings, as the 'comma' notation implies, or are they instead the various constituent boundaries of some sort of intonational constituent structure? (Liberman 1975: 9f).

In short, the empirical problem with IPs runs something like this: IPs are supposed to be delimited by boundary phenomena of some intuitively definable sort, but they are also supposed to have well-defined internal phonological structure and to match up with the syntax in well-defined ways. So any stretch of speech set off by audible boundaries is assumed to be an intonational phrase, and at the same time any stretch of speech identifiable on structural grounds as an intonational phrase is assumed to be set off by boundaries. Since there are not always obvious boundaries in the latter case, notions like 'potential for pause' creep in to most definitions of boundary in order to keep the assumptions working, and hypotheses about intonational phrasing thereby become virtually unfalsifiable.

1.2 Two levels of intonational phrasing

One possible solution to this difficulty would be simply to abandon the assumption that audible prosodic boundaries have any special role to play in defining phonological domains. This has been done explicitly (before the Trager–Smith analysis was codified) by Pike (1945) and (as a reaction to the Trager–Smith orthodoxy) by Householder (1957); it is implicit in the models of Bolinger (1958, 1986) and of 't Hart and his colleagues (e.g. 't Hart & Collier 1975).

Pauses cannot be equated with the borders of intonation contours, since pauses may occur (1) at the borders of the contours...or (2) in the middle of contours...or (3) may be absent from a junction of two contours (Pike 1945: 40).

Orthodox S[mith]T[rager]-ites must often be distressed by the rule which says that every phrase has exactly one primary...either a phonemic phrase need not have a precise boundary, or, looked at otherwise, a phonemic phrase may contain two (or perhaps more) primary stresses (Householder 1957: 237f).

For various reasons, however, I do not propose to pursue this possibility here. The main problem I see with both Bolinger's and 't Hart's models (and in effect with Pike's as well) is that they assign no theoretical status to the nucleus and more generally deny the existence of relational differences of prominence among pitch accents. (I have discussed this problem with respect to Bolinger's model in Ladd 1980: ch. 2; for the same problem with the 't Hart model, see e.g. Rietveld 1984; Rietveld & Gussenhoven 1985; Kruyt 1985.) If we assume that prominence is relationally defined and that the nucleus is the designated terminal element of a given intonational domain, then intonational domains must exist; and it is implausible that audible boundaries would not be associated with (abstract) domain boundaries at least some of the time.

A more promising approach to solving the problems of the standard IP theory is suggested by a variant of the standard theory itself. In a number of descriptions there are, in effect, two types of IP, which we might informally call big ones and little ones. Examples are O'Connor & Arnold's distinction between single bar and double bar boundaries (1973: 4); Trim's minor and major tone groups (1959); and Beckman & Pierrehumbert's intermediate phrase and intonation phrase (this volume). Details vary considerably, and I do not mean to imply that all these proposals are the same. (For example, Trim's big IPs are roughly the same size as O'Connor & Arnold's little ones, and O'Connor & Arnold's big ones may in some cases be equivalent to Beckman & Pierrehumbert's little ones.) In all of them, however, little IPs are assumed to *have a nucleus* and big IPs are assumed to be *set off by audible breaks*; and in all of them a big IP can consist of one or more little ones.

The relevance of this double-decker IP structure to the problem just

discussed should be evident. In (1b), we can mark 'big' boundaries after *brother* and *geologist*, while in (1a/2a) we will mark only a 'little' boundary after *brother*; (2b) will contain no boundary at all:

- (1) a'. || My brother | lives in Denver ||
 b'. || My brother || who is a geologist || lives in Denver ||
 (2) b'. || My brother lives in Denver ||

That is, we can mark boundaries where we 'need' them for a sensible description of the intonational phonology, while reserving a different sort of boundary mark for those boundaries that have conspicuously audible phonetic correlates.

This solution is not a mere trick of formalism. By saying that the falling accent on *brother* is the nucleus of a separate 'little IP', we predict that it will not be eligible for rhythmic stress shift, whereas the high accent in the same position – analysed as prenuclear – should be shiftable. This prediction appears to be correct:⁴

- (3) a. A [on telephone to B, who is on holiday in a Mediterranean resort]: Sorry to hear about the weather there. Is the hotel decent, at least?
 B: No, the hotel's terrible.
 b. A [same situation]: So how are you enjoying yourself down there?
 B: Well, the hotel's terrible. But we're having great weather, and there are lots of good restaurants around.

In (3a), *hotel* is in the context and can have a prenuclear High accent in B's reply; stress shift (The HOTEL's TERRIBLE) is possible. In (3b), *hotel* is newly introduced by B and must have its own falling (nuclear) accent; stress shift is extremely unlikely. A similar case is the following pair:

- (4) a. A [a fanatical gardener phoning home from a holiday to check on his various plants]: And how's my bamboo surviving?
 B: Oh, yes, I was going to tell you about that – the bamboo hasn't been doing so well.
 b. A [same situation]: So how is everybody?
 B: Well, there's one bit of bad news – the bamboo hasn't been doing so well.

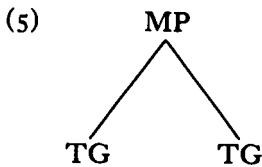
In (4a), *bamboo* is already in the context and the entire sentence *the bamboo hasn't been doing so well* can form a single tone group; one possible rhythmic pattern is to shift the stress on *bamboo* and have prenuclear accents on BAM- and HAS-. In (4b), *bamboo* is newly introduced and must have its own falling accent. The fact that this accent is nuclear (and that the sentence thus has two separate tone groups) is shown by the extreme improbability of associating it with the syllable BAM-.

Based on the foregoing evidence, then, I propose to recognise two types of intonational phrasing domain, MAJOR PHRASE (MP) and TONE GROUP (TG). An MP is set off by audible prosodic breaks – rhythmically

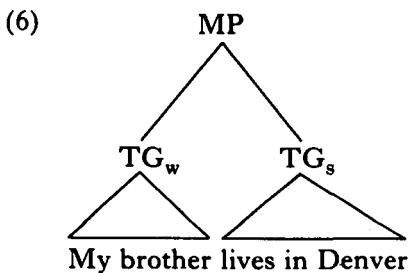
organised⁵ pauses marked by actual silence and/or the prolongation of the pre-pause syllable, accompanied, in many cases, by additional pitch movements (boundary tones, in current terminology) such as a rise following an accentual fall. A TG, on the other hand, is merely a structural unit of intonational phonology – the domain within which a nucleus is defined – and the boundary between TGs need not be accompanied by any rhythmic break or additional pitch movement at all. TGs are identified solely on the basis of tonal structure (i.e. the presence of a nuclear pitch accent) and without any expectation that their edges will be marked by a breath, a rhythmic pause, a boundary tone, or any other of the phenomena often said to be associated with IP boundaries.

1.3 Intonational constituent structure

The fact that an MP may consist of one or more TGs suggests that it is appropriate to speak of hierarchical structure in intonational phonology. At the very least, we have a hierarchy of prosodic categories of the sort discussed by Selkirk (1980) or Nespor & Vogel (1982, 1983, 1986):⁶

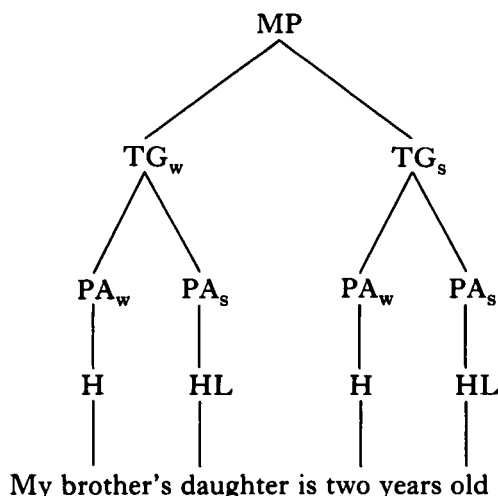


Furthermore, there is evidence of metrical prominence relations in such trees: as noted above, the putatively nuclear accent on *brother* in (1a/2a) appears to be less prominent than the nuclear accent on *Denver*. This could be represented by treating the first TG as weak relative to the second:



Extending the tree notation even further, we could represent more complex contours by taking into account the fact that TGs consist of one or more pitch accents (PA), with the nucleus the most prominent.⁷ Thus:

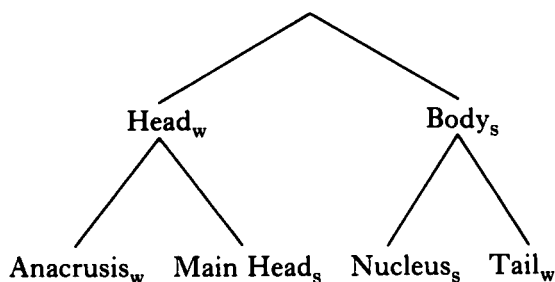
(7)



How far can we usefully develop such a hierarchical model?

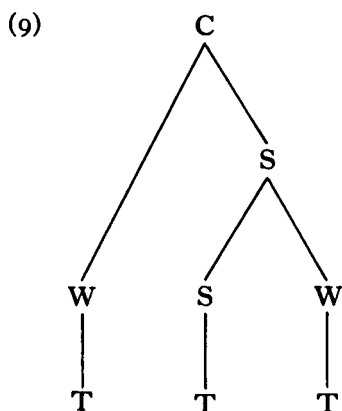
In a number of traditions of intonational description it has been noted that contour types usually consist of an obligatory part, which begins with the most prominent syllable, and an optional part covering the syllables that precede the most prominent. Pike (1945), for example, calls these Primary Contour and Precontour respectively. In the British tradition the contour is generally divided up into four parts – Prehead, Head, Nucleus and Tail – but the boundary between Head and Nucleus can clearly be equated in many cases with the boundary between Precontour and Primary Contour, and the Prehead–Head and Nucleus–Tail boundaries can be regarded as somehow subordinate. In fact, the hierarchical arrangement of these boundaries was recognised explicitly as long ago as Chao (1932), who divided contours into Head and Body, and further divided those constituents into Anacrusis and Main Head, Nucleus and Tail. We might translate Chao's classification into a quasi-metrical tree structure as follows:

(8)

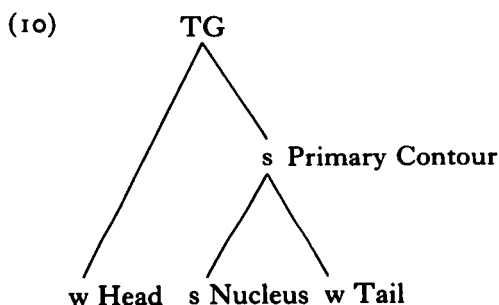


Specifically metrical constituent structures for intonation contours were first proposed by Liberman (1975); they were a natural extension of Liberman's original presentation of the theory that has since become metrical phonology. Liberman analysed the internal structure of simple

contours as follows (where C is the 'content' of the intonation contour, and T is any of the level tones of Liberman's analysis; boundary tones are omitted here):



Except for the fact that Liberman treats the prehead (Chao's anacrusis) as the reflex of an initial boundary tone, the similarity of this structure to the basic contour structure suggested by Chao is striking. If we follow Liberman (and a number of subsequent investigators) in the treatment of the prehead, and if we modify Chao's terminology slightly, then we might reconcile the two versions of intonational constituent structure as follows:

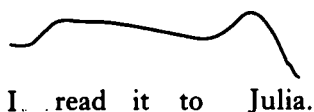


So far (10) has no terminal PA nodes, however. Before we attempt to add them, we must deal with Pierrehumbert's non-hierarchical model of intonational structure, and more specifically with her denial of any theoretical status to the head. The major theoretical point of Pierrehumbert's thesis (1980) is that intonational structure is exclusively linear; contours are phonologically strings of pitch accents, and pitch accents are sequences of target levels or tones. She presents a number of arguments against what we might call 'overlay' models of intonational structure, in which contour shapes are specified for domains of different sizes (e.g. accent group and phrase) and then superimposed to yield output contours;⁸ more generally, she contends that there are no cases in which intonational units can usefully be specified in terms of overall contour shapes.

As part of this line of argument, Pierrehumbert denies the existence of the head as an identifiable component of contours. Her model treats the head as nothing more than the string of accents that precede the nucleus. It is true that in traditional British descriptions, the head is described as an overall contour shape – ‘stepping head’, ‘high head’, etc. – and the pitch movements at each individual prominent syllable within the head are treated fairly fuzzily as correlates of stress. If we accept the argument against overall contour shapes in phonological specifications, we can no longer retain such labels as ‘high head’ as part of our formal description; if we accept the idea that intonation contours are strings of pitch accents we must acknowledge the occurrence of multiple pitch accents within e.g. the ‘stepping head’.

However, it is important to distinguish the argument against the head qua overall contour shape from any argument against the head qua constituent. Pierrehumbert’s view carries the unfortunate implication that each accent preceding the nucleus is independently meaningful. The traditional overall-shape view, while it unquestionably leads to difficulties in getting from phonological specification to phonetic detail, nevertheless makes what seems to be the correct pragmatic prediction that the shape of the head reflects a *single linguistic choice*. Consider the following pairs of sentences:

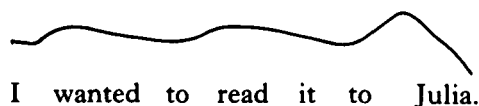
(11) a.



H

HL

b.



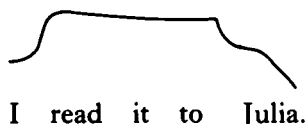
H

H


HL

Intonational nuance: relatively neutral.

(12) a.

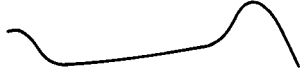
H[!]

HL


b. 
I wanted to read it to Julia.

H[!] H[!] HL

Intonational nuance: '...and that's that'. (The downstep /[!]/ applies to the following H.)

(13) a. 
I read it to Julia.

L HL

b. 
I wanted to read it to Julia.

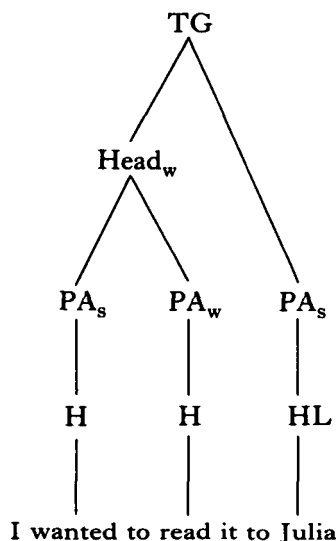
L L HL

Intonational nuance: '...as you ought to know'. (This is the Sag & Liberman 1975 'surprise–redundancy contour'.)

Both members of each pair appear to have 'the same' intonation, in the sense that both convey the same pragmatic force suggested by the informal glosses. The number of prenuclear accents seems to depend solely on the number of accentable prenuclear syllables, and the type of prenuclear accent – high, downstepping high, low – seems to represent a single choice, regardless of whether the head contains a single accent or several. (For example, the phonological specification of the 'surprise–redundancy' contour in (13) could be stated informally as 'one or more low head accents followed by a high falling nucleus'.) Pierrehumbert's analysis has no way to treat the repetition of prenuclear accents as the relatively low-level phenomenon that it thus appears to be.⁹

More generally, it should be clear that there is no necessary contradiction between Pierrehumbert-style linearity and hierarchical organisation. Positing a constituent structure of the sort just illustrated is perfectly compatible with the view that intonation contours are strings of pitch accents or tones, just as positing syntactic constituent structure is compatible with the view that sentences are strings of words. If we assume that intonation has constituent structure of the sort discussed so far, we can retain the obvious advantages of Pierrehumbert's linear model without accepting the implication that the head is not a constituent. The head would be defined as the part of the TG tree dominated by the topmost weak left branch:¹⁰

(14)



The fact that both pitch accents of the head are the same could be specified formally in a variety of ways, e.g. by some sort of feature percolation from the Head node, or by well-formedness conditions on the association of constituent structures with strings of pitch accents generated by a Pierrehumbert finite-state grammar. In either case, the assumption of constituent structure makes it possible to acknowledge the existence of the head without allowing overall contour shapes into the description.

Obviously, the foregoing is intended as a very preliminary proposal. Details of tree structures and node labelling conventions, and in particular the status of boundary tones and tail accents, are all matters for further investigation. Nevertheless, it appears that a hierarchical model could bridge the gap between the assumption that the head represents a single choice and the view that each accent is individually specified. More generally, it appears that the assumption of hierarchical structure in intonation makes it possible to avoid some of the problems of traditional views of intonational phrasing without throwing away any of the insights of recent work on intonational phonology.

2 Recursiveness in intonational structure

2.1 The Strict Layer Hypothesis

One of the fundamental assumptions of the standard theory of intonational phrasing is that prosodic structure is non-recursive. In almost all research on intonation it is taken for granted that the division of utterances into IPs is simply a linear segmentation; any division of IPs (into e.g. feet) is also assumed to work the same way. In other words, while there may be a hierarchy of levels (e.g. Utterance, IP, Foot, Syllable), a unit at any given level in the hierarchy can never be composed of anything other than units

at the next lower level. Recursive structures of the sort found in syntax, where e.g. a Sentence may contain a Noun Phrase which in turn contains a Sentence, are assumed not to occur.¹¹

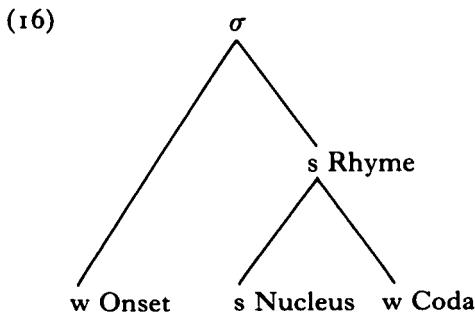
This assumption has been stated explicitly by Selkirk (1984: 26) and Nespor & Vogel (1986) under the name Strict Layer Hypothesis (hereafter SLH). Nespor & Vogel's statement of the SLH is as follows:

- (15) a. A given nonterminal unit of the prosodic hierarchy, X^p , is composed of one or more units of the immediately lower category, X^{p-1} .

- b. A unit of a given level of the hierarchy is exhaustively contained in the superordinate unit of which it is a part.

(Nespor & Vogel 1986: § 1.2.1)

The intonational constituent structure proposed in the preceding section does not strictly speaking obey the constraints predicted by the SLH. In fact, it bears a strong resemblance to many proposals for syllable structure, which Nespor & Vogel (1986: § 1.2.1) explicitly exclude from the scope of their theory on the grounds that it does not obey the SLH. Given a syllable structure like the following:



the SLH would predict that Onset and Rhyme are the same kind of constituent, and that there should be able to be more than two such constituents. The same could be said of Head and Primary Contour in the structure of the TG.

It might, to be sure, be possible to define the constituents of the proposed TG structure so that they appear not to violate the SLH. However, quite apart from TG structure, there is more general evidence that intonational structure – at all levels – does not actually conform to the SLH anyway. This part of the paper discusses a variety of evidence for the existence of recursive structures in intonational phonology.

2.2 Embedding of intonational phrasing domains

One consequence of the SLH is that every boundary at a given level of structure is simultaneously the end of one unit and the beginning of the next. If we state that sentence (17a) (= 1b) is interrupted twice by MP boundaries, then according to the SLH we must have a sequence of three

MPs, as in (17b), and not anything like the structure in (17c), which is suggested by the syntax:

- (17) a. || My brother || who is a geologist || lives in Denver ||
 b. [_{MP} My brother]_{MP} [_{MP} who is a geologist]_{MP} [_{MP} lives in Denver]_{MP}
 c. [_{MP} My brother [_{MP} who is a geologist]_{MP} lives in Denver]_{MP}

Structures like (17c), in which the first and third chunks form part of the same constituent, are completely excluded under the SLH. An implicit prediction of this exclusion is that phonological dependencies between non-adjacent domains – like chunks 1 and 3 of sentence (17) – should not occur. This prediction is not supported by intonational data, as can be seen from the following two cases.

2.2.1 Declination and parenthesis. Cooper & Sorensen (1981) studied the behaviour of declination¹² in sentences containing parenthetical phrases and clauses such as:

- (18) The book on the table, it seems to me, was a gift from my mother.

Having developed a model of declination in simple sentences, they attempted to extend the model to a variety of more complex syntactic types. For sentences like (18), they found that they could do this most successfully by simply ignoring the parenthetical *it seems to me*. That is, they found that the declination on the matrix clause was essentially the same whether it was uttered with the parenthetical or as a complete utterance by itself. The declination was, as it were, interrupted by the parenthetical, and resumed when the parenthetical was complete, just as if the parenthetical had not been there. This result has since been replicated by Kutik *et al.* (1983).¹³

These findings make sense if we assume that the matrix sentence constitutes a single phonological domain – specifically, a domain across which declination operates – regardless of whether it is interrupted by another domain. That is, these results provide evidence for the existence of structures like (17c) that do not conform to the Strict Layer Hypothesis. Maintaining the SLH in the face of this evidence would require us to formulate (and, more difficult, to constrain) rules to establish dependencies between non-adjacent domains.

2.2.2 Terminal and non-terminal boundaries. A second case of phonological dependency between ostensibly independent non-adjacent domains involves the distribution of terminal and non-terminal boundary markers.¹⁴ The simplest statement of their distribution (e.g. Lieberman 1967: ch. 5) is that non-terminal boundary markers occur at sentence-medial IP boundaries and that terminal boundary markers occur sentence-finally. However, this statement is considerably oversimplified. Even superficial investigation is sufficient to reveal that this choice depends primarily on whether the ‘sentence-so-far’ – i.e. the part of the sentence up to the

boundary – is *syntactically complete*. For example, consider the medial boundaries in the following (\ marks terminal and / non-terminal boundaries):

- (19) a. I'm going to visit my brother\, who is a geologist\
 b. My brother/, who is a geologist/, lives in Denver\.

As is clear from this example, the nature of the boundary after *brother* is not determined by the syntactic relation between *my brother* and *who is a geologist*, since this relation is the same in both cases. Rather, it is related to the fact that in (19a), the MP *I'm going to visit my brother* is syntactically complete in some sense in which *My brother* is not. Further examples:

- (20) a. I gave the encyclopedia to my cousin in Birmingham\, who collects old books\
 b. I gave the encyclopedia/, which was in perfect condition/, to my cousin in Birmingham\
 (21) a. Bill smokes only in the living room\, a palatial Edwardian room with high ceilings\, and with a cross draught that keeps the air reasonably clear\
 b. Bill smokes both in the living room/, a palatial Edwardian room with high ceilings/, and in the poorly ventilated storage closet that serves as his study\.

The relevance of these cases for the point being made here is that the distribution of terminal and non-terminal boundary markers cannot be determined locally. That is, the choice of boundary marker does not depend on a property of MPs considered in isolation, something that can be determined at the end of each MP for that MP alone. In example (21b) above, there is a non-terminal boundary at the end of the MP *a palatial Edwardian room...*, while in (21a), the same phrase is followed by a terminal boundary. The assignment of terminal boundary markers must involve dependencies between prosodic domains.

Note that the choice of boundary marker is a *phonological* choice, and cannot simply be 'read off the syntax' directly. Consider what happens if we remove the word *both* from (21b):

- (21) c. Bill smokes in the living room, a palatial Edwardian room with high ceilings, and in the poorly ventilated storage closet that serves as his study.

This could then be spoken with either terminal or non-terminal markers at the two medial boundaries. With *both* omitted, the first chunk is syntactically complete in the relevant sense, and the speaker may choose the prosody of (21a):

- (21) c'. Bill smokes in the living room\, a palatial Edwardian room with high ceilings\, and in the poorly ventilated storage closet that serves as his study\.

Alternatively, the speaker may choose to signal intonationally that the first chunk is (contrary to appearances) incomplete, in which case we get the prosody of (21b):

- (21) c". Bill smokes in the living room/, a palatial Edwardian room with high ceilings/, and in the poorly ventilated storage closet that serves as his study\.

There is no difference syntactically, but the speaker may choose between two phonological possibilities.

How might these two phonological possibilities best be represented? Given structures of the sort shown in (17c), in which one MP interrupts another, we might analyse (21c') and (21c'') as follows:

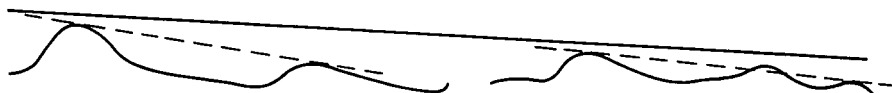
- (21) d'. [_{MP} Bill smokes in the living room]_{MP} [_{MP} a palatial Edwardian room with high ceilings]_{MP} [_{MP} and in the poorly ventilated storage closet that serves as his study]_{MP}
 d". [_{MP} Bill smokes in the living room [_{MP} a palatial Edwardian room with high ceilings]_{MP} and in the poorly ventilated storage closet that serves as his study]_{MP}

We could then say that non-terminal boundary markers are used at boundaries where one or more MPs are left open, while terminal markers are used where all open MPs are being closed. Naturally, in order for this account to succeed, we would need a full account of the mapping rules that get us from syntactic structures to prosodic structures like (21d') and (21d''); unfortunately, I can only touch on this topic briefly at the end of the paper. The main point of this section is to note the existence of structures that appear to involve phonological dependencies between what the standard theory would treat as non-adjacent phrasing domains.

2.3 Superdomains

Evidence for a different kind of cross-boundary dependency – this time between adjacent domains – comes from recent studies of what might be called 'declination within declination'. In many descriptions (e.g. Maeda 1976), the traditional IP or something like it is supposed to be the domain of declination, and the declination function is 'reset' at each IP boundary. However, it is quite clear that these resets are not independent. Pitch seems to decline across larger domains (e.g. sentence, paragraph) as well, and sentence-medial resets at 'IP boundaries' do not substantially affect the higher-domain trend. For example:

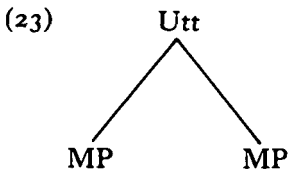
(22)



I asked him what he thought of it, and he said it was pretty bad.

That is, the declination that occurs across domains smaller than the sentence – MPs in the case of (22) – can somehow be superimposed on a declination function that spans the sentence. This has been demonstrated repeatedly in instrumental studies on European languages (e.g. Cooper & Sorensen 1981: §2.3; Thorsen 1984; Ladd forthcoming), and comparable phenomena are reported in descriptions of downdrift in African languages (e.g. Schachter & Fromkin 1968 on Akan, cited by Pierrehumbert 1980: 149f).

In any hierarchical model – with or without the SLH – the obvious way to describe this phenomenon is to assume that the units across which the ‘short-domain’ declination operates must be organised into some higher prosodic category across which we can specify the ‘long-domain’ trend. In the case just illustrated, the categories involved are presumably Utterance and MP:



However, there are other cases in which the ‘higher prosodic category’ needed to account for the patterns of declination within declination is not an independently motivated category like Utterance, but instead seems only to serve as a placeholder in a hierarchical constituent structure formed by the lower-category domains. Examples of this sort come from recent instrumental work on declination within declination.

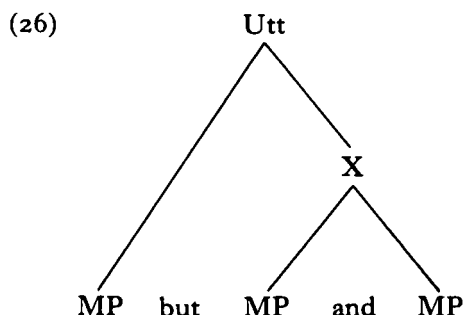
When declination is ‘reset’ following an MP boundary within an utterance, the size of the resetting – the actual amount by which the post-boundary accent peak is higher than the pre-boundary peak – may in some cases be governed by a hierarchical organisation of MPs. Instrumental evidence for this is provided by Ladd (forthcoming); cf. also Bruce (1982). My own study showed that in matched structures like:

- (24) a. Ryan is a stronger campaigner, and Warren has more popular policies, but Allen has a lot more money.
 b. Ryan is a stronger campaigner, but Warren has more popular policies, and Allen has a lot more money.

the initial accent peaks following the *but* boundary were higher than those following the *and* boundary. A control study showed that this was not due to any effect of the word *but per se*; rather it appeared to reflect the fact that the *but* in these sentences opposes one proposition to the conjunction of the other two. That is, the three clauses are in some sense grouped hierarchically as in (25a) or (25b):

- (25) a. [(Ryan...) and (Warren...)] but [(Allen...)]
 b. [(Ryan...)] but [(Warren...) and (Allen...)]

The fact that this grouping is reflected intonationally would appear to require us to posit another prosodic category between the MP and the Utt:

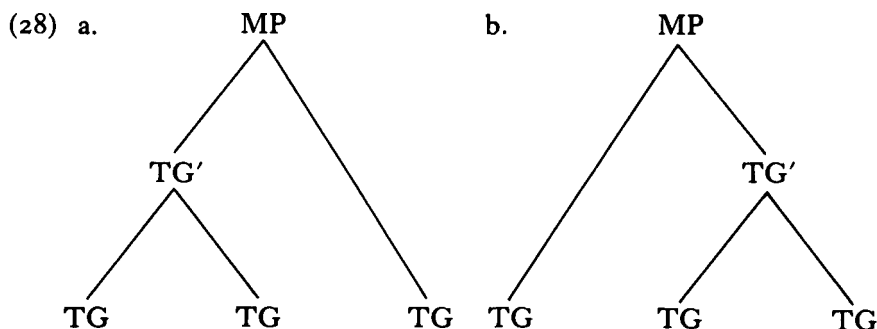


However, there is no independent basis for such an intermediate unit. In effect, 'X' is simply another MP – sister to the other MP on the other side of the *but* – that happens to be composed of two MPs. Following the earlier work of Selkirk (e.g. 1980) and Nespor & Vogel (e.g. 1982, 1983), I propose to call the intermediate unit a super-MP or MP', analogous to other superdomains such as Σ' and ϕ' .

Grouping into superdomains also appears to apply to TGs within an MP. Impressionistically, at least, the following pair of sentences involves a comparable effect to that seen in (24):

- (27) a. My sister's neighbour and his cousin from Calgary are opening a restaurant.
 b. My sister's neighbour is moving to Calgary and opening a restaurant.

That is, there seems to be a subtle cue in the declination pattern that signals the pairing of coordinate constituents:



Instrumental studies would of course be useful in determining the exact nature of the cues to this structure.

Finally, the overall pattern of the analysis suggests that we should find PA' nodes as well. This is an obvious way to label the Head and Primary Contour nodes in the basic TG structure shown in (10).

2.4 Remarks on 'register'

My underlying assumption in this part of the paper has been that it is both necessary and appropriate to enrich the phonological representation of intonation in order to express the fact that syntactic organisation may be signalled intonationally in fine differences of target height. This assumption needs to be explicitly justified.

There is general agreement that in modelling intonational phonology it is necessary to ignore a certain amount of 'gradient variability' in setting up intonational categories. More specifically, any pitch accent model of intonation, whether Bolinger's, Pierrehumbert's or 't Hart's, posits a small number of categorically distinct pitch accent types, and allows for gradient variability in the way those pitch accent types are realised phonetically. Most of this variability involves 'pitch range' or 'register' – i.e. the relative height of pitch targets on a fundamental frequency scale¹⁵ – and there can be little doubt that some of the observable variation in the way pitch targets are realised is due to relatively unsystematic (and at this stage certainly unformalisable) 'paralinguistic' factors such as degree of emphasis and degree of speaker arousal.¹⁶

It might well be argued that the phonetic differences on which I have based my phonological proposals are merely gradient differences of register, which should not be allowed to clutter up the phonology of intonation and must be explained in other ways. This is a good illustration of the fact that, in the absence of a good theory of intonational function, there is no *a priori* basis for distinguishing systematic, formalisable, categorical linguistic differences of target height (such as High tone *vs.* Low tone) from unsystematic, unformalisable, gradient paralinguistic ones. As I have discussed elsewhere (e.g. Ladd 1980: ch. 5), this problem is the source of dozens of specific analytical disagreements in the literature, such as the question of whether to distinguish High Fall from Low Fall as two different types or only as gradient variants of a single category Fall.

Indeed, there is not even any *a priori* basis for assuming that all the factors affecting target height are necessarily either categorical and linguistic, or gradient and paralinguistic. Yet this assumption is pervasive. For example, Beckman & Pierrehumbert (this volume) provide nice evidence that the scaling of final low boundary tones reflects discourse organisation, but in a way that cannot be analysed as involving declination over syntactically definable domains; from this they conclude that declination may be 'truly paralinguistic'. What might 'paralinguistic' usefully mean, if it includes both the expression of speaker arousal and the signalling of discourse organisation? It seems fair to say that, like most other investigators, Beckman & Pierrehumbert's use of the term is based on the rule of thumb that goes: 'if it involves target scaling and isn't categorical, then it must be paralinguistic'.

My proposals in this section are an attempt to get beyond this implicit two-way division of intonational phenomena. I believe we must distinguish at least three kinds of factors affecting intonational target scaling – tonal

(categorical, etc.), paralinguistic (gradient, emotional, etc.), and prosodic (factors having to do with the organisation of tonal strings into hierarchical domains). The proposals here are a first attempt at showing how the prosodic factors might be described.

3 Some descriptive consequences

3.1 Complex intonation contours

This section briefly discusses two long-standing points of difficulty in standard analyses of intonation, and shows how, in the framework developed so far, they can be analysed as manifesting a more complex – and explicitly recursive – contour structure.

3.1.1 *Intonational tags*. A number of phrase types – vocatives, epithets, various parenthetical clauses, etc. – are often accompanied by one of a restricted set of intonation types sometimes known as intonational tags. These are illustrated in (29):

- (29) a. ‘Who’s been eating my porridge?’, said Papa Bear.
b. Would you like some tea, Ian?

The difficulty with these for standard intonational descriptions is that the tag is preceded by an obvious intonational boundary, but does not otherwise have the characteristics of an independent IP. There is often very little pitch movement on the tag, and no clear nucleus. Probably the most thorough discussion of intonational tags is that of Bing (1979), who posits a restricted set of intonational choices for such tags (her ‘Class 0 Contours’) that is distinct from the normal set of possible contours (‘Class 1 Contours’). Other analysts (e.g. those of the Trager–Smith school) have simply ignored the problem, treating these tags as entirely analogous to any other IP. Given the standard theory’s assumption that IPs are independent phonological units that succeed one another linearly, these are effectively the only two ways of dealing with the problem – either to ignore it, or to set up a special class of IP types.

The key to analysing tags is to note that their pitch contours are clearly dependent on the choice of nucleus in the main part of the sentence. Example (29b) is particularly revealing in this regard, since polite questions of this sort typically have a high–rising nucleus in American English and a high falling–rising nucleus in British English:

- (30) a.



(American) Would you like some tea?

b.

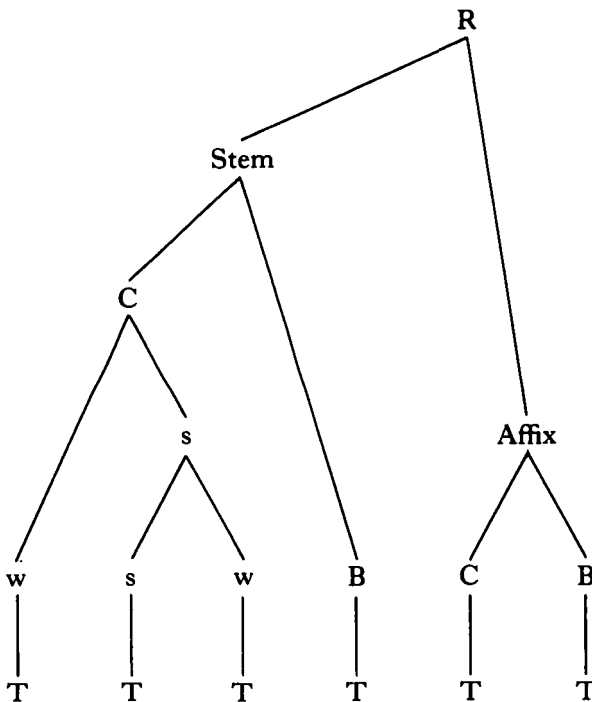


(British) Would you like some tea?

The choice between these two nuclear movements is mirrored on the vocative tag in the American and British versions of (29b): the pitch movement on the tag simply continues the pitch movement of the tail of the intonation contour on the main part of the sentence, exactly as if there were no intervening prosodic boundary. This dependency has been recognised by a variety of authors, including Liberman (1975), Ladd (1980) and Beckman & Pierrehumbert (this volume). Liberman's preliminary analysis is worth further exploration.

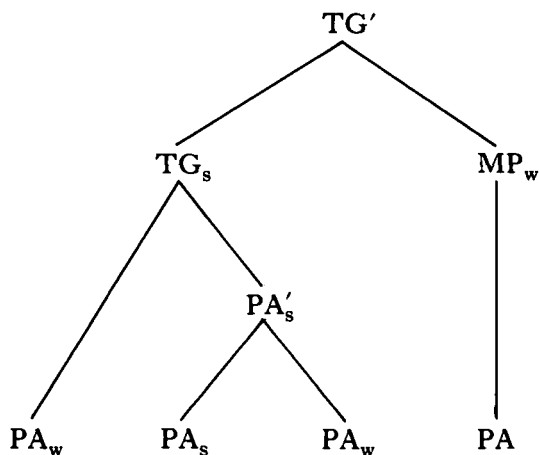
The main interest in Liberman's proposal is that it ascribes the properties of intonational tags largely to properties of their constituent structure. Liberman suggests that tags are part of structures like the following (B = boundary, R = root of tree):

(31)



Allowing for the recursiveness of intonational categories (and again ignoring boundary tones) we could translate this structure into the terms being proposed here as follows:

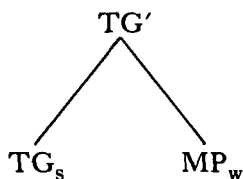
(32)



The fact that the tag is set off by audible boundaries is expressed by treating it as an MP. The fact that the contour on the tag behaves essentially as if it were the tail of a simple contour is represented by the place of the MP in the tree – on a weak right branch like any other tail.

The possibility of structures like:

(33)

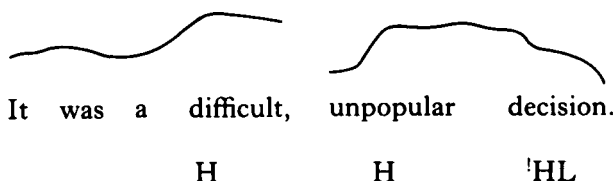


is of course dependent on the more general theoretical proposal that the prosodic categories of intonation are recursive. But if we allow for recursive structure in intonation, it appears that the phonology of intonational tags poses no difficulty.

3.1.2 Level tone. The treatment of intonational tags as MPs embedded in TGs raises the question of whether MPs might be embedded in TGs in other ways as well. It appears that other possibilities do indeed exist, and that they can be used to account for another perennial controversy in the description of intonation, namely the question of 'level nuclear tone'.

Consider the following sentence:

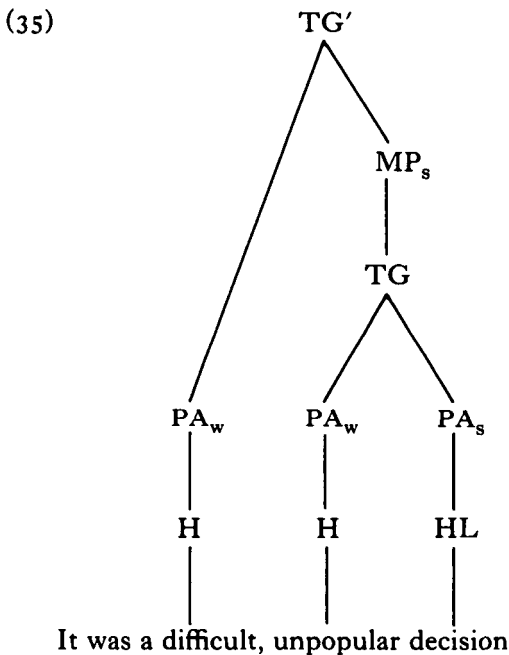
(34)



Sentences like this are a problem in traditional descriptions of intonation, because the accent on *difficult* is intuitively subordinate to the nucleus on

decision – i.e. it appears to be part of the head – and yet it is followed by an audible boundary which given the assumptions of the standard theory should make it the nucleus of an IP *It was a difficult*. The problem has been given one of two treatments. In one analysis, the subordinate or prenuclear status of the accent on *difficult* is acknowledged, and the audible boundary must therefore be ignored in order to treat the whole structure as a single ‘intonational phrase’ with a single nucleus on *decision*. In the other, the presence of the audible boundary is acknowledged, forcing the recognition of a ‘nucleus’ preceding the boundary, on *difficult*. This second analysis is most consistently adopted by Crystal (1969), who treats accents like the one on *difficult* as ‘level nuclear tone’ (and who also develops his whole ‘theory of intonational subordination’ (1969: §5.10) primarily to deal with the intuition that the level tone is subordinate as well as nuclear).

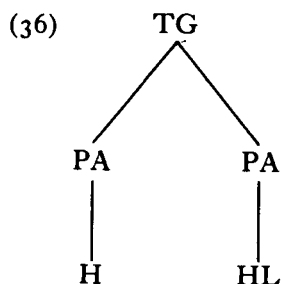
Given the more complex intonational structures proposed here, sentences like (34) can be said to have an MP as a constituent of a higher TG. Thus:



I make no attempt to justify the details of (35), which must be regarded as preliminary. However, it seems fair to add that while other plausible analyses could be proposed within the general framework being developed here, all would involve MP dominated (directly or at a distance) by TG.

Finally, we may note that controversy has arisen over a putative ‘level

tone', rather than some other pitch accent type, because of the fact that (36) is the most common declarative intonation (cf. Ladd 1983):



In the analysis just given, the accent on *difficult* is an ordinary High tone that is in effect the head of the TG'. It is entirely comparable to other High tone head accents, such as the ones in (11)–(14) above, except that given the more complex structure, it is directly followed by an MP boundary rather than by another head accent or a nucleus. The resulting pitch contour rises to a prominent syllable and does not immediately fall (as at any other High tone head accent), but then is interrupted by an audible boundary. The boundary makes the preceding contour appear 'nuclear' under the assumptions of the standard theory: hence, 'level nuclear tone'.

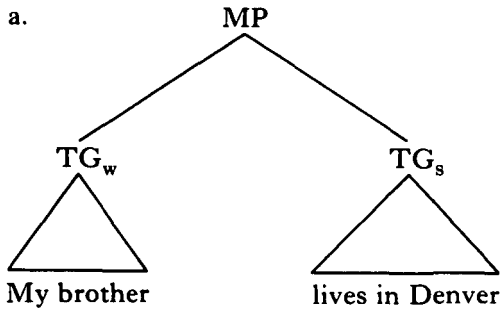
3.2 Syntax–prosody mapping

The possibility of analysing intonational structures as recursive has important implications for the analysis of the mapping between syntax and prosody. In the standard theory, the correspondence between syntactic constituent types and prosodic ones is highly variable, since the make-up of the prosodic constituents is influenced by a variety of essentially linear factors. This is the problem that has occupied the attentions of Nespor & Vogel.

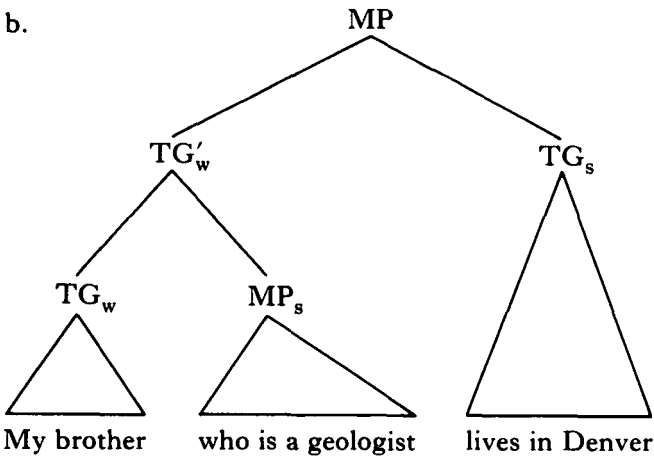
Consider again the pair of examples in (1). In the standard theory, there can be no generalisation about the prosodic status of an NP like *My brother*. When it is followed by a non-restrictive relative, as in (1b), it must constitute a separate MP; but when it is followed immediately by its sister VP *lives in Denver*, as in (1a), it must not do so, except possibly under special emphasis. Because the intonational status of the NP depends on its position in a linear string of intonational phrases, the question 'How are NPs realised intonationally?' does not even arise.

Given the possibility of embedded intonational structures, however, the intonational status of the NP *My brother* can be seen as much more invariant. Whether or not it is followed by an MP boundary, *My brother* is and remains a constituent TG of the MP formed by the matrix sentence *My brother lives in Denver*. This is shown in the following:

(37) a.



b.



This suggests the hypothesis – for which there appears to be a good deal of evidence – that NPs are commonly realised as separate tone groups. More generally, it suggests that the notion ‘invariant syntax–prosody mapping’ is not only theoretically possible but also a useful focus of research. A more thorough study of this subject is in preparation.

4 Summary

The main points that emerge from the foregoing discussion are the following:

- (i) In much past work, IPs have been defined both in terms of the location of phonetic (and to some extent syntactic) boundaries, and in terms of their internal intonational structure (e.g. as the domain of declination, or as the domain within which a nucleus must occur). Because these defining criteria sometimes conflict, they are often stated vaguely or used in circular ways. By treating boundary cues and

structural properties separately, we define two different types of intonational phrasing domain, major phrase and tone group.

- (ii) These two types of domains form hierarchical structures ostensibly similar to those discussed in recent work on prosodic organisation. However, intonational structure does not obey the predictions of Selkirk's Strict Layer Hypothesis: one cannot simply segment a stretch of speech into a linear sequence of phrases of a given type. Rather, the internal structure of the tone group is similar in some respects to the internal structure of the syllable, and dependencies between major phrases suggest that MPs may be (a) embedded in other MPs (b) grouped into 'super-MPs'. That is, intonational structure is in some sense recursive.
- (iii) Evidence for the recursiveness of MP structure comes, in the first instance, from instrumental studies of declination and declination reset. However, positing recursive structures suggests solutions to some long-standing problems in intonational phonology, and gives promise of simplifying the mapping from syntax to prosody.

NOTES

- * In developing the ideas presented here I have profited from discussions with Ronnie Cann, Heinz Giegerich, Haruo Kubozono and Mary Tait, and from the comments of Mary Beckman, Steve Isard, and an anonymous *Phonology Yearbook* referee on an earlier version of the paper. Responsibility for the content of the paper is mine alone.
- [1] It is important for the comparison intended here that (1a) be read as an 'all-new' sentence, i.e. with *My brother* being introduced into the discourse or otherwise fully accented. The significance of this restriction will become clear when example (2) is discussed.
- [2] Limitations of space do not permit a discussion of specific instances from past analyses that illustrate this point. Lest the whole argument be thought a straw man, however, I provide in the appendix a largely uncommented list of cases which (in my interpretation) involve positing (or not positing) IP boundaries primarily on the basis of hypotheses about the internal intonational structure of IPs or about the relation between intonational and syntactic phrasing.
- [3] In other words, Maeda defines the breath group as the domain of baseline declination – i.e. in terms of internal structure – rather than as the chunk extending from one inhalation to the next – i.e. in terms of boundary markers. But he goes on to concede that his model does not successfully treat baseline declination in breath groups other than sentence-initial ones. This means that he is identifying sentence-medial breath group boundaries on some other basis that is not made explicit.
- [4] The intended comparison between the (a) and (b) versions of (3) and (4) requires that all of Speaker B's sentences should be read with accents on both the subject and the predicate. In the 'all-new' versions (3b) and (4b), another reading is possible, with a nucleus only on the subject and the rest of the utterance in the intonational tail (*The hotel's terrible; The bamboo hasn't been doing too well*).
- [5] See Scott (1982) for instrumental evidence that the duration of boundary pauses depends on the place of the pause in the foot structure of the utterance; for a theoretical treatment see Selkirk (1984: ch. 6).
- [6] Despite the general similarity between the structures under discussion here and those treated by Selkirk and Nespor & Vogel, it should be emphasised that I am dealing in the first instance with *intonational* phonology and that the structures proposed are not necessarily more generally relevant. For example, while MP

seems to be identifiable with Nespor & Vogel's category I, it does not appear that TG is directly comparable to anything in their hierarchy (the most likely candidate being ϕ'), since their hierarchy is based on consideration of syntactic structure and segmental phonological processes. I assume that, if the tonal and segmental hierarchies are in fact different, then the well-formed association of a tonal string with the segmental string will need to be sensitive to the hierarchical structure of both – an idea developed by Liberman (1975). This is a problem that lies well outside the scope of this paper.

- [7] I assume without comment that intonation contours are to be modelled as strings of pitch accents, as in the autosegmental theory of Pierrehumbert (1980) and work that builds on it (e.g. Ladd 1983; Gussenhoven 1983; Lindsey 1985). The minimal pitch accent notations (e.g. H HL) here and throughout are based on Ladd (1983), though the representation of the downstepping accent (in e.g. sentence 12) has been modified from 'H to H'.
- [8] Linear and overlay models are what I have elsewhere (Ladd 1983) termed the 'tone sequence' and 'contour interaction' approaches respectively. Strictly linear models include the traditional American pitch level theory (Pike 1945; Trager & Smith 1951; and others) and the recent autosegmental descriptions that build on Pierrehumbert (1980). The classic overlay description of English intonation is Armstrong & Ward (1922); modern overlay models of intonation include the work of Fujisaki on Japanese (e.g. Fujisaki & Sudo 1971) and Thorsen on Danish (e.g. 1979).
- [9] Many of the difficulties that Selkirk (1984) encounters in her attempt to assign intonation before metrical structure can be attributed to the fact that she follows Pierrehumbert in treating every pitch accent as an independently meaningful linguistic choice. If we acknowledge that the choice of intonational type is made for the head as a whole, then it seems clear that the actual number of pitch accents depends in some way on the metrical structure and not vice versa.
In this connection consider also the pilot experiment reported in Pierrehumbert (1980: ch. 4), where a speaker was asked to produce sentences of increasing length with a downstepping intonation pattern. By Pierrehumbert's own account the speaker 'was quite successful' in extending the series of downstepped accents to fit the number of accentable syllables in the test sentences. But by Pierrehumbert's theory this success is actually somewhat puzzling: the two-accent sentence is supposed to be $H^* H^- + L^* L^- L\%$ and the three-accent sentence $H^* H^- + L^* H^- + L^* L^- L\%$, and there is no obvious reason in Pierrehumbert's theory why $H^- + L^*$ should be the 'right' choice for the second accent in the three-accent sentence. The speaker's lack of difficulty is much more consistent with an analysis like that proposed here, in which the head accent H^1 is repeatable in the contour $H^1 HL$.
- [10] The category label 'Head' will be replaced by the more general PA' in the second half of the paper.
- [11] An exception to this statement is the work of Daniel Hirst (see e.g. Hirst 1983) and his student Pierre Imbert (e.g. Imbert 1985), who posit recursive intonational structures similar in some respects to those suggested here.
- [12] I use the term declination in the broadest sense of any downward trend of F_0 , however caused and however analysed. There is by now quite a substantial body of research on declination; for a review see Ladd (1984). Although past work reflects a considerable diversity of assumptions and of attitudes toward linguistic description, it seems to take for granted that declination somehow operates from boundary to boundary – i.e. across some phrase-like domain. This assumption is retained in the following discussion.
- [13] Cooper and his associates are open to a number of important criticisms in the design and analysis of their experiments (see e.g. Pierrehumbert & Liberman 1982). However, my own informal measurements suggest that their findings about declination and parentheticals would stand up to more rigorous scrutiny.
- [14] The terminology is ad hoc. By non-terminal boundary marker I mean roughly a pitch rise immediately before the boundary; by terminal boundary marker I mean roughly a pre-boundary fall to the bottom part of the speaker's range. In

many cases these two types can be equated with Pierrehumbert's High and Low boundary tones. This is scarcely an adequate definition of the contrast, but I believe the following examples are nonetheless quite clear.

- [15] From the point of view of a model like 't Hart's or Bolinger's, the differences of pitch range are seen not as differences of target scaling but as differences of size of pitch movement. However, Liberman & Pierrehumbert (1984) present convincing experimental evidence that the target-scaling view is preferable to the excursion-size view.
- [16] See Ladd *et al.* (1985) for experimental evidence that differences of register and differences of contour type have clearly separate influences on listeners' judgements of the affective force of utterances.

APPENDIX

Hockett (1958: ch. 4)

- (33) What do you do | with a stiff neck
(74, 75) The man in the street | is my brother
(115) The word | pig | is a noun

O'Connor & Arnold (1973: 276, dialogue 3)

What is there about Copenhagen | that makes you keep going back there?
I've often wondered that | myself.
But I've always found it | a very happy place.
And Tivoli | seems to me | to be a very good symbol of Copenhagen.
I've got to have a wretched chimney knocked down | and rebuilt.

and cf. the following, with audible boundaries not marked as such:

But mostly, I suppose | the people.
Isn't that a bit like beauty, though | in the eye of the beholder?

Trager & Smith (1951: 51)

- (1) At the little market | near the corner.

Lieberman (1967: ch. 5)

- (C) They decorated | the girl with the flowers.
(C') They decorated the girl | with the flowers.
(E) They kept | the car in the garage.
(E') They kept the car | in the garage.

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