

Kansas Working Papers in Linguistics

Volume 8, Number 1

Edited by Letta Strantzali

The editor would like to express her thanks to the faculty and staff for their help in the preparation of this volume. Funding for this journal is provided by the Graduate Student Council from the Student Activity Fee.

© Linguistics Graduate Student Association  
University of Kansas, 1983

Reprinted 1992

Kansas Working Papers in Linguistics

Volume 8, number 1, 1983

CONTENTS

Maria Alzira Nobre Frances Ingemann	Oral Vowel Reduction in Brazilian Portuguese	1
Patricia J. Hamel	Brazilian Portuguese Stressed Vowels: A Durational Study	31
Andrea G. Osburne	Comma Intonation in a Tone Language	47
Philip Hubbard	Albanian Reflexives: Violations of Proposed Universals	63
Mark J. Elson	The Generative Relationship	73
Hiroshi Nara	On Michael Dummett's Notion of Decidability	87
Kenneth L. Miner Barbara Lynn Taghva	Computerized Permutation of Pikean Field Matrices	97
Anne M. Ediger	An Analysis of Sex Stereotypes in the Japanese Language	107
Contents of Previous Volumes		129

## COMMA INTONATION IN A TONE LANGUAGE

Andrea G. Osburne  
Central Connecticut State University

Except in the case of downdrift, which has been extensively studied, discussion of intonational phenomena in languages with lexical tone has frequently been anecdotal, with only marginal note being taken of their existence. Part of the problem has been that intonational pitch phenomena in tone languages are often difficult to isolate from nonintonational or lexical pitch phenomena; it has been compounded by the fact that intonational pitch phenomena are not as prominent in tone languages as in languages without nonintonational use of tone, since, due to overloading of the pitch channel in tone languages, intonations there may have to be manifested by nonpitch mechanisms. As a result, information about these intonations has frequently been scanty, with brief statements being tucked away in odd corners of dissertations and grammars. The purpose of this paper is to investigate one aspect of intonational phrasing in a tone language in greater detail. The language is Zahao, a Chin language of northwestern Burma, and the intonation is what might best be called 'comma intonation', in the usage of Leben (1976: 94-96), who describes something very similar for Hausa and Mende.

### 1.0. The Phonetic Facts

Zahao has three lexically distinctive tones, a high tone (H), a low tone (L), and a rising tone (R) which must clearly be regarded as a sequence of level tones in order to facilitate explanations of tone sandhi phenomena; many syllables have no underlying tone, but receive tone as a result of the operation of tone acquisition processes. Little is known about Zahao intonational tones, or lexically meaningful intonation contours, but two intonational tones which function in intonational phrasing are known, a low tone which signals the end of a sentence, serving as a neutral sentence intonation contour, and a rising tone which functions as the comma intonation cited above. Both these tones are 'floating tones', since they constitute the only actualization of grammatical morphemes (Leben, 1976: 91). They are also both nondurative intonations in the sense that, in contrast to durative intonational phrasing phenomena like downdrift, they are expressed not over (i.e. as a modification of) successive tones appearing in a syntactic unit but rather on (as a modification of) a single tone in a syntactic unit--the last one.

In the neutral sentence intonation contour, at the end of a sentence, Zahao high and rising tones acquire a following low tone, actualized as a terminal falling glide, while the low tone remains unaffected. The presence of this terminal falling glide results in

the appearance of two pitch contours which are otherwise not present in Zahao, a falling tone and a convex or rising-falling tone (all Zahao data from Osburne 1975):

cemR 'spend, use'  
 roolR → L ?anHney? LmiHpoolL tamHzetL ?al cemR-L  
 | (by lexical tone sandhi [see 4.0])  
 food they-have-one-pl.-many-very he-spend

'He uses up all the food they have.'

siH 'be'  
 ?uHpatHzetL miH ?al siH-L  
 be-respected-very-one he-be

'He's the most respected one.'

The Zahao comma intonation is the replacement of a low or high tone by a rising tone before a mid-sentence pause, with a rising tone remaining unaffected; it is associated most clearly and consistently, but not exclusively, with sentences which involve the giving of lists of items:

haYLhna?HhaYLra?H?anHCiR → L tamHbiik R → L miH  
 | (by tone sandhi)  
 vegetables they-plant many-most-one  
 cuuH → R, kolpiH → R, ?anHtam → R, hlamHmaayR, leer,  
 as-for cabbage mustard pumpkin and  
 belteH → R, khaHsuanL tiL veekH tlaL ?al siH-L  
 bean onion said like e.g. it-be

'The vegetables they plant most are things like, for example, mustard, pumpkins, and beans (and) onions.'

?anHhriam naamH hmiR → L cuuH → R, hreyLtluyH → R,  
 | (by tone sandhi)  
 their-tool name as-for axe

tuLhmuyH → R, leer, naamRtoH, LtlaL ?anHsiH-L  
 hoe and machete e.g. they-be

'The names of their tools are axes, hoes, and machetes, for example.'

Both these tones can only be described plausibly in terms of an intonation superimposed on already specified or lexical tones. For

the intonational low tone, this presents no problem; the low tone is clearly simply added on or associated at the end: H+L gives HL, LH (=R) + L gives LHL. The rising comma intonation, however, cannot be so easily accounted for, particularly if we view it as consisting, like the lexical rising tone, of a sequence of two level tones, low followed by high, since then it cannot be viewed as a simple add-on. True, we might say that a lexical low tone has a low-high sequence added to it, resulting in the expected low-high rise (L+LH gives LLH or LH), but adopting the same approach for an affected lexical high tone results in a high-low-high sequence which does not occur. And abandoning an 'add-on' approach for some sort of feature-changing rule is not satisfactory either, if the low-high formulation of the intonational rising tone is maintained, since rules like  $H \rightarrow LH$  and  $L \rightarrow LH$  seem to unnecessarily remove and replace features in an ad hoc manner. Furthermore, trying to reformulate the intonational rising tone as an added-on level high tone, paralleling the level tone analysis of the neutral sentence intonation contour, is ineffective because the required contour cannot then be produced on lexically high-toned syllables. The simplest obvious solution is to view the intonational rising tone as a unitary contour tone specified by the feature [Rising], with a rule that changes low and high tones to [+rising] tones when under the influence of the intonational rising tone, since such a description produces the correct results for all underlying tones; before adopting such a solution, however, it is first worthwhile, for reasons to be discussed in 3.0, to examine alternatives.

## 2.0. Alternatives

Suppose we decide to represent the intonational rising tone as a LH sequence, operative on a separate autosegmental tier. And let us suppose also, for the sake of expository convenience, that Zahao lexical tones are also autosegmental, leaving aside the question of whether they actually are (I have argued elsewhere that they are not). Goldsmith's model of autosegmental phonology specifies that 'no feature may appear on more than one tier' (1979: 205), so we find ourselves with representations for high, low, and rising tone words with comma intonation as follows:

<p>...kopi,...  <math>\begin{array}{ccc}   &amp;   &amp;   \\ L &amp; HL &amp; H \end{array}</math>          cabbage</p>	<p>...?antam,...  <math>\begin{array}{cccc}   &amp;   &amp;   &amp;   \\ H &amp; L &amp; L &amp; H \end{array}</math>          mustard</p>
--	--

The comma intonation is realized by a 'floating' LH sequence, floating tones being segments with representation in terms of tone features only, or 'melodic levels...that map onto the syllabic structure' (Goldsmith 1976a: 57). Docking the intonational LH to segments and obtaining the correct shape is most difficult in the case where there is a lexical high tone; here we must somehow dock the L to

the left of the preceding H, and this would require us to cross association lines, thus violating Goldsmith's well-formedness condition (1976b: 27).

We can, of course, make the specification that the tones associated with vowels to which a comma intonation is to be docked disappear or be deleted along with their association lines prior to docking, and thus avoid crossing association lines, but, aside from the ad hoc nature of such a formal convenience, it is probably incorrect, since no such deletion occurs in the case of the intonational low tone.

We might also attempt to get around the difficulty of crossing association lines by adopting Leben's suggestion that a new feature with a 'relational' definition be used to represent the comma intonation: a tone feature defined as 'a tone higher in pitch than the preceding tone' (1976: 95-96). There is now no problem with crossing association lines, since the relational tone T is simply docked to a preceding vowel:

...kopi,...      ...?antam,...  
 $\begin{array}{c} \downarrow \\ \text{L} \end{array} \begin{array}{c} \downarrow \\ \text{HT} \end{array}$        $\begin{array}{c} \downarrow \\ \text{H} \end{array} \begin{array}{c} \downarrow \\ \text{LT} \end{array}$

There is still a problem, however, because of the way the relational feature is defined. Defining it as 'higher in pitch than the preceding tone' suggests that a comma intonation docked to a vowel with high tone results in a higher-pitched rise than would be the case if the comma intonation were docked to a preceding vowel with an already associated low tone:

...kopi,...       $\begin{array}{c} \text{HT} \\ \text{L} \end{array}$       ...?antam,...       $\begin{array}{c} \text{H} \\ \text{L} \end{array}$        $\begin{array}{c} \text{LT} \\ \text{L} \end{array}$

In Zahao, there is no evidence that this is the case.

Note also that abandoning any attempt at an autosegmental account and resorting to conventional 'standard theory' phonological rules will not be very helpful either, as long as we are still considering the intonational rise to be a LH sequence, since it would require us to insert a low tone before a preceding vowel with high tone ( $\emptyset \rightarrow [+L] / \_ [+H]$ ), but a high tone after a preceding vowel with low tone ( $\emptyset \rightarrow [+H] / [+L] \_$ ), a clearly awkward solution.

We might make a further attempt to operate within an autosegmental framework, this time using a model suggested by Hart (1981) which differs from Goldsmith's in allowing features to appear on more than one tier: indeed, 'one feature can appear on all of the tiers it functions on' (1981: 1); this is possible because the tiers are considered tiers of operative domain instead of tiers of

feature--i.e. autosegmental tiers are not tiers of tone features, for example, but rather of syllabic domain, word domain, and so forth. In that case, we have the same tone features, which may operate on a word tier (or, more accurately for Zahao, a syllabic tier) and on a tier of some syntactic domain, the domain of the intonational rising tone, however we eventually decide to specify it. Sample representations are as follows:



To have the phonetic actualizations come out right, we must specify that the features on the wider-domain tier take precedence over those on tiers of narrower domain. We immediately come into conflict with Hart's model, since he finds that exactly the opposite must be specified for nasality in, for example, Tereno, where it is the level immediately dominating a segment which takes precedence (1981: 2). This suggests that, if Hart's model is correct, specifications about which level dominates would have to be different from one language to another, or one autosegmentalized feature to another, leading to considerable loss of generality. Such a solution appears rather ad hoc, hence unsatisfactory.

In fact, all these solutions are rather unsatisfactory. The purpose of this discussion, however, is not to criticize these various theoretical models, but merely to indicate some of the difficulties involved, and to suggest that now is the time to reconsider the concept of a unitary rising tone feature, since it allows for the simplest description of the comma intonation.

### 3.0. Contour Features in Phonological Theory

A decision to make use of a contour feature to characterize a contour tone could not be considered a conventional one within the framework of linguistic theory. Although structuralist (Pike 1948) and early generative (most notably Wang 1967) models of tone used contour features regularly to describe such tones, phonologists turned against the use of contour features for a variety of reasons, the most well-known of which are summarized below.

3.11. Contour Features are Unnatural. Contour tones are probably more marked than level tones, since diachronically and synchronically they are frequently replaced by level tones in a process known as tone simplification (Hyman and Schuh 1974: 91; Schuh 1978: 242). Numerous examples of this process exist in a variety of languages; since this paper is primarily concerned with Zahao, a Zahao example will be used to illustrate. In Zahao, short rising tone syllables ending in a vowel only retain the rising tone in isolation or in

sentence-final position (where, in fact, they acquire an additional sentence-final intonational low tone, thus ultimately ending up with a rising-falling contour). Elsewhere, the rising tone of such syllables is replaced by a high tone; this might be viewed as tone simplification:

thi <sub>R</sub>	'die'
?a <sub>L</sub> thi <sub>R</sub>	'he died'
?a <sub>L</sub> thi <sub>H</sub> di <sub>H</sub>	'he'll die'
thi <sub>H</sub> cop <sub>L</sub> ?o <sub>H</sub>	'drop dead' (die-simply-imperative)

Contour features usable to specify contour tones are unnatural in the sense that they are intolerably different from other features. They may be viewed as expressing 'articulatory gestures' rather than 'articulatory targets', unlike phonological features generally (Lieberman 1975: 16). If they are viewed as expressing articulatory targets (two or more level pitches in succession, the endpoints of the contour), they are still unnatural in that, unlike other features, they are then concerned with merely specifying the order of pitches which are already specifiable by level tone features, since features like [Falling] and [Rising] differ only in the order in which the same contour endpoints are said to appear; furthermore, the level tone features have their own articulatory correlates, while the contour features have no separate articulatory correlates of their own (Woo 1969: 37-38).

An additional indication of the unnaturalness of contour tones is the fact that they are divisible--their divisibility is clearly shown by their behavior in tonal processes (see below); since contour tones are thus divisible, the features [Rising] and [Falling], if used to represent them, must also be regarded as divisible, unlike other phonological features (Leben 1973: 139-140).

3.12. Contour Tones are Illusory. A contour tone is simply a sequence of level tones. The apparent glide between the pitches is a function of natural phonetic transition (Woo 1969: 39), so its description can be left to 'physics, physiology, and common sense' (Lieberman 1975: 67). Indeed, the fact that some underlying level tones may be realized as contours under certain circumstances is 'no more surprising than that a [+ nasal] segment might actually vary in degree of nasality through time on the surface' (Goldsmith 1980: 416). In some cases, apparent contours, especially on syllables with short vowels, may be a result of the phonetic tone-raising or tone-depressing effects of a consonant in the syllable (Woo 1969: 126-128). Or, the distinction between rising and falling pitches, for example as the terminals of an intonation contour, may often be viewed as related to phonetic symbolism or iconicity, as part of an ideophonic system (Lieberman 1975: 92-98).



3.13. Contour Features Obscure the Nature of Many Restrictions on Tonal Distribution. If level tone features are used to specify contour tones, then the description of the distribution of a language's permissible tone melodies, where these are restricted at the word level, is facilitated. This is because the relationship between a tone sequence like LH on a single-syllable word, where both pitches occur on the one syllable, and its occurrence on a two-syllable word, where each pitch occurs on a separate syllable, can be easily seen; if contour features are used, however, the relationship is not obvious (Yip 1980: 4-5), since the tone sequence on the single-syllable word will be considered to be a single tone, specified as [+ rising], while the tone sequence on the two-syllable word will be considered to consist of a low tone, specified [+ low], followed by a high tone, specified [+ high]. Unfortunately, Zahao cannot provide an example here, since on Zahao words, any combination of lexical tones may appear, with no restrictions, but the phenomenon exists in other languages, with Mende providing what is perhaps the most-discussed case (see e.g. Leben 1973; Goldsmith 1976a, 1976b; Clark 1978; Yip 1980).

Additionally, the use of contour features would make it difficult to account for frequent restrictions on the occurrence of contour tones--in many languages, for instance, lexical contour tones only occur on syllables with a final consonant in cases where this final consonant is a sonorant (Yip 1980: 4). Zahao provides a good illustration of this, since lexical rising tones cannot occur on syllables ending in a consonant specified [-sonorant, -continuant]. And if contour tones are specified by a single unitary contour feature like [Rising] or [Falling], the nature of the restriction is unclear, because a level tone, also specified by a unitary feature, would seem to be as plausibly subject to restriction (Yip 1980: 4).

3.14. Contour Features Obscure the Nature of Tonal Processes. Level tone features facilitate the description of tonal processes (Lieberman 1975: 17). On the other hand, the use of contour features would make many tonal rules or processes difficult to explain naturally because with contour features it is impossible to refer to a contour tone's endpoints, and such reference is necessary because it is the only means to explain certain ways that contour tones operate in tone rules (Yip 1980: 5). In particular, in 'tone copy' rules, when a syllable lacks underlying tone and takes its tone from an adjacent syllable, usually on its left (Hyman and Schuh 1974: 95), only the closest endpoint of a contour tone is copied, rather than the whole contour; that is, a high pitch is copied from a rising (low-high) tone to the left, and a low pitch is copied from a falling (high-low) tone to the left (Leben 1971: 195, Fromkin 1972: 62). Thus, in Zahao, a toneless syllable becomes high in tone after a syllable with rising tone:

khuʔ	'wear (as a hat)'
luɾkhuʔ <sub>H</sub>	'hat (lit.: head-wear)' (becomes lu <sub>H</sub> khuʔ <sub>H</sub> by the process of tone simplification cited above)
-zet	'very' (intensifier affix)
ʔa <sub>L</sub> thooɾ	'it's delicious'
ʔa <sub>L</sub> thooɾzet <sub>H</sub>	'it's very delicious'

Similar independence of the endpoints of a contour tone is seen in tone spreading, a tonal assimilation in which a contour tone is created by a level tone's lasting beyond its own syllable into an adjacent one with a different level tone (Hyman and Schuh 1974: 87-88), and in a subtype of spreading, absorption, where the last part of a contour tone, after moving to a following syllable with tone identical to the last part of the contour tone, is absorbed into the tone of this following syllable and disappears (Hyman and Schuh 1974: 90-91). Thus, one Zahao tone sandhi process causes a sequence of rising (low-high) tone plus high tone to be actualized as a sequence of low tone followed by high tone, since the high part of the contour disappears into the following high tone: for example, ʔa<sub>L</sub>thooɾzet<sub>H</sub> 'it's very delicious', cited above, becomes ʔa<sub>L</sub>thoo<sub>L</sub>zet<sub>H</sub> (see 4.0).

3.15. Contour Features are Unnecessary. All apparent contour tones can be analyzed as sequences of level tones, which are needed anyway, since, while many languages have level tones without also having contour tones, no languages have contour tones without also having level tones.<sup>1</sup> The only type of contour tone which would seem to present difficulty in terms of level tone analysis (or a dynamic tone analysis: see Clark 1978: 195-201 and Yip 1980: 85-86), a contour tone on a short syllable (difficult because there is only one vowel to carry a tone feature), can still be handled in terms of level tones by various means. Such means include (1) allowing a nonvowel syllable-final sonorant segment to carry a tone feature (this strategy, first proposed in Woo 1969, would, in actuality, probably take care of the majority of cases), or, where this fails, because there is no sonorant available, (2) changing the nature of allowable segments (see, for example, the suggestion in Osburne 1979), or (3) abandoning a segmental analysis (or a suprasegmental one, since it would require eventual mapping onto segments, and therefore, as acknowledged in Leben 1976: 72, not solve the problem), and substituting instead an autosegmental analysis, which associates tones and segments as separate tiers, without doing any mapping, and which in any case is independently motivated (Goldsmith 1976a: 32).

A counterargument, that humans perceive contour tones in terms of pitch movement during the tone rather than in terms of the contour's endpoints (Gandour and Harshman 1978: 28-30, summarized in

Gandour 1978), is really irrelevant to a discussion of the underlying nature of contour tones because perception is not necessarily reflective of phonological structure; the same strategy of perception (i.e. reliance on contour) is evidently used by individuals whose language's contour tones have been clearly established as nonunitary on other grounds and by individuals whose language's contour tones have not yet been clearly established as nonunitary (Anderson 1978: 154-155). Furthermore, although there may be cases where rules involving contour tones cannot be satisfactorily formulated in terms of level tones, like the example of Lue cited by Gandour and Fromkin (1978--their argument is, however, disputed by Maddieson 1979), in which one lexical tone has two possible shapes, level (before contour tones) and rising (before level tones), such cases are rare enough to be dubious (Anderson 1978: 159).

3.16. Contour Tones are Superfluous. Since contour tones are unnecessary, they are superfluous and should be rejected, since it would be best to keep the number of features to the minimum needed. Anyway, including contour features along with level tone features would create problems in that this would suggest a contrast between unitary contours and contours composed of level pitches (a falling tone specified by the feature [+ falling] versus a falling tone composed of a high tone followed by a low tone, for example), and such a contrast does not occur (Yip 1980: 5-6).

3.20. Evaluation. The arguments against the use of contour features vary in strength. As far as naturalness is concerned, contour tones may be more marked than level tones, but this is not particularly important as the same is obviously true of many segments with respect to each other. If contour features express 'articulatory gestures', the same might be said in some sense of ordinary manner-of-articulation features as opposed to those which involve place of articulation. And contour features should be viewed in this way, rather than being viewed as representing articulatory targets. Anderson is, of course, correct in stating, as mentioned above, that the observation by Gandour and Harshman (Gandour 1978: 67) that humans perceive dynamic tones in terms of contours (movement away from one point and towards another), not endpoints (movement from one fixed point to another), does not require linguistic description of such tones in terms of unitary contour features, as it simply reflects 'a general strategy in perception, applicable to languages for which the linguistic evidence shows clearly that contours are phonologically composed of sequences of level tone units as well as to languages for which such evidence is unavailable' (1978: 154-155). However, if we establish on independent grounds a need for contour features, then the perceptual evidence allows us to define these features in such a way as to negate the objection that contour features simply order other features, since the contour features, having perceptual rather than articulatory correlates, will be concerned with movement, not endpoints. With

respect to the supposed illusory or transitory nature of the glide part of a contour tone, this clearly depends on perspective--if the glides or pitch changes are focused on (as they are in dynamic tone theory, for instance), then it is the endpoints which take on a secondary role. And as for the nonmelody restrictions on tonal distribution (frequent restriction of contour tones to particular types of syllables), this could be a valid argument. However, it might also plausibly be wondered why, if contour tones are just sequences of lows and highs, they should be distributed differently from other lows and highs (level tones). This is especially the case if the wondering is done within an autosegmental framework, so that the number of pitches associated with a particular segment is not a problem.

Of most weight is the argument that contour features obscure the nature of tonal processes, supplemented by the related arguments on the distribution of tonal melodies and the divisibility of contour tones (but not contour features, which, as mentioned above, need not be viewed as divisible in the sense of ordering endpoints). The argument that contour features are unnecessary is naturally valid only to the extent that this can be shown to be true.

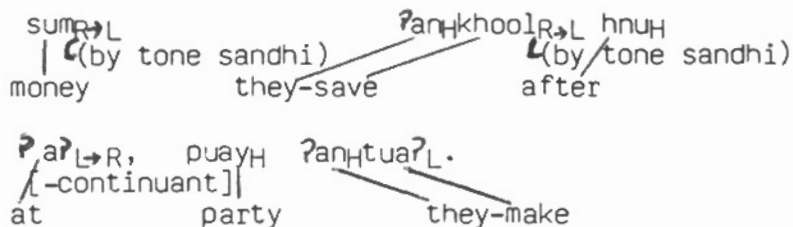
But what these arguments all share is the assumption that contour feature representation of contour tones is an all-or-none proposition--that all contour tones must be represented either in terms of level tone features, or contour tone features. If a choice must be made, then the weight of evidence is clearly on the level tone feature side, mainly because of the number of tonal phenomena that can then be handled. And we must simply endure a residue of tonal phenomena, like the Zahao intonational rising tone, that cannot be easily accounted for. But it is not clear that a choice must be made. In fact, only Yip (1980: 5-6) really addresses this issue directly, in admitting the possibility of both kinds of representation, while arguing against it on the basis of the value of minimizing tonal inventory. However, it is not clear that all necessary tone features have yet been discovered; Yip herself introduces new features to account for tonal register (1980: 24; perhaps contour features could be adapted for this purpose). In any case, contour features, viewed in the manner suggested here, do not conflict with level tone features. There is no reason why a feature like [Rising], for example, could not be introduced for use; we need only recognize that, like the feature [Covered], it may not be widely exploited in the languages of the world, especially for lexical tone (as opposed to intonational tone), for which no convincing evidence for unitary contours has really been presented, in Zahao or other languages (the Lue data discussed by Gandour and Fromkin 1978 is unfortunately incomplete, as Maddieson 1979 points out).<sup>2</sup> Furthermore, because of the fundamental difference between a rising tone specified by a [+ rising] feature and one specified by a sequence

of two level tone features, despite the surface identity, we will expect to find some contrast between them, as Yip (1980: 6) in effect suggests we should.

#### 4.0. Looking for a Contrast

The lexical and intonational rising tones are actualized identically. The place to look for contrasts between them, then, must be in any special characteristics of the lexical rising tone. Such characteristics would have to involve either (1) restrictions on the tone or (2) rules the tone undergoes.

As far as restrictions are concerned, a contrast between the two rising tones involves the kinds of syllables on which each may occur. While, as mentioned above, lexical rising tones cannot occur on syllables ending in a consonant specified [-continuant], the intonational rising tone is totally unrestricted with respect to the type of consonant closing a syllable on which it occurs:



'After they saved up money, they made a party.'

The major phonological rule which the lexical rising tone undergoes is tone sandhi; unfortunately for our purposes, however, this difference need not be explained in terms of a clear underlying distinction between the two tones. The intonational rising tone occurs before pauses, and tone sandhi, even for lexical rising tones, never occurs across pause boundaries; the intonational rising tone thus never occurs within the operative domain of tone sandhi rules. So while the two tones differ in restrictions on accompanying final consonant, no difference with respect to rules undergone can be confirmed. But before abandoning the search for a clear contrast in rules, it is useful to examine an exception to Zahao tone sandhi.

Tone sandhi rules in languages tend to be highly regular. For example, discussions of the well-known Mandarin tone sandhi rule according to which a low tone followed by another low tone changes into a rising tone do not include lists of low-tone words which do not undergo the expected change. Nonetheless, it is necessary to list such an exception for Zahao tone sandhi--the conjunction leer 'and', which invariably fails to undergo the expected change to high tone

(when following a rising tone, which itself then changes to a low tone, as mentioned above), or to a low tone (when preceding a high tone):

fah<sup>H</sup>hmaar leer hlam<sup>L</sup>hmaayr kai ci<sup>H</sup>R-L  
 cucumber and pumpkins I-plant

'I planted cucumbers and pumpkins.'

paar<sup>R</sup> sa<sup>H</sup> leer bu<sup>H</sup> ?a<sup>L</sup>si<sup>H</sup>-L  
 | (by tone sandhi) and rice it-be

'It was chicken and rice.'

The expected tone sequences fah<sup>H</sup>hmaar lee<sup>H</sup> hla<sup>L</sup>m<sup>L</sup>hmaayr and paar<sup>R</sup> sa<sup>H</sup> lee<sup>L</sup> bu<sup>H</sup> simply do not occur.

It is of course simple enough to note lee<sup>R</sup> as irregular and mark it in the lexicon with an exception feature like [-tone sandhi rules]. It is worthwhile, however, to consider how such an exception to the otherwise perfectly regular tone sandhi rules might have come to exist. I would like to suggest that the irregularity of lee<sup>R</sup> is related to its extremely frequent placement in prepausal position, either as a clause-final particle (the only common one with rising tone) or in lists of items (see examples in 1.0 above), and that the extremely frequent placement of lee<sup>R</sup> in environments where it would be subject to the intonational rising tone has evidently caused it to have an original lexical low-high rising tone replaced irregularly by the otherwise strictly intonational unitary rising tone as its new lexical tone. Thus the failure of lee<sup>R</sup> to undergo tone sandhi, which is basically an assimilatory process, is not surprising; if not viewed or defined in terms of endpoints, the contour does not assimilate to surrounding level tones. Here again is an indication of underlying distinction between the lexical and intonational rising tones, the distinction we set out to look for.

## 5.0 Conclusion

The ease with which a unitary contour feature [Rising] accounts for comma intonation in Zahao, combined with the contrast between the lexical and intonational rising tones, suggests that the use of such a feature can indeed be helpful in simplifying a description of the intonational rising tone and elucidating the relationship between lexical and intonational tones in this tone language, and perhaps in others which share the use of a rising pitch as a comma intonation. Such a description should, however, ideally be part of a complete description of intonation in tone languages. In particular, there is a need for greater study of the relationship between lexical and

intonational pitch phenomena in tone languages, intonational tunes as well as intonational phrasing, not only synchronically but historically (as an example, it would be interesting to attempt to reconstruct the intonational tones and see how they interact with the development of the lexical tones). It is unlikely that we will ever find pitch to be functioning intonationally in tone languages to the same degree that it functions in many nontone languages, since pitch is also being used lexically (for instance, the phenomenon described by Ladd 1980 as 'deaccenting', accomplished in English by intonational means, is accomplished by change of verbal aspect in Chin languages like Zahao). However, it may ultimately be impossible to understand the nature of the lexical tones fully without a better idea of their interaction with intonation.

#### NOTES

1 But for an alternative view, which makes use of dynamic tone markers instead, see Clark 1978; Clark's dynamic tone theory is essentially the type of tone theory described by McCawley (1978: 128-129), where description focuses on pitch changes (rises and falls) instead of specific pitches.

2 And certainly contour features would not be expected to take precedence over level ones. Not only would this be counterintuitive, but the only proposed theory to give contour features precedence, dynamic tone theory, has a serious shortcoming in that it does not account for contour tones on short syllables, as admitted by Clark (1978: 196-197).

#### REFERENCES

- Anderson, Stephen R. 1978. Tone features. Tone: A Linguistic Survey, ed. by Victoria A. Fromkin, 133-175. New York: Academic Press.
- Clark, Mary. 1978. A Dynamic Treatment of Tone With Special Attention to the Tonal System of Igbo. University of Massachusetts dissertation. [Distributed by Indiana University Linguistics Club.]

- Clements, George N. 1977. The autosegmental treatment of vowel harmony. Phonologica 1976, ed. Wolfgang Dressler and Oskar Pfeiffer, 111-119. Innsbruck: Institut für Sprachwissenschaft der Universität Innsbruck.
- Fromkin, Victoria A. 1972. Tone features and tone rules. Studies in African Linguistics 3.47-76.
- Fromkin, Victoria A. 1974. On the phonological representation of tone. The Tone Tome: Studies on Tone from the UCLA Tone Project, ed. by Ian Maddieson, 1-17. Los Angeles: UCLA.
- Gandour, Jackson T. 1978. The perception of tone. Tone: A Linguistic Survey, ed. by Victoria A. Fromkin, 41-76. New York: Academic Press.
- Gandour, Jackson T. and Richard A. Harshman. 1978. Crosslanguage differences in tone perception: a multidimensional scaling investigation. Language and Speech 21.1-33.
- Gandour, Jackson T. and Victoria A. Fromkin. 1978. On the phonological representation of contour tones. Linguistics of the Tibeto-Burman Area 4.73-74.
- Goldsmith, John A. 1976a. An overview of autosegmental phonology. Linguistic Analysis 2.23-68.
- Goldsmith, John A. 1976b. Autosegmental Phonology. MIT dissertation. [Distributed by Indiana University Linguistics Club.]
- Goldsmith, John A. 1979. The aims of autosegmental phonology. Current Approaches to Phonological Theory, ed. by Daniel A. Dinnsen, 202-222. Bloomington: Indiana University Press.
- Goldsmith, John A. 1980. Review of Tone: A Linguistic Survey, ed. by Victoria A. Fromkin. Language 56.413-418.
- Goldsmith, John A. 1981. Towards an autosegmental theory of accent: the case of Tonga. [Distributed by Indiana University Linguistics Club.]
- Halle, Morris and Jean-Roger Vergnaud. 1980. Three-dimensional phonology. Journal of Linguistic Research 1.83-105.



- Hart, George W. 1981. Nasality and the organization of autosegmental phonology. [Distributed by Indiana University Linguistics Club.]
- Huang, Cheng-Teh James. 1979. Metrical structure of terraced-level tones. Cahiers Linguistiques D'Ottawa 9 (Proceedings of the Tenth Annual Meeting of the Northeast Linguistic Society), 257-270. Ottawa: University of Ottawa.
- Hyman, Larry M. and Russell G. Schuh, 1974. Universals of tone rules: evidence from West Africa. Linguistic Inquiry 5.81-115.
- Ladd, D. Robert. The Structure of Intonational Meaning: Evidence from English. Bloomington: Indiana University Press.
- Leben, William R. 1971. Suprasegmental and segmental representation of tone. Studies in African Linguistics, supplement 2, 183-200.
- Leben, William R. 1973a. Suprasegmental Phonology. MIT dissertation.
- Leben, William R. 1973b. The role of tone in segmental phonology. Consonant Types and Tone (Southern California Occasional Papers in Linguistics 1), ed. by Larry M. Hyman, 115-149. Los Angeles: University of Southern California.
- Leben, William R. 1976. The tones in English intonation. Linguistic Analysis 2.69-107.
- Leben, William R. 1978. The representation of tone. Tone: A Linguistic Survey, ed. by Victoria A. Fromkin, 171-219. New York: Academic Press.
- Liberman, Mark Y. 1975. The Intonational System of English. MIT dissertation. [Distributed by Indiana University Linguistics Club.]
- Maddieson, Ian. 1979. More on the representation of contour tones. Linguistics of the Tibeto-Burman Area 4.7-10.
- McCawley, James D. 1978. What is a tone language? Tone: A Linguistic Survey, ed. by Victoria A. Fromkin, 113-131. New York: Academic Press.
- Osburne, Andrea G. 1975. A Transformational Analysis of Tone in the Verb System of Zahao (Laizo) Chin. Cornell University dissertation.

- Osburne, Andrea G. 1979. Segmental, suprasegmental, autosegmental: contour tones. Linguistic Analysis 5.183-194.
- Pike, Kenneth L. 1948. Tone Languages. Ann Arbor: University of Michigan Press.
- Sampson, G. 1969. A note on Wang's phonological features of tone. IJAL 35.62-66.
- Schuh, Russell G. 1978. Tone rules. Tone: A Linguistic Survey, ed. by Victoria A. Fromkin, 221-256. New York: Academic Press.
- Wang, William S-Y. 1967. The phonological features of tone. IJAL 34.94-104.
- Woo, Nancy. 1969. Prosody and Phonology. MIT dissertation. [Distributed by Indiana University Linguistics Club.]
- Yip, Moira Jean. 1980. The Tonal Phonology of Chinese. MIT dissertation. [Distributed by Indiana University Linguistics Club.]