Floating accent in Mayo*

Larry Hagberg

University of Arizona & Summer Institute of Linguistics

0. Introduction

A major claim of this paper is that the distinctive features of lexical accent are formally identical to those of tone, or at least to a subset of tonal features. The terms *accent* and *tone* have been used in many different ways in the literature, but throughout this paper I will use both terms to refer only to *lexical* features that surface as contrastive pitch, length, volume and/or other features of prominence. By *lexical* I mean features whose phonetic realization cannot be predicted by any regular metrical structure or phonological rule.

I am assuming that the placement of stress is always determined by a set of language-particular (but parameter-based) rules which build metrical structure, with the location of exceptional stress indicated by a lexical diacritic called *accent*. Examples of such systems of rules are described in Hayes (1982), Hammond (1986) and Halle and Vergnaud (1987 a and b).

Although metrical structure has generally been associated with non-tonal languages, there are also some tonal languages which exhibit the presence of metrical structure. Examples of such languages include Creek (Haas (1977)), Malayalam (Mohanan (1982)) and Copala Trique (Hollenbach (1988)). Thus the presence of metrical structure is not sufficient in itself to distinguish a non-tonal language from a tonal language. What, then, distinguishes these two categories from one another?

There are two general distinctions which have traditionally been made in classifying languages as tonal versus non-tonal. One distinction is that many tonal languages exhibit a variety of lexically contrastive tones, while most, if not all, of the degrees of stress in a non-tonal language can usually be explained using only one kind of lexical accent. Thus, tonal languages can have more than one kind of lexical tone, whereas non-tonal languages can have lexical accent but not tone, and there is apparently only one kind of lexical accent. I will discuss this apparent asymmetry in section three.

The other distinction between tonal and non-tonal, for which I present counterevidence in this paper, is that autosegmental status has been attributed to tone, but not to accent, in a number of languages; see, for

example, Goldsmith (1976), Williams (1976) and Pulleyblank (1983). For all such languages, the Universal Association Convention (UAC) (Goldsmith (1976)) predicts the location of most tones, with the remaining tones accounted for by lexical pre-linking.

From an examination of the literature it appears, then, that the main distinction between the terms *tonal* and *non-tonal* is that tonal languages have lexical tone while non-tonal languages have lexical accent. Formally, both of these devices are lexical diacritics, but they appear to differ in that tone can be an autosegment, while no such status has ever been claimed for accent. Therefore, the question to be addressed in this paper is this: Can an accentual diacritic have autosegmental status? Using data from Mayo, a Uto-Aztecan language of northwestern Mexico, I will show that the answer is *yes*. The implication, then, is that accent is formally the same as tone, or at least the same as one variety of tone.

A significant claim follows from this. If accent is formally the same as a tone, then no language can exist in which lexical accent occurs independently of all tonal features. As far as I know, no such language has been shown to exist.

The paper is organized as follows. Section one presents the data and provides two possible analyses of Mayo stress using the theory of Halle and Vergnaud (1987 a and b) (henceforth H&V). I show that Mayo has lexical accent which floats in underlying representation (UR), just like an autosegmental tone. Section two demonstrates that stress assignment crucially has to precede and follow reduplication, thus indicating that the rules of stress assignment are cyclic and that lexical accent refloats at the end of each cycle. In section three I explore the theoretical implications of this analysis and propose that accent is formally the same as tone.

1. Mayo Stress

All Mayo words have a single stress on either the first or second syllable; there is no secondary stress, except in compound words.[1] Hagberg (1988 c) demonstrates that the only acoustic feature that can be attributed to stress is high pitch, and there appears to be no systematic difference in the level of pitch on a word-initial stressed syllable versus the pitch on a non-initial stressed syllable. That is, the phonetic realization of stress seems to be independent of its position in the word.

The basic paradigm for Mayo stress is presented in (1) through (8). Consider first the three forms in (1). Notice that each has the same stem [chúpnake] *will harvest*, and that stress falls on the first syllable in each word even when that syllable is a prefix. The same is true of the sets of forms in (2) through (4): stress falls on the first syllable in every case.

In contrast, each of the forms in (5) through (8) bears stress on the second syllable. Notice that the prefixes are the same as those in (1) through (4).

First Syllable Stress:			Second Syllable Stress:		
(1)	chúpnake	*will harvest (trans)*	(5)	ponáka	*playing (trans)*
	xichupnake	*will harvest (intr)*		xipónaka	*playing (intr)*
	xixichupnake	*will always harvest*		xixiponaka	*always playing*
(2)	b^{w}á'anake	*will eat (trans)*	(6)	ba'áte	*irrigate (trans)*
	xi'ib^{w}anake	*will eat (intr)*		xibá'ate	*irrigate (intr)*
	xixi'ib^{w}anake	*will always eat*		xixiba'ate	*always irrigate*
(3)	chíknake	*will sweep (trans)*	(7)	wiséka	*sawing (trans)*
	xichiknake	*will sweep (intr)*		xiwiseka	*sawing (intr)*
	xixichiknake	*will always sweep*		xixiwiseka	*always sawing*
(4)	ná'ikia	*count (trans)*	(8)	chiwéka	*shelling (trans)*
	xina'ikia	*count (intr)*		xichiweka	*shelling (intr)*
	xixina'ikia	*always count*		xixichiweka	*always shelling*

The data in (1) through (8) are representative of the entire Mayo language in that stress falls on either the first or second syllable of every word. Furthermore, a survey of some 1600 Mayo words listed in Collard and Collard (1962) indicates that the Mayo lexicon is roughly evenly divided between first and second syllable stress.

I will use the theoretical framework of H&V to describe stress assignment throughout this paper. H&V provides three devices for stress assignment. These include (a) rules of metrical constituent construction, (b) lexical accent and (c) extrametricality. For Mayo, it is clear from (1) through (8) that metrical constituents are needed to explain the fact that stress always falls on the left edge (ie, first or second syllable) of the word and never anywhere else. Without metrical constituents there would be no way to explain such a limited distribution of stress.

It is also clear that one of the two remaining devices is needed in order to capture the contrast between words with first syllable stress, as in (1) through (4), and words with second syllable stress, as in (5) through (8). If extrametricality is to be used for this purpose, then the forms in (5) through (8) must be lexically marked so as to render the first syllable extrametrical. In what follows I will provide evidence against this.

If, however, lexical accent is to be used to capture the difference between first and second syllable stress, several questions arise. First, which set of forms contains lexical accent? Second, which vowel in these forms bears the accent? Since stress shifts leftward whenever a prefix is added to a word, the answer to this question is not immediately obvious. And finally, what is lexical accent and how should it be represented?

With respect to the first question, consider the Spanish loan words in (9) through (13). Each of these must have transferred from Spanish to Mayo, and not the other way around, since they existed in Spanish long before the first contact between Europeans and native Americans. In each case the Mayo form has second syllable stress even though the Spanish form has first syllable stress. This pattern generally holds for loan words; with very few exceptions, words end up with second syllable stress when they get borrowed into Mayo. I take this as evidence that second syllable stress is the unmarked case for Mayo words.

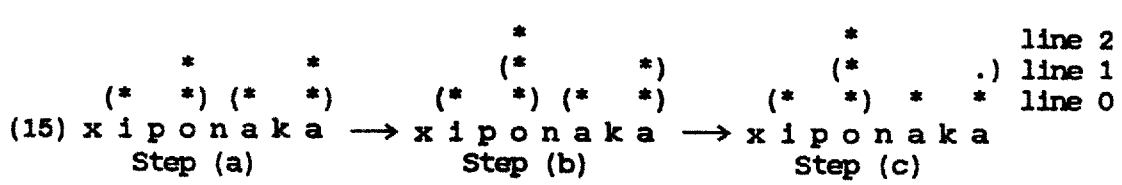
	Spanish:	Mayo:	English:
(9)	váca(s)	wakás[2]	*cow*
(10)	bócha	bochá	*shoe*
(11)	cábra	kabára	*sheep*
(12)	péso	pesó	*peso (money)*
(13)	páscua	paxkó	*festival ('Passover')*

This is also a strong argument against the earlier-mentioned possibility that words with second syllable stress are marked underlyingly for extrametricality: It would be difficult if not impossible to explain how first syllable stress could be transformed into first syllable extrametricality in loan words if first syllable stress were already the unmarked case in non-loan words.

Assuming that second syllable stress is indeed the unmarked case for Mayo words, what rules of metrical constituent construction are required? At first glance there is more than one possible set of rules, but the rules for which I will argue are presented in (14); a sample derivation is given in (15). The feature of (14) which crucially distinguishes it from other possible analyses is that feet in (14) are *bounded*, which means they are maximally binary.

(14) **Stress assignment in Mayo:**

(a) Construct bounded right-headed feet from left to right.
(b) Construct an unbounded left-headed word tree.
(c) Conflate lines 1 and 2. (No secondary stress)[3]



An alternative to (14) is given in (16) with a corresponding derivation. Notice that this analysis has unbounded feet. In the next section I will show that Mayo feet are in fact bounded, as in (14), rather than unbounded.

(16) **Alternative analysis for stress assignment:**

	[*]* * *
(a) Mark the first syllable as extrametrical:	xiponaka
(Cannot apply when first syllable has lexical accent)	*
	[*](* * *)
(b) Construct an unbounded left-headed foot:	xi ponaka

Now consider again the forms in (1) through (4), all of which have first syllable stress. By default these must have lexical accent since I have already shown two things: First, accent has to occur with one of the two stress types in order to account for the surface contrast between first and second syllable stress. Second, the forms with second syllable stress do not have lexical accent because nearly all loan words, which one would expect to be unmarked, have second syllable stress. I conclude, therefore, that the words with first syllable stress have lexical accent.

But now the other questions which were raised earlier must be answered: Which vowel bears the accent, and how should that accent be represented? In H&V it is implicitly assumed that lexical accent is always associated with a particular stress-bearing unit in UR. If this is assumed to be true for Mayo, then one is forced to conclude that each of the twelve forms in (1) through (4) has lexical accent on the first syllable. But if this is true, then the indefinite object prefix [xi-] must have lexical accent, so eight out of the twelve forms in (5) through (8) should exhibit first syllable stress. In fact all of the forms in (5) through (8) have *second* syllable stress, which indicates that the prefix [xi-] does not have underlying accent.

Thus the assumption that lexical accent is always associated with a particular stress-bearing unit in UR leads to a paradox. This paradox is easily resolved if the assumption (that accent is always associated with a particular stress-bearing unit) is abandoned so that accent, like tone, can 'float' as an autosegment in UR. The UAC, which has the effect of associating a floating tone to the leftmost vowel, can then be used to explain how the 'floating accent' of Mayo finds its place within a word. Once it has linked up to a vowel, this accent is then interpreted metrically as the head of its domain, just like any other accented vowel in H&V's theory.

How, then, should lexical accent be represented? H&V represents lexical accent as a line 1 asterisk; this means it is indistinguishable from stress after the rules of metrical constituent construction have been applied. In contrast, Hammond (1988) demonstrates for English that accent needs to be distinguishable from stress at intermediate levels in a derivation in order to prevent accent from deleting when metrical structure is erased at the beginning of a new cycle. In the following section I will show that Mayo accent likewise needs to be distinguishable from stress cyclically. Therefore I will follow Hammond (1988) in using a representation for accent that is crucially different from the line 1 asterisk used in H&V. Unlike Hammond, however, I will represent accent with

an [H] to indicate high tone. In all other respects I will continue to use the notation and mechanism of H&V, interpreting an [H] as the head of its metrical domain.

There are three reasons for using [H] for Mayo instead of Hammond's diacritic. First, the use of an arbitrary diacritic is *ad hoc;* there is no cross-linguistic motivation for it other than the need to separate accent from stress. On the other hand, [H] is already attested in all tonal languages. Second, Mayo accent floats in exactly the same manner as a tonal autosegment. Third, the only acoustic feature that consistently distinguishes Mayo stress from non-stress is a relative peak of pitch. (See Hagberg (1988 c) for evidence). Therefore it seems logical to represent Mayo accent as a high tone.

The application of the rules of Mayo stress assignment (14) is illustrated for an accented word in (17). Notice that accent is represented by an [H] on line 1. It associates to the leftmost vowel before (or at least at the beginning of) the application of (14). The presence of [H] forces the first foot to be degenerate because Mayo feet are right-headed; this is how first syllable stress is generated.

	Association:	Feet:	Word tree:	Conflation:	
			*	*	Line 2
	H	H * *	(H * *)	(H . . .)	1
	* * * *	(*)(* *)(*)	(*)(* *)(*)	(*)* * *	0
(17)	b^{w}a'anake ⟶	b^{w}a' ana ke ⟶	b^{w}a' ana ke ⟶	b^{w}a'anake	

2. Reduplication and Cyclic Stress

In the preceding section I demonstrated that Mayo accent floats in UR. In this section I will show that the rules of stress assignment are cyclic, and that lexical accent refloats whenever cyclic affixation erases earlier metrical structure.

The argument for the cyclic perseverance of Mayo accent depends crucially upon the fact that metrical structure has to be built both before and after the process of reduplication. In what follows I will use the model of reduplication that is proposed in McCarthy and Prince (1986) (henceforth M&P).[4] This model consists of both a target and a base of reduplication. The *target* is an affix consisting only of a prosodic structure, such as a syllable or a foot, with no melodic content of its own. The *base* is that portion of the stem's melody which is made available for mapping to the target. The base may be prosodically defined, such as the first syllable or foot, or it may be morphologically defined, such as the entire stem.

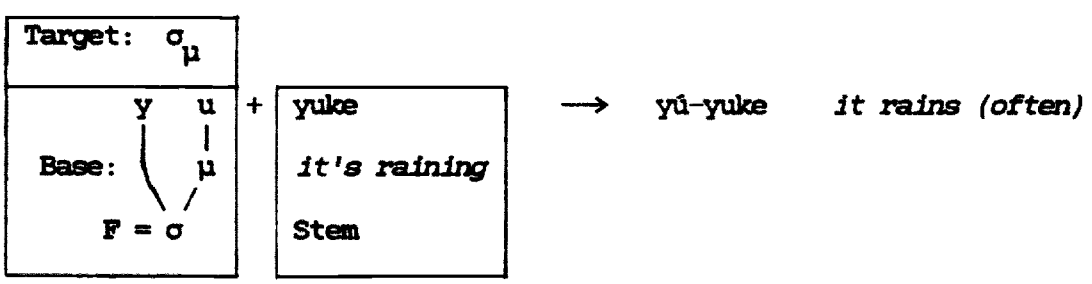
There are two reduplicative targets in Mayo, both of which are prefixes. Both of them are applicable to nearly all verbs and adjectives regardless of stress category. One of these prefixes is an empty monomoraic syllable and the other is an empty bimoraic syllable. Escalante (1985)

demonstrates that these two prefixes have different meanings in the closely related language, Yaqui. In Mayo, however, both prefixes carry the general meaning of habitual or repetitive aspect, and speakers seem to vary freely in their use of the two prefixes, except with a few stems which I won't discuss here.

In what follows, I will show that the base, from which the reduplicative prefixes receive their melodic content, is always the first foot of the stem. In the case of accented words, this foot is identical (on the surface) to the first syllable of the word, but when I examine reduplication in unaccented stems it will become apparent that the prosodic unit corresponding to the base must be the foot, not the syllable.

I will examine the effects of reduplication first with accented stems and then with unaccented stems. An example of Mayo reduplication is illustrated in (18) showing a monomoraic syllable as the target and the foot of the stem as the base. The stem in this case is an accented word, so the base consists of only the first syllable, which is a foot. Since the target and base in this case have the same structure, there is a one-to-one mapping between them.

(18)



Both the target and the base in (18) are monomoraic. Now consider what happens when both the target and the base are bimoraic. Each of the stems in (19) through (22) is accented, which means that the reduplicative base in each case consists of the first syllable only. Furthermore, in these particular examples each of the stems happens to begin with a closed syllable. The free variation in the habitual forms is due to the existence of the two targets described above. The monomoraic target copies only the onset and vowel of the base, while the bimoraic target copies the melody of the entire base, which is itself bimoraic. Thus the mapping between target and base is again one-to-one.

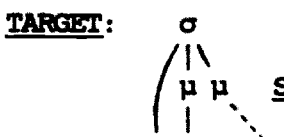
	Stem:	Habitual:			Gloss:
(19)	nókwa	nó-nokwa	~	nók-nokwa	*known language*
(20)	wáttiawa	wá-wattiawa	~	wát-wattiawa	*put (collective)*
(21)	búyte	bú-buyte	~	búy-buyte	*run (sg)*
(22)	wómte	wó-womte	~	wóm-womte	*be frightened*

Now consider the forms that result when the target is larger than the base. This is illustrated in (23) through (28), where the base has to be monomoraic because each of the stems is accented and begins with an open

syllable. (Recall that the first foot of an accented word is monosyllabic). Again, the monomoraic target achieves a one to one mapping with the base, but the bimoraic target still has one mora waiting to be filled after it has exhausted the base. Therefore the final mora of the target obtains its melody from the initial segment of the stem via a simple rule that spreads the root node leftward, as illustrated in (29). See Hagberg (1989) for independent motivation for this rule.

	Stem:	Habitual:			Unattested:	Gloss:
(23)	nóka	nó-noka	~	nón-noka	*nók-noka	*know language*
(24)	yúke	yú-yuke	~	yúy-yuke	*yúk-yuke	*rain*
(25)	chíke	chí-chike	~	chít-chike	*chík-chike	*comb*
(26)	wáate	wá-waate	~	wáw-waate	*wát-waate *wáa-waate	*remember*
(27)	xíma	xí-xima	~	xíx-xima	*xím-xima	*throw*
(28)	tíwe	tí-tiwe	~	tít-tiwe	*tíw-tiwe	*be ashamed*

(29) **Spreading**:



[nón-noka]

A comparison of the unattested forms in (23) through (28) with their attested counterparts in (19) through (22) makes it clear that the base of these stems consists of only the first syllable. Now consider the unattested forms associated with the accented stems (19) through (22), repeated below as (30) through (33). Notice that spreading is unattested with these stems. This is precisely because the first foot (i.e., the base) of each of these stems is bimoraic, so the bimoraic target will be exhausted when it is applied to the base. This is illustrated in (34).

	Stem:	Habitual:			Unattested:
(30)	nókwa	nó-nokwa	~	nók-nokwa	*nón-nokwa
(31)	wáttiawa	wá-wattiawa	~	wát-wattiawa	*wáw-wattiawa
(32)	búyte	bú-buyte	~	búy-buyte	*búb-buyte
(33)	wómte	wó-womte	~	wóm-womte	*wów-womte

(34) Base = $\sigma_{\mu\mu}$ nókwa ⟶ nó-nokwa ~ nók-nokwa ⟶ Spreading cannot apply.
Target: σ_{μ} $\sigma_{\mu\mu}$

Thus far I have demonstrated that the reduplicative base for stems with lexical accent is the first syllable, which happens to be the same as the foot in accented stems. Spreading applies whenever the target cannot obtain all of its melody from the base, as in (35). Spreading cannot apply, however, whenever the base is as large as the target, as in (34).

(35) Base = σ_{μ} nóka ⟶ nó-noka ~ nó( )-noka ⟶ Spreading can
Target: σ_{μ} $\sigma_{\mu\mu}$ apply.

Next I will examine reduplication in unaccented stems. Whenever the first syllable is closed, spreading is unattested, just as I showed for accented stems. This is illustrated in (36) through (39).

	Habitual:			Unattested:	Gloss:
(36)	b^{W}a-b^{W}ánnake	~	b^{W}an-b^{W}ánnake	*b^{W}ab-b^{W}ánnake	*will cry*
(37)	b^{W}i-b^{W}íknake	~	b^{W}ik-b^{W}íknake	*b^{W}ib-b^{W}íknake	*will sing*
(38)	no-nóknake	~	nok-nóknake	*non-nóknake	*will speak*
(39)	o-'ómte	~	om-ómte	*o'-'ómte	*hates*

But it turns out that *more* than the first syllable is available for copying in unaccented stems. The bimoraic target copies the first three segments of the unaccented stem in (40) in spite of the fact that these three segments are not tautosyllabic. This indicates that the base of an unaccented stem, unlike that of accented stems, must consist of more than just the first syllable of the stem.

					Foot of Stem:	* (* *) [noka]
(40)	no-nóka	~ nok-nóka	*non-nóka	*speak*		

Now compare (40) with (23), repeated below as (41). These two stems differ only in the presence of accent in (41) versus its absence in (40). Notice that the forms are identical, except for the location of stress, when the monomoraic prefix is applied, but their melodic content is different after the bimoraic prefix has been applied. The difference is that the reduplication process has copied *more* than the first syllable of the unaccented stem, whereas *only* the first syllable gets copied from the accented stem.

						H (*)
(41)	nó-noka	~ nón-noka	*nók-noka	*know language*	Foot:	[no]

The asymmetry between nok-nóka in (40) and nón-noka in (41) is neatly explained under the assumption that the foot is always the reduplicative base. Without such an assumption it would be necessary to stipulate that reduplicative affixation copies the first syllable for words with first syllable stress, and that it copies the first three segments for words with second syllable stress. Such counting ability is clearly to be rejected as too powerful a device for phonological processes, as argued by H&V and Poser (1987). Thus, the existence of structure larger than the syllable is necessary prior to the process of reduplication. The only candidate for this structure is the foot because it alone has the property of being consistently monosyllabic in accented words and bisyllabic in unaccented words.[5]

Notice that (16) again has to be rejected in favor of (14) as the correct set of rules for Mayo stress, because (16) creates unbounded feet for both accented and unaccented words. The reduplication data show not only that feet must be created prior to reduplication but also that accented words have degenerate feet, just as (14) predicts.

More examples like (40) are given in (42) through (44). Each of these stems is unaccented and begins with an open syllable. In every case the bimoraic prefix takes the entire bisyllabic foot as its base, so spreading is unattested.

	Habitual:		Unattested:	Gloss:
(42)	b^{w}a-b^{w}ána	~ b^{w}an-b^{w}ána	*b^{w}ab-b^{w}ána	*cry*
(43)	si-sime	~ sim-sime	*sis-sime	*go (SG)*
(44)	b^{w}i-b^{w}ika	~ b^{w}ik-b^{w}ika	*b^{w}ib-b^{w}ika	*sing*

The analysis of Mayo reduplication is summarized in chart form in (45) through (47). The accented stem in (45) begins with a closed syllable, so the bimoraic target is filled by the base. In contrast, the accented stem in (46) begins with an open syllable, so spreading applies to fill the second mora of the bimoraic target. The unaccented stem in (47) has a bisyllabic foot, so the bimoraic target will always be filled by the base regardless of the length of the first syllable.

		TARGET		
		σ_{μ} = C μ	$\sigma_{\mu\ \mu}$ = C μ μ	Unattested
(45)	Accented H Stem = nokwa Foot = [nok]	C μ | | n o k n o k w a [nónokwa]	C μ μ | | | n o k n o k w a [nóknokwa]	*[nónnokwa]
(46)	Accented H Stem = noka Foot = [n o]	C μ | | n o n o k a [nónoka]	C μ μ | | ⋱ n o n o k a [nónnoka]	*[nóknoka]
(47)	Unaccented Stem = noka Foot = [noka]	C μ | | n o k a n o k a [nonóka]	C μ μ | | | n o k a n o k a [noknóka]	*[nonnóka]

To summarize the point of all the reduplication data, the reduplicative base for Mayo clearly consists of the *foot*. Therefore, foot building has to *precede* reduplication.

Now reconsider the instances of reduplication found in (1) through (4). Since the stem had first syllable stress prior to the application of reduplication, how did the stress get moved from the first syllable of the stem to the prefix? In H&V's theory there are only two logically possible answers. Either the accent was erased along with all other metrical structure at the beginning of the cycle, or else the accent was copied by the prefix along with the melody of the base. If the former is assumed to be true, then the process of reduplication should neutralize the contrast between accented and unaccented words, and all reduplicated forms should have second syllable stress as in (48)(b). This, however, is not the case.

If, on the other hand, the accent was copied by the prefix along with the melody of the base, then the original accent should still be on the first syllable of the stem and the word should receive two stresses; this is illustrated in (48)(c).

(48)(a) xi-xichupnake (b) *xi-xichupnake (c) *xi-xichupnake

Since cyclic affixation neither copies lexical accent nor destroys it, I conclude that accent refloats whenever cyclic affixation causes the existing metrical structure to be lost. This is illustrated in (49).

```
          H                H                H
          |                                 |
(49) xi- + xichupnake ⟶ xixichupnake ⟶ xixichupnake
```

In summary, stress assignment crucially has to precede and follow reduplication. This implies that the rules of stress assignment in Mayo are cyclic and that lexical accent refloats at the end of each cycle. In the next section I will explore the theoretical implications of this analysis.

3. Theoretical Implications

In section two I demonstrated from Mayo reduplication data that lexical accent must be distinguishable from stress cyclically, as proposed in Hammond (1988) for English. This argues in favor of Hammond's general claim that accent must be distinguishable from stress at all points in the derivation, and against H&V's claim that metrical structure eliminates the distinction between accent and stress.

The first part of this paper, however, raises a more significant theoretical issue. In section one it was shown that Mayo words with first syllable stress have lexical accent which floats in UR and associates from left to right. These two properties of Mayo accent are strikingly similar to those of an autosegmental tone. This is clear evidence that accent has the same distributional possibilities, cross-linguistically, as tone.

In light of this close parallel between the properties of tone and the properties of accent, I will now propose (50) as a formal hypothesis and then briefly discuss its empirical claim.

(50) **Accent Hypothesis**: Tone and accent are formally identical devices.

Under the Accent Hypothesis, the set of all languages can be divided into three categories: those which have tones but no metrical structure, those which have metrical structure but no tones, and those which have both.[6] An example of the first category is Chinese. An example of the second category is Maranungku (Tryon (1970)), in which stress occurs on every other syllable beginning from the left edge of the word. Numerous examples of the first two categories have been reported in the literature, but what about the third category?

If tone and accent are really the same, then all the languages which have been analyzed as having lexical accent may be thought of instead as having a single underlying tone that interacts with metrical structure. This tone may be lexically linked, as in English, or it may float, as in Mayo. Since tone in each of these languages functions as the head of a metrical constituent, it has the same phonetic realization, within a given language, as any other metrical constituent head in that language. That is, we do not find a phonetic distinction between tone and stress in languages which have only one tone.[7]

Kintandu, a Bantu language, is like Mayo in that it has autosegmental high tone which interacts with metrical structure. Goldsmith (1987:88) states that Kintandu 'assigns its tones through a system of accent placement that looks surprisingly like the systems of accent placement that we are familiar with from the stress languages described in the literature.' Although Goldsmith does not use the term *accent* in the same manner as I am using it, his major point is that both metrical structure and autosegmental tone are needed in order to describe the distribution of tone in Kintandu.

How about a language which has metrical structure plus more than one underlying tone? Examples of such languages include Malayalam (Mohanan (1982)) and Copala Trique (Hollenbach (1988)). In the case of Malayalam, stress is determined by a set of rules which amount to the formulation of metrical constituents. There is a word melody of the form LH (Low-High); the low tone anchors to the stressed syllable, and the high tone spreads to all metrical constituent heads. Thus, tone and metrical structure are inextricably linked in Malayalam.

It might be argued that Malayalam should be classified simply as a stress language, as Mohanan points out, since the same LH melody is applied to all words. Therefore, I will now discuss Copala Trique as a clear example of a tonal language with phonetically distinct stress. Hollenbach (1988) uses three tonal features to describe five distinct underlying tones. All Copala Trique words carry primary stress on the final syllable, and a small percentage of words also have secondary stress. Regarding this secondary stress, Hollenbach (1988:176) states: 'Tone-bearing non-final

syllables have secondary stress if they contain a tone level that is [+HIGH], but not if they contain only one that is [-HIGH].' These observations can be captured quite simply with unbounded, right-headed feet and the stipulation that a [+HIGH] tone must be the head of its metrical domain; a right-headed word tree would then produce the correct degrees of stress.

What is significant in Copala Trique is that secondary stress placement is totally predictable from the placement of independently-needed lexical tone; the purely tonal feature [+HIGH] is equivalent to the feature [ACCENT] in this language.

The Accent Hypothesis raises an important empirical question: Can a tonal language be found in which lexical accent occurs independently of all tonal features? That is, is stress placement ever unpredictable in a language that allows lexical tone to be linked to non-stressed syllables? If so, then the Accent Hypothesis is false.

Although various attempts have been made in the literature to incorporate the use of accentual diacritics in the analyses of tonal languages, Pulleyblank (1984) argues quite convincingly against virtually all such attempts. I will not repeat the arguments here, but Pulleyblank's conclusion, if correct, provides strong support for (50): if accent can be subsumed under the term *tone*, then it should be possible to describe all tonal languages without the use of accent.

One additional issue needs to be addressed. As I pointed out in the introduction, there are many instances of a language that exhibits a variety of contrastive tones, yet there is no clear evidence that any language makes use of more than one kind of lexical accent. One possible explanation for this asymmetry lies in the general nature of metrical structure. Many theories of metrical structure, such as those of Hayes (1982) and Hammond (1986) (but not H&V), assume a one-to-one relationship between constituency and headship. That is, the existence of a metrical constituent implies the existence of a unique head corresponding to that constituent, and vice versa. Assuming this to be true, the role of foot construction in stress systems is to locate a head which will subsequently exhibit some language-particular phonetic realization. Therefore, even in a stress language having several distinct varieties of tone, there has to be a unique feature or combination of features which always gets interpreted as the head of its metrical domain. If a language were to specify that *every* tonal feature be interpreted as the head of its metrical domain, then two very distinct resulting surface patterns would be logically possible. On the one hand, the rules of the language could require that every tonal feature preserve its distinct status in surface representation. In this case there would be no stress except, perhaps, on a few toneless syllables where the location of stress would be predictable. On the other hand, the rules of the language could neutralize the various underlying tonal contrasts by assigning the same phonetic interpretation to the head of every metrical constituent. Such rules would, of course, have the immediate effect of

transforming a 'tonal' language into a 'stress' language with just one underlying tone or sequence of tones, as in Malayalam.

Thus, the apparent asymmetry between multiple kinds of tone versus only one kind of accent can be explained if one assumes a one-to-one relationship between metrical constituents and their heads.

4. Conclusion

In summary, I have shown that Mayo accent possesses three tone-like properties. First, accent floats in UR since it always associates to the leftmost vowel *after* any prefixes have been added. Second, it is distinct from stress cyclically; therefore it is represented with a diacritic [H] instead of H&V's line 1 asterisk. And third, accent associates cyclically from left to right.

Thus Mayo accent has the same properties as an autosegmental tone. This suggests that the universal principles that govern the distribution of tone are the same as those that govern the distribution of accent. Taking this one step further, I have proposed that tone and accent are the same formal device. A claim that stems from this proposal is that no language will ever exhibit a distinction between lexical accent and lexical tone. If this claim turns out to be true, then it should be possible to describe all prosodic and tonal phenomena using a single set of universal principles and parameters.

ENDNOTES

*Many thanks to Diana Archangeli, Michael Hammond, Barbara Hollenbach, Masahide Ishihara and Cari Spring for their insights and helpful comments. All errors are, of course, my own.

[1]My impression is that secondary stress is realized as a pitch level that is intermediate between high and low; some acoustic evidence for this is given in Hagberg (1988 c). Since its domain seems to be limited to compound words, I do not discuss secondary stress in this paper.

[2]Mayo has phrase-final extrametricality which forces stress to shift to the preceding syllable when it would otherwise occur phrase-finally. Any analysis of Mayo stress that is based on a word list will therefore be misleading. For details of this phenomenon see Hagberg (1988 a, b, 1989).

[3]The device of conflation simply means that only one stress is assigned per word; all non-heads in the word tree are ignored rather than being assigned secondary stress. The same effect could be obtained through the parameter of iterativity versus non-iterativity, as argued in Levin (1989). Mayo would then be considered non-iterative since the phonology never refers to any foot other than the first one.

[4]This is not the only model of reduplication which will work for Mayo. For example, Spring (1989) claims that reduplicative processes never make

use of both affix and base simultaneously. The data presented here can be analyzed within Spring's theory without affecting my crucial point, which is that metrical structure has to be built both before and after the process of reduplication.

[5]M&P demonstrates that some languages have two kinds of feet, one for stress assignment and another for prosodic morphological processes such as reduplication. Since Mayo does not seem to have this distinction, I am using the term *foot* to refer to both kinds of feet. Thanks to Diana Archangeli for pointing this out.

[6]It is also possible, at least in theory, for a language to have neither tone nor metrical structure, but such a language obviously has little to contribute to a theory of tone and accent.

[7]I am not making any claim about the cross-linguistic phonetic features of stress; obviously there is variation. Rather, I am making a specific claim about languages which exhibit interaction between metrical structure and lexical tone. Any tone which functions as the head of a metrical constituent will undergo the same phonetic implementation rules that are applied to any other metrical constituent head in that language. Thus, all stressed syllables in English acquire the feature [+LONG], regardless of whether the stress is regular or exceptional. In Mayo, however, all stressed syllables acquire the feature [+HIGH TONE], regardless of whether the stress is regular or exceptional.

REFERENCES

Collard, H. and E. Collard (1962) *Vocabulario Mayo.* Serie de Vocabularios Indígenas Mariano y Silva Aceves, No. 6. Instituto Lingüístico de Verano: México, D.F.

Escalante, F. (1985) 'The phenomenon of reduplication and its ram ifications in Yaqui phonology', paper presented at the Uto-Aztecan Working Conference, Tucson, AZ.

Goldsmith, J. (1976) *Autosegmental phonology.* Ph.D. dissertation, MIT.

_____ (1987) 'Tone and accent, and getting the two together', *Proceedings of the Berkeley Linguistic Society* 13:88-104.

Haas, M. (1977) 'Tonal accent in Creek', in L. Hyman, ed., *Studies in stress and accent, Southern California Occasional Papers in Linguistics* 4:195-208.

Hagberg, L. (1988 a) 'Stress and Length in Mayo', in W. Shipley, ed. *In Honor of Mary Haas.* Mouton de Gruyter: Berlin.

_____ (1988 b) 'Prosodic structure and stress in Mayo', ms. University of Arizona.

_____ (1988 c) 'The acoustic features of prominence in Mayo', ms. University of Arizona.

_____ (1989) 'Mayo syllabification', ms. University of Arizona.

Halle, M. and J. Vergnaud (1987 a) 'Stress and the cycle', *Linguistic Inquiry* 18:45-84.

_____ (1987 b) *An essay on stress.* MIT: Cambridge.

Hammond, M. (1986) 'The obligatory-branching parameter in metrical theory', *Natural Language and Linguistic Theory* 4:185-228.

_____ (1988) 'Cyclic secondaries, stress copy, and accent in English', *Proceedings of WCCFL.*

Hayes, B. (1982) 'Extrametricality and English stress', *Linguistic Inquiry* 13:227-276.

Hollenbach, B. (1988) 'The asymmetrical distribution of tone in Copala Trique', in H. van der Hulst and N. Smith, eds. *Autosegmental studies on pitch accent.* Foris Publications: Dordrecht.

Levin, J. (1989) 'Iterative footing reexamined', paper presented at the Second Annual Arizona Phonology Conference.

McCarthy, J. and A. Prince (1986) 'Prosodic Morphology', ms., University of Massachusetts and Brandeis University.

Mohanan, K. (1982) *Lexical phonology.* Doctoral dissertation, MIT. (Published by Indiana University Linguistics Club, Bloomington).

Poser, W. (1987) 'Locality conditions on rules and the size of phonological domains', talk presented at U of A Colloquium, Tucson, AZ.

Pulleyblank, D. (1983) *Tone in Lexical Phonology.* Doctoral dissertation, MIT. (Revised edition (1986) Reidel: Dordrecht)

_____ (1984) 'Autosegmental accent', *Proceedings of NELS* 14:343-359.

Spring, C. (1989) 'Reduplication without affixes: The prosodic word base in Axininca Campa', ms. University of Arizona.

Tryon, D. (1970) *An introduction to Maranungku.* Pacific Linguistics Series B, #14. Australian National University, Canberra.

Williams, E. (1976) 'Underlying tone in Margi and Igbo'. *Linguistic Inquiry* 7:463-484.