Autosegmental Studies on Pitch Accent

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The Variety of Pitch Accent Systems: Introduction

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The question of the precise definition of Pitch Accent, and the related question of the difference between a Pitch Accent Language and a Tone Language on the one hand, and a Stress Accent Language on the other, is one that has exercised phonologists for a long time. The first generative phonologist to seriously address the problem however was McCawley (McCawley 1978).

What we will suggest here is that a simple division among the Non-stress cases into two categories (Pitch Accent Language - Tone Language) represents a gross over-simplification of the facts. Rather, it seems to be the case that languages employing non-intonational pitch distinctions make up a continuum that from a theoretical point of view should be approached in terms of a set of parameters that seem to define systems as being more typically "Tone Languages" or more typically "Pitch Accent Languages".

Our intention then is not merely to try and provide a definition of "Pitch Accent Language", but rather to discuss the variety of systems that occupy the "space" between pure Tone Languages - if indeed any such exist - and pure Stress Languages, and the parameters that lie behind this variation.

There is of course no language that does not at some level employ phonological pitch (i.e. tonal) distinctions. The most important break, we feel, is between those languages that employ phonological pitch distinctions within the Word (including cases where there is spreading of tonal patterns outside the strict boundaries of the word) - whether these are marked in lexical entries, or only introduced via lexical rules - and those languages that ONLY employ phonological pitch distinctions which are spread over larger stretches of the utterance, and which are not typically introduced as parts of the constituent word or stem morphemes. This last use of pitch is usually referred to as INTONATIONAL, and is rather typical of languages which have so-called Stress Accent systems, such as Dutch and English.

In one approach to intonational systems of this kind, tonal contours are decomposed into a limited set of pitch-movements, which are called pitch accents. These pitch accents are combined and aligned with the "text". The alignment or

association rules do this with reference to stressed/unstressed syllables in focussed constituents, and syntactic and/or prosodic structures. Note then that what intonational pitch accent systems and (one type of) word-internal pitch accent system have in common is that they both involve associations between tonal patterns and accented syllables.

In this introduction however we will not be concerned with intonational pitch accent, the study of which within the nonlinear framework was more or less initiated by Pierrehumbert (1980). We refer the reader to the articles dealing with Intonation by Gussenhoven, Hirst and Kornai and Kálmán, as well to a lesser extent to that by Haraguchi.

Let us now proceed by defining the margins of the "space" we have referred to above, between true tone languages and stress accent languages.

1. TONE AND STRESS LANGUAGES

1.1. What is a Tone or Stress (accent) Language?

Many definitions of a tone language have been given. We can take the classical definition provided by Pike (1948:3):

> "A tone language may be defined as a language having lexically significant, contrastive, but relative pitch on each syllable."

There is one obvious problem with Pike's definition. Most (and perhaps all) tone languages have at least some syllables (i.e. one or more syllables of certain morphemes) for which tone is NOT contrastive (phonologically distinctive), but is PREDICTABLE from the environment.

A rather interesting definition is provided by Welmers (1959:2):

> "A tone languages is a language in which both pitch phonemes and segmental phonemes enter into the composition of at least some morphemes."

Clearly this definition is extremely liberal. It includes everything from tone to the most marginal pitch accent system, but excludes stress accent languages such as English and (Standard) Dutch.

Let us at this point introduce the concept of "restricted" tone language, employed by Voorhoeve (1973) and Schadeberg (1973). We might take Pike's definition as referring to cases where tones play much the same role as vowel qualities in languages like Italian, in which every syllable may contain a distinctive vowel - irrespective of the vowels in the other syllables. The vocalic aspect of the individual syllables would be completely "paradigmatic" - i.e. the full paradigm of options is available for every syllable. The analogous tonal case would then be an "unrestricted" tone language making a paradigmatic use of tone.

Must such an ideal tone language be restricted to bearing one tone per tone bearing unit (TBU) or may contour tones occur? The fact that more than one tone occurs with a single TBU in some languages may be compared with the occurrence of vocalic diphthongs, which some languages allow, while others do not.

Since Welmer's definition draws a line between those languages possessing morphemes with tonal properties, and those languages not availing themselves of this option, it is clear that in his terms we have a dichotomy between tone languages and stress/non-tone languages.

Does this dichotomy correspond to the realities of the situation? It has been claimed by some researchers (for example Fry 1955, 1958) that, in so-called stress languages such as English, the most important cue to accent is not in fact amplitude, but a combination of this with duration and intonational pitch, with the last being the most significant as an indicator of accent.

However, recent work by Beckman has suggested that the most important phonetic correlate of English "stress" is not in fact pitch at all, but what she terms "total amplitude" - a function of amplitude and duration (Beckman 1986). In any event it must be made explicit whether one is speaking about stresses which function as the anchor point of intonational pitch accents, and those which do not. Clearly, the first type will have tonal information associated with them, but this is irrelevant to the definition of stress accent as such insofar as this information is derived from the intonation pattern.

We believe that instead of defining STRESS in terms of some physical property or properties, it makes more sense to say that stressed syllables are designated syllables in terms of prosodic constituent structure, which by themselves do not convey any tonal information. This is not to say - as we have just made clear - that stress cannot be aligned with tonal information, or for that matter, that stressed syllables cannot have tonal information added to them at the morpheme or word level, as is the case in the Scandinavian languages (cf. section 2.1., and the article by Withgott and Halvorsen).

As will become clear, only the minimal syllable may be the bearer of stress. Hence we claim that the "mora" is never the domain of stress. This is not to say that "morae" play no role in stress assignment. As is well-known stress assignment may be sensitive to syllable weight, where weight is usually calculated in terms of the number of morae contained in the syllable.

Cases which have been claimed to involve a distinction:

$$(\overset{*}{m}\ m)_{\sigma} \neq (m\ \overset{*}{m})_{\sigma}$$

do not then in our opinion represent STRESS distincions but involve rather the direct association of tonal information to either the first or second mora (cf. the mora-based systems in Croatian discussed by Babić, or the Somali system dealt with by Banti).

Finally let us mention a four-way classification made by Clark (this volume). Note that in this classification what are referred to as pitch accent systems do not fall into a single category, but are split up between classes IB and IIB.

I. TONAL SYSTEMS

A. *Free Tone*	B. *Restricted Tone (limited number of tone melodies)* incl. Tonal Pitch Accent (one tone melody)
eg. Ewe	eg. Mende/Japanese

II. METRICAL ACCENT

A. *Stress Accent*	B. *Metrical Pitch Accent (realized as H)*
eg. English	eg. Ancient Greek

The "metricality" of type IIB systems lies in their recognition of "strong" syllables as the basis for tone association.

It is possible for languages to possess two cooccurent systems, eg. free tone and stress accent. And presumably Clark would categorize Western European "pitch accent" systems as a combination of Stress Accent and Metrical Pitch Accent, and Central Carrier (see below) as a combination of Stress Accent and Restricted Tone.

We are slightly suspicious of this classification. Our main criticism concerns its nonexhaustive nature. If it is not possible to categorize all languages as belonging to a single category, there is clearly something wrong, since the categories are clearly already combinatory in nature. One qualification would concern category IB) which ought perhaps to be subdivided. There are several possible parameters:

a) whether the underlying tones spread to cover the whole word

b) whether the underlying tone (pattern(s)) have a fixed position in the word

c) if the language has a stress accent system in addition; what the consequences of this are for the placement of the tones - i.e. all tonal information on the stressed syllable, tonal information starting from the stressed syllable, or no relationship (note that this subcategorization of (c) already causes problems, since the first two types might be better regarded as combinations of IIA and IIB, while the third type might be IIA and IB).

This suggests that rather than a classification into exclusive categories, some kind of feature system might be more adequate.

A number of articles in this collection are concerned with developments producing new types of prosodic system (e.g. the articles by Goldsmith, Odden, and Clark, in particular arguing from the facts of Bantu languages). Taking these articles together it appears that one developmental path that is followed starts from Free Tone and proceeds round the four categories mentioned here clockwise, ending up with Stress Accent. In the conclusion a number of such developmental paths will be mentioned briefly.

2. INTERACTIONS BETWEEN TONE AND STRESS

Of great importance for the consideration of PITCH ACCENT is the set of possible relationships between tone and stress (within the individual lexical item). This may be represented in terms of the following two types:

a) tone attracted by stress/tone rejected by absence of stress

b) stress attracted by tone

2.1. Tone Dependent on Stress

An example of this would be West European languages such as the Scandinavian languages (see the article on Norwegian by Withgott and Halvorsen), and Rhenish dialects of Dutch and German (Hermans 1982) where segmental processes such as vowel syncope led to the development of "tones". Here morphemes contain tonal information (either lexical or supplied by default rules). This tonal information is restricted to an H (High Tone) or L (Low Tone), which is associated with reference to the stressed syllable. In these cases the stresses play their "usual" role in functioning as potential anchor points for intonational pitch accents. The syllable-based accent systems of Croatian (Babić) appear to fall into this type too. The systems with opposed H and L behave as above, while

there is a second type of system lacking this contrast. Here a redundancy rule associates an H to the stressed syllable.

A rather different case is discussed in the article by Hollenbach - that of Trique. Here there is not a total rejection of distinctive tonal information on non-primary stressed syllables - a few such syllables possess tonal information that is phonologically significant. In fact we can identify among Otomanguean languages a whole continuum of cases, involving the gradual reduction of the distinctive occurrence of tonal information on non(-primary) stressed syllables, with complete - or near-complete (as in the case of Trique) - rejection as the logical end-point, with a corresponding increase in the complexity in the types of tonal information expressed on the stressed syllable. Note that we abstract away from cases where a reduction in the number of morae in unstressed syllables has the concomitant effect of reducing the number of contour patterns allowed in such syllables. This is an additional factor to be reckoned with.

A case where stress only slightly influences the range of tonal options is to be found in Cajonos Zapotec (Nelis and Hollenbach 1980). Here we have a system of four underlying tones - H, L, HL, and M (Mid). M however is disallowed in unstressed syllables. Note that despite the fact that stressed vowels are long, and unstressed vowels short, the contour HL does occur in unstressed syllables.

As we have said above, a case illustrating the virtual rejection of tonal information on non-primary stressed syllables is that of (Copala) Trique (Hollenbach). In this language lexical tones normally only occur on stressed (final) syllables, with the occasional occurrence of one tone (pattern) on an unstressed syllable The set of tonal possibilities is:

a)	stressed syllables:	simple tones:	3, 4, 5	(5=High)
		contour tones:	21, 32, 53, 34, 35	
b)	unstressed syllables:	simple tones:	3, 4	
		contour tones:	21	

The comparison of cognates from this dialect and the Chicahuatla dialect (Hollenbach 1977) is highly instructive.

Chicahuatla	*Copala*	*Gloss*
$ga^3C\bar{i}^{23}$	$gaC\bar{e}^{32}$	to pass
ga^3ne^{23}	$qan\underline{e}^{32}$	to chew
$wa^3?a^{23}$	$wa?\underline{a}^{32}$	to spin

$ni^3t\bar{i}^{43}$	$ret\bar{e}^{34}$	vegetable pear
a^3ne^{43}	ane^{34}	to bathe
ni^4Ca^3	$ni\underline{C}a^{53}$	full
mmi^{343}	$yum\underline{e}^{34}$	sweet potato
wwe^{343}	$yuw\underline{e}^{34}$	century plant

Here we can observe a rightwards shift of tonal information to the stressed syllable, with the additional limitation that Copala contours are limited to two tones.

Another case where we have historical evidence on tone reduction - Mandarin Chinese - exhibits a different strategy. Tones on unstressed elements are not shifted towards the stressed syllable, but simply reduced, in a similar fashion to what happens with unstressed vowels.

A point that should be emphasized here is the fact that the association of tonal information solely or principally with the stressed syllables of words has as a consequence that it is not necessary to specify the location of the tonal information lexically - it is sufficient to include in the lexical representation a statement concerning the tone pattern (or absence of such).

2.2. Stress dependent on Tone

A good example of a case where the location of the stressed syllable is completely dependent on tonal information is that of Ayutla Mixtec (Pankratz and Pike 1967). The usual case in such languages is that H has a particular attraction for stress.

In Ayutla Mixtec stress is assigned as follows:

a) on the first HL sequence if present; if none then,
b) on the first ML sequence if present; if none then, (NB, HM is absent)
c) on the first H if present; if none then,
d) on the first syllable

Note that here every syllable will possess a tone.

Another case illustrating the attraction H tones have for stress would be that of Kimatuumbi (Odden 1984; this volume).

A rather different type of case would seem to involve the Croatian mora-based systems (Babić). Unlike the syllable-based systems these do not allow the determination of the location of the tones on the basis of the stress pattern because here we have an opposition within long stressed syllables of H on the first mora versus H on the second mora. There are basically two types

of system: only lexical H; and lexical H versus L. In either case the single tone present - whose location must be lexically specified - will define the position of the stressed syllable.

3. NO INTERACTION BETWEEN TONE AND STRESS

3.1. Systems with Stress

Note that there does not require to be any relationship between the location of the stressed syllable and the location of any particular tonal information.

Central Carrier (Pike 1986) has consistent word-final stress. However as far as tonal information is concerned there seem to be three types of word:

a) words containing a step down between two syllables:

```
H  L
mandah          "canvas"

 H H L  L
nanaditso       "dew"
```

b) words that are H; the following item is usually lowered in tone:

```
 H   (L)
yəs  (X..)      "wolf"
```

c) words that are H; the following item is never lowered:

```
 H  H    H
hunliz (X..)    "skunk"
```

We may assume that these three types have lexical representations whereby the last H before an L is lexically marked. As we shall see this type resembles the kind of tone pattern encountered in Japanese (section 3.2. and the article by Haraguchi):

```
H                   H
|                   |
mandah              nanaditso

 H
 |
yəs                 hunliz
```

The surface forms may be simply derived by assuming a rule of leftwards H-spreading, and default L for the H-marked items, and a rule of final H-insertion for the unmarked items.

Another case that might at first appear to be a combination of free tone and stress is interpreted by Clark as representing a tonal pitch accent language. Stress placement in Zulu is apparently a matter of some controversy (cf. footnote 16 in Clark's article) but this is not relevant for the content of her article since stress is independent of tonal information.

At first sight Zulu might appear to be a free tone language - in nouns (maximally bisyllabic) we have HH, HL, LH and LL. The facts are more complex than this bald statement suggests - Laughren (1984) analyses the tone patterns as respectively HHL, HL, LHL and L.

Clark presents evidence for interpreting these oppositions in terms of the following underlying representations:

```
  H          H          H
 / \         |          |
CVCV       CVCV       CVCV          CVCV
```

3.2. Languages without Stress

Obviously languages lacking lexical stress also have no correlation between (lexical) stress and lexical tone. Such a language is Japanese, where stress appears to be absent altogether (Beckman 1986).

The tonal behaviour of most Japanese dialects (Haraguchi 1977; this volume) appears to be classifiable in terms of the following two parameters:

a) location of marked H: fixed/free
b) spreading of H: none/right/left (>1 choice possible)

This results at least in the following types:

Dialect	a-1 fixed	a-2 free	b-1 none	b-2 right	b-3 left
Old Kyoto	-	+	+	+	+
Osaka	-	+	+	-	+
Tokyo	-	+	-	-	+
Hirosaki	-	+	-	+	-
Nakamura	-	+	+	-	-
Shimigawa	+	-	+	-	-
Sendai	-	-	-	-	-

In the case of Shimigawa the H obviously does not require lexical specification

as its position is forecastable. Sendai does not exhibit any tonal information specific to individual lexical items. Its patterns should perhaps be treated under the heading of intonation.

The systems with a free linked H also all have patterns without any linked H (cf. Central Carrier).

There are currently two main types of analysis for Japanese. Haraguchi works with a * designating syllables/morae that form the anchor point for particular melodies. This suggests of course a parallel with stress accent.

The other main type of analysis employs linked H tones (Archangeli and Pulleyblank 1984; Clark (in press)).

A number of advantages could be listed in favour of the second analysis:

a) the occurrence of long syllables with differing "mora accents" in some dialects.

```
   *                    *
  m m      versus      m m
```

This possibility is rejected by a number of linguists.

b) the existence of "accentless" patterns - in both syllable systems and mora systems

c) the existence of Japanese-like systems such as Central Carrier, with independent stress marking

Similar to Japanese are two Cushitic systems discussed by Banti in that one mora may be associated to a tonal pattern.

In Somali the tone is H, and basically other morae are L (although a preceding mora within the same syllable may be raised).

In Oromo there are two melodies H and HL (as in one possible interpretation of Kagoshima Japanese (Haraguchi 1977; this volume)). Unlike Kagoshima, the location of these melodies is not restricted to final position, and as in most Japanese dialects we also have spreading. In Oromo the H-tone spreads to the right.

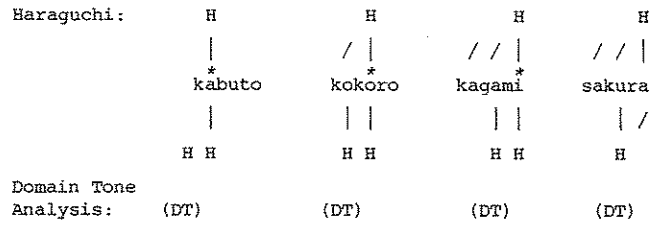
Rather similar to Japanese too are the tonal systems of the Ịjọ languages (Williamson, this volume). These systems are very complex, forcing Williamson to distinguish between three types of tonal information:

a) linked H's

b) so-called Domain Tones (i.e. spreading) H/L

c) floating (non-spreading) H/L

To elucidate the distinction between the last two types, these could be represented by floating tones, and initial tone association rules (ITAR's) respectively. To elucidate the distinction between the first two types we compare an analysis utilizing Domain Tones with Haraguchi's analysis of Tokyo Japanese:



Note that these representations take no account of the initial lowering that applies to the last three words. In Haraguchi's account the H is first associated to the starred syllable, then spread leftwards; in the DT account there would be a linked H associated to the same syllable, while a Domain (floating in the more usual sense of this term) tone would associate to all syllables to the left.

Individual lexical entries may contain all three types of tonal information in some cases in some languages.

Another language treated in this book which is claimed not to possess lexical stress is Isthmus Zapotec (Mock). This represents quite a different type of language, however. No tonal information has to be associated with a particular syllable, rather the tonal information is associated with the morpheme as a whole. Four tone melodies occur: H, L, HL, LH.

Stress as a lexical category is non-existent; it is however employed to indicate focussed elements in the sentence, whereby stress is assigned to the first syllable of such a focussed element.

Yet another kind of stressless sytem is encountered in Kinga (Odden). This however is, as Odden remarks, very stresslike in its distribution of tones. The two most normal patterns are Pre-Stem-Initial (PSI) and Antepenultimate (APU), corresponding to underlying H-toned and toneless morphemes (which acquire the APU pattern by default). From Odden's remarks about this system it is clear that we must place it among Clark's Metrical Pitch Accent systems.

4. LANGUAGES MAKING MARGINAL USE OF TONE

In this section we wish to mention two languages making a highly marginal use of lexically specified tonal information - Huave and Jeh.

4.1. Huave

In Central American Huave (Pike and Warkentin 1975) we find four tonal patterns whose occurrence is nearly exclusively determined by the syntactic make-up of the sentence or phrase. In other words tonal information in this languages can be interpreted as intonational, although the burden of "true" intonational contrast is borne, as in many Central American languages, to the last mora or two of the sentence.

There is however a very restricted set of items for which lexical tonal information is required. This is only apparent in one of the afore-mentioned four patterns. When a lexical item appears with the part-intonational pattern LHL where the H occupies the first mora of the final syllable, we find a number of items - with a bimoraic final syllable - where the second mora is also H.

Normal Pattern		Abnormal Pattern	
L H			
olam	"sugar cane"	-	
HL		HH	
peac	"tortilla"	tiʌk	"hill"
L HL		L HH	
apiis	"dress"	ombiʌm	"house"
L HLLL			
ateaaig	"he breaks"	-	

Note that stress is on the final syllabic in Huave so that this system is reminiscent of Western European pitch accent systems with their opposition between H-marked and unmarked morphemes.

4.2. Jeh

This language is of interest in that its lets us observe how a restricted tone system may arise. Jeh is a Mon-Khmer language of Vietnam described in Graden (1966).

Northern Jeh has a limited tonal opposition occurring on the second mora of final open syllables. A number of items have a H tone in this position, e.g.:

H
|
tEE "to scythe"

When we compare the corresponding Southern Jeh form, the source of this H tone becomes obvious, Southern Jeh has a final /h/ instead of a H tone.

tEh

What we have here is then a former allophonic tonal feature of /h/ which has been phonologized by the loss of the segment /h/.

In the Northern Jeh dialect of Dak Trap H tone has a wider distribution, occurring also on some final nasals. This is again an innovation as can be seen by a comparison of these forms with those of other forms of Northern Jeh.

Dak Trap	*Other N. Jeh*	*Gloss*
H | tram	trap	muddy
H | waN	wak	(boy's name)

(N = 'ng')

This conceivably illustrates the development of a restricted tone language as a step on the way to a free tone language.

5. CONCLUSION

We would like to conclude by briefly reconsidering the possible developmental routes illustrated in this collection.

Taking as a departure point the pure tone language, we can see from the articles dealing with Bantu languages (Goldsmith, Odden, Clark) and also from Wright's contribution, that there are a number of things that can happen - a restriction on the combination of tones, i.e. the development of a limited number of tone patterns; the replacement of the opposition H - L by the opposit-

ion H - Ø; the development of metrical structure (where the designated element is associated with H); and finally the loss of tonal information (development to a Stress Accent language). For the Bantu languages it may well be the case that the stated order here represents the developmental order.

The Otomanguean languages of Mexico display a different pattern of development. Virtual tone languages occur here too, often combined with a stress accent prosodic system - frequently fixed word final or stem initial stress. What we see first here is a reduction of the tonal possibilities on unstressed syllables. This may be combined with a tendency to shift the tone pattern or a significant part of it onto the stressed syllable.

In a language like Jeh on the other hand we see how a nontonal language may become a (very) restricted tone language. It is of course not presumably merely chance that this is a South East Asian language. This region has been claimed to illustrate tonogenesis on a large scale.

The Western European "pitch accent" languages on the other hand owe the addition of tonal information to lexical entries to historical interactions between intonational pitch accent and processes affecting syllabic structure. There is therefore no hard and fast line of development for the introduction of such tonal information.

This collection is of course concerned with the correct generative phonological treatment of "pitch accent". There is quite a variety of treatments utilized as the reader will have realized from this introduction, incomplete as it is.

Most articles proceed from one or other autosegmentally based approach - that is the primary mechanism for the representation of tonal information is formed by an association line linking a tone to some element in the segmental structure of the word. There are differences to the degree that metrical structure is allowed to play a mediating role in this, cf. the various analyses of Japanese referred to in the text. Wright takes a minority standpoint with her level-based model, involving falls and rises BETWEEN elements of the segmental structure. This shows parallels with earlier work by Clark (Clark 1978; cf. also McCawley 1968, 1973).

We hope at least that the picture gained by reading the articles contained in this collection will supply readers with a representative view of generative phonological work in the tricky area between tone and stress.

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