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Lingua 122 (2012) 1494–1521

Lingua

www.elsevier.com/locate/lingua

Deconstructing stress

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Received 15 November 2011; received in revised form 2 August 2012; accepted 16 August 2012
Available online 3 October 2012

Abstract

In this article, I will show that, despite its wide use, the term 'stress' is too ambiguous and therefore must be replaced by a set of other terms that together cover the various usages of 'stress'. Firstly, we need to be able to distinguish between the formal representation of 'stress' and the *correlates* of 'stress'. Within the formal representation of 'stress' I will show that we have to separate four notions: *accent*, *edge prominence (EP), rhythm* and *weight*. Accordingly, we also need to reckon with potentially different correlates. Here, I will use stress as a general label for *phonetic* correlates and distinguish stress^{A}, stress^{EP}, stress^{R} and stress^{W}. The article will then mainly focus on accent and its correlates. I will first propose central parts of a theory of accent. Then, I will address the question as to whether we need to single out pitch (or tone) as a special correlate of accent, i.e. one that is not included in the correlate stress^{A}, which would entail a currently controversial distinction between what is traditionally called *stress-accent* and *pitch-accent*. The article concludes with a discussion of refinements, problems and extensions of the accentual system proposed here (including the deconstructing of 'tone').
Published by Elsevier B.V.

Keywords: Accent; Stress; Rhythm; Syllable weight; Tone; Pitch accent

1. Introduction

In this article, I will focus on clarifying the notions 'stress' and 'accent'. I will continue to use scare quotes around the term 'stress' until I have replaced it by a variety of precisely defined terms. This deconstructing of 'stress' is the subject of section 2. First, I separate the formal representation of 'stress' from the various 'stress' realizations. A central formal component of 'stress' is *accent*. In van der Hulst (2011a) I discuss and defend the notion *accent*, essentially elaborating the view which is embodied in Abercrombie (1976 [1991]):

> When I say that such-and-such syllable of a word has an (or the) accent, or is accented (other syllables therefore being unaccented), I am not saying anything about the phonetic characteristics of that syllable. All that is being said is that in certain conditions (which must be specified) in utterances, an accented syllable will show certain characteristics which can be predicted. The various possible realisations of accent may have nothing phonetic in common. An accented syllable *may* be realised as stress, with various features of pitch, of syllable length and segment length, of loudness, and of articulatory characteristics in various combinations. But none of these are included in the definition of accent. In other words, accent is ineffable. It plays no part in the phonological analysis of utterances; its place is in the lexicon. Accent, in fact, is what is indicated by the 'stress marks' in the English Pronouncing Dictionary.

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0024-3841/$ – see front matter. Published by Elsevier B.V.
http://dx.doi.org/10.1016/j.lingua.2012.08.011

This view[1] conforms to a fairly traditional distinction between *musical accent* and *dynamic accent* or (with much the same meaning) *pitch-accent* and *stress-accent*. In each case, the modifier of the head noun ('accent') says something about the way in which the accent is 'manifested' or 'realized', common realizations being 'stress' or *pitch*. I then argue that in addition to *Accent* (A), three other formal components enter into the surface appearance of 'stress', namely *Edge Prominence* (EP), *Rhythm* (R) and *Weight* (W). Each of those can have a 'stress' correlate, but to allow for the possibility that these correlates differ (though they are all being called 'stress' in the literature), I will refer to them as stress^{A}, stress^{EP}, stress^{R} and stress^{W}. The first three correlates involve the strengthening of the articulation with effects on duration, intensity and pitch, and are thus likely to converge on a similar phonetic appearance. Stress^{A} (being lexical, see section 2.2) may additionally correlate to greater phonotactic complexity. Stress^{W} may be nothing more than the perceptual effect of the intrinsic properties of heavy syllables.

From then on, this article will mostly focus on the notion of accent. In section 3, I develop a formal theory of accent location and placement, showing how the variety of bounded and unbounded accents systems can be reduced to a small set of parametric choices.[2] This theory will account for several sources for accent (lexical specification, syllable weight and position in the accent domain) and their interactions. Some mention is made of the interaction between accentuation and morphological structure, as well as of the interaction between accent and either Edge Prominence or Rhythm, although space limitations will force me to refer to other works on these subjects. In section 4, I zoom in on a controversy about the proper treatment of so-called pitch accent languages. Section 5, then, deals with an array of further issues which involve addressing specific (apparent) problems that my theory of accent encounters and some consequences (which include the partial deconstruction of 'tone'), although here too I will sometimes be referring to other works where such matters are discussed more extensively. Section 6 offers my main conclusions.

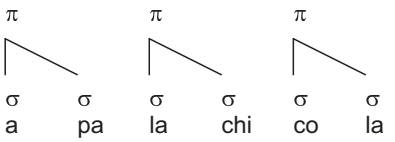
2. '**Stress**'

2.1. Metrical theory

The central idea of *Metrical Theory* (Liberman and Prince, 1977) is that 'primary stress' is derived by organizing the syllables of a word into *headed feet* and, subsequently, feet into a *word structure* in which one foot is the head. The head of the head foot, being a head at both levels (the so-called *Designated Terminal Element*), represents the 'primary stress' location. In this view, *rhythm* is assigned first, while 'primary stress' is regarded as the 'promotion' of one of the *rhythmic beats*:

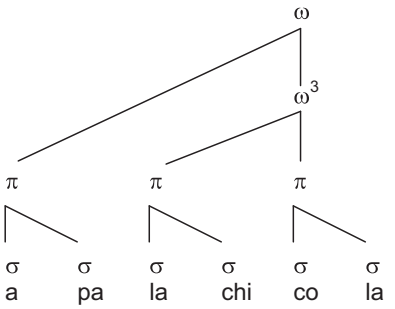
(1) Metrical Theory[3]

STEP 1



Group from R-to-L into bounded left-headed feet

STEP 2



Group feet into an unbounded right-headed word tree

[1] This view can be found in many other works (e.g. Hyman, 1977; van Coetsem, 1996; Revithiadou, 1999; Alderete 1999; van der Hulst, 1999, 2010, 2011a). See Fox, 2000: chapter 3 for a clear review of the notion accent.

[2] I do not adopt an optimality theoretic perspective (Prince and Smolensky, 1993) which means that I do *not* give a role to language-specific constraint ranking in accounting for differences between (phonological) grammars. Instead, I account for differences between systems in terms of parametric choices. My reasons for rejecting OT are given in van der Hulst (2011c).

[3] In early versions of metrical theory the constituent corresponding to the word was thought to be recursive, even though intermediate, 'word' labels were not specified. In later versions (e.g. Halle and Vergnaud, 1987), the word was taken to be a flat constituent.

Metrical theory thus expresses primary 'stress' and non-primary 'stresses' in a layered arboreal structure, where the two levels directly correspond to the distinction between rhythm and primary 'stress'. With this elegant theory, word 'stress' rules can be formulated as a set of parameters with specific settings for forming a binary branching organization within the word.

(2) Word stress parameters
Foot formation
Feet are left-headed/right-headed
Feet are assigned from right-to-left/left-to-right
Word formation
Feet are grouped into a left-headed/right-headed word tree
Extrametricality
The final syllable is ignored (yes/no)
Weight-sensitivity
A syllable with internal weight must be a foot head (yes/no)

In this theory, the term 'stress' is a label for the head of a metrical unit, either the head of a foot, or the head of the whole word.

An initial success of metrical theory was that examples could be found for a lot of all the possible types (Vergnaud and Halle, 1978; Hayes, 1981), although not all types turned out to be equally common and some were not attested at all. This led to changes in the inventory of feet (see Hayes, 1995) which allowed a better match between the theoretical possibilities and the empirically attested cases (see van der Hulst, 1999, 2000 for detailed overviews of these changes).

In the next section, my goal is to argue that the formal representation which underlies 'stress' must be more rigorously decomposed into several independent ingredients. The most fundamental problem with standard metrical theory is precisely that it attempts to unify primary stress and rhythm into one representation that is constructed at one level. In this respect, metrical theory follows the tradition of Chomsky and Halle (1968). In response to Chomsky and Halle's work, Odden (1979) argued for separate treatments for primary stress and rhythm. This idea has also been a leading theme in my work since van der Hulst (1984).[4] My proposal is thus to sharply separate an account of primary stress and rhythm, most explicitly by placing them at different derivational levels, so that their independent properties and roles can be more clearly recognized and appreciated.

2.2. Separating accent, edge prominence, rhythm and syllable weight

As shown in the preceding section, metrical theory integrates an account of primary 'stress' and rhythm (non-primary stress). Although this seems an elegant way of going about it, there are certain considerations that militate against this unification.[5] The most important problem with selecting primary 'stress' from a wave of rhythmic beats is that, whereas the primary 'stress' location is often subject to morphological information and lexical irregularity, the distribution of rhythmic beats appears to always be fully regular and automatic.[6] This suggests that the formal representation of 'stress' should be broken down into two steps which are accounted for at two different linguistic levels:

(3) Primary 'stress' ⇒ lexical level
Full rhythmic pattern ⇒ post-lexical

It is commonly assumed that regularities that are subject to morphological properties and lexical idiosyncrasies ('exceptions') apply in the lexicon, where such information is readily available. Accordingly, we expect regularities that are *blind* to such information to apply at a post-lexical level where such information is taken to be unavailable. The term 'post-lexical' is, however, unfortunate because the relevant level, in my view, is also 'post-syntactic' pertaining to the planning of full utterances. As such, the level is, in a sense, 'post-grammatical' (in that it follows the formation of words *and* sentences). I wish to keep this level distinct from 'phonetic implementation', which models the articulatory and acoustic properties of the actual utterances. For an extensive defense for the need for the levels assumed here, I refer to van der Hulst (2011b), where I also use the term *utterance level* as equivalent to post-grammatical level. By placing rhythm at a

[4] I did not become aware of Odden's important article until recently.

[5] See van der Hulst, 1984, 1996, 1997, 2009, in preparation; Goedemans and van der Hulst, in press. I also refer to these works for references to related views held by others.

[6] This bold assessment of rhythm faces some obvious problems some of which will be addressed in section 5.

post-grammatical or utterance level, we explain why rhythmic alternations are automatic and dependent on speech style and tempo, properties that are generally regarded as signs of non-lexical status (Kiparsky, 1985). That rhythm qualifies as post-grammatical is also witnessed by the fact that words cannot be marked as exceptions to rhythm or as subject to a special form of rhythm.

The proposed separation of primary 'stress' and rhythmic 'stress' has led me to adopt the term *accent* which refers to the formal representation of the primary 'stress' and the term *rhythm* for rhythmic (or non-primary or secondary) 'stress'. A theory of accent assignment (to be discussed in section 3) resembles in several respects the metrical machinery, but since it does not need to account for the full rhythmic structure it essentially boils down to building just one foot on the periphery (left edge or right edge) of words. However, as I will show in section 3, we need an account that is actually crucially different from any version of foot theory that has been previously proposed.

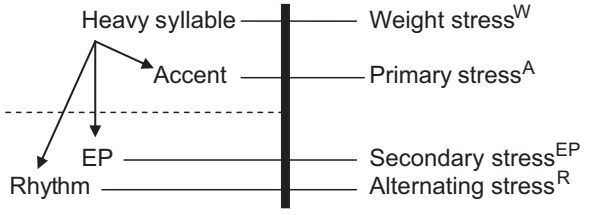
To account for *rhythm*, the proposal is that rhythmic beats are assigned to syllables post-grammatically. This process is subject to the phonology-phonetics *interface condition* that the accented syllable must have a rhythmic beat as well as various other conditions which limit the occurrence of so-called *clashes* and *lapses* (see van der Hulst, in press-a).

In addition to rhythmic beat addition, I postulate a second utterance level process which strengthens syllables that lie on the edge opposite to the accent. This process is called *Edge Prominence* (EP; Moskal, to appear). Edge Prominence lies behind the fact that, for example in English, initial syllables can have a secondary 'stress' (the *àbracadábra* effect).[7] Rhythmic beat addition respects *both* accent and EP (most clearly manifested by avoiding clashes[8]), which can be formalized by an extension of the above-mentioned condition that syllables thus selected must have a rhythmic beat. With enough space in between accent and EP, rhythmic beat addition will alternate away from either one or the other, or, variably, both. Space limitations prevent me from presenting the formal theory of rhythm based on the available empirical evidence, for which I refer to van der Hulst (in press-a).

Having distinguished accent, EP and rhythm, which are abstract notions that do not have inherent phonetic content, I propose to reserve the term *stress* for phonetic correlates (of either accent, EP or rhythm). On the production side, stress essentially involves 'articulatory force', which is manifested in 'exaggerating' or 'hyperarticulating' the inherent properties of the speech signal along the temporal dimension (duration), fundamental frequency (pitch), intensity, as well as other factors that result from strengthening the articulation. I do not wish to imply that the phonetic properties of accent stress, EP stress or rhythmic stress are the same, despite the fact that we use the term stress in all cases, which is the reason for the superscript letters in (4). Maintaining the term stress for all these cases where there are certain *prominence-lending properties*, may or may not be justified. In fact, the term stress, used as proposed here, seems to mean little more than prominence, or the fact that some syllables 'stand out' perceptually. I return to this issue in section 4.

Accent, EP and Rhythm are properties of syllables[9], but syllables can come in different forms. A difference between so-called *light* and *heavy* syllables can influence the selection of syllables as bearing accent, EP or a rhythmic beat. This can be expressed by recognizing that heavy syllables can *influence* the location of accent, EP or rhythmic beats. But in the absence of these *extrinsic* factors, heavy syllables can be perceived as being prominent (entirely based on their *intrinsic* properties) which has also invited many linguists to refer to them as having 'stress'. The following diagram summarizes the various types of stress that have been distinguished thus far:

(4)



The properties to the left of the black bar are formal, lacking inherent phonetic content, and here, as suggested earlier, I completely shun the term stress. To the right of the bar I place the various sorts of stress, differentiated by their formal sponsors. The formal properties are compartmentalized into *grammatical properties* (syllable structure, accent) and *post-grammatical* properties, separated by the broken horizontal line.[10]

[7] In Liberman and Prince (1977) and in Prince (1983) the initial beat is seen as the result of a rule that operates on the metrical grid, called *Initial Beat Addition*.

[8] But see Moskal (in press) for the possible role of EP in systems that have clashes. The precise range of interactions between EP and rhythm remains to be established.

[9] In section 5.3, I turn to the possibility of subsyllabic units like *moras* being accent-bearing units.

[10] I will not decide on whether the representation that accounts for EP and rhythm involves a particular kind of constituency grouping.

2.3. A note on cyclic stress

Thus far no reference has been made to yet another source of 'stress'. In morphologically complex words, syllables that carry primary 'stress' on an embedded unit (when this unit occurs on its own), may be perceived as stressed within a larger unit, even though another syllable in this larger unit now carries the primary 'stress'. Formally, this seems to suggest that words can contain multiple accents, on the condition that each accent is introduced at a different morphological 'cycle'. However, since embedded accents receive a lower degree of stress^{A}, there has to be a convention which will guarantee that effect. What this means, essentially, is that the strength of stress^{A} must always override the strength of a stress^{A} that is already present. The kind of phenomenon that gives rise to recognizing cyclic stress is exemplified by Daniel Jones' claim that 'non-primary stresses' can play a 'linguistic role'.[11] He cites the word *certification* which may have secondary 'stress' on the first or second syllable, with a difference in meaning. The form with initial secondary 'stress', he says, means 'act of certifying', while the form with secondary 'stress' on the second syllable means 'granting a certificate'. This perceived difference seems to imply that Jones was observing *cyclic* '*stresses*' since the location of the secondary 'stress' in this case can be predicted if we assume that the two forms are derived from *certify* and *certificate*, respectively. One possible formal account of cyclic 'stresses' was first proposed in Chomsky et al. (1956) and further developed in Chomsky and Halle (1968). The following famous word (pair) also illustrates the cyclic effect:

(5) cómpensàte còm**pen**sátion
    còndénse còn**dèn**sátion

The second syllables in the words on the right are different in that in *compensation* the vowel is reduced (schwa), whereas in *condensation* it is (or can be) pronounced with full vowel quality. The cyclic explanation is that *condensation* is derived from a word that has a 'stress' on the syllable /den/ which 'persists' in the derived word. The secondary *initial* stresses in the derived words in both cases are due to other stress mechanisms (responsible for non-cyclic rhythmic secondary stresses) and thus do not need a cyclic explanation which is available in the words *compensate*.

As is well-known, cyclic stresses are not stable and over time (or in fast speech) may disappear, with rhythmic stresses stepping in. This is more likely to happen in words that are complex because of affixation, but can also occur in compounds (see Giegerich, 1985; Visch, 1999).

It is possible that cyclic effects are more likely to occur in languages in which the location of accent is heavily dependent on lexical factors (as opposed to being predictable). Unpredictable accent suggests an alternative account that does not depend on cyclic rule application, since the accent, rather than being assigned by rule, would be lexically specified. It could be argued that lexically marked accent (as opposed to predictable accents) can be phonologized in the form of *phonological weight* (as suggested in Kager ms.). Bolinger (1981) makes a similar proposal, proposing to specify the distinction between reduced and full vowels in English lexically. Taking this route (by combining the proposals of Kager and Bolinger) would reduce cyclic effects to instances of stress due to syllable weight, i.e. stress^{W}.

Leaving this matter for further research, in the next section, I will propose a procedure for word accent assignment (based on and updating the proposal in van der Hulst, 2009), which I take to be a grammatical (in this case lexical) module. Here I will not deal with EP and rhythm referring to van der Hulst (in press-a).[12]

3. The accent module[13]

In this section, I propose some central parts of a theory of word accent.

3.1. Bounded systems

In many 'stress' languages, primary 'stress' must fall on a syllable near the edge of the word (initial, second syllable, third syllable, antepenultimate, penultimate, final)[14]:

[11] As noted in Fox (2000:129 fn. 16).

[12] Although this article is on word 'stress', the various distinctions made here also apply to phrasal 'stress'. This causes a problem when words are uttered in isolation because the word and phrasal properties become impossible to separate. See Gordon (in press) for the kinds of problems this causes when descriptions and analyses of 'word' stress are based on words uttered in isolation.

[13] The proposal in this section is a further development of the system proposed in van der Hulst (2009).

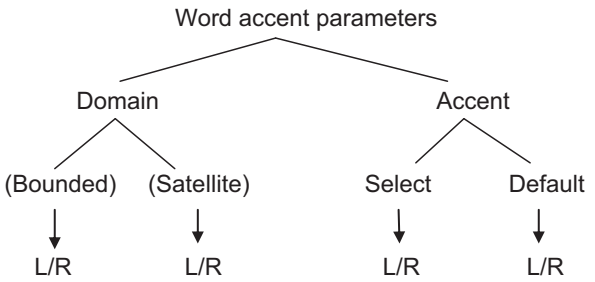
[14] These characterizations of stress/accent locations are based on StressTyp, a database for word stress/accent systems of the languages of the world; cf. Goedemans and van der Hulst (2009). Except for some cases that are discussed in more detail, I did not include references for the languages mentioned here and below, but these can all be found in the database that is available online: http://www.unileiden.net/stresstyp/.

(6) Possible accent locations in bounded systems

Left			*Right*		
Initial	*Second*	*Third*	*Antepenultimate*	*Penultimate*	*Ultimate*
Czech	Dakota	Winnebago	Macedonian	Polish	Turkish

I will assume that systems of this sort set a *domain* limitation on accent and then determine the location of accent within this domain. To this end, I propose the following four parameters (see 7), two of which ('Bounded' and 'Satellite') are *unary* in the sense that they can be chosen as active or not; this is indicated by parentheses. Whether the other two parameters can be chosen, rather than being obligatory, will be discussed further in section 5.1. If a parameter is chosen as active (or when obligatory), a value must be specified. In all four parameters at issue the values are L(eft) and R(ight).

(7)



We also need mechanisms that determine accents in the first place:

(8) Sources for accent
- a. syllable weight (weight-to-accent)
- b. diacritic marking (lexical accent)

Weight-to-accent, then, is also a parameter, which, if active, has further values to determine which properties of the syllable contribute to weight. I will not discuss the array of potentially relevant properties here (see Gordon, 2006).

I will clarify how each of these parameters delivers a relevant distinction:

(9) Explanation of parameters
- a. Bounded = form a bisyllabic domain: on the left or right side of the word
- b. Satellite = 'add' one syllable: to the left or right of the domain
- c. Select = select the leftmost or rightmost accent in the domain
- d. Default = if no accent mark is present in the domain: assign accent to the leftmost or rightmost syllable

The first parameter (Bounded) allows us to distinguish between bounded and unbounded accentual domains. If the domain parameter is *not* active, the domain equals the whole word, which leads to an unbounded system. If, however, this parameter is active, we must choose an edge for the domain. Bounded(L) gives us a left edge accent (first or second syllable, depending on parameters Select and Default), while Bounded(R) gives us a right edge system (final or penultimate, again dependent on Select and Default). A bounded domain is somewhat like a non-iterative *foot* in Metrical Theory, but it does not have the rhythmic connotation of this term which is why I prefer the neutral term *domain*. Additionally, metrical feet are headed domains. In the present approach headedness results from the parameters Select and Default.

The parameter Satellite tells us that there is a syllable to the left or right of the domain. In unbounded systems, satellites correspond straightforwardly with the notion of *Extrametricality*, i.e. syllables at the edge of the word domain that cannot be accented. In bounded systems, however, there is a two-fold possibility for satellites. The satellite can occur next to the word edge (an external satellite) or inside the word (an internal satellite); domain *plus* satellite are here between curly brackets. These two options are illustrated in (10) for a right edge bounded domain:

(10) a. Bounded(R); Satellite(R):
. . . . σ {(σ σ)+σ}] (external satellite)

b. Bounded(R); Satellite(L):
. . . .σ {σ+(σ σ)}] (internal satellite)

The notion of satellite allows us to extend a two syllable window with an 'adjunct' into a three syllable window. It would appear that external satellites are always *in*visible for accent. The need for internal satellite which are visible to accent

comes from specific cases in which the third-syllable-in can be accented so that, as a result, three syllables are available for accentuation, either regularly or in specific circumstances (see section 3.3).

The Select parameter is necessary because a domain can contain more than one accented syllable, at most two if the domain is bounded (ignoring the satellite option), but more if the domain is unbounded, Select will designate the leftmost or the rightmost accent as the actual accent within the domain, which implies, by convention, that all others are deleted.[15]

Finally, if the domain contains no accent at all, Default assigns an accent to the leftmost or rightmost syllable in the domain.

The independent need for both Select(L/R) and Default(L/R) can be illustrated by considering so-called bounded *weight-sensitive* languages. In such cases, the actual accent is not fixed on a particular syllable in the word, but neither does the accent rule randomly target just any syllable. As shown in van der Hulst (2009), within a bisyllabic domain (ignoring the option of satellites here) there are four logical options for right-edge weight-sensitive systems. First, all heavy syllables (represent as bold sigma) are projected as a grid mark which is used as the formal notation for accents. Select deletes a grid mark (represented as '⁎') if the domain contains multiple marks, and Default adds a mark if the domain is empty:

(11) Right-edge weight-sensitive systems

	x	x	⁎ x	x	
i.	a. (**σ** σ)]	b. (σ **σ**)]	c. (**σ** **σ**)]	d. (σ σ)]	e.g. Epena Pedee
			Sel: right	Def: left	
	x	x	⁎ x	x	
ii.	a. (**σ** σ)]	b. (σ **σ**)]	c. (**σ** **σ**)]	d. (σ σ)]	e.g. Yapese
			Sel: right	Def: right	
	x	x	x ⁎	x	
iii.	a. (**σ** σ)]	b. (σ **σ**)]	c. (**σ** **σ**)]	d. (σ σ)]	e.g. Sunda
			Sel: left	Def: left	
	x	x	x ⁎	x	
iv.	a. (**σ** σ)]	b. (σ **σ**)]	c. (**σ** **σ**)]	d. (σ σ)]	e.g. Aklan
			Sel: left	Def: right	

We also find four patterns on the left edge:

(12) Left-edge weight-sensitive systems

	x	x	⁎ x	x	
i.	a. [(**σ** σ)	b. [(σ **σ**)	c. [(**σ** **σ**)	d. [(σ σ)	e.g. Capanahua
			Sel: right	Def: left	
	x	x	⁎ x	x	
ii.	a. [(**σ** σ)	b. [(σ **σ**)	c. [(**σ** **σ**)	d. [(σ σ)	e.g. Archi
			Sel: right	Def: right	
	x	x	x ⁎	x	
iii.	a. [(**σ** σ)	b. [(σ **σ**)	c. [(**σ** **σ**)	d. [(σ σ)	e.g. Malayalam
			Sel: left	Def: left	
	x	x	x ⁎	x	
iv.	a. [(**σ** σ)	b. [(σ **σ**)	c. [(**σ** **σ**)	d. [(σ σ)	e.g. Ossetic
			Sel: left	Def: right	

[15] This does not run counter to cyclic 'stresses' if these are seen *not* as correlates of accents, but rather as correlates of weight; see section 2.3. Accent deletion cannot, of course, deprive a heavy syllable from its intrinsic weight. If there are languages in which non-selected accents turn up as having some degree of 'stress', this might imply that Select adds a grid mark to the winner, leaving the other accents in place.

If the domain contains only one heavy syllable, as in the first two columns, it will always be accented; both Select and Default are not relevant here. Column (c), which shows the case of two heavy syllables, and thus two accents if weight-to-accent is 'on', shows the need for an edge choice for Select, while column (d), in which the domain contains no accent at all, shows that the setting of Default is independent of the setting of Select, which is why we have four different systems.

It should be noted that the four-way distinction that we find at each edge *cannot* be accounted for in any of the foot typologies that have been developed in standard varieties of metrical theory (Vergnaud and Halle, 1978; Hayes, 1981, 1995; Idsardi, 1992, 2009). At least, no inventory of feet has ever been proposed in the metrical literature that accounts for this diversity *without additional machinery* such as movement or deletion rules. For example, Hayes (1981) and Halle and Vergnaud (1987:45–46), must adopt a stress retraction rule to account for penultimate accent in Aklan when words ends in two heavy syllables (see 11ivc above). My account does not require such additional rules because it separates the notion domain from headedness within this domain. It would seem then that standard foot inventories are not rich enough to account for all bounded primary stress locations. On the other hand, they are too rich to account for rhythm, as I show in van der Hulst (in press-a). In conclusion, standard foot theories, in trying to generalize over primary stress and rhythm are both too limited (for primary stress) and too rich (for rhythm). The present approach allows the necessary complexity for primary stress, thus allowing a simple approach to rhythm.

3.2. Unbounded systems

Interesting confirmation for the approach taken here can be drawn from a class of accentual systems that we have not considered thus far. In this class of systems, the accent may occur *anywhere in the word* because the parameter Bounded is not active. For reasons to be given below, we can only clearly detect such systems in weight-sensitive systems. If we assume that unbounded systems have the same options for Select and Default, we expect four possible weight-sensitive unbounded accent types:

(13) Four types of weight-sensitive unbounded systems[16]
- a. Accent the last heavy, or else the first light syllable; e.g. Sikaritai
- b. Accent the last heavy, or else the last light syllable; e.g. Puluwatese
- c. Accent the first heavy, or else the last light syllable; e.g. Tahitian
- d. Accent the first heavy, or else the first light syllable; e.g. Amele

All four patterns are attested in the languages of the world (also see Hayes, 1995). Recall that the four-way distinction is possible because both Select and Default have two values which can be chosen independently:[17]

(14) LAST/FIRST

Sel: right	x * x σ σ **σ** σ **σ** σ σ σ σ	Def: left	x σ σ σ σ σ σ
LAST/LAST			
Sel: right	x * x σ σ **σ** σ **σ** σ σ σ σ	Def: right	x σ σ σ σ σ σ
FIRST/LAST			
Sel: left	x x * σ σ **σ** σ **σ** σ σ σ σ	Def: right	x σ σ σ σ σ σ
FIRST/FIRST			
Sel: left	x x * σ σ **σ** σ **σ** σ σ σ σ	Def: left	x σ σ σ σ σ σ

[16] From a functional point of view, unbounded systems are curious because the location of accents provides no information about word edges. It must be concluded that in systems of this sort the 'greed' of heavy syllables in catching the word accent has overtaken the edge-based preference of bounded systems. This kind of conflict is expressed in terms of the ranking of constraints in Optimality Theory (Prince and Smolensky, 1993). The present article follows a parametric approach to language variation. My reasons for rejecting OT have been provided elsewhere (van der Hulst, 2011c).

[17] Additional weight-sensitive unbounded systems arise when Extrametricality (i.e. external satellites) plays a role.

I mentioned that unbounded systems can be recognized as such only when the location of accent is dependent on syllable weight. Logically, we could ask what happens when the accent is *not* weight-sensitive within the unbounded window, i.e. when weight does not play a role. The result of this mix of parameter settings, taking into account the *satellite* option, gives yet another 4 possible systems:

(15) Four types of weight-insensitive unbounded systems

Unbounded	[(σσσσσσσσ)]	[(σσσσσσσσ)]
Unbounded + Sat.	[σ(σσσσσσσ)]	[(σσσσσσσ)σ]

However, these four systems seem descriptively equivalent to the following weight-insensitive *bounded* systems:

(16) Ambiguity

Bounded	[(σσ)σσσσσσ]	[σσσσσσ(σσ)]
Bounded + Sat.	[σ(σσ)σσσσσ)]	[σσσσσ(σσ)σ]

I suggest that the difference between (15) and (16) is revealed in their patterns of exceptions if we assume that an *un*bounded weight-insensitive system sets no limit on exceptional patterns, whereas a bounded insensitive system can only have exceptions which represent minor variations of the bounded pattern, as in Polish. An unbounded weight-insensitive pattern is Turkish which has regular final accent, but allows accent to occur far inside the word if an accent is introduced by a suffix or a root with irregular accent that is followed by several other suffixes (see van der Hulst, 1999). The cases of Polish and Turkish are discussed more fully in section 3.4.

Unbounded systems have always been problematic for metrical theory. In early varieties of this theory a special category of *unbounded feet* was proposed (see Vergnaud and Halle, 1978; Hayes, 1981) but working with such unbounded feet created various ambiguities. In the end, the majority view was to reject such unbounded foot types, thus restricting the scope of metrical theory to bounded systems (Hayes, 1995). However, such a strict separation of bounded and unbounded systems is not necessary if, as I have proposed here, we simply adopt the choice of domain (bounded or unbounded) as a basic parameter. In fact, if we do this, we reveal a clear generalization about the variety of bounded and unbounded systems which is that, once the domain (and peripherality) has been set, the location of accent is determined by the same set of accentual algorithms in both cases:

(17) Bounded and unbounded systems

Weight-sensitive	Bounded (right/left edge)				Unbounded	
Sel(R);Def(R)	x (**σσ**)	x (σ**σ**)	⁎x (**σσ**)	x (σσ)	⁎ x (σσ**σ**σ**σ**σσσ)	x (σσσσσσ)
Sel(L);Def(R)	x (**σσ**)	x (σ**σ**)	x⁎ (**σσ**)	x (σσ)	x ⁎ (σσ**σ**σ**σ**σσσ)	x (σσσσσσ)
Sel(L);Def(L)	x (**σσ**)	x (σ**σ**)	x⁎ (**σσ**)	x (σσ)	x ⁎ (σσ**σ**σ**σ**σσσ)	x (σσσσσσ)
Sel(R);Def(L)	x (**σσ**)	x (σ**σ**)	⁎x (**σσ**)	x (σσ)	⁎ x (σσ**σ**σ**σ**σσσ)	x (σσσσσσ)

It is worth noting that languages with unbounded 'stress' can have rhythmic beats, caused by post-grammatical rhythm. Juwalarai (a Pama-Nyungan language; Williams, 1980) presents a clear case of combining the unbounded nature of accent with rhythmic beats. All long vowels project an accent (it would appear that Select is not active). If there is no heavy syllable accent, Default assigns accent to the first syllable. Additionally, there are rhythmic beats on alternate syllables preceding and following accents.

3.3. Internal satellites

Instead of having a parameter Extrametricality(L/R) which would move the accent domain one syllable inward (on the left or right side), I have proposed a new mechanism called Satellite(L/R) which allows the accent domain to have an extra

syllable on either side. This includes Extrametricality cases which involve an extension of the accentual domain at the word periphery (where the satellite was called *external*), but it also includes an extension of the accent domain with an *internal* syllable (see 10a and 10b).[18] While in the Extrametricality case, (10a), the added extra syllable appears to always be invisible (which is perhaps the true meaning of being extrametrical), internal satellites are visible and thus accentable (in which case accent can fall on any of the three peripheral syllables); of course, if internal satellites could be invisible, we would not be alerted to them in the first place.

An example involving an external satellite is Classical Latin, where the accent rule is as follows: ''Stress falls on the penultimate syllable if it contains a long vowel or is closed. Else stress is antepenultimate.''

(18) Classical Latin

x	x	⁎x	x
{ (**σσ**) σ}]	{ (σ**σ**) σ}]	{ (**σσ**) σ}]	{(σσ) σ }]

(19) a. Bounded(R)
b. Satellite(R)
c. Select(R)
d. Default(L)

Internal satellites are relevant for languages in which stress falls in a three-syllable window such that all syllables are visible and thus can bear accent such as Spanish (Roca, 1999) or Greek (Revithiadou, 1999). In these cases then, the satellite is internal and always visible. Sometimes, it would appear that the visibility of the internal syllable is conditioned. To illustrate this I discuss the case of Munster Irish which has third syllable accent in the specific case that a word starts with the sequence LLH (Doherty, 1991).[19]

The patterns that are possible are the following:

(20) Munster Irish accent

x	x	x
[σ**σ**σ	[**σ**σ**σ**	[σσσ
x	x	
[**σσ**σ	[**σ**σσ	
x	x	
[σσσ	[σσ**σ**	
x		
[σ**σσ**		

This looks like the kind of system found in Capanahua (see 12i), except for one case. When the first two syllables are light and the third is heavy, accent is on the third syllable:

(21)

i. x	ii. x	iii. ⁎x	iva. x	ivb. x
[{ (**σσ**) σ}	[{ (σ**σ**) σ}	[{ (**σσ**) σ}	[{(σσ) σ }	[{ (σσ) **σ**}

(22) a. Bounded(L)
b. Satellite(R)
c. Select(R)
d. Default(L)

[18] This does not account for cases of 'foot extrametricality', a mechanism used in Hayes (1981), which then would call for some other explanation.

[19] Old Irish had initial QI accent, but Munster Irish has developed a QS variant.

In the first three cases the satellite can be heavy or light (indicated by the italic sigma), but we note that it is not selected if the bounded domain contains a heavy syllable. Select has access to the satellite only if the two-syllable domain contains no heavy syllable and thus no accent. So the satellite visibility is an option that takes precedence over last resort Default, making a difference between the last two cases. Munster Irish is special (perhaps transitional in some sense) in that the internal satellite is only visible in specific circumstances.

3.4. Lexical accents

In (8) it was stated that accents can have two sources: syllable weight or lexical marking. In the latter case, syllables are attractors of stress^{A} without having intrinsic weight properties. For example, a standard analysis of a central part of Russian stress runs as follows (see Halle, 1973; Melvold, 1989; Idsardi, 1992; Dogil, 1999; Revithiadou, 1999; Alderete, 1999). Morphemes can have syllables that are accented, although morphemes can also be unaccented. When various morphemes are combined to form a complex word it is said that the leftmost accent is stressed. If all morphemes making up the word are unaccented, a special default accent rule places an accent on the first syllable.[20] The following Russian examples are taken from Revithiadou (1999:124):

(23) Neuter nouns in –o

	Nom.Sing.	Nom.plur.	
a.	zérkalo	zerkalá	‘mirror’
b.	jábloko	jábloka	‘apple’
c.	bolóto	bolóta	‘swamp’

The stem in (23a) is unaccented. Provided with the accented –a suffix (Nom.Plur.) the word ends up with accent on the suffix. However, the –o suffix (Nom.Sing.) is not accented and in this case the word ends up with the default initial accent (which is the third source of accent). The cases in (23b) and (23c) involve stems that have an accent (on the first or second syllable, respectively). This accent prevails when the accented –a suffix is added, showing that the leftmost accent wins. This pattern then is an instance of what Halle and Kiparsky (1977) baptized the ‘Basic Accentuation Principle’ which is characteristic of several Balto-Slavic languages and more generally of languages in the Indo-European family. The ‘BAP’ is in fact one of the four ways in which an unbounded accent system can work (see 13d). Russian is thus a case in which the reason that Select must be specified is the presence of lexical accents (cf. 8b). It is clear that lexical accents function in the same way that *weight accents* function and for this reason we could call these accents *diacritic weight accents*. We can then analyze Russian as an unbounded system as follows:

(24) Russian
- a. Select (L)
- b. Default (L)

The parameters Bounded and Satellite are not active. The leftmost accented syllable carries the accent that underlies stress^{A}, or, if there is no lexically marked syllable, accent lies on the first syllable. Indeed, systems of this kind are often called *lexical accent systems* (see van Coetsem, 1996; Revithiadou, 1999; Alderete, 1999).

Lexical accents can also, of course, play a role in bounded systems. A case in point is Polish which has fairly regular penultimate stress^{A}:

(25) Polish
- a. Bounded(R)
- b. Default(L)

Exceptions in Polish have been discussed in Comrie (1976), Halle and Vergnaud (1987), Franks (1985), Hammond (1989), Idsardi (1992), Halle and Idsardi (1994) and Dogil (1999) (here ‘A’ is antepenultimate, ‘P’ is penultimate and ‘F’ is final):

[20] There is also a class of unaccented stems that ‘direct’ the accent on a post-stem suffix, or, if such a suffix is lacking, on their own final syllable.

(26) Polish exceptions

A/P	P/A	F
uniwérsytet	gramátyk	rezím
'university'	'grammar-GEN-PL'	'regime'
uniwersytét-u	gramátyk-a	rezím-u
'id-GEN-SG'	'id.-NOM-SG'	'id.-GEN-SG'
universytet-ámi	gramatyk-ámi	rezim-ámi
'id-INS-PL'	'id.-INS-PL'	'id.-INS-PL'

In the A/P case, the final syllable is lexically specified as a satellite (right), which pushes the domain one syllable in. When a suffix is added, this satellite specification is erased because it can no longer be right-adjoined to the domain. In the third column in (26), there is a lexical accent on the final syllable. Upon the addition of a bisyllabic suffix the lexical accent is out of reach. The P/A case is more complicated. In this case, the penultimate syllable of the stem *gramatyk* is lexically accented and marked as a satellite (left). If no affix is added, the satellite status of the syllable (ma) is moot. If one syllable is added, the lexical accent can still be seen so that we can get antepenultimate stress. But when a bisyllabic suffix is added, the satellite is no longer visible because it is not adjacent to the bounded window. As a consequence the lexical accent is out of reach and accent resorts to the regular penultimate position.[21] Clearly, with Polish being bounded, there is no point in asking whether syllables outside the bounded domain can have lexical accents. Theoretically they can, but their weight mark can never be seen by the regular accent system.

In section 3.2, I mentioned the case of Turkish, which in the majority of cases has final stress^{A}, or, as has been argued in Levi (2005), final pitch.[22] This, in any event, suggests Default(R). The question is whether the domain is Bound(R) or unbounded (which means that the domain parameter is not active). How can we tell? It so happens that Turkish has a minor rule which causes stress^{A} or high pitch to be on another syllable than the last one.

The relevant words are mainly (though not exclusively) native and foreign place and personal names, and recent borrowings. Although these borrowings mostly conform to segmental aspects of Turkish phonology, their accent pattern is deviant. This class of items has been drawn attention to and analyzed by Sezer (1983), Kaisse (1985) and Barker (1989).[23] In (27) I list some of the examples, taken from Sezer (1983), arranged according to the weight of the final syllables (cf. above). The periods represent syllable boundaries:

(27) Turkish

a. antepenult light, penult light, final heavy or light

O.dí.pus	'Oedipus'
In.di.ya.na.pó.lis	'Indianapolis'
Gö.ré.me	'Göreme
Ke.né.di	'Kennedy'
Pi.to.lé.mi	'Ptolemy'

b. antepenult light, penult heavy, final heavy or light

Sa.mu.él.son	'Samuelson'
Va.síng.ton	'Washington'
Ha.li.kár.nas	'Halicarnassus'
lo.kán.ta	'restaurant'

c. antepenult heavy, penult light, final heavy or light

án.ka.ra	'Ankara'
şa.mán.dı.ra	'buoy'
pén.çe.re	'window'
şév.ro.le	'Chevrolet'

[21] A form like *gramatýczny* 'grammatical' has regular penultimate accent. I will assume that lexical accent can disappear in an environment created by derivation as a result of accent deletion triggered by (classes of) suffixes.

[22] This would make Turkish a pitch-accent language; see section 4.

[23] A general overview of Turkish stress is Inkelas and Orgun (2003).

d. antepenult heavy, penult heavy, final heavy or light

Men.dél.son	'Mendelssohn'
Ay.zɨn.hó.ver	'Eisenhower'
Kam.çát.ka	'Kamchatka'

The generalization here is clear, as both Sezer and Barker note:

(28) If the antepenult is heavy and the penult is light, accent falls on the antepenult; otherwise it falls on the penult

One way to think about this subclass of words is that they are subject to a completely separate accent rule:

(29) ''Sezer-words''[24]
a. Bounded(R)
b. Satellite(R)
c. Weight(R)
d. Default(R)

This is the same system as in Yapese (10ii) except that it includes a setting for the Satellite parameter. It is interesting to note that the regular portion of the vocabulary differs from the place and personal names and recent borrowings in at least two respects: first, the irregular items have final syllable extrametricality, and, second, the irregular items show weight-sensitivity.

The question is now how we can integrate the Sezer words into the regular accent system. We can do this by assuming the accentual system of Turkish to be unbounded, and having a R-setting for Default which accounts for the final stress^{A}/pitch when there is no accented syllable further up in the word.[25] It then follows that the accented syllable of a ''Sezer-words'' will attract the accent, because in that case Default will not apply:

(30) a. Select (?)
b. Default(R)

We can actually also determine what the value of Select is. There are suffixes which trigger primary stress on the syllable immediately preceding them. In (31), I give some examples (taken from Barker, 1989), in which the exceptional suffix is bracketed:

(31) a.	taní -[ma] -dık -lar -ım -ız	'those we do not know'
b.	koalisyón -[la]	'with coalition'

The relevant suffixes are *pre*-accenting, which means that they are associated with a rule that assigns an accent to the syllable preceding them. We now have a way of establishing what kind of unbounded system Turkish has by pinpointing the value of Select. To establish whether the Select parameter involves a left or rightmost setting we need to consider words that have more than one accented syllable. For this we need to look at cases in which we have a *pre*-accenting suffix which is attached to a ''Sezer-word'':

(32) şévrole-la 'with Chevrolet'

As noted, the leftmost accented syllable has stress^{A}/pitch, which means that it is selected as the word accent. Turkish thus has an unbounded system that is identical to the weight-sensitive unbounded system of Tahitian (see 13c):

(33) a. Select (L)
b. Default(R)

[24] Kabak and Vogel (2001) treat these words as having lexical accent which does not affect the argument being made here, namely, that Turkish has an unbounded system.

[25] It has actually been reported in Levi (2005) that the major phonetic correlates of accent is pitch. Whether, in all cases, pitch should be included in the cover term stress will be discussed in section 4.

We can conclude that lexical diacritic accents behave just like weight accents. Note that here I have assumed that diacritic accents in lexical accent systems like Russian (where lexical marking is the norm) and diacritic accents as exception devices (in Polish, where regular accentuation is the norm) are the same thing. This generalization is questioned in Revithiadou (1999), based on the fact that languages do sometimes allow borrowed words with accent locations that fall totally outside the regular accentuation system. I agree that for such cases, we need to say that (a) there is lexical accent and (b) the words in question are marked as not undergoing the accentual rules at all.

3.5. Brief comparison to other theories

An appeal to Select and Default (although using different terms) is not unprecedented. Hyman (2006, 2007) sees the properties *culminativity* ('at most one') and *obligatoriness* ('at least one') as defining properties of 'stress' and these two properties can be seen to result from Select and Default, respectively. The difference is that I attribute these properties to accent, which then entails that they are typically manifested in the perceptible properties that I call stress^{A}. I also refer to Inkelas and Zec (1988) who analyze Serbo-Croatian not as accentual but as having H tones. Nonetheless, the key elements of their model are Delete(H) and Insert(H) which are completely analogous to my Select and Default, and I would argue that these operations in Serbo-Croatian operate on accents that underlie the tonal phenomena (which is precisely the view that Inkelas and Zec argue against; see section 4). The idea of Select is also an important element of the accent theory proposed in Gussenhoven (1992), who develops a formal system in which, for purposes of primary 'stress', all accents but one are deleted. In his theory, as in classical metrical theory, rhythm is another source of accent, which means that he does not need a Default parameter. Rhythm, feeding into the accent module, will guarantee that the domain always contains at least one accent. Also similar to the approach followed here are the theories of Revithiadou (1999) and Alderete (1999) who utilize the same notion of accent defended here. These authors also propose mechanisms analogous to Select (called Resolution in Alderete's work) and Default. These authors also offer additional insights that I briefly mention in the next subsection.

3.6. Refinements

In the preceding section, we have seen that an accentual module must contain mechanisms that resolve the conflict of having multiple diacritic accents (sponsored by different morphemes) by selecting one as the word accent. In addition, there is a Default providing an accent when none is present in the domain. These mechanisms, as we have seen, are also operative in weight-sensitive systems. However, it is clear that Select and Default cannot be the whole story, at least not in systems where lexical accent plays a role. As has been demonstrated in Revithiadou (1999) and Alderete (1999), other mechanisms must also be made part of an accentual theory. In morphologically complex words, when multiple accents turn out to be available for (being the) word accent, we cannot always account for the winner in terms of the Left/Right options of Select (which, following Alderete, 1999, we can call *Directional Resolution*). While Alderete focuses on the idea that the accent of roots as a matter of principle prevails over affixes, allowing affixes to prevail only as a result of affix-specific lexical specifications, Revithiadou attributes a central role to the notion *head of word*. In cases of inflectional affixes, both proposals converge (assuming that the stem is the head of an inflected word), but in cases of derivational affixation, there is a difference. Here, as Revithiadou clearly shows, derivational affixes can prevail over stems, which is consistent with the idea that derivational affixes are heads (because they determine the category of the complex word; see Hoekstra et al., 1980). An important area for further research lies in the question whether Select, operating in a strictly directional manner and Select, based on morphological information (such as root, or head), are both motivated to the same extent. It seems that directional Select is operative in weight-sensitive unbounded systems where single morphemes can contain multiple weight accents, and it remains to be seen whether there are solid cases in which accents sponsored by different morphemes are reduced to one directionally or are always based on morphology (as Revithiadou and Alderete claim). For example, both authors analyze Russian 'stress' and claim that Select is dependent on morphology, rather than direction. Interestingly, no such claims have been made about Default, which always seems directional, choosing a left or right edge of the word. This might suggest that whereas Select definitely must operate at the grammatical level, where morphological information is available, Default could be post-grammatical, at least in some languages, or perhaps specifically in unbounded systems. In support of this, Gordon (2000), based on phonetic analyses of Dobrovolsky (1999), shows that the default accents in the unbounded system of Chuvash in words with only light syllables have different phonetic properties from the winning weight-accents in words with heavy syllables. It is worthwhile to explore whether a post-grammatical default is perhaps to be identified with Edge Prominence (EP).[26]

[26] Default in unbounded systems, if lexical, would then be a phonologization of EP, while Default in bounded system, which is perhaps always lexical, would be the phonologization of rhythm.

Revithiadou (1999) also addresses another important question. Is the location of lexical accents in lexical accent languages (where lexical accents are the norm, as in Russian) completely free, or are there phonotactic constraints that limit their distribution? According to Revithiadou there are such constraints, and, if she is correct, an account of these constraints must also be a part of the accentual analysis.

Another issue is whether there is just one type of accent (preferred), or whether there are different types of accents (such as 'strong' and 'weak' accents that have different phonetic effects). Both Revithiadou (1999) and van Coetsem (1996) make proposals for different types of accents, which is another matter that needs further investigation.

Finally, accent rules can be associated with specific (classes of) affixes. Such rules are no different from segmental rules like the 'velar softening' rule of English which replaces /k/ by /s/ before certain suffixes. Affixes, in general, can, in addition to having lexical accents, cause the addition, movement or deletion of accents on their base. In this article, space limitations prevent me from discussing these various aspects of the accentual module in detail; see Alderete, 1999: chapter 5.

3.7. Accent, EP and rhythm

As proposed in the previous section, accent is formally represented in terms of an arbitrary symbol 'x' (equivalent to '*', as in Goldsmith, 1975). The effect of EP and rhythm can be formally represented in terms of a grid (perhaps bracketed), which comprises the accent mark, adopting a convention, familiar from the grid based approach (Prince, 1983, Selkirk, 1984), which guarantees that the different sources of grid marks remain distinguishable:

(34)

a.
```
Apalachicola
          x      accent
```
b.
```
Apalachicola
x         x      EP
          x      accent
```
c.
```
Apalachicola
x   x     x      rhythm
x         x      EP
          x      accent
```

I refer to van der Hulst (in press-a) for a detailed account of rhythm and EP and their interaction. Here, I leave undecided whether the full grid needs to contain brackets to represent grouping; see Kenstowicz (1994) for discussion.

4. Pitch accent languages

In the preceding sections, we have mainly focused on languages in which accent forms an anchor for stress^{A}. Accent can also play a role in so-called non-stress languages, for example by providing an anchor for pitch. This distinction presupposes that we have an idea of what is meant by stress^{A}, phonetically, such that it is distinct from pitch (the perceptual counterpart of fundamental frequency). The determination of the phonetics of 'stress' (whatever kind) has turned out to be notoriously difficult (see Lehiste, 1970; Allen, 1973 and many other more recent sources, such as Sluijter and van Heuven, 1996). Earlier assessments put *duration*, *fundamental frequency* and *intensity* central, in addition to other factors involving the relative 'strength' of phonemes in 'stressed' syllables. Sluijter and van Heuven add *spectral tilt* to the list. Some claimed that fundamental frequency takes the lead in all of this (Mol and Uhlenbeck, 1956; Fry, 1955). It was then shown that the big role of (changes in) fundamental frequency results from the fact that the pitch properties of 'stressed' syllables are due to the fact that the examined words are uttered in isolation. This causes their 'stressed' syllable to be bearers of intonational pitch movement. When words are examined in positions where their syllables do not attract intonational pitch movement (in 'out-of-focus' positions) it turns out that pitch is *not* a major cue at all, but rather duration, spectral tilt and other effects of articulatory force (which may include a small pitch rise). However, there are languages in which what makes one syllable salient *is* specifically pitch, whether the word is in or out of focus. Such languages I regard as pitch-accent accent languages. Turkish could be an example of this type (Levi, 2005).

Gussenhoven (2006) discusses the case of Nubi, a creole language spoken in Uganda and Kenya with a 90% Arabic vocabulary. In this language, each word has precisely one syllable with high pitch, located on one of the last three syllables of the word. The most frequent location is penultimate, but antepenultimate and ultimate also commonly occur.

A shift from penultimate to ultimate accent functions as a marker of plurality. In verbs there are three morphological categories which may differ by the position of accent:

(35) Nubi
a. séregu ‘steal
b. serégu ‘stealing’
c. seregú ‘be stolen’

Thus gerunds are marked by penultimate accent, although verbs that are carry ultimate ‘stress’ retain their ultimate ‘stress’ in the gerund form. This could be construed as the rightmost accent winning in case of a conflict.

Gussenhoven makes the point that this language could be analyzed either as a tone language, a pitch accent or a stress language. However, in my view Nubi is a clear example of a pitch-accent language: it has accent that is realized in terms of a predictable pitch profile which is not dependent on intonational pitch movements triggered by focus. Whether it is appropriate to analyze this language as tonal revolves around the notion of distinctivity. If ‘tone’ is defined as contrastive use of pitch, Nubi is *not* a tone language. The point is that the kind of ‘tone’ is fully predictable. A possible compromise between a purely accentual analysis (in which the pitch profile is seen as a realizational phonetic mater) and a tonal analysis would be to follow the spirit of older analyses of pitch-accent languages (Goldsmith, 1975, who refers to predecessors) by analyzing the system as accentual and postulate a rule that inserts a H tone for the winning accent. I see no reason to promote this compromise, however.

Another typical case of a pitch accent language is Tokyo Japanese, which, however, raises some additional interesting issues. Consider the three nouns in (36):

(36) Pitch accent in Tokyo Japanese

a.	i noti	ko ro	tama a
	‘life’	‘heart’	‘head’
b.	ˈi noti	koˈkoro	ataˈma

These words have a specific ‘tonal pattern’ (L) H (L). There is always an H (possibly spread out over more than one syllable) and sometimes a preceding L and/or a following L.[27] However, instead of literally assigning tones to words, it is sufficient to mark the syllable after which there is a drop to low, as in (b). Then we assign high pitch to the marked syllable and the syllables preceding it, except for the first *mora* (see Gussenhoven, 2004 for an analysis and further references).[28] The ‘marks’ have usually been called *accents* (see Haraguchi, 1979, who refers to many predecessors) rather than ‘stresses’, and this is precisely the point. The marked syllables are provided with an accent (which is taken to be unpredictable in the case of nouns and predictable for verbs and adjectives; but see below) and this accent is phonetically manifested in terms of a pitch contour. Tokyo Japanese thus qualifies as a pitch-accent language: it has accent that is realized in terms of a predictable pitch profile which is not dependent on words being in focus or not.

But again one might ask: why not refer to Japanese as a *tone*-accent language, meaning that the accent location is manifested by attracting a tone, H in this case. This is indeed the view expressed in Haraguchi (1979), i.e. the view that I called the ‘compromise view’. Pulleyblank (1986) then proposed to replace the accent mark by specifying a H tone directly in the lexical representation of morphemes and this approach has since then followed in most work. I refer to van der Hulst (2011a) for further discussion and comparison of the different analyses of which we have now seen three:

(37) a. accent with a phonetic pitch correlate (my account)
b. accent with a predictable phonological H tone correlate (Goldsmith, 1975, Haraguchi, 1979))
c. tone (Pulleyblank, 1986, Hyman, 2007)

It seems obvious that the tone-only approach (37c) does not subscribe to the idea that Tokyo Japanese and English share a notion of accent, and that the difference between these two languages is due to the choice of phonetic correlates

[27] By using the symbols ‘H’ and ‘L’ I make no commitment to either a phonological tonal specification or a phonetic realization.

[28] The high plateau preceding the accented syllable, preceded by a low, can also be analyzed as resulting from a left boundary tone; see Gussenhoven (2004) for such an analysis.

of accent. In opposition to this view, (37a), my approach (following Abercrombie's view) seeks to maintain the generalization that stress-accent languages and pitch-accent languages (or non-stress languages as Beckman, 1986 refers to them) share the notion of accent.

In support of the claim that English and Tokyo Japanese share a notion of accent, Kubozono (2011) shows that the location of accents in Tokyo Japanese is not only predictable in verbs and adjectives but also in many nouns. Firstly, *most* loan words have antepenultimate accent. This rule measures the location of accent in terms of the number of moras, but accent ends up being a property of the syllable that contains the antepenultimate mora:

(38) bánana 'banana',
orénzi 'orange'
wasíngton 'Washington'
painápuru 'pineapples'

Kubozono then states that the antepenultimate rule also accounts for the most frequent location of accent in accented nouns. 60% of nouns behave according to this rule and in the Sino-Japanese nouns this number is even 90%. The antepenultimate pattern of Japanese nouns, as Kubozono points out, is (like the English accent pattern) reminiscent of the 'Latin accent rule' (which states that accent falls on the penultimate syllable if light and otherwise on the antepenultimate syllable). There are certain differences in that the heaviness of final syllables is not ignored in Japanese which is based on a mora count. Thus, a final heavy syllable prevents antepenultimate accent, but Kubozono points out that changes 'now in progress' suggest that in these cases too the Latin rule is gaining ground. Adding up these findings with the predictable patterns of verbs and adjectives, it might be concluded that all accented words are subject to the same rule (which applies rigorously in verbs and adjectives and as a strong tendency in nouns); the main differences between nouns on the one hand and adjectives and verbs on the other hand is that in nouns the final syllable is 'extrametrical'. This indeed makes the Tokyo Japanese accent rule very similar to the Latin style English accent rule and thus strengthens the position (maintained here) that English and Tokyo Japanese are both accentual which, then, comes with certain characteristic properties. A tonal analysis of Tokyo Japanese makes the resemblances entirely accidental, unless it can be shown that some other commonality, as yet unidentified, accounts for the resemblances.

The accentual nature of Tokyo Japanese is further amplified by the fact that if words (actually what is relevant is a larger domain called the accentual phrase; see Pierrehumbert and Beckman, 1988) end up with multiple accents, all but one have to go. In others word, Select is active. Words that have an accent may be provided with a suffix that either carries an accent or assigns an accent to the preceding syllable. In that case, there is more than one accent which means that one needs to be selected. In Tokyo Japanese this is the first accent, which suggests that Select is set on Left.[29]

(39) yóm – tára > yóndara 'if he reads'
yob – tára > yondára 'if he calls

Let us now ask whether Tokyo Japanese also has a Default setting. Tokyo Japanese allows *unaccented words*. When used without a suffix, the high pitch plateau ranges from the second syllable (or rather mora) to the end of the word. If a suffix is added, the high pitch covers its syllable as well. This might suggest that final syllables in words that do not have a lexical accent acquire an accent 'by default':

(40) Words with and without accent

a. t a ˈm a - a g a
accented word

b. k u r a - g a s a
unaccented word

[29] Alderete (1999) argues, however, that the selection of the winning accent may not be directional, but rather based on morphological origin of the winning accent. In his analysis accents of roots win.

This suggests that Tokyo Japanese has the following accent system:

(41) Tokyo Japanese
a. Select(L)
b. Default(R)

I assume here that such a default would be 'late', possibly post-grammatical, because /ga/ would not be accented when yet another suffix is added. However, it has been questioned that unaccented words receive a final default accent on the basis that the 'high' pitch on the final syllable of such words (with or without suffix) does not reach the same pitch level as words that are lexically accented. This is reminiscent of the report in Gordon (2000) mentioned in section 3.6 concerning Default in the weight-sensitive unbounded system of Chuvash. So, there are two ways to go. Either one can say that in Tokyo Japanese default is final, allowing for pitch realizations to be sensitive to a difference between lexical accents and default accents, or there is no default in Tokyo Japanese in which case the pitch contour itself must be attributed to the effect of boundary tones; for such an analysis see Gussenhoven (2004).[30]

Another pitch-accent language, Somali, testifies perhaps more clearly to the fact that in pitch-accent languages words can be (*and remain*) unaccented (Hyman, 1981; Banti, 1988). Let us consider the Somali noun roots in (42):

(42) Somali

	root	masculine	feminine
a.	/inan/	ínan 'boy'	inán 'girl'
	/naʕas/	náʕas 'stupid man'	naʕás 'stupid woman'
b.	/goray/	góray 'male ostrich'	goráy 'female ostrich'
	/darmaan/	darmáan 'colt'	darmaán 'filly'
	/ʕeesaan/	ʕeesáan 'young he-goat'	ʕeesaán 'young she-goat'
c.	/dameer/	daméer 'he-donkey'	dameér 'she-donkey'
	/doofaar/	doofáar 'pig'	doofaár 'pigs'
	/kalx/	kálax 'lady'	kaláx 'ladies

As shown in (42), in nouns there is a 'tonal' contrast that is used to express gender and plurality. However, what is of interest here is that in contrast to nouns, some verb forms are *unaccented* and yet have full word status (Hyman, 1981:182). This seems to indicate that Default can remain unspecified, indicating that this parameter can be inactive.

(43) Unaccented verbs
aragtay 'she-saw'a'
yahah 'is'

Somali can be analyzed as a pitch accent language in which the high 'tone' is a pitch realization of accent. Select is active because there can be only one accent per word; I do not discuss here whether select is set to left or right. The point that is relevant for our present discussion is that words can be unaccented, which means that we must assume that Default need not be active.

5. Further issues

Having outlined a theory of accent (leaving many issues to be more fully worked out; see section 3.6), I now turn to some further important issues concerning the accentual approach.

5.1. Must accent be obligatory and culminative?

The preceding examples led to the following important question. Can languages be accented without having settings for Default? Leaving open the possibility that Tokyo Japanese has a Default, the answer is affirmative for Somali and this might be used as an argument that we are *not* dealing with accent at all, but rather with tone which (being used purely syntagmatically) can be present or absent on any given syllable, but only in one location, making the system *look like* an accentual system. However, instead of adopting the tonal analysis, we could also consider that obligatoriness (resulting

[30] In Gussenhoven's analysis, the 'accented' syllable has a lexical H tone and the preceding high plateau is due to spreading of boundary tones coming from the left side of the accentual phrase. When there is no lexical H, the high plateau accounts for the entire pitch profile.

from Default) is, in fact, itself need not be an inherently active part of an accentual system. This then implies the view that accent is not necessarily *culminative*. In van der Hulst (2011a), I have even suggested that we could consider a system that allows multiple high tones as being accentual if we allow Select to be non-active.[31] This then leads to the conclusion that all 'tone' languages with just H and L 'tone' could be represented as accentual languages. This leads to the following picture

(44) A four-way typology of accentual systems[32]

Default \ Select	Yes	No
Yes	A: All words have exactly one 'H': *Kinga*	C: at least one syllable must have 'H': *Chuave*
No	B: at most one syllable can have 'H' (unaccented words allowed): *Tinputz*	D: every syllable can have 'H': *Ekoti*

Contrary to this 'extreme' accentual view, Hyman (2007, in press-a) suggests that all these languages *can* be analyzed as (being) tonal, ranging from very restricted (A) to completely free (D), with B and C being intermediate cases. For this reason, he claims, the notion accent is not necessary. This is the extreme tonal view.[33] A reviewer suggests that a tonal approach should be taken as the null hypothesis because ''a tone is a tone'', which presumably means that the occurrence of high pitch is mostly likely, or perhaps even necessarily, the exponent of a phonological H tone. He also wonders whether other cases in which a certain phonetic property is culminative (such as the occurrence of glottalization in Cuzco Quechua; see Hyman, 2007) are open to an accentual analysis if accents are available theoretical devices. This is an interesting idea and given that my agenda is to push the notion accent, I would certainly wish to consider such an accentual analysis. For me, the null hypothesis is an approach which captures otherwise unexplained distributional similarities between many different phonetic properties. I thus accept that the relationship between phonological entities and phonetic properties is not biunique. Of course, if more than one phonetic property 'looks accentual', a choice has to be made. At this juncture, there is no room to discuss potential case studies of this sort. But let me state clearly that the present approach does *not* promote 'accentual incoherence', i.e. the use of multiple accent systems within the same words.[34] This being said, I will discuss *one* circumstance in section 5.3 that allows two accentual systems within single words, namely one system operates on the moraic level, while the other applies to the syllabic level.

I conclude that a high pitch does not have to be a tone; it can be an accent. Pike (1974) argues that there is a real choice between these two analyses, although he refers to what I call the accentual analysis as involving 'stress'. Pike (1974:169) famously asks the following question:

> We are presenting a problem. Given a language which has syllables with high pitch and syllables with lower pitches, on what do we base the decision that the high pitched syllables are part of a tone system, rather than a part of a stress system? This is especially pertinent when we are confronted with a language with more than one stress (or more than one high pitch) per word.

Clearly, Pike here focuses on languages in which various syllables in the word can have high pitch, which, for him, creates the ambiguity between tone and 'stress', assuming that high pitch can be part of the stress package and assuming that stress, like tone, can occur multiple times within a word, as in the case of Campa which Pike and Kindberg (1956) analyze as a 'multiple stress' language. From my perspective, the issue is here whether the relevant languages are *tone* languages (with H and L toned syllables) or *pitch-accent* (with accented and non-accented syllables) languages. If the latter analysis is adopted, Select would not be active, which allows multiple accents that are realized as pitch. These accents can be due to syllable weight or lexical marking.[35] Pike enumerates a set of criteria that can help the linguist decide whether a syllable with high pitch carries a high tone or is 'stressed' (read: accented), based on the phonetic details of the pitch property, or on whether or not the high pitch is accompanied by other typical 'stress'-like properties. If he is right in assuming that the systems in question are superficially ambiguous between tonal and accentual systems, we might be able to explain why tonal systems develop in 'more obvious' accentual systems in which the occurrence of accent is subject to Select and Default.

[31] In section 3.2 I already mentioned that in Juwalarai, Select is also not active causing all weight accents to be qualified as having equal 'primary stress'.

[32] All example languages are discussed in Hyman (2007).

[33] It is perhaps no coincidence that a tonologist (Hyman) would push for tone, while a student of 'stress' systems (myself) would push for accent. Progress can only be made if we are prepared to test the limits of our theoretical devices.

[34] A different situation arises if a language has different classes of words with different accentual properties.

[35] Another possible analysis of languages with multiple pitch peaks is that these peaks are phonetic exponents of rhythm.

Although, then, I see no a priori reason for making Select and Default obligatorily active in order to speak of an accentual system, there is an important question that needs to be addressed: if we find all four options in (44) when the correlate of accent is pitch, do we then also find four types of stress-accent languages? The standard view of stress-accent languages is that all major category words have precisely one accent. In such systems, if there are multiple accents (because of syllable weight or marking) all but one are removed (due to Select) and there are no words that have no accent at all (due to Default), i.e. in the absence of syllable weight or lexical marking words still have stress. Putting aside that it is also often said that the mandatory and culminative presence of accent only holds for 'major category' words[36], we thus need to explain why, within 'stress' languages, there are no words that are stressless (as a result of being unaccented) or have multiple equal 'stresses' (as a result of multiple accents).

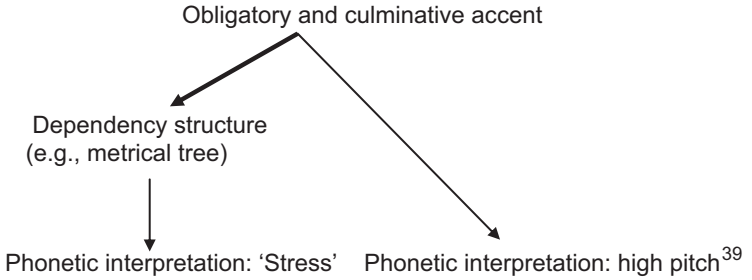
Although the claim that 'stress' languages do not have stressless words seems very solid, it has been argued that there are languages that have multiple equal 'stresses'. Despite, Pike's use of 'multiple stress languages', his cases might not be relevant if they involve pitch rather than the set of exponents that we find in typical 'stress' languages such as English.

Hayes (1995), for example, reports many languages that are said to have multiple 'stresses' with no 'stress' being primary. These are mostly cases in which the ambiguity that Pike worries about doesn't arise, because the stress properties are ambiguously stress-like (i.e., do not seem to mainly involve pitch).[37] In most of these cases we seem to be dealing with stress^{R} (stress sponsored by rhythm), sometimes accompanied by stress^{W}. I have suggested in van der Hulst (1997) that these languages do not have accents and only have utterance level rhythm. In these languages there could be no 'stressless' words given that there can be no words that exceptionally have no rhythm. I return to these cases in section 5.2.

So let us focus on 'stress' languages that do have a primary stress and no words that are stressless, languages like English. Within the four possibilities in (44), there is one case in which accent is both culminative and obligatory. I would like to suggest the idea that it is precisely this combination of values for Select and Default that gives rise to the phonetic exponents that are subsumed under the label 'stress^{A}', whereas the three possibilities in (44) are more likely to cause specifically pitch to be the phonetic exponent. The question is why this would be so? I propose that this is for the following reason.

An obligatory and culminative entity qualifies as a *head of the word*, taking this notion to imply the obligatory presence of a unit of which there can be only one within a certain domain. It could thus be said that a language in which *all* words have a unique accent is a language in which there is a formal requirement demanding that the word is a headed domain (in the lexicon). To say that the word must be headed is equivalent to saying that there is a dependency structure in which it is expressed that all other syllables are dependent on one syllable, the head, which can be formally expressed in terms of a dependency graph (as in Dependency Phonology; Anderson and Ewen, 1987; van der Hulst, 2011c), or in terms of a headed tree structure (without foot structure) as in metrical theory (which is essentially a dependency-based theory; see van der Hulst, 2011b). I suggest that the package of phonetic properties usually called 'stress' is utterly suited to providing the head with greater *perceptual salience* than all non-heads. This leads to enhancement of all sorts of phonetic properties (duration, intensity, F0, spectral tilt, phonatory effects, fuller articulation etc.).[38] This is not meant to say that a head-based ('metrical') system could not choose to have mainly pitch as a correlate, but rather that the overall package of 'stress' correlates is the most natural, default correlate:

(45)



In this view, accentual systems that do *not* require every word to have a unique head are unlikely to adopt the *syntagmatic* or global 'stress' package for accent, which is exquisitely suitable to boost one syllable to the expense

[36] Which is, presumably, a *diachronic* result of the fact that such words can form utterances on their own.

[37] We saw such a claim for Juwalarai in section 3.2.

[38] Perhaps pitch can play a bigger part if duration is 'blocked' because the language has contrastive vowel length; see Berinstein (1979).

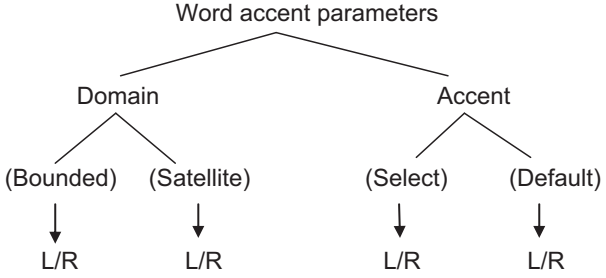
[39] Let me remind the reader that instead of assigning high pitch directly to the accent, a compromise position would be to first insert H tones (as in Goldsmith, 1975; Haraguchi 1979), but the need for such an intermediary step would have to be positively shown.

of all others. If accents are not heads of words, a more *paradigmatic* of local exponents of equal pitch to all accents is sufficient.[40,41]

This proposal entails the recognition that languages differ in whether words are lexically headed or not. From the viewpoint of Dependency Phonology, headedness is a fundamental property of domains because it is a necessary property of combining units into bigger units; But, if the proposal here is on the right track, we must accept that words are not necessarily headed domains. It remains to be determined whether languages in which words can be headless are non-headed only lexically such that heads will emerge post-lexically or post-grammatically. It seems plausible to me that the demand of headedness could enforce head-assignment at the phrasal level, binding syllables into phrasal units by marking one or both of their edges. Perhaps, then, this leads to a characterization of stress^{A} languages as those languages in which the notion of word as a lexical-grammatical unit, distinct from phrasal units, is more firmly established.

In conclusion, having seen that accents can be absent or multiply present, we can say that the parameters Select and Default can be active or inactive:

(46)



All parameters are unary in the sense that they can be active or not. When active, a value must be specified.

5.2. Stress languages without accent

Stress^{A} (by definition) cannot occur without accent. In the preceding section I have suggested that stress^{A} is typical of languages in which accent is culminative and obligatory. In other accent languages we are more likely to find pitch^{A}. But languages can have stress in the sense of rhythm (stress^{R}), EP (stress^{EP}) or weight (stress^{W}) without being accentual. We discussed the rhythmically stressed languages that lack a primary stress in the previous section. In this section I will first discuss the case of non-accentual languages that have stress^{EP} (with or without rhythm and/or weight). It would seem that such cases qualify as the prototypical metrical systems in which the strongest stress is on the first or last syllable (assuming that EP can only hit strictly peripheral syllables). If a language always has initial stress and no sign of lexical exceptions, it could be argued that this is a post-grammatical effect, in short EP. Hungarian, with strict initial stress could be an example of such a language (thus having stress^{EP}). But note that if EP has limited power, being able to only hit a peripheral syllable, any language with peninitial or penultimate stress would have to be accentual which entails the prediction that no such language is likely to be a 100% regular. This is a prediction that needs to be tested in future work. I would also expect that even languages with strict peripheral 'stress' are likely to be accentual if the presence of word stress is robust, meaning not subject to phrasal context, speech rate and so on, since the absence of such symptoms points to lexical-grammatical processes. Listening to Hungarian speech, it is easy to establish that the initial 'stress' is a very robust property of each word.

But before we analyze any language as an initial EP language, we first need to decide whether EP *can* exist in a non-accentual language. One interpretation of EP is that it is a 'polar' *response* to accent, strengthening the edge that is opposite to the edge where accent is located, thus creating a 'hammock pattern, i.e. two peripheral peaks with a valley in between'. If this is what triggers EP, then it will not exist in languages, or words, that lack accent. For the moment, I will leave the precise nature of EP (entirely independent or responding to accent) undecided.

Finally, let me return to rhythm-only languages, already mentioned in the preceding section. If there is no accent, no EP, but there is rhythm (possible combined with weight) will we necessarily have the case in which all rhythmic beats are

[40] Interestingly, van Coetsem (1996) takes pitch to be the default exponent of accent. This view is not incompatible with what is proposed here. In systems where accent functions as a head, pitch is included in the overall package of stress exponents.

[41] Does this entail that we can also analyze length as accentual, even if it is not confined to a single syllable? Yes, but accentual coherence implies that only one property can be analyzed as accentual in any given language.

equally strong?[42] It might also be possible that there is some aspect to rhythm which promotes a beat near one of the edges as the strongest beat (leading to a non-accentual primary stress^{R}). If we would reckon with such a 'beat strengthening' process, we would effectively have restated the full apparatus of classical metrical theory. I am reluctant to make that move because such a strengthening process cannot be made to follow from basic rhythmic principles (no clash and no lapse) and as such it would be a supplementary process. To keep analytic options to a minimum, I therefore will refrain from postulating such an edge based rhythmic beat strengthening process.

Nonetheless, it seems that in non-accentual languages, whether rhythmic or not, we may find that a syllable on the left, or, more typically, right edge, is more prominent. As said, this could be an effect of EP (if this process is not necessarily triggered by accent), but there is also another possibility. We must reckon with the fact that when words appear on the edge of larger prosodic units, their edge syllables may be the anchor point for intonational tones ('pitch accents' in the sense of Bolinger, 1965) or boundary phenomena (tonal or segmental) which create the perceptual sensation of these syllables being prominent. The linking of intonational pitch movement or other properties to edges of phrases, and thus edges of words that are peripheral in phrases, may lead to the *illusion* of the words having primary 'stress', while, synchronically speaking, there is no primary word stress at all (which is one way of analyzing French 'word' stress; see Gussenhoven, 2004). In van der Hulst (1997) I argue that this phrasal-intonational effect may be the factor that leads to languages in which rhythm seems to crucially feed the assignment of primary stress. I there refer to such languages as having 'count systems'. In the model proposed here in which primary 'stress' results from accent which, being lexical, precedes rhythm, which is post-grammatical, such a state of affairs is *not* possible. Therefore, I suggest that those languages do in fact not have primary stress (stress^{A}), but rather are unaccentual, having rhythm and a post-grammatical phrasal anchoring of intonational pitch movements or phrasal edge strengthening; I discuss the specific case of Creek in section 5.4.1, where I also suggest another possible approach to count systems. As has been argued and shown in Hyman (1977) and Gordon (in press) such phrasal effects may over time be analyzed as *word* accent.

5.3. Syllables, moras and accentual coherence

Hyman (2007, in press-a) points out that whereas 'stress' seems to be a property of syllables, alleged pitch-accent languages seem to often involve tones with a moraic distribution, which is then transformed into an argument against an accentual analysis of these cases by equating accent with stress and observing that stress is always a property of whole syllables. However, we can also assume that there are two types of accent-bearing units: moras (or rhymal units) and syllables (or rhymes), as is done in Halle and Vergnaud (1987). If accent is assigned to moras, let us say within a bounded window, we end up, if Default is set to Left, with an accent *in* (rather than *on*) the penultimate syllable of the final rhyme if its rhyme is monomoraic or in the final syllable if its rhyme is bimoraic:

(47) a. σ σ b. σ σ
| | | |
μ (μ μ) (μ μ)
x x

This must be distinguished from assigning an accent at the syllabic level in a weight-sensitive system although this might superficially end up with a similar effect (again with Default on Left):

(48) a. x b. x
(σ σ) (σ σ)
| | | |
μ μ μ μ μ

In (48), accent ends up on the ultimate syllable if it is heavy and on the penultimate otherwise, but in (47) it ends up on the penultimate mora. The reason for why pitch-accent systems can (but do not have to) be moraic, while stress-accent systems *must* be syllabic lies in the fact that moraic accent cannot lead to stress^{A} for the simple reason that a mora, being inside a syllable, cannot be taken to be the head of the word. Only syllables can be heads of words. Moras can, at best, be

[42] I ignore here the issue that rhythmic beat of heavy syllables might be perceived as more salient than rhythmic beats of light syllables.

heads of syllables (or rhymes). There is thus no problem in analyzing systems with a *moraic* distribution of high pitch as accentual.[43]

We could now ask whether a language can have *both* moraic and syllabic accent. Trubetzkoy (1939) makes a distinction between syllable-counting and mora-counting languages and was the first to propose that both syllables and moras can be accent-bearing units.[44] He also states that mora accent typically has a pitch exponent, while syllable accent correlates with intensity and duration (i.e. 'stress').

Both Trubetzkoy and Halle and Vergnaud take the two types of accent to be mutually exclusive, implying that a language has either one or the other. In this view, the choice of accent bearing unit is an independent parameter of the accentual system. That would certainly have been a possibility. But let me mention one system which appears to clearly have both. Bennett and Henderson (in press) describe and analyze the accentual system of Uspanteko, a Mayan language spoken in the western highlands of Guatemala. Uspanteko has both 'stress' and 'tone'. 'Stress' is confined to the last two syllables and so is 'tone', the former being obligatory, while 'tone' is not. In my analysis, all words have a (syllabic) stress-accent, but not all words have moraic pitch-accent. Thus I reanalyze Bennett and Henderson's tonal system in terms of a moraic accent, located on the penultimate mora, which is realized as high pitch. Long vowels only occur in the final syllable and this being so, high pitch occurs on the first mora of the final syllable, if it contains a long vowel, or on the mora of the penultimate (always short) vowel, if the final syllable contains a short vowel. This is precisely the situation depicted in (47). Since not all words have a 'tone', the moraic accent rule is lexically determined, i.e. it applies only in certain words. Interestingly 'stress' in Uspanteko is sensitive to the presence of a moraic accent. We know this as follows. In non-'tonal' words the stress-accent is final, irrespective of whether the final vowel is long or short. In 'tonal' words, stress-accent is attracted to the syllable with the 'tone' (i.e. with a pitch-accent), which I interpret by regarding syllable weight being determined by the presence of a moraic accent.[45] Syllabic accent is assigned within a bisyllabic window on the right edge. The Default is set on right (based on cases where there is no moraic accent), leading to final stress-accent if there is no tone. Select cannot be set because the domain never contains more than one moraic accent.[46] Thus syllabic stress-accent, which is interpreted as stress^{A}, is as in (48).

Other languages that can be analyzed along similar lines are Lithuanian, which has different 'tonal' options that can be accounted for in terms of moraic accent (as proposed in Trubetzkoy, 1939 and Halle and Vergnaud, 1987). But it could be argued that this language also has a syllabic accent which is 'tone'-sensitive and selects the leftmost syllable with a 'tonal' property, or, if there is no such syllable, the leftmost syllable of the word.[47] I suggest that Serbo-Croatian can also be analyzed in terms of a moraic accent and stress^{A} much like Lithuanian.[48] Scandinavian languages (Swedish, Norwegian) and many dialects in Europe have stress^{A} (much like English and Dutch), while also having a tonal opposition between H and L (or zero) in or near the stress syllable which can be analyzed as a moraic accent.[49] Space limitations prevent me from developing these suggestions in detail (see van der Hulst, in preparation).

Finally, it is interesting to note that moraic accent can be 'weight'-sensitive in the following way. In certain moraic accent languages (such as Tokyo Japanese) only the first mora of a long vowel can bear accent. Assuming that the first Mora is the head of the rhyme, this implies that moraic accent can only be assigned to head moras. This is not always the case. In Aguarana, a pitch-accent language analyzed in Alderete (1999) long vowels can be accented on the first or the second mora.

The present section has revealed that the prosodic systems of languages can be complex. In addition to combining stress-accent and pitch-accent (as in Uspanteko), languages can be both accentual and tonal, i.e. languages may be truly tonal in having a more than binary tonal opposition with such opposition only fully expressed on a stressed^{A} syllable. Suárez (1983) mentions Northern Pame and Yaitepec Chatino as languages that have a tonal contrast only in the syllable that is said to be stressed (which is stress^{A} on the last syllable in both cases, presumably of the stem). Thus, notions such as accent, tone and stress are *properties* of languages that are not incompatible. That language typology should refer to properties of languages rather than languages as a whole has been correctly emphasized in Hyman (2007, in press-b).

[43] Recall that moraic accent is compatible with accent being absent (Default: No) or with having multiple accents (Select: No). For example, Somali has Default (No) and Select (Yes).

[44] Matt Gordon (p.c.) points to Numic languages (a branch of Uto-Aztecan) which involve a binary 'stress' count with long vowels counting as two moras, with stress potentially falling on either half of the long vowel. The way out here can be to analyze the two moras as different syllables, although it is also relevant that we are here dealing with stress^{R} and not with stress^{A}.

[45] Tone-sensitive stress has been proposed for other cases as well. See among others van der Hulst and Smith (1988), van der Hulst (2011a) and de Lacy (2002).

[46] An issue for further research is whether words can have more than one moraic accent; that is, how Select and Default operate at the moraic level. Another important question is whether languages that allow unaccented words are always moraic.

[47] For a strictly tonal analysis see Blevins (1993).

[48] For a strictly tonal analysis see Inkelas and Zec (1988).

[49] See Gussenhoven (2004) for tonal analyses of such systems.

5.4. Lexical feet

There is one final issue that must be included here. A basic idea behind the theory presented in this article is that accent always precedes rhythm, an ordering that follows from the architecture of the grammar: what is specified as the utterance level follows what is specified in the grammar. I will discuss two challenges to that claim.[50]

5.4.1. Count systems

The following pattern is found in Creek in words that contain only light syllables (Haas, 1977; Martin and Johnson, 2002):

(49) In even-syllable words: primary accent final
In odd-syllable words: primary accent is prefinal

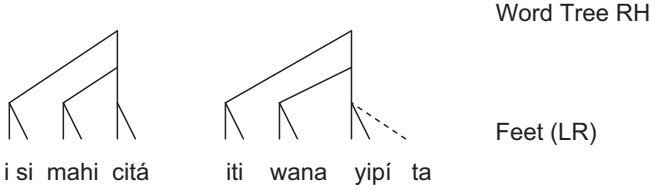
In words that contain heavy syllables, we need to locate the rightmost heavy syllable and then apply this procedure to the stretch of light syllables following this heavy syllable. Here I illustrate the case with words that have only light syllables:

(50) Creek accent

cokó	'house'
osána	'otter'
apataká	'pancake'
anocíta	'to love'
isimahicitá	'one to sight at one'
itiwanayipíta	'to tie each other'

In this type of system, accent appears to be right-edge bounded, but the location, while being rule-based, cannot be locally determined at that edge; to know where the accent is we must parse entire words into feet. In a standard metrical analysis, syllables are grouped into left-headed feet from left to right and feet are grouped into a right-headed word:

(51) Creek metrical structure



None of the bounded systems considered earlier require such an elaborate exhaustive procedure for accent location, which is one reason for why I adopted the practice to locate one bounded domain on the edge where primary stress falls. But in Creek we seem to crucially need a 'rhythm first' approach. However, as will be clear, only in systems like this, in which the edge at which footing starts differs from the edge location of the head foot (as is the case in Creek), we crucially must apply iterative footing first. In all other cases we can simply locate one foot-like domain, select the head and leave rhythm to the utterance level. It would seem that these 'count systems' provide a powerful argument for the standard metrical approach. But we should not forget the primary motivation for the accent-first approach which *explains* why primary 'stress' (=accent) is often dependent on lexical and morphological information, whereas rhythm never seems to be. And we also need to consider a host of other arguments that suggest a separation of accent and rhythm (see Goedemans and van der Hulst, in press).

How then can we explain count systems, if the accent first approach is maintained? There are several ways to go, but perhaps the most straightforward solution is to say that count systems are non-accentual in the sense that they lack an accent algorithm (which is not to say that this language could not have words with exceptional accent locations that need to be marked in the lexicon). Lacking accent, as has been argued in the preceding section, does not imply that there can be no rhythm, since it has been assumed here that rhythm is assigned in the utterance module. To deal with a count system, I have suggested in section 5.2 that in non-accentual, rhythmic languages, a rhythmic beat on the edge may be

[50] A challenge, not discussed here is the use of foot-structure for the expression of phonotactic constraints; see on this Bennett (2012).

more prominent than other beats within the word, but that this selection is dependent on factors that are playing out at the phrasal level, rather than the word level (cf. van der Hulst, 1997). This may lead to two possible relations between the direction of rhythm and the edge with greatest prominence. In languages such as Indonesian (which, in my view, is a stress^{R} language; see Goedemans and van Zanten, 2007) it would appear that the 'leading' beat (i.e. the beat that is assigned first, rhythm operating from right to left) rises to prominence, whereas in Creek it is the 'trailing' beat. In Creek, the realization of prominence is in the form of pitch on the tailing beat; the other beats do not correspond to phonetic cues (Haas, 1977; Martin and Johnson, 2002). To account for count system, then, it is *not* necessary to assume a system of lexical footing that feeds accent assignment.

5.4.2. Allomorphy selection based on foot structure

In this section we look at evidence for foot structure that apparently must be present in the lexicon. The idea that the lexical phonology must have access to some kind of '*foot*' *structure* is supported by cases in which allomorphic variation is due to a syllable-counting regularity which suggests foot structure beyond or independent of the domain needed for stress^{A} (see Gonzalez, 2008; Vaysman, 2009). In these cases the feet needed for the allomorphy do not necessarily account for rhythmic beats and thus are purely motivated to account for the allomorphic variation. This suggests that rhythm can be lexicalized or phonologized in terms of some kind of foot structure, which then can condition allomorphy, while the language has meanwhile developed a different post-grammatical surface rhythm. Gordon (2011) draws the same conclusion in his discussion of one of the cases that is discussed in Vaysman (2009). Instead of discussing an example from the works mentioned, let me briefly review a case that is closer to home (at least for me), the case of diminutive allomorphy in Dutch. For a general discussion (and reference to most of the preceding literature I refer to van der Hulst, 2008). One aspect of the allomorphy of this suffix concerns the presence of an extra schwa, making the suffix disyllabic. The bisyllabic (-/ətjə/ form is chosen if the final syllable contain a lax vowel followed by a sonorant consonant and carries stress^{A}; otherwise the form is monosyllabic (-/Cjə/, with the obstruent alternation between /t/, /p/ and /k/, depending on the final segment of the base):

(52) zɔ́n - ətjə 'sun, DIM' zon - tjə 'son, DIM'

The stress condition, however, can also be fulfilled by a secondary stress. Compare the following form:

(53) zɔ́n - ətjə 'sun, DIM'
bízɔ́n - tjə 'bison, DIM'
hɔ́rizɔ̀n - ətjə 'horizon, DIM'

In the form /bízɔn/ the second syllable has no prominence (even though it has a full vowel; this is where Dutch differs from English), but in the form / hɔ́rizɔ̀n/ there is a secondary 'stress' on the final syllable, which one is likely to see as stress^{R}. But this would imply that a case of allomorphy is dependent on rhythm and, given that the allomorphy alternation has limited lexical exceptions, this would suggest that the presence of the schwa is fixed lexically. This, then, would also be a case in which I would have to postulate a lexical mechanism, despite the fact that, in this example, the final syllable *does* end up with a stress^{R} as a result of post-grammatical rhythm.

A reviewer reminded me of the problem that allowing some kind of lexical foot structure apparently weakens my claim that rhythm follows accent. However, the substance of my claim, namely that perceptible rhythm cannot feed accent remains valid. The lexical mechanism that conditions allomorphy is *not* rhythm as it occurs in utterance structure, it is a phonologization of rhythm. In fact, it *would* be a problem if we did *not* find cases in which rhythm has been lexicalized since rhythm would then be unique in resisting phonologization. My critics could now reply by saying that it should then also be possible for accent assignment to be dependent on lexicalized foot structure which would offer us a standard metrical account of count systems. We need to examine count system more closely to establish whether the binary count that feeds into 'word prominence' is always surface rhythm (as suggested section 5.4.1) or can also be lexical footing. For the moment, it would seem that the only kind of structure that is relevant for accent is the bounded domain with its accent, which could be regarded as the lexicalization of a peripheral foot. Extending the spirit of ideas in Gordon (to appear) we might assume that bounded accent systems arise from the lexicalization of intonational properties which associate to peripheral syllables which are rhythmically strong.

6. Conclusions

In this article I have discussed the notions 'stress' and 'accent'. Having shown that 'stress' is many things, I have proposed to deconstruct this notion into a number of ingredients, each with their own terms, one of which was accent. I

then focused on this notion and developed what I see as a central part of the accentual module which I posit in the lexical phonology. My main conclusion is that accents are necessary devices in the analyses of many 'stress' languages in which there is an obligatory and culminative syllable that is said to have primary 'stress'. Conceptually, accents are clearly distinct from metrical structure and both, in turn, are distinct from phonetic properties that occur as correlates of these abstract notions. But since accents are abstract it is possible that they also function as anchors for other properties than metrical structure and stress. Arguing that there is no reason for demanding that accents must always be obligatory and culminative, I showed that typically obligatory and culminative accents qualify as a trigger for stress (via a dependency structure), because such accents can function as word heads. Cases where accent is not obligatory or culminative can be said to underlie a wide variety of alleged purely tonal languages, as long as these languages do not exceed a binary tonal contrast. The gain from analyzing not only stress^{A} languages but also 'tonal' languages as accentual is that shared properties such as culminativity (Select) or obligatoriness (Default) become non-accidental, as do various additional accentual 'effects' having to do with the power of affixation to change accentual properties of the base.

I have left open whether accentual 'tone' languages actually have tones at all (relegating the high pitch properties to the phonetic interpretation). But if they do (if there is evidence for tonal behavior) then they should be inserted on accents, rather than being directly lexically specified, a view that goes against the current mainstream (cf. Hyman, 2007). It could be said that when accents trigger the addition of a tone they *function as* 'empty tonal nodes', whereas they *function as* heads in stress^{A} languages.

Gussenhoven (2004) sees accent as an analytic device, suggesting that it is the 'invention' of the linguist, adopted in order to organize data, and that therefore it is not as 'real' as a H tone or 'stress', which we can 'hear'. But it seems to me that notions such as H tone, or metrical-dependency structures which underlie 'stress' are just as 'analytic'. The difference is perhaps that H correlates with phonetic properties more obviously (higher fundamental frequency), but then again 'H' can also correlate with other, e.g., phonatory properties.[51] Many if not all aspects of analyses are *analytic devices* and I do not see how we could do without them unless we give up doing phonology.

Acknowledgements

I wish to thank three anonymous reviewers, two of which served me with a second round of comments, for their excellent feedback on the first and second version of this (apparently controversial) article. In addition, I'm grateful to Matt Gordon, Haruo Kubozono, Beata Moskal and Anthi Revithiadou for helpful suggestions and corrections. As earlier version of this paper was presented at the International Symposium on Accent and Tone (ISAT 2010) held at the National Institute for Japanese Language and Linguistics (NINJAL) in Tokyo on December 19–20, 2010.

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[51] Lockwood (1983) analyzes phenomena which have no pitch correlate as 'tone', but it seems that his notion of 'tone' is in fact identical to my notion of 'accent' (in particular moraic accent).

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