PART VI
THEORETICAL EPILOGUE

18
A unified account of phonological and morphological accent

Harry van der Hulst

18.1 Introduction

My goal in this chapter is to lay out a unified theory of word prominence, which covers the role of phonological accent rules, while considering that such rules often apply within domains that are smaller than the whole grammatical word, being dependent on the morphosyntactic structure of words as well as on specific demands of affixes in forming such word-internal domains. The typological literature on word prominence usually classifies languages as having accent (typically called 'stress') on a syllable whose location is determined with reference to the left or right 'word' edge (possibly sensitive to syllable weight), implicitly assuming that the notion 'word' is the 'grammatical word', thus ignoring a possible role for smaller, *word-internal domains*. For many languages this may be the correct approach. However, we know that even in familiar languages, such as English, the domain for word stress is smaller than the grammatical word, as acknowledged in Chomsky and Halle (1968), where so-called level II affixes (Siegel 1984; Allen 1978) are excluded from the domain for the Main Stress Rule. It stands to reason that a focus on languages with highly complex morphologies will reveal that subword domains that are dependent on morphological structure have an important role to play with respect to phonological rules and processes, including those that account for prominence. In this chapter, I will make specific proposals with regard to the formation and role of domains (which I will call *accentual domains*) that are relevant for the determination of accents. Unlike the Metrical approach to word prominence, I do not adopt the view that accents are built on a layer of rhythm, captured in terms of foot structure. In my previous work on word prominence (going back to van der Hulst 1984; see additional references in Section 18.5 of this chapter), I have rejected the metrical model and replaced it by an approach that represents rhythm as 'secondary', i.e. as being assigned after word accents have been determined at the lexical level. Rhythm arises at a post-grammatical level, as part of phonetic implementation (see van der Hulst 2011). In this chapter, I

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will not discuss the assignment of rhythm (see van der Hulst 2014a for an extensive account), but I will locate the rhythmic module in the overall architecture of phonology more precisely in Section 18.4.

Interestingly, languages with 'long words' have played an important role in the development of the metrical theory of word stress. This is because this theory has focused on word-internal rhythmic patterns which need long sequences of syllables to unfold (hence 'long words'). Metrical theory has paid little attention to morphological structure, as Hayes (1995: 32) admits. As mentioned, in my approach, rhythmic patterns do *not* feed the assignment of word accents. Given that I delegate rhythm to a 'post-grammatical' level, it is actually not surprising that metrical theory has seen little need to consider morphological structure, given that this theory is foremost about rhythmic aspect of word prominence. If rhythm is a post-grammatical phenomenon, we would expect that grammatical structure has become invisible at this level. What is surprising is that for several of the polysynthetic languages discussed in this volume, the authors make explicit mention of the fact that there is in fact no detectable rhythmic structure (and thus no need for foot structure).

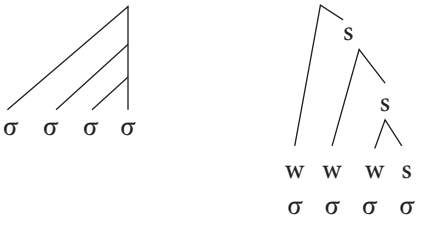
In my previous work, I have also made the point that the issue of *locating* loci of prominence must be distinguished from the phonetic realization that creates the perception of salience, taking the term 'stress' to refer to the realization of accent, and other sources such as syllable weight and rhythm (see Bogomolets and van der Hulst, this volume). In Section 18.2, I discuss the central notion of accent in detail, making various distinctions in the usage of this term that are adopted in this chapter. Section 18.3 proposes a formal account of so-called 'structure paradoxes' which involve discrepancies between the morphological structure of words and another structure, here called *phonotactic*, which I will take as relevant for accent determination in 'morphologically'-driven systems, although, as I will show, phonotactic structure also plays a role in phonologically driven accent systems when these have more than one accentual algorithm for different domains of the phonotactic structure. A key notion will be that the phonotactic structure is *headed*, which makes it a dependency structure of sorts. In Section 18.4, I briefly motivate making a distinction between two types of phonological structure, called phonotactic and prosodic. Section 18.5 outlines a formal theory of phonologically driven accent assignment, while Section 18.6 explains the notion of morphologically driven accent, i.e. systems in which lexically specified *diacritic* accents play a major part. This section concludes with a summary of the unified theory of word accent that I put forward in this chapter. Section 18.7 presents a series of brief case studies, among others of the languages that are covered in the other chapters in this volume, in an attempt to place all of these within the proposed framework. Section 18.8 offers a summary of the model developed in this chapter and some conclusions. The chapter concludes with two appendices that summarize the properties of the accentual systems that have been discussed in this chapter.

Finally, another note on terminology. I use the term *grammatical word* as standing for simplex and multimorphemic expressions that form the output of a *morphological (i.e. word formation) component*, which is distinct from the *syntactic component* that forms *grammatical phrases* (and sentences).[1] Both components are syntactic in the sense of forming hierarchical, recursive structures. The notions 'word' and 'phrase' are also often used in combinations such as 'phonological word' and 'phonological phrase', but I will avoid such usage and adopt a neutral terminology for phonological, specifically phonotactic domains.

18.2 Different kinds of accents

In this chapter, I identify the notion of domain accent with 'head of the domain'. I propose that the syllables that make up accentual domains are organized (in all languages) into a dependency structure that designates one syllable of the domain as the head of the domain. In more familiar parlance, a dependency structure (D-structure) is called a 'metrical structure'. A simple metrical structure for a string of four syllables in which the last syllable is the head can be represented as in (1a) or (1b):[2]

(1) a. b.



In (1a) the vertical line identifies the head of the domain. In this chapter, I will use both notations, depending on which one is more convenient in the examples that will be discussed, but they are fully equivalent.

In addition to the notion of domain accent, we also need accents as properties of syllables, which I call *syllabic accents*. Syllabic accents are *potential* domain accents and they have two sources. First, syllabic accents can be predictably based on phonological syllable 'weight'. If, in a language the location of the word accent is 'weight-sensitive' this means that certain syllables play a role in constructing the dependency structure that locates the domain accent. When syllabic accents

[1] I maintain this position, being aware of approaches that do not recognize the word/phrase distinction, which may seem very tempting when considering the kinds of languages that are central in this volume.

[2] In this chapter, I mostly use a constituent-based representation that is augmented with (the nostalgic) S/W labels to indicate headedness. Other notational systems have been proposed, as shown in (1). See van der Hulst (in prep.) for discussion and comparisons.

interfere with the assignment of a dependency structure that comprises the whole domain (as in 1), the domain accent can be pulled away from the 'edge' of the domain and fall on a syllable with a syllabic accent, but in the absence of an accented syllable, the domain head will be on a non-accented (i.e. light) syllable at the 'edge' of that domain. As discussed in detail in Section 18.5, when the domain contains more than one syllable with a syllabic accent, a *resolution procedure* that precedes D-structure formation, will designate one syllabic accent as the 'winner', which, then, is the one that determines the dependency structure. In Section 18.5, I will discuss this resolution procedure and also the fact that in the absence of any syllabic accent, a domain accent is determined by the D-structure, as shown in (1). In this section, I will account for the distinction between so-called bounded and unbounded accent systems. In the former, accent is assigned in an accent domain with reference to an *accentual window* that is located on the left or right side of the accentual domain (see Section 18.5).

Secondly, syllabic accents can also be 'diacritic', i.e. not based on phonological weight. For this reason, I will say that such syllables have 'diacritic weight'. I will assume here that diacritic syllabic accents behave with respect to the assignment of the dependency structure in precisely the same way as heavy syllables.[3] The defining difference between phonological weight and diacritic weight is that the former is inherently present in the phonological content of syllables which means that phonological weight is 'overt', whether it is considered by metrical structure or not. Diacritic weight, on the other hand, is devoid of content and as such 'covert'.[4] Non-weight-based syllabic accents are used to mark exceptions in languages that have an otherwise fairly regular phonological determination of the word accent. However, in languages that are said to have 'free stress', diacritic accents are the norm. Such languages, often called 'lexical accent systems', have accented and unaccented *morphemes*, with diacritic accent located on a specific syllable in the accented morphemes.[5] When words end up with more than one diacritic accent, as in true weight-based systems, a resolution procedure is required *before* a dependency structure can be assigned, and also in this case a procedure is required to locate the word accent in words that only contain unaccented morphemes.[6] Like

[3] I return to the question as to whether diacritic weight and phonological weight *always* count as equal in Section 18.5.

[4] See van der Hulst (to appear) for a discussion of proposals to derive diacritic weight from segmental content specifications, specifically laryngeal specifications. In such proposals, it remains the case that diacritic syllabic accents are intrinsically without content, due to the fact that the alleged laryngeal specifications do not have their usual phonetic correlates, but rather seem to involve the 'diacritic' usage of phonological means.

[5] In some cases, especially for root morphemes, this location could be predictable. Revithiadou (1999) claims that the diacritic accent location in morphemes can be such that the resulting word will conform to a certain set of what she calls 'prosodic templates'. I will not discuss this proposal here.

[6] However, as we will see, if a dependency structure is 'independently supplied' (by being derived from the morphological structure), resolution can be handled by rules that label nodes in this structure as heads ('strong') or dependents ('weak'); see Section 18.6.

true weight-based systems, lexical accent systems can be unbounded (in which case the whole word is the accentual domain) or bounded (in which the domain accent is determined within a two- or three-syllable window (see Bogomolets and van der Hulst, this volume)). In addition to being lexically specified, it is also possible that non-weight accents are assigned by morpholexical rules, i.e. a phonological rule that applies in a specific morphological context. This includes cases in which specific morphemes are pre- or post-accenting, which I account for in terms of morpholexical rules, which can also assign accents in specific morphological contexts, with reference to morphosyntactic features (see for example Roca 1999 on Spanish).[7] The question as to whether the accentual domain in unbounded systems always coincides with the whole grammatical word will be addressed in Section 18.4.1. We know for a fact that this is not the case when accent location is bounded, as we will see in Section 18.7.

In addition to syllabic accents, languages can also have *moraic accents*, which are marked 'inside the syllable rhyme' on either the head position in the rhyme or the dependent position. The term 'mora' is simply used here as a convenient label for those daughters of the syllable rhyme constituent that can bear an accent. A familiar example of a language with moraic accents that can occur on the head or dependent mora is Lithuanian; see Halle and Vergnaud (1987) and Blevins (1993). Mora accents do not directly interfere with the construction of the dependency structure that comprises the whole accentual domain, unless they function to make syllables heavy, in which case they project a syllabic accent in addition to having a moraic accent. Like syllabic accents, mora accents are lexical properties of specific syllables, or they can be assigned by morpholexical rules. I refer to van der Hulst (to appear) for examples and further discussion of the role that moraic accents play in so-called 'restricted' tone languages. What I call moraic accents are often analyzed as H tones, as in Blevins (1993) for Lithuanian and, for Serbo-Croatian, in Inkelas and Zec (1988).

It has long been observed (e.g. in Trubetzkoy 1939) that syllabic accents and moraic accents typically occur with different phonetic correlates. Syllabic accents which feed directly into dependency structure formation and can thus end up as word accents are typically expressed with 'stress' properties (extra duration, intensity, etc.). Moraic accents, on the other hand, usually correlate with high pitch, which in some accounts means that they are associated with an H tone or are directly represented as lexically specified H tones.[8] Such languages are often called pitch-accent languages, although not every language thus named necessarily has moraic accents. A predominant pitch correlate can also occur in a language that

[7] In this category also belong rules that assign diacritic accents following a certain prefix or preceding a certain suffix. Such post- or pre-accenting rules are part of the morphological operation that introduces these affixes, comparable to the rule that turns /k/ into /s/ before certain suffixes in English.

[8] Although a common view is that such H tones can be used to replace moraic accents, which are then not needed. See Hyman (2006, 2009) and van der Hulst (2011, to appear).

is otherwise just like a stress-accent language (with or without syllabic accents), as demonstrated by the case of Nubi (Gussenhoven 2006). I refer to van der Hulst (2011, to appear) for an extensive discussion of these distinctions.

Given the distinction between diacritic syllabic and moraic accents, the question arises of whether a language can make use of both. Arapaho (Bogomolets 2020, this volume; see Section 18.7.2.2) has diacritic syllabic accents, but it also has lexically specified falling tones that are independent of the accentual system. Elsewhere (van der Hulst 2011, to appear), I have proposed that lexical H tone specifications do not need to be used (in fact, should not be used) in the absence of a tonal contrast. I argue that such noncontrastive H tones must be specified in terms of moraic or syllabic diacritic accent. This means that in Arapaho we have to distinguish between syllabic diacritic accents, which are interpreted as stress, and moraic diacritic accents, which are interpreted as high pitch. The moraic analysis for Arapaho is confirmed by the fact the falling tone only occurs on some long vowels, which means that the moraic accent is then *on the first mora* of such long vowels.[9] In Arapaho (Bogomolets, this volume) we thus see a co-occurrence of syllabic accents and moraic. This would also seem to be the case in certain of the Circassian languages discussed in Gordon and Applebaum (this volume).

To be clear, let me state that languages that have domain accents do not have to have either syllabic (whether phonological or diacritic) or moraic accents. In some languages, 'word stress' is predictably located on a fixed syllable (being determined with or without reference to phonological weight),[10] without reported exceptions. For example, in Finnish or Hungarian stress is fixed on the first syllable. In such a language, dependency structure formation is not dependent on syllabic accents, whether phonological or diacritic. In some languages in this category, stress is reported to be weak or somewhat variable, which might lead to the conclusion that such languages do not have a word domain accent and that any apparent stress cues are the result of 'boundary cues', such as boundary tones that occur at a word edge, either in all words or only when those words occur in a certain phrasal position. Another source of the apparent word stress in such languages, when only perceptible in phrase-final words, is that we in fact are dealing with a phrasal prominence peak. Finally, the perceived prominence could be a 'rhythmic effect' of some kind, which is certainly possible if we separate the notion accent from rhythm.

However, I maintain that all words in all languages have a dependency organization, which technically means that they have a word domain head. This does

[9] We do not necessarily predict a contrast with a moraic accent on the second mora. The restriction of only the first, head mora being available for accent occurs in other languages, such as for example Tokyo Japanese.

[10] We must thus bear in mind that 'fixed' does not mean that the word accent also falls on the same syllable position, because when weight is involved the position of the accent can vary.

not necessarily mean that such heads have to be correlated with anything if the primary function of the dependency organization is cognitive in nature and as such demanded by cognitive principles that govern the mental representation of the internal structure of words. I will not explore this issue here; see van der Hulst (in prep.).

18.3 Levels, domains, and planes

In the preceding section I have distinguished between the sources of prominence and their phonetic correlates that make these sources perceptually salient. As discussed in Bogomolets and van der Hulst (this volume), several different sources of prominence can be distinguished, such as syllabic accents (whether marking phonological or diacritic weight), rhythm, syllable weight, and tonal specifications. With respect to these different sources, we have to acknowledge that they arise or become relevant at different levels of the derivation. Certain sources of prominence, specifically syllable weight and diacritic weight, are present in the lexical representations of morphemes and words. Diacritic weight is either lexically specified or results from morpholexical accent rules that apply in specific morphological environments. Phonological weight and diacritic weight feed the assignment of domain accents. This does not in itself tell us at which stage the accentual algorithms apply, although, when accent assignment is sensitive to diacritic accents, this entails that it is lexical, on the assumption that diacritic marking is not visible post-lexically. When the location of domain accents is only sensitive to phonological weight of syllables it can, but does not have to be, assigned lexically, either because there are exceptions that require lexical marking or because there is positive evidence for the accentual algorithm applying to a subdomain of the word, which implies that the term 'lexical' is not specific enough. As has been extensively argued and justified in the tradition of lexical phonology (Kiparsky 1982), following earlier work by Siegel (1974) and Allen (1978), phonological rules can be located at different levels *within* the lexicon, corresponding to different classes of word formation rules, and applying after each morphological rule within each level, creating the effect of cyclic rules application. In addition, certain rules apply post-cyclically, in principle after each cyclic block.[11]

There has been much discussion about the question as to whether these domains for lexical phonological rules are 'morphological' (or morphosyntactic)

[11] In work on English, post-cyclic rules were located after the so-called class I block of morphological rules. This post class I level, which was called the 'word level' in Chomsky and Halle (1968) is discussed in detail in Borowsky (1993). The term 'word level' is a misnomer because it precedes the attachment of Class II affixes (Siegel 1974, Allen 1978, Kiparsky 1982). Booij and Rubach (1987) refer to the relevant rules as 'post-cyclic', allowing for such rules to apply at more than one word-internal domain, each with its own 'cyclic' (i.e. morphological) structure.

or 'phonological' domains that are derived from the morphological structure according to a mapping system.[12] It could be that both types of domains are in principle available for phonological algorithms (even at the same time, as argued in Booij 1983). In that case, different diagnostic properties, such as greater or lesser sensitivity to non-phonological information, such as morpheme classes, word classes, and even the specific identity of individual morphemes, would reveal which type of domain is most suitable for a given phonological rule. As mentioned, I assume that pre- and post-accenting rules are morpholexical rules that are associated with specific morphemes, which means that they apply with reference to the morphosyntactic structure.

The idea that at least some phonological rules require phonological domains that are distinct from morphosyntactic domains was championed by Selkirk (1978) and Nespor and Vogel (1986). This approach was called the *indirect syntax* (or *indirect reference*) approach because the rules in question would not refer to morphosyntactic structure directly. Opposed to this view was and is the *direct syntax* (or *direct reference*) approach, which holds that no rules require reference to domains other than morphosyntactic domains (see Kaisse 1985; Seidl 2001).[13]

Most theories that postulate a phonological structure that is distinct from the morphosyntactic structure assume that there is one unique phonological structure that serves all phonological rules. As argued in van der Hulst (2009), we likely have to acknowledge not one, but two phonological structures. In this, I follow Rischel (1983, 1987), who distinguishes between what he calls 'deep phonology' and 'surface phonology', both hierarchical in nature.[14] While the deep phonology closely mirrors the syntactic structure (albeit not without deviations), the surface phonology is much more autonomous, being foremost guided by word and phrasal stresses and rhythmic principles. As shown in Lahiri and Plank (2010, 2022) the recognition of such a surface phonological level of hierarchical representation has a long tradition, going back to much work in the nineteenth century by British and German linguists. The so-called 'Abercrombian foot', which groups syllables with primary word stress and subsequent syllables up to the next primary word stress,

[12] See Scheer (2010, 2022) for an extensive, historical account of the interaction between phonology and morphosyntactic structure and the possible mediation of some kind of phonological structure, often called prosodic structure.

[13] A potential problem is that morphosyntactic domains are highly theory-dependent, which allows for specific theories to postulate intermediate or adjusted morphosyntactic domains that 'happen' to work well for the phonology.

[14] Whether one or two phonological structures are postulated, the question comes up what kind of structure is required. Since Selkirk (1978) it has been claimed that the phonological structure is hierarchical, albeit displaying a different kind of hierarchy than what we see in morphosyntax. The phonological hierarchy that Selkirk and others after her envisaged had a *strict layering* and, relatedly, shows no evidence for recursion. Since then, there has been much discussion about the nature of the phonological structure. A denial of recursion is a common theme (but see van der Hulst 2010a), but some even deny any hierarchical structure whatsoever, claiming that phonological organization is strictly linear (see van der Koot and Neeleman 2016). I will not enter into this discussion here, but see den Dikken and van der Hulst (2020).

forms a pivotal unit in this surface hierarchy.[15] Plank and Lahiri show that the surface phonological structure, and in particular the Abercrombian foot, provides explanations for diachronic processes in Germanic languages. In the Selkirkian model, only one level of phonological structure was recognized. It would seem that this structure with its strict-layer organization conflated the driving forces of syntax *and* rhythm.[16] Interestingly, Liberman (1975) and Liberman and Prince (1977) envisaged a different kind of phonological structure which was in fact a copy of the morphosyntactic structure, but with its nodes provided with S/W labels, an approach adopted in Ladd (2008), which is similar to Rischel's deep phonology.[17] By adopting a second structure, the metrical grid, projected from the tree structure, but then subject to rules that reflect rhythmic properties of words and phrases, they actually came quite close to recognizing *two* phonological structures, somewhat comparable to those proposed by Rischel.[18] Unfortunately, further developments in metrical theory aimed at eliminating having *two* structures, with some going for the grid as the only structure (Prince 1983), while others put all their money on the tree structures (Kiparsky 1979), allowing rhythmic adjustments by formulating arboreal transformations. This approach was further developed in Giegerich (1985), who starts out with a 'metrically interpreted' syntactic structure which is then changed into a surface rhythmic structure by means of metrical transformations.[19]

In van der Hulst (2009) and here, I accept Rischel's model and refer to deep phonological structure as *phonotactic structure*, while I reserve the term *prosodic structure* for the surface phonology. It is important to keep in mind that the surface prosodic structure is not copied from the phonotactic structure. Rather, its organization is foremost driven by rhythmic principles that take into account the primary stresses of words in the utterance.[20]

[15] Various authors who recognize the need for two phonological organizations refer to the so-called 'Abercrombian foot', recognized by the phonetician Abercrombie (e.g. Abercrombie 1967) as a characteristic part of the surface phonological structure; see Anderson and Ewen (1987) and Fudge (1999). Clearly, these Abercrombian feet are quite different from the metrical feet proposed by Liberman and Prince (1977) which encode rhythmic beats in between word accents that only appear to be confined to word boundaries when words are treated as complete utterances.

[16] In Selkirk (2011) the driving forces of syntax are captured by constraints that demand the phonological structure to be faithful to the syntactic structure, while markedness constraints capture the rhythmic forces, which, if higher ranked than the faithfulness constraints can enforce phonological structure to deviate from the syntactic structure.

[17] This is what Zubizarreta and Vergnaud (2005) call a 'metrically interpreted' structure.

[18] The question whether the surface prosodic structure is a 'grid-only' structure or has some kind of constituent structure is indeed an independent issue. Neeleman and van der Koot (2006) argue that the Selkirkian phonological structure is not a constituent structure, but it would seem that their arguments regard the notion of a surface prosodic structure and not the deep phonology, which I call the phonotactic structure.

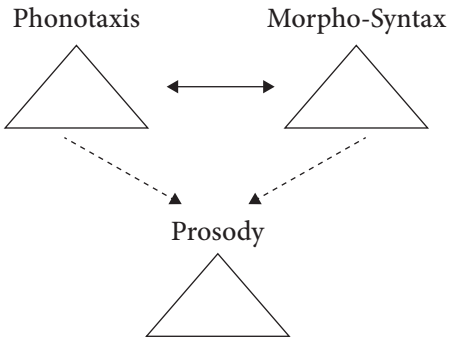
[19] See Kager and Zonneveld (1999) for an excellent historical review of different views in Generative Phonology on 'prosodic structure'.

[20] As discussed in Lahiri and Plank (2022) the surface, prosodic structure, while largely following its own autonomous principles, can reflect syntactic structure in more formal styles of speaking.

The module that is responsible for building the prosodic structure could be the so-called *phonetic implementation system*, which is also responsible for all automatic segmental processes (and thus not only for those that are universal), as proposed in Pierrehumbert (1980). Following Liberman and Pierrehumbert (1984), van der Hulst (2011), and Liberman (2017), I will in fact assume that *all* automatic processes, including all processes that have been called 'allophonic' can be grouped under implementation. Given the proposal to separate 'primary stress' from rhythm, with the latter following the former (rather than the opposite route, which Metrical Phonology pursues), we could then locate the assignment of rhythm in this implementation model. Acknowledging that some languages do not have phonetic correlates of domain accents, it is possible that the perception of syllables as being rhythmically strong, and even some stronger than others, is entirely due to the prosodic level.

In summary, when considering where to locate phonological rules or processes, including those that account for word prominence patterns, we need to consider at least three available hierarchical organizations:

(2)



It has long been recognized that linguistic expressions have (hierarchical) representations in two planes, giving rise to the property of duality of patterning (Hockett 1960), also called *double articulation* (Martinet 1960).[21] The structures in each plane are subject to their own constraints and as such not (necessarily) isomorphic, although mutual influence can be observed, mostly going from syntax to phonosyntax. Given the distinction made here between two levels of phonological structure, we have to conclude that duality of patterning is not enough: we need to recognize three dimensions.[22]

[21] See Ladd (2014) for an in-depth discussion of this notion, showing that Hockett's and Martinet's views were not the same, a point also discussed in van der Hulst (2009).

[22] The three-way distinction does not necessarily exhaust the structures that prominence rules (or phonological rules in general) can refer to. For example, one could distinguish different levels of morphosyntactic structure, as in the original version of generative grammar, a deep structure and a surface structure (not to mention intermediate levels). In such an approach the phonotactic structure could

In this chapter, I will focus on the role of the phonotactic structure for rules that account for word prominence, specifically domain accents. I will assume that the morphological structure is only phonologically relevant for the application of morpholexical rules, i.e. rules that are associated with specific morphemes, such as pre-accenting or post-accenting rules or segmental rules such as the k/s rule that is associated with suffixes like *-ity* and *-ism* in English. Rules that account for domain accents refer to the phonotactic structure, while rhythm is delegated to the prosodic level.[23]

In the next section, I will argue that specific demands of affixes may cause the phonotactic structure to deviate from the morphosyntactic structure. I will also address the issue that linguistic simplex (monomorphemic) words that lack morphosyntactic structure in my view have an internal phonotactic structure, which, as I will suggest, is due to the syllabic organization (that displays recursivity) and D-formation.

18.4 Phonotactic structure

Following Liberman (1975) and Rischel (1978), I take the basic organization of the phonotactic structure (which runs from the lowest level of features up to the entire sentence) to be largely isomorphic to the morphosyntactic structure *above the level of simplex words*, albeit stripped of all morphosyntactic labels and provided with S/W labeling. However, in some cases a mismatch between the phonotactic structure and the morphosyntactic structure occurs. Above the grammatical word, mismatches result from the phonotactic grouping of grammatical words, including so-called clitics (see Zubizarreta and Vergnaud 2005). I will not discuss this here. I will instead focus on structural mismatches below the level of the grammatical word.

18.4.1 Mismatches between phonotactic and morphosyntactic structure

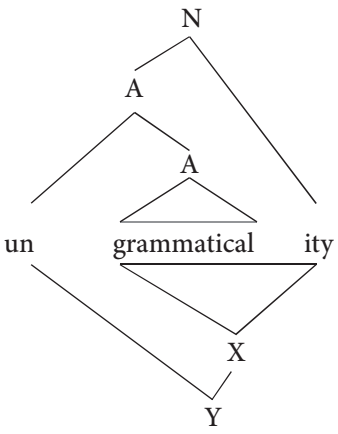
In this section, I will briefly discuss what is perhaps the clearest case in which phonotactic structure diverges from the morphological (or morphosyntactic)

be regarded as reflecting either the initial syntactic structure or a structure that results from transformations. In this chapter, I will take a 'simple' view of morphosyntactic structure that only allows a single level, which is of the kind advocated in the 'simple syntax' approach of Culicover and Jackendoff (2005).

[23] Rules that are analogous to morpholexical rules but applying at the phrasal level are less common, but occur, as documented in Hayes (1990). These rules and the more common morpholexical rules belong to the *grammatical phonology* which is opposed to the *post-grammatical, implementational phonology*; see van der Hulst (2011). Both types of phonology include the rules/constraints that account for the wellformedness of the hierarchical structure at each level.

structure. Consider the following well-known case which presents what has been called a 'structure paradox' or 'bracketing paradox':

(3)



The morphological structure undeniably has the suffix *-ity* as the outer layer because the prefix *un-* that attaches to adjectives (and only exceptionally to nouns), has to be attached first. Nevertheless, it would seem that there is 'some other structure' that groups *grammatical* together with *-ity*, *un-* being external to that combination. This second structure has been deemed 'phonological' in nature. Some phonologists use the term 'PStem' and 'PWord', for X and Y, respectively. Kaye (1995) refers to X as a non-analytic (or synthetic) domain and Y as an analytic domain, while Inkelas (1990) uses the neutral labels α-domain and β-domain, which I will here adopt.[24] Whatever the labeling, since I will assume that this structure is phonotactic, we then have to ask why this structure diverges from the morphosyntactic structure. Although this warrants a longer discussion (see van der Hulst, in prep.) I will simply say that the phonotactic structure deviates from the morphological structure due to the fact that affixes do not only have a *syntactic insertion frame*, but also a *phonotactic insertion frame*. So-called integrating affixes form an α-domain with their base, while non-integrating affixes form a β-domain ('X' stands for α or β):

(4)

	Non-integrating	integrating
prefix	$[\ \text{-}\ \text{X}]_{\beta}$	$[\ \text{-}\ \text{X}\ ]_{\alpha}$
suffix	$[\text{X}\ \text{-}\ ]_{\beta}$	$[\text{X}\ \text{-}\ ]_{\alpha}$

[24] Labels such as 'phonological *word*' and 'phonological *phrase*' are biased toward languages that do not have very long words, where as a result there is a high degree of isomorphism between 'words' and 'phrases' in the morphosyntactic and the phonological structure. However, when we consider polysynthetic languages such isomorphism is often lacking, which makes the use of terms like 'word' and 'phrase' in the phonological structure completely unmotivated.

Additionally, I will assume that morphological roots form a minimal α-domain.[25]

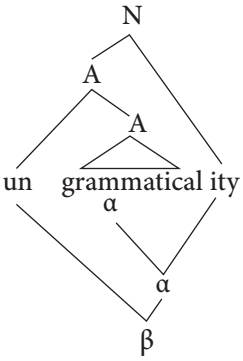
To account for the fact that integrating affixes tend to occur inside non-integrating affixes, I adopt the following constraint which penalizes the occurrence of a β-domain inside a α-domain:

(5) * α
|
β

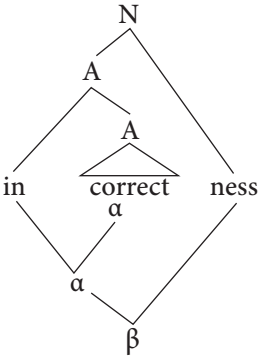
Since Aronoff (1976) and Sproat (1985) we know that this constraint can be violated, but I will not discuss this matter here.

The fact that affixes are associated with two frames gives rise to two different structures for complex words that contain them:[26]

(6) a.



b.



It would thus seem that the phonotactic 'behavior' is *a lexical property of individual affixes*.[27] This confirms that structures are phonotactic and not prosodic.

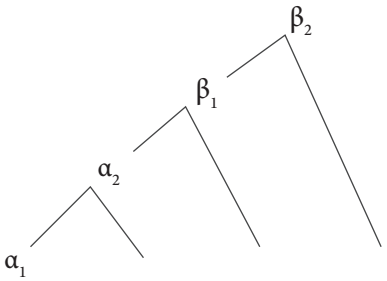
[25] In the spirit of using Greek letters to label domains, I will also use ρ and γ to label a phonotactic 'root domain' and a phonotactic phrasal domain in the case studies in Section 18.7.

[26] The question arises whether so-called heavy affixes form an α-domain on their own. I will not address this issue here.

[27] This is essentially also the position taken in Halle and Vergnaud (1987).

Given that multiple affixes can be attached at each level, the resulting phonotactic organization will have a recursive structure, with multiple α-domains included in each other and the same for β-domains:[28]

(7)



Rules that apply within the domain type for which they are specified can be said to apply cyclically within that domain. This raises the question whether rules can be marked as cyclic or non-cyclic (or post-cyclic). Cyclic rules have access to the recursive structure of phonotactic domains, whereas post-cyclic can apply only at the largest recursive instance of each domain type. Here I will assume that so-called post-cyclic rules are in fact phonetic implementation rules and that each maximal domain is shipped to this module for phonetic implementation. Maximal domains can be regarded as 'phases' in that sense; see Revithiadou and Spyropoulos (2016). For English, post-cyclic processes that apply at the α-domain include the deletion of /n/ in words like *column*, which appears in *columnar*, syllabic /l/ and /r/ in *cycling*, but not in *cyclic*, but also, and this is the interesting part, processes that are clearly allophonic, which confirm the implementational nature of post-cyclic processes. An example is reported in Harris (1987). In Belfast English the /d/ in *spider* is subject to an allophonic dental variant due to the follow rhotic sound, but the /d/ in *wider* is alveolar, which suggests that the domain of this process excludes the comparative ending in *wider*. In my terminology this rule applies at the post-cyclic α-domain.

However, cyclic rules, especially those that apply at the α-domain, can *look like* post-cyclic ones when they apparently only apply to the maximal domain at a given level. For example, the evidence for cyclic application of accent rules at the α-level in English is weak. Cyclic application of accent rules in principle produces 'cyclic accents', i.e. prominence peaks on syllables of embedded constructions. It has been claimed for English that such prominence peaks occur in words like *condènsátion* (which has an embedded accent on [condéns]), as

[28] Downing and Kadenge (2020) convincingly argue against the use of word recursion, trying to avoid the notion of PStem. There is a lot of work that reports on the phonological distinction between PStem and PWord. In by far the majority of cases, prefixes fall outside the PStem even when their morphological status is being closer to the 'root' than the suffixes.

opposed to *compensation*, which has the 'regular' secondary accent on the first syllable. The cyclic accents are manifested in the resistance to vowel reduction on the second syllable of *condensation*, although reduction *is* possible. Acknowledging the relevance of phonotactic domains for accent assignment opens the door to cyclic accent assignment, because both phonotactic domains can have a recursive structure when more than one affix is involved, but it would seem that once complex words are lexicalized, the accent rules only apply at the 'maximal' α-domain. We could formally account for this by assuming that lexicalization bleaches the internal α-domains, turning the complex word, in Kaye's (1995) terminology, into a non-analytic domain.

A diagnostic that can be used to differentiate between cyclic and post-cyclic (implementation) processes is that only the former can be sensitive to diacritic lexical and morpheme-specific information. Post-cyclic rules are blind to such information and can therefore have the appearance of automatic, even allophonic, processes.

To conclude this section, we can ask whether there are reasons for why suffixes, rather than prefixes, integrate with the root, even though exceptions to this generalization occur.[29] I think there are three conspiring factors that play a role here.

Firstly, the integrating behavior of suffixes seems to be favored by the fact that integrating suffixes tend to start with a vowel which triggers syllabification of the stem-final consonants and the suffix vowel, thus leading to phonotactic integration (van Oostendorp 1995). Even though not every stem necessarily ends in a consonant, in the majority of cases it does, and when a root is vowel-final, that final vowel typically deletes (English: *piano* ~ *pian-ist*) or triggers insertion of a consonant. It is thus significant that non-integrating suffixes like *-hood, -ful*, and *-ness* start with a consonant. Prefixes could potentially trigger syllabification with the stem if they are consonant-final (like the prefix *dis-*) and the stem is vowel initial (*dis-information*), but with consonant-initial stems they are syllabically independent, a property which is then generalized to all cases.

Secondly, as shown by Rice (this volume), roots, due to their semantic centrality in complex words, in many languages have primary 'stress' which feeds into a 'trochaic' grouping of these roots and following unstressed suffixes, trochaic grouping being perhaps the most natural organization in languages, which as such is also manifested at the prosodic level.

Thirdly, unlike suffixes, prefixes, like roots, can occur in word-initial position (especially when prefixation is obligatory), which suffixes, by definition, never do. This distributional property is shared by prefixes and stems. Assuming that

[29] Axininca Campa (Downing 2006) illustrates the mirror-image pattern: the prefixes plus root form a domain for phonological processes which excludes the 'less cohering' suffixes; The same pattern is observed in Nivkh; see Mattissen (this volume).

roots can initiate or even be phonotactic words (when they occur by themselves), the property of being an independent phonotactic unit (and indeed often like a phonotactic word) is transferred to prefixes which, on their left side, already behave like phonotactic words.

18.4.2 The internal structure of the smallest α-domain

As argued in the preceding section, the phonotactic structure of accentual domains results from copying the morphological structure, modulo the phonotactic demands of affixes. Simplex words, which I assume form an α-domain that is included in an isomorphic β-domain, have an internal phonotactic structure, but this structure obviously cannot be a copy of any other structure. I assume that the internal phonotactic structure of the smallest α-domain results from D-formation, which groups the syllables within such a domain into a binary structure. The syllables themselves also display a phonotactic structure that is dictated by the syllable constraints of the language. It has been argued that syllables sometimes need to be organized into feet, i.e., in between the syllable structure and the binary dependency structure that comprise the whole word. One motivation for feet is to account for rhythmic prominence, but it is important to see that it is not necessary to appeal to feet here, because rhythm is not part of the phonotactic structure in the approach proposed here. I refer to van der Hulst (2014a) for a footless account of rhythmic patterns, which, in the model proposed here, arise at the prosodic level. However, it has been argued that in some languages a foot-like grouping of syllables is required to account for allomorphic alternations. In this case, I assume that the alleged feet are in fact instances of *recursive syllable structure*. I refer to van der Hulst (2010a, 2012) for the notion of recursive syllable structure and examples of 'foot'-dependent allomorphy.

18.5 Phonologically driven word accent

In van der Hulst (1999, 2012), I developed a theory of 'word accentuation' for bounded and unbounded stress-accent systems, which I will here summarize (in a slightly modified form). This theory is based on the claim that word accent and rhythm form different modules of the phonology, rather than being conflated in one formalism as in Metrical Phonology (Liberman & Prince 1977). Many arguments for the separation of accent rhythm, as well as precedents of this view, are given in van der Hulst (1984, 1996, 1997, 2009, 2012, 2014a, b, in prep.) and in Goedemans and van der Hulst (2014). The accent module contains two crucial components: resolution and the assignment of a dependency structure (which accounts for the default accent location). As mentioned, I will not discuss the

assignment of rhythm in this chapter (see van der Hulst 2014a), which I locate in the implementation module of the grammar.[30]

Resolution refers to the selection of a syllabic accent from a number of 'competitors' for the domain accent. In a weight-sensitive stress-accent language, competition between syllabic accents can arise due to the occurrence of multiple heavy syllables and/or diacritic accents. Taking a bounded, weight-sensitive, right-edge system as an example, my way of determining the domain accent involves three steps. Firstly, heavy syllables (given in bold) project what I call a *variable accent* (notated as '(x)'). Secondly, I capture resolution in terms of setting a *licensing parameter* (with the values 'left' and 'right').[31] A variable accent that is licensed becomes the 'winning accent', i.e. the domain accent; the other accents become 'invisible', and can therefore not have any phonetic cues.[32] The third step constructs a left- or right-headed dependency structure (D-construction), which (by default) will designate a syllable as the domain head in case the domain contains no syllables with a syllabic accent. In bounded systems, these three steps are preceded by the formation of a two- or three-syllable *accentual window* (indicated with parentheses):

(8) Right-edge weight-sensitive system with stress on the rightmost heavy syllable

i. projection of variable accents

(x)	(x)	(x)(x)	
a. (**σ** σ)]	b. (σ **σ**)]	c. (**σ** **σ**)]	d. (σ σ)]

ii. Licensing of rightmost variable accent

x	x	x	
a. (**σ** σ)]	b. (σ **σ**)]	c. (**σ** **σ**)]	d. (σ σ)]

iii. Construction of dependency structure

x	x	x	
a. (**σ** σ)]	b. (σ **σ**)]	c. (**σ** **σ**)]	d. (σ σ)]

Licensing accounts for the property of *culminativity*: there can only be one winner. This leaves us with the fourth column, where there is no heavy syllable in the accentual window. This case requires a 'default clause'. While in van der Hulst (2012) 'default' simply inserts a syllabic accent on the left or right edge in the window (which is then automatically the winner), I propose here that the culminativity of stress-accent systems is the result of a parameter setting which determines

[30] A possible refinement of the separation approach is suggested at the end of Section 18.7.1.5.

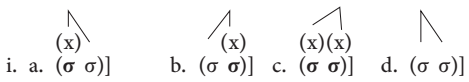
[31] There is a formal analogy here with my work on vowel harmony, where I use the notion of variable specification for harmonic elements and licensing to account for whether or not a variable element is phonetically realized; see van der Hulst (2018). The kind of licensing that is invoked here can be called linear licensing. In Section 18.6 I will introduce a notion of hierarchical licensing, which selects the winner with reference to the headed, hierarchical phonotactic structure.

[32] In Section 18.7.2.2 I will discuss whether this is always true and what to do if 'losers' show up with phonetic exponents.

the constructing of a *dependency structure* (D-structure) that groups all syllables (first in the accent window, and eventually in the whole relevant domain) into a single word structure. A dependency structure is just like a 'metrical structure'. The idea of invoking dependency structures in phonological representation originates in *Dependency Phonology* (Anderson and Jones (1974); see Anderson and Ewen (1987) for a full exposition of this theory). Dependency structures (or metrical structures) account for the fact that the relevant domain has a unique head, or what Liberman and Prince (1977) call a 'designated terminal element' (DTE). In the present proposal, the presence of a dependency structure is responsible for the property of *obligatoriness*.[33]

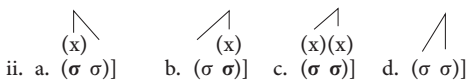
I have shown in previous work that the setting of the licensing parameter and the D-construction parameter are independent, thus allowing four different systems, which I give in (9), with all three steps conflated for reasons of space, thus leaving the variable accents as '(x)', even those that are licensed[34]:

(9) Right-edge weight-sensitive systems[35]



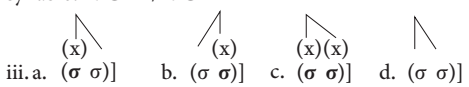
i. a. (**σ** σ)] b. (σ **σ**)] c. (**σ** **σ**)] d. (σ σ)]

e.g. Epena Pedee: stress the rightmost (last) heavy syllable, otherwise the leftmost (first) syllable (i.e. if there is no heavy syllable): R/L[36]



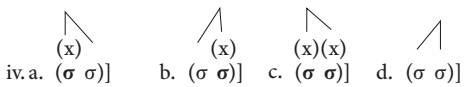
ii. a. (**σ** σ)] b. (σ **σ**)] c. (**σ** **σ**)] d. (σ σ)]

e.g. Yapese: stress the rightmost (last) heavy syllable, otherwise the rightmost (last) syllable: RIGHT/RIGHT



iii. a. (**σ** σ)] b. (σ **σ**)] c. (**σ** **σ**)] d. (σ σ)]

e.g. Sunda: stress the leftmost (first) heavy syllable, otherwise the leftmost (first) syllable: LEFT/LEFT[37]



iv. a. (**σ** σ)] b. (σ **σ**)] c. (**σ** **σ**)] d. (σ σ)]

e.g. Aklan: stress the leftmost (first) heavy syllable, otherwise the rightmost (last) syllable: L/R

In a bounded system, the accentual module operates within a *two-syllable window*, either on the right edge of the word (as in (8) and (9)), or on the left edge of the

[33] A dependency structure looks like a binary branching tree structure, although, strictly speaking, a dependency approach does not involve constituent structure. I will ignore this point here.

[34] References for the languages cited are given in van der Hulst (1999).

[35] I here adopt 'Right/Left' as the label for this system, instead of 'Last/First', although the latter label has also been used, especially for unbounded systems.

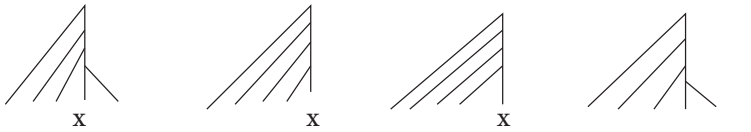
[36] Hayes (1995: 179–188) reports this kind of system for Awadhi and Sarangani Mamobo.

word (not shown here), modulo 'extrametricality', which pushes the window one syllable in.[37]

The same procedure applies to weight-sensitive bounded systems at the left edge, which display the same four types (van der Hulst 1999, 2012). In weight-insensitive, bounded systems, the word head is located in term of D-formation, with the possible interference of diacritic lexical accent for exceptions.

The branching unit that comprises the syllables in the bisyllabic window is not a 'foot', in the sense of Metrical Phonology. There is in fact no foot typology that would cover the four options in (9). I refer to van der Hulst (1999, 2012, in prep.) for further motivation of this point. The bisyllabic D-structure is incorporated into a dependency structure that comprises the whole word. This structure takes the head of the bisyllabic accentual domain as the ultimate head of the whole word structure, which can then be interpreted as being prominent due to certain phonetic cues:

(10)



a. [σ σ σ (σ σ)] b. [σ σ σ (σ σ)] c. [σ σ σ (σ σ)] d. [σ σ σ (σ σ)]

e.g. Epena Pedee: stress the rightmost heavy syllable, otherwise the leftmost (first) syllable (i.e. if there is no heavy syllable)

In line with the separation of word accent and rhythm, this dependency structure does not account for rhythmic patterns in terms of a sequence of feet. Rhythm is assigned 'later' and does not in fact require foot structure (see van der Hulst (2014a) for an extensive account of attested rhythmic patterns).[38]

The procedure just outlined also applies to cases in which 'stress' is not weight-sensitive. In that case, the bisyllabic 'window' is only subject to D-formation. However, in such systems, the default head orientation of D-formation can be overruled when syllables are marked as exceptions, which in my model means that they have a diacritic variable syllabic accent. In such a system it is unlikely that the accent window will contain more than one diacritic accent, but that situation might arise when the window comprises a stem-final syllable and a suffix syllable, both with a diacritic accent, in which case resolution is required, through licensing of one of the variable accents. Recall that we must also take into consideration

[37] Extrametricality can also apply at the level of syllable structure when a final consonant is not syllabified, which turns a potentially heavy syllable into a light one. Syllable extrametricality can be external or internal; see van der Hulst and Rosenthal (1999). In van der Hulst (2011, in prep.).

[38] As mentioned above, whenever it appears that 'foot' structure has to be present lexically or 'early' in the phonology, I regard this structure as a recursive extension of syllable structure. See van der Hulst (2010a, to appear).

the fact that syllabic accents can be rule-governed when specific morphological categories are always accented, or when a complex word contain pre- or post-accenting affixes.[39] The occurrence of multiple diacritic accents can easily arise in so-called lexical accent systems, which are typically unbounded systems in the sense that the accentual window comprises the whole word.

Diacritic syllabic accents can also co-occur with syllabic accents that are due to phonological weight. I am assuming that both types of accent are treated alike by the accentual algorithm. This predicts that in a system as in (8), a diacritic accent to the left of a heavy syllable could not 'overrule' the latter, which means that the exceptional pattern of penultimate 'stress' when the word ends in a heavy syllable is impossible. This empirical prediction could turn out to face counterexamples, which, then, would imply that diacritic weight can outrank phonological weight, either universally or in specific systems. The potential need for 'weight scales' that mix both types of weight are motivated in Vaxman (2016, 2019). Independent need for weight scales could also come from languages which have a greater than binary distinction in phonological weight; this has been analyzed with a 'weight scale' (e.g. Pirahã, Everett 1988; Crowhurst and Michaels 1995). When weight scales are relevant, I will assume that resolution is fed by a subroutine that creates a syllable weight tier with only the heaviest syllables. I refer to Vaxman (2016, 2019) for analyses of such cases adopting this approach.

Turning to unbounded systems, it is well-known that there are four types of unbounded, weight-sensitive stress systems:[40]

(11) Four types of weight-sensitive unbounded systems[41]
   a. RIGHT/LEFT: Stress the rightmost (last) heavy, or else the leftmost (first) light syllable; e.g. Sikaritai
   b. RIGHT/RIGHT: Stress the rightmost (last) heavy, or else the rightmost (last) light syllable; e.g. Puluwatese
   c. LEFT/LEFT: Stress the leftmost (first) heavy, or else the leftmost (first) light syllable; e.g. Amele
   d. LEFT/RIGHT: Stress the leftmost (first) heavy, or else the rightmost (last) light syllable; e.g. Tahitian

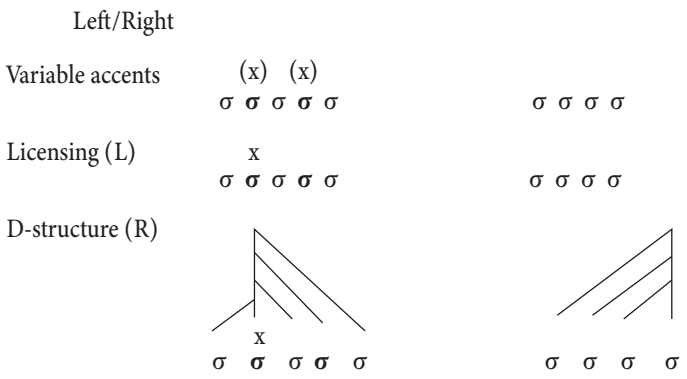
[39] This is clearly demonstrated in Roca's (1999) analysis of stress in Spanish. In this language, stress occurs within a three-syllable window on the right side of the word. In underived words, the location of stress is largely unpredictable, but in inflectional paradigms, certain morphological categories predictably occur with an accent.

[40] Again, note that I do not use a 'Last/First' (L/F) system to label an unbounded system, which is more common, to be consistent with the labeling of bounded types. The two practices can lead to considerable confusion, given that Amele in my labeling is L/L (LEFT/LEFT), which can be confused with the other labeling, which would be Last/Last for Puluwatese. I will here use the LEFT/RIGHT terminology.

[41] From a functional point of view, unbounded systems are curious because the location of accents provides no information about word edges, thus lacking a demarcative function. It must be concluded that in systems of this sort the 'greed' of heavy syllables in catching the word accent has overtaken the

All four patterns are attested in the languages of the world (see Hayes (1995); van der Hulst (1999)). As is clear from the verbal statements, these four types are exactly the same as the four types for bounded systems in (9). In van der Hulst (1999, 2012, in prep.), I therefore propose the same analysis for both unbounded and bounded systems, the difference being that the size of the accentual window comprises the whole accentual domain in unbounded systems (modulo extrametricality). Unbounded systems can thus be formally analyzed in the same way as I analyzed the four right-edge bounded systems. Heavy syllables are represented as variable accents, licensing recognizes the left- or rightmost variable accent as the word accent and all words are subject to the formation of a left- or right-headed dependency structure. Recall that the four-way distinction is possible because both licensing setting and the D-formation setting can be chosen independently. I illustrate this in (12) for a left/right system, with the same three steps:[42,43]

(12)



Weight-insensitive, unbounded systems would only display D-formation (with the possible interference of diacritic lexical accents). In fact, such systems are only identifiable as unbounded by exceptional locations that clearly lie outside the domain of a bounded window. In van der Hulst (1999, 2012), Turkish is identified as an example of this kind. As argued in Özçelik (this volume), the manifestation of diacritic accents is 'stress', while the default final position owes its prominence to

edge-based preference of bounded systems. In essence, demarcation is due to the accentual window being bounded. This kind of conflict is expressed in terms of the ranking of constraints in Optimality Theory (Prince and Smolensky 1993 [2004]). The present chapter follows a parametric approach to language variation. My reasons for not adopting OT have been provided elsewhere (van der Hulst 2011).

[42] The adjunction of the first syllable immediately preceding the head is not motivated here, but it could reflect a general principle that favours right-adjunction.

[43] We find that in unbounded systems, the D-formation parameter may require its domain to be bounded (see Vaxman's 2016 analysis of Witsuwit'en). This raises the possibility that default D-formation always applies first in a bounded domain before it groups all syllables in accentual domain into a dependency structure. I refer to van der Hulst (in prep.) for further discussion.

the association of a boundary tone. This is why the default head location is not represented in terms of an accent mark because this would trigger the same phonetic prominence exponent for both the accent location and final prominence.

In the cases discussed thus far in this section, there is an algorithm that locates the domain accent. This algorithm can be weight-sensitive or weight-insensitive and in either case exceptional patterns can be accounted by specifying diacritic syllabic accents on syllables that attract the word accent, acting as if they are phonologically heavy, despite being phonologically light. Such languages are said to have fixed accent, even though there may be exceptions.

There are, however, also languages in which diacritic accents take center stage. In this type of language, morphemes are either diacritically accented or unaccented. In the former case, one syllable within an accented morpheme bears a syllabic accent. A case in point is the stress system of Russian (see Revithiadou 1999):

(13) Russian
Stress the rightmost diacritic accent or else the leftmost (first) syllable

Language of this kind are often said to have a lexical accent system, or have 'free accent', but being free does not mean that there is no need for a procedure to decide which lexical syllabic accent will emerge with the word domain accent. When more than one morpheme bears a lexical accent, only one of them can be the word domain accent.[44] Also, if no morpheme in a word is accented there must be a default procedure to locate the syllable that will have the word domain accent. As it turns out, these procedures for a language like Russian are not different from the procedures that we have discussed in this section for languages that were said to have weight-sensitive domain accents. If the lexical accents in Russian are represented as variable (i.e. as potential domain accents), we can use linear licensing (set to left) to select the winning accent. And if there is no accent, a left-headed dependency structure will designate the first syllable as the default domain head. What this means is that the Russian system is just like the unbounded weight-sensitive systems in (11c), the only difference being that licensing selects from diacritically heavy syllables instead of phonologically heavy ones (see Bogomolets and van der Hulst, this volume).

This does not mean that systems in which diacritic syllabic accents play a major role must be unbounded. In bounded systems it is also possible for the location of the word accent to be heavily dependent on diacritic weight, varying its position within the window for different words. A case in point is Greek, as analyzed

[44] In unbounded systems the accentual domain always seems to be the whole word domain: (modulo extrametricality). If empirically true, this requires an explanation. See the concluding paragraphs of Section 18.6 for an attempt.

in Revithiadou (1999), where the word accent occurs within a right-edge three-syllabic accentual window, its location being dependent on lexical accents and accents that are predictable on morphological grounds, or Spanish, as analyzed in Roca (1999).

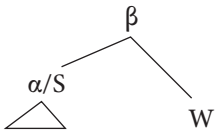
Paradoxically perhaps, as was noted in Bogomolets (2020: 11–14, Chapter 2), we can conclude that when resolution is linear in lexical accent systems, whether bounded or unbounded, the location of word accent is phonologically driven (given that we regard linear licensing as a phonological operation) while at the same time the syllabic accents that feed into the accent algorithm are 'lexical and morphological' in nature.

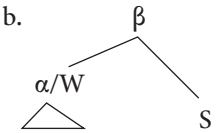
While resolution in Russian, Greek, and Spanish is due to linear licensing, we will see in the next section that lexical accent systems can also require a licensing procedure that refers to the morphologically driven hierarchical phonotactic structure that was discussed in Section 18.4, in which nodes are labeled as 'strong' or 'weak', in effect a dependency or metrical structure that is derived from the morphological structure. Bogomolets (2020) proposes and convincingly argues that linear and hierarchical resolution are the only two strategies that lexical accents use to designate one of the syllabic accents as the domain accent. In this chapter, I follow that proposal, albeit with a somewhat different take on how hierarchical resolution is implemented.

However, before we turn to these systems, we need to add one more 'dimension' to phonology-driven accentuation. As stated, accentuation refers to an *accentual domain* (and within this domain possibly to a potentially smaller *accentual window*). As we saw in Section 18.4, there may be more than one phonotactic domain within words, referred to as the α- and β-domain. It is therefore possible that different phonotactic domains have their own accentuation algorithm, which means that a word can end up having more than one domain accent. Where this is the case, we usually find that one accent is more prominent than the other. In this case we then might need a way to determine which domain accent prevails over the other.[45] I propose that we can handle this prominence effect in terms of the headedness of the phonotactic structure. I will here illustrate this with reference to English. It is possible to analyse English word prominence in terms of two accentual algorithms, one locating the 'primary stress' on the right edge of the word (being guided by both phonological and diacritic weight), while the other places a secondary, polar accent on the left edge. I suggest that these two algorithms apply in the α- and β-domain, respectively, and that the smaller α-domain is labeled Strong, which makes the right-hand daughter of the β-domain Weak. As we will see

[45] Again, I remind the reader that multiple domain accents only arise when the accentual windows are bounded. In unbounded systems, the accentual window always seems to comprise the whole grammatical word.

in the case of Mapudungun (Section 18.7.1.3) in other languages the S/W relation is the other way around, making the accent of the β-domain the most prominent:

(14) a. 

b. 

What we will see in reviewing word prominence in a sample of polysynthetic languages is that these two logical possibilities can both obtain dependent on phrasal context, thus revealing a role for the headedness of the phonotactic structure.[46]

It is of course not necessary that accentuation is sensitive to word-internal, phonotactic subdomains that are derived from the morphosyntactic structure. If a language has a single, fixed stress location, a single accentual algorithm will do. It will not be easy to determine whether in that case the domain is an α-domain or a β-domain, which would both cover the same stretch of syllables that makes up the whole word.

In summary, the system for phonologically driven accent locations has five parameters:[47]

(15) Parameters for phonologically driven accentuation
  a. Bounded (left/right)
  b. Satellite (left/right)
  c. Project weight (yes/no)[48]
  d. Licensing (left/right)
  e. D-formation (left/right)

As discussed, to accommodate the distinction between so-called bounded and unbounded accent systems, we need to make a distinction in the size of the accentual window. The accentual window can be either 'bounded' (a bisyllabic window on the left or right side of the phonotactic domain) or unbounded (the whole phonotactic domain), both subject to the option of an extra syllable *on either side* of the accentual domain, which are called satellites.[49] The first two parameters are

[46] The effect in English called rhythmic reversal, which involves a greater prominence on the polar accent, can be handled by reversing the S/W labeling, as in essence was the proposal in Kiparsky (1979).

[47] In van der Hulst (2014a) I propose a set of rhythm parameters which will not be reviewed in this chapter.

[48] Weight projection determines whether or not syllables with specific phonological properties (which make them intrinsically 'heavy') enter into the computation of the word accent location. Diacritic weight is 'automatically' projected because it is specified as a diacritic property of syllables.

[49] I construe extrametricality in terms of a Satellite parameter which can add an extra syllable to the left or right of the accentual window. This allows extrametrical syllables that are not word-peripheral, but I will here not motivate why we need this. Basically, a word-internal extrametrical syllable can be accented, while a peripheral extrametrical syllable (which reflects extrametricality in the traditional sense) cannot. I here do not discuss the motivation and properties of internal satellites in any detail; see van der Hulst (2012, in prep.).

'optional'. If no value is set for parameter (15a), the system is unbounded, in which case there is no further left/right choice to be made. Likewise, parameter (15b) also does not have to be set because systems do not have to use it. The other three parameters are not optional and thus always active. The weight projection parameter is self-evident; the *yes* option makes heavy syllable available as variable accents for the computation of accent, but some syllables may have a variable accent and behave as heavy due to diacritic marking.[50] The licensing parameter determines the winning accent in the accentual window. However, in a weight-insensitive system, licensing can only be set when there are diacritic accents to mark exceptional word accent locations, although that typically does not deliver competition (unless complex words are involved in which more than one morpheme bears a diacritic accent). Finally, the D-formation parameter accounts for the default accent location if there is no accent due to phonological or diacritic weight, first within the accent window and then within the whole accentual domain.

It must be kept in mind that the computation of word accent is dependent on two notions of 'domain'. When words are morphologically structured, accent computation can take place with reference to domains that are smaller than the whole word, such as the α-domain. Rather than referring to such domains as 'morphological', I have called them phonological, specifically phonotactic, to distinguish them from prosodic domains that arise at a later level of the derivation. The second notion of domain was called the *accentual window* which can comprise the entire phonotactic domain, in which case we say that accent placement is unbounded, or a bisyllabic subdomain (possible, extended with a satellite syllable), in which accent placement is bounded. In both cases, accent location can be weight-sensitive or weight-insensitive (weight being either phonological or diacritic).

18.6 Morphologically driven accent

In the preceding section, I have explained phonologically driven accentuation algorithms in which resolution is linear. These systems were called phonologically

[50] Perhaps we also have to consider the possibility that a heavy syllable behaves as light? I am not aware of real cases that require such an exception for medial syllables, although, in general *final* mora or consonant extrametricality can make a final heavy syllable behave as light and still be visible; see Rosenthal and van der Hulst (1999) for discussion of cases in which heavy syllables count as light, but only in word-final position. Another issue is that sometimes syllables need to be marked as 'unaccentable' or 'stress-repelling', which goes further than being marked as light. Giving a role to S/W labeling in addition to diacritic accents, a possible approach is to mark such syllables with a diacritic label 'W', which prevents them from ending up in a strong metrical position. A detailed account of these special cases can be found in van der Hulst (to appear). Thirdly, some phonologists make a distinction between strong and weak accents (see for example Kiparsky 2021), which could mean that diacritic accents can involve degrees, just as has been claimed for phonological weight in languages such as Pirahã (Everett 1988) and Nanti (Crowhurst and Michaels 2005).

driven because the resolution part of the accentual algorithm, called linear licensing, is strictly linear in that it selects the leftmost or right accent within the window as the winner. Nevertheless, we saw that such systems can have a hierarchical dimension, namely, firstly, when the accent algorithm make reference to specific phonotactic domains and, secondly, when accents in different such domains are of unequal prominence, which invoked the headedness property of phonotactic structure.

Focusing on resolution, Bogomolets (2020) argues convincingly that some languages appeal to a *non-linear resolution* strategy that depends on hierarchical structure, which in her theory is morphosyntactic, albeit augmented with prosodic boundaries.[51] I have argued in Section 18.4.1 of this chapter that we need to recognize a *strictly* phonological structure, what I call the phonotactic structure, which resembles the morphological structure but can deviate from it due to the fact that affixes can have phonotactic insertion frames that cause them to group 'intimately' with the root (causing integration in what I have called the α-domain) or more 'remotely' (falling to integrate and forming what I called a β-domain). Operating under the assumption that head/dependency relations are omnipresent, the nodes in this phonotactic structure are labeled as S or W, following specific labeling principles that can differ from language to language (see Section 18.7). It is important to note that the headedness of the phonotactic structure can also play a *direct* role in determining the winning accent in complex words. I will refer to this as *hierarchical resolution*. Like linear resolution, hierarchical resolution decides between competing diacritic accents. However, while linear resolution is not dependent on the hierarchical phonotactic organization of its domain, hierarchical resolution is crucially based on the hierarchical organization and headedness of the phonotactic structure. In short: the diacritic accent in a phonotactic head position prevails over a diacritic accent in a non-head position. In the absence of diacritic accents, a default domain head is determined by a dependency structure. Rather than illustrating this kind of licensing here, I refer to Section 18.7.3, where I offer a detailed analysis of accent in two Sahaptian languages, which Bogomolets (2020) analyses in terms of hierarchical (in her terms: 'cyclic') resolution.

[51] Alderete (1999, 2004) analyzes the accent system of Cupeño, in which, in his interpretation, the root accent wins over accents in suffixes and prefixes; this is called 'root-control'. Bogomolets (2020) shows that there is no need for a third kind of licensing that makes specific reference to roots (or to affixes, for that matter). She claims that we only find 'trivial' root-control in systems in which only roots can be marked for lexical accent, with all affixes being unaccented. Multiple examples of such systems have been reported, for instance, Gitksan (Penutian; Forbes 2015), Wappo (Yukian; Sawyer 1991), Jamul Tiipay (Yuman; see Rice 2010 for an overview); also see Rice (this volume). Garde (1973) also proposes that an approach that is 'morphological', albeit not in the sense that hierarchical structure is taken to be relevant, but rather in the sense that morpheme classes of a language can be ranked on a scale in terms of their 'accentual strength' such that the accent of the strongest morpheme wins, an approach that has been further developed in Vaxman (2019). It is possible that his scalar resolution approach is required for languages that can be called hybrid because they have competition between syllables that are phonologically heavy and syllables that are marked for diacritic weight.

The notion *head* that drives hierarchical licensing is thus *not* to be understood as a morphosyntactic head, but rather as the head of the phonotactic structure. In this sense my proposal differs from those in Revithiadou (1999) and Bogomolets (2020). In my proposal, hierarchical resolution relies on the headedness of phonotactic domains, which means that I essentially adopt the idea that resolution appeals to what Zubizarreta and Vergnaud (2005) call 'a metrically interpreted morphological structure'. However, as we have seen, this approach goes all the way back to earlier work of Liberman (1975) and Rischel (1987) and is also adopted in Ladd (2008).

We thus end up with a set of parameters for morphologically driven accentuation that is quite similar to what we needed for phonologically driven accentuation:

(16) Parameters for morphologically driven accent
  a. Bounded (left/right)
  b. Satellite (left/right)
  c. Diacritic weight (yes)
  d. Licensing (S/W labeling rules)
  e. D-structure (SW/WS)

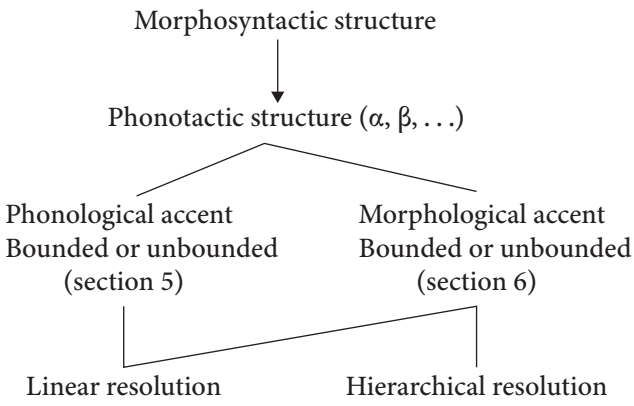
The difference lies in the fact that morphologically driven systems refer, perhaps exclusively, to diacritic weight, but more crucially in the resolution parameter (16d). Interestingly, I have seen no evidence for an unbounded system that is sensitive to phonological weight in which resolution is anything else than linear. This requires an explanation, which I will suggest at the end of this section.

Hierarchical licensing is most noticeable in languages that have an unbounded accentual window, but it can in principle also apply when the window is bounded. However, although both options are in principle applicable to bounded systems, it would seem that the linear approach is more prevalent and perhaps always sufficient in bounded systems, simply because the domain is too small to see any effect of the headedness of the phonotactic structure. To see the effect of hierarchical licensing in a bounded system, we would need a situation in which an accented root is followed by an accented suffix, both occurring within the bounded right-edge accentual window, with selection of the winner being either the left accent or the right accent, depending on the morphosyntactic properties of the suffix. Possible cases could be Greek (as analyzed in Revithiadou 1999) and Spanish (as analyzed in Roca 1999).

In summary, the unified theory of word accent proposed here has the following structure:[52]

[52] For a more extensive summary, the reader could also read Section 18.8 at this point, before proceeding to the case studies.

(17)



Even in English morphologically complex words, we have seen that a distinction between at least two domains (called the α- and β-domain) is needed and that a case can be made for saying that such complex words are subject to two accentuation algorithms, with one causing primary stress on the right side of the α-domain and the other causing what I called a polar accent on the left edge of the β-domain. I have suggested that the relative 'strength' of these two accents can be accounted for by assuming that the α-domain is 'Strong' (labeled 'S'), which means it is the head in the overall phonotactic structure. I have proposed that the S/W labeling in the phonotactic structure plays two roles. Firstly, in languages that have different domain accents, the S/W labeling accounts for the relative prominence of the different domain accents; this is illustrated in the English case. Secondly, in languages that have predominance of diacritic accents ('lexical accent systems') the S/W labeling drives what I have called hierarchical licensing.[53]

A correlation that remains to be fully explained is that morphologically driven accentuation (i.e. hierarchical resolution) is only relevant when the syllabic accents are predominantly diacritic. While a deeper investigation of unbounded weight-sensitive systems is required, it seems that licensing in such systems is always linear, as opposed to hierarchical licensing which *can* be at play in so-called lexical accent systems.

To explain why phonological weight-based systems always seem to have linear resolution, I suggest that phonological weight and linear licensing form natural partners in that both are phonological in nature. This correlation would become theoretically necessary if we wanted to argue that unbounded accent algorithms

[53] One might perhaps think that all resolution can be treated as hierarchical, arguing that selecting the leftmost or rightmost variable accent could be done in terms of a left- or right-branching dependency structure on a special tier that only contains the accented syllables, the head of which designates the winning accent. However, there is no independent motivation for such a structure, neither as derived from the morphology nor as one that organizes all syllables of the word. So, this would merely be a notational variant of the linear resolution strategy.

that are strictly sensitive to phonological weight should be analyzed as implementational. In contrast, the mechanism of lexically marked diacritic accents forms a natural partner with morphologically driven hierarchical licensing. But the correlation in the latter case is not perfect, because lexical accent systems can also appeal to the phonological mechanism of linear licensing (as in Russian). To explain this imperfection, we must take note of the fact that when diacritic weight is the major type of weight, diacritically marked syllables can often be traced back historically to syllables that were phonologically heavy, a situation which would naturally have triggered linear licensing. As noted in Halle and Kiparsky (1977), the widespread unbounded Left/Left pattern in Indo-European, specifically Slavic languages that mark weight diacritically, can be traced back to a Proto-Indo-European tonal stage in which weight was phonological, with rightmost H toned syllables attracting the word accent, which went to first syllables in the absence of an H tone. Likewise, in Spanish, which can be analyzed as a bounded lexical accent system with linear licensing, diacritic weight can be traced back to phonological weight in terms of vowel quantity in Latin. It is thus likely that the possible occurrence of linear licensing in languages with predominant diacritic weight has been 'carried over' from an earlier stage when weight was still phonological, giving rise to an 'unnatural' co-occurrence of non-phonological weight and phonological resolution. Bogomolets and van der Hulst (this volume) wonder whether linear resolution might be the unmarked option for all accentual systems, since it is always observed in systems that are based on phonological weight and often in lexical accent systems, almost necessarily so in bounded lexical accent systems given that competition between diacritic accents in such small domains is unlikely to occur.

A second question that I have mentioned earlier regards all unbounded systems that have linear licensing (whether diacritic or phonological). I have noted that it seems to be the case that the domain of licensing always coincides with the whole grammatical word, i.e. the β-domain. If this is indeed the case, and linear licensing naturally occurs in systems that observe syllable weight, the explanation for this fact might be that the notion 'unbounded' can simply be interpreted as 'the entire word domain'. Thus, if the parameter that specifies the location of a bounded window is not set, the accentual domain by default comprises the whole grammatical word (modulo extrametricality).

18.7 Case studies

In this section I will offer brief analyses of prominence patterns in a number of languages with highly complex morphologies, some of which are the subject of chapters in this volume. My goal here is not to significantly deviate from the analyses that have been proposed in the chapters in the volume or in other sources.

Rather, my goal is to demonstrate how the framework developed in this chapter might offer a unified account of what seems at first sight like a heterogeneous collection of word prominence systems. In doing so, I must omit many details, for which I refer to the chapters in this volume.

In Section 18.7.1, I will first discuss several of the languages that display essentially the same 'accentual duality' that we can observe in English, which I have proposed to analyse with two accent rules, applying in the α-domain and the β-domain. I will show that the same analysis can be applied to languages that have a typical morphological structure that is much more complex than English. In these phonologically driven systems, the S/W labeling of the phonotactic structure differentiates between the different accents that belong to different phonotactic domains. In Sections 18.7.2 and 18.7.3, I will then turn to languages in which morphemes in the lexicon are marked as diacritically accented or non-accented, showing how resolution operates linearly or hierarchically, although the choice between these options is in some case difficult to make or controversial.

18.7.1 Phonological accent: Competing domain accents

18.7.1.1 Australian languages: Ngalakgan

Mansfield (this volume) discusses three Australian languages, Ngalakgan, Bininj Gun-wok (both Gunwinyguan), and Murrinhpatha (Southern Daly). I will here mainly focus on Ngalakgan, in which simplex words can display two prominent syllables, marked by an H 'pitch accent'. On the left edge of the grammatical word an accent occurs on the first syllable, unless the first syllable is light and the second syllable is heavy, which is a bounded F/F (Left/Left) pattern (i.e. the pattern in 9iii, but at the left edge of the word). The second accent, which is not weight-sensitive, occurs on the penultimate syllable of the 'word' (although only manifested when it is phrase final):[54]

(18) (13) $[(\text{kúru})_{\Sigma}(\text{cáʈu})_{\Sigma}]_{\omega}$ 'olive python'
(14) $[(\text{kúr})_{\Sigma}(\text{mú}[\text{uʔ})_{\Sigma}]_{\omega}$ 'bluetongue lizard'
(15) $[\text{pu}(\text{ʈól})_{\Sigma}\text{koʔ}]_{\omega}$ 'brolga (a bird)'
(16) $[(\text{pícu})_{\Sigma}\text{ʈu}]_{\omega}$ 'whirlwind'

(Baker 2008: 71, 82, 179, 226)

(The 'second numbering' is the numbering in Mansfield's chapter in this volume; I will refer to his examples as, for example '(18/13)', in which his numbering follows mine, separated by '/'.)

[54] The examples here given indicate the foot structure that Mansfield initially assumes, although he concludes that reference to foot structure is not necessary. I also maintain his labels for the relevant phonological domains.

In Mansfield's terms, the domain of the initial accent is the main stem plus a TAM suffix, thus excluding prefixes, which are assumed to adjoin at the next level, the Prosodic Phrase:

(19) (20) {ŋuruɳ-mu-[(ɳéː)$_{\Sigma}$]$_{\omega}$}$_{\varphi}$
1INCL.OBJ-VEG-burn.PRS
'It (the sun) burns us.'

(21) {ŋuruɳ-pu-pak-[(pólk)$_{\Sigma}$-(pu-n)$_{\Sigma}$]$_{\omega}$}$_{\varphi}$
1INCL.OBJ-3AUG-APPL-noise-hit-PRS
'They are making noise on us.'

(22) {ŋun-[(ŋáriɲ)$_{\Sigma}$]$_{\omega}$-[(pé-ɲ)$_{\Sigma}$]$_{\omega}$}$_{\varphi}$
1MIN.OBJ-hand-bite-PST.PUNC
'It bit my hand.'

(Baker 2008: 167, 172)

Following Baker (2008), Mansfield refers to the domain of the initial accent as the prosodic word (ω). As shown, there can be multiple stems within a grammatical word that project their own prosodic word. Mansfield says that 'syntactically incorporated' stems are separate ω constituents, but lexicalized incorporation, especially of coverbs, leads to prosodic integration. In his (20/25, 26) the first stem is syntactically incorporated, and thus an independent ω, while the second and third stem form a lexicalized combination and are thus prosodically integrated:

(20) (25) {ŋun-[(ŋéj)$_{\Sigma}$]$_{\omega}$-[(wí-ɳa-n)$_{\Sigma}$]$_{\omega}$}$_{\varphi}$
1MIN.OBJ-name-forget-see-PRS
'He's forgotten my name.'

(26) {pur-[(kúɳʈu)$_{\Sigma}$]$_{\omega}$-[(ŋéj)$_{\Sigma}$-(pu-n)$_{\Sigma}$]$_{\omega}$}$_{\varphi}$
3AUG-country-name-hit-PRA
'They name the country'.

As shown in (18/13 and 14), simple nouns that form one ω may host one or more accents. However, the manifestation of the second accent is limited to a prosodic word that is phrase final, as shown in (21/29, 30).

(21) (29) {cu-[(ɳámu)lu]$_{\omega}$-[(kérŋe)-(ɳá-na)$_{\Sigma}$]$_{\omega}$}$_{\varphi}$
2MIN-really-body-see-FUT
'You'll have to find that animal properly.'

(30) {ŋu-pu-[(kérŋe)$_{\Sigma}$]$_{\omega}$-[(púrʔ)$_{\Sigma}$-(na-ni)$_{\Sigma}$-(kkóro)$_{\Sigma}$]$_{\omega}$}$_{\varphi}$
1MIN-3A-body-know-see-IRR-PRS.NEG
'I don't know them.'

(Baker 2008: 94)

Like I suggested for English, Ngalakgan locates an accent in two different domains, as Manfield's analysis makes clear. Following the approach laid out in this chapter, I will refer to Manfield's prosodic word as the α-domain, in which case prefixes

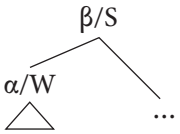
that preceded the first stem could be adjoined into the β-domain. The accent algorithms for the α-domain and β-domain are given in (22) and (23):

(22) α-domain: left edge, weight-sensitive (Left/Left)[55]
a. Bounded (left/~~right~~)
~~b. Satellite (left/right)~~
c. Project weight (yes/~~no~~)
d. Licensing (left/~~right~~)
e. D-formation (left/~~right~~)

(23) β-domain: right edge, weight-insensitive (Left)
a. Bounded (left/~~right~~)
~~b. Satellite (left/right)~~
c. Project weight (~~yes~~/no)
d. Licensing (left/right)[56]
e. D-formation (left/~~right~~)

As mentioned, both accents are associated to an H pitch accent. When there is a second accent within one (phrase-final) ω, this accent is upstepped from the first. (I would refer to this phrase domain as the γ-domain.) Perhaps for this reason Baker uses distinct diacritics for what he regards as secondary and primary stress, e.g. *kùrucáʈu*. Mansfield wishes to remain neutral on the relative prominence of both accents and uses the same diacritic marker for any (pitch) accent, e.g. *kúrucáʈu*. If the second, β-domain stress would turn out to be more prominent, this would indicate a W/S labeling of the phonotactic structure:

(24)



However, as the examples in (18/16) and (20/25) show, a potential clash between the initial and the final accent is resolved in favor of the initial accent, unlike in (18/14), where the left-edge accent falls on a heavy syllable. This might suggest that the initial accent is 'stronger', which means that there is contradicting evidence with respect to which accent is 'stronger'. If we wish to maintain (24), we would have to attribute clash removal to a separate rule.

A technical problem arises when the β-domain is not formed by the addition of non-integrating suffixes, but yet has to be there as the domain for an accent rule.

[55] In Appendix 1, I summarize the parameters c and d as: 'weight-sensitive (Left/Left)' for (22) and as 'weight-insensitive (Left)' for (23).

[56] Recall that in a weight-insensitive system, licensing cannot be set, unless a complex word would happen to contain multiple morphemes that have a diacritic accent.

This is the case in non-derived words such as those in (18), which would have the structure in (25). To indicate a prominence difference, we would have to assign S/W labels to nodes that are in a mother-daughter relationship, i.e. designating the α-domain as weak, which forces an S label on the β-domain node:

(25)

The prosodic structure of verbs in Bininj Gun-wok (BGW) is reported by Mansfield to be quite similar to Ngalakgan, although in BGW the H α-domain pitch accent on the left edge of ωs is variable and appears to depend on phrase-level factors. Mansfield reports that accent placement is much simpler in Murrinhpatha. Each word has exactly one H accent, predictably positioned on the penultimate syllable of the rightmost ω in the phrase. However, the domain for the penultimate accent is smaller than the whole verb. Inflectional suffixes are divided into prosodically integrated and non-integrating 'adjunct' elements. This suggests that the domain for the penultimate accent is the α-domain. If we assume that the entire word forms a β-domain, there would then be no accent rule for this domain.[57]

Given that the structure in (24) is a way of indicating which domain accent is more prominent, one might expect that a change in prominence involves the reversal of the S/W labeling. I here suggest that a reversal of this type might explain the shift in Czech, which has initial primary stress, from an earlier stage more like we find in Polish, which has penultimate primary stress and initial secondary stress. Switches of this kind could also have occurred in Australian languages in which we also find both languages with penultimate primary stress and initial primary stress; see Goedemans (2010).

18.7.1.2 Circassian languages

In this group of languages (reported on by Gordon and Applebaum, this volume), stress is confined to a two-syllable window at the right edge of what the authors call the prosodic word, which contains a single root with typically one or more affixes and usually coincides with the grammatical word in these languages (but see below). Stress, here illustrated with examples from Kabardian, is weight-sensitive and falls on the final syllable if it is closed by a coda consonant or contains a long

[57] Mansfield mentions that earlier accounts of Murrinhpatha posit secondary stress, although without any details on proposed phonetic correlates or native-speaker perceptions, which is not uncommon in reports on rhythmic patterns in many of the languages that have played an important role in the motivation for foot typologies in Hayes (1995), but also in my own account of rhythm in van der Hulst (2014a). There is reason to be doubtful of such accounts, especially because all three accounts differ significantly in their proposed locations for secondary stress (Mansfield 2019: 97; cf. de Lacy 2014).

vowel (26/2a) and otherwise on the penultimate syllable (26/2b), i.e. a Right/Left pattern:

(26)	(2a)	sɐˈbən	'soap'
		tɐpˈʃɐkʲ	'plate'
		saːˈbəj [saːˈbiː]	'baby'
		naːˈnəw [naːˈnəː]	'kid'
	(2b)	ˈsaːbɐ	'dust'
		ˈməʃɐ	'bear'
		ʔɐˈdaːqʼɐ	'rooster'
		χɐrˈzənɐ	'good'

However, there are certain cases in which stress falls on a light final syllable, which seems to be the result of certain morphemes having a diacritic accent. For example, in Abzekh Adyghe (assumed to be similar to Kabardian) the predicative suffix *-ə* is stressed when it is attached to the noun *ɕʷəz* 'woman' following the demonstrative *ar* in the phrase *ar ɕʷəˈzə* 'that person there, she's a woman.'[58]

However, the domain for accent can be smaller than the grammatical word because certain classes of morphemes belonging to a morphological word are excluded from the stress domain. The authors refer to Colarusso (1992) who observes 'for Kabardian that suffixes attaching to just nouns or both to nouns and verbs are "extraprosodic" whereas those that are strictly verbal are included in the prosodic word'. In (27/4a), the instrumental suffix *-kʲʼɐ* (27/9a), being excluded from the domain of stress, fails to attract stress to the final syllable, unlike the purely verbal future suffix *-nəw,* which can attract stress (27/9c).

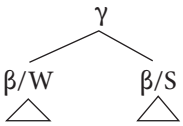
(27)	(9a)	{ˈwənɐ}$_{ω}$-kʲʼɐ
		house-INSTR
		'with a house'
	(9c)	{də-1ɐʒɐ-ˈnəw}$_{ω}$-s
		1PL.ABS-work-FUT-DECL
		'We will work'

[58] The authors say that evidence for secondary word stress is more elusive than support for primary stress. Speakers do not appear to have intuitions about secondary stress and Gordon and Applebaum (2010a) do not find any acoustic evidence for secondary stress in their study of stress correlates of words up to six syllables long in Kabardian. There are certain suffixes that have a prominence that is subordinate to the main stress in a preceding nominal root, but this prominence is due to high pitch, which could implicate a lexical H tone.

In my labeling conventions, the domain of stress is the α-domain (which the authors refer to as the 'prosodic word'). The authors also report that prefixes may fall outside the stress domain (for the Ulyap variety of Kabardian), with the same prefix behaving differently when combined with nouns or with verbs. The entire word forms a β-domain that is not subject to an additional accentuation rule. This means that there is no evidence for S/W labeling for the two domains.

The authors report that in 'phonological phrases' consisting of multiple words, the rightmost stress is the strongest one. For example, in the phrase $[\{\text{'ʃə}\}_{\omega}\{\text{''ʃ'aːlɐ}\}_{\omega}]_{\text{PP}}$ 'young horse', the stress on the second word is stronger (indicated by a double stress mark) than the one on the first word. This greater prominence could be due to an intonational element, such as a boundary tone (Paschen 2014) or it could mean that the 'prosodic words' that form a phonological phase (a γ-domain) are organized in a W/S structure:

(28)



18.7.1.3 Mapudungun

Molineaux (this volume) analyses word prominence in Mapudungun, offering clear evidence for two patterns of accentuation, which apply in two different domains:

> 'Stress is right-aligned to a domain. At the word level it is trochaic and weight-sensitive, while at the stem-level it is simply final'
>
> (p. 326)

In more detail:

(29) Stem level (in my terms: α-domain)
Stress falls on the final syllable of the stem in nouns and verbs, which is defined as the root plus specific diathesis changing suffixes. This rule also assigns final stress to adjectives, adverbs, and pronouns, as well as to the first element of compounds.

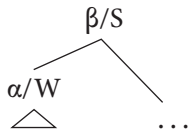
Word-level stress (in my terms: β-domain)
At the word level there is a second stress rule which assigns stress to the final syllable if it is heavy and otherwise to the penultimate

In the examples in (30) both domains are indicated, but Molineaux labels the smaller domain as R (root) and the larger domain as the phonological word (ω):

(30) (12) Morphologically complex verbs: root (R) and word (ω) in brackets
a. [['lef.]$_R$–pu.–'le–j]$_ω$
RUN–TRLOC–PROG–IND.3
'she/he/they is/are running here'
b. [[θew.'ma.]$_R$–ka.–'ki–j]$_ω$
MAKE–CONT–HAB–IND.3
'she/he/they is/are usually making'
c. [[i.'t͡ʂif.]$_R$–tu.–pu.–ke.–'la–j.–m–i]$_ω$
THROW–REST–TRLOC–HAB–NEG–IND–2–SG
'you don't usually throw X back here'
d. [[t͡ʂi.'pa.]$_R$–ke.–'la–j.–m–i]$_ω$
EXIT–HAB–NEG–IND–2–SG
'you don't usually go out'

Where a clash between the two stresses arises, it is resolved in favor of the 'word-level' stress, which suggests that the α-domain is weak with respect to the morphemes that form the β-domain, which requires a S/W labeling:

(31)



Molineaux notes that the two stresses are equal in prominence. This is not incompatible with proposing the labeling in (31) which, then, determines clash resolution but not necessarily relative prominence. However, when the stem is complex (i.e. a stem that consists of the root and the diathesis changing suffix) the 'stem stress' 'tends to prevail'. This means that the S/W labeling rule must refer to the complexity of the α-domain (where 'A' and 'B' stands for 'sister nodes'):

(32) [A B]$_β$ A is Strong iff it branches

The accentual algorithms for this language are as follows:

(33) α-domain: right edge, weight-insensitive (Right)
a. Bounded (~~left~~/right)
~~b. Satellite (left/right)~~

c. Project weight (~~yes~~/no)
d. Licensing (left/right)[59]
e. Default (~~left~~/right)

β-domain: right edge, weight-sensitive (Right/Left)

a. Bounded (~~left~~/right)
~~b. Satellite (left/right)~~
c. Project weight (yes/~~no~~)
d. Licensing (~~left~~/right)
e. D-formation (left/~~right~~)

Molineaux remarks that there is no evidence for rhythmic (foot) structure.

18.7.1.4 Satipo Ashaninka

In this section, I turn to the case of Satipo Ashaninka, following Mihas and Maxwell (this volume). In this language, once more, there are two types of word edge prominence peaks:

(34) a. Right-edge weight-sensitive primary stress
b. Left-edge weight-sensitive *polar* secondary stress

Ashaninka words like the one in (35) tend to give an impression of having multiple 'equal' stresses,[60] but the authors show that the phonetic correlates of the two stress types differ. The 'primary stress' is realized with a combination of longer vowel duration, increased intensity, and, sometimes, higher pitch; secondary stress is cued by increased intensity and sometimes by higher pitch (but the evidence for f0 as the phonetic exponent of secondary stress is inconclusive). This suggests that the 'primary stress' is more perceptually salient than the secondary stress, hence the designation 'primary'. In this case, there is no clash avoidance, i.e. polar accents are not avoided when they immediately precede primary-stressed syllables.

Heavy syllables occurring in the 'valley' between the primary stress and polar secondary stress are inherently salient due to their segmental length and they do not exhibit phonetic cues of secondary stress. There is no evidence for an additional rhythmic pattern.

In (35/1), these three types of prominences are given in bold:

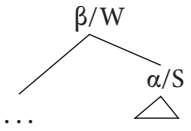
(35) (1) i-ne-a-shintsi-pini-t-aka-ak-e-na/i.ˌ**nea**.ʃiN.ˌ**tsʰi**. pi.ni.ta.ˈ**kaː**.ke.na
3M.A-see/feel-EP-be.strong-HAB-EP-APPL.SOC.CAUS-PFV-REAL-1SG.OBJ
'He wants me to make an effort.'

[59] In weight-insensitive systems the licensing parameter cannot be set.
[60] See Pike and Kindberg (1956), who argued that Ashaninka words have multiple equal stresses.

In this language, there is no evidence that morphological structure, as reflected in the phonotactic structure, is relevant to stress assignment. The simplest analysis would then be to apply both rules at the β-domain, which comprises the whole word. However, if domains tend to have only one accent rule, we could assume that the primary stress applies with the α-domain, whereas the secondary stress applies in the larger β-domain. With primary stress occurring on the right side of the word, there is no way of telling whether it comprises the whole word, including all prefixes, or whether prefixes fall outside an α-domain that is formed by the root and following suffixes.

The primary stress rule is sensitive to lexical exceptions, while the polar rule is not. This suggests that the primary stress rule is 'cyclic', albeit that in this case there is no evidence for cyclic application from smaller to larger domain cycles within the α-domain (i.e. no cyclic secondary stresses are reported), which means that the rule applies at the *maximal cycle of the α-domain*.[61] I will thus assume that the domain of the polar rules is the β-domain. However, the polar rule *could* be regarded as *post*-cyclic, i.e. implementational. The post-cyclic nature of the secondary stress is perhaps supported by the fact that when all initial syllables are light, the polar accent location shows intra- and interspeaker variation: it either falls on the second light syllable (which is the dominant pattern), or on the first. The advantage of assuming that both rules apply in different domains is that this then gives us a tool to derive the greater prominence of right-edge stress from the S/W labeled phonotactic structure:

(36)



Both rules are weight-sensitive and the dividing line between heavy (h/H) and light syllables (l/L) is CVV(N), CV_1V_2 (N) vs. CV(N), i.e. vowel length is crucial. The basic accent pattern for primary stress is Left/Left); capital L/H indicates stress:

(37) …(Ll)], …(Hh)], …(Hl)], …(lH)]

This pattern is attested in other languages (see Section 18.5, (12)). Some of the examples provided by the authors reveal that there are exceptional stress locations that require lexical specification of the final syllable being 'extrametrical' and perhaps diacritic accents (depending on the specific analysis), which suggest sensitivity of primary stress to lexical marking. The need for lexical marking is confirmed by various other deviations from the pattern in (40). I refer to Mihas and Maxwell (this volume) for further details.

[61] This is comparable to the situation in English, as discussed in Section 18.1.

Interestingly, the pattern for initial polar stress is the mirror image of primary stress (Right/Right):

(38) [(Hl)..., [(hH)...,[62] [(lL)..., [(lH)...], [(llH)...

The two accent rules can be stated as follows:

(39) Maximal α-domain (cyclic): right edge, weight-sensitive: Left/Left
  a. Bounded (~~left~~/right)
  b. Satellite (left/~~right~~), lexically specified
  c. Project weight (yes/~~no~~)
  d. Licensing (left/~~right~~)
  e. D-formation (left/~~right~~)

(40) Maximal α-domain or β-domain (post-cyclic): left edge, weight-sensitive: Right/Right
  a. Bounded (~~left~~/right)
  b. Satellite (~~left~~/right) in case of [llh
  c. Project weight (yes/~~no~~)
  d. Licensing (~~left~~/right)
  e. D-formation (~~left~~/right)

The pattern of having two accent rules, applying at opposite edges of the word can be compared to what we find in English, which has right-edge primary stress, applying in the α-domain and being subject to lexical marking and left-edge polar stress which displays no such marking and could apply at the β-domain, which includes non-integrating prefixes.

18.7.1.5 Muskogean languages

Moving to North American languages, Gordon and Martin (this volume) discuss word prominence patterns in the Muskogean language family, focusing on Chickasaw, Choctaw, and Muskogee (also referred to in the literature as Creek and Seminole), which show the relevance of various phonotactic domains for prominence.

For Chickasaw the authors motivate two different prominence domains below the Intonational Phrase.[63] The smaller domain, referred to by the authors as the 'prosodic word', comprises the root and only certain prefixes and suffixes, excluding others. A larger domain that is coextensive with the grammatical word and is

[62] This pattern is not attested, but not contradicted either, in the data that the authors present.

[63] It also seems that specific suffixes can attract a pitch accent in the rightmost word in an intonational phrase in Chickasaw. The locus of this association does not fall out from any independently diagnosed phonological domain. 'This shows the unusual case in which intonational association requires direct reference to the morphology rather than reflecting any prosodic boundary, at least not one diagnosed independently by other phenomena.' (Gordon and Martin, this volume).

called the 'minor phrase' is subject to a primary stress rule. I will refer to these two domains as the α- and β-domain, respectively.

Rather than being the domain of accent rules, the α-domain is the domain of LR iambic weight-sensitive footing:[64]

(41) (2a) /asabikatok/ 'I was sick' → (aˌsa·)(biˈka·)(ˌtok)
(2b) /ʧikisilitok/ 'S/he bit you' → (ʧiˌki·)(siˈli·)(tok)
(3a) /ʧokoʃkomo/ 'S/he plays' → (ʧoˌkoʃ)(koˈmo)
(3b) /ʧiʧokoʃkomoʧi/ 'S/he makes you play' → (ʧiˌʧo·)(ˌkoʃ)(koˈmo·)(ˌʧí)

Footing triggers iambic lengthening (indicated with one raised dot) in Chickasaw and Choctaw, except in final vowels.[65] The stresses that indicate the iambic parse are equal in prominence. However, there is evidence for culminativity, at least in Chickasaw. Within the whole word, here called the β-domain, a primary stress falls on the final syllable of this domain, unless 'attracted leftward' to a long vowel.

(42) (7) (ˌis)(soˈ**ba**) 'horse'
(tʃaˌlak)(ˈ**kiʔ**) 'Cherokee'
(hoʃon)(ˈ**ti**) 'It is cloudy'
(8) (aˈ**boː**)(koʃiʔ) 'river'
(ˌok)(ˈ**ʧaː**)(ˌlin)(ˌʧiʔ) 'savior'

If more than one long vowel is present, the location of stress is variable, i.e. either long vowel or both can attract the primary stress:

(43) (9) (ˌiʃ)(tiˈ**laː**)(ˌmaː)(ˌʧiʔ) 'fan'
(ˌiʃ)(tiˌlaː)(ˈ**maː**)(ˌʧiʔ) 'fan'
(ˌiʃ)(tiˈ**laː**)(ˈ**maː**)(ˌʧiʔ) 'fan'

This is an 'almost' unbounded Right/Right pattern, except for the variability when more than one long vowel is present, in which case a 'pure' Right/Right system would only predict the pattern in (43/8b).

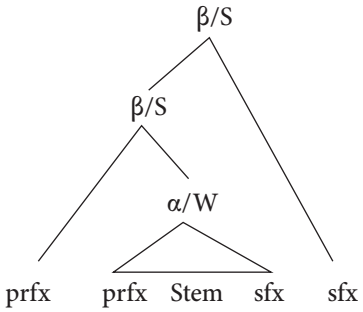
There is thus evidence for two domains that are relevant for word prominence:[66]

[64] The authors show that the β-domain can contain multiple α-domains because each lexically marked tone initiates a new prosodic domain.

[65] Muskogee lacks iambic lengthening of strong syllables. The phonetic exponent of the iambic structure in Muskogee is an H-plateau ranging from the first strong syllable to the last strong syllable.

[66] The authors also discuss a third kind of word prominence: 'In addition to the iambic and final prominence observed in the family, there is also evidence for prominence on the penultimate syllable of the stem in Muskogean languages. The stem is a morphological domain that includes the root plus certain tightly bound suffixes immediately following the root.' I propose that the PU pattern applies to a domain that is smaller than the α-domain, which I will label as the ρ-domain (loosely, the root domain).

(44)



Because the unbounded accent rule locates the most prominent syllable, there is evidence for a specific S/W labeling of the phonotactic structure, as shown in (44).

Returning to the Left/Left rules (applying, as I assume, at the maximal β-domain), the accentual algorithm refers to variable accents that are projected from long vowels. The authors note that the long vowels that attract the stress can be underlyingly long *or be long due to iambic lengthening*. This entails that the unbounded 'Right/Right' algorithm for primary stress is fed by the LR iambic pattern which is established in the smaller α-domain. This ordering is seemingly in conflict with my proposal that accent assignment is not sensitive to footing or rhythm, given that I have claimed that rhythm always comes later. I have previously referred to systems in which accentuation is seemingly fed by rhythm as 'count systems' and in fact Muskogee has long been noted as a counterexample to the claim that rhythm cannot feed accentuation. However, since rhythm is established within the maximal α-domain it is not a case in which rhythm directly feeds into an accentual algorithm that applies within the same domain, because the Right/Right algorithm applies at the β-domain. LR rhythm can be implementational at the α-domain. We can thus refine the rhythm-last hypothesis as being relative to phonological phases, given that the maximal α-domain and maximal β-domain form such phases. But this requires that the α-domain is visible *with its implementational properties* when the Right/Right algorithm applies within the larger β-domain. As mentioned at the end of Section 18.5, it must be explored whether unbounded accent algorithms that are strictly sensitive to phonological weight should be analyzed as implementational, in which case such questionable sensitivity can be avoided, although we then end up saying that unbounded stress location can be fed by rhythm if both are implementational. The strict separation theory that blocks accent from being fed by rhythm would still stand when we are dealing with accentual algorithms that are phonological and apply lexically.

18.7.2 Lexical accent systems: Linear licensing

Moving to lexical accent systems, I will first consider two Uto-Aztecan languages that have a lexical accent system, one unbounded (Cupeño), the second (Choguita Rarámuri) bounded, both using *linear* resolution strategy.

18.7.2.1 Cupeño

Bogomolets (2020) discusses the case of Cupeño, which has a lexical accent system in which roots, prefixes, and suffixes are underlyingly specified as accented, unaccented, and also pre-accenting[67] (Alderete 1999, 2001; see Bogomolets 2020 for additional references). While Alderete (1999; 2001) proposes that in case of multiple accents, the root accent wins, following Yates (2017), Bogomolets analyses the system as an unbounded linear Left/Left system. Yates (2017: 55), citing Halle and Kiparsky (1977), refers to this algorithm as 'The Basic Accentuation Principle'. Alderete's argument for root-control is based on his claim that there are accented prefixes which, if combined with an accented root, lose. However, Yates shows that these prefixes are in fact not accented. It is just that prefixes can show up as accented due to the default clause, when there are no lexical accents in the word, which places accent on the first syllable of the 'word'. Cupeño is thus an unbounded Left/Left lexical accent system with linear resolution (set to 'left') and default also to 'left'.[68] There is no evidence for relevance of morphological structure: both licensing and D-construction can apply at the β-domain.

18.7.2.2 Choguita Rarámuri

Choguita Rarámuri, a sister language to Cupeño, has been analyzed as having Root-Controlled Accent (Caballero 2008). Bogomolets (2020) argues this system can be reanalyzed as a linear system. Her analysis accounts for all the data, including data which are problematic for the Root-Controlled Accent analysis. Recall that Bogomolets suggests that root-control is in fact not a resolution strategy at all and that we only find 'trivial' root-control in systems in which only roots can be marked for lexical accent, with all affixes being unaccented.

With specific reference to Choguita Rarámuri, Bogomolets shows that the location of accent within a morphological word can be explained with the combination of (i) a left-edge three-syllable window rule, (ii) underlying accent specification for every morpheme within a word form; the leftmost diacritic accent within the accentual window wins (iii) default second-syllable stress. This language is thus an example of a *bounded* Left/Left lexical accent system.[69] Bogomolets (2020) argues

[67] Pre-accenting only applies to roots that are unaccented, which is also the case in pre-accenting in Russian and Tokyo Japanese (Alderete 1999: 2–4).

[68] We cannot establish whether the default applies to a bounded or unbounded window.

[69] The default is set to 'left', because the first syllable is 'extrametrical'.

in detail that a linear resolution strategy is not only possible, but also empirically superior to a root-control analysis.

18.7.2.3 Arapaho

Bogomolets (2020; this volume) provides an analysis of the Plains Algonquian language Arapaho. Most of the Algonquian languages which have received attention in theoretical accounts have been analyzed as having iambic stress systems (see Rice 2010, this volume, for an overview of stress in North American languages). Plains Algonquian languages have a different prominence profile. Bogomolets analyses the Arapaho system as a bounded *lexical accent* language. Both roots and affixes (prefixes and suffixes) can be underlyingly accented or unaccented; suffixes can also be pre-accenting. When multiple accents occur in a word, they are all reported as equal in prominence. However, if no accent occurs in a right-edge bounded accentual window, a default penultimate accent is assigned in this window. In this language, too, there is no evidence for relevance of morphological structure; hence this default accent placement can be located at the β-domain, applying within a bounded window. Since non-winning diacritic accents leave a perceptible trace, there is no need for a resolution strategy. In this case all accents can thus be specified as *in*variable.[70]

The algorithm for the default penultimate accent is as follows, giving Left/Left system:

(45) Accent parameters
  a. Bounded (~~left~~/right)
  b. Satellite (left/~~right~~)
  c. Project weight (yes/~~no~~)
  d. Licensing (left/~~right~~)
  e. Default (left/~~right~~)

As mentioned in Section 18.2.2, in addition to syllabic accents, Arapaho also has lexical falling tones that are independent from the accentual system, which means that this language uses both syllabic diacritic accents and diacritic moraic accents.

18.7.3 Lexical accent systems: Hierarchical licensing

In this section I will discuss two examples of languages that have a lexical accent system (i.e. predominantly diacritic syllabic weight) and resolution that is hierarchical rather than linear. I analyse one example (Sahaptian languages) in some detail, while Salish languages are only briefly discussed.

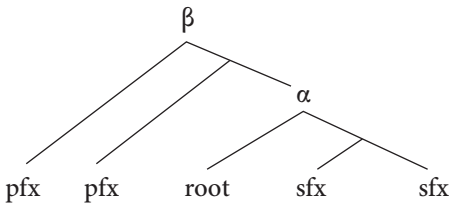
[70] Bogomolets nevertheless proposes that linear resolution resolves accent clashes.

18.7.3.1 Sahaptian languages

As proposed in Bogomolets (2020), selection of the winning accent can be established linearly within the accentual window which can be bounded or unbounded, or it can be established hierarchically, where the latter option is most clearly available in an unbounded accentual domain, because bounded domains are often too small to contain diagnostics for hierarchical accent assignment. In the preceding sections, we have seen several examples of linear resolution, both in accent systems that are phonologically driven and in those that are morphologically driven. In this section I will discuss the languages Ichishkiin and Nez Perce (both Sahaptian languages), which have unbounded systems in which resolution appears to be hierarchical, or as Bogomolets (2020) puts it 'cyclic'. I will follow Bogomolets' presentation of the relevant data[71] and suggest a hierarchical analysis which is based on S/W labeling of the phonotactic structure.

A major generalization for both languages is that accents on suffixes always prevail over accents on prefixes, irrespective of the morphological, hierarchical rank of the affixes. This immediately suggests that suffixes are integrating and prefixes are not, suggesting the following general phonotactic structure:

(46)



The following generalizations characterize the system in Ichishkiin:

(47) Basic generalizations
- a. The accent in the *rightmost* suffix (if any) wins
- b. The accent in the root wins over the accent in a prefix
- c. If there is no suffix accent, and no root accent, the leftmost accent in a prefix (if any) wins
- d. D-formation: If there is no diacritic accent, stress is on the penultimate syllable of the root

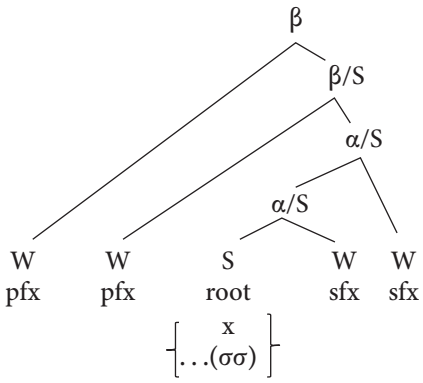
I will start with the last generalization:

(48) When all morphemes are unaccented, stress surfaces on the penultimate syllable of the root if the root has two or three syllables.
ʔi-ʔatˈɬawi-ʃa 'S/he is begging him/her.' (Bogomolets 2020: 103)
3SG-beg-IPFV

[71] For data Bogomolets relied for Ichishkiin on Hargus (2005) Hargus and Beavert (2016); for Nez Perce on Crook (1999).

This is the default case in the system, which applies within a right-edge bisyllabic window within the root, which means that it is bounded. It is remarkable that the default option refers to the root, rather than the whole word. I take the significance of the root to be an indication that the root is strong within the α-domain which leads to the following structure. The S label is automatically projected upward in the phonotactic structure of the β-domain, given that no further diacritic accents are introduced:

(49)

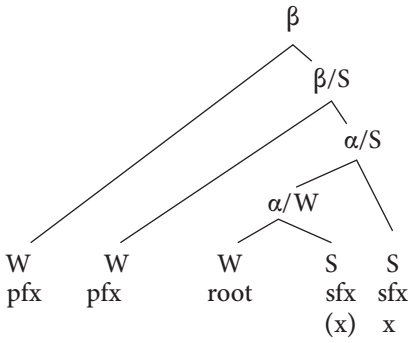


The default root accent determines the S/W labeling of the entire structure in the absence of any underlyingly accented morpheme.

As stated in (47a), the rightmost accent suffix prevails in all cases:

(50) When multiple underlyingly accented suffixes are combined with an unaccented root, the rightmost (outermost) accented suffix wins:
ʃjak-'ɬa-an'mi 'of a scout' (Bogomolets 2020: 92)
scout-AGT-GEN

(51)



As shown in (51), I take it to be a general principle for S/W labeling that an accented suffix commands an S label, making its sister W. This S/W labeling automatically makes *the outermost accented suffix* prevail over inner accented suffixes,

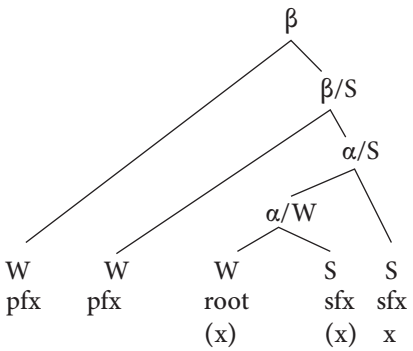
which means that its variable accent becomes non-variable and thus the head of the phonotactic structure:

(52) Labeling rule: [AB],
B is strong iff B contains a diacritic accent

The dominance of the outermost suffix accent is also evident when the root contains an underlying accent, as in the next case.

(53) In words containing an underlyingly accented root and one or more underlyingly accented suffixes, the rightmost suffix accent wins:
ʔiˈwaχi-ˈɬa 'one who waits' (Bogomolets 2020: 94)
wait-AGT
ʔiˈwaχi-t-paˈma-ˈnmi 'of a waiting place'
wait- NMLZ-THING.FOR-GEN

(54)

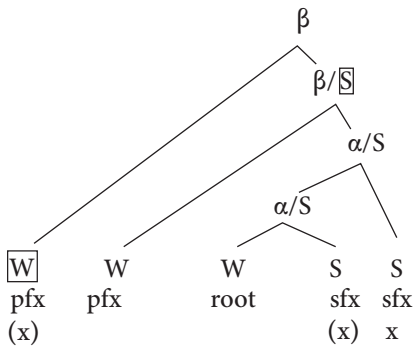


Both the accented root and the accented suffix, in principle, command an S label. In accordance with (52), the accent on a suffix takes priority over the accent in the root.

We now turn to two situations in which a straightforward 'outermost wins' pattern does not work, while (52) makes the right prediction, even when the prefix is outermost in terms of the morphological structure (which I assume is the case in these examples):

(55) When an underlyingly unaccented root is combined with one or more underlyingly accented suffixes and one or more underlyingly accented prefixes, the rightmost underlyingly accented suffix wins:
piˈna-kʼinu-tʼ-ˈawaas 'mirror, window' (Bogomolets 2020: 93)
RFL-SEE-NMLZ-INSTR

(56)

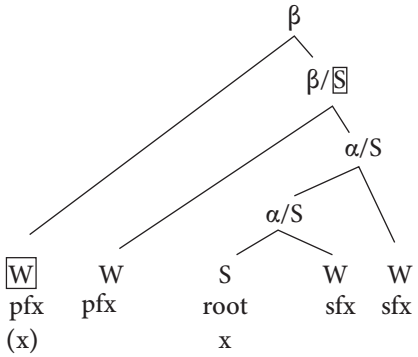


Given (52), the required S/W labeling is W/S because the right-hand node dominates a syllabic accent.

The second case shows that accented roots prevail over accented prefixes, again in line with (52).

(57) The accent in the root wins over the accent in a prefix:
ˈpa-ʔiˈwaχi-m ‘Wait for me.’ (Bogomolets 2020: 93)
INV-wait-CISLOC

(58)



These two cases show that accented prefixes lose in a competition with a root or suffix accent.

It will not have escaped the attention of the astute reader that all cases discussed thus far can be handled with a ‘simple’ linear resolution rule, such as:

(59) Linear licensing (R)

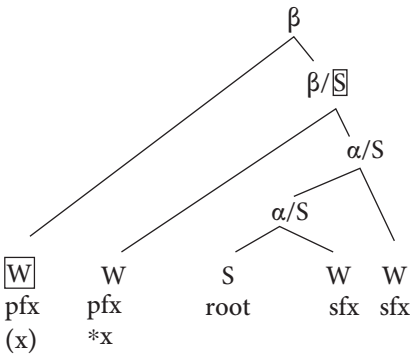
The licensing rule in (59) designates the rightmost variable accent as the winner.

We now turn to a critical case that shows the inadequacy of linear resolution.

(60) When multiple underlyingly accented prefixes are combined with an unaccented root, the leftmost (outermost) underlyingly accented prefix wins:
'pa-ʃa'pa-wina-ta 'S/he will let her/him go.' (Bogomolets 2020: 106)
INV-CAUS-go-FUT

This case does not square with the linear resolution rule in (59), but it also does not square with the S/W labeling rule in (52):

(61)



Clearly, linear licensing makes the incorrect prediction. It is not the rightmost accented prefix that wins, but rather the outermost accented prefix. However, (52) does not make the correct prediction either because it will also designate the inner accented prefix as the winner. With the linear resolution approach, we can only solve this problem by stating *two* licensing rules, one for the α-domain (formed by the root an suffixes) and one for the β-domain:

(62) a. α-domain: license (R)
b. β-domain: license (L)

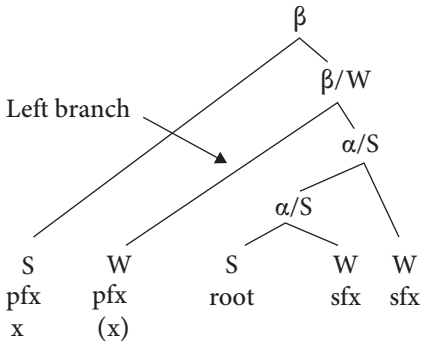
One might think that this linear approach does not work because for (55–57) it will wrongly select a prefix accent over a root or suffix accent, but this is not the case if we assume that a non-variable accent in the α-domain cannot be overruled by a variable accent in the β-domain, because there is no competition between variable accents.

However, to account for the two 'problematic' cases, we can also amend the hierarchical labeling rules with an extra clause:

(63) Ichishkiin
Labeling rule: [AB],
B is strong iff B has a variable accent *on a right branch*

This amended labeling rule accounts for all of the data in Ichishkiin. Specifically, it achieves the correct resolution in the β-domain, i.e. when multiple accented prefixes have been added, as shown in (64):

(64)



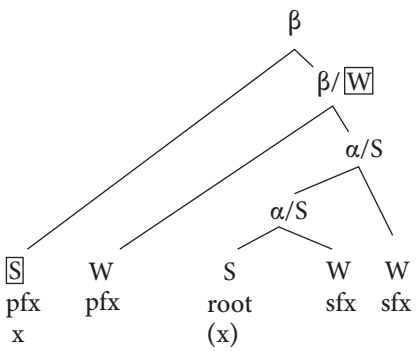
In conclusion, while the facts can be accounted for in terms of two linear resolution rules, the hierarchical licensing alternative that uses a single S/W labeling rule must be preferred on grounds of simplicity of the analysis.

Let us consider the facts for Nez Perce, which differ from Ichishkiin in two ways:

(65) Difference between Ichishkiin and Nez Perce
The underlyingly accented prefixes in Nez Perce win in a competition with the underlyingly accented roots, *in the absence of underlyingly accented suffixes*

In (66) we have the configuration in which a prefix accent takes precedence over a root accent (which is not the case in Ichishkiin):

(66)



We can account for the fact that prefixes take precedence over roots, but not over suffixes in Nez Perce by adopting a different (albeit related) condition in the S/W labeling rule for Nez Perce:

(67) Nez Perce
Labeling rule: [AB],
B is strong iff B has a variable accent *on a suffix*

The condition is related to the one in (63), but it is more specific than the condition we need for Ichishkiin, because suffixes are always on a right branch.[72]

Bogomolets discusses another difference between the two languages. While Ichishkiin does not have secondary stress, Nez Perce has been described as having secondary stress on all accents that do not win. This is not expected if variable accents that are not licensed 'cease to exist'. Given that secondary stresses are notoriously elusive and the report for Nez Perce is not instrumentally confirmed, this difference may not actually exist. However, assuming that the difference *is* real, we can say that in Nez Perce accents are non-variable. In this case there is no resolution, but that does not change the fact that only one of the accents occurs in the designated position in the S/W structure, which, then, accounts for the fact that it is more prominent than the other accents.

18.7.3.2 Salish languages

In this section I will present a partial analysis of word stress in some Salish languages, based on Revithiadou (1999) and Dyck (2004) and via these two sources on the descriptive and theoretical sources that the authors have used.[73] Revithiadou focuses especially on two languages of the Northern Interior branch of the family, namely Thompson (Nłeʔképmx) and Lillooet Salish (St'at'imcets), but also uses examples from two Salish languages of the Southern Interior branch, namely Moses-Columbia (Nxaʾamxcín) and Spokane. Revithiadou did not include Squamish in her work, but alludes to the fact that her proposals likely apply to this language as well, which Dyck (2004) confirms *to some extent*.[74] Dyck discusses the approach of Revithiadou, which she uses to analyse prominence patterns that distinguish two classes of so-called lexical suffixes, albeit with some reservations.[75] In Dyck's account these classes

[72] Kiparsky (2021) develops a different analysis of word prominence in Nez Perce, arguing in fact for linear resolution, albeit that *two* different resolution rules are proposed because he makes a distinction between 'weak' accents and 'strong' accents, in addition to the absence of accent. A comparison between his and my analysis (which follows Bogomolets 2020) will here not be given for reasons of space; see van der Hulst (in prep.).

[73] Dyck's analysis is largely based on the detailed descriptions of Squamish in Kuipers (1967, 1969).

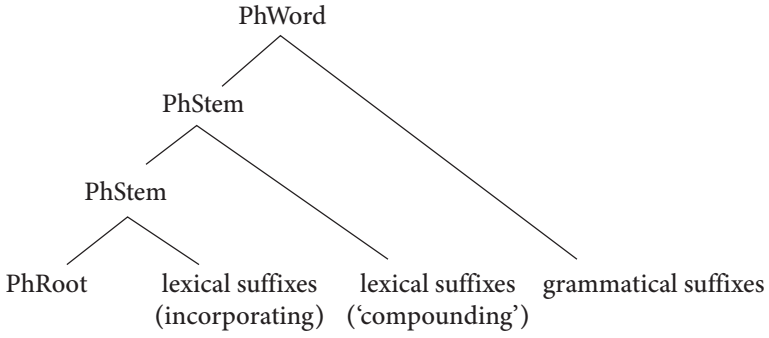
[74] Dyck's account of Squamish does not address the possibility of words have more than one stress, and if so under which conditions. Her source (Kuipers 1967, 1969) does sometimes indicate multiple stresses all with the same accent diacritic. Dyck also refers to rhythmic stress which in her analysis accounts for stress in the phrasal domain. She states that there is a tendency for alternating stress to occur in words of four or more syllables and a general reluctance to stress the final syllables of words. Dyck (p. 221): '[…] secondary stress, as in many Salishan languages (see, for instance, Czaykowska-Higgins and Kinkade 1998), does not surface consistently.'

[75] This division is based on Czaykowska-Higgins (1997) analysis of lexical suffixes in Moses-Columbian.

differ in terms of their phonological affiliations. Whereas the 'inner class' combines with the phonological root domain (that contains the morphological root) into a 'phonological stem' domain, the 'outer' class forms 'phonological word' domains. A third class of suffixes that we will consider are called grammatical suffixes.

In Revithiadou's account *all* lexical suffixes group into a phonological stem domain, while grammatical suffixes are adjoined within a phonological word domain. The location of stress differs in both these domains. I represent her proposal (which does not cover reduplicative and non-reduplicative prefixes and infixes) with the following simplified structure, which distinguishes two classes of lexical suffixes:

(68)



In brief, Revithiadou claims that the location of stress in stems depends on the type of suffix, albeit more deeply on whether or not suffixes are *morphological heads*. The core of her theory is that heads capture stress. Observationally, incorporating constructions have stress on the root, while compounding and grammatical suffixes are stressed (the latter only if they are 'functional heads'). Revithiadou accounts for this by analyzing incorporating suffixes as arguments to a verbal root, which makes the root the morphological head in such constructions. In the compounding constructions, the root functions as a modifier of the lexical suffix which makes the suffix the morphological head.[76] Examples of incorporating lexical suffixes are presented in (69):[77]

[76] The same modifier-head relation occurs in root-root compounds, which thus also have stress on the second unit, which in this case is not a suffix but a root.

[77] Revithiadou refers to incorporating structures as 'LexS predicates' and to compounding structures as 'LexS compounds'.

(69) (3) Root=LexS incorporations in Thompson
(cited in Revithiadou 1999: 231)

a.	kʷén=kn' 'grab s.o. by the back (of clothes)'	
	√*grasp=back* (/kʷén/, /=íkn'/)	both accented
b.	n/paw'=íkn' 'get a layer of ice on top'	
	LOC/√*freeze=top* (/paw'/, /=íkn'/)	suffix accented
c.	táx̣ʷ=yek' 'lower s.t., s.o. with a rope'	
	√*lower=rope* (/táx̣ʷ/, /=eyek'/)	root accented
d.	n/páw'=ymx_ 'the ground is frozen'	
	LOC/√*freeze=ground* (/paw'/, /-uymxʷ/)	neither accented
e.	cək=xən 'get foot chopped or cut'	
	√*hew=foot* (/cək/, /=xən/)	neither accented
f.	məkʷʔ=ús-m 'cover one's face'	
	√*wrap=face*-MIDDLE (/məkʷʔ/, /=us/)	neither accented

The pattern that is observed is that when only one unit is accented, root or suffix, this unit has stress. When neither unit is accented the default stress rule goes into effect: stress the leftmost full vowel and (if the only vowels are schwa), the rightmost schwa.[78] The case that reveals the role of headhood, in this case of the root, is when both units are accented, which shows that the root gets the stress.[79]

The role of headhood is more pervasive in the case of compound structures, in which case the suffix, being the head, always gets stress, *irrespective of lexical accents*.

Turning now to the word as a whole, Revithiadou's point of departure is that 'the morphological word is the scope of purely syntactic processes' (p. 284). She proposes that grammatical suffixes, *when functional heads*, capture the stress by virtue of their headhood, whether or not they are attached to a stem that is accented.[80]

> p. 232: [...] stress is on the root unless a plural or an intransitive marker (e.g. aspectual marker, modal marker, reflexive or reciprocal suffix) are present. Then, stress is on the plural or the intransitive suffix.

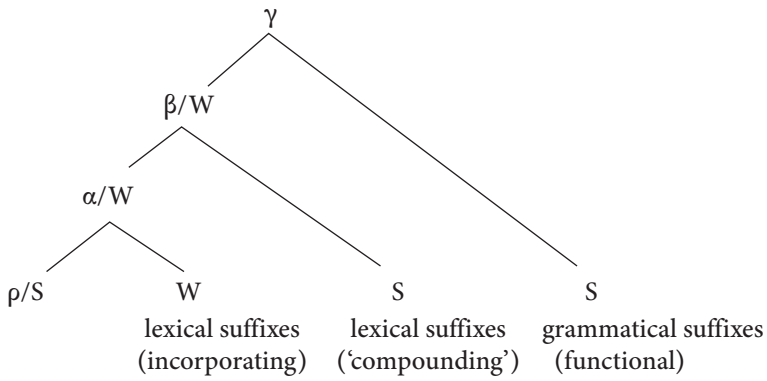
[78] This F/L pattern is formulated by several authors as an alternative to the weight-based penultimate rule that Dyck (2004) formulated for roots.

[79] Dyck (p. 216): 'However, it should be noted that in contrast to the major role assigned to it in Revithiadou's (1999) analysis of stress in other Salishan languages, lexical accent plays a relatively minor role in Squamish stress, simply because only a small minority (fewer than five percent) of morphemes in the language are demonstrably marked for accent.'

[80] Revithiadou refers to these two systems as head-dependent and stress-dependent, respectively, but I do not find these two terms helpful. The difference is rather that in the stem not all suffixes are heads, whereas all grammatical suffixes are heads by definition.

I will now show how these generalizations can be represented by assigning a S/W labeling to the phonotactic structure, which I take to be isomorphic to the structure in (68). I propose the labeling rules in (71) for the phonotactic structure in (70):

(70)



(71) a. Labeling rules for incorporating structures
$[A\ B]_{\alpha}$ B is strong *if accented*[81]
b. Labeling for compounding structures
$[A\ B]_{\beta}$ B is Strong
c. Labeling for structures with grammatical suffixes
$[A\ B]_{\gamma}$ B is Strong *if a functional head*

The fact that incorporating and compounding structures have a different labeling suggests that these domains are of a different type, which I label α and β. If grammatical suffixes define a domain that differs from the compounding suffixes in some respect (although not in stress), then the grammatical suffixes could form, as in Dyck's structure, a phonological phrase, which I label as γ.

In the α-domain, the S/W labeling is dependent on two factors, headedness and lexical accent. We could say that labeling in incorporating structure is 'accent-sensitive', whereas it is not in the two higher domains where the S/W labeling is blind to lexical accents and thus only dependent on the phonotactic head status of morphemes.

Let us now ask whether this case provides convincing support for the hierarchical resolution method in terms of the S/W labeling of the hierarchical structure. Recall that in the case of the Sahaptian languages, we found data that

[81] In the absence of an accent, a default accent is assigned.

favored the hierarchical resolution method. The rule in (71a) *could* be stated as a linear resolution strategy that selects the rightmost accent as the winner. In (71b) a strictly linear approach is not possible because there is no selection; the right-hand unit will be strong whether it is accented or not. A linear approach is even less obvious for a domain that is formed by grammatical suffixes. Here headedness is commanded by functional heads, but not by other grammatical suffixes. Again, given that linear licensing is limited to referring to accents (as in 71a) and therefore cannot see grammatical distinctions that relate to being or nor being a functional head, a licensing approach is excluded. Given that hierarchical resolution is at play in the β- and γ-domain, it is reasonable to assume that in the lower α-domain this is also the case, rather than ending up with a 'mixed' resolution system. We can add to this that (71a) conforms to the recurrent pattern that diacritically accented syllables command an S-position.

18.8 Summary and conclusions

In this chapter, I have proposed a unified account of word prominence phenomena, putting emphasis on the fact that a variety of factors contribute to prominence peaks inside grammatical words and that the phonetic manifestations of these prominence peaks can differ, depending on which factors determine them, but also simply cross-linguistically. Focusing here on the *location* of domain accents, rather than the phonetic correlates, I have distinguished between phonologically driven accentuation and morphologically driven accentuation, the main difference being, as proposed in Bogomolets (2020), the manner in which conflicts between syllabic accents are resolved, being linear and hierarchical, respectively. In phonological systems, licensing is linear, while in morphological systems licensing is linear or hierarchical. A second difference regards the role of diacritic syllabic accents, which is more pervasive in morphologically driven systems (which from this perspective are often called 'lexical accent systems'). However, the headed hierarchical structure plays a role in both phonologically and morphologically driven accent systems. In the former, headed phonotactic structure determines a prominence ranking between competing domain accents that can result from different accentual domains having their own accent. In that case, the headed structure 'promotes' (rather than selects) one such accent to be the accent that correlates with the most prominent phonetic exponents. In morphologically driven systems, on the other hand, the hierarchical structure functions as a resolution (also here called licensing) mechanism by designating 'the winner' from among diacritic syllabic accents. I have proposed that syllabic accents are variable (i.e. they are *potential* domain accents) so that selection as a licensing procedure will designate

one variable accent as non-variable. The non-licensed variable accents remain phonetically silent.[82]

An interesting correlation that was noted is that morphologically driven hierarchical licensing *only* occurs when the syllabic accents are diacritic, while purely phonologically weight- based systems always make use of linear licensing. I have suggested that the co-occurrence of phonological weight and linear phonological licensing on the one hand and diacritic, morphological weight, and hierarchical licensing on the other is to be expected, adding that the marked co-occurrence of morphological weight and phonological licensing (as in Russian) can be given a historical explanation.

I have distinguished two notions of 'domain', only one of which is relevant in words that have morphological structure. When words are morphologically structured, accent computation can take place with reference to accentual domains that are smaller than the whole word. Rather than referring to such domains as 'morphological', I have called them phonological, specifically phonotactic, to distinguish them from prosodic domains that arise at a later, more 'shallow' level of the derivation. The phonotactic structure can deviate from the morphological structure due to the fact that affixes can have phonotactic insertion frames that cause them to group with their base 'intimately' (causing integration in what I have called the α-domain) or more remotely (falling to integrate and forming what I called a β-domain). In words that are monomorphemic, or in languages in which accent assignment is not sensitive to morphological structure, we can simply say that these words project an α-domain and an isomorphic β-domain, where both domains can be subject to their own accent rule.

The second notion of domain was called the *accentual window*, which can comprise the entire phonotactic domain, in which case we say that accent placement is unbounded, or a bisyllabic subdomain (possibly extended with a satellite syllable), in which case accent placement is bounded. In both cases, accent location can be weight-sensitive or weight-insensitive (weight being either phonological or diacritic). Licensing of variable accents within accentual windows can be linear or hierarchical, although the latter type is harder to detect when the accentual window is bounded.

We have seen that delimiting the accentual window with reference to an accentual domain, does not tell us where the domain accent is because the accentual window can contain more than one syllabic accent or, in fact, it may contain no accent at all. In accent algorithms, two steps are required to determine the domain

[82] However, if in a language losing accents are 'audible,' one could suggest that the diacritic accents are non-variable; see Section 18.7.3.1. If there is an apparent winner in such a case, this effect must either be caused by the occurrence of this accent in a 'strong' position or be due to the association of an intonational element.

accent. If there is more than one syllabic accent, one has to be licensed and thus designated as the 'winner'. If the domain does not contain a syllabic accent, a word accent is established by assigning a dependency of 'metrical' structure to that domain, which designates the left- or rightmost syllable as the domain head. The D-structure is assigned in all domains, also in those that have a licensed syllabic accent, which, in that case must be the head of that structure. If the accentual window is bounded, all syllables in the accentual domain will be incorporated in the metrical structure, so that all syllables are exhaustively grouped in one metrical structure.

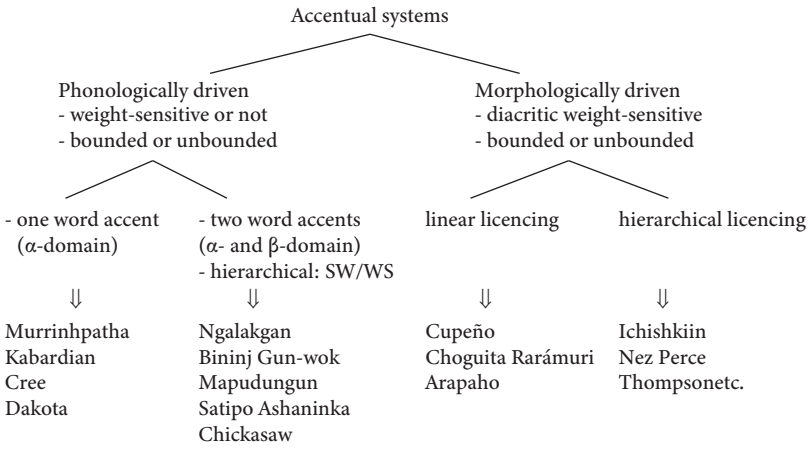
It is important to see that this D-structure is strictly phonological, i.e. it organizes syllables into a hierarchical structure in domains that either have no morphological structure or that have morphological structure that is not visible to the phonology (which may be typical for the α-domain which is prone to lexicalization). This phonological D-structure 'feeds' into a higher-level phonotactic structure which is dependent on the morphological structure (which is typical for domains 'above' the α-domain).

We have seen that the relevance of word-internal phonotactic domains is quite common, occurring also in languages such as English that do not have a highly complex morphology. We even observed that it is possible to analyse word prominence patterns in English in terms of two accent algorithms, one locating the primary stress on the right edge of the word (being guided by both phonological and diacritic weight), while the other algorithm places a 'secondary' accent on the left edge of the word. I have suggested that these two algorithms apply in the α- and β-domain, respectively. What we have seen in reviewing word prominence in a sample of polysynthetic languages is that a similar situation seems to obtain quite often in these languages. When two accentual algorithms apply, we effectively end up with two competing word accents (both non-variable due to the selection phase of each accentual algorithm) which, then, calls for a 'resolution' procedure. I have proposed that this procedure is hierarchical, appealing to the S/W labeling of the phonotactic structure of the word. This means that the headed hierarchical phonotactic structure is relevant for designating a winning accent from among variable lexical, diacritic accents and from among non-variable word accents that have been assigned by an accentual algorithm in different phonotactic domains.

Acknowledging the relevance of phonotactic domains for accent assignment opens the door to cyclic accent assignment because both the α- and β-domain can have an internal recursive structure when more than one affix is involved. We have not seen the need for recursive, cyclic accent assignment in the languages considered in this chapter. Rather, 'cyclic' accent algorithms always seem to apply

to what I called the maximal domain.[83] Nevertheless, I maintained the term cyclic for rules that apply at this maximal domain, so that we can make a terminological distinction between cyclic and post-cyclic rules, the idea being that post-cyclic rules apply to maximal domains *without* regard for any lexical information, i.e. applying as automatic processes even with potential allophonic effects, and as such they are located in the implementational component.

In Appendix 1 and 2 I summarize the partial analyses that have been proposed for the case studies in Section 18.7. In Appendix 1, I list phonologically driven systems, with one or two accentual algorithms. In the latter case the hierarchical headed structure decides which accent is most prominent. In Appendix 2, I list morphologically driven systems, some of which use linear licensing and other hierarchical licensing:



Phonological systems that access different domains in the hierarchical, morphology-based structure, rather than 'simply' assigning one word accent to 'words as a whole', make use of morphologically driven hierarchical, phonotactic structure. Morphological systems that use linear licensing 'fail' to access the morphologically-based phonotactic structure for the purpose of resolution. In a sense, we are dealing with hybrid systems in both cases, rather than systems that are purely phonologically driven or purely morphologically driven with respect to accentuation.

[83] Recall that cyclic accent assignment within the α-domain has been claimed for English to account for so-called cyclic stresses.

18.9 Appendix

18.9.1 Appendix 1

Table 18.1 Phonologically driven accent systems

Ngalakgan Bininj Gun-wok (Section 18.7.1.1)	Australian	two accent rules	α-domain: S - bounded: L - weight-sensitive: L/L - no exceptions - correlate H	β-domain: - bounded: R - weight-insensitive: L - no exceptions - correlate H, only in phrase-final words (with upstep)
Murrinhpatha (Section 18.7.1.1)	Australian	one accent rule	α-domain: -	β-domain: - bounded: R - weight-insensitive: L - no exceptions - correlate H, only in phrase-final words
Kabardian (Section 18.7.1.2)	Circassian	one accent rule	α-domain: - bounded: R - weight-sensitive: R/L - exceptions	β-domain: - (γ-domain: WS)
Mapudungun (Section 18.7.1.3)		two accent rules	α-domain: W - bounded: L - weight- insensitive: Right/Right - no exceptions	β-domain: - bounded: L/F - weight-sensitive - no exceptions
Satipo Ashaninka (Section 18.7.1.4)		two accent rules	α-domain: S - bounded: R, - weight-sensitive: Left/Left - exceptions	β-domain: - bounded: L - weight-sensitive: Right/Right - no exceptions - post-cyclic (variability)
Chickasaw (Section 18.7.1.5)	Muskogean	two accent rules	α-domain: LR iambic	β-domain: - unbounded - weight-sensitive: Right/Right

18.9.2 Appendix 2

Table 18.2 Morphologically driven accent systems

Cupeño (Section 18.7.2.1)		lexical accent system	α-domain: -	β-domain: - unbounded - diacritic weight: Left/Left
Choguita Rarámuri (Section 18.7.2.2)		lexical accent system	α-domain: -	β-domain: - bounded: L - satellite: L - diacritic weight: Left/Left
Arapaho (Section 18.7.2.3)		lexical accent system	α-domain: -	β-domain: - bounded: R - satellite: L - diacritic weight: Left/Left
Ichishkiin (Section 18.7.3.1)	Sahaptin	lexical accent system	α-domain: -	β-domain: -unbounded - B is strong iff B has an (variable) accent *on a right branch*
Nez Perce (Section 18.7.3.1)	Sahaptin	lexical accent system	α-domain: -	β-domain: -unbounded - B is strong iff B has an (variable) accent *on a suffix*
Thompson Lillooet Moses-Columbia Spokane Squamish (Section 18.7.1.4)	Salish	lexical accent system	α-domain: - unbounded - B is strong *if accented*	β-domain: - unbounded - B is strong γ-domain: - unbounded B is strong *if a functional head*

Acknowledgments

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