Chapter 1

Word Accent

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1.1. Introduction

There is a lot that most people know about the subject matter of this book. To make this clear, and to allow readers to approach the subject making use of this knowledge, I will introduce it in a rather non-technical fashion. To avoid delving too deep right at the start, I will introduce some terminology without providing explicit definitions (e.g. syllable, word) and I will use illustrative examples that clarify central properties of our subject, even though an extensive analysis of these examples may ultimately raise problems of various kinds that are not discussed here. This chapter serves a double purpose. My aim is to provide a thorough overview of one particular approach to the study of word accent, viz. **metrical theory** and also to offer a theoretical background to the other chapters in this book. My first goal involves discussing a few aspects of metrical theory that do not relate directly to any of the languages that are studied in this volume. In most cases, however, references to the other chapters will make it clear that the study of word accentual patterns in a number of the European languages, an important venture in its own right, has a direct bearing on many important theoretical issues.

As we proceed, I will introduce the metrical notational system for representing **accentual patterns** of words. In §1.2, I will not focus on notational issues as such, however, but concentrate on introducing basic terminology and discussing the relations between regular accent placement, syllable structure, lexical irregularity and the role of morphological structure. I will also address the difference and the relation between primary and secondary accent.

In §1.3 I will then move on to a more detailed discussion of **metrical phonology**. This section will present the important controversies and developments in metrical theory, especially with respect to foot structure, making it obvious at the same time that all versions of metrical phonology share certain basic premises concerning the architecture of accentual representations. §1.4 will single out a number of variants of the metrical approach that are in use in the present volume. It also presents some of the history of metrical phonology and its notational conventions. In §1.5 I will discuss the relation between accent and tone, and, more generally, the typology of word-prosodic systems including both stress- and pitch-accent systems.

The phenomena that are studied in this volume are rich and varied and this has inevitably led to a proliferation of terms. In this introductory chapter, I will use my own terminology as consistently as I can. Such consistency, however, is not maintained throughout the whole volume. In §1.6 I will therefore also discuss a number of terminological issues, as well as matters involving phonetic and phonemic transcription.

1.2. Basic concepts

1.2.1 Accent

In dictionary entries lexicographers often use a graphic symbol, adjacent to or on top of one of the letters, to indicate what is called the location of "accent" or "stress"; henceforth, I will use the term "accent(ed)" and return to terminological issues in §1.6. If a phonetic

transcription is added to the spelling form, the accent symbol is often a small superscripted vertical line which is placed before the syllable that is accented. This practice is illustrated with a few random examples from an English dictionary:

(1) escalade [ɛsk@ˈleid] ...
escalate [ˈɛsk@leit] ...
escallop [isˈkɔl@p] ...

The symbol in question is meant to provide information regarding the correct **pronunciation** of the entries. In the example at hand, the idea is that the syllable following the symbol is pronounced in a manner that makes it perceptually more "salient" than the other syllables. For the moment let us simply assume that salience is achieved by enhancing or modulating those properties that all sounds have, i.e. duration, intensity, pitch, and manner of articulation.

Right from the start, I would like to make a sharp conceptual distinction between the notion **accent**, here conceived of as an abstract property of a unit such as the word, and the **phonetic cues** (or phonetic exponents) that signal the accent to the listener. Accentual "marks" do not provide information about the phonetic cues. The first four sections of the present chapter are mainly concerned with the notion of accent and different types of accentual patterns and algorithms. Questions such as how differences in phonetic cues can be used to typologize languages, as well as whether the typology of accentual types is independent from the typology of accentual cues, will be addressed in §1.5. Chapter 6 examines the phonetic exponents of word accent in a number of European languages.[1]

The information that one must extract from the accent symbol pertains to the pronunciation of all syllables of the word, also the ones that do not bear the accent. In English, some of the unaccented syllables must be pronounced with a "lax" manner of articulation, leading to vowel reduction, possibly to schwa, a vowel quality which is never found in accented syllables. Thus, even though the symbol is introduced as a property of a particular syllable, it is quite clearly a property of the whole word, a point that is also strongly suggested by the fact that each dictionary entry is normally provided with at most one such symbol. This property of accent is often called **culminativity**. Accents are "maxima" of some kind, which implies that each accent "signals" the presence of one accentual "domain". If we take the domain to be the "word" (without attempting to define this unit here) one might say that accents function to signal the number of words in a sentence. Moreover, we can say that if two accents are detected, a word boundary must be somewhere in between. Thus, accents may play a role in parsing sentences into their constituting words. In fact, in languages where the location of accent is on a fixed syllable in the word (e.g. the first one, as in Icelandic, Hungarian and Czech), the exact boundary between words can be uniquely determined. This is what is called the (potential) **demarcative function** of accent.

The culminative property of accent implies that accent is a **syntagmatic** property, i.e. a property of the linear structure of units that form the accent domain. Syntagmatic properties contrast with **paradigmatic** properties, i.e. properties that can be present or absent on more and possibly all linearly arranged units that form a domain. Thus, vowel

frontness is paradigmatic if all vowels in a word can be front (or back) in principle. Some languages (such as most of the Finno-Ugric and Turkic languages) show a phenomenon of **vowel harmony** which involves (roughly speaking) the situation that all vowels in the word must be front or back. In such cases, frontness is in fact a syntagmatic property, rather than a paradigmatic property. One might therefore, as Garde (1968) proposes, refer to vowel harmony as accentual. From a functional point of view, harmony probably indeed helps to parse sentences, since a shift from front to back vowels (or vice versa) in principle marks the vicinity of a word boundary. Thus harmony may be said to have an identifying and demarcative function, like accent. In this volume we do not examine harmony patterns, however. We do not, then, make an attempt to study all properties of words that may serve identifying or demarcative functions.

Returning to common dictionary experience, we might note that some entries (or words), particularly those consisting of one syllable, are not provided with the accent symbol. To the user of a dictionary this causes no problems since he uses the tacit rule that in such cases the accent falls on the only syllable there is. That a monosyllable can bear accent suggests that "being accented" is not a purely relative notion. Among the monosyllabic words in English there is a majority which must always be pronounced with a full vowel quality, i.e. not a schwa, but for a small category of words (like articles), a pronunciation with schwa is perfectly possible. This appears to indicate that not all monosyllables are accented. It turns out that the second class of words, i.e. the unaccented words, always belong to closed word classes, such as the classes of articles, pronouns, conjunctions, etc.

The importance of the distinction between accented and non-accented monosyllables becomes clear if we consider the pronunciation of utterances. In probably all languages, utterances are provided with an **intonational melody** (Bolinger 1978). The manner in which the pitch movements that make up this melody are lined up with the words in the utterance expresses information regarding which parts of the utterance are "important". In addition, intonation contours also provide cues bearing on the overall syntactic and semantic structure of utterances, i.e. the grouping of words into meaningful "chunks".

In English, perceptual salience is given to the important parts of an utterance by lining up the accented syllables of certain words with specific pitch targets. These pitch targets can be represented in terms of intonational **tones**. For example:

```
(2)        Harry wrote [A LENGTHY INTRODUCTION]
                                        |
                                        H
```

Let us assume that the above utterance is an answer to the question: What did Harry write? The important part of the utterance is then *a lengthy introduction*. We say that the phrase in question is **in focus** and we use capitalization to graphically signal the focused phrase. The point of interest to us is that the pitch peak, which designates this part as important, is lined up with a particular syllable in the relevant phrase, more specifically with a particular syllable of the word *introduction*. This is also the syllable that the lexicographer would represent as being accented. In English, it would be inconceivable to

line up the pitch peak will the syllable *tro*. The reason is that this syllable does not bear the accent.

Note that if we line up the H tone with the accented syllable of the word *lengthy*, the relevant utterance would more likely be an answer to the question: "what kind of introduction did Harry write?" In the answer to this question, the phrase in focus is *lengthy*.

The example in (2) shows that an intonational tone that signals focus associates with a specific word in the relevant phrase. Speakers of English, then, must know which word in a focused phrase will make its accented syllable available for this function. Looking at (2) one might suggest that it is the last word in a focused phrase that does this, but matters are not that simple. Here we will not be concerned, however, with the regularities that are at play at the intonational level. I refer to Fuchs (1976), Gussenhoven (1984a), Baart (1987) and Selkirk (1984, 1995) for extensive discussion of these issues. One of the relevant rules will be mentioned, however.

The association locus of intonational tones could be referred to as the **phrasal accent**. Thus, a particular syllable that carries the **word accent** can at the same time carry a phrasal accent. In this view, intonational pitch movements are phonetic cues of intonational tones that associate to phrasal accents if the relevant phrase is placed in focus. If the same phrase is uttered without being focused, the phrasal accent is still there, and possibly has phonetic cues, but it will not be associated to an intonational tone. This fact shows that syllables can be accented with reference to several inclusive domains, i.e words and phrases.

Words that belong to closed classes and that are unaccented do not, and in fact cannot function as association loci for intonational tones that signal focus on phrases that these closed class words are properly contained in. They can only bear intonation tones if they are themselves placed in focus, as in the following utterances:

```
(3) I didn't say [A] long introduction, I said [THE] long introduction
                   |                                  |
                   H                                  H
```

In this case, the unaccented word is not properly contained in a focused phrase, but rather forms a focused phrase by itself. In such cases, it would seem that an accent is forced onto the word, which is then typically pronounced with a full vowel.[2]

Words belonging to closed classes may have two variants, one accented and one unaccented. This is rather typical for pronouns. In this case, the accented variant will be used if the pronoun stands in the right place in a focused phrase that it is properly contained in or if the pronoun itself forms the focused phrase. Often the term (phonological) **clitic** is applied to the category of unaccented (variants of) words. See also chapter 3.

A natural question at this point is whether polysyllabic words must have an accent, or, put differently, whether phonological clitics must be monosyllabic. We observe that in English and in many other languages there are no polysyllabic words that contain only syllables with a schwa. I will not go into this issue any deeper here.[3]

So far we have assumed that in polysyllabic words only one syllable is accented. Staying with lexicographic practices a little longer, we now draw attention to the fact that in some dictionaries a second symbol is used to indicate what is called **secondary** or **non-primary** accent. When words are sufficiently long, even more than one non-primary accent can be found, as some of the words in (4) below show. For English, we find this practice in words like the following (taken from chapter 8.2):

(4)		
	húrricàne	ìnstruméntal
	télephòne	ìnstrumèntálity
	páradìse	èlèctrícity
	àpalàchicóla	sènsàtionálity
	còmpensáte	còmpensátion

The desire to mark non-primary accents stems from the fact that not all syllables lacking the primary accent are felt to be equal in salience. In English, for example, syllables marked with a non-primary accent symbol cannot have a pronunciation with a schwa-like vowel. They have a full-vowel quality, a property which they share with primary accented vowels. Still, such syllables are felt to be less salient than the primary accented syllable and furthermore they normally fail to function as anchor points for intonational tones.[4]

Opinions sometimes differ with respect to the location of syllables that bear non-primary accent. This is especially so if non-primary accented syllables do not manifest clearly detectable phonetic cues and one therefore has to rely on impressionistic judgements or "intuitions". Differences in opinion with respect to the location of non-primary accents may of course also be due to the fact that the location of these accents is unstable, dependent on the phrasal context in which a word occurs or performance factors such as speech style, rate of speech and so on.

Disagreement with respect to primary accent location is untypical.[5] If there is disagreement about primary accent location this usually means that there are two possible primary accentuations of the word. Consider the following examples from Dutch:

(5)				
	hélsinki	-	helsínki	'Helsinki'
	chímpansee	-	chimpansée	'chimpansee'

Usually in such cases one of the accent locations is exceptional whereas the other is a regularized form. The initial accentuations in (5), for example, violate the rule in Dutch that primary accent cannot lie to the left of a penultimate closed syllable. But even for primary accent location systematic disagreement sometimes occurs, especially if the language lacks clearly detectable phonetic cues (cf. the studies in Odé & van Heuven 1994 on accentual patterns in Indonesian).

In some lexicographical works, symbols are used to distinguish among the non-primary accents, thus leading to notions such as secondary accent, tertiary accent, and so on. Others claim that the three-way distinction between primary accented, non-primary accented (i.e. secondary) and unaccented is sufficient.

In our discussion so far, the notion accent is crucially connected to the notion domain, i.e. an accent signals the presence of some domain. For example, primary accents signal the word domain and phrasal accents signal the phrasal domain. Given this

understanding of the notion accent, secondary accents must be properties of a domain that is smaller than the word. An alternative is that it is altogether wrong to refer to the salient syllables that do not bear primary accent as accented. One could, for example, argue that these salient syllables reflect something like a "rhythmic pattern", which is quite different in nature from an accentual pattern. I will return to this issue in §1.4.4, and for the time being proceed on the assumption that non-primary "accents" are indeed accents. This forces us to postulate a non-primary accent domain, which we will refer to as the **foot domain** (or, for short, the **foot**).

Before we continue I will introduce a notation for our findings so far:

```
(6)   3                                x        <- phrase accent
      2     (x                         x     )  <- word accent
      1     (x          (x             x     )  <- foot accent
      ∅     (x     x)   (x     x)      (x    x)  <- accent-bearing units
        σ    σ     σ     σ     σ      σ    σ
        a  lengthy     in tro    duc tion
```

The levels are numbered for convenience. At the lowest level, we mark all syllables that could bear accent. This is where clitics are excluded.[6] Then at level 1 we mark accents that signal feet; the syllables that form feet have been indicated as constituents on level 0 by placing brackets around them. Repeating this procedure, we represent those feet that form a word at level 1, i.e. we put them in brackets and mark primary accent at the next level, i.e. level 2. Words that form phrases receive the same treatment. The hierarchical structure in (6) will be referred to as a **bracketed metrical grid**.

Chapter 2.4 and chapter 3 address the metrical structure of phrases and the influence that phrasal patterns may have on lower levels, so called top-down effects, but most studies in this volume are mainly concerned with accent distribution up to and including the word level. We will see that languages may differ in principled ways with respect to the organization of the metrical grid.

1.2.2 Syllable weight

So far we have implicitly assumed that the accent rule assigns an accent with reference to the word edge only. Now consider the following example:[7]

```
(7)   Rotuman :  Primary accent falls on the final syllable if this
                 syllable contains a long vowel, otherwise it falls on
                 the penultimate syllable (Churchward 1940: 75)
      Yapese  :  Primary accent falls on the penultimate syllable, if
                 the final is closed and the penultimate is open,
                 otherwise it falls on the final syllable (Hayes 1980:
                 65-66)
```

Accent rules that are sensitive to the structure of the syllables are usually called **quantity-sensitive**. This term suggests that the accent rule is primarily sensitive to **vowel length** distinctions. The Yapese example shows that next to vowel length, syllable closure attract the accent as well. Vowel length and syllable closure can both make a syllable "heavy" or "accent-attracting". Below we will see that quantity and closure are probably

independent factors that determine heaviness, and that there are still other accent-attracting properties that syllables may have that can play a role as well. Hence, it is better to adopt the more abstract term **weight-sensitive**, rather than quantity-sensitive. Generally, only two weight categories matter. These are called **heavy** (long vowels, closed, etc.) and **light** (absence of these properties).

In §1.2.2.1 I will briefly discuss the factors length and closure in relation to the internal structure of syllables and mention other weight-factors in section §1.2.2.2.

1.2.2.1 Quantity and syllable closure

Except for a number of specific cases, weight never depends on the presence or complexity of the pre-vocalic part of a syllable, called the **onset**.[8] I will maintain here that only properties of the remainder of the syllable, called the **rhyme**, are directly relevant for accent distribution. It is often assumed that accents are assigned to syllables, but given the irrelevance of onsets, we could just as well completely ignore the notion syllable and deal with rhymes only. In my view, the onset-rhyme split is primarily motivated on the basis of phonotactics. Saying this, however, is not answering the question why onsets are irrelevant to weight.

A common remark in works on syllable structure is that syllables have a characteristic **sonority profile**. What sonority is is not discussed here, since that would lead us into a treatise on the internal structure of segments. We simply assume that segments differ in their degree of sonority and that this degree can be "read off" from their feature structure (for a possible view, see van der Hulst 1994a,b, 1995). We can distinguish major sonority classes, such as vowels, sonorant consonants and obstruents, and minor subdivisions, such as low vs. high vowels, liquids vs. nasals, fricatives vs. stops, voice obstruents vs. voiceless obstruents, and so on.

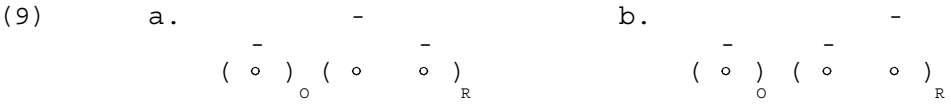
We will say that the sonority profile of a syllable can only contain two sonority peaks if these are adjacent. I define a **peak** as a segment which is not followed by a segment with a higher degree of sonority. In accordance with this, (8a) cannot be a single syllable, since it has two non-adjacent peaks, whereas (8b) can ("∘" stands for segment, and "-" indicates relative degree of sonority):

```
(8)      a.      -     -            b.      -
              -     -                      -     -
              ∘  ∘  ∘  ∘                   ∘  ∘  ∘
```

Note that in (8b) the third segment, even though its sonority is as low as that of the initial segment, counts as a sonority peak by our definition because it is not followed by a segment with a higher degree of sonority. The part of the syllable that has been called the onset, then, is the sonority slope rising toward the first peak. The notion of peak does not clash with the idea that the onset-rhyme cut is a useful and necessary one for phonotactic reasons. But if we say that peaks are relevant to accent, we have found a reason for the onset's irrelevance to weight.

It necessarily follows from the above definition of peak that if there are two peaks that differ in sonority, the one with the highest sonority comes first:

(9) a. b.

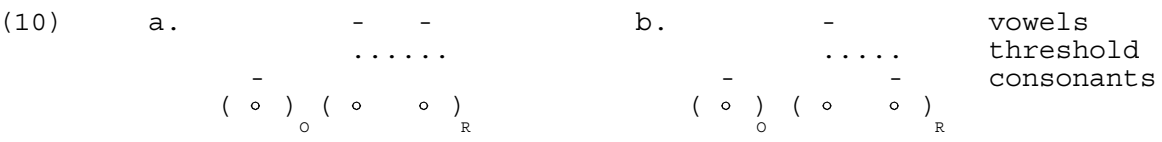


This implies that syllables such as in (9b) cannot exist. This is not an uncontroversial claim, but I will leave this matter for future research.

I now wish to show that only sonority peaks may contribute to weight. Introducing another commonly used term let us say that a sonority peak that contributes to weight is called a **mora**.

With reference to the structure in (9a), we can say that whether a second peak counts as moraic or not is dependent on its sonority degree. Consider the difference between languages in which syllable closure contributes to weight and those in which only vowel length produces a heavy syllable. For the purpose of this example, we take vowels and consonants to be two major sonority classes. If only vowels contribute to weight we might say that the "threshold" for moraicity is set minimally on the sonority degree that vowels have. In the former case, where both long vowels and closed syllables contribute to weight, the threshold is set so low that consonantal peaks count as moraic:

(10) a. b.

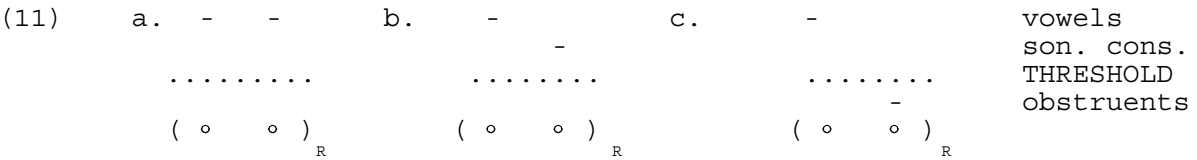


In this view, moraicity is viewed as a "label" assigned to positions in the rhyme. The first segment in the rhyme is universally labelled as moraic whereas the second is labelled as moraic depending on the moraic threshold value that is set for a particular language.[9]

By defining moraicity in this way we predict that if consonants are moraic, the second half of long vowels will be too, an implication suggested in Jakobson (1937) and Trubetzkoy (1939) and generally held to be valid.[10]

The approach to syllable weight just sketched predicts that the division between heavy and light syllables can be made in different ways in different languages, so that, for example, syllables with long vowels, and those closed by sonorant consonants count as heavy, while syllables with short vowels, possibly closed by an obstruent would be light:

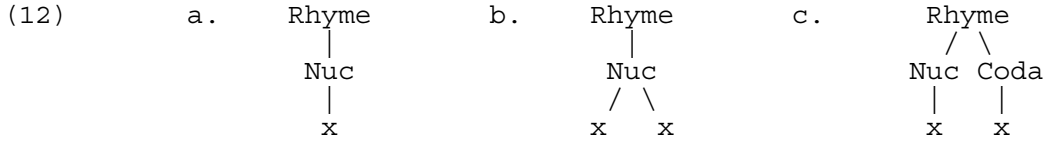
(11) a. b. c.



For Kwakw’ala it has been argued that, apart from long vowels, only closing sonorants produce a heavy syllable (Bach 1975; Hayes 1995:297); Zec (1988) also discusses sonority divisions of this type.

The above account of weight differences does not presuppose an internal organization of the rhyme. As an alternative to specifying a threshold condition for mora-status, we might appeal to further structuring of the rhyme into nucleus and coda:

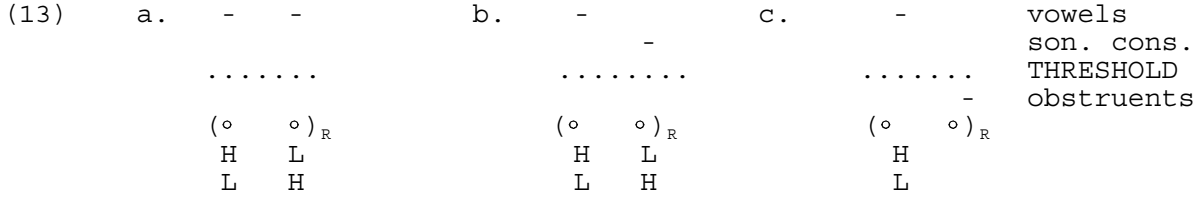
(12)



The threshold for moraicity could in this situation be considered as a threshold for nucleus membership, i.e. for consonants to occur in the second nuclear position. In this view, only segments occurring in the nucleus would count for weight-purposes.[11] In other words, what is called **moraic** in the rhyme-only theory is called **nuclear** in the alternative in (12).

Apart from playing a role in determining weight, moras are also relevant for **tone assignment**. In languages that employ lexical tone, a distinction between monomoraic and bimoraic rhymes plays a role in that only the latter can occur with a sequence of two tones forming a tonal contour. In such cases, it is in fact typical that in order for the vowel-consonant sequence to count as bimoraic, the second consonant must be a sonorant, examples being Limburgian dialects and Lithuanian (cf. chapter 5, chapter 9.2 and chapter 12.2). In Lithuanian, syllable weight plays no role in accent assignment.[12] There is a contrast between rising and falling tones on accented bimoraic rhymes, which is absent on short vowels and on short vowels followed by an obstruent:

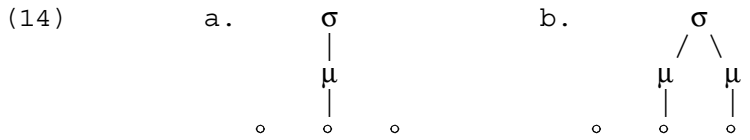
(13)



Appealing to moras does not, strictly speaking, explain why a contrast between H and L is impossible on a monomoraic rhyme in Lithuanian. This would only follow from a further assumption, viz. that tonal realizations of accent must be contours. If that is the case, monomoraic accented rhymes have to remain toneless and be realized at neutral pitch.

I have so far regarded moraicity as a label of certain segments in the rhyme. It has more recently been proposed that the mora is a **constituent** of the syllable. This so called mora theory of the syllable has a few variants (Hyman 1985; Hayes 1989), but the prevalent idea appears to be that the difference between monomoraic (closed) and bimoraic syllables is represented as in (14):

(14)



At least for purposes of accent assignment, it seems to me that this theory offers no advantage to either of the two rhyme theories presented above.[13]

The above discussion is meant to clarify some of the issues surrounding the role of syllable structure in accent assignment and accent realization. We suggest that weight (involving vowel length and syllable closure) is simply a matter of looking at the (number of) moraic segments in the rhyme. If moraicity plays a role in accentuation, the first rhyme element (a vowel) will universally count as a mora. Whether the second segments counts as a mora too is dependent on the mora threshold (or the nucleus threshold) that is set for the language, or even rule in question. The claim that weight-sensitivity involves a binary opposition will have to follow from the independent claim that rhymes contain at most two segments (cf. Kaye, Lowenstamm & Vergnaud 1990).

1.2.2.2 Other weight factors

We encounter weight-sensitive accent rules that appear to separate heavy from light syllables in other ways than we have seen so far:

(15)

	heavy	light	possible examples
a.	full vowel	reduced vowel	East. Cheremis; Hayes 1995:296
b.	high tone	low tone	Golin; Hayes 1995:278
c.	lower vowel	higher vowel	Mordvin; Kenstowicz 1994b
d.	glottal closure	other	Cahuilla; Hayes 1995:132 ff.

Perhaps there are more types. These cases do not seem to involve mono- vs. bimoraicity, but rather have been said to involve **prominence** (Hayes 1995). Thus, rhymes with full vowels, high tone, lower (and thus more sonorous) vowels, or rhymes with a complex vowel involving glottalization count as "more prominent" than their respective counterparts.

Given my use of the term weight rather than quantity for the cases discussed in the previous section, we can take prominence to be one of the manifestations of weight, i.e. regard weight as an abstract notion that may be instantiated in many different ways, including quantity, syllable closure, and the properties in (15).

The way in which I represent the weight-sensitivity of accent rules will be discussed in §1.2.[14]

1.2.3 Fixed accent, free accent and morphology

1.2.3.1 Primary accent

Limiting our attention to primary accent and proceeding on the basis of what most readers (tacitly perhaps) know, let us return to the example in (1), repeated here for convenience:

(16)

escalade	[esk@ˈleid] ...
escalate	[ˈesk@leit] ...
escallop	[isˈkɔl@p] ...

Why is it, one may ask, that accents are indicated on a word-by-word basis in English dictionaries? Some readers may be aware of the fact that such usage is generally not found

in dictionaries of Turkish, Polish or Finnish. The reason for this difference is simple. In these latter languages, all or most words have their primary accent located on the same syllable:

(17) Turkish: final syllable (cf. §1.3.8.5)
Polish : penultimate syllable (cf. §1.3.8.1 and chapter 11.1.6)
Finnish: initial syllable (cf. chapter 7.2.2)

One only has to know the "rule" to be able to pronounce each word correctly in these languages. The location of accent in all three cases can be expressed with reference to (the distance from) the word edge. Systems in which the location of accent is rule-based are called **fixed**. I also include in this category the cases in (7) where syllable weight plays a role.

Where does English fit in? For English word accent, it is not so easy to find a rule. If the location of primary accent is rule-governed, the rule cannot be simple and must have many exceptions. This state of affairs has led lexicographers to their decision to mark the accent for each word. Sometimes, it has been claimed that languages like English indeed have no rule, implying that the accent for each word must be learned (e.g. by the language-learning child). This has been referred to as **free accent**.

The reader might wish to know at this point where morphology enters the picture, realizing perhaps that morphologically complex words may have accentual patterns that are predictable in the sense that even though for each morpheme (and thus also underived words) accent is unpredictable, primary accent will be on the rightmost or leftmost morpheme in case the word is complex. Below we will argue that such cases indeed exist and hence that the terms fixed vs. free accent refer to extreme situations that do not exist in any real language in a pure form. If, for example, we take fixed accent to mean that the location of accent is located in accordance with a rule that refers to word edge (and syllable weight) and nothing else, in all words (simple and complex) of the language, we may have a hard time finding a language that meets this description; cf. Anderson (1984).

First of all, most, if not all, languages have at least some (simple) words that fail to conform to whatever the rule is. In Polish, for example, which has regular penultimate (PU) accent, we find words that have their accent on the antepenultimate (APU) syllable and also some that have ultimate accent (U):

(18)

a. Regular - PU	b. Irregular APU	c. Irregular U
marmólad	uniwérsitet	reżím
‘marmelade-GEN-PL’	‘university’	‘regime’
wiósna	gramátyka	menú
‘spring’	‘grammar’	‘menu’

One’s first reaction might be to say that the irregular words are loans, thus implying that their deviance does not affect the claim that Polish has fixed accent. But if these exceptional cases are otherwise pronounced in accordance with the phonetics of the language, if they are in normal use because there are no "non-foreign" equivalents and if, to put it sharply, it is only the special accentual pattern that makes these words recognizable as loan words, we have to seriously consider regarding them as an integrated part of the accentual system of the language. For the time being, let us assume that

exceptions as in (18b) and (18c) are dealt with by giving the syllables that are unexpectedly primary accented a mark in their lexical representation. In the next section I address the question what the nature of such marks might be.

Sometimes exceptions might form a subsystem of some kind, and so it might be said that one language has more than one regular pattern (cf. §1.3.8.5 on Turkish). It may turn out that these subsystems can be independently characterized in terms of some non-accentual property, i.e. a specific word class. Thus, we might encounter languages in which nouns are accented differently from verbs and adjectives. In such cases we need no lexical marks, but rather two accent rules that are sensitive to word class.[15]

If non-phonological factors such as word class can be determinants for accent placement, we need to re-examine languages in which accent is claimed to be completely free.

English, for example, turns out not to have a free accent system, as many years of research have revealed, because different word classes have somewhat different regularities (cf. note 15). The rule-based character of English accent becomes clearer if one broadens the set of factors that accent rules may be dependent on, to include morphological structure and, in particular, different classes of affixes.[16]

An additional reason that has been mentioned for not classifying English as a free-accent language is that it has been observed that the occurring patterns (including those of "exceptional" words) are almost entirely limited to ultimate (U), penultimate (PU) and antepenultimate (APU) (except in cases of so-called accent-neutral affixes). If pre-antepenultimate (PAPU) is lacking and the relevant language has words that exceed the number of three syllables, this is a fact that calls for an explanation, which is tantamount to saying that even the class of exceptional words obeys some sort of system. I discuss such regularities in §1.3.8.

We now return to a perhaps more extreme case of free accent. Russian has often been put forward as an example of the situation we mentioned above: the location of accent must be marked lexically per morpheme on some arbitrary syllable (i.e. is free) but when morphemes are strung together to form words a rule will decide which of the lexically marked syllables will receive the primary (i.e. word) accent (cf. chapter 11.3).[17] Thus, in such a free system there still is a regularity if we consider words that are morphologically complex. Languages of this type have been called **lexical accent languages**. I return to such systems in §1.3.7, where I also raise the question concerning the inclusion of lexical accent systems in a metrical theory if foot structure is not involved in these systems.

The discussion so far reveals that morphology plays an important role in characterizing the accent location as fixed or free. With respect to this, we have to make a distinction between affixation (inflection and derivation) and compounding.

In a fixed accent language like Polish, primary accent is on the penultimate syllable, irrespective of morphological structure (and ignoring exceptions). That is to say, no matter how many suffixes are added to the word, accent is never further away from the right edge than two syllables (again ignoring exceptions). In Polish, then, affixational morphology does not interfere with accent.

In other languages, however, words that have undergone affixation often deviate from the rule for underived forms. A language might have final accent in each root

morpheme and thus in all monomorphemic words, but through the addition of suffixes, words can end up not having final accent. In that case the suffixes are called **accent-neutral**. It is also possible that some suffixes are integrated in the domain that receives final accent whereas other suffixes are accent-neutral.[18] Finally, independently of the integrating/accent-neutral distinction, affixes may have accentual properties of their own. Such affixes may be marked for receiving the primary accent, or they might determine the primary accent location in some other way (by being pre- or post-accenting, for example). In practice, if most affixes behave like this and there is no clear accent rule for stems, we end up with the situation found in Russian.

If whole classes of affixes behave consistently with respect to accentuation (i.e. either integrate in the accent domain or are outside of it), a model of morphology-phonology interplay known as **Lexical Phonology** can be motivated. In a model of this type, rules for primary accentuation apply after integrating affixes are added to the stem, and before accent-neutral affixation; cf. Borowsky (1992) and Booij (1993) for recent discussions of this kind of approach and chapter 8.3.5, for an application of such a model to Dutch.

Having discussed affixation, we now turn to compounding. As will be shown in chapter 3, members of compounds behave like independent domains for accent in many languages, although it is possible that compound members fuse into one domain. Both types can occur in one and the same language (cf. chapter 3). A question that is raised by the first type is the following: when both members form independent domains for primary accent, an extra grid layer will have to represent the so-called compound accent. The question is whether this layer is distinct from the layer of phrasal accents. I illustrate this with the following Dutch compound:

```
(19)  3      x                                        <- phrase accent
      2     (x                          x)            <- word accent
      1     (x          x)     (x       x)            <- foot accent
      ∅     (x     x)   (x)     (x     x)   (x)       <- accent-bearing units
         [[ σ     σ     σ ]   [ σ     σ     σ ]]
            al    ma   nak     com   mi    tee
           'almanac committee'
```

The rule that determines the location of the compound accent can be different from the rule that determines the phrasal accent. In Dutch, for example, accent in noun compounds is on the left member, whereas this is not the case for phrasal patterns. It would seem that **post-lexically** primary word accent of non-compound words and compound accent are treated as the same.[19]

1.2.3.2. The nature of lexical marks

We might ask what the nature is of the marks that we assign to syllables that receive primary accent due to lexical marking rather than their location or inherent weight properties. I have appealed to such marks in two types of cases. In a case like Polish exceptional words (cf. 18 above), the marks are used to interfere with the assignment of a regular accent rule. In the other situation, as found in Russian, there appears to be no

regular accent rule at the level of underived forms so that morphemes need a mark in order to receive primary accent.

Do we regard both types of marks as primary accents themselves, lexically assigned, or as entities which are distinct from primary accents? I will return to this issue in §1.3.7 §1.3.8, but we can note here that these marks are not to be regarded as lexically specified primary accents for the simple reason that in case more than one occurs in a (morphologically complex) word, only one of them shows up as being primary accented. It therefore seems more appropriate to compare these marks to syllable weight, since the marks in fact partition the set of syllables into two categories, such that an unmarked syllable (just like a light syllable) only receives primary accent in the absence of competition with a marked syllable. Moreover, the mark, like weight, does not necessarily imply primary accent. The marked syllable must be in the right position to be primary-accented. If, for example, as in Russian, more than one marked syllable is present, the rightmost marked syllable is primary accented. For this reason, we might actually describe the marks as **diacritic weight**.[20]

1.2.3.3 Non-primary accent

The discussion of free versus fixed accent has so far been limited to the location of primary accent. One might wonder whether the fixed/free opposition applies to non-primary accents as well. In many cases, the position of non-primary accents is rule-based (thus fixed). The simplest case is that in which these accents form an alternating pattern moving away from the primary accent, or sometimes moving toward it (henceforth, I represent level 0 of the metrical grid with the symbol σ):

```
(20)      a.                  x          b.                  x
                 x     x     x                  x     x     x
          σ (σ   σ)(σ   σ)(σ   σ)            (σ   σ)(σ   σ) σ (σ   σ)
          <<<<<<<<<<<<<<                     >>>>>>>>>>>>>>>
```

I will discuss many details of footing, both weight-sensitive and insensitive, in the next section. Let us agree for the moment that the location of non-primary accents in cases like (20a) and (20b) is fixed.

I am not aware of any system in which the location of non-primary accents in words that lack morphological structure is lexically determined (thus free). This is a significant fact, which will have implications for the way in which we wish to analyse non-primary accents, a matter that I discuss in §1.4.4.

The question could be raised whether the location of non-primary accents can be dependent on morphological structure. The answer to this question is affirmative, although the location of non-primary accents is dependent not so much on morphological structure itself, as on the location of the primary accents of the words that are embedded in complex words. This is seen most clearly in the compound cases that we have discussed in §1.2.3.1, in which embedded primary accents surface as non-primary accents postlexically. Thus, the location of non-primary accent in these compounds is dependent on the location of the primary accent in the units that they are composed of (which does not imply that

the accentual structure of compounds is always in accordance with this principle; cf. chapter 3).

The question is whether non-primary accent locations of complex words that do not involve compounding can also be dependent on the accentual patterns of their parts, even in those cases in which the complex word forms one accentual domain (i.e. one prosodic word). It has been argued that this is indeed possible.

In such cases, primary accents of words can surface as secondary accents when these words are embedded through affixation. It is crucial, of course, to show that the location of such "persistent" accents does not accord with the fixed non-primary accent pattern that underived words have in the language at issue.

Suppose, for example, that primary accent is final and that in three-syllable underived words non-primary accent falls on the first syllable. If, in such a case, a form that is derived by the addition of a monosyllabic suffix has non-primary accent on the penultimate syllable, this case would clearly reveal the influence of the embedded word:

```
(21)   a.          x          b.                x
             x     x                      x     x
           [ σ  σ  σ]                [ [ σ  σ  ]  σ ]
```

We could call the non-primary accents in (21) persistent. The usual term is **cyclic**, alluding to the way the overall pattern can be derived. The accent rule can be made to apply to each successive morphological domain, i.e. apply in a cyclic fashion.

It is important to observe that cyclic accents occur only in languages in which the rule for primary accent location is sensitive to lexical marks (i.e. has lexical exceptions), and not in languages in which accent location is free of lexical irregularities. This might imply that in the latter type of language the accent rule does not apply cyclically, but the question arises why this should be so. An answer could be that the accent rule does not actually apply cyclically in the former case either, i.e. that accent rules never apply cyclically, but that the primary accent locations are dependent on lexical marks in the whole vocabulary despite the fact that some regularity is present.[21] This would reduce languages that have cyclic secondary accents (like English) to lexical accent systems (like Russian); cf. Gussenhoven (1991, 1992). A further possibility is that the phonetic exponents of the cyclic accents are simply incorporated in the phonetic form of the morphemes (i.e. as actual heavy syllables), a position that Kager (forthcoming c) adopts.

1.3. Metrical theory

1.3.1 The lexicographic practice

Limiting the attention to primary accent again, we have come across five types of accent rules:

(22) a. Weight-insensitive
French : final syllable
Polish : penultimate syllable
Finnish : initial syllable

b. Weight-sensitive
Rotuman : final in case of σh], penultimate otherwise
Yapese : penultimate in case of hl], final otherwise

A variety like this raises the question what other types are possible. I postpone a discussion of weight-sensitive systems and first consider the full array of attested weight-insensitive systems:

(23)

Left		*Right*		
initial	*postinitial*	*final*	*penultimate*	*antepenultimate*
Czech	Dakota	Turkish	Polish	Macedonian
Finnish		French		

In a typologically impressionistic survey, Hyman (1977) counts more penultimate than initial cases, final stress coming in third place. Postinitial and antepenultimate are rare. Hardly any cases of accent falling on the antepenultimate syllable have been reported.[22] At this point we will not be concerned with frequency of occurrence but focus on possibilities.

Initial and final accent could be accounted for by primary accent rules that seek out edges of the accentual domain. Such rules would construct elementary metrical grids as in (24), i.e. bracketless grids lacking level 1:

(24) a. x b. x
(σ σ σ σ σ) (σ σ σ σ σ)

But what about postinitial, penultimate and antepenultimate accent?

Let us first focus on the observed asymmetry between left edge accent and right edge accent. Whereas the latter seems to be able to "reach" the third syllable from the edge (as in Macedonian), postpostinitial accent is hardly ever attested. Even though only few examples of fixed antepenultimate accent occur, we will see in §1.3.8 that this location is frequently found in the exceptional vocabulary of languages that have fixed penultimate accent. A theory of accent placement must not only account for this asymmetry, it must also account for the fact that weight-insensitive fixed patterns other than those in (23) are never found. If primary accent placement were unrestricted, in the sense that any syllable that is at a fixed distance from the word edge could be reached, we would expect to find languages having accent on the fourth syllable from either the left or right edge, or in the middle.

We therefore need a mechanism for primary accent placement that will not allow us to construct such cases. Let us first consider what would not be an appropriate mechanism. Suppose we formulate primary accent rules that literally place an accent mark on a particular syllable, i.e. as implied in connection with (24). We will call this the lexicographic practice. A first drawback of this theory is that it fails to account for the fact that words can have only one primary accent, i.e. it does not account for the culminative

property of accent. The theory of accent placement proposed in Chomsky & Halle (1968) has the same drawback. This is the lexicographic practice in a formal disguise, which acknowledges a segmental feature [±accent] (or rather [±stress]), formally identical to other segmental features such as [±round] and [±sonorant]. The lexicographic practice, then, does not explain the culminative character of accent. No aspect of that theory prevents us from assigning an accent mark to the first and last syllable, or indeed to every syllable in the word.

The lexicographic practice also does not account for the ways in which accent can exhibit its edge-preference (i.e. the demarcative property). If the rules in (25a) are necessary to construct the representations in (24), we can formulate the rules in (25b) for the other cases in (23) just as easily. But what, then, will stop us from going on, so to speak, and formulate rules as in (25c)?

(25)

a. i.	σ	->	x σ	/	-)	(Turkish)
ii.	σ	->	x σ	/	(-	(Hungarian)
b. i.	σ	->	x σ	/	- (σ))	(Polish)
ii.	σ	->	x σ	/	- (σ (σ)))	(Macedonian)
iii.	σ	->	x σ	/	((σ) -	(Dakota)
c. i.	σ	->	x σ	/	- (σ (σ (σ))))	(Unattested)
iv.	σ	->	x σ	/	(((σ) σ) -	(Unattested or doubtful)

The lexicographic practice is clearly inadequate as a theory of primary accent placement. Its inadequacy also emerges when we consider the full accentual pattern including non-primary accents.

We have noted that the distribution of non-primary accents is rule-based and non-random. Leaving aside cyclic accents and weight sensitivity, non-primary accents basically show an alternating pattern in which stretches of unaccented syllables larger than two (so-called **lapses**) and accent on adjacent syllables (**clashes**) are avoided (cf. chapter 3 for a further discussion of these notions). Thus, languages may be said to have a binary (26a) or ternary rhythm (26b) at the lowest level of the rhythmic organization, but not quaternary rhythm (26c):[23]

(26) a.
```
x   x   x   x   x
σ σ σ σ σ σ σ σ σ
```
b.
```
x     x     x
σ σ σ σ σ σ σ σ σ
```
c.
```
x       x       x
σ σ σ σ σ σ σ σ σ
```

In the previous section we have suggested that rhythmic non-primary accents can be regarded as properties of a domain that is smaller than the word, which we called the foot.

It would seem, then, that we must construct a set of algorithms for assigning foot structure. These form the central core of what is known as metrical theory. We will turn to this in the next section. It will become clear that the presence of foot structure enables metrical theory to reduce primary accent rules to rules placing primary accent on the rightmost or leftmost "foot accent":

(27) Primary accent rules

i.
```
          x              2
x  ->    x  /  - )      1
```
ii.
```
          x              2
x  ->    x  /  ( -      1
```

We will also see that metrical theory explains the culminative nature of accent, i.e. its once-per-domain-occurrence[24], by viewing accents as heads of these domains. Thus, non-primary accents will be represented as heads of feet, and primary accents as heads of words. On the assumption that domains can have no more than one head, culminativity follows.

1.3.2 The foot

I will start the discussion with the form of and the motivation for the category **foot**. The term foot will be familiar from the study of poetic meter. Poetry can, as we know, make use of a number of different foot types, among which the **trochee** and the **iamb** are the most familiar ones. Both metrical foot types combine two syllables. In this sense, trochaic and iambic feet are **bounded** or **binary constituents**. The difference between them lies in their **salience pattern**. In trochaic feet, the first syllable is more salient than the second and in iambic feet the opposite relation holds. In some theories of poetic meter, one finds the following notation for trochaic and iambic lines of verse (cf. Hayes 1983):

(28) a. Trochaic line

```
  S  W    S  W    S  W    S  W    S  W
( σ  σ )( σ  σ )( σ  σ )( σ  σ )( σ  σ )
```

b. Iambic line

```
  W  S    W  S    W  S    W  S    W  S
( σ  σ )( σ  σ )( σ  σ )( σ  σ )( σ  σ )
```

There is a suggestive resemblance between the metrical organization of verse lines and the accentual patterns of words. If we focus on the edges of lines, we may note that because of the bounded nature of trochaic and iambic feet (i.e. their limitation to two syllables), the right or leftmost salient syllable will be peripheral or near-peripheral. Thus, a line cannot end in ...sWWWWW. This is reminiscent of the (near-)peripheral character of primary accent.

In this respect, lines of verse are like words and the beginnings and endings of the lines in (28) correspond to initial, post-initial, penultimate, and final locations of accented syllables, respectively.

Metrical patterns correspond to accentual patterns in yet another way. The salient syllables are not distributed randomly, but rather they are orderly, forming an alternating pattern.

In short, metrical patterns of verse lines and accentual patterns of words show a high degree of correspondence in their edge preference for the leftmost or rightmost strong or accented syllable and in the rhythmic pattern of the whole unit.

Having noted the correspondences between metrical patterns of verse lines and the accentual pattern of words, Liberman (1975) proposes to analyze the latter in terms of the concept that is basic to the former: the foot. Liberman's basic insight is that the edge preference of primary accent and the alternating character of non-primary accents simply follow as necessary properties if accentual patterns are represented by assigning feet (which group together the syllables of words) and assigning primary status to the accent of the leftmost or rightmost foot.

Over the years various notations have been proposed to represent accentual patterns metrically. Because of its graphical simplicity, I adopt here the bracketed grid notation proposed by Halle & Vergnaud (1987) and Hayes (1987, 1995); I refer to §1.4.3 for a discussion of other notations. The representation in (29a) represents initial primary accent and a rightward alternating rhythmic pattern. The "recipe" in (29b) specifies the metrical **parameter settings**:

(29) a.
```
 x                          2
(x       x       x       )  1
(σ  σ) (σ  σ) (σ  σ) σ      0
```

b. Metrical algorithm
foot structure
i. left-accented
ii. assigned from left to right
word structure
left accented (i.e. the leftmost foot-accent receives primary accent

In (29), as before, I have assumed that a single syllable cannot form a foot by itself. We will say that a single syllable is not parsed, i.e. that it is "trapped" (cf. Mester 1993) or "stranded". Allowing trapped syllables implies that we do not require foot parsing to be exhaustive. In accordance with current practice, let us refer to a foot that would consist of a single (light) syllable as **degenerate** or **unary** (cf. §1.3.6.2). The righthand bracket in (29) on level 1 encloses the unparsed syllable, but exactly how trapped syllables are incorporated into the metrical structure is an open issue (cf. Vogel forthcoming).

To avoid misunderstandings I emphasize the fact that the feet that Liberman introduced are not in any sense "poetic". These feet form part of the formal representation of the accentual structure of linguistic units.

Before I elaborate on this theory, let us briefly see how it deals with the characteristic properties of accentual patterns. I have said that accents are properties of domains, and that each domain has at most one accent. This property of accent is manifested by the following facts:

(30) a. A primary accent on one syllable implies its absence on all others in the same domain (i.e. word)
b. A rhythmic accent on a syllable implies its absence on immediately adjacent syllables (i.e. within the same foot).

It is useful at this point to make explicit that metrical theory appeals to tree structures of a particular kind, viz. **headed tree structures**, represented in the form of bracketed grids. Headed trees express the idea that constituents contain exactly one central unit, called the head, and in addition one or more non-heads, called dependents. The notion **head** is central in the kind of structures that linguists posit in syntax, morphology and phonology. I refer to Anderson & Ewen (1987), Halle & Vergnaud (1987), Dresher & van der Hulst (1995, forthcoming) for a principled discussion of the notion head in phonological structure.

The use of headed structure, and, more specifically the identification of the notions head and accent guarantees that every domain (corresponding to a level in the grid) has precisely one accent. In this way, we derive the property of culminativity of accent. The additional property that heads in metrical structure can only be located at edges of constituents expresses the demarcative function of accent (cf. §1.4.4).

The notions head and dependent are purely formal and have no specific phonetic content. As pointed out above, headed trees have been proposed as proper representations of linguistic structures in a number of theories of phrase structure, and this fact alone

points to the abstractness of these notions. Clearly, this is not the place to investigate in depth whether the notions head and dependent that are used in the tree structures representing the morpho-syntactic hierarchy and those in the prosodic hierarchy are in some abstract sense identical. We will merely refer to the minimalist point of view that our basic expectation should be that a notion like head which is fundamental to both hierarchies (which also share the notion of tree-shaped structures) can be reduced to a single primitive concept.

A subsequent extremely important development of metrical theory is that the accentual patterns of different languages can be represented by varying the ingredients in the construction rules in (29):

(31) Metrical algorithms
foot structure
i. left-headed (LH)/right-headed (RH)
ii. assigned from left to right (LR)/right to left (RL)
word structure
left-headed (LH)/right-headed (RH)

This parametric approach to accent was first proposed by Halle & Vergnaud (1978) and further developed and richly exemplified in Hayes (1980).

The schema in (31) allows us to represent eight different accentual patterns. To detect the consequence of directionality (i.e. 31ii) one must use an uneven string of syllables.

The four possibilities in (32) assign head status to the foot that comes first (i.e. leftmost in left-to-right, and rightmost in right-to-left parsing). This correlation between directionality and primary accent location is typical:

(32)

		Odd	Even
a.	Word(LH)	x	x
	Foot(LH, LR)	(x x) (σ σ)(σ σ) σ	(x x x) (σ σ)(σ σ)(σ σ)
b.	Word(LH)	x	x
	Foot(RH, LR)	(x x) (σ σ)(σ σ) σ	(x x x) (σ σ)(σ σ)(σ σ)
c.	Word(RH)	x	x
	Foot(LH, RL)	(x x) σ (σ σ)(σ σ)	(x x x) (σ σ)(σ σ)(σ σ)
d.	Word(RH)	x	x
	Foot(RH, RL)	(x x) σ (σ σ)(σ σ)	(x x x) (σ σ)(σ σ)(σ σ)

(33)		Odd	Even
a.	Word(RH)	x	x
	Foot(LH, LR)	(x x)	(x x x)
		(σ σ)(σ σ) σ	(σ σ)(σ σ)(σ σ)
b.	Word(RH)	x	x
	Foot(RH, LR)	(x x)	(x x x)
		(σ σ)(σ σ) σ	(σ σ)(σ σ)(σ σ)
c.	Word(LH)	x	x
	Foot(LH, RL)	(x x)	(x x x)
		σ (σ σ)(σ σ)	(σ σ)(σ σ)(σ σ)
d.	Word(RH	x	x
	Foot(RH, RL)	(x x)	(x x x)
		σ (σ σ)(σ σ)	(σ σ)(σ σ)(σ σ)

Van der Hulst (1984) and Hammond (1984b) argue that the systems in (33) are much less typical, although they do occur. In van der Hulst (1992, forthcoming) these systems are called **count systems**. Note that in systems of this kind the exact location of primary accent is dependent on the number of syllables that the word is composed of.

A count system of the type in (33c), second syllable or first, is reported for Malakmalak (Goldsmith 1991:xxx). All other cases known to me are both weight-sensitive and left-to-right directional. Some of these have trochaic footing (for example, Cairene Arabic), but most are iambic (cf. Hayes 1995:205ff. for examples). A number of LR count systems are said to lack a clear primary accent. I return to systems of this kind in §1.4.4.

As for weight-insensitive primary stress location, (31) is almost adequate except for the fact that we have not yet found a manner of deriving antepenultimate accent. This will be discussed in §1.3.5.

In this section, I have introduced two foot types, the trochee (left-headed) and the iamb (right-headed). A language will typically choose one of these, thus arriving at a uniform accentual pattern for all words.

A theory of accent based on these two foot types can be called **symmetrical**. An issue that has come up is whether trochees and iambs are equally popular in languages. Hayes (1985, 1995), for example, argues that iambs only play a role in weight-sensitive systems. We will first discuss weight-sensitive patterns and then turn to a number of controversies regarding foot structure.

1.3.3 Weight-sensitivity

In (22b), we have seen examples in which the location of primary accent was determined in part by properties of the syllables at the relevant edge.

In such systems, which are called weight-sensitive, a distinction must be made between heavy and light syllables. This section explains how the theory of foot assignment can be enriched such that weight-sensitive systems can be accommodated. The basic idea is very simple: weight sensitivity arises whenever certain syllables (i.e. those that are heavy) refuse to occupy the dependent position in the foot with the result that they always end up as the head of the foot.

Let us assume, then, a weight parameter, which can be set to "yes" or "no". If the weight parameter is set to yes, a further decision must be made with respect to what counts as heavy (cf. §1.2.2).[25] Let us consider the effect of weight in a system of the following sort:

(34)
foot structure
i. left-headed
ii. assigned from right to left
iii. weight-sensitive
word structure
right-headed

We focus on the rightmost foot for the moment. Four configurations may occur:

(35) h l] l h] h h] l l]

The square brackets represent the morphological word boundary.

The first and fourth case present no problem since we can simply assign a binary trochaic foot without violating the weight condition which prevents a heavy syllable from occurring in the dependent foot position. It is important to bear in mind that this condition bans heavy syllables from dependent position. It does not bar light syllables from head position:

(36)
```
x                                   x          2
x   )                               x   )      1
(h  l) ]      l  h  ]      h  h  ]  (l  l) ]   0
```

I place foot-level grid marks on level 1 and the word-level grid mark on level 2; "h" and "l" represent heavy and light accent-bearers on level 0. The problem lies in the middle two cases. Clearly, if weight is to be respected, we cannot assign a trochaic foot over the two word-final syllables here because a heavy syllable would then end up in the weak position of the foot. What we can do, however, is assign a monosyllabic foot to the final syllable only:

(37)
```
x              x            x          x          2
x   )          x)           x)         x   )      1
(h  l) ]    l (h) ]      h (h) ]    (l  l) ]   0
```

In the middle two cases, the heavy syllable forms a foot by itself. The structures in (37) are appropriate for a system which has primary accent on the final syllable if this is heavy and on the penultimate syllable otherwise, i.e. the type I attested in (22b) for Rotuman:

(38) Rotuman: final in case of σh], penultimate otherwise

In (22b) we also mentioned a second type of weight-sensitive system. In Yapese, primary accent differs from what we find in Rotuman in the case of *l l]*, where we get final accent, as opposed to penultimate accent in Rotuman. How do we deal with a system of this type?

The simplest option appears to be to take an iambic, rather than a trochaic foot:

(39) Yapese: penultimate in case of hl], final otherwise

x	x	x	x	2
x)	x)	x)	x)	1
(h) l]	(l h)]	h (h)]	(l l)]	0

The first configuration deserves special attention. It would appear that in this case we could have assigned a foot to the final light syllable only. What we have done instead is to skip the final light syllable. This gives the correct result, but the question is whether the skipping of the final light syllable represents a legitimate move. I have assumed earlier that single syllables cannot form feet by themselves (cf. (32) and (33) above), when we considered weight-insensitive systems. I will now refine the ban on undersized feet and assume the following:[26]

(40) Condition on foot size
- a. In weight-insensitive systems feet cannot consist of one syllable[27]
- b. In weight-sensitive systems feet cannot consist of one light syllable

Mirror images of Rotuman and Yapese occur, i.e. in Ossetic and Malayalam, respectively (Hayes 1995:261, 92-93):

(41) a. Ossetic: initial in case of [hσ, postinitial otherwise

x	x	x	x	
(x (x	(x) (x)	(iamb)
[(h) l	[(l h)	[(h h)	[(l l)	

b. Malayalam: postinitial in case of [lh], initial otherwise

x	x	x	x	
(x (x	(x (x	(trochee)
[(h l)	[l (h)	[(h) h	[(l l)	

1.3.4 Retraction rules

The analysis proposed here, especially that of Yapese and Malayalam, is not uncontroversial. One could, to mention just one obvious alternative, treat these cases as weight-insensitive (iambic and trochaic, respectively) and then add a **retraction rule** to the system which moves the accent from the outermost syllable if it is light and the adjacent syllable is heavy. This could be seen, diachronically speaking, as the first step toward a weight-sensitive system, the next step would be to restructure the system and arrive at a weight-senstive system:

(42)

a.	Yapese type (. x), retraction	Rotuman type (x .), weight-sensitive
b.	Malayalam type (x .), retraction	Ossetic type (. x), weight-sensitive

Unfortunately, not enough is known about the historical scenarios along which accentual systems change. Weak support for the suggestion in (42) is that the Yapese/Malayalam type (which is relatively complex under the retraction analysis) appears to be the less common variety. (The Yapese pattern is also found in a subset of the vocabulary of Turkish, cf. §1.3.8.5).

Metrical theory does not, in principle, exclude rules that adjust patterns that are derived from the possible metrical algorithms. Readjustment rules in the form of removing, adding or moving accents have been abundant in the literature.

There are in fact two other kinds of weight-sensitive bounded systems, Aklan and Capanahua, which have been analyzed with retraction rules:

(43) a. Aklan: penultimate in case of hσ], final otherwise

```
 x                x          x<<<            x     2
 x   )            x)         x  x)           x)    1  (iamb)
(h) l  ]      (l  h) ]      (h)(h) ]     (l  l) ]  0
```

b. Capanahua: postinitial in case of [σh], initial otherwise

```
   x              x           >>>x        x      2
  (x           (   x          (x  x       (x     1 (trochee)
[ (h  l)      [ l (h)       [ (h)(h     [ (l  l)  0
```

In the hh case (final or initial) we crucially need a rule retracting the accent to the near-peripheral heavy. We might also appeal to a dislike for peripheral non-branching feet to bear primary accent (cf. §1.3.8.6).

A question that keeps arising, then, is whether systems such as in Yapese, Malayalam, Aklan and Capanahua have any generality that we should seriously reckon with in the construction of a theory that must account for recurrent basic accentual patterns. Their rarity can be taken as an argument for the (somewhat arbitrary) retraction approach, since in this approach at least we do not burden the basic metrical algorithm scheme with the particularities of these systems.

I finally point out that a further type of bounded weight-sensitive system has been reported:

(44)

```
h́ l ]       l h́ ]       h́ h ]      Í l ]
```

Hayes (1995:179-188) reports this kind of system for Awadhi and Sarangani Mamobo. He proposes an analysis that makes final syllables extrametrical in clash:

(45)

```
 x            x          x           x
(x)          (x)        (x)<x>      (x .)
 h l ]       l h ]       h  h ]      l l ]
```

Given the existence of systems of this type we have a total of four right-edge weight-sensitive bounded systems (cf. van der Hulst 1984:169):

(46)

ń l]	l ń]	h ń]	Í l]	Rotuman
ń l]	l ń]	h ń]	l Í]	Yapese
ń l]	l ń]	ń h]	l Í]	Aklan
ń l]	l ń]	ń h]	Í l]	Awadhi

Van der Hulst (forthcoming) takes this typology as an argument for a different, non-foot-based approach. I discuss this approach briefly in §1.4.4.

1.3.5 Extrametricality

In §1.3.1 we saw that there are languages which have a primary accent on the antepenultimate syllable. One might argue that in these cases accent location is the result of assigning a left-headed ternary foot, i.e. a **dactyl** at the right edge of the word:

(47)

```
        x
...     x    )
σ σ σ(σ σ σ)
```

This may be the correct move in case the overall accentual structure shows a ternary pattern (I discuss such cases in §1.3.6.3), but if this is not the case it would seem that another option is preferable, namely one in which the final syllable is not footed. This is even clearer in the case of a language like Classical Latin. Here primary accent falls on the penultimate syllable if this is heavy and otherwise on the antepenultimate syllable. The final syllable is not taken into account at all whether it is heavy or light. Antepenultimate accent, then, seems to require that the final syllable is "ignored" (cf. chapters 6 and 10 for an analysis of Classical Latin).

The proposal to ignore a peripheral syllable comes from Liberman (1975). Again analogous to verse metrics, Liberman proposes that a peripheral syllable can sometimes be left "unconsidered", i.e. left outside the metrical scansion. Such a syllable is **extrametrical**. Vergnaud & Halle (1978) suggest that extrametricality is a parametric option in accentual patterns, thus enhancing the analogy between prosodic words and lines of verse.

Extrametricality, if applied to word accentual patterns, offers a means of placing an accent three syllables away from the edge while using binary feet. The extrametrical syllable is put between angled brackets in metrical illustrations:

(48)

```
        x
...     x  )
σ σ σ(σ σ)<σ>
```

In verse, extrametricality occurs on the left- and right edge of lines. If this mechanism works the same way in accentual patterns we would expect to find languages that have postpostinitial accent. Apparently there are no such cases (cf. note 22). At this point one might go in two directions. One is to stipulate that extrametricality only applies to the right edge. This route is chosen by Prince & Smolensky (1993), who rename

extrametricality **non-finality**. The other way is to say that since postinitial accent is so rare to begin with, finding a combination of a left-edged iamb and extrametricality is highly unlikely.

Left-edge extrametricality can also be diagnosed in systems that have right-edge primary accent, however. An example of this type is discussed in chapter 14.2.1 If extrametricality is symmetrical, we need to specify the edge to which it applies.

It has furthermore been argued that various types of units can be made extrametrical. In fact, examples can be found in the literature for each of the following cases:

(49)
a. segment
b. consonant
c. vowel
d. mora
e. syllable
f. light syllable
g. foot
h. light (i.e. non-branching) foot

Hayes (1995) proposes to allow foot extrametricality, (48g), but some of the cases he discusses also seem to be analyzable in terms of syllable extrametricality (cf. Jacobs 1990). He suspects that (49d) is not called for. Case (49h) is called **late extrametricality** in §1.3.8.6 and chapter 8.3. The typical case is a final non-branching foot which is barred from carrying primary accent. Such cases arise only in weight-sensitive systems, since otherwise the final syllable could not form a foot by itself. A case in point is Dutch, which has regular antepenultimate accent if the final syllable is heavy (van der Hulst 1984; Kager 1985). In practice, late extrametricality is equivalent to extrametricality of a final heavy syllable; cf. §1.3.8.6.[28]

Note that the introduction of extrametricality renders the metrical analysis of a language like Polish in principle ambiguous:

(50) penultimate accent: Polish

a.
```
      x
...   x  )
σ σ σ σ(σ σ)
```

b.
```
      x
      x)
σ σ σ(σ σ)<σ>
```

I will return to this ambiguity in §1.3.8.1, arguing that the system of exceptions shows that, for Polish, (50a) is the correct analysis. The moral to be drawn from this example is that the availability of extrametricality blurs a transparent relation between a certain surface pattern and its trochaic or iambic analysis.

Implicit in the above account of antepenultimate accent is the idea that extrametricality must only apply to the edges of accentual domains, so that we do not allow extrametrical syllables anywhere in the accentual domain. This has been called the **peripherality condition** (on extrametricality). Instead of appealing to a condition of this type, one could also formalize extrametricality by other means than appealing to angled brackets, which, after all, are nothing more than a graphical notation. Thus, one could

argue (following Inkelas 1989) that the non-finality effect results from a misalignment between the domain for accent and the string making up the relevant lexical item:

(51)

```
                        x
                (       x   )
            [  σ  σ  σ (σ  σ) σ ]
```

The alignment of the accentual domain with the lexical item would, in this view, normally be such that the edges of both domains coincide. The marked option, misalignment on the right side, would then produce the extrametricality effect. The phenomenon of extrametricality suggests that the domain for accentuation cannot be identified with any morphological domain, even though the two are equal in size in many cases. From now on I will refer to the accentual domain (i.e the domain marked with level-1 brackets) as the **prosodic word**, assuming that the prosodic word is related to but not necessarily isomorphic to the **morphological word** (cf. McCarthy & Prince 1993a,b). I discuss prosodic constituency in §1.4.2; cf. in particular chapter 3.

One could also, following Idsardi (1991) and Halle & Idsardi (1995), achieve the desired extrametricality effect by assuming that feet are built by inserting foot brackets in the string, and, furthermore, that one location for inserting a (right) bracket is to the left of the rightmost syllable. I return to Idsardi's approach in §1.4.3.3; cf. also chapter 11.1.1.[29]

1.3.6 Foot typology

In this section I discuss one of the central issues in metrical theory, viz. the inventory of metrical feet.

1.3.6.1 Uneven and even feet

In accordance with early versions of metrical theory we have so far adopted two parameters for foot form: headedness (LH/RH) and weight sensitivity (Y/N). These two parameters make up four foot types:

(52)

	LH	RH
W-Sen.		
W-Ins.		

Combined with the parameter of Direction (LR/RL) and Word Headedness (LH/RH), the theory produces 16 possible systems. Although Hayes (1980) adduces evidence to support the claim that all the cells of the metrical theory can be filled, Hayes (1985, 1987, 1995) concludes that there are some serious "data gaps" in so-called iterative systems:

(53) Data gaps
a. RH/weight-insensitive: rare
b. LH/weight-sensitive: absent LR

He proposes to eliminate the parameters for headedness and weight-sensitivity and to replace them with an asymmetrical inventory of basic metrical units, as in (54):

(54) a. Syllabic Trochee

x			.
(σ	σ)	otherwise	σ

b. Moraic Trochee

x		[= x		or	x	] otherwise	.
(σ	σ)	(l	l)		(h)		l

c. Uneven Iamb

	x		otherwise	x		or	.
(l	σ)			(h)			l

(The following changes in terminology were also introduced: Uneven = weight-sensitive, Syllabic = weight-insensitive, Iamb = RH, Trochee = LH)

For weight-insensitive systems, then, only the trochee survives. For weight-sensitive systems, the iamb survives. To be able to deal with systems which were formerly analysed in terms of uneven trochaic feet, a new foot type, the **Moraic Trochee** (MT) is introduced. The essential point of the MT is that heavy syllables now necessarily form a foot by themselves. One can say that heavy syllables are **metrical islands**. Trochaic systems share the property of allowing maximally and minimally two units − syllables in the case of the syllabic trochee and moras in the case of the moraic trochee. The moraic trochee, like the uneven iamb, respects the distinction between heavy and light syllables. To account for the data gaps noted by Hayes (1985), McCarthy & Prince (1986, 1990) propose the same inventory of foot types.

Note that (54) assumes that in syllabic systems left-over syllables − and in the other systems left-over light syllables − are left unparsed. I already anticipated this practice, although earlier versions of metrical theory did in fact not ban unary feet explicitly.

It is important to establish precisely the empirical differences between the old and the new theory. Let us briefly compare these systems with regard to the patterns they can generate.

1.3.6.1.1 Weight-insensitive systems

The new theory excludes the iambic foot in insensitive systems. It is claimed that patterns which were derived by this foot in the old theory can in fact be derived with the help of extrametricality and the trochaic foot. To see the important implications of this point, we have to look at the two directions of footing separately. For both directions we must consider an uneven and even string of syllables:

(55)

i.	DIR (LR)[30]	OLD	DIR(LR)	NEW
a.	Word (LH) Foot (RH)	x (x x x) (1 2) (3 4) (5)	Word (LH) Foot (LH)	x (x x) <1> (2 3) (4 5)
b.	Word (LH) Foot (RH)	x (x x) (1 2) (3 4)	Word (LH) Foot (LH)	x (x) <1> (2 3) 4

ii.	DIR (RL)	OLD	DIR(LR)	NEW
a.	Word (RH) Foot (RH)	x (x x x) (5) (4 3) (2 1)	Word (RH) Foot (LH)	x (x x x) (5 4)(3 2)(1)
b.	Word (LH) Foot (RH)	x (x x) (4 3) (2 1)	Word (LH) Foot (LH)	x (x x) 4 (3 2)(1)

Left-to-right (LR)

Weight-insensitive systems with primary accent on the second syllable are not frequent. Nonetheless, if they cannot be derived with a weight-insensitive iamb, some other analysis must be developed. We have noted before how extrametricality can conveniently help analyzing a superficial trochaic pattern as iambic (cf. 50). It turns out that the reverse is also possible if extrametricality is allowed to apply at the left word edge.[31]

In LR mode (55ia) in a word with an odd number of syllables an **accent clash** on the last two syllables is produced in the old theory (i.e. on syllables 4 and 5). An accent clash is defined as a situation in which two adjacent syllables are accented (i.e. heads of feet). A significant property of the new theory is that no clash is produced in the parallel string in (55ia) under "new". Presumably this is a desirable result, since clashes of this type typically do not arise. But if the word consists of an even number of syllables, the prohibition against unary feet (adopted in the new theory) will lead to the generation of a **lapse**, i.e. a sequence of two unaccented syllables on syllables 3 and 4 in (55ib). This is a less desirable result since sometimes we do find an accent on syllable 4. According to Hayes (1995:100), these cases must be explained as phonetic word edge effects.

Right-to-left (RL)

With RL mode, (55ii), a different situation holds. The old theory produces cases with final accent straightforwardly. Without a syllabic iamb there are two ways of producing final accent.[32]

First, one could say that in such cases there is a separate statement that assigns primary accent to the final syllable (cf. 56a. After this primary accent has been placed, trochees can be assigned from right to left. With an accent mark present on the final syllable, the trochaic algorithm has no choice but to turn the last syllable into a unary foot (cf. 56b):

(56) a.
```
                x
[ σ  σ  σ  σ  σ]
```

b.
```
                x
   (x     x     x)
[ (σ  σ)(σ  σ)(σ)]
```

This mode of accent assignment is labelled "rimary accent first"in van der Hulst (1984, forthcoming) and bottom-up-parsing in Hayes (1995); cf. §1.4.4.

Secondly, we could make use of the postulation of a "silent" syllable in final position. This mechanism has been proposed by Kiparsky (1991) (the "Ω" represents a silent syllable):[33]

(57)
```
 x    x    x    x .
(σ σ)(σ σ)(σ σ)(σ Ω)
                =====
```

Kiparsky refers to overparsing as **catalexis**, suggesting a comparison with the fact that lines of verse may sometimes come short of a syllable. Catalexis involves another kind of misalignment between the morphological word and the prosodic word, and forms the logical counterpart to extrametricality.

1.3.6.1.2 Weight-sensitive systems

It turns out that the descriptive capacity of the "old" uneven trochee and the "new" moraic trochee are the same in right-to-left application, if we ignore differences in bracketing:

(58) a. Uneven LH,RL
```
 x  x    x    x    x
(h)(l l)(h l)(l l)(h l)
```

b. Moraic LH,RL
```
 x  x    x     x    x
(h)(l l)(h) l (l l)(h) l
```

However, in LR-mode a systematic difference comes out:

(59) a. Uneven LH,LR
```
 x         x     x     x
(h  l) l (h  l)(l  l)(h  l)
```

b. Moraic LH,LR
```
 x  x     x  x        x
(h)(l  l)(h)(l  l) l (h) l
    -        -
```

According to Hayes (1987, 1995:67ff.) no LR systems using the uneven ("old") trochee have been attested, whereas systems that have the pattern with the moraic ("new") trochee occur (a number of Arabic dialects and Cahuilla). This implies that where the uneven trochee and the moraic trochee differ, the moraic trochee wins on empirical grounds.

Accepting the replacement of the uneven trochee by the moraic trochee, Kager (1993) takes the next logical step and argues that the uneven iamb can be replaced by a moraic iamb. This calls for an examination of the empirical differences between both foot types. As one might expect, both types produce the same pattern in LR-mode:

```
(60)    a.    Uneven RH,LR       x      x  x      x      x
                               (l  h)(l  l)(h)(l  l)(l  h)

        b.    Moraic RH,LR       x      x  x      x      x
                              l (h)(l  l)(h)(l  l) l (h)
```

The moraic iamb simply leaves those light syllables, which adjoin to a heavy syllable in the unbalanced iamb, unparsed. In principle, then, both approaches are equivalent, although in specific cases (such as in the case of Chugach) the moraic approach achieves better results (cf. Kager 1993a).

In RL-mode, however, both foot types produce different results:

```
(61)    a.                         x         x      x      x
              Uneven RH,RL   (l  h) l (l  h)(l  l)(l  h)

        b.    Moraic RH,RL       x      x  x         x  x
                              l (h)(l  l)(h) l (l  l)(h)
```

It now turns out that neither approach has an empirical advantage. Both produce patterns that are slightly off the mark.

A pattern that comes close to both is that of Tübatulabal, which assigns accents as follows (Hayes 1995:263):

```
(62)   a. Final syllables, whether heavy or light
       b. Heavy syllables
       c. Every other light syllable before a heavy syllable
```

The uneven iambic pattern, (61a), fails in two ways. First, it would not assign an accent to the final syllable when a words ends in an "h l" sequence. Secondly, it would not assign an accent to the first light syllable in a "h l l h" sequence. In both cases the light syllable would be skipped, given the prohibition on unary feet, whereas in Tübatulabal it receives an accent.

The moraic parsing, (61b), fails because it will also skip the final light in a hl case. Moreover it assigns an accent to a pre-heavy light syllable, which would be incorrect for Tübatulabal. This could not be avoided by invoking some kind of clash-driven skipping of the underlined syllables since that still does not produce the Tübatulabal pattern in the "h l l h" case (the skipped syllable is italicized):

```
(63)                                                  x
              Moraic RH     (   x         x      x      x)
              & skipping     l (h) l  l (h)(l  l) l (h)
```

If the conclusion is that the Tübatulabal pattern must be derived without appealing to weight-sensitive iambs (whether uneven or moraic), two questions must be answered. Firstly, how is the Tülatülabal pattern derived, and, secondly, why is it that patterns created by RL iambs do not occur?

In response to the second point, Kager says that RL applications of the moraic iamb do not occur because they will always produce backward clashes in "l l h"

environments. So, Kager proposes that such systematic backward clashes (and systems that systematically have them) are universally prohibited.[34]

With respect to the first issue, Kager argues that systems like Tübatulabal are rare to begin with. Only three are known in the literature: Aklan, Tübatülabal and Tiberian Hebrew. He proposes to analyse the required pattern by assigning a final primary accent first, followed by a moraic trochee:[35]

(64) a.

```
                                                x
      Moraic RH    (   x  x     x     x      x)
                    l (h)(l  l)(h) l (l  l)(h)
```

b.

```
                                                x
      Moraic RH    (   x  x     x     x      x)
                    l (h)(l  l)(h) l (l  l)(l)
```

Note that the primary accent foot must also be assigned to a final light syllable, as in (64b). The fact that such systems require a primary accent first account explains why they are relatively rare, according to Kager.

The derivation of such systems is in fact identical to that proposed for weight-insensitive final accent systems (cf. 56). Thus, in Kager's theory the scope of iambic footing is reduced to LR systems.

The table in (65) summarizes the different predictions made by a system that allows uneven feet and a system that allows even (i.e. bimoraic) feet only. We show the effect of these feet in three different contexts. The cases that are underlined are crucially different in the two theories:

(65)

	FOOT (LH)		FOOT (RH)	
	even	uneven	even	uneven
DIR (LR)	(x .) [l l	(x .) [l l	(. x) [l l	(. x) [l l
	(x) [h l	(x .) [h l	(x)(. [l l	(x)(. [l l
	(x)(x .) h l l	(x .) h l l	(x)(. x) h l l	x)(. x) h l l
DIR (RL)	even	uneven	even	uneven
	(x .) l l]	(x .) l l]	(. x) l l]	(. x) l l]
	(x) l h]	(x) l h]	(x) l h]	(. x) l h]
	(x .)(x) l l h	(x .)(x l l h	(. x)(x) l l h	(. x) l l h

In case of the upper lefthand box the empirical evidence weighs in favour of the even trochee, which means that the uneven trochee can be dispensed with entirely.[36] In the case of the lower righthand box, both theories produce the wrong pattern, which makes it more problematic to decide whether weight-sensitive iambic systems are even or uneven. I refer to Kager (1993a) for further argumentation in favour of the even iamb, based on an analysis of Chugach.

From the above discussion, it would seem to follow that iambic weight-sensitive systems only operate from left to right, and always in a weight-sensitive fashion (often producing count systems; cf. (33a)). Compared to trochaic feet, then, iambic feet play a relatively minor role in the typology of accent systems.[37]

1.3.6.2 Unary feet

We have seen that the newer foot typologies abandon unary feet, i.e. monosyllabic feet in weight-insensitive systems (possible on a language specific basis) and light syllable feet in weight-sensitive systems (universally).[38]

If unary feet are disallowed, two consequences must be detectable in the data. Firstly, in longer words with an odd number of syllables there will be unparsed syllables, and, secondly, a word must minimally consist of a branching foot.

Addressing the first point, let us spell out what the advantage is of banning unary feet in weight-insensitive syllabic systems:

(66) a. Word (LH)
Foot (LH, LR)

```
        x
    x   x   x
(σ σ)(σ σ)(σ σ) σ
```

b. Word (RH)
Foot (LH, RL)

```
            x
      x     x     x
σ (σ σ)(σ σ)(σ σ)
```

c. Word (LH)
Foot (RH, LR)

```
      x
    x   x   x
(σ σ)(σ σ)(σ σ) σ
```

d. Word (RH)
Foot (RH, RL)

```
            x
      x     x     x
σ (σ σ)(σ σ)(σ σ)
```

Case (66d) is perhaps non-existent (cf. the previous section on the non-occurrence of RL iambic parsing, as well as the elimination of weight-insensitive iambs) and case (66c) is rare at best, and if the pattern occurs it could be trochaic (cf. again the previous section). As we expect, cases as in (66b) will not have an accent on the first syllable, since this would produce a clash. To explain this we do not need a ban on unary feet. In fact, in these cases we do find a tendency to put an accent on the first and not on the second syllable. This has been referred to as the **initial dactyl effect**:

(67) Word (RH)
Foot (LH, RL)

```
          x
    x     x
(σ  σ) σ (σ σ)(σ σ)
```

Case (66a) could have an accent on the final syllable without producing a clash or triggering any readjustment and here the facts go in two directions. Some systems reject final secondary accent, whereas others appear to have it (Hayes 1995:99-100). We can conclude that the advantage of banning unary feet in syllabic systems is not so clear. In the case where it makes a real difference (66a), the empirical evidence is not clearly in favour of this move; cf. chapter 8.7 for a discussion of unary feet in Icelandic.

One could, then, also say that unary feet are allowed under the condition that they produce no clash (de Haas 1991), adding a rule destressing final syllables to languages that show the pattern in (66a). Hayes takes a different route, by maintaining that unary feet are banned and suggests that languages that would appear to have the relevant non-primary final accent in actual fact have some kind of word edge strengthening process that is not foot-based. An alternative to this edge strengthening hypothesis is to invoke catalexis and assume that if final accents occur a catalectic syllable is present:

(68)

Word (LH)	x
Foot (LH, LR)	x x x x
	(σ σ)(σ σ)(σ σ)(σ Ω)

Kiparsky (1991) and Kager (1995b) explore this option. They point out that languages that allow (68) must then also allow monosyllabic words. There indeed appears to be a correlation between the occurrence of final secondary accents and the occurrence of monosyllabic words. It is clear, however, that this correlation can also be expressed if it is assumed that unary feet are allowed under the no clash condition (de Haas 1991). Thus both (66a) and (66b) are correlated under catalexis as well as in a theory that allows unary feet provided there is no clash:

(69)

a.i.	x	ii.	x	
	x		x	x
	(σ)		(σ σ)	(σ)
b.i.	x	ii.	x	
	x		x	x
	(σ Ω)		(σ σ)	(σ Ω)

In spite of the fact that Hayes does not adopt the unary foot for peripheral non-primary accent in (66a) type systems, he does allow unary feet under specific circumstances, namely if they end up being primary accented (cf. Kager 1989:143). Consider the following minimal pair. We see here two count systems (cf. 33) which differ in whether or not they allow unary feet under primary accent:

(70)

	a.	Antepenultimate or penultimate
Word (RH)		x
Foot (LH, LR)		(x x x)
		(σ σ)(σ σ)(σ σ) σ
	b.	Penultimate or final
		x
		(x x x x)
		(σ σ)(σ σ)(σ σ)(σ)

Both systems are count systems and we find them in Cairene Arabic and Auca, respectively (cf. Hayes 1995). The latter appears to allow the unary foot under primary accent ("weak ban"), while the former bans unary feet altogether ("strong ban"). Allowing primary-accented unary feet entails allowing monosyllabic words as a consequence.

If the weak ban applies, a unary foot under primary accent may also occur in non-count systems, but would then result from a Primary Accent First mode.[39]

1.3.6.3 Ternary feet

In the previous section, we have seen that the antepenultimate accent does not necessarily lead to admitting ternary feet such as the one in (71):

(71)
```
    x
(σ  σ  σ)
```

In the early days of metrical theory it was argued that ternary feet could be banned from the theory entirely. Ternary feet that occurred on either the left or right side of words could be handled with deaccenting rules and extrametricality, conspiring for initial dactyls and final dactyls, respectively. Hayes (1980), in favour of a strictly binary theory, noted that the pattern in Cayuvava (which we discuss below) is problematic if only binary feet are admitted, but he offered no solution at the time. Since then, however, more and more languages with ternary rhythmic patterns throughout the word have come to the forefront (Levin 1988; Haraguchi 1991; Rice 1992; Hayes 1995:307-366). This necessitates a reconsideration of the ban on ternary feet. Let us consider some examples of ternary systems in order to establish how they can be treated.

In Cayuvava (Hayes 1995:309-314) primary accent lies on the antepenultimate syllable, and preceding that syllable we find ternary rhythm. If we approach such a pattern in terms of the **syllabic dactylic foot** (assigned from right to left and ignoring foot internal brackets) we derive the representations in (72):

(72)
```
a.      x        x        x
     (σ  σ  σ)(σ  σ  σ)(σ  σ  σ)

b.            x        x
        σ  σ (σ  σ  σ)(σ  σ  σ)

c.            x        x
           σ (σ  σ  σ)(σ  σ  σ)
```

It is of interest to note that no secondary accent is reported if the available span of syllables is shorter than three, as in (72b-c), but we will not dwell on that property here.

Hayes (1995) proposes an alternative that appeals to a special parsing mode, weak local parsing. The footing algorithm is allowed to skip a unit each time after having assigned a foot. In Cayuvava this mode applies in conjunction with extrametricality:

(73) a. x x x
(σ σ) σ (σ σ) σ (σ σ)<σ>

b. x x
σ σ (σ σ) σ (σ σ)<σ>

c. x x
σ (σ σ) σ (σ σ)<σ>

To order skipping after foot assignment is crucial, since otherwise a fourth from the edge pattern can be derived if the weak local parsing mode is combined with extrametricality.

Dresher & Lahiri (1991) analyze Germanic in terms of a **moraic dactylic foot**. Since primary accent is strictly initial, also in case an initial light syllable is followed by a heavy syllable, Dresher & Lahiri claim that heavy syllables in second position, following an initial light, carry no secondary accent; they act as light syllables and are incorporated into the foot that contains the preceding light syllable. This is what Dresher and Lahiri call **resolution**. The resolution effect is not a property of all ternary moraic systems and must thus be stated in the form of a further parameter.[40]

There is no straightforward alternative using weak local parsing. Van der Hulst & Lahiri (1988), Halle, O'Neil & Vergnaud (1993), Kenstowicz (1994) and Hayes (1995) argue in favour of various alternatives, using the moraic trochee. If we assume that the Dresher & Lahiri analysis stands, we may conclude that next to the syllabic dactyle we also need a moraic dactylic, but more needs to be said about the fact that for both alternatives have been put forward. Stronger support of the moraic dactyle additional cases would be welcome.

The syllabic amphibrach (a foot type not present in my typology) was introduced in Halle & Vergnaud (1987) to analyze Cayuvava, combined with extrametricality. The syllabic dactyl and syllabic amphibrach differ in descriptive potential at the edge where parsing starts, if extrametricality is not involved to neutralize the difference. A pure amphibrachic system would have penperipheral primary accent and a further ternary rhythmic pattern. At present I am not aware of such cases, however.

Rice (1992) proposes a typology of ternary foot types that allows four moraic and four syllabic possibilities. I give all the possibilities in (74), underlining those that my typology has acknowledged:

(74)

	foot: iamb	foot: trochee
MORAIC		
head: trochee	x (μ (μ μ)) "moraic amphibrach"	x ((μ μ) μ) "moraic dactyl"
head: iamb	x (μ (μ μ)) "moraic anapest"	x ((μ μ) μ) "moraic amphibrach
SYLLABIC		
head: trochee	x (σ (σ σ)) "syllabic amphibrach"	x ((σ σ) σ) "syllabic dactyl"
head: iamb	x (σ (σ σ)) "syllabic anapest"	x ((σ σ) σ) "syllabic amphibrach"

So far no appeal has been made to the anapest in either moraic or syllabic systems. The differences between the two syllabic amphibrachs will probably be hard to identify in addition to the fact that amphibrachs are already competing with the syllabic dactyl (cf. above).

He suggests that the moraic amphibrach in the left upper corner of (20) is used for Sentani, right-to-left. The alternative that Hayes (1995:330-333) proposes appeals to the moraic trochee applied in weak local parsing mode. A possible trochaic alternative appeals to a bisyllabic moraic trochee for primary accent and a dactyle for the remaining rhythmic structure. In that case we must accept that a dactylic foot type that forbids heavy syllable in weak foot position, but allowing a foot to be "h l l".

Rice puts the other moraic amphibrachs to use in Chugach (in a LR mode). In Chugach a (primary) accent falls on the first syllable if it contains a long vowel or if it is closed. Thereafter we find a ternary alternation. As an alternative to Rice's analysis, we could again appeal to a dactylic syllabic foot that forbids heavy syllables in dependent position. To get the trochaic chain started we make an initial light a syllable extrametrical; we also must allow unary feet:

(75)

```
 x       x                x         x
(h   l) (l)              (h   l  l)(l)

 x      x                    x       x   x
(h   l)(h   l)             l (l  l  l)(l) (h)

    x       x                x       x      x!
 l (l  l  l)(l)             l (l  l  l)(l   l) l

    x       x                x         x         x
 l (h  l  l)(l)             (h   l) l (l   l  l)(l)
```

The third string in the right-hand column shows an additional constraint: a right-edge lapse is resolved by accented the final light syllable.

Both for Sentani and Chugach I have appealed to a trochaic foot type that is essentially syllabic, yet reluctant to place bimoraic syllables in dependent position. In van der Hulst (1984:211) I refer to such feet as no mismatch feet. We probably also need no-mismatch feet in the "min" (i.e. bisyllabic) syllabic foot type. In Finnish, for example, a [σ σ l h ... string does not receive a secondary accent on the third syllable to avoid a trochaic (l h) grouping; cf. Grijzenhout (1992).[41]

1.3.6.4 Concluding remark

The preceding sections have shown that the exact details of the foot inventory remain an area for debate. We now turn to systems that can be analysed in terms of so-called unbounded feet, although, as we will see, a reasonable alternative is to analyse them as footless systems.

1.3.7 Unbounded feet

Consider the following accent rules (Hayes 1995:296-297 gives several examples of all of these):

(76) Weight-sensitive unbounded systems

RIGHT/LEFT
Primary accent falls on the RIGHTmost heavy syllable,
Default: if there is no heavy syllable, primary accent falls on the LEFTmost syllable

LEFT/RIGHT
Primary accent falls on the LEFTmost heavy syllable,
Default: if there is no heavy syllable, primary accent falls on the RIGHTmost syllable

RIGHT/RIGHT
Primary accent falls on the RIGHTmost heavy syllable,
Default: if there is no heavy syllable, primary accent falls on the RIGHTmost syllable

LEFT/LEFT
Primary accent falls on the LEFTmost heavy syllable,
Default: if there is no heavy syllable, primary accent falls on the LEFTmost syllable

Primary accent falls on the left- or rightmost heavy syllable. If there is no heavy syllable in systems with these rules, the default option is to "same edge" (E/E) or "opposite edge" (E/-E).

Systems of this type seem to lack the alternating patterns of secondary accents that is typical of the cases discussed so far, and moreover the restriction that the location of primary accent is bound to a three- or two-syllable window does not seem to hold. Such systems have been called **unbounded**, as opposed to systems in which the location of primary accent is foot-based, which are called **bounded**.

All examples in (76) show weight-sensitivity. This leads to the question what a weight-insensitive unbounded system looks like. Clearly such cases would have fixed

peripheral accent without a further alternating patterns of non-primary accents. An alternative approach to such systems is to regard them as having bounded feet, and to assume that footing is non-iterative, i.e. that only one foot is assigned at the left or right edge. The problem of multiple analyses (mentioned before, when I discussed extrametricality) may point to an over-articulated structural richness of the theory. Hayes (1995:298) seems to suggest that unbounded feet only occur in systems which have syllable weight distinctions.

Consider how an unbounded weight-sensitive system is handled in the standard metrical theory. Directionality is not relevant in such systems. All heavy syllables form the head of a foot, and what must be known is whether light syllables group to the left or to the right of these heads. This follows from setting the headedness parameter. This parameter also decides what kind of foot is built if there are no heavy syllables. At the word level we then promote the left- or rightmost foot head to primary accent status.[42] (77) illustrates a last/first system:

(77) A last/first system

```
Word (RH)                        x                x
Foot (LH)    (x     x            x       )       (x             )
             (l  l)(h  l  l  l)(h  l  l)         (l  l  l  l  l)
```

A first/last system has RH feet and a LH word:

(78) A first/last system

```
Word (LH)           x                                          x
Foot (RH)    (      x            x     x)       (             x)
             (l  l  h)(l  l  l  h)(l  l)         (l  l  l  l  l)
```

The other types of unbounded system (last/last, first/first) are problematical, however, and the standard theory did not offer a satisfactory solution. The proposal was to assume that such systems had unbounded feet that required heavy syllables as their head.[43] Due to this requirement words consisting of light syllables only could not be assigned a foot at all, because the foot head must be heavy. Hence in such words the word tree will, instead of promoting a peripheral foot head, promote a peripheral syllable:[44]

(79) A last/last system

```
Word (RH)                        x                          x
Foot (LH)    (      x            x       )       (          ?)
              l  l (h  l  l  l)(h  l  l)         (l  l  l  l  l)
```

(80) A first/first system

```
Word (LH)           x                x
Foot (RH)    (      x            x       )       (?             )
             (l  l  h)(l  l  l  h) l  l           l  l  l  l  l
```

To derive these cases we need a principle (called the **continuous column constraint** in Hayes 1995) that generates the missing "x" in the light syllable words.[45]

Several other proposals have been made. Prince (1985) points out that unbounded systems can be derived straightforwardly by assuming that bounded feet are assigned only if they can be headed by a heavy syllable, and in the absence of these to one of the edges. Surface unbounded feet may be derived by adjoining light syllables to such a bounded foot. Prince's proposal implies that unbounded feet need not be taken as primitives of the theory, but at the same time it reinforces the question whether unbounded systems really have foot assignment of any sort.

Halle & Vergnaud (1987) offer an account that essentially reconstructs Hayes' (and their own; cf. Vergnaud & Halle 1978) earlier "standard" metrical approach.

Hayes (1995:xxx) remarks that since unbounded systems show all the logical possibilities "there is little to constrain a theory". An issue that has apparently lost attention is whether unbounded systems make use of the same means as bounded systems, differing from these in a single parameter setting. Hayes handles E/-E systems with unbounded weight-sensitive foot construction (as in the standard theory). E/E-systems are handled by projecting prominence distinctions, i.e. heavy syllables and directly assigning primary accent to the left- or rightmost heavy or (in the absence of a heavy) left- or rightmost syllable. Hayes suggests that E/E systems could also involve foot construction, but we would then have to add that the primary accent rule will always select a foot headed by a heavy over a foot headed by a light syllable.

Of course we may also take the opposite route and argue that E/-E systems involve no foot construction either. In that case we simply say that such systems assign primary accent to the rightmost or leftmost heavy syllable, assuming furthermore that the default rule is independent and may select the same or the opposite edge of the word. Goldsmith (1990: 180ff.) seems to suggests an approach of this type. I will return to this approach in §1.4.4.

Finally, let us note that unbounded systems may also involve lexically marked syllables rather than heavy syllables. In this case we get statements which are like those in (81), with "heavy" replaced by "lexically marked". Systems of this type are often called **lexical accent systems**. Examples of lexical accent systems that show the variety that has also been found for unbounded systems are given in (81):

(81) Lexical mark unbounded systems

a.	*RIGHT/LEFT*	(vacancy)
b.	*LEFT/RIGHT*	Turkish
c.	*RIGHT/RIGHT*	Modern Hebrew
d.	*LEFT/LEFT*	(Russian)

These cases are discussed in chapter 11.3 and §1.3.8.5 and §1.3.8.4, respectively.[46]

In §1.2.3 I raised the question whether lexical accent systems can be dealt with in a metrical, i.e. foot-based theory. We have seen that early versions of metrical theory indeed attempt to represent unbounded systems (in which I include lexical accent systems) using feet. Here I have cast doubt on the usefulness of the foot concept for unbounded systems. This does not mean, however, that unbounded systems and bounded (clearly foot-based) systems have nothing in common or cannot be seen as resulting from the options

that a general theory of word accent allows. I sketch such a theory in §1.4.4, and in van der Hulst (forthcoming xxx).[47]

1.3.8 The treatment of exceptions

In this section I discuss how lexical items can be marked in order to deal with forms that are exceptional to the regular accent algorithm.

In the literature various ways have been suggested to mark entries for exceptional information. In a number of cases it has been argued that different devices necessarily complement each other, in other cases we appear to deal with competing devices (perhaps only different notationally).

There are two trends in marking exceptions. In the first (explored in this section), all marking is done in terms of lexical specification of marks ("diacritic weight") or other aspects of the elements that constitute an accentual representation (such as foot or domain brackets). Another approach is to say that exceptional words are subjected to another accentual algorithm (Tsay 1990). Thus, if a language has final accent, but a subset of words has penultimate accent, one might argue that this subset has a different foot type. This approach claims that exceptional words fall outside the prosodic system of the regular words. The advantage of this approach is that one appears to make the correct prediction that exceptional words always represent a possible accentual system, i.e. an accentual system that is regular in some other language. For example, a language with penultimate accent, may have exceptions with antepenultimate or final accent (both being possible accentual patterns), but no accents that occur on the fourth syllable from the end. The disadvantage of this approach is that one incorrectly predicts that the exceptional words may exhibit a totally different accentual system. For example, one would predict that a language having weight-insensitive penultimate accent, mat have an exceptional weight-sensitive initial accent. No such cases have ever been reported, although Turkish (§1.3.8.5) comes close.

The most common approach, then, is to mark exceptional words with partial information, i.e. information which "bleeds" certain but not all parts of the regular algorithm. In this way words come out as being partially deviant. I will assume here that all we need most of the time is lexical marking of weight and lexical marking of extrametricality. In certain cases of deaccenting and preaccenting extra mechanisms seem to be required, however.

Let us consider some of the cases that have received attention in the literature.

1.3.8.1 Polish

Exceptions in Polish have been discussed in Comrie (1976), Halle & Vergnaud (1987), Franks (1987, 1991), Hammond (1989), Idsardi (1992) and Halle & Idsardi (1995); cf. chapter 11.1.6. Polish has regular penultimate accent and three types of exceptions:

(82)

A/P	*P/A*	*F*
uniwérsytet	gramátyk	reżím
‘university’	‘grammar-GEN-PL’	‘regime’
uniwersytét-u	gramátyk-a	reżím-u
‘id-GEN-SG’	‘id.-NOM-SG’	‘id.-GEN-SG’
universytet-ámi	gramatyk-ámi	reżim-ámi
‘id-INS-PL’	‘id.-INS-PL’	‘id.-INS-PL’

The difference between A/P and P/A is that the second is regularly penultimate in isolation, but shows antepenultimate if a V-suffix is added. In the A/P case we find the reverse.

It should be noted, however, that the special behaviour of the *gramatyka* class applies to inflectional endings only. A form like *gramatýczny* ‘grammatical’ has regular penultimate accent. I will assume that lexical markings can disappear in an environment created by derivation.

Idsardi (1993) and Halle & Idsardi (1995) make no appeal to marking diacritic weight, but represent all exceptions with pre-assigned brackets. This approach is discussed in §1.4.3.3 and adopted in chapter 11.1 and 11.3:

(83) a.

)	)	)
uniwersytet	uniwersytet-u	uniwersytet-ami
(σ σ)(σ σ)	(σ σ)(σ σ)(σ σ)	(σ σ)(σ σ) (σ σ)
uni wersytet	uni wersy tet-u	uni wersytet-ami
x	x	x
(x x)	(x x x)	(x x x)
(σ σ)(σ σ)	(σ σ)(σ σ)(σ σ)	(σ σ)(σ σ) (σ σ)
uni wersytet	uni wersy tet-u	uni wersytet-ami

b.

)	)	)
gramatyk	gramatyk-a	gramatyk-ami
(σ σ)	(σ σ)	(σ σ)(σ σ)
gramatyk	gramatyk-a	gramatyk-ami
x	x	x
(x)	(x)	(x x)
(σ σ)	(σ σ)	(σ σ)(σ σ)
gramatyk	gramatyk-a	gramatyk-ami

c.

(	(	(
reżim	reżim-u	reżim-ami
(σ)	(σ σ)	(σ (σ σ)
reżim	reżim-u	reżim- ami
x	x	x
(x)	(x)	(x x)
(σ)	(σ σ)	(σ σ) (σ σ)
reżim	reżim-u	reżim- ami

I have assumed that unary feet are not constructed, except in the third case, because otherwise this word would have no foot at all. The function of the) brackets is to reduce the accent domain (i.e extrametricality), whereas the (brackets function to indicate diacritic weight. The use of brackets in both cases actually obscures the difference between the two classes of exceptions. I therefore would prefer to mark the final syllable of *rezim* with diacritic weight.

Since Polish has trochaic footing, placing brackets or diacritic weight in any other places has no effect, e.g.:

(84)

```
                                    x     x
σ  σ) σ  σ    =>    (σ  σ)(σ  σ)
```

This explains why no Polish word can have irregular PAPU accent and this fact decides that Polish primary accent does not have the characteristics of an unbounded (right/right) system.

1.3.8.2 Macedonian

Macedonian has regular antepenultimate accent; cf. chapter 11.2. In certain exceptions accent falls on the final or penultimate syllable, however. This irregular accent is preserved under suffixation, unless so many syllables are added that the irregular accent would end up on the pre-antepenultimate or earlier position in the word. In that case accent ends up in the regular antepenultimate position:

(85)

konzumátor	‘consumer’
konzumátor-i	‘consumers’
konzumatór-i-te	‘the consumers’

Halle & Idsardi (1995) use "(" brackets to deal with this case:

(86)

```
      (              (                   (
konzumator    konzumator-i        konzumator-i-te

     (σ)σ           (σ σ) σ             (σ σ  σ) σ
konzumator    konzumator-i        konzumator-i-te

      x              x                   (x
     (σ)σ           (σ σ) σ             (σ(σ  σ) σ
konzumator    konzumator-i        konzumator-i-te
```

As in the case of Polish, instead of "(" brackets we can also use lexical marks.

1.3.8.3 Spanish

Roca (1990) analyses the Spanish noun system as having an extrametrical desinence vowel. Halle, Harris & Vergnaud (1991) propose that the unmarked stem-final accent is derived by a general rule, assigning diacritic weight to the last syllable of the stem (*sabán-a* ‘savahna’, *sutíl* ‘subtle’). Some word classes (*sában-a* ‘sheet’, *exámen* ‘exam’, *régimen*

'regime') are lexical exceptions to this rule, the stem-final syllable of *régimen* in addition being lexically marked as extrametrical. The general accent rule is followed by the construction of a trochaic foot on the right edge of the stem:

(87) marking rule:

```
            x          x                              )
         sabán-a    sutíl    sában-a    exámen    régimen
```

footing:

```
           (x)        (x)    (x .)       (x .)     (x .)
         sabán-a    sutíl    sában-a    exámen    régimen
```

The plural of *régimen*, *regímenes*, must be explained by assuming that the lexical ")" bracket disappears, so that this form behaves like *sábana*:

(88)

```
                                (x .)
         regímen-es     =>     regímen-es
```

A similar approach is taken up in chapter 10, where verbal stress in particular is treated as involving lexical marking only, with no foot construction, along the lines of a lexical accent system.

1.3.8.4 Modern Hebrew

Bat-El (1993) analyses the accent system of Modern Hebrew nouns, which involves lexical marking of stems and suffixes. Here, I summarize the basic facts and provide an analysis which is consistent with the assumptions stated earlier.

The regular pattern is final accent. Accent is final both in the singular and the plural form (cf. 89a). This regular pattern is violated in four classes of words (cf. 89b-e):

(89)

a. *Final*

sabón	'soap'	sabon-ím	PL
gamád	'dwarf'	gamad-ím	PL
yomán	'diary'	yoman-ím	PL

b. *Fixed stem-final*

salát	'salad'	salát-im	PL
balón	'balloon'	balón-im	PL
gáz	'gas'	gáz-im	PL

c. *Fixed stem-penultimate*

tíras	'corn'	tíras-im	PL
tráktor	'tractor'	tráktor-im	PL

d. *Stem-penultimate, final*

xóref	'winter'	xoraf-ím	PL
bóten	'tractor'	botn-ím	PL

e. *Stem-antepenultimate, penultimate*

télefon	'telephone'	telefón-im	PL

The exceptions in (89b) and (89c) reflect diacritic weight. The third case involves lexical extrametricality, which is lost under inflection. Both means of lexical marking fail for the fourth case:

```
(90)        x            x              )            x
         salat         tiras          xoref        telefon

            x            x              x            x
            x)           x  )           x)           x    )
         salat         tiras          xoref        telefon

            x            x                    x     *  x
            x     )      x       )            x)       x          )
         salat - im    tiras - im     xoref - im     telefon - im
```

The primary accent for the regular and the irregular cases reflects a Last/Last system, as Bat-El (1993) suggests:

(91) Put primary accent on the rightmost accented syllable or, in the absence of an accented syllable, on the rightmost syllable.

The *telefon* class is problematical. I see no way to derive the PU accent in the plural. We must assume something like a rhythmic accent on the PU in case the word ends in more than two unaccented syllables. This, rhythmic accent, being the rightmost accent, will catch the primary accent due to a retraction rule:

```
(92)                      =>        x
             x   x                (x   x   )
           telefon-im           telefon-im
```

In the above example, the plural suffix was seen to have no special accentual properties of its own. Bat-El refers to suffixes showing the neutral behaviour (and to regular stems like *sabon*) as plain. There are also other types of suffixes:

```
(93)     Inherently accented
         milyón    milyón-im   milyon-ér    milyon-ér-im
         tráktor   tráktor-im  traktor-íst  traktor-íst-im
```

The derivational suffixes *-er* and *-ist* are lexically marked for weight. The stems in this case are lexically accented as well, so these forms confirm the rule in (91): the rightmost accent gets primary accent.

There are also suffixes which do not take final primary accent, not even if added to a regular stem:

```
(94)       Inherently unaccented
           tinók  'baby'    tinók-et  F    tinok-ót  F PL
```

Thus *-et* is marked as extrametrical. Bat-El says that there is only one suffix of this type.

She also discusses "pre-accenting" suffixes. These cannot be marked as extrametrical because the diacritic weight that they pre-assign remains under further derivation:

(95) Pre-accenting

kibúc	kibuc-ím	kibúc-nik	kibúc-nik-it	kibúc-nik-iy-ot
'kibbutz'	id. PL	'person (M) from a kibbutz'	id. F	id. PL

-nik thus assigns diacritic weight to the preceding syllable. Note that its pre-accenting effect remains upon further suffixation even if primary accent ends up falling outside a two-syllable right-edge window. The notion pre-accenting seems to call for either a rule or lexical representations that involve complete foot structure. The latter option would represent *-nik* as the weak syllable in a trochaic foot; cf. Selkirk (1980) and Gussenhoven (1991) for such an approach for comparable English cases.

Finally, we discuss a class of affixes that is fundamentally different. These are the "de-accenting" suffixes:

(96) *De-accenting*

salát	salat-ón	salat-on-ím
sólo	sol-án	sol-an-ím

-on de-accents the stem, but it does not have a lexical accent itself, as the plural form shows. (This suffix is never found after an accented suffix.) This is the category which Bat-El accounts for in terms of a rule. An alternative is to say that every lexically accented stem (redundantly) has an accentless allomorph for which *-on* is subcategorised. In chapter 14 we will see other cases of pre- and deaccenting suffixes.

1.3.8.5 Turkish

Turkish has a left/right unbounded system. Normally primary accent is on the final syllable. In some cases, however, we see that primary accent ends up elsewhere, not necessarily within the three syllable window.[48]

Let us first consider the regular pattern, which the following examples show (taken from Sezer 1983):

(97)

tanı - dík	'acquaintance'
tanı - dık - lár	'acquaintances'
tanı - dık - lar - ím	'my acquaintances'

Turkish does not show preservation under embedding, which means that two options for analysis are available. We could simply assume that accent is assigned only once to the whole word or that each time a suffix is added, the accent rule reapplies concurrent with another rule that deletes the previously assigned accent. Such a view entails a derivation in the following manner for *tanı-dık-lar-ım-ız* 'our acquaintances', for example:

```
(98)     Accent rule                    Accent deletion
            x
         tanı

            x    x                            x
         tanı - dık                     tanı - dık

                  x     x                          x
         tanı - dık - lar               tanı - dık - lar

                        x    x                            x
         tanı - dık - lar - ım          tanı - dık - lar - ım

                             x    x                              x
         tanı - dık - lar - ım - ız     tanı - dık - lar - ım - ız
```

The condition under which the previous accent is deleted could be stated generally as "not being on the last syllable" or one could assume that reference is made to an accent clash. In the latter case an accent would be deleted if and only if it occurs immediately before another accent. At this point the second option may be considered unnecessarily specific, but one should realize that both options make the same predictions only if it were true that all suffixes are monosyllabic. If polysyllabic suffixes occur, the second option is only correct if in those cases accent is preserved. Interestingly, it has been observed that such polysyllabic suffixes are exceptional to the final accent pattern. Barker (1989) therefore argues that the cyclic approach indeed has advantages in accounting for the behaviour of these "exceptional suffixes".

(99) akşám - leyin ‘at evening’

For this case, the derivation is exactly the same as in (98): /akşam/ is accented on the final syllable. When /-leyin/ is attached, final accent is assigned, creating /akşámleyín/. Because the structural description of the clash deletion rule is not satisfied (recall that this rule only applies to immediately adjacent syllables), there is no accent clash and no accent is deleted.

Since primary accent surfaces on the syllable preceding the bisyllabic suffix we now learn from this example that Turkish assigns primary accent to the leftmost accented syllable.

This analysis is elegant, but it is difficult to accept the idea that final accenting is a cyclic rule. If it was not for the bisyllabic suffixes, one would expect the Turkish accent rule to be a post-cyclic word-level rule (in the sense of Borowsky 1992). Given what we know about typically cyclic accent rules, we expect such rules to more "lexically governed", i.e. triggered by specific classes of affixes.

I would like to propose that polysyllabic suffixes are regarded as independent accentual domains which themselves undergo the word level accent rule. The accent pattern of words derived with these suffixes, then, is analogous to that of compounds which carry primary accent on the first stem:

(100) bás ‘one’ + bakán ‘minister’ → básbakan ‘prime minister’
çıríl ‘stark’ + çıplák ‘naked’ → çırílçıplak ‘stark naked’

Whether one single primary accent rule applies to words derived with bisyllabic suffixes and compounds remains to be investigated. The important point here is that in the former case primary accent is assigned to the leftmost accent.

Turkish also has a class of exceptional bisyllabic suffixes:

(101) yap - árak ‘by doing’

We cannot say that these suffixes have a final extrametrical syllable, because the accent does not become final when another regular suffix is added. Thus I conclude that there is a lexical mark on the first syllable of these suffixes.

There are also suffixes with trigger primary accent on the syllable immediately preceding them. In (102), I give some examples (taken from Barker 1989), in which the exceptional suffix is bracketed:

(102) a. taní - [ma] - dık - lar - ım - ız ‘those we do not know’
b. tanı - dık - lar - ım - íz - [mi] ‘our acquaintances?’
c. koalisyón - [la] ‘with coalition’

These, then, must be marked as pre-accenting.

The three classes of suffixes that we have discussed reveal that Turkish is an unbounded system at the word level. Primary accent falls on an accented syllable anywhere in the (phonological) word and on the final syllable if there is no accent. This analysis is confirmed by the accent behaviour of a special part of the vocabulary, where primary accent is foot-based. The relevant words are mainly (though not exclusively) native and foreign place and personal names, and recent borrowings. Although these borrowings mostly conform to segmental aspects of Turkish phonology, their accent pattern is deviant. This class of items has also been drawn attention to and analysed by Sezer (1983) and Kaisse (1985b).

In (103) we list some of the examples, taken from Sezer (1983) and Barker (1989), arranged according to the weight of the final syllables (cf. above). The lowered dots represent syllable boundaries. Note that /vr-/ (103c) is not a permissible syllable onset, so that *şevrole* must be syllabified as indicated below.

(103) a. O.dí.pus ‘Oedipus’
Gö.ré.me ‘Göreme’
Ke.né.di ‘Kennedy’
Pi.to.lé.mi ‘Ptolemy’
In.di.ya.na.pó.lis ‘Indianapolis’

b. Sa.mu.él.son ‘Samuelson’
Va.şíng.ton ‘Washington’
lo.kán.ta ‘restaurant’
Ha.li.kár.nas ‘Halicarnassus’

c. án.ka.ra ‘Ankara’
şa.mán.dı.ra ‘buoy’

	pén.ce.re	'window'
	şév.ro.le	'Chevrolet'
d.	Men.dél.son	'Mendelssohn'
	Kam.çát.ka	'Kamchatka'
	Ay.zın.hó:.ver	'Eisenhower'

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

(104) If the antepenult is heavy and the penult is open with a short vowel, accent falls on the antepenult; otherwise it falls on the penult.

The formal expression of this generalization has triggered a debate in which, amongst others, Kaisse (1985), Hammond (1986) and Barker (1989) have participated. The bottom line is that in these words, the final syllable is extrametrical. Then a weight-sensitive trochee is assigned (i.e. the Yapese pattern). For a representation of this pattern, which is foot-based, I refer to (39) above. Let us call the relevant footing rule the **Minor Accent Rule** (MAR).

It is interesting to note that the regular portion of the vocabulary differs from the place and personal names and recent borrowings in at least three respects: first, the irregular items somehow ignore the final syllable, second, the irregular items show a sensitivity for syllable weight, and, third, regular accent is not foot-based. I will assume that the MAR is a lexical rule that applies before the word-level accent rule or whose effects are possibly simply lexically marked. The important point to note is that words that conform to the MAR when suffixed do not switch to the final pattern.

In fact we now have a second way of establishing that Turkish has a first/last system, rather than a last/last system. To establish whether the specific clause involves a left or rightmost setting we need to consider words that have more than one accented syllable. For this we need to look at cases in which we have exceptional monosyllabic suffixes, so-called pre-accenting suffixes which are attached to a "Sezer-word":

(105) şévrole-la 'with Chevrolet'

This case, as well as the example in (99), illustrates that Turkish has a first/last system.

1.3.8.6 Dutch

In Dutch a final heavy (i.e. closed) syllable appears to push the primary accent foot to its left:

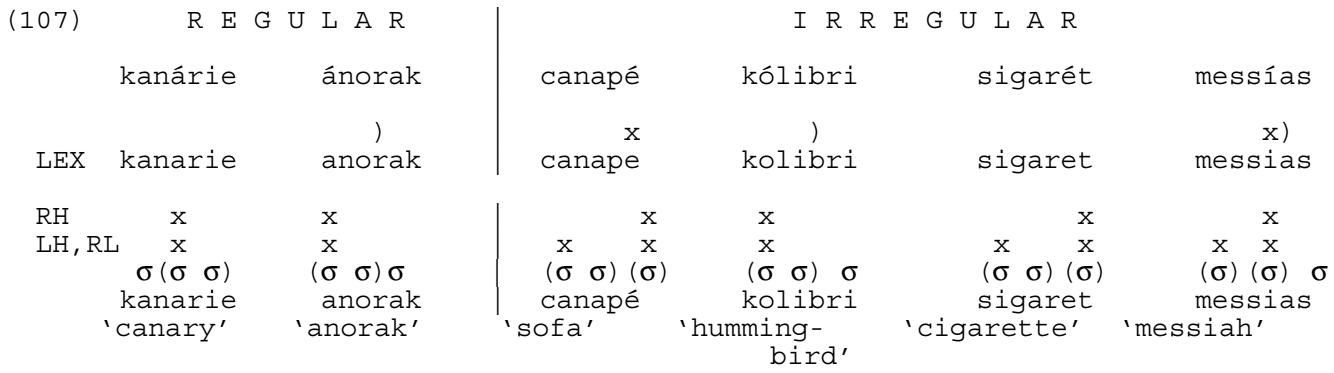
(106)

a.	b.
x	x
(x x)	(x x)
(sa lo)(mon)	(ma ka)(ro ni)
'Salomon'	'macaroni'

Employing metrical trees, van der Hulst (1984) and Kager (1985) propose an account that makes use of a special labelling rule that marks a final non-branching foot as weak (the

Lexical Category Prominence Rule (LCPR)). Trommelen & Zonneveld (1989) replace the LCPR formulation by what they call late extrametricality. The idea is that a syllable is made extrametrical, after feet have been assigned. This has the same effect as the LCPR, i.e. making a final foot extrametrical if and only if the foot is non-branching. The reason why they replace the LCPR by a different mechanism is that they abandon a binary organization of the word tree. If the word tree is "flat" (as it is in bracketed grid theory), the LCPR cannot be formulated. Lahiri & Koreman (1988) replace late extrametricality by final non-branching foot extrametricality. To all these mechanisms we could add another that has the same effect, i.e. making a final closed syllable extrametrical. This is the approach that must be taken if all exceptions must involve either diacritic weight or lexical extrametricality marking.

I assume that there is a rule that lexically marks final closed syllables extrametrical. The generalization that final closed syllables are extrametrical has positive exceptions (*kólibri* 'humming-bird') and negative exceptions (*sigarét* 'cigarette'). In addition, some words have their final syllable marked with diacritic weight. In a complex cases like *messías* 'Messiah', we have both extrametricality and weight marking:



A drawback of this analysis is that both lexical extrametricality and regular footing make independent reference to syllable weight. The behaviour of heavy syllables is thus not explained in a uniform manner. In chapter 8.2, Trommelen and Zonneveld offer a different analysis that does not have this disadvantage.

1.3.8.7 Concluding remark

In this section I have focussed on exceptional marking, including marking extrametricality (adjusting the accentual domain) and marking weight (interfering with foot formation). In some cases this has led to analyses that differ slightly from proposals in the literature or chapters in this book. Whatever the correct analyses turn out to be, it seems clear that there is a need for narrowing down the number of ways in which exceptions can or must be marked.

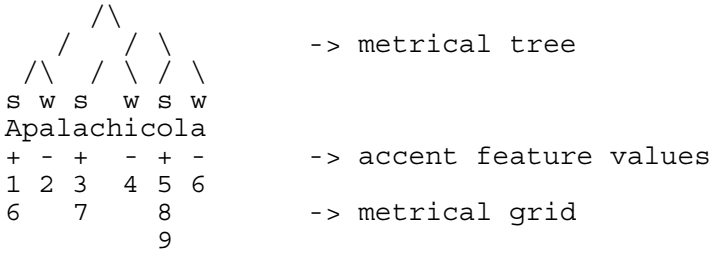
1.4. Overview

1.4.1 The development of metrical theory

Metrical theory was first developed in Liberman (1975). His thesis primarily deals with the intonational system of English, but Liberman included a new proposal for the representation of English word accent in his work, elaborating on Prince (1976). The theory in its initial form is best known from Liberman & Prince (1977).

As we have seen, the novelty of metrical theory is that the string of segments was fed into an algorithm that parsed it into a constituent structure, which produces the accentual pattern as a by-product. The metrical algorithm that Liberman & Prince introduced added to the syllabified string a layer of bisyllabic constituents, called feet. The resulting tree structure was augmented with the labels "Strong" and "Weak". The S label was assigned to syllables that contained an accented vowel:[49]

(108) a. Every sequence of syllables +-, +-- etc. forms a metrical tree (i.e. a foot). The feet are organized into a right branching tree:

b.


In this proposal "being accented" corresponded to being positioned in the strong part of the foot. As shown in (108), a further layer of structure was added, grouping feet into a constituent labeled M (for "Mot"). This term was chosen to make it clear that the notion of word alluded to here was not that of a unit in the morpho-syntactic structure, but rather a "phonological word", a unit that forms part of the metrical (i.e. phonological) constituent structure.

In (108) we see that in addition to phonological constituent structure, Liberman & Prince introduced a second phonological plane, called the **grid**. The grid represented relative prominence that could be read off from the tree according to the algorithm in (109), Liberman & Prince (1977: 316):

(109) In any constituent of which the strong-weak relation is defined, the designated terminal element of its strong subconstituent is metrically stronger than the designated terminal element of its weak constituent.

Soon, phonologists noticed a certain redundancy in the theory, as far as the expression of representation or accent is concerned. In fact, it would appear that accent is expressed three times, i.e. in terms of [±accent], S/W-labelling and grid columns.

If other phenomena than accent are taken into consideration, it could perhaps be argued that each level exhibits independent properties. One could, for example, argue that the [±accent] distribution is the result of a grammaticalised rule that refers to abstract levels of representation and is governed by idiosyncratic lexical and morphological

information (much as in *SPE*). The S/W labelling could be seen as a projection from segmental structure onto a phonological structure that governs the application of phonological processes such as aspiration and flapping. The grid, finally, could be seen as an independent layer, if it could only partially be projected from the tree, because we need additional rules that add "beats" to improve the rhythm only with reference to this level. Be this as it may, in the next stage of development metrical theory underwent changes that were motivated by attempts to eliminate this overlap.

Selkirk (1980) proposed to build the *SPE* accent rule into the foot formation algorithm by making the factors that determine the distribution of this feature directly responsible for the distribution of feet. Thus, footing (including S/W-labelling) became the way in which accent was assigned, whereas at first it was a mere projection from segmental structure.

Kiparsky (1979) showed that the rules that had motivated the grid level (among others the well known **Rhythm Rule** applying in *THIRteen men*) could also be reformulated with reference to the tree structure alone. His argument was generally accepted and grids disappeared from the scene (see chapter 3 for discussion of these cases).

In retrospect, it is perhaps the case that the use of S/W labelling concealed the fact that Liberman & Prince were actually proposing that phonological constituent structure is headed. The daughter labeled "S" was really the head of the foot and the foot that was dominated by S nodes alone was the head foot of the prosodic word. Prominence or accent could simply be regarded as one of the suprasyllabic exponents of headedness. Thus, metrical theory was a first step toward recognizing the central organizing rule of head-dependency relations in phonology. Gradually the S/W notation was replaced by other graphical means to indicate headedness (cf. below).

In Vergnaud & Halle (1978) the Liberman & Prince theory of English accent is transformed into a parametric theory of accent systems. Vergnaud and Halle discovered that the word accent rules of a great variety of languages could be "unravelled" and represented in terms of settings for these parameters. Their proposals were elaborated and richly documented in Hayes (1980). In the previous section I discussed the basic parameters that emerged from these and later works.

1.4.2 The prosodic hierarchy

The emergence of metrical theory was also the starting point of taking seriously the familiar insight that natural languages have a dual patterning (or dual articulation), i.e. the insight that next to a morpho-syntactic organization, natural language expressions have an organization that underlies the substantive (i.e. perceptible) side of these expressions. This fundamental insight in language structure provides the very basis for phonology, which would otherwise consist of listing the sound shape of all words or utterances of the language.

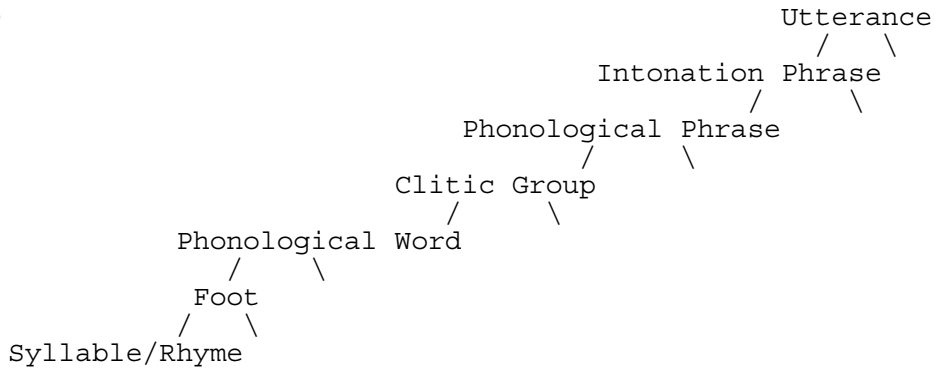
Metrical theory made the crucial move by introducing a phonological constituent structure, which shares certain properties to the hierarchical organization that is adopted in many theories of morpho-syntax. A simultaneous development argued that segments are organized in terms of a hierarchical syllabic organization (Kahn 1976). The idea then

further developed that there is a phonological hierarchical organization corresponding to complete utterances. This organization takes the form of a layered constituent structure usually called the **prosodic hierarchy** (Selkirk 1981, 1995; Nespor & Vogel 1986), or the **phonological hierarchy**.

The idea of strict layering is that prosodic structure reflects a hierarchy of inclusive constituents such that each layer dominates (and perhaps exhaustively groups all the) units on the immediately lower layer. This is a first indication that prosodic structure is not isomorphic to morpho-syntactic structure since the morpho-syntactic organization does not have such a structural property. (If full isomorphy existed, there would be little motivation for a dual articulation in the first place.)

Syllables (or rhymes) can be thought of as forming the lowest layer. Syllables, then, are grouped into so-called feet. Feet are combined to form phonological words and these to form phonological phrases. Phonological words and phonological phrases correspond only roughly in size to morpho-syntactic words and syntactic phrases, which is a second indication for the non-isomorphy between the two hierarchies. According to some theories, there is a constituent in-between the phonological word and the phonological phrase, viz. the clitic group. Above the level of the phonological phrase, most researchers postulate in intonational phrases which combine to form the utterance. Again, these units correspond only roughly to syntactic or sentence-size constituents.

(110)



A third reason for believing that the morphosyntactic structure (M-structure) and the Prosodic structure (P-structure) is non-isomorphic is due to the simple fact that monomorphemic words have no M-structure. Since such words can of course be polysyllabic they will have an independent prosodic structure up to the phonological word level, at least.

Generally a morpho-syntactic word will correspond to minimally one prosodic word; compounds usually form more than one prosodic word. The Clitic Group is the odd one out in that it does not dominate collections of phonological words, but rather one phonological word and lexical forms which are syntactically more or less independent (for simplicity, let us say that they are morpho-syntactic words), but phonologically less than a phonological word (cf. chapter 2).

Saying that M-structure and P-structure are non-isomorphic does not entail that both structures are totally unrelated. We already implicitly suggested that there is a certain correspondence in the form of word and phrases in M- and P structure. It will also be

clear that the boundaries between intonational phrases are not randomly distributed, like in the middle of words. Rather, there is a clear tendency to align intonational and syntactic constituent edges.

Given that M-structure and P-structure are non-isomorphic but not totally unrelated either it will not come as a surprise that linguists have investigated the nature of the "syntax-phonology connection". This is a complicated research area not only because precise theories expressing the relevant correspondences must make assumptions concerning the details of both organizations, but also because theories about either articulation are the result of specialized work, changing rapidly on the basis of purely articulation-internal considerations; cf. Selkirk (1984), Nespor & Vogel (1986), Kaisse (1985a), Inkelas & Zec (1990).

The **strict layer hypothesis** just introduced has been challenged with respect to the syllable and foot layer, especially due to the ban on unary feet (cf. §1.3.6.2). With respect to the clitic group strict layering does not hold in principle, as we have just seen, since this unit groups together Phonological word and units that are too small to form a phonological word by themselves (in fact, the are often too small to form even a foot).[50]

In those works that address the M/P-connection (such as Selkirk 1978; Nespor & Vogel 1976), prosodic structure is erected on the basis of morpho-syntactic structure. More recent approaches move away from a directional view and simply state the connection in terms of correspondence rules or **alignment** (cf. Selkirk & Shen 1990; McCarthy & Prince 1993b).

1.4.3 Variants of metrical theory

1.4.3.1 Grid-only theory

In §1.4.1 I noted that the original Liberman & Prince theory contained built-in redundancies. The major trend was to eliminate the grid, but Prince (1983) explores the other logical possibility, arguing that the independent evidence for foot structure is rather limited.

Thus he translated footing into **Perfect Gridding** and word tree construction into end rules. The latter proposal implied a flat view on the prosodic word organization. By allowing that Perfect Gridding could be specified as "peak first" or "trough first", Prince could mimic the effect of trochaic or iambic parsing. Weight-sensitive systems were represented by projecting heavy syllables on the grid and letting Perfect Gridding apply to stretches of light syllables. This approach, in fact, is comparable to the (later developed) bimoraic footing idea, since it suggests that heavy syllables are "metrical islands", placed outside the algorithm that distributes rhythm to light syllables.

Prince’s paper renewed the interest in evidence for foot constituency. Halle & Vergnaud (1987) provided examples of accent shifts, the direction of which could only be understood if foot boundaries are part of the metrical structure (cf. Dresher 1990 for a critical note and Kenstowicz 1991, 1993 for further support).

Prince (1983) is an important and influential paper even though one of its central proposals (i.e. no foot boundaries) did not gain general acceptance. This influence was partly notational (cf. the use of the (bracketed) grid), partly terminological (the "End Rule"

for what I call "primary accent rule" here) and partly substantial (the island treatment of heavy syllables, the flat word structure).

1.4.3.2 Bracketed grid theory

Even though Halle & Vergnaud (1987) pleaded for the return of foot boundaries, they decided to add the foot brackets to the grid, rather than returning to the graphical shape of trees. Thus they adopted (111c), rather than the arboreal notation in (111a,b):

```
(111) a.        /  \        b.         /|\          c.
              S      \                /  |  \
            / \       \             /    |    \
           S     W      W         S      W      W
          /\    /\     /\        /\     /\     /\       x
         S  W  S  W   S  W     S  W   S  W   S  W    (x     x     x      )
         σ  σ  σ  σ   σ  σ     σ  σ   σ  σ   σ  σ    (σ  σ) (σ  σ) (σ σ)
```

The difference between (111a) and (111b,c) lies, then, in the amount of structure that is assigned to the Word Tree. Representations like (111b) and (111c) are fully equivalent. Next to (111c), tree notations that were and are in use replace S/W labels by graphically marking heads with a dot or small circle. Hammond (1984a) proposed this notation and termed it "lollipop-notation". Usually heads are also dominated by a vertical line. A similar notation is proposed in **Dependency Phonology** (Anderson & Ewen 1987).

On the substantial side, Halle & Vergnaud (1987) essentially argue for the standard foot typology, except for the fact that moraic trochees are created if leftheaded feet are built directly on a layer of zero-level x’s that correspond to moras, rather than syllables.

1.4.3.3 Bracket-first theory

Idsardi (1992) and Halle & Idsardi (1995) propose a new algorithm for constructing bracketed grids. The basic idea is that the algorithm starts out placing left- or right brackets in the string. Further steps fill in the pairing of brackets and heads. The theory that they propose is described and used in chapter 11.1. We also made brief reference to this approach in §1.3.8.

I am inclined to be sceptical about this approach since the manipulation of brackets seems to imply a conception of phonology that is preoccupied with the notational system and not so much with its "semantics", i.e. the content of the theory.

Still (but this may very well be a coincidental effect), it could be argued that the bracket-first approach has a unifying effect on marking exceptions since it reduces marking extrametricality and foot structure to the same device, viz. inserting a bracket. We have seen this in §1.3.8.1 and I suggested reasons why this unification is perhaps not desirable.

1.4.4 Primary Accent First theory

Van der Hulst (1984, 1992, forthcoming a,b,c) challenges the view that the rhythmic organization at the word-level is derived by first directionally constructing a layer of feet and then selecting a peripheral or near-peripheral foot to bear primary accent, while the other feet express non-primary accents. Instead he proposes a **Primary Accent First** (PAF) theory in which primary and non-primary accent assignment are regarded as separate algorithms. The initial observation which led to this theory was the fact that, in the majority of cases, the assignment of primary accent does not depend on prior exhaustive footing.[51] Additional support for this view is found in the fact that there are languages in which primary accent appears to be weight-sensitive, whereas non-primary accent is not. (This has been suggested for English and Dutch). There are also cases in which both are weight-sensitive, but in different ways. In Chugach (Hayes 1995:xxx-xxx), for example, both syllables with long vowels and closed syllables count as heavy with respect to primary accent assignment, whereas only syllables with long vowels count as heavy with respect to non-primary accents. Also, non-primary accent location often has properties that are diagnostic of post-lexical rules, such as optionality and a lack of arbitrary exceptions, whereas primary accent is not optional and typically has exceptions and subregularities, thus exemplifying a lexical process.

By way of introducing the PAF theory let us say that primary accent is always assigned to the left- or rightmost special syllable. Special syllables are visible at level 1 of the grid. Syllables can be special in three ways:

(112) a. Heavy syllables
b. Marked syllables (i.e. diacritic weight)
c. Strong syllables (due to foot structure)

These factors may occur separately, in combination, or not at all. If there is no special syllable, level 1 will be provided with a mark by a default rule referring to the word-edge. Hence, the general scheme for primary accentuation is in (113):

(113) a. Project special syllables of type X to level 1
(X = heavy, marked, strong)
b. Assign a mark to the leftmost/rightmost syllable in case level 1 is empty
c. Assign primary accent to the leftmost/rightmost level 1 mark

Following Prince (1983) I refer to the rule in (113c) as the **End Rule** and to the rule in (113b) as the **Default Rule**. To differentiate between bounded and unbounded systems, PAF incorporates a domain parameter. In bounded systems the domain for primary stress is not the word, but the first or last two syllables of the word (with the extra option of extrametricality). In unbounded systems the domain for primary stress is the prosodic word (also with the extrametricality option).[52]

The basic rule schema generates four types of bounded systems (on the left and right side) and four types of unbounded systems. We have seen in §1.3.4 that on the right side four types of bounded systems have been attested (Rotuman, Yapese, Aklan and Awadhi). On the left side only three have been attested (Ossetic, Malayalam, Capanahua). I illustrate here the right edge bounded systems and the unbounded systems:

(114) a. *Rotuman : final in case of σh], otherwise penultimate*

```
 x                x              x            x
 x   )            x)           x  x)          x   )
(h  l) ]      (l  h) ]       (h  h) ]      (l  l) ]
```

=> rightmost heavy, otherwise leftmost

b. *Yapese : penultimate in case of hl], otherwise final*

```
 x                x              x              x
 x   )            x)           x  x)            x)
(h  l) ]      (l  h) ]       (h  h) ]      (l  l) ]
 ====
```

=> rightmost heavy, otherwise rightmost

c. *Aklan: penultimate in case of hσ], otherwise final*

```
 x                x            x                x
 x   )            x)           x  x)            x)
(h  l) ]      (l  h) ]       (h  h) ]      (l  l) ]
```

=> leftmost heavy, otherwise rightmost

d. *Awadhi: penultimate except in case of lh]*

```
 x                 x           x           x
 x                 x           x  x        x
[h l) ]          (l h) ]      (h  h) ]    (l l) ]
```

=> leftmost heavy, otherwise leftmost

(115) a. Classical Arabic, Huasteco, Eastern Cheremis

```
                          x             x
        (         x       x     )       (x            )
         l  l  l  h  l  l  l  h  l  l       l  l  l  l  l
```

=> rightmost heavy, otherwise leftmost

b. Aguacatec, Golin, Western Cheremis

```
                  x                                     x
        (         x                           (         x)
         l  l  l  h  l  l  l  h  l  l)       l  l  l  l  l
```

=> rightmost heavy, otherwise rightmost

c. Komi, Kwak'wala

```
                          x                             x
        (                 x       )       (             x)
         l  l  l  h  l  l  l  h  l  l       (l  l  l  l  l
```

=> leftmost heavy, otherwise rightmost

d. Indo-European accent, Murik

```
                  x                       x
        (         x             )       (x            )
         l  l  l  h  l  l  l  h  l  l       l  l  l  l  l
```

=> leftmost heavy, otherwise leftmost

The proposal, then, that the simple rule schema in (113), combined with the domain parameter generates all the relevant primary accent locations is almost fully instantiated. The analysis of unbounded systems without foot structure (i.e. those in 115) raises the question whether the syllables that carry primary accent are the heads of the prosodic words that contain them. If they are, we must conclude that heads need not be in the vicinity of constituent edges. If they are not, the possibility arises of allowing a prosodic structure that takes the the syllables with primary accent as a point of departure. I leave this issue for further research.

Having thus separated the assignment of primary accent from the assignment of non-primary accent, the latter can be seen as resulting from a fairly simple word level or post-lexical "rhythm box". Roca (1986) assumes that the domain of rhythm is the phonological phrase, but it is possible that other domains of the prosodic hierarchy (cf. chapter 2) are also relevant. The content of the rhythm box cannot be universally fixed because there are differences between languages. Rhythmic footing, for instance, can be weight-sensitive or weight-insensitive, binary or ternary; perhaps rhythmic footing is overwhelmingly trochaic (cf. footnotes 37, 52). The reason to assume that non-primary accent assignment follows primary accent assignment, rather than that the two are completely independent, has to do with the fact that the pattern of non-primary accents can often be regarded as a rhythmic wave that either moves away from the primary accent (**echo rhythm**) or towards it from the opposite edge of the word (**polar rhythm**). The

difference between these two types of rhythms can be seen in words with an odd number of syllables:

(116) a. *Pintupi* (echo)

Word (RH)	x	2
Foot (LH,R)	(x x x)	1
	[(σ σ) (σ σ) (σ σ) σ]	0

b. *Garawa* (polar)

Word (LH)	x	2
Foot (LH,R)	(x x x)	1
	[(σ σ) σ (σ σ) (σ σ)]	0

In these examples we see that non-primary accent assignment respects primary accent location and is thus not completely independent.

1.4.5 Optimality theory

Optimality theory, OT (Prince and Smolensky 1993, McCarthy & Prince 1993a,b) is not about phonology *per se*. It is a new conception of the way in which grammar works. Most of its applications so far are in phonology, but OT work in syntax is also becoming available. A fair discussion of this approach deserves more space. I will limit myself to a few illustrations.

The central idea is that the grammar consists of a (universal) list of output constraints. This list is ordered partly universally and partly language-specifically. The last fact forms the basis for variation among languages.

Constraints state what the output of grammar must look like, but because they sometimes conflict, outputs cannot conform to all constraints. Constraint conflicts are solved by ranking the constraints. On the basis of the ranked list of constraints, the grammar selects optimal forms from a pool of candidates which are freely generated on the basis of the input (i.e. lexical or underlying) forms. Free generation involves providing input forms with all conceivable syllabifications, metrifications and so on. The optimal output is the one whose first constraint violation occurs lower on the list than the first violation of all its competitors. The following example may illustrate this.

There is a constraint which states that heavy syllables must be heads. We will call it **Weight**. If this constraint was universally top-ranked, all languages would be weight-sensitive. Since this is not the case, there must be another constraint with which Weight potentially conflicts. If this constraint outranks Weight, the language is weight-insensitive. What could this constraint be? Recall that in weight-sensitive languages heavy syllables disturb a regular two-by-two parsing, leading to accents on adjacent syllables. Let us therefore assume that there is a constraint that militates against such clashes; cf. Kager (1993b).

By ordering Weight and NoClash in two ways we now produce two types of languages:

(117) weight-insensitive: NoClash >> Weight
weight-sensitive : Weight >> NoClash

It will be clear that a parametric system can easily be translated into a constraint-based system if we declare both settings to be separate constraints. In this respect the rankings in (117) are more interesting since it might be argued that the two constraints are not exactly opposite, but rather independent and overlapping.

Even typical procedural parameters like direction of footing can be accommodated in a constraint-based approach. The relevant constraint type states that feet must be on the left or right edge of the word. Clearly, if the complete word must be footed, only strictly peripheral feet succeed in not violating the constraint, but on the assumption that violation is minimal, (118a) is better than (118b):

(118) Foot-alignment: feet must be on the left edge
a. (σ σ)(σ σ)(σ σ) σ
b. σ (σ σ)(σ σ)(σ σ)

To describe a left-directional language, Foot-Alignment (left) must dominate Foot-Alignment (right).

Another application of OT involves extrametricality (which OT proponents limit to the right edge, but that is an independent issue). It is well-known that extrametricality is suppressed if the word it should apply to would become too small to foot. We may see this as a case in which extrametricality (as a constraint) is outranked by a constraint that requires (content) words to have a foot. This idea of overruling extrametricality by "something higher" was already implicit in the parametric approach and since the ranking in this case is taken to be universal it does not support the specific conception of language-specific ranking that is the hallmark of OT.

OT applications to accent can be found in Hewitt (1992), Hung (1993), Kager (1994b,c), Kenstowicz (1994), McCarthy & Prince (1993a,b) and van der Hulst & Rosenthall (forthcoming). Burzio (1994) proposes a constraint-based theory that shares important features with OT such as violability and ranking of constraints.

One point that must be borne in mind is that OT does not solve and is not intended to solve, issues of representations or foot typology. For example, when one wants to provide an OT analysis of ternary patterns, one must first decide on what type of foot is needed to represent such systems. Only then can constraints be formulated which pick out the appropriate representations from the candidate outputs.

1.5. Accent and tone

In §1.1 I assumed that we can separate the accent pattern from the manner in which this pattern is phonetically manifested. In English, the phonetic properties of primary accented syllables, are, on the one hand, exponents of the accent itself (like greater duration, loudness and pitch) and, on the other hand, exponents of the units that make up the intonational melody. The latter exponent is only present if the accented syllable is an anchor for an intonational unit.[53]

I will use the phrase **word prosodic system** to refer to the system that characterizes the abstract shape of the accentual structure and the phonetic properties that in some sense are parasitic on the location of accentual heads. As stated in §1.1, we have chosen to focus on the phonetic manifestation of the accentual structure and not on all demarcative or identifying phonetic cues that manifest other aspects of the prosodic structure such as boundaries of constituents, or indeed the domain as a whole (as in various forms of harmony). Thus, for example, if a certain sound is permitted to occur at the beginning of words only, its actual occurrence *de facto* marks a word boundary. The distributional properties of this sound have a demarcative function just like accent may have (cf. Beckman 1986:24-25; Hyman 1978a). Such phenomena might be taken into account in a system of word prosody, but they are not studied in this book.

My main interest so far in this chapter has been to discuss a theory about the accentual side of word prosodic systems. The approach taken here makes a strong prediction with respect to the set of possible word-prosodic systems, namely that the accentual typology can be cross-classified with all occurring phonetic exponents (and combination of exponents) for accents. In this section I will argue that this can be maintained, though there are certain ill-understood accentual locations that seem only to occur in connection with tones. Also it appears that the variety of accent locations that can be found in non-tonal accentual system is not in its entirety found back in tonal systems.

Various studies in this book illustrate that it is indeed useful to distinguish between accent (or accentual pattern) and its phonetic manifestation, especially in the context of a typological study that aims at establishing correspondences and differences between (not necessarily related) languages. Thus we enable ourselves to identify languages as having identical accentual patterns, "seeing through" the superficial phonetic differences. Superficial here is not intended to mean unimportant. First of all it is important in its own right to investigate the possible exponents of accentual structures (cf. chapter 5). Secondly, the claim that the accentual typology is really independent from the typology of phonetic exponents is an empirical one which needs testing; cf. van Heuven (1993, forthcoming).

1.5.1 Tone

In this section I discuss the relation between tone/pitch and accent, drawing on illustrations from non-European languages mainly. In chapter 7, we will apply our findings to European word-prosodic systems. One of the central issues that has concerned typologists of word prosodic systems is that of the relation between **tone** and **accent**. The questions that I will address in this section are the following:

(119) If a system is both accentual and has word level tone, what are the possible interaction between accent and tone?

This question presupposes several other questions:[54]

(120) a. When do we call a system tonal?
b. When do we call a system accentual?

A classical answer to the question in (120a) is given by Pike (1948:3), who presents the following definition: "A tone language may be defined as language having lexically significant, contrastive, but relative pitch on each syllable".

If tones can be contrastive on all syllables tone is fully paradigmatic, like other properties that vowels (or subsyllabic units) may have (provided these are not harmonic), and the tone system is unrestricted.

In my view, there is no reason for limiting the term "onal language"to cases in which tone is strongly paradigmatic, and perhaps no language meets this "platonic ideal". Presumably, all tonal systems show some kind of restriction either resulting from tonal spreading, from limiting the number of tonal melodies or from relations between tone distribution and accentual structure which lead to accent-driven reduction (cf. §1.5.3.2).

On the other extreme we find a definition of Welmers (1973:2) who proposes: "A tone language is a language in which both pitch phonemes and segmental phonemes enter into the composition of at least some morphemes."

This definition includes languages in which there are tonal contrasts in certain, or even one position, and, depending on how one defines "pitch phonemes", a languages in which all words carry the same tone on their last syllable (thus showing no contrast). We might refer to these cases as polymelodic (contrast) and monomelodic (no contrast), respectively. If one dismisses monomelodic systems as having pitch phonemes such systems will not be tonal, according to Welmers' definition.

As soon as we have tonal contrast, phonological tones must be specified in the lexical entries. These could be either different tones (e.g. H, L, etc.)[55] or, in the limiting case, the presence of a tone (most likely H) versus the absence of a tone (leading to a phonological or phonetic default low tone). Let us say that in the former case the tonal contrast is **equipollent**. The latter case will be referred to as **privative tonal** contrast.

The question is, however, whether a language should be called tonal if it does not have a tonal contrast, i.e. in case it is monomelodic which implies that each word is provided with the melody in question. The issue here is not one of merely "labelling" a language as tonal or not, but rather whether it is correct to say that a language that has no tonal contrast has (or can have) lexical, i.e. phonological tones. We address the issue of how to analyse languages with respect to being tonal or not (not how to label them) in the next section.

1.5.2 Monomelodic systems: three alternatives

One possibility to analyze languages that have one high-pitched syllable in every word is to assign a H tone, lexically (if its location is not predictable) or by rule (if the position is fixed). Let us refer to this tonal analysis of a monomelodic system as the **restricted tonal** analysis, since the specification of only one tone (or one melody) is involved. An alternative to the restricted tonal analysis would be to assume that words are accented (lexically or by rule) and that a H tone is associated to this accent by a late rule. In that case high pitch is the phonetic exponent of the H tone, which associates to an accent. I will call this the **tonal accent** analysis. In case the analysis would point to supplying every accent with a tone, the obvious analysis is to have just accents (lexically or by rule),

taking pitch to be a direct manifestation of accent. I will call this the **pitch-accent** analysis.

Thus, at first sight, monomelodic systems can be analyzed in three ways:

(121) a. *Restricted tone analysis*
Pitch as an exponent of (non-contrastive) tones
b. *Tonal accent analysis*
Pitch as an exponent of tone, which associates to accents
c. *Pitch accent analysis*
Pitch as an exponent of accent

These three analyses have been put forward as rivals, rather than as applying to different situations. The spirit of the discussion that follows will be to suggest that option (121a), if taken literally, is at most the coincidental consequence of developments that lead to erosion of the tonal (melody) inventory. The hypothesis is that so-called restricted tone systems in the literal sense (say one H, occurring in positions that have nothing accentual to them) may arise accidentally via tonal assimilation or because of a process of limiting the number of melodies, but one would expect such cases to undergo rapid accentual reanalysis, and one may even speculate that such assimilations and melody reductions will (also) have an accentual drive to begin with.

Systems in which high pitch rather obviously signals indisputable accent locations (and this includes unpredictable locations, as well as those that occur at edges) will be referred to as pitch accent systems, i.e (121c).

I will propose below that the tonal accent class, (121b), primarily − and perhaps exclusively − applies to cases in which H tones associate to indisputable accent locations, and in which these H tones are not predictably generated for each accent, but rather introduced by morphemes or morphological classes. In such systems we encounter words that lack the occurrence of a H tone. In my interpretation of such systems, absence of the H tone does not mean that a word is unaccented.[56] Systems of this type have a privative tonal contrast.

To make matters more concrete, let us take a look at a classical example of a monomelodic system, viz. Tokyo Japanese (noun system). For this dialect the three analyses have been put forward as competitors.

1.5.2.1 Japanese

In Tokyo Japanese, nouns have a specific pitch contour which in some but not all cases involves a LHL contour. In those words that have the full LHL pattern, the L occurs on the initial syllable (or mora). This syllable is followed by a high plateau, which drops to low at some point. After the drop, remaining syllables are low. In some words the initial L, and in other words the final L is missing. Thus, we find the following patterns:

(122)	a.	H	L	L		b.	L	H	L		c.	L	H	H		L	d.	L	H	H		H
		σ	σ	σ			σ	σ	σ			σ	σ	σ	(- | σ)		σ	σ	σ	(- | σ)

In Tokyo Japanese trisyllabic nouns can be in any of these categories. Verbs and adjectives either belong to the second or fourth pattern. I will first present a tonal accent analysis.

Using the notation introduced above, we can represent the accentual pattern of Tokyo Japanese as follows.[57]

(123)

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

The first three cases have a lexical mark (diacritic weight). The fourth pattern is special since in this case the primary accent rule is fed by a default rule that assigns a mark to the final syllable. This pattern is usually called unaccented. Thus, from an accentual point of view the Tokyo Japanese nominal system is a last/last system. This can be formulated in terms of the rule schema discussed in §1.4.4:

(124) *Tokyo Japanese nouns*
a. Project special syllables of type X to level 1
(X = marked)
b. Assign a mark to the rightmost syllable in case level 1 is empty
c. Assign primary accent to the rightmost level 1 mark[58]

We have seen in §1.2.1 that languages such as English allow unaccented words within closed classes only, and such words are moreover mostly monosyllabic. The unaccented character of such words (called clitics) is manifested on the phonetic surface, and we have assumed that such forms do not undergo a primary accent rule. The case of Japanese unaccented word is very different. In my conception these words are accented as a result of the default clause in (124).

With the accentual patterns in (123) we can now derive the surface tonal pattern by assuming that there is one tonal melody, i.e. H which is associated with the accentual pattern and then spread out; this gives us the tonal accent analysis:

(125)
a. Align H with the accented syllable
b. Spread the H to all syllables to its left, except to the first syllable
c. All syllables that are not associated with H, will be L

In a pitch-accent analysis one would not recognize the tonal pattern as a phonological entity and directly derive the contour as the phonetic exponent of the accentual pattern. This route is possible since there is only one tonal melody for all words. The essential point is that the rules in (125) would not be regarded as phonological but as part of the phonetic implementation (cf. Beckman & Pierrehumbert 1988).[59]

Let us now turn to the *restricted tone* analysis. In this approach one would lexically assign a H tone to the syllable that I have provided with a lexical mark in the tonal accent analysis. This would require an adjustment of the association scheme:

(126) a. Align H with the final syllable if no lexical H is present
b. Spread the H to all syllables to its left, except to the first syllable
c. All syllables that are not associated to H, will be L

I have now briefly discussed three different approaches to a system such as that of Tokyo Japanese, namely those mentioned in (121). All three approaches have been defended in the literature. The tonal accent approach comes closest to the analysis offered in McCawley (1968). Lexically, the language is accentual, but in the course of the derivation (presumably at the word level) tone is added and from that point on the language is tonal. This approach was adopted as part of the autosegmental analysis of languages like Japanese and other monomelodic systems (cf. Goldsmith 1976, Haraguchi 1979, 1988). However, it was not terminologically distinguished from what I called the pitch-accent analysis here.

Lockwood (1983) is a representative of (121c), the pitch-accent analysis. The restricted tone approach has been advocated by Meeussen (1972), Pulleyblank (1986) and Clark (1987).

To what extent do these linguists recognize the possibilities in (121), other than the one proposed for Japanese, as valid for other languages? Clark (1988) rejects (121b), but claims that (121c) represents an independent possibility, next to (121a). She makes a distinction between restricted tonal systems, i.e. (121a) and metrical pitch accent systems, i.e. (121c). The difference between the two types is claimed to be that only metrical pitch accent systems have the characteristics that we also find in non-tonal accent languages with respect to accent locations (e.g. influence of syllable weight) and other phonetic cues that occur as the manifestation of accent. In so-called tonal pitch accent languages the accent is simply a tone at every level of representation, according to Clark (1988:52). Hyman & Wilson (1991) discuss Clark's proposal to recognize e.g. (121a) (for Japanese, Kinga, etc.) and (121c) (for Vedic and Ancient Greek), observing that the steps taken by Clark (1987) to view Tokyo Japanese as an instance of (121a) could equally well be applied to Ancient Greek and Vedic. If this line is followed, all monomelodic systems could be analyzed as restricted tone systems (assuming that (121b) is not considered as an independent possibility).

I would now like to defend the opposite view, and argue that monomelodic systems are accentual (either tonal accent or pitch accent systems). The most important drawback of the restricted tone approach is that the distribution of tones in case of predictability often looks a lot like the distribution of accent in non-tonal languages. An important generalization would be missed if the entire theory of accent placement (cf. §1.2), must be repeated in the form of a theory of H placement. We might also add that the lexical specification of the tone (as either H or L) is strictly speaking redundant if there is no tonal contrast.

Haraguchi (1988) strengthens this objection by showing that the possible locations of accent in Japanese dialects reflect the same choices that have been attested in non-tonal accent systems. In various Japanese dialects, the tone(s) associate to a fixed position rather than to lexically marked syllables. Sometimes such fixedness is found in particular word

classes (e.g. verbs). The point is that the locations are those that are familiar from non-tonal accent languages. Haraguchi (1988:132) gives the following list:

(127)
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first/first: Kumi
first/last:  Tokyo, Osaka
last/first:  (gap)
last/last:   Hirosaki
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Haraguchi points out that these patterns are familiar from the study of unbounded accent systems (cf. §1.3.7).

The default option of these patterns is necessary for those words in the dialects mentioned that have no lexically marked syllable. These words are provided with an accent (by default) which is then the target for tonal association or phonetic pitch. In some dialects (such as Fukuoka) all words have a lexically marked accent so that the default option is not activated.

The fact that in some monomelodic systems accent location is not predictable (for example in the Tokyo Japanese nominal system) cannot be used as an argument against an accentual analysis, as Blevins (1993) claims, who says that diacritic accents have no motivation other than signalling the locus for association. This is a somewhat peculiar objection, since diacritic accents (diacritic weight) are clearly necessary and thus motivated in non-tonal accentual systems, e.g. in Russian. The essential point is therefore that we expect such diacritic accents in tonal accentual systems as well.

What Blevins and others also seem to forget is that many monomelodic systems have the characteristic property that words possess a single high tone, either spread out over several syllables or limited to one syllable. This distribution motivates an accentual analysis, which is in no way undermined by the observation that the location of the accent may be lexically determined. In my model such systems are either tonal accent languages or pitch accent languages.

The only real problem for an accentual analysis (whether involving tonal accent or pitch accent) is the occurrence of apparently unaccented non-clitic words, which surface with only low tones. I have noted earlier that the presence of unaccented words in the lexicon is not in itself problematic, as long as an accent is provided by a default rule, as in Tokyo Japanese. This does not happen in all dialects, however. Haraguchi discusses the system of Tsuruoka which has a class of unaccented words that surface with all syllable low toned, where accented words have a high tone. The occurrence of unaccented words, which (and this is of course crucial) remain unaccented can be used to undermine the claim that tonal or pitch accentual systems and stress systems share the same theory of accentuation, since we know that stress languages do not allow unstressed words (apart from clitics). The question is, then, why the default rule can be inactive if the accent is the target for tonal association or pitch, whereas it cannot be inactive if accents are manifested though non-tonal phonetic cues?[60]

There are also other examples of (surface) unaccented words in other candidates for tonal/pitch accent analyses. For such systems, Odden (1988) makes a distinction between an H-class and a toneless class, which is what Haraguchi proposes for Tsuroka (cf. above). Hendriks (1995) discusses languages of the Highlands Stock of the Papuan

language family, in which words with only low tones occur next to a class that has the single high property.

The occurrence of unaccented words provides one of the key arguments for the restricted tone approach argue (cf. Clark 1988:52). But before we accept this let us consider an alternative.

An alternative is to say that in tonal accent systems that allow all-low words, tones are not introduced as a realization of accent (as in Tokyo Japanese, where a pitch accent analysis is a possible alternative, cf. above), but rather are properties of morphemes or tenses. Tones, when present, will associate with reference to accentual positions (e.g. penultimate syllable, first syllable of the stem), but if no morpheme or tense introduces an H tone, the word will be all low, but still have the same acented syllables. This approach has been proposed by Hyman & Katamba (1993) for Luganda, and I believe that we can apply it to the Tsuruoku system, which implies that we are not committed to the view that the all-low words are unaccented.

A consequence of this approach is that systems that allow all-low words have a privative tonal contrast (H versus 0), although H vs. L is also possible (cf. §1.5.3.3).

Let us now address the question whether Tokyo Japanese requires the specification of melodies as part of the phonology (in which case it is a tonal accent system, even though it has no L words) or whether we may view pitch as the direct exponent of accent (cf. notes 56 and 59). The difference hinges on whether the pitch property is introduced in the phonetics or in the phonology. If one capitalizes on contrastivity, (121c) must be favoured. In recent years, it has been shown, however, that properties that are phonologically non-contrastive (redundant) may be activated in the phonology proper. This view allows (121b) despite the non-contrastive character of pitch. One might point to the fact that there is spreading, assuming that the phonetic implementation component cannot cover language-specific spreading phenomena. However, models of phonetic implementation have been proposed that contain a clear language-specific character. Thus, even spreading and other tone-like behaviour could be compatible with the implementation approach. The question then remains why we should prefer the tonal accent analysis over an analysis that treats the pitch contours as direct manifestations of the accentual structure. If we follow Lockwood (1983) and Hyman (1981) we say that the tone step can be skipped, and adopt the pitch-accent analysis for Tokyo Japanese.

In the next section we will take a look at some other systems that are either monomelodic (or privatively) polymelodic.

1.5.2.2 Other monomelodic systems

In Somali, if H-toned, words have a single non-spreading H tone; cf. Hyman (1981), Biber (1981), Banti (1988). The interesting part of this word-prosodic system clearly lies in its accentual part. Accents are located on the right edge, finally or penultimately, the difference depending on morphological factors. Hyman (1981) analyzes the system as involving neither accent nor tone underlyingly. Accents are assigned by rules (that make references to morphological categories) to the final or penultimate mora. He then considers the possibility of assigning tones to accents which in turn are interpreted as pitch, but says: "rather than having a process whereby accent → tone → pitch, it is possible to go

directly from the accent specifications ... to the pitch integers themselves" (Hyman 1981:194). In our terms, Hyman adopts the pitch accent analysis.

It is important to mention that "in contrast to nouns, some verb forms are unaccented and yet have full word status" (Hyman 1981:182). The occurrence of all-low words does not necessarily imply that these words are unaccented. In line with the preceding section, we would have to conclude that high pitch in Somali is not just a realization of accent, but rather that tones are introduced, or lexically present, independently from accents. In other words, Somali would be a tonal accent system after all, presumably with a privative tonal contrast.

A case that has been discussed widely in the context of monomelodic systems is that of Luganda. McCawley (1978) and Heny (1974) argued that an accentual analysis for this system is possible, since at most one HL sequence is possible in a major lexical word. Thus, both scholars referred to Luganda as a pitch accent system; the distinction between tonal accent and pitch accent was not made. Building on this insight, several analyses explored the accentual approach (Hyman 1982). The accentual approach was then rejected as being inadequate and replaced by the restricted tone approach (Pulleyblank 1986). Hyman & Katamba (1993) then also reject the restricted tone approach and propose a combination of accents and lexically specified or inserted HL melodies. The accents play a role in getting the tones in the right place, but there is no one-to-one correspondence between accents and HL-units. An analysis of this type places Luganda in the category of tonal accent languages.

Bantu word-prosodic systems are of special interest to the debate regarding the appropriate analysis for languages that have both tone and accent. Odden (1998) discusses a variety of systems in Bantu languages. In this broad family we find the whole range of word-prosodic systems ranging from the Vunjo dialect of Chaga which has a non-accentual tonal system with four phonetic pitch levels to Swahili which has penultimate non-tonal accent. Odden discusses two groups in which tone and accent interact (cf. Goldsmith 1988:87-89, who identifies two similar groups). The first group, which he calls the Lake Nyasa Area languages, includes Safwa and Kinga, which Voorhoeve (1973) and Schadeberg (1973) have identified as restricted tone languages. The restriction is such that only one H tone occurs per word. This H tone is restricted to only a small number of locations in the word: it may occur on any of the final three vowels, or on a prefix vowel two syllables to the left of the stem. These positions can be identified as accentual much in the same way that we analyzed fixed accent locations in non-final languages. Odden himself does not choose an accentual analysis. He formulates the regularities directly in terms of locations where the H tone occurs. He thus appears to favour the restricted tone analysis, which I propose to replace by the tonal accent analysis.

The second group is referred to as multiple-H languages. An example is Makua, which has a pattern with an H tone on the first syllable and the third syllable in verbs; a rule of H tone doubling produces a span of H from the first to the fourth syllable. Other cases are Kimatuumbi (which also, although less pervasively, has cases of the first and third pattern, and a default pattern assigning H to the first only) and Kikuria (in which H tone may be assigned to any of the first four vowels in the stem). Goldsmith argues that this group shows effects of a vowel count or rhythm. Odden suggests that the vowel count

finds its origin in left-to-right (non-accentual) tonal mapping, whereas Goldsmith seems to suggest a more direct influence of a foot-like organization.

Hyman (1989) offers a lucid overview of the various approaches to "accent in Bantu", stating the issues we address here in a clear manner and with many illustrations. From his overview we learn that most, if not all, restricted tone systems have accentual characteristics. Thus even although tones are present or introduced independently, accentlike positions must be recognized that play a role in associating the tones to specific positions. This boils down to the type of analysis that Hyman & Katamba (1993) propose for Luganda. He then raises the important question whether these accent-like positions fall within the scope of the accentual theory that has been proposed for non-tonal languages. He points to the fact that in a number of Bantu languages initial stem position or penultimate position have accentual properties like allowing more segmental contrasts or triggering vowel lengthening. In languages in which this occurs, it may happen that even though the tones associate to special positions, these positions do not necessarily coincide with the accented positions. If these special positions are analysed as accentual, this means that in such cases more than one accentual structure must be recognized in one language. This situation raises the issue of accentual coherence (Dresher & Lahiri 1991). If one language possesses several syntagmatic word level features, is it necessary that all of them make reference to a single accentual structure? It would seem that this is not always so. Apart from the examples that Hyman mentions, other linguists have pointed out that co-existing syntagmatic features may take syllables or vowels at different edges of the word as their primary anchor. Garde (1968), for example, points out that if vowel harmony is taken to be accentual, Turkish might be said to have a left-edge accent for harmony, whereas Turkish stress appears on the right edge.

Hyman also discusses cases in the second group mentioned above in which tones fall on a special position that seems outside the scope of what metrical theory can account for, like the fourth mora. One might think that the descriptive power of metrical theory would be overstretched if ones tries to deal with these positions in terms of that theory, although we note that in the metrical literature in non-tonal languages, the fourth-from-the-edge position has been made available by allowing foot extrametricality (cf. Hayes 1995:105, 128); cf. §1.3.5.

In the next section I will discuss polymelodic systems; I will look at systems that are clearly tonal (because they are polymelodic) and also clearly accentual (because the accent is often manifested through stress-like cues unrelated to pitch). I will distinguish three ways in which phonological tones and accent can interact (cf. van der Hulst & Smith 1988).

1.5.3 Polymelodic systems

1.5.3.1 Tone-sensitive accentuation

It may be that a language has tonal contrast (on all or most syllables) and that accent structure is assigned with reference to tone. This would be the case if syllables that carry a certain tone count as heavy (or prominent; cf. §1.2.2.2). An example is Golin, where the last (i.e. rightmost) high-toned syllable in the word is accented; cf. Hendriks (1995:104) and Hayes (1995:278). In case the word happens to have no high tone, accent goes to the

final syllable. Golin is thus an unbounded last/last system. In their description, Bunn & Bunn (1970) do not talk about accent but about stress. The usage of this term may imply that the accented syllable has extra phonetic "stress-like" cues involving duration and/or intensity.

Van der Hulst & Smith (1988: xv-xvi) discuss the case of Ayutla Mixtec where accent is assigned as follows:

(128) Accent falls on:
a. the first HL sequence or
b. the first ML sequence or
c. the first H or
d. the first syllable

Thus, Ayutla Mixtec is a first/first tone-sensitive unbounded system.

Halle (1979) analyzes a number of Slavic languages as tone-sensitive accent systems, although in some of these (e.g. Russian, chapter 11.3) the lexically assigned tones are synchronically diacritic accents. In other Slavic languages which have surface pitch, accent can be assigned to the first H tone, or to the first syllable in case there is no high tone (cf. Kiparsky & Halle's 1977:209 Basic Accentuation Principle). In this tradition Hayes (1995:278-279) also places Serbo-Croatian and Lithuanian in the category of tone-sensitive accent systems.

If one adopts a tonal accent analysis for these cases, the first step is that H tone is assigned on the basis of lexically present accents (i.e. diacritic weight). In Serbo-Croatian H-spreading subsequently takes place. After high tone spreading has taken place, a post-lexical rule places a primary accent on the first high tone (cf. chapter 11.2 and Zec 1995). This word-level rule is a tone-sensitive accent rule. I the analysis of such systems, then, I distinguish three levels, making up two accentual systems:

(129) lexical ----------→ tones ---→ primary accent
acents

\I II / \ III /
tonal accent tone-sensitive accentuation

It stands to reason that when the restricted tone analysis in which the lexical accent is replaced by the lexical tones is adopted (i.e levels I and II are conflated), what remains is only the tone-sensitive primary accent rule.

1.5.3.2 Accent-driven tonal reduction

The second possible interaction between accent and tone is that they are independent in the sense that neither is assigned with reference to the other. One might argue that tone systems, in which tones are not associated with reference to accent fall into this category if such a system present evidence for an accentual organization, for example because the penultimate vowel is automatically lengthened.[61]

In these systems it may be the case that the accentual structure has influence on the tonal contrasts and that neutralization takes place in weak or unstressed positions. A case

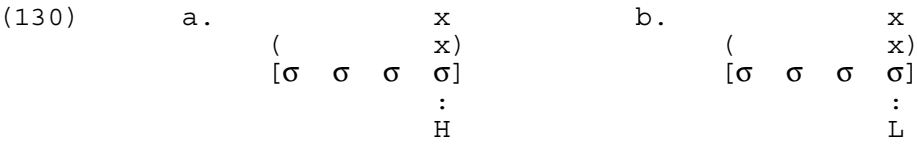
in point is offered by Chinese, where the weak part of compounds undergoes tonal neutralization (Yip 1980).[62]

Once accent-driven reduction has occurred, and no tonal alternations bear witness of the reduced tones, it may be motivated synchronically to analyze the remaining tones as being properties of the whole accentual domain, which are associated in an accent-driven manner. This leads us to the third way in which tone and accent can be related.

1.5.3.3 Accent-sensitive tone association (i.e. tonal accent systems)[63]

The third way in which tone and accent may interact is found in systems in which accent plays a role in the distribution of tone. Consider a language in which a two-way tonal contrast can be realized on a particular syllable in the word, and in which only one syllable per word can have either of the two tones. We could say that this syllable carries a primary accent. Its location would be accounted for in terms of the structures that we have discussed for accentual patterns, i.e. it could be rule-based (bounded or unbounded, weight-insensitive or weight-sensitive) or lexical. It would not be correct in such a case to view the pitch-levels as direct exponents of the accentual structure. Rather, we must view the pitch levels as exponents of phonological tones that associate with reference to the accented syllable. Let us suppose that the accent is final and that the tones are H and L:

(130)



Hyman (1978b:xxx) refers to the case of Fasu in which "a phonological word consists of one obligatory nuclear syllable carrying a high or low tone and from zero to at least eight marginal syllables". The location of the nuclear (i.e. accented) syllable is not predictable.

In addition to functioning as an anchor for the association of lexical tones, such accented syllables may have independent stress-like properties and this may explain why in such cases tones are said to associate to the stressed syllables. A clear example of such a case is found in the tonal Scandinavian languages (cf. chapter 4.2.1 and 9.1) and in the dialects spoken in and around Limburg (cf. chapters 4.2.2 and 9.2). Various polymelodic dialects of Japanese also fall in this category (cf. Haraguchi (1979, 1988, 1991). Lockwood (1993:132) mentions Swedish. In my view Lithuanian falls in this category (HL, LH) and we can add dialects of Gaelic to this list (cf. van der Hulst and Smith 1988). In many of these cases, and more generally when the tonal contrast is binary, an analysis may be appropriate in which the contrast lies in the presence or absence of one tone; cf. note 63.

Let us consider another example. Hollenbach (1988) discusses the case of Copala Trique; cf. also van der Hulst & Smith (1988: xiv-xv). In this language accent plays a role in tonal association, even though some unaccented syllables may also have a limited tonal contrast. The numbers represent tones (simple and contour) and only those that are italicized may occur in unaccented syllables:

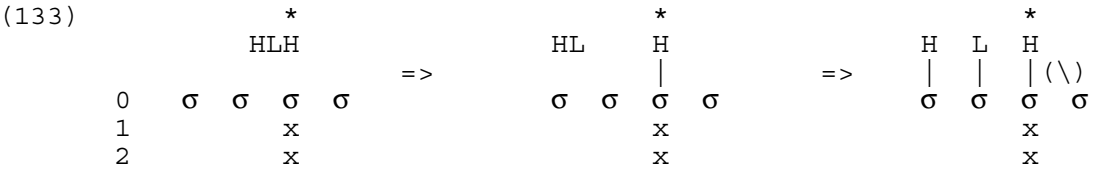
(131) Tones *3* *4* 5
21 32 53
34 35

When Copala Trique is compared to the closely related Chicahuatla dialect, we can clearly see that the tones formerly associated with unaccented syllables have not disappeared but rather moved over to the accented (final) syllable, sometimes pushing tones already there overboard:

(132)	*Chicahuatla*	*Copala Trique*	
a.	2 23	32	
	gaci	gaCe	'to pass'
	2 23	32	
	gane	gane	'to chew'
b.	3 43	34	
	niti	rete	'vegetable pear'
	3 43	34	
	nica	niCa	'full'

This illustrates that an accent-sensitive tonal system may naturally develop out of a situation in which tone and accent are independently present, but in which we find accent-driven tonal reduction.[64]

If association is accent-sensitive this does not imply that all tones forming word melodies must associate to the accented syllable. It may also be that one designated tone of a word melody associates to the accented syllable whereas the other tones associate 1:1 to preceding or following syllables. In this latter case the designated tone usually is H. When more than one H is present in the word melody, the designated H must be marked:



If, in systems of this type, the location of the accent is unpredictable, the distinction between accent-sensitive association and a restricted tone system that has full or partial lexical association of the tones is hard to make (cf. Hendriks 1995) for a discussion of several Papuan word prosodic systems for which it is sometimes not clear whether to analyze them as in (133), with unpredictable accent location, or in terms of tones that are lexically associated without reference to an accent).

1.5.4 The phonetic manifestation of tone

Lockwood (1983) raises the following interesting question. Is it necessarily the case that phonological tone is phonetically realized in terms of pitch? At first sight, it might seem that the answer must be positive, but Lockwood suggests that it is negative. His idea is

that the phonological category TONE includes all cases of phonetic exponents which operate over a domain that is larger than a single segment, yet no greater than the word and that is not culminative. Although it remains to be explained in detail exactly when the domain exceeds that of a segment, I completely agree with the spirit of this proposal.

Just like the notion accent is neutral with respect to potential phonetic exponents, so is TONE, although both can be said to have prototypical manifestations. For accent this is presumably intensity and duration, and for TONE this is pitch.

This view enables one to make sense of so-called "multiple stress languages" such as Waffa and Campa (E. Pike 1974). In these systems phonetic properties normally associated with accent (intensity) manifest themselves in a tonal manner in that every syllable can be stressed or unstressed. Hendriks (1995) suggests that it is possible to interpret these cases as tone languages. What is called stress in these cases is not, then, the exponent of an accentual structure, but rather the exponent of TONE.

The reverse situation holds in pitch-accent languages (i.e. monomelodic systems that show no evidence for a phonological tone entity). Here, accent is manifested by pitch, rather than the typical stress-like properties.

This view is convenient for tonal accent languages as well, because cases have been mentioned in which accented syllables are provided with "quasi-tonal" contrasts. This is suggested, for example, for some of the Dagestanian languages (e.g. chapter 15). We can also include the Scandinavian stød-systems in the class of tonal accent systems, which includes the Scandinavian language that use (real) pitch distinctions. If Lithuanian is taken to be a tonal accent language, we do not have to reject this view if it turns out that the actual phonetic cues of the tone is something else than pitch (cf. Blevins 1993:242, especially note 6, and chapter 5.1.3).[65]

An example of an unexpected tonal analysis in Lockwood's model is Estonian. In this language accent is initial. Initial syllables may have the property of overlength which is manifested on the accented vowel or on the consonant following it (depending on which is phonological long). Lockwood proposes to treat the lengthening effect as the phonetic exponent of a tone that is associated to the accented syllable. Since the location of accent is predictable he does not refer to this system as a tonal accent system, but if I accept his tonal interpretation of overlength, I would.[66]

1.5.5 Accent locations in tonal accent languages

The view in this chapter is that tonal and pitch accent systems can in principle make use of the full array of possibilities for accent placement. We have seen many examples in which this is true and some cases (in Bantu) which pose some problems; cf. Hyman (1989).

In my view we are justified in saying that the notion of accent that underlies tonal accent and pitch accent systems can be identified with the notion of accent that we find in language that are commonly referred to as stress languages.

There appear to be some gaps, however. We have seen that Tokyo Japanese has an unbounded systems of the lexical type: the End Rule is fed by lexical marks.We might thus wonder whether we also find unbounded systems in which the End Rule is fed by weight, e.g.:

(134) *WORD domain*
H tone occurs on the rightmost heavy or on the first syllable

I have also not come across a bounded weight-sensitive tonal accent system:

(135) *FOOT domain*
H tone occurs on the rightmost heavy or on the first syllable

If such cases turn out not to exist, it is perhaps so that tonal or pitch accent systems always have weight-insensitive accent or moraic accent. Hendriks (1995) suggests that weight-sensitivity does occur in tone systems, in the form of moras being the tone bearing units. The apparent complementarity of the role of moras in tonal and non-tonal accent systems is striking indeed. We could say (as has been argued elsewhere, cf. Hyman 1981) that a moraic accentual system is necessarily a tonal or pitch accent system. But it remains mysterious, strictly speaking why a weight-sensitive accent rule (which assigns accents to syllables rather than moras) cannot produce accent that get a tonal interpretation. For the time being, then, we expect that the systems described in (134) and (135) are possible.

1.5.6 Summary

The preceding discussion reveals that I use the term tonal accent systems for the cases discussed in §1.5.2 (i.e. those that have a privative tonal contrast and all cases in section §1.5.3.3. In such systems we find next to the phonological category of accent, **phonological tone** because there is tonal contrast or because not all tones that appear can be seen as being introduced by the accent, which implies that morphemes may or may not introduce an H tone (hence we have a contrast between H and zero).

I reserve the term pitch-accent for monomelodic systems (as McCawley 1978 does), but restrict it further to cases that give no evidence for recognizing a phonological tone (i.e. no contrast and no tones that are introduced independently from accent).[67]

We thus arrive at the following typology of systems that have accentual structure and tone/pitch:

(136) a. Tonal accent
b. Tone-sensitive accent
c. Accent-driven tonal reduction
d. Pitch accent

Type (136d) is in fact an "accent-only" language in which the exponent of accent is pitch; the others have accent and (phonological) tone. Other accent-only languages have different phonetic cues such as intensity or duration of mixtures of these (cf. chapter 6).[68,69]

One could talk about restricted tone languages that are non-accentual when the number of tonal melodies is severely reduced due to tonal spreading, but, as said before, most if not all languages placed in this category show evidence for accents. I therefore suspect that the category of restricted tone languages can at best be seen as a subclass of non-accentual tonal languages, i.e. the subclass that is pretty far removed from the Pikean ideal of a tonal language.

Next to these types we must probably recognize non-accentual languages. The question has been raised (e.g. in Hyman 1978b), whether such languages must be tonal. He mentions Berber as an example of languages that appear to be neither tonal nor accentual. My inclination would be to think that such languages are non-tonal, but not non-accentual, because I assume that all languages have an accentual organization. It is simply not necessary that the accentual structure is manifested in terms of clear phonetic cues.

Systems that are accentual can be distinguished according to the principles of accent assignment. Accent can be lexical or rule based, and in the latter case we find a variety of possibilities (all near to the edges). Systems that combine accent and (contrastive) tone can be categorised according to the number of tonal contrasts.

1.6 Terms and transcriptions

So far we have seen that metrical theory is not completely homogeneous. There are different variants of the theory. Differences involve substantial issues such as the inventory of feet, the precise form of feet and word trees, as well as notations (bracketed grids versus headed trees) and terminology. Such a state of affairs is inevitable in a field that is so lively and widely explored.

I will conclude this chapter with some terminological matters. In §1.2.1 I have argued that we must make a sharp conceptual distinction between the representation of accentual patterns and the phonetic characteristics of utterances cues that may be seen as exponents of this accentual patterns, or cues of some of its ingredients.

Since then I have consistently used the term accent and accentual pattern, avoiding the terminological field based on the word "stress". Following Hyman (1977), I take the term stress to make reference to the phonetic level, i.e. to a particular set of phonetic cues.

In many studies in this book, the term stress is used in the way that I use accent, or the term refers to the package accent-plus-certain phonetic cues. Thus, Bruce (chapter 9) uses the term stress for primary and secondary accent, and the term accent for the syllables that carries a lexically distinctive tone. This is also how A. Liberman (1982) uses the term accent. Since many Scandinavian languages have lexically distinctive tone, one often finds the terms "accent I" and "accent II".

With reference to non-primary accents, one often finds terms like terms like rhythmic beats/rhythmic stress/rhythmic accent, but these differences usually do not correspond with different theories.

In this chapter I have used the term "pitch-accent" for word prosodic systems that mainly or exclusively use pitch as the cue of accent. The term pitch-accent has also come into use for the tones that mark focus (cf. §1.2, especially note 1). In this case pitch is directly associated with the accentual head. The difference with what happens in pitch accent systems is that in the latter the relation between pitch and accentual head holds at the lexical (not at the intonational) level. For further terminological matters I refer to the subject index of this book.

There are different practices for marking word accents (primary or secondary) in transcriptions. In the studies in this book two practices can be found, one slightly more informal than the other.

In the tradition of IPA, primary and secondary accents are marked with small vertical strokes before the relevant syllable. The upper stroke [ˈ] marks primary accent, the lower stroke [ˌ] secondary accent. Another symbol ["] is sometimes used to mark that a syllables is the head of a focus constituent.

A somewhat less formal method uses [´] on top of the primary accented vowel and [`] on top of the secondary accented vowel. Visch (chapter 3) uses [^] to indicate ternary stress.

The formal/informal style also applies to the way words are written down. In many cases, plain or somewhat adapted orthography is used, while in other case genuine (broad) phonetic transcriptions are offered.

7. Concluding remarks

The present chapter has been offered as an introduction to the metrical theory of (word) accentuation. It provides a theoretical background to the studies that are collected in this volume.[70]

Notes

1. I take the term "stress" to refer to a not particularly well-defined subset of the cues that may signal accent in languages such as English, Dutch or Spanish. The term stress-accent is usually taken to apply in cases where the most prominent cue of accent is not pitch. If pitch is the most prominent cue, one often speaks of pitch-accent (cf. Hyman 1978b). I discuss this dichotomy in §1.5. The reader must at this point also bear in mind that I do not use the term "accent" to refer to systems that involve pitch. I use the term here for an abstract propertty of phonological structure.

2. One can even place some arbitrary syllable of a word in focus: *I didn't say HamLET, but HamBURG*.

3. Russian has a disyllabic clitic with two schwas: *pered domon* 'in front of the house' (Sandro Kodzasov, p.c.). In §1.5 I discuss cases in so-called "pitch-accent" systems of polysyllabic "unaccented" words, arguing that such words always surface with a primary accent and are thus quite unlike clitics.

4. Cf. chapter 4.3, on the potential relevance of non-primary accents to intonation.

5. There are, however, cases in which it is reported that there is no "primary accent". In van der Hulst (forthcoming c) I suggest that this is typical of languages with a polysynthetic morphology. In such cases disagreement may be the result of the perceptual bias of different analysts.

6. This is a simplification: clitics and, more generally, syllables with unaccentable vowels must be incorporated into the prosodic structure, either at the foot level or at higher levels (cf. Itô & Mester 1992; Peperkamp 1995; Vogel forthcoming).

7. In this section I have used language names from the literature in order to label the relevant accentual patterns. Most of them stem from Hayes (1980, 1995) and Halle & Vergnaud (1987). The Rotuman type is reflected in many of the Germanic languages, for example, and the Yapese pattern is relevant for part of the vocabulary of Turkish. To mention any of these European languages here, however, necessarily raises questions, because often accent patterns in languages turn out to be more complex than such simple statements as in (7) lead one to expect. By making reference to languages like Rotuman and Yapese, I try to avoid such questions at this point, since in this book we neither wish to support nor dispute the analyses for these languages that have been suggested in the literature.

8. Goedemans (forthcoming) discusses apparent onset-weight cases and argues that the interaction between onset properties and accent is quite different from that between rhyme properties and accent.

9. Whether or not a segment counts as moraic may also be seen as a property of the rule that is said to be weight-sensitive. Such a view would be necessary if it turns out that in one language different rules may set different values for the mora threshold. The difference should involve two rules in one language that both make use of a heavy-light contrast, with different standards for what counts as bimoraic and with reference to the same syllables. Hayes (1994, 1995) suggest that such situations are attested (cf. van der Hulst & Rosenthall (forthcoming) for a discussion of various forms of weight variability).

10. Dutch appears to form a counterexample to this implication, depending on how one analyzes the class of tense vowels. If these are analyzed as phonologically long, Dutch indeed runs counter to the implication since closed syllables count as heavy, while long vowels (in open syllables) do not. This matter is discussed in chapter 8.2. Lahiri & Koreman (1988) propose that this situation can only exist in case the distinction between V and VV is neutralized in open syllables. One could understand this neutralization in such a way that the light category does not really contain VV, but rather V only (cf. Jakobson 1937; Trubetzkoy 1939; Anderson 1984; Vennemann 1990; van der Hulst 1994c; van Oostendorp forthcoming).

11. A potential difference between the two approaches is that only the first (i.e. the one that has no nucleus-coda division) will exclude a situation in which a closed syllable is heavy whereas long vowels are not, or one in which syllables closed by obstruents are heavy whereas those closed by a sonorant are not. In the nucleus-coda approach one could account for these cases by assuming that accent rules may be sensitive to the rhyme structure (instead of the nucleus structure). It is presumably undesirable to allow such cases. This either means that the nucleus-coda division must be rejected, or that one must stipulate that accent rules can only be sensitive to nuclear segments.

12. Accentwise Lithuanian bases primary accent location on lexical marks. I discuss such systems in §1.3.7.

13. Moraic theory capitalizes on the relative stability of "rhyme" position under deletion of segmental material, as well as the impossibility of having geminate consonants properly contained in the onset part (cf. Hayes 1989).

14. A question one could ask is whether two languages can be identical with respect to their syllable make-up and yet differ in being weight-sensitive or not. A language with a simple CV structure (i.e. only open syllables and no long vowels), ignoring the option of prominence-sensitivity, cannot be weight-sensitive. Such a language can be called trivially weight-insensitive (or weight-incapable). But what if a language does have long and short vowels and/or open and closed syllables? Can such a language be weight-insensitive? Such questions and issues are addressed in Kager (1992, 1993) and Yip (1992).

15. An example is Lenakel (cf. Hayes 1995:167-168). For English, a milder difference between word classes involves extrametricality; cf. §1.3.5 and chapter 8.2. Differences between nouns and verbs are found in the Romance languages. In chapter 10 an analysis is presented of nouns as largely foot-based and verbs as largely based on lexical marks.

16. The point remains, however, that even rules that take into account non-phonological information have a relatively high number of exceptions.

17. It may be the case that there are no morphemes in a word with inherent accent. In that case there must be a "default" accent location, which is initial in Russian.

18. Integrating affixes are called **cohering**, while non-integrating, i.e. accent-neutral, affixes are called non-cohering (Booij & Rubach 1994).

19. This suggests that the most prominent syllable of a compound has a level-2 accent, while the primary accent of the second member has been demoted to level 1, becoming indistinguishable from a non-primary accent that can also be found on the syllables *nak* and *tee*. Some linguists argue that formerly primary accents must be representationally different from non-primary, "rhythmic" accents (cf. chapter 4.3.1). Referring to chapter 3 for relevant discussion of compound accentuation, we leave this matter for further research.

    We must also notice that in many cases, prefixes behave like the left members of compounds.

20. "Marks" differ from heavy syllables in that it will never be the case that one morpheme will have more than one marked syllable. This does not seriously undermine the comparison between marked syllables and heavy syllables. No morpheme will need more than one mark since it will always be either the leftmost or rightmost mark that will be able to bear primary accent. A language learner will never have evidence to postulate two marks. Heavy syllables differ in this respect, because usually more than one can occur in a morpheme.

21. This view is strengthened by the observation made in Brame (1974) that cyclic effects always involve inner domains that constitute independently occurring accentual domains (i.e. stems). Thus if it is assumed that the persistent accents are simply lexically present accents of these units, there is no need for cyclic application of the accent rule.

22. Winnebago had been mentioned as such in Hayes (1980), but reanalysed in Hayes (1995:346ff.).

23. If secondary and lower degrees of accent are differentiated, the former will typically occur on the strict periphery of the word, e.g. initially if the primary accent is on the right. I am actually unaware of reports on secondary accents (as distinct from tertiary accents) on the right periphery.

24. A word of caution is in place here. It could be argued that the distribution of non-primary accents is a matter that is entirely separated from primary accent location. This does not change the fact that the lexicographic theory of primary accent is completely unrestricted. The relation between primary and non-primary accents will be further discussed in §1.4.4.

25. Hayes (1995:270ff.) argues that weight due to vowel length and syllable clossure must be treated differently from weight due to prominence. I ignore this issue here.

26. In Vergnaud & Halle (1978) and Hayes (1980) systems like Yapese were analyzed in terms of a special foot type, the so-called **Obligatory Branching** foot. Halle & Vergnaud (1987) also develop a marked procedure for this type. Given the skipping option, no special measures are necessary.

27. This clause has been questioned by Kager (1992a, 1993b), who argues for a language-specific basis of banning unary feet in weight-insensitive systems.

28. In binary word tree approaches these cases are handled with a special way of S/W labelling, called the LCPR; cf. Hayes (1980:120ff.) for further details.

29. Goldsmith (1990:216ff.) mentions Paamese, an Oceanic (Austronesian) language, which has APU accent. Some APU vowels are arbitrarily marked as unaccentable (cf. Hayes 1995:178-179). If the word is long enough, the accent will appear on the PAPU, otherwise on the PU. The device that we require here cannot be reduced to any other independently needed device. We need to be able to say that a vowel can be "unaccentable", i.e. is weak. This is the opposite of a lexical mark. I place the relevant syllables between square brackets, but it remains to be seen what kind of device is needed here:

```
a.          x
    .. σ (σ  σ)<σ>#        regular case

b.            x
      # [σ](σ)<σ>#

c.         x
    ... (σ)[σ] σ <σ> #
```

The final syllable is extrametrical (in order to get APU in the regular case), marking the APU as unaccentable will lead to PAPU if we assume that unary feet are not allowed, unless the word will otherwise get no foot at all; cf. §1.3.6.2. The last point explains why trisyllabic words get PU accent.

30. Note that iambic footing combined with extrametricality allows accent placement on the third syllable.

31. An alternative option that Hayes (1995:267) mentions is that the iamb that creates the relevant pattern is really weight-sensitive, but that it happens to be the case that the language does not make a heavy/light distinction. I believe that this option undermines the central idea behind Hayes' symmetrical approach, which seems to be based on a correlation between foot type and weight sensitivity; cf. note 32.

32. Again, we could again say that such systems have a weight-sensitive iamb, but that there happen to be no heavy syllables. This, then, is a third alternative.

33. Silent syllables are fundamentally different concepts from empty-headed syllables as proposed in Kaye, Lowenstamm & Vergnaud (1990). Typically these latter entities, invoked for phonotactic reasons, are not visible to accent assignment.

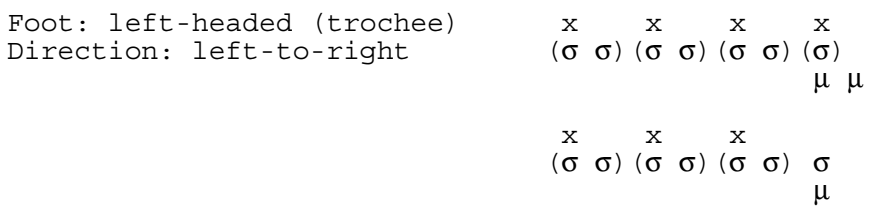
34. A similar explanation is not available for Hayes, who makes no suggestion here.

35. Since the mode is RL, an uneven trochee would produce the same result.

36. Van der Hulst & Klamer (1995) question this conclusion, however. They offer a prosodic analysis of the phonotactic structure of roots in Kambera, drawing attention to the fact that the minimal and maximal structure of roots can be characterized prosodically as an uneven trochee to which an extra consonant can be added. They suggest that rejecting the uneven trochee as a prosodic primitive is not really supported by the templatic analysis of Kambera and add that many other instances of templatic morphology make use of "h l" units (cf. Kager 1994a, forthcoming a). They re-examine the evidence against the uneven trochee from accent systems and show that this evidence (or evidence in favour of the moraic trochee) is rather weak. The Arabic cases are special anyway because we deal here with count systems (cf. 33), whereas the Cahuilla case can be analyzed in a RL mode in which case the different between the uneven and the moraic trochee evaporates.

37. Van de Vijver (1995) attempts to show that LR iambic systems can be analyzed with LR even trochees. Van der Hulst (forthcoming b) proposes to use uneven trochees instead. Both proposals aim at a trichee-only foot inventory. The latter includes ternary systems in the discussion.

38. Hayes (1995) and Kager (1993b) claim that a language showing weight-insensitive foot assignment will discriminate between light and heavy syllables at the end of the parse, thus allowing a monosyllabic foot if the final syllable is heavy only:



They refer to the relevant trochee as "generalized". If all weight-insensitive trochee systems behave like this, we can say that even in those systems only monomoraic feet are forbidden.

39. As in the analysis of Tübatulabal proposed by Kager (1993a), discussed in the previous section (cf. 64b). The relevant pattern also occurs in English in words of the following type:

```
 x
(x  x)
(l)(h)
Hittite
```

This situation arises systematically in Cahuilla (Hayes 1995:132ff.).

40. The picture changes if the post-light heavy is always a closed syllable, since in that case the closed syllable can simply count as light (by contextually suppressing weight-by-position; van der Hulst & Rosenthall, in prep), so that resolution is no longer required. Another important issue is that in a "primary accent first" approach primary accent assignment is treated as essentially syllabic (cf. Van der Hulst & Lahiri 1988), in which case the argument in favor of a moraic dactylic foot also becomes less easier to make. Dresher and Lahiri argue furthermore that a string "l h l l" contains only one foot, i.e. is parsed as in (a) below and not as in (b):

```
a.    x                          b.    x
    ((l h) l) l                      (l h)(l l)
```

However, the crucial examples are nor provided.

41. This strengthens the case for a trochee-only approach as suggested in van de Vijver (1995) and van der Hulst (fortcoming b) (cf. note 37).

42. With opposite word-headedness (77) and (78) produce systems that have fixed peripheral primary accent and non-primary accents on all heavy syllables. Such systems have been reported as well; cf. Hayes (1995).

43. This so-called Obligatory Branching parameter must not be confused with the parameter that produces ternary systems, discussed in the previous section. The OB-parameter was proposed for unbounded as well as bounded systems (e.g. Yapese), and revised in Hammond (1984b). We have seen in §1.3.6.1.2. that systems such as Yapese can be analysed with a standard foot, on the assumption that skipping of light syllables is allowed. Hayes (1995) also abandons the OB-parameter for unbounded systems.

44. Last/last and first/first systems can also be derived from the systems mentioned in footnote 45, by a retraction rule.

45. Opposite word headedness changes E/E into E/-E. This shows that foot structure (i.e. the choice between LH or RH feet) is completely irrelevant in such structures.

46. Sometimes it is clear that the lexical mark is in fact the synchronic reflex of an earlier weight property, often tonal in character; cf. Halle (1979).

47. In fact in this theory, I cast doubt on the use of the foot concept in bounded systems as well, at least for the purpose of assigning primary accent in all non-count systems.

48. In this section I offer a discussion of stress in Turkish, which according to Underhill (1976) and Lewis (1987) is most accurately described as having a pitch accent system with a H tone occurring on the accented syllable. The present discussion is based on §1.3.1 in van der Hulst & van de Weijer (1991). I include a somewhat more extensive discussion of Turkish here, because this volume does not contain a separate chapter on Turkish (cf. also chapter 7.2). Inkelas (1994) offers an extensive analysis of Turkish stress.

49. The idea that relative salience relations can be seen as a side-effect of grouping was independently suggested in Garde (1968), Rischel (1972), and Martin (1972).

50. It has also been argued recently that there is no prosodic constituency above the level of the phonological phrase (XXX ref).

51. The count systems described in §1.3.2 are exceptions in that they have primary accent on the last foot that is assigned rather than the first foot and hence must be exhaustively footed before the location of primary stress can be determined (cf. footnote 52).

    The standard metrical analysis of primary accent has also been challenged in other works, most explicitly in Harms (1981), Roca (1986) and Hurch (1992). Cf. van der Hulst (forthcoming xxx) and van der Hulst & Kooij (1994) for further references.

52. In count systems primary accent is foot-based. This can be expressed in this theory by assuming that the domain is the prosodic word and that metrically strong positions project a line grid mark. If the accent domain is set to two syllables, the domain is too small for footing to be possible. Thus option (112) is only possible in unbounded systems, producing the variety, known as count systems. Most count systems are iambic, applying left-to-right, cf. (33).

53. These intonational units are usually referred to as **pitch accents**. This use of the term stems from Bolinger (1958, 1986) and was taken over in Pierrehumbert (1980) and Gussenhoven (1988); cf. also chapter 4. Below I will use this term to denote a particular kind of word prosodic system.

54. Typological studies in which such questions are addressed are numerous: Trubetzkoy (1939), Hockett (1955), Greenberg & Kashube (1967), Garde (1968), Meeussen (1972), Goldsmith (1976, 1988), Hyman (1977, 1978b, 1981), Lockwood (1982, 1983), Clements & Goldsmith (1984), Beckman (1986), van der Hulst & Smith (1988), Clark (1987, 1988), Haraguchi (1988), Hollenbach (1988), Mock (1988), Odden (1988) and Wright (1988). In this section I find myself in agreement with many of the insight expressed in Hyman's and Lockwood's articles.

55. Cf. van der Hulst & Snider (1993) for a discussion of tonal feature systems.

56. A question that will remain, then, is whether it may not also be necessary to recognize cases in which a high pitch corresponds to each accent (with no other sources for tones) as having both accent and (inserted) tone, because, for instance, certain typically tonal rules (like spreading or assimilation) apply. If this is the case, then such systems are also tonal accent systems (cf. footnote 59).

57. There is a difference between (123c) and (123d). Roughly (123c) is LHH and (123d) is LHM, with the H in the latter not quite as high as the Hs in the first. The two also have different effects on following words (accentual phrases) inside the IntermediateP: (123c) causes downstep, (123d) does not; cf. Beckman & Pierrehumbert (1988). These feet are used by Haraguchi (1988) against a purely tonal analysis of the Tokyo Japanese system, i.e. final accented and unaccented words have different tonal properties and effects.

58. I have not shown that the rightmost marked syllable "wins" in case there is more than one. We can see this when certain morphologically complex words are considered (cf. Beckmann & Pierrehumbert 1988).

59. Some dialects of Japanese have two melodies, however (cf. Haraguchi 1988). In this case words must have tonal information associated with them in the lexicon. For this reason, and because we see that high pitch spreads to the left, one might choose in favour of the tonal accent analysis over the pitch-accent analysis and refer to Tokyo Japanese as a tonal accent language (cf. note 56).

60. Haraguchi also discusses Japanese dialects in which all words are accentless, the unaccented languages (Kagoshima, Miyakonojo, Sendai) which he groups together with non-accentual tone languages (Chinese, Mende). The difference between non-accentual tone languages and non-accentual "unaccented" languages (Kagoshima, etc.) is perhaps not principled, since it seems to be related to the number of tonal patterns. In both tones are essentially mapped in a directional fashion. In these kinds of systems there are neither lexically marked syllables nor is there a default accent rule.

61. One might speculate that all languages have an accentual structure in which case all languages that are usually claimed to have only tone would fall in this category.

62. In general tonal reduction may be the target of reduction, but also a consequence of loss of bimoraicity in unaccented syllables which no longer permit contour tones.

63. In this section I discuss polymelodic systems, i.e. those that have a tonal contrast that goes beyond the privative opposition of H vs. 0. This includes cases which have a H vs. L contrast, although for these a H vs. 0 analysis is probably often possible as well.

64. In the Otomanguean family we can clearly see that accent-sensitive association is closely related to accent-driven reduction. We find in this family a continuum of reduction of tonal contrast and, interestingly, an increase of tonal contrasts on the accented syllable. A case where accent has only mildly influenced tonal contrast is found in Cajonos Zapotec (Nelis & Hollenbach 1980). Of the four underlying tones H, L, HL and M, only M is disallowed in unaccented syllables.

65. Lockwood also discusses the systems of Latvian. He points out that tonal contrast can occur on heavy syllables only (cf. chapter 11). In Latvian primary accent is fixed on the initial syllable. We could say that the distribution of tones is accent-driven in the sense that heavy syllables can be taken to carry a secondary accent.

66. Lockwood includes as possible realizations of TONE forms of harmony involving emphasis (in various varieties of Arabic), vowel harmony based on tongue root position and nasal harmony cases. Since the phenomena typically involve wide scope (i.e. word domain) spreading, they strike me as being rather different from tonal systems, in which the domain is the mora or the syllable, even though bounded or even unbounded spreading of tone does occur. I will leave this issue for further research.

67. Here I almost agree with Lockwood (1993) who reserves the term tonal accent for cases in which we have contrastive tone and non-predictable accent location. If a tonal contrast occurs on a predictable location, he considers this as a separate type. As an example we could think of Copala Trique. In my view such cases can be placed in the tonal accent category, which we then take to include contrastive tone on a designated syllables which is lexically marked or predictable.

When there is no tone contrast (i.e. monomelodicity), Lockwood sees pitch as the direct exponent of accent (referring to this type as "simple accent systems"), and including not only Japanese dialects, but also Kinga. For the latter it may be the case, however, that tones are introduced independently from accents, which implies that Kinga is a tonal accent language.

68. I suppose that Lockwood does not want to refer to such systems as accentual because accent, being predictable, is not phonological. This is certainly a serious point for considering such systems as non-accentual tone systems. One might perhaps say that in such cases the tones would associate via purely edge-based tonal association rules. They would differ from other tone systems in having rather

small tonal melodies. Automatic accent would then (happen to?) fall on the same edge.

69. Hyman (1977, 1978b) wants to use the term stress-accent languages for cases in which accent has no inherent phonetic properties and is only manifested to functioning as the anchor for intonational tones, mentioning languages such as English as an example. It has been shown, however, that in such cases inherent properties such as duration and intensity can be established.

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