Word Prosodic Systems
in the Languages of Europe

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EUROTYP 20-4

Editors

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edited by

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General preface

The present volume is one of a series of nine volumes in which the results of the European research project "Typology of Languages in Europe" (EUROTYP) are published. The initiative for a European project on language typology came from a proposal jointly submitted to the European Science Foundation (ESF) by Johannes Bechert (University of Bremen), Claude Buridant (University of Strasbourg), Martin Harris (University of Salford, now University of Manchester) and Paolo Ramat (University of Pavia).

On the basis of this proposal and following consultations with six experts the Standing Committee for the Humanities of the ESF decided to organize a workshop (Rome, January 1988), in which this idea was further explored and developed. The results of this workshop (published by Mouton, 1990) were sufficiently encouraging for the Standing Committee to appoint a preparatory committee and entrust it with the tasks of drawing up a preliminary proposal, of securing interest and participation from a sufficiently large number of scholars and of finding a suitable programme director. The project proposal formulated and sent out by Simon Dik (University of Amsterdam) as chair of this committee met with very supportive and enthusiastic reactions, so that the Standing Committee for the Humanities recommended the funding of a planning stage and the General Assembly of the ESF approved a year zero (1989) for an ESF Programme in Language Typology.

During this planning phase all major decisions concerning the management structure and the organisation of the work were taken, i. e., the selection of a programme director, the selection of nine focal areas around which the research was to be organized, the selection of a theme coordinator for each theme and the selection of the advisory committee.

The first task of the programme director was to draw up a definitive project proposal, which was supplemented with individual proposals for each theme formulated by the theme coordinators, and this new proposal became the basis of a decision by the ESF to fund the Programme for a period of five years (1990–1994).

Language typology is the study of regularities, patterns and limits in cross-linguistic variation. The major goal of EUROTYP was to study the patterns and limits of variation in nine focal areas: pragmatic organization of discourse, constituent order, subordination and complementation, adverbial constructions, tense and aspect, noun phrase structure, clitics and word prosodic systems in the languages of Europe. The decision to restrict the investigation to the languages of Europe was imposed for purely practical and pragmatic reasons. In the course of the project an attempt was made, however, to make as much sense of this restriction as possible, by characterizing the specific features of European languages against the background of non-European languages and by identifying areal phenomena (*Sprachbünde*) within Europe.

More specifically, the goals of the EUROTYP project included the following:

– to contribute to the analysis of the nine domains singled out as focal areas, to assess patterns and limits of cross-linguistic variation and to offer explanations of the patterns observed.
– to bring linguists from various European countries and from different schools or traditions of linguistics together within a major international project on language typology and in doing so create a new basis for future cooperative ventures within the field of linguistics. More than 100 linguists from more than 20 European countries and the United States participated in the project.
– to promote the field of language typology inside and outside of Europe. More specifically, an attempt was made to subject to typological analysis a large number of new aspects and domains of language which were uncharted territory before.
– to provide new insights into the specific properties of European languages and thus contribute to the characterization of Europe as a linguistic area (*Sprachbund*).
– to make a contribution to the methodology and the theoretical foundations of typology by developing new forms of cooperation and by assessing the role of inductive generalization and the role of theory construction in language typology. We had a further, more ambitious goal, namely to make a contribution to lingustic theory by uncovering major patterns of variation across an important subset of languages, by providing a large testing ground for theoretical controversies and by further developing certain theories in connection with a variety of languages.

The results of our work are documented in the nine final volumes:
Pragmatic Organization of Discourse in the Languages of Europe (edited by G. Bernini)
Constituent Order in the Languages of Europe (edited by A. Siewierska)
Subordination and Complementation in the Languages of Europe (edited by N. Vincent)
Actance et Valence dans les langues d l'Europe (edited by J. Feuillet)
Adverbial Constructions in the Languages of Europe (edited by J. van der Auwera)
Tense and Aspect in the Languages of Europe (edited by Ö. Dahl)

Noun Phrase Structure in the Languages of Europe (edited by F. Plank)
Clitics in the Languages of Europe (edited by H. van Riemsdijk)
Word Prosodic Systems in the Languages of Europe (edited by H. van der Hulst)

In addition, the EUROTYP Project led to a large number of related activities and publications, too numerous to be listed here.

At the end of this preface, I would like to express my profound appreciation to all organizations and individuals who made this project possible. First and foremost, I must mention the European Science Foundation, who funded and supported the Programme. More specifically, I would like to express my appreciation to Christoph Mühlberg, Max Sparreboom and Geneviève Schauinger for their constant and efficient support, without which we would not have been able to concentrate on our work. I would, furthermore, like to thank my colleague and assistant, Martin Haspelmath, and indeed all the participants in the Programme for their dedication and hard work. I finally acknowledge with gratitude the crucial role played by Johannes Bechert and Simon Dik in getting this project off the ground. Their illness and untimely deaths deprived us all of two of the project's major instigators.

Berlin, September 1995 *Ekkehard König, Programme Director*

Preface and acknowledgements

When I was asked to act as coordinator of a EUROTYP theme group I tried to ensure that the focus would be on a relatively "well-defined" topic, word prosodic systems, and that the group of researchers would share a homogeneous theoretical perspective on the topic. I am glad that these conditions could be met and I would like to thank the designers of the EUROTYP project, the project director Ekkehard König, his assistant Martin Haspelmath, and the Scientific Committee for making it possible for various approaches to the typological study of language to co-exist within the EUROTYP project. Sadly, Simon Dik, chairman of the Scientific Committee, died in 1994, before the project ended. His work in guiding and supporting all plenary meetings of the EUROTYP theme coordinators is an example to all of us.

The condition of theoretical homogeneity (and the fact, because of financial limitations, that only a small number of researchers could be "contracted") prevented me from inviting many people who one would otherwise have liked to be involved in a project of this type. As a consequence, the scope of this volume is necessarily limited, both in terms of the topics and languages that are covered as well as in terms of the theoretical perspectives on the areas dealt with.

Having said this, I hasten to add that the contributors to the present volume have invested a great deal of time and energy in this project. They enthusiastically participated in the theme group meetings and wrote the impressive collection of studies contained in this volume. All chapters offer original work, often resulting from cooperation between linguists, in a number of different ways. Some chapters have been written by a single author (chapters 1, 2, 3, 12, 14, 15), who in some cases could rely on the help of fellow linguists (e. g., chapter 10), while others are the product of co-authorship (chapters 4, 6, 7, 13). Still others are combinations of individual contributions (chapters 5, 8, 9, 11), sometimes partly edited by one of the contributors (chapter 8).

This volume contains two types of studies. The first six chapters are thematic in nature, addressing specific aspects of the phenomenon of word prosody. The choice of topics for the thematic chapters reflects the interests and expertise of the members of the theme group. Undoubtedly, other topics could have been included (for example, the interplay between accent and morphological structure). Chapter 1 offers a general background to the theoretical perspective that most chapters share. It also attempts to give an indication of some of the topics that could have been dealt with in separate thematic chapters if more time and resources had been available.

The second half of the volume contains case studies of the word prosodic systems of individual languages or language families. The relativity of notions such as "theoretical homogeneity" and "well-defined topic" has prevented us from organizing all the language chapters according to a rigid format. We have deliberately chosen an approach involving theoretical analysis and confrontation rather than supplying information in accordance with a questionnaire-like approach. Here too, it was impossible to be exhaustive. We do not cover all language families in the European area, nor has it been possible in most cases to consider dialectal variation in any detail. These omissions do not reflect a lack of interest on my part for any particular area, dialect, language, language family, or type of accentual system, but merely the fact that only a limited number of people could be involved, all of whom had to be willing to commit themselves to a five-year project. Chapter 7 summarizes the analyses of the case studies that follow, but also makes a modest attempt to fill in a number of gaps, by briefly sketching the accentual type of a few representatives of families or subfamilies that do not fall within the scope of a separate chapter. For these gaps, we made use of the information that is stored in StressTyp, a database initiated as a pilot project within the EUROTYP program (cf. Rob Goedemans, Harry van der Hulst & Ellis Visch (eds.) *Stress patterns of the World. HIL Publications* 2. The Hague: Holland Academic Graphics, 1996).

During 1990–1994 our theme group met ten times, each meeting being attended by about 10 members of the theme group. Three meetings took place during plenary conferences at which all EUROTYP theme groups were present (Il Ciocco, March 22–24, 1991, San Sebastian, September 2–5, 1992, Le Bischenberg, March 27–30, 1994). The first two meetings took place in Leiden: March 29–31, 1990 and June 13–15, 1990. The other five meetings were organized by members of our theme group: Salzburg, October 11–13, 1991 (Gabriel and Angelika Drachman), Colchester, April 10–12, 1992 (Iggy Roca), Konstanz, April 16–18, 1993 (Aditi Lahiri), Lund, August 30–September 2, 1993 (Gösta Bruce), Utrecht, October 28–30, 1994 (Mieke Trommelen and Wim Zonneveld). Thanks to the organizers and their local institutions for support.

All theme group meetings were attended by about 10 people from the following list of theme group members: Kristján Árnason (Reykjavik, Iceland), Gösta Bruce (Lund, Sweden), Gaberell and Angelika Drachman (Salzburg, Austria), Greg Dogil (Stuttgart, Germany), Carlos Gussenhoven (Nijmegen, The Netherlands), Jadranka Gvozdanović (Amsterdam, The Netherlands), Ben Hermans (Tilburg, The Netherlands), Harry van der Hulst (Leiden, The

Netherlands), José Hualde (Illinois, United States of America), Haike Jakobs (Amsterdam, The Netherlands), Sandro Kodsazov (Moscow, Russia), Aditi Lahiri (Konstanz, Germany), Marina Nespor (Amsterdam, The Netherlands), Tomas Riad (Stockholm, Sweden), Curt Rice (Tromsø, Norway), Iggy Roca (Colchester, England), Mieke Trommelen (Utrecht, The Netherlands).

In addition, we were sometimes able to invite extra guests for one or more of the theme group meetings: Mary Beckman (Ohio, United States of America), François Dell (Paris, France), Eric Hamp (Chicago, United States of America), Bruce Hayes (California, United States of America), Larry Hyman (Berkeley, United States of America), René Kager (Utrecht, The Netherlands), Lisa Selkirk (Amherst, United States of America) and Leo Wetzels (Amsterdam, The Netherlands).

With the support of a small ESF grant, an extra meeting was held in Leiden (December 6–7, 1994), in connection with the preparation of Chapter 10. This meeting was attended by the following specialists in Romance languages: Roberto Bolognesi (Amsterdam, The Netherlands), Luigi Burzio (Baltimore, United States of America), François Dell (Paris, France), Haike Jakobs (Amsterdam, The Netherlands), Joan Mascaró (Barcelona, Spain), Sérgio Menuzzi (Leiden, The Netherlands), Marina Nespor (Amsterdam, The Netherlands), Sandra Reinheimer (Bucharest, Romania), Iggy Roca (Colchester, England), Patrick Sauzet Montpellier/Paris, France).

I would like to thank the Department of General Linguistics and the Holland Institute of Generative Linguistics (HIL) of Leiden University for allowing and supporting me to act as coordinator for our theme group. I am also grateful to the Faculty of Arts of Leiden University for making it financially possible to entrust many of the organizational tasks during the first three years of the project to Simone Langeweg. I would like to take the opportunity of thanking her for the excellent work she did for this project.

The antepenultimate versions of all chapters were discussed at the last theme group meeting in October 1994. These versions were then provided with editorial comments, with valuable help from Jeroen van de Weijer. I would also like to thank Jeroen for efficiently taking care of numerous other matters. The penultimate versions were read by Rob Goedemans, Sam Rosenthall and Bernadet Hendriks, leading to many useful suggestions regarding both content and presentation. In this respect, I am especially grateful to Bernadet who also assisted in the final phase of the editing. The final version has undergone a last check by Simone Langeweg. Rose Ritter and Paulus-Jan Kieviet assisted me in the proofreading phase. All this editorial help was made possible by unexpected ESF reserves.

I spent the first half of 1994 working on the introductory chapter and various other planning activities surrounding this volume at the Netherlands Institute for Advanced Science (NIAS). I would like to thank Dirk van der Kaa, Director of NIAS, for having me there as his guest, and the entire NIAS staff for their enduring hospitality.

Finally, I would like to acknowledge the very helpful and important guidance of the members of the ESF administration: Christoph Mühlberg, Max Sparreboom and Geneviève Schauinger.

Leiden, 8 January 1998 *Harry van der Hulst*

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Abbreviations

General

ˈ	primary stress
ˌ	secondary stress
μ, m	mora
σ	syllable
x	skeletal position
Ω	silent syllable
Σ, F, Ft	Foot
⊗	defooting
ω, w, Wd	phonological word
φ, ø	phonological phrase
*	pitch accent, grid mark
1, 2, 3	1 st, 2 nd, 3 rd person
A	adjective
AA	Article Allomorphy; Articulatory Accent
ABS	absolutive
ACC	accusative
ACT	active
Adv	adverb
ALL	allative
AOR	aorist
APP	active past participle
APU	antepenultimate
ART	article
AUG	augment
AUX	auxilary
BA	Beat Addition
BAP	Basic Accentuation Principle
BD	beat deletion
BEN	benefactive
BI	Beat Insertion
BND	bounded
C	consonant
C, Cl, CLT	clitic (group)
C-Adj.	comparative adjective
CCC	Continuous Column Constraint
COLL	collective
COM	comitative
comp	complementizer
COND	conditional

Conf	Conflation
CONJ	conjunctive
CONS	consonantal; consonantal declensioin
D	desinence
DAT	dative
DG	Domain Generation
DIM	diminutive
DIR	directional
DO	direct object
Dph	Diphthongisation
DTE	designated terminal element
DU	dual
E/-E	opposite edge
E/E	same edge
EM	extrametricality
ER (L)	End Rule (Left)
ER (R)	End Rule (Right)
ERG	ergative
ESF	English speaker's foot
Exp	Expansion
EXT	extrametrical
F	falling tone; feminine
F, Ft, Σ	foot
F_0	fundamental frequency
FAR	Future Accent Rule
FC	foot construction
Fr	Fronting
Ft, Σ, F	foot
FUT	future
G	glide
GEN	genitive
H	high tone
H, h	heavy syllable
H_I	high tone at intonat. phrase boundary
H_i	high tone at smaller inton. phrase boundary
HT	head-terminal
Hz	Hertz
i	(smaller) intonational phrase

I	intensity; intonational phrase
ICC	Iterative Constituent Construction Parameter
IMP	imperative
IMPF	imperfect
INESS	inessive
INFL	inflection
INST	instrumental
IO	indirect object
L	liquid; low tone
L, l	light syllable
LCPR	Lexical Category Prominence Rule
LEX	lexeme, lexical item
LH	left-headed
L_I	low tone at intonat. phrase boundary
L_i	low tone at smaller inton. phrase boundary
LOC	locative
LR	left-to-right
LSSh	Laryngeal Setting Shift
M	masculine; mid tone
m, μ	mora
M-structure	morphosyntactic structure
MAR	Minor Accent Rule
MC	metrical construction
ms	milliseconds
MT	moraic trochee
N	noun
NEUT, NT	neuter
NOM	nominative
NP	noun phrase
NSR	Nuclear Stress Rule
O	onset; oxytone
obst	obstruent
OSL	Open Syllable Lengthening
OT	Optimality Theory
P	preposition
P-structure	prosodic structure
PAF	Primary Accent First
PAPU	pre-antepenultimate
PART	partitive
PASS	passive
PL	plural
PLUP	pluperfect
PN	person/number marker

PO	paroxytone
POL	polite
pop.	popular
PPO	proparoxytone
PROG	progressive
PRS	present
PrWd	prosodic word
psg	subglottal pressure
PST	past
PU	penultimate
QA	quantity-based accenting
R	rhyme; reduction; rising tone; Root
RAR	Romance Accent Rule
REFL	reflexive
RER	Romance Extrametricality Rule
RES	resultative
RH	right-headed
RL	right-to-left
RVAR	Romance Verb Accent Rule
S	clause; derivational suffix; spectral structure; strong
SA	stress algorithm
SEC	Stress Equalization Convention
SG	singular
SL	Saussure's Law
SLH	Strict Layer Hypothesis
son	sonorant
SPE	*The Sound Pattern of English*
SR	stress retraction
SUBJ	subjunctive
SubPr	Subsidiary Prominence
T	duration
TAM	tense/aspect/mood marker
TBU	Tone Bearing Unit
TPPC	Textual Prominence Preservation Condition
TS	Trisyllabic Shortening
TV	theme vowel
U	phonological utterance; ultimate
uninfl	uninflected
V	verb; vowel
VOT	voice onset time
VS	Vowel Shortening

W	weak
w, ω, Wd	phonological word
W-Ins.	weight-insensitive
W-Sen.	weight-sensitive
WC	word construction
Wd, ω, w	phonological word
WSF	Welsh speaker's foot

Languages

BP	Brazilian Portuguese
Ctl.	Catalan
Du.	Dutch
eOE	early Old English
eOF	early Old French
eOHG	early Old High German
EP	European Portuguese
Fr.	French
IE	Indo-European
It.	Italian
lPN	late Proto-Nordic
ME	Middle English
MHG	Middle High German
MNL	Middle Dutch
MSw.	Middle Swedish
NGmc.	North Germanic
Occ.	Occitan
ODa	Old Danish
OE	Old English
OF	Old French
OHG	Old High German
OI	Old Icelandic
ONw.	Old Norwegian
OSw.	Old Swedish
PN	Proto-Nordic
Prt.	Portuguese
Rmns.	Romansh
Rum.	Rumanian
SGk	Standard Greek
SOSw.	Southern Old Swedish
Spn.	Spanish
Srd.	Sardinian
Sw.	Swedish
WGmc.	West Germanic

Part I
Thematic Chapters

Harry van der Hulst

1 Word accent

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 main goal involves discussing aspects of metrical theory that relate directly to the languages that are studied in this volume. In most sections of this chapter, then, 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	[ɛskə'leid] ...
	escalate	['ɛskəleit] ...
	escallop	[is'kɔləp] ...

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 5 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), particulary 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 making 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 (1984 a), 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 chapters 2 and 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 judgments 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
	0		(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 syllable is closed and the penultimate syllable 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* dinstinctions. The Yapese example shows that next to vowel length, syllable closure attracts 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 will not be 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 1994 a, 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, voiced 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, (8 a) cannot be a single syllable, since it has two non-adjacent peaks, whereas (8 b) can ("o" stands for segment, and "–" indicates relative degree of sonority):

```
(8)  a.      –     –          b.      –
          –     –                  –     –
          o  o  o  o               o  o  o
```

Note that in (8 b) 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 only 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.               –
          –           –                –     –
          (o)O  (o    o)R              (o)O  (o    o)R
```

This implies that syllables such as in (9 b) 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 (9 a), 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.				
			–	–			–		vowels
			....				....		threshold
		–				–		–	consonants
		$(o)_O$	$(o$	$o)_R$		$(o)_O$	$(o$	$o)_R$	

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.		
	–	–	–		–		vowels
				–			sonorant consonants
	....		....		....		THRESHOLD
						–	obstruents
	$(o$	$o)_R$	$(o$	$o)_R$	$(o$	$o)_R$	

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)  a. Rhyme        b. Rhyme        c. Rhyme
            |               |                / \
          Nuc             Nuc          Nuc  Coda
            |              / \           |     |
            x             x   x          x     x
```

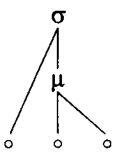
The threshold for moraicity could in this situation be considered as a threshold for nucleus membership, i. e., for consonants to occur in the second nuclear position. In this view, only segments occurring in the nucleus would count for weight-purposes.[11] In other words, what is called *moraic* in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

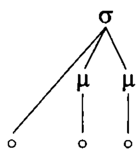
Apart from playing a role in determining weight, moras are also relevant for *tone assignment*. In languages that employ lexical tone, a distinction between monomoraic and bimoraic rhymes plays a role in that only the latter can occur with a sequence of two tones forming a tonal contour. In such cases, 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 5.1, 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)  a.  –     –       b.  –             c.  –           vowels
                                  –                       sonorant consonants
          ..........        ..........        ..........  THRESHOLD
                                                    –     obstruents
          (o    o)R         (o    o)R         (o    o)R
          H     L           H     L           H
          L     H           L     H           L
```

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) a. 

b. 

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 segment also counts as a mora 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 1994 b
	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	[eskə'leid] ...
	escalate	['eskəleit] ...
	escallop	[is'kɔləp] ...

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 right-most or left-most 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 (18 b) and (18 c) 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 of 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 2, 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 2). 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						←	compound accent
	2	(x					x)	←	word accent
	1	(x		x)	(		x)	←	foot accent
	0	(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; cf. chapter 3. 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 and § 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 right-most 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 (20 a) and (20 b) 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 analyze 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. $\begin{array}{ccc} & & x \\ x & & x \\ [\sigma & \sigma & \sigma] \end{array}$ b. $\begin{array}{ccc} & & x \\ & x & x \\ [[\sigma & \sigma] & \sigma] \end{array}$

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 does not show 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 b) 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 initial	Postinitial	Right 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. Only few 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.

$$\begin{array}{ccccc} x & & & & \\ (\sigma & \sigma & \sigma & \sigma & \sigma) \end{array}$$

b.

$$\begin{array}{ccccc} & & & & x \\ (\sigma & \sigma & \sigma & \sigma & \sigma) \end{array}$$

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 (25 a) are necessary to construct the representations in (24), we can formulate the rules in (25 b) 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 (25 c)?

(25) a. i. $\sigma \rightarrow \overset{\text{x}}{\sigma} \; / \; \text{—} \;)$ (Turkish)

ii. $\sigma \rightarrow \overset{\text{x}}{\sigma} \; / \; (\; \text{—}$ (Hungarian)

b. i. $\sigma \rightarrow \overset{\text{x}}{\sigma} \; \text{—} \; (\sigma) \;)$ (Polish)

ii. $\sigma \rightarrow \overset{\text{x}}{\sigma} \; / \; \text{—} \; (\sigma \; (\sigma)) \;)$ (Macedonian)

iii. $\sigma \rightarrow \overset{\text{x}}{\sigma} \; / \; (\; (\sigma) \; \text{—}$ (Dakota)

c. i. $\sigma \rightarrow \overset{\text{x}}{\sigma} \; / \; \text{—} \; (\sigma \; (\sigma \; (\sigma))) \;)$ (Unattested)

iv. $\sigma \rightarrow \overset{\text{x}}{\sigma} \; / \; (\; ((\sigma) \; \sigma) \; \text{—}$ (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 (26 a) or ternary rhythm (26 b) at the lowest level of the rhythmic organization, but not quaternary rhythm (26 c):[23]

$$
\begin{array}{lllllllllll}
(26) & \text{a.} & \text{x} & & \text{x} & & \text{x} & & \text{x} & & \text{x} \\
 & & \sigma & \sigma & \sigma & \sigma & \sigma & \sigma & \sigma & \sigma & \sigma \\
 & & & & & & & & & & \\
 & \text{b.} & \text{x} & & & \text{x} & & & \text{x} & & \\
 & & \sigma & \sigma & \sigma & \sigma & \sigma & \sigma & \sigma & \sigma & \sigma \\
 & & & & & & & & & & \\
 & \text{c.} & \text{x} & & & & \text{x} & & & & \text{x} \\
 & & \sigma & \sigma & \sigma & \sigma & \sigma & \sigma & \sigma & \sigma & \sigma
\end{array}
$$

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 right-most or left-most "foot accent":

(27) Primary accent rules

$$
\begin{array}{llllllll}
\text{i.} & & & \text{x} & & & & 2 \\
 & \text{x} & \rightarrow & \text{x} & / & \_ &) & 1 \\
\text{ii.} & & & \text{x} & & & & 2 \\
 & \text{x} & \rightarrow & \text{x} & / & (& \_ & 1
\end{array}
$$

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 presented 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 (S = strong, W = weak; 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 left-most 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 left-most or right-most 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 left-most or right-most 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 (29 a) represents initial primary accent and a rightward alternating rhythmic pattern. The "recipe" in (29 b) specifies the metrical *parameter settings*:

(29) a.
$$\begin{array}{llllllll} \text{x} & & & & & & & 2\\ (\text{x} & & \text{x} & & \text{x} & &) & 1 \\ (\sigma & \sigma) & (\sigma & \sigma) & (\sigma & \sigma) & \sigma & 0 \end{array}$$

b. Metrical algorithm

foot structure

i. left-accented

ii. assigned from left to right

word structure

left accented (i. e., the left-most 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.

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., 31 ii) 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       )        (x     x     x  )
                            (σ  σ) (σ  σ)  σ        (σ  σ) (σ  σ) (σ  σ)

   b. Word (LH)                x                       x
      Foot (RH, LR)         (  x       x   )        (  x      x     x)
                            (σ  σ) (σ  σ)  σ        (σ  σ) (σ  σ) (σ  σ)

   c. Word (RH)                        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)

(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 (LH)                    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 (1984 b) argue that the systems in (33) are much less typical, although they do occur. In van der Hulst (1992, 1996, 1997) 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 (33 c), second syllable or first, is reported for Malakmalak (Goldsmith 1991: 174–177). 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: 205 ff. 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 (22 b), 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 right-most 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 (22 b) for Rotuman:

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

In (22 b) 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-sensitive 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 Turkish vocabulary, 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 (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]	ĺ 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)	h́ l]	l h́]	h h́]	ĺ l]	Rotuman
	h́ l]	l h́]	h h́]	l ĺ]	Yapese
	h́ l]	l h́]	h́ h]	l ĺ]	Aklan
	h́ l]	l h́]	h́ h]	ĺ l]	Awadhi

Van der Hulst (1997) 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, (48 g), but some of the cases he discusses also seem to be analyzable in terms of syllable extrametricality (cf. Jacobs 1990). He suspects that (49 d) is not called for. Case (49 h) 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		b.					x	
	...				x	)						x)	
	σ	σ	σ	σ	(σ	σ)		σ	σ	σ	(σ	σ)	$\langle\sigma\rangle$

I will return to this ambiguity in § 1.3.8.1, arguing that the system of exceptions shows that, for Polish, (50 a) 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 1993 a, 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 right-most 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)

<table>
<tr><th></th><th>LH</th><th>RH</th></tr>
<tr><td>W-Sen.</td><td>| \
σ σ</td><td>/ |
σ σ</td></tr>
<tr><td>W-Ins.</td><td>| \
σ l</td><td>/ |
l σ</td></tr>
</table>

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   .
                           (μ  μ)          (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; "μ" stands for mora)

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 analyzed 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 even and uneven string of syllables:

(55)

i.	DIR (LR)[30]	Old					DIR (LR)	New				
a.	Word (LH)		x				Word (LH)		x			
	Foot (RH)	(	x		x	x)	Foot (LH)	(	x		x	)
		(1	2)	(3	4)	(5)		⟨1⟩	(2	3)	(4	5)
b.	Word (LH)		x				Word (LH)		x			
	Foot (RH)	(	x		x)		Foot (LH)	(	x		)	
		(1	2)	(3	4)			⟨1⟩	(2	3)	4	

ii.	DIR (RL)	Old					DIR (LR)	New				
a.	Word (RH)					x	Word (RH)					x
	Foot (RH)	(x		x		x)	Foot (LH)	(x		x		x)
		(5)	(4	3)	(2	1)		(5	4)	(3	2)	(1)
b.	Word (LH)			x			Word (LH)		x			
	Foot (RH)		(	x		x)	Foot (LH)	(	x		x)	
			(4	3)	(2	1)		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 (55 i a) 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 (55 i a) 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 (55 i b). 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, (55 ii, 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. 56 a. 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. 56 b):

```
(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 "primary accent first" in van der Hulst (1984, forthcoming) and top down-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: 67 ff.) 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 1993 a).

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, (61 a), 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, (61 b), 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 Tübatulabal 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, Tübatulabal and Tiberian Hebrew. He proposes to analyze 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 (64 b). 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)	
DIR (LR)	Even	Uneven	Even	Uneven
	(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 (1993 a) 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. (33 a)). 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)	x						
Foot (LH, LR)	x		x		x		
	(σ	σ)	(σ	σ)	(σ	σ)	σ

b.

Word (RH)						x	
Foot (LH, RL)		x		x		x	
	σ	(σ	σ)	(σ	σ)	(σ	σ)

c.

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

d.

Word (RH)							x
Foot (RH, RL)			x		x		x
	σ	(σ	σ)	(σ	σ)	(σ	σ)

Case (66 d) 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 (66 c) is rare at best, and if the pattern occurs it could be trochaic (cf. again the previous section). As we expect, cases as in (66 b) 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)						x	
Foot (LH, RL)	x			x		x	
	(σ	σ)	σ	(σ	σ)	(σ	σ)

Case (66 a) 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 (66 a), the empirical evidence is not clearly in favor 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 (66 a). 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)

$$\begin{array}{llllllllll}
\text{Word (LH)} & \text{x} & & & & & & & \\
\text{Foot (LH, LR)} & \text{x} & & \text{x} & & \text{x} & & \text{x} & \\
 & (\sigma & \sigma) & (\sigma & \sigma) & (\sigma & \sigma) & (\sigma & \Omega)
\end{array}$$

Kiparsky (1991) and Kager (1995 b) 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 (66 a) and (66 b) are correlated under catalexis as well as in a theory that allows unary feet provided there is no clash:

(69)

$$\begin{array}{lllllll}
\text{a. i.} & \text{x} & & \text{ii.} & \text{x} & & \\
 & \text{x} & & & \text{x} & & \text{x} \\
 & (\sigma) & & & (\sigma & \sigma) & (\sigma)
\end{array}$$

$$\begin{array}{llllllll}
\text{b. i.} & \text{x} & & \text{ii.} & \text{x} & & & \\
 & \text{x} & & & \text{x} & & \text{x} & \\
 & (\sigma & \Omega) & & (\sigma & \sigma) & (\sigma & \Omega)
\end{array}$$

In spite of the fact that Hayes does not adopt the unary foot for peripheral non-primary accent in (66 a) 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)
$$\begin{array}{ccc} \text{x} & & \\ (\sigma & \sigma & \sigma) \end{array}$$

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 favor 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 world 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 (72 b–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 favor of various alternatives, using the moraic trochee. If we assume that the Dresher & Lahiri analysis stands, we may conclude that next to the syllabic dactyl we also need a moraic dactylic foot. Stronger support of the moraic dactyl from additional cases would be welcome, however.

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):

(74)

Moraic	Foot: iamb	Foot: trochee
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	**Foot: iamb**	**Foot: trochee**
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).

Rice suggests that the moraic amphibrach in the left upper corner of (74) 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 dactyl 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 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 accenting 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 binary 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 analyzed in terms of so-called unbounded feet, although, as we will see, a reasonable alternative is to analyze 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 right-most 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 of what a weight-insensitive unbounded system looks like. Clearly such cases would have a fixed peripheral accent without 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 an 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 systems (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: 33) 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 right-most heavy or (in the absence of a heavy) left- or right-most 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 right-most or left-most heavy syllable, assuming furthermore that the default rule is independent and may select the same or the opposite edge of the word. Goldsmith (1990: 180 ff.) seems to suggest 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 (1996).[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, may 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, however, extra mechanisms seem to be required.

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 'university'	gramátyk 'grammar-GEN-PL'	reżím 'regime'
	uniwersytét-u 'id-GEN-SG'	gramátyk-a 'id.-NOM-SG'	reżím-u 'id.-GEN-SG'
	universytet-ámi 'id-INS-PL'	gramatyk-ámi 'id.-INS-PL'	reżim-ámi 'id.-INS-PL'

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

It should be noted, however, that the special behavior 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.

(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 (83 c), 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)

$$\begin{array}{cccccccccc} & & & & & & \text{x} & & \text{x} & \\ \sigma & \sigma) & \sigma & \sigma & \Rightarrow & (\sigma & \sigma) & (\sigma & \sigma) & \end{array}$$

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 a 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
$(\sigma)\sigma$	$(\sigma\,\sigma)\ \sigma$	$(\sigma\,\sigma\ \ \sigma)\ \sigma$
konzumator	konzumator-i	konzumator-i-te
x	x	(x
$(\sigma)\sigma$	$(\sigma\,\sigma)\ \sigma$	$(\sigma(\sigma\ \ \sigma)\ \sigma$
konzumator	konzumator-i	konzumator-i-te

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

1.3.8.3. Spanish

Roca (1990) analyzes 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 *examen*:

(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. 89 a). This regular pattern is violated in four classes of words (cf. 89 b–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 (89 b) and (89 c) 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 right-most accent, will catch the primary accent due to the rule in (91):

```
(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 behavior (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 right-most 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
'kibbutz'	id. PL	'person from a kibbutz' (M)	id. F
kibúc-nik-iy-ot			
id. PL			

-nik thus assigns diacritic weight to the preceding syllable. Note that is 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
'salad'	'salad' DIM	'salad' PL DIM
sólo	sol-án	sol-an-ím
'solo'	'soloist'	'soloist' PL

-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 subcategorized. 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 left-most 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 be 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) báş 'head' + bakán 'minister' → báşbakan '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 left-most 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 which 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 analyzed by Sezer (1983) and Kaisse (1985 b).

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-/ (103 c) 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.síng.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. To establish whether the specific clause involves a left- or right-most 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 mono-syllabic suffixes, so-called pre-accenting suffixes which are attached to a "Sezer-word":

(105) şévrole-la 'with Chevrolet'

This case, showing initial accent, 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. x                          b.          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:

(107)	Regular		Irregular			
	kanárie	ánorak	canapé	kólibri	sigarét	messías
		)	x	)		x)
LEX	kanarie	anorak	canape	kolibri	sigaret	messias
RH	x	x	x	x	x	x
LH,RL	(x)	(x)	(x x)	(x)	(x x)	(x x)
	σ(σ σ)	(σ σ)σ	(σ σ) (σ)	(σσ) σ	(σσ) (σ)	(σ) (σ) σ
	'canary'	'anorak'	'sofa'	'humming-bird'	'cigarette'	'messiah'

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]

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 word and the phonological phrase, viz. the clitic group. Above the level of the phonological phrase, most researchers postulate intonational phrases which combine to form the utterance. Again, these units correspond only roughly to syntactic or sentence-size constituents.

(110)

```
                                              Utterance
                                               /   \
                                   Intonation  Phrase
                                          /       \
                            Phonological Phrase
                                   /      \
                        Clitic Group
                          /      \
             Phonological Word
                 /    \
                Foot
               /   \
        Syllable/Rhyme
```

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, as 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 because precise theories expressing the relevant correspondences must make assumptions concerning the details of both organizations.

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.)

(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.
```
     M
     /\
   /  /  \          → metrical tree
 /\  /\  /\
 s w s  w s w
 Apalachicola
 + - +  - + -       → accent feature values
 1 2 3  4 5 6
 6   7    8         → metrical grid
          9
```

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 grammaticalized 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.

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 the Phonological word and units that are too small to form a phonological word by themselves (in fact, they 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, Kaisse 1985 a, Inkelas & Zec 1990), 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 1993 b).

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, arguinig 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.

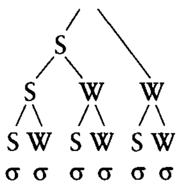
Prince's paper renewed the interest in evidence for foot constituency. Halle & Vergnaud (1987) provided examples of accent shifts, the direction of which could only be understood if foot boundaries are part of the metrical structure (cf. Dresher 1990 for a critical note and Kenstowicz 1991, 1993 for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

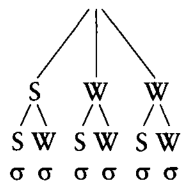
1.4.3.2. Bracketed grid theory

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 (111 c), rather than the arboreal notation in (111 a, b):

(111) a.



b.



c.

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

The difference between (111 a) and (111 b, c) lies, then, in the amount of structure that is assigned to the Word Tree. Representations like (111 b) and (111 c) are fully equivalent. Next to (111 c), tree notations that were and are in use replace S/W labels by graphically marking heads with a dot or small circle. Hammond (1984 a) 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, 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; 1996; 1997; forthcoming) 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: 333–346), 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 that 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 (113 c) as the *End Rule* and to the rule in (113 b) 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 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 1993 a, 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 candidate is determined by eliminating candidates that violate constraints that other candidates do not, starting this procedure with the highest ranked constraint and working down the list. 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 (1993 b).

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 paramters 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, (118 a) is better than (118 b):

(118) Foot-alignment: feet must be on the left edge

a. $(\sigma \;\; \sigma) \; (\sigma \;\; \sigma) \; (\sigma \;\; \sigma) \;\; \sigma$

b. $\sigma \;\; (\sigma \;\; \sigma) \; (\sigma \;\; \sigma) \; (\sigma \;\; \sigma)$

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 form a 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 (1994 b, c), Kenstowicz (1994), McCarthy & Prince (1993 a, 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 the accentual structure. 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 1978 a). 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) and Van Heuven & Sluijters (1996).

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 interactions 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 "tonal 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", languages in which all words carry the same tone on, for instance, their last syllable (thus showing no contrast).

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 "labeling" 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 analyze 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