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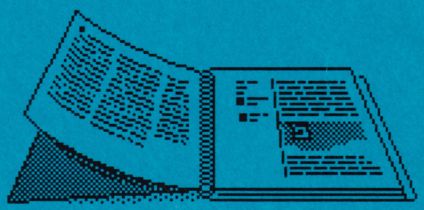

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On Words and Phrases in Phonology

A Comparative Study with Focus on German

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Contents

1. Introduction

Since Selkirk's 1972 dissertation on phrasal phonology, phonologists agree that there are domains of rule or constraint application above the word that have to be accounted for. Numerous proposals have been made since then in order to derive these domains on the basis of the syntactic structure.

In the eighties, one of the biggest issues was the extent to which phonology had access to syntactic information; e.g. whether phonological rules referred directly to syntactic structure (cf. the work by Kaisse, Odden, etc.) or to an intervening prosodic structure, as most phonologists assume. How is this prosodic structure related to the syntax? The most influencing proposals on this topic are summed up in the sections 1.4 and 1.4.2.

In the beginning of the nineties the powerful effects that focus has on the phonological phrasing were recognized. Crosslinguistically, narrow focus on a constituent overrides prosodic phrasing (see Kenesei & Vogel 1990, Hayes & Lahiri 1991). By this, prosody can also disambiguate the syntax.

Nowadays, the main focus of research in the area of phonology-syntax interface has shifted to the question which constraints govern the syntax-phonology mapping.

This thesis is concerned with the domains of phonological processes that are larger than the word. The aim of the thesis is to defend the following three claims on the syntax-phonology-mapping:

I. There are two types of languages with respect to the mapping of syntax into phonological domains: phrase-based languages and word-based languages.
II. The postlexical phonology is subdivided into a rhythmic and a segmental component.
III. The mapping of syntax into phonology interacts with the speech rate.

Since the postlexical component differs in many respects from the lexical component, all current theories, even surface-based ones, assume - either implicitly or explicitly - that both are separate domains of representation.

Only little research has been done on speech-rate dependent segmental phonological processes that operate after the syntax. This is especially true for German, one of the languages this study focuses on. Although many aspects of the phonology of German are well-investigated, phonological domains above the

word have up till now only been considered relevant in the context of its intonation.[1] Previous studies on segmental phonology of German were basically concerned with words in isolation. The present study attempts to fill this gap by examining postlexical segmental and prosodic processes in German and by comparing them to other languages. In particular, I look at the role of the phonological word and the phonological phrase in German and consider questions such as the followings: what determines phonological domains? How are they constrained? Which constraints on the prosodic hierarchy are universal?

The dissertation is organized as follows: in the remainder of this chapter the theoretical assumptions on which this thesis is based are outlined. First I illustrate the three claims mentioned above and I show how they are correlated. Potential problems are summed up in 1.2.

In 1.4 the basic models of the interaction of phonology and syntax are introduced. This results in an account of a postlexical component, where the rhythmic and the prosodic phonology are separated and interact.

The postlexical component is constrained by many extra-phonological factors. The best-known of these is focus. Focus and its influence on the phonological phrasing is one subject of chapter 2, where I argue that the Phonological Phrase (PPh) is not a domain that plays a role in German segmental phonology. Arguments that support the PPh in German (most of which are somehow connected to focus) are refuted. Alternatively, I argue that in German (and in languages that are typologically related to German in this respect) the phrasing has no grammatical function. The main trigger of phrasing in German and related languages is to be found in peripheral linguistic domains, namely discourse requirements.

Chapter 3 compares the functions of the Phonological Phrase crosslinguistically. Arguments will be given against the standard assumption that all categories of the prosodic hierarchy are universal. Instead, as mentioned above I hold that there are *phrase-based* and *word-based* languages. In phrase-based languages, PPhs mirror syntactic phrasing, and in this sense, PPhs are predictable. In such languages PPhs are the domain of both segmental and rhythmic rules.

In chapter 4 I look at the phonological word (PWd) in German. On the basis of data from prosodic integration of clitics, I show that cliticization in German supports my statement that German has the properties of a word-based language. For

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1 See Hall 1992; Wiese 1988 for studies on the phonology-morphology-interface; Giegerich 1985 for metrical phonology of German; Féry 1993; Uhmann 1991 for studies on German intonation, Wiese 1996 as an overview of German phonology.

example, it is argued that the phonological word has to be recursive. Next I look at different speech styles and rates and show that contrary to, for instance, French, the PWd is the domain of all postlexical phonology in German. I list the relevant rules and show why they have different outputs depending on speech style and rate.

Chapter 5 deals with other word-based languages. Data from German phonological phrasing are compared to data from languages such as Portuguese and Dutch. On the basis of this data I argue that all of these languages are "word-based" since in their postlexical component, the PWd rather than the PPh functions as a rule domain. I also show in this chapter that these languages have other properties in common that separate them from phrase-based languages. This is a further justification for my claim that languages should be classified according to their postlexical domains.

In the past, several proposals have been made that in various ways connect rhythmic and segmental properties of languages and exploit the results for a typology - for example, the distinction between stress-timed versus syllable-timed languages. This distinction has been criticized by several phonologists and as a consequence, other typologies have been proposed. Chapter 6 examines these typologies and compares them to the classification proposed in this thesis. In a concluding section the results are summed up.

1.1 Phonological Domains

In addition to phonological representations and rules or constraints applying to them, all theories must also recognize phonological domains. This aspect of phonology has attracted considerable attention in recent years and the present study is one contribution to this debate. The thesis is couched in the framework of the "domain-based approach" (cf. Kisseberth 1994: 133). The domain-based approach assumes that phonological material is ordered within domain boundaries and it attempts to capture the principles of their ordering.

The best-known model of phonological domains is the prosodic hierarchy. A standard theory version of the prosodic hierarchy assumes that phonological domains are organized in a hierarchy like the one given below.

(1) The prosodic hierarchy above the word (Nespor & Vogel 1985)

Phonological Utterance

Intonation Phrase

Phonological Phrase

Clitic Group

Phonological Word

Below I introduce examples for the two domains that are most relevant for this study: the Phonological Phrase and the Phonological Word. For details on the prosodic hierarchy I refer to section 1.4.2.1 a discussion of the clitic group can be found in chapter 4.

A good example for a domain-based process is syllabification. Cross-linguistically, syllable onsets are maximized in syllable-structure assignment.[2] However, languages vary with respect to the limits of onset-maximization. In Dutch, as well as in many other Germanic languages (e.g. German) syllabification is constrained by PWd-boundaries, in other words, the PWd is its domain. While word-internally, onsets are maximized (i.e. *hondje* 'little dog' is syllabified as *hon.tje* and not as **hont.je*) this process is blocked by PWd boundaries, as can be seen in (2).

(2) The PWd in Dutch (Booij 1985: 29f)

(a) [hand]$_{PWd}$ [appel]$_{PWd}$ 'eating apple'

(b) [ont]$_{PWd}$ [aard]$_{PWd}$ 'degenerate'

(2)(a) shows that each member of a compound is syllabified separately, since onsets are not maximized across them. (2)(b) illustrates that prefixes such as *ont-* are separate domains of syllabification, although they form a single grammatical word together with the stem.

In contrast to German and Dutch, the domain of syllabification in French is the PPh. Onsets are maximized by a resyllabification process that applies both within PWds and across the boundaries of PWds. This process is known as *enchaînement*. It is illustrated in (3).[3] Consonants that undergo liaison are printed bold.

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2 This is expressed in the CV-rule (Clements & Keyser 1983) as well as in the ONSET-constraint (McCarthy & Prince 1994).

3 See also Chapter 3.

(3) Liaison in French (Tranel 1987)

[ses anciens étudiants]$_{NP}$ [[annoncèrent]$_{V}$ [un grand exploit]$_{NP}$] $_{VP}$
[se.s an.cien.s é.tu.diants]$_{PPh}$ [a.nnon.cè.rent]$_{PPh}$ [un gran.t ex.ploit]$_{PPh}$
his former students *announced* *a great achievement*

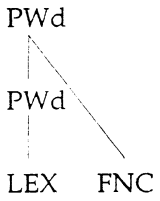
The constraints on the prosodic hierarchy and its nature are discussed in section 1.4.2.1. Moreover, I make the following two assumptions about it that are not uniformly accepted.

(4)

i. Postlexical prosodic constituents can be recursive (cf. Ladd (1992), Selkirk (1995))
ii. Prosodic constituents are not necessarily universal.

The recursivity of prosodic constituents has been underdiscussion since Ladd's (1992) paper in which he argues that some puzzling effects in phonology can only be explained if one assumes that prosodic phrases can be recursive. Selkirk (1995) similarly argues that the PWd can be recursive. In this thesis I assume that all constituents of word size and beyond can be recursive as shown in (5), taking cliticization as an example.

(5) The recursive Prosodic Word (cf. Selkirk 1995))



The PWd in (5) is recursive since it dominates another PWd. A recursion allows for an extension of a rule domain. This extension, however, is more constrained than an introduction of a new prosodic constituent would be. For example, in (5) the left brackets of both PWds coincide and only the right brackets do not. This restricts different rule applications to the right edge of the PWd.

The second assumption in (4)(ii) says that prosodic constraints might be language-specific. In order to illustrate this, below I sum up the phonological evidence that can identify a domain.

Domains can be identified by rules applying within them. If a rule systematically exploits a certain type of domain (in a pretheoretical sense), then this domain is to be identified as phonological. According to Rice (1990) and Selkirk (1980), there are three kinds of such rules. They are listed in (6):

(6) Domains of rule application
(a) Domain span rules
(b) Domain limit rules
(c) Domain juncture rules

Domain span rules apply within a certain domain. In the structural description of such rules, the kind of domain must be specified. (cf. Rice 1990: 303). For example, in Dutch, the phonological word (PWd) is the domain of syllabification, as was shown in (2).

Domain limit rules apply at the end of a certain domain (cf. Rice 1990: 305). Such a rule is the German Final Devoicing (FD), which devoices obstruents that are at the end of a syllable (see chapter 4).

(7) German Final Devoicing (Vennemann 1972; Hall 1992)
[-son] → [-voice] / __]$_\sigma$

Examples of FD are given in (8).

(8) German Final Devoicing (Hall 1992: 53)

(a)	Dieb	[di:p]	'thief'
	Berg	[beʁk]	'mountain'
(b)	Trüb-heit	[tʀy:p.hait]	'dimness'
	les-bar	[le:s.ba:ʁ]	'readable'
(c)	Dieb-e	[di:.bə]	'thief.PL'
	Berg-e	[beʁ.gɔ]	'mountain.PL'
(d)	Diebe	[di:.bə]	'thief.PL'
	trübe	[tʀy:.bɔ]	'dim.PL'

In (8)(a), the (underlyingly voiced) obstruents are devoiced at the end of a word. (8)(b) shows that FD also applies within a word: obstruents are devoiced before a consonant-initial suffix. In (8)(c), where the obstruents are no longer syllable-final but are syllabified as the onset of the second syllable, FD is blocked.

The third possible type of rule are *domain juncture rules*, which apply only at the juncture between two domains. An example for this is High-Tone Insertion in Kimatuumbi. Consider the data in (9), where vowels which undergo H-Insertion are underlined.

(9) High Tone Insertion in Kimatuumbi (cf. Odden 1987, cited in Hall 1997a)
(a) [Mamboondó]$_{PPh}$ [aawíile]$_{PPh}$
[Mamboondo$_{NP}$ died$_{VP}$]$_S$
[Mamboondoó]$_{PPh}$ [nnaáso]$_{PPh}$
[Mamboondo$_{NP}$ [is [tall]$_{AP}$]$_{VP}$]$_S$
(b) [munduu ntokómau]$_{PPh}$
[a person$_{NP}$ lazy$_{AP}$]$_S$

The relevant contrast can seen when comparing the data in (9)(a) and (b). Everything else being equal, the final vowel in *munduu* in (9)(b), which is not at the end of a PPh, gets no high tone. The explanation for the contrast in (9) is to assume that H-insertion in Kimatuumbi applies at the boundary between two PPhs (cf. Truckenbrodt (1996), who rejects this rule later on and Hall (1997a), who defends a similar rule).

(10) Kimatuumbi High Tone Insertion (Hall 1997a)
$\emptyset \rightarrow$ H / __]$_{PPh}$ $_{PPh}$[

Domain juncture rules are rather rare and, according to Rice (1990: 307), rules that appear to be domain juncture rules can be reanalyzed as a result of other, independent, processes that need not refer to a domain juncture. Accordingly, there are proposals to revise the commonly assumed rule of Kimatuumbi Tone Insertion (Truckenbrodt 1996).

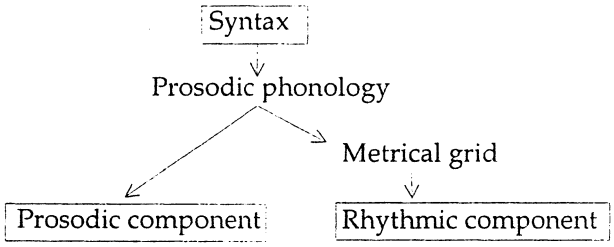
The nature of phonological rules may vary depending on the domain involved. For example, it is well-known that the domains above and below the word have fundamentally distinct properties (see, for example, Nespor & Vogel 1983).

Studies on prosodic domains of word-size or below usually concentrate on segmental evidence, that is, elision, epenthesis etc. in connection with syllabification. Studies on domains above the word often focus on their prosodic properties, such as phrase-final intonational phenomena like lengthening or tonal structure. Some authors even question the reliability of segmental phenomena as a diagnostics for prosodic domains. Devine & Stevens (1994: 289) point out that in spoken language, mismatches can occur between the chunking of a sequence of words into intonational domains and its external sandhi domains. For example in Chinese, pauses can occur even within a single tone sandhi domain.

In this thesis I have to make two assumptions about the principles governing the postlexical component. The first assumption that is required is the distinction

between prosodic and rhythmic phonology (see Nespor 1990b). I follow Nespor's general claim which says that the prosodic structure and the metrical grid are two distinct levels of representation (Nespor 1990b: 244). While my analysis modifies this model slightly (see chapter 6), the general idea remains the same: there is a rhythmic component that contains information on eurhythmy etc and there is a separate level that refers to prosodic domains. The most fundamental difference is that the latter may vary cross-linguistically, whereas the rhythmic component is the same cross-linguistically and varies only with respect to irrelevant details.[4]

(11) The postlexical phonology according to Nespor (1990b: 244)



The motivation behind (11) is to account for the different characteristics of both rhythmic phonology and external sandhi rules. The model in (11) assumes that there is a prosodic component which mediates between syntax and phonology in that it inserts the prosodic domain boundaries. The actual postlexical phonology in Nespor's model consists of two components. The metrical grid is a sequence of more or less prominent units and has no internal structuring. The rhythmic component contains rules that apply on the metrical grid.

In contrast to this, in the prosodic component the input is analyzed as (prosodic) constituents and rules in this domain can only refer to these boundaries but not to the metrical grid. In 1.3.1 evidence for this separation is provided.

Based on the distinction between the prosodic and rhythmic components I set up a model of postlexical domains that claims that not all domains are universal. Instead, I argue that individual languages treat their prosodic units differently.

1.2 Phonological Preliminaries

In this section I briefly sum up the phonological preliminaries of this thesis and the theoretical assumptions that I make.

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4 For example, all languages have level in the metrical grid which is sensitive to clashes, the "minimal clash" level. The metrical grid varies cross-linguistically only with respect to which level the sensitive one is.

1.2.1 The Postlexical Phonological Level

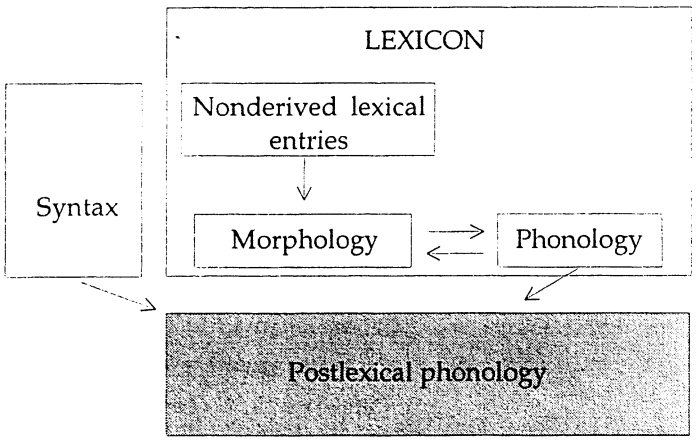
I presuppose that there are two distinct levels of phonology, as proposed by Lexical Phonology (see Kiparsky 1982, Mohanan 1986), the lexical and the postlexical one. Unlike other assumptions of Lexical Phonology (e.g. the ordering of morphological levels), this distinction is still widely accepted in phonological theory.

Unless there is evidence to the contrary, I assume that certain word-internal phonological rules apply at an "earlier" stage, i.e. in the lexicon. This is uncontroversial as long as syllable-assignment, stress-assignment, and other rules on the word level are concerned.

According to Kaisse & Shaw (1985) postlexical rules share other properties, such as their sensitivity to speech rate. Also, it is important to note that postlexical rules typically apply across the board while lexical rules have idiosyncratic exceptions.

As proposed in the Lexical Phonology model (cf. (12)), I assume that the input to postlexical phonology are words including their complete prosodic structure, in other words, metrical structure (word stress) and syllable structure.

(12) Lexical Phonology model (Kaisse & Shaw 1985)



The present study deals with phonological structures and domains after the lexicon. There are many open questions with respect to this domain.

Concerning the prosodic hierarchy, the question whether there is one single prosodic hierarchy, as Nespor & Vogel (1986) and Selkirk (1984) propose, or whether lexical and postlexical domains have different characteristics, such as in the theory of Prosodic Lexical Phonology (see Inkelas 1989), is not yet resolved.

1.2.2 Factors that Govern Phonological Domains

In languages like German there are fundamental differences between casual speech and formal speech which depend on the rate of speech. They all have to do with the size of the domain of rule application. In this section I discuss the differences, together with the relevant postlexical rules. The following systematic differences have to accounted for:

(13)

In casual speech and formal speech PWds have different sizes. At fast speech, the otherwise unviolable left PWd-boundary can be violated.
Casual speech and formal speech have different ways of refering to the syntax.
Cliticization occurs at formal and casual speech and has other restrictions than the fast speech reduction of unstressed forms.

In section 4.3.5, this is illustrated.

Certain processes which intuitively might be attributed to casual speech style do in fact occur at formal speech level as well. In (14)-(15), some of them are listed.

(14) Vowel reduction in spoken German

(a) ich mach**[ə]**	→	ich mach'
		'I make'
wollt**[ə] ich**	→	wollt' ich
		'wanted I'
(b) ich rechn**[ə]**	→	*ich rechn'
		'I count'

As in (14)(a), inflectional ə is usually suppressed in spoken German, regardless of speech rate and style i.e., *ich mache* 'I do' becomes *ich mach'* (see Kohler 1977: 214ff). However, ə is not deleted if this results in an ill-formed coda, i.e., *ich rechn[ə]* 'I count' is not reduced to **ich rechn* as in (14)(b). But notice that at fast speech, this latter reduction does occur (although speakers may deny this when asked).

In German, nasals assimilate to the place of articulation of a following consonant. Slow speech and fast speech differ with respect to the domain of nasal assimilation. This is illustrated (15) and (16).

(15) Nasal assimilation at slow speech (i.e. both formal and casual style)

i	ii	iii	iv
in Köln	kommt man	kann Markus	Rennbahn
[ɪnkœln] [ɪŋkœln]	[kɔmtman][kɔmpman]	[kanmaʁkus] *[kamaʁkus]	[ʀɛnba:n]*[ʀɛmba:n]
in Cologne	*come.3SG one*	*can.3SG Markus*	*race+course*
'in Cologne'	'does one come'	'can Markus?'	'racecourse'

At slow speech, nasal assimilation only applies across function word boundaries. This can be seen from the contrast between (15) (i), (ii) and (15) (iii), (iv). Lexical word boundaries block nasal assimilation, regardless of whether they stand alone as in (15)(iii) or whether they are members of a compound (15)(iv).

At fast speech, however, the domain of assimilation increases, as can be seen from (16).

(16) Nasal assimilation at fast speech[5]

i	ii	iii	iv
in Köln	kommt man	kann Markus	Rennbahn
[ɪŋkœln]	[kɔmpman]	[kamɐkus]	[ʀɛmba:n]
in Cologne	*come3SG one*	*can3SG Markus*	*race+course*
'in Cologne'	'does one come?'	'can Markus?'	'racecourse'

I return to the domain of nasal assimilation in section 4.2.5.

Another rule that is relevant in this context is r-vocalization.

(17) r-vocalization (Hall 1992: 57)

$$\begin{bmatrix} +\text{son} \\ +\text{cons} \\ +\text{cont} \end{bmatrix} \rightarrow [-\text{cons}] \;/\; \begin{matrix} \text{X} \\ | \\ \text{C} \\ | \\ \_\_ \end{matrix}$$

condition: optional after a short vowel

The rule of r-vocalization interacts with syllabification, as it applies only to an /ʀ/ in the coda. At the postlexical level, it can therefore serve as a diagnostics for the boundaries of the domain of syllabification. This can be seen from (18).

(18)

(a) fahr+en	[fa:.ʀən]	'drive'
(b) fähr+t	[fɛ:ɐt]	'drive.3.SG'
(c) fahr ich	[fa:.ʀɪç]	'drive I'

The stem-final /ʀ/ in (18)(a) does not vocalize, since it is syllabified as the onset of the following syllable. In (18)(b) it vocalizes, because it is followed only by a con-

5 These are examples of potential reductions. At fast speech there are several degrees of phonetic reductions possible.

sonantal suffix and therefore remains in the coda. (18)(c) illustrates cliticization. The host and the clitic syllabify together, as can be seen from the blocking of r-vocalization.

The various properties of speech styles can be summarized as follows.

(19) Types of spoken language

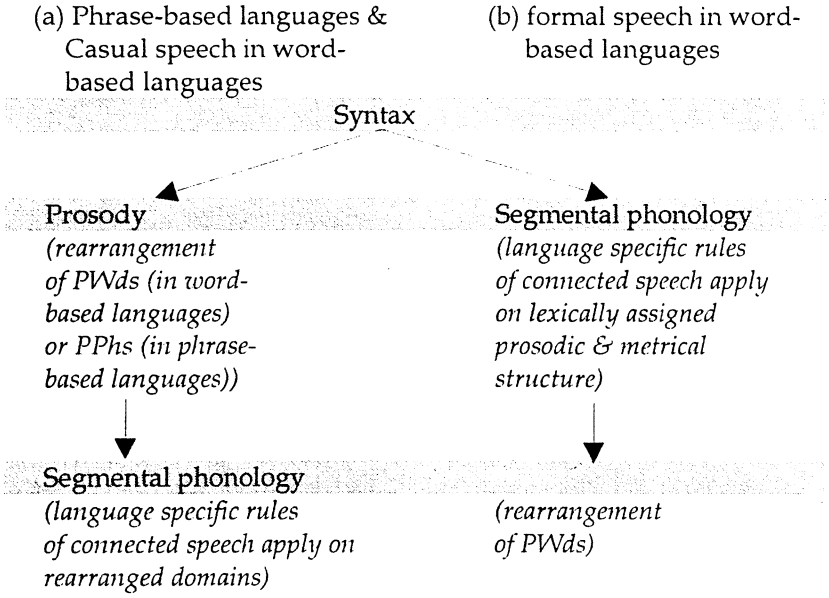
	Formal speech	Casual speech
Slow speech rate	Function words appear as separate PWds, proclitics, or enclitics, depending on the syntactic relation to their host. Left edges of lexical items are unviolable.	Clitics are incorporated to any item to their left, regardless of their syntactic relation. Restrictions on syllable structure apply. Left edges of lexical items are unviolable.
Fast speech rate	As above (of possible at all)	As above, but all unstressed forms are fused, even lexical items. No restrictions on syllable structure. Left edges of lexical items can be violated.

A model that can account for these facts is claimed to be the one in (20). (20) predicts that an decrease of formality and an increase of speech rate require the syntactic boundaries to be ignored to the benefit of an optimization of the prosodic structure of the PWd. This is achieved by putting the unstressed clitic forms at the end of a PWd, regardless of their position in the syntactic phrase.

1.3 A Model of Postlexical Phonology

I argue that the postlexical domain is organized as shown in (20).

(20) The phonology-syntax interface



(20) differs from the standard assumptions of prosodic phonology in the following respects. First, it assumes a separation between prosodic and rhythmic phonology (cf. Nespor 1990b). Second, the phonology-syntax interface is argued to be the result of an interaction between prosody & segmental phonology.[6] In formal speech, the segmental phonology applies "before" (or simultaneously with) the prosody. In other words, phonology refers only to lexically assigned prosodic and metrical structure. This level (which corresponds to the basic idea of the direct-syntax approach, cf. 1.4.1) is used, for example, for disambiguation. Casual speech is generated the other way round: prosody comes first and phonology applies on prosodic units which have been restructured.

I use the model in (20) since it can account for the difficulties that arise when comparing the postlexical components of various languages. First, (20) accounts for the fact that there are crosslinguistic differences with respect to the domains of rule or constraint application. Second, (20) explains why there is language-internal variation of these domains that is caused by speech rate. (21) and (22) illustrate this:

6 I argue in chapter 4 that this only holds for word-based languages like German.

(21) Crosslinguistic variation of domains of syllabification

(a) German	(b) French
vier Offiziere	quatre officiers
[fi:ɐ.ɔfi.tsi:.ʀə] *[fi:.ʀɔ.fi.tsi:ʀə]	[ka.tRO.fi.sje]
four officers	*four officiers*

As the examples in (21) show, the domain of postlexical syllabification may vary from language to language (cf. the discussion on onset maximization in (2)). The phonetic realization of the sequence vowel + word-final *r* in *vier* in (21)(a) indicates that, in German, the domain of syllabification is the PWd.[7] A vowel + r sequence in German undergoes r-vocalization. If both the underlying *r* as well as the preceding vowel are in the same syllable (cf. Hall 1992: 57) they appear as *[ɐ]*. r-vocalization applies to the final segment in *vier*, not only in isolation but also if *vier* is followed by a vowel-initial word: in the sequence *[fi:ɐ.ɔ.fi.tsi:.ʀə]* the word-final *ʀ* never resyllabifies to the onset of the following vowel-initial word. The potential output **[fi:.ʀɔ.fi.tsi:.ʀə]* does not surface.

In contrast, in French, syllabification operates across prosodic words, as one can see from the data in (21)(b). The domain of syllabification in French is some larger unit, possibly of phrase size.[8]

A fact which is often ignored in theoretical work is that also in languages of the type (21)(a) is that, they too may have domains of larger sizes, as can be seen from (22). At faster speech rates, syntactic boundaries are overridden and lexical items that have no main stress behave like functional items (i.e. they incorporate into a stressed PWd).[9] Fast speech data like (22) are often not considered relevant, because they do not seem to be systematic. In section 4.3.5 I show that fast speech can be captured in terms of phonological domains and that it is systematically related to slow speech.

(22) Language-internal variation due to speech rate (German)

das letzte woran er sich erinnert: er ist an der Deutzer brücke
the last thing that he REFL recalls: he is at the bridge of Deutz (place name)
'the last thing that he recalls is that he was standing at the bridge of Deutz'

(a) Slow Speech:	[das letzte] [woran**=er** sich **ɐinɐt]**	**[**ɐis andɐ deutzer brücke]
(b) Fast Speech:	[das letzte woran**=er** sich **ɐinɐd=ɐ]**	is annɐ deutzer brücke]

---

7 In this example, the PWd coincides with the grammatical word, but this is not a necessary condition.

8 The details are discussed in chapter 3.

9 This is the topic of chapter 4.

The relevant difference between the slow speech syllabification in (22)(a) and the fast speech syllabification in (22)(b) is not the clitic pronoun *er*. Even at slower speech, pronouns attach to lexical items to their left. However, this process is blocked by syntactic barriers such as the beginning of an embedded sentence as in (22). Therefore, at slower speech, *er* cannot attach to *erinnert* in (22). This can be deduced from the behavior of the final obstruent. In (22)(a) it surfaces voiceless since it is in syllable-final position, while at fast speech rate, as in (22)(b), it remains voiced since it is not syllable-final.[10] The prosodic domains in (22) are not labeled. I argue in chapter 4 that, in German, this domain is always the PWd, regardless of its size.

To summarize, while the domain of syllabification has to be specified for each language, it may be expanded, depending on speech rate.

1.3.1 The Postlexical Component

As said before, this thesis presupposes that there are two distinct levels of phonological representation, the lexical and the postlexical level as was suggested by traditional Lexical Phonology (see section 1.2.1).

Concerning the interaction of phonology and morphology within the lexicon, LP was replaced by models that have no cyclic interaction. The theory of prosodic phonology (cf. Nespor & Vogel 1986, Inkelas 1989) presupposes that the domain of phonological rules are constituents of the prosodic hierarchy (see section 1.4.2.1)). Even studies within Lexical Phonology have raised doubt about level ordering and orderings of phonological rules within one level (cf. Hannahs 1995a; 1995b).

The model in (20) presupposes that the postlexical component consists of two sub-components which are in charge of distinct phonological processes. On the one hand, the rhythmic component rearranges the PWd-boundaries (see section 1.3.2.1). On the other hand, the segmental component governs the application of rules and constraints on these domains (see section 1.3.2.2). The reason why I assume that these processes are located on separate domains are cases such as the ones in (21) and (22).

In the following sections I introduce the most important models of the postlexical domain. This is important, first because my proposal is not essentially

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10 The generalization that intervocalic obstruents surface voiced in certain prosodic environments holds only for the dialects that have "intervocalic voicing" (cf. chapter 4). (22)(b) is an example taken from such a dialect.

new, but is composed of earlier assumptions of these theories, and second, because in the central chapters of this thesis, they will be applied to problems of word-level and phrase-level phonology.

First of all, the mapping of syntax and phonology has to be accounted for. In principle, there are three conceivable ways of mapping depending on what one assumes to be relevant in phonology. They are sketched in (23), (24), and (25), respectively.

The prosodic hierarchy model was first introduced by Nespor & Vogel (1986). It is presented in (23).

(23) Prosodic hierarchy

Syntax
↓
Prosodic Hierarchy
(Intonated Surface)
↓
Postlexical Phonology

The basic idea behind (23) is that the syntactic structure is the input to an algorithm which rearranges this structure into prosodic domains. These are the input to postlexical phonology.

Prosodic subcategorization was introduced by Inkelas in her 1989 dissertation. Based on a detailed analysis of the domain of cliticization in various languages, she argues that a prosodic hierarchy is too restrictive to account for that (see section 1.4.2.2). She argues that the prosodic properties of words (i.e. how they can be prosodically licensed) are a part of the lexical entry. Function words have prosodic subcategorization frames that trigger processes of cliticization.

(24) Prosodic subcategorization

Syntax
↓
integration of prosodic
frames
↓
Postlexical Phonology

The direct-syntax approach illustrated in (25) differs from the others in that there is no prosodic structure mediating between phonology and syntax. As proposed by Kaisse in her 1985 dissertation, phonological rules include the syntactic relation of the constituents involved in their structural description (see section 1.4.1).

(25) Direct access to syntax

Syntax
↓
P1-rules
↓
Prosody
(Pause Insertion)
↓
P2-rules

All accounts face certain problems when applied to data such as in (21) and (22) that concern both the crosslinguistic variation of choice of prosodic domains and language-internal variation of domain size depending on the speech rate.

One of these issues concerns the difference between simple clitics and weak pronouns. In German for example, in formal speech only functional categories form a prosodic constituent with a lexical host item while at casual speech, all unstressed items are grouped together with a preceding stressed form. This fact cannot be accounted for in these models. One would either have to assume that all clitics are generated in the lexicon and would then lose the generalization that most of them are phonologically derived from their full forms postlexically. Or, if prosodic information was not at hand, one would have to assume a separate cliticization mechanism. The direct syntax model needs an additional clitic module (in order to account for slow speech cliticization without P2 rules), which is not desirable either. Another theoretical disadvantage is the derivation across the postlexical levels.

Some authors assume that the postlexical component consists of distinct levels, i.e. word prosody and segmental rules. In Hannahs (1995) these are assumed to coincide with the lexical and the postlexical domain: while the lexicon is the place of the prosodic operations, the phonological rules are assumed to be restricted to the postlexical domain.

I propose to account for the facts described above by assuming different input structures to postlexical phonology, as shown in (26).

(26) The input to postlexical phonology

(a) Formal speech
(used if phonology has to disambiguate syntax; often the level of phonological descriptions)

Syntax → phonological rules are blocked by the lexically assigned prosodic & metrical structure
→ Prosody: inserts bondary tones at the end of syntactic domains.

(b) Casual speech

Syntax → Prosody (may dramatically rearrange the bracketing)
→ Phonology (refers to the rearranged prosodic boundaries)

Below I show the difference between this approach and the ones introduced above. The data I am going to discuss suggest that the postlexical component has to account for a great deal of systematic variation depending on speech rate and style.

The basic idea for the model in (20) goes back to Nespor (1990b), who distinguishes between the prosodic and the rhythmic component. The prosodic component consists of the domains of segmental phonology, while the metrical grid is the input to rhythmic phonology (cf. (11), where I have schematized the assumptions made by Nespor). According to (11), prosodic phonology is the input to both, the prosodic and the rhythmic component. The mapping of word boundaries into prosodic words, however, depends on speech rate. Fast speech may even ignore major syntactic boundaries, as the example showed.

(22) is an example of a case where - at fast speech level - the phonological groupings differ significantly from their syntactic basis: the initial constituent of an embedded clause is phrased together with the main clause. This can be seen from the fact that there is no PWd boundary between the two elements, the pronoun *er* 'he' cliticizes to the preceding word, regardless of the syntactic break.[11] The lack of the corresponding phonological boundary can be deduced from the fact that syllabification is not blocked. The word-final obstruent surfaces voiced.[12] According to German final devoicing (cf. (8)) and other constraints on syllable codas, this indicates that the obstruent is not syllable-final.

All these cases indicate that, at fast speech rate, the phrasing is different from the phrasing at slow speech.[13] Below I show how the assumption that the rhyth-

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11 At least some of these processes are predicted some of the theories. E.g. in the prosodic hierarchy approach it could count as a prosodic utterance. In German, however, the utterance is not the domain of the rules involved (cf. chapter 4).

12 Which is underlyingly voiceless but is voiced by intervocalic voicing (see chapter 4).

13 In chapter 4, more examples, contrasting clitics and fast speech reductions are going to be considered.

mic and the prosodic component are separated earlier in the postlexical phonology may help to account for this.

Recall Nespor's model in (11). It assumes two postlexical components: first, prosodic phonology builds the prosodic domains, that is, clitic groups, phonological phrases and phonological utterances. Then these sequences that are grouped into domains pass the prosodic component and the rhythmic component simultaneously. Prior to the rhythmic component the string is assigned metrical structure.

Evidence for the separation of components in (11) comes from the fact that results from rule application in one of these domains do not affect the other domain. For example, in (27), the word-stress in the Italian word *ventitré* 'twenty-three' is moved away from the final position if the noun it modifies starts with a stressed vowel. This process, position deletion, is a rhythmic one.

(27) Position deletion in Italian (Nespor 1990b: 251)

```
                      *
       *     *        *
 *     *     *     *  *
 *  *  *     *  *  *  *   *
ventitre → ventitre barche     'twenty-three boats '
```

Accordingly, the output of the rhythmic component is a word with initial stress. However, prosodic rules that require word-final stress as their input do not take this into account. Rules in the prosodic component consider only the lexically assigned stress. Even external sandhi rules, such as Raddoppiamento Sintattico (RS)[14] always refer to the lexical stress, as can be seen from (28).

(28) RS and final stress (Nespor 1990b: 251)

(a) ventidúe [b]arche	(ventidúe)	'twenty-two boats'
(b) véntitre [b:]arche	(ventitré)	'twenty-three boats'

In (28)(a), RS is blocked from application as expected, i.e. the initial *b* in *barche* is not lengthened. But consider (28)(b): at the surface, *barche* is preceded by an unstressed vowel and should therefore - as in (28)(a) - not undergo RS. But unlike *ventidúe*, *ventitré* has final lexical stress. Although is does not appear stressed at the surface before *barche* (by rhythm rule), RS still applies, as if it would. According to Nespor (1990b: 251), this shows that RS applies independent of the output of the rhythmic component, since it treats the final vowel in véntitre as if it was still stressed.

---

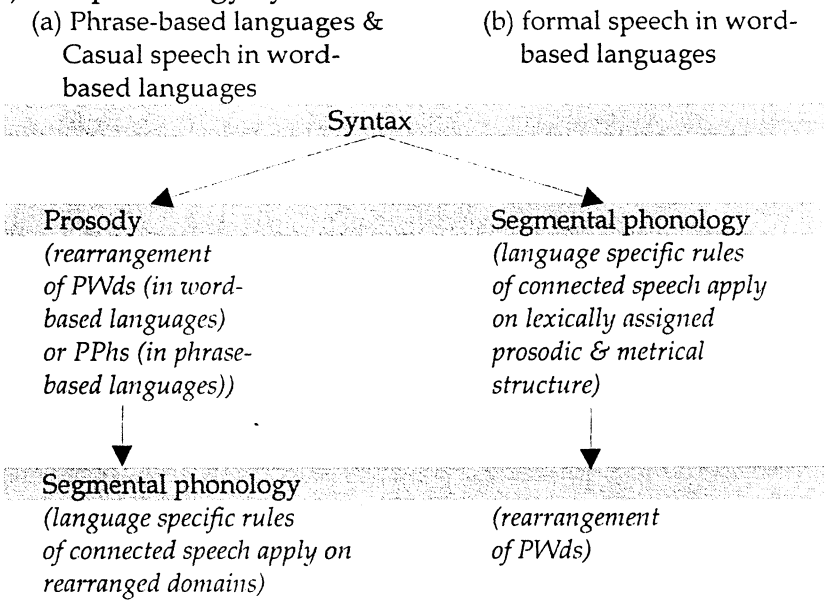
14 RS lengthens a word-initial consonant. The conditions are more complicated than mentioned here. They are introduced in more detail in chapter 2.

From data like these, Nespor (1990b) generalizes that the prosodic (=segmental) component applies independent of the rhythmic component. The two components must therefore be distinct, as shown in (11).[15]

1.3.2 The Revised Proposal

Recall the model I have proposed in (20). In this section I show in how far it differs from Nespor's proposal and the advantages of these differences. The model is repeated in (29) for convenience.

(29) The phonology-syntax interface



(29) shares with Nespor's proposal the separation between rhythmic and prosodic phonology. The basic difference between my proposal and Nespor's original approach is the interaction between the components. Recall that in Nespor's approach all strings of speech are the input to prosodic phonology first. In other words, the input for the phonological rules are always pieces of speech that are organized into PPhs and IPs (see section 1.4.2.1).

In contrast to Nespor's model, (29) proposes a complete separation of these two processes. The PWd can be expanded and it can become recursive. The segmental rules refer either to the PWds as provided by the lexicon or they refer to an ex-

---

15 One might now object that this contradicts my proposal according to which the two components interact. But notice that I assume this only for the word-based languages, whereas Italian is a phrase-based language.

panded PWd and to its internal structuring. The properties of the recursive PWd are summarized in (30).[16]

(30) The recursive PWd-domain
The inner PWd is the domain of word stress, i.e. the outer parts of the PWd are not dominated by a foot.
The outer PWd is the domain of syllabification.
The edge between inner and outer PWd is the domain of dialectal intervocalic voicing.

I assume that sequences of sounds are either organized into small-sized PWds, resulting from (29)(a) or into larger chunks (i.e. expanded PWds), resulting from (29)(b).

1.3.2.1 The Rhythmic Component

According to Nespor, all languages share an "aspiration towards maximal rhythmic alternation", that is, a succession of stressed and unstressed syllables. The rhythmic component contains linear sequences of grid beats and the language-specific regularities on them.

(31) Rhythm types (illustrated in Selkirk 1995: 564)

(a) Ideal	(b) Clash	(c) Lapse
x x	x x	
x x x x x	... x x...	...x x...

Languages may only differ with regard to details, such as the level of a minimal clash, which is parametrized (Nespor 1990: 252).

With respect to the rhythm types illustrated in (31), Liberman (1975) set up the rhythmic principles "Avoid Clash" as well as "Avoid Lapse", which trigger language specific rhythmic rules, that is, rules that delete or move metrical grid positions in order to maintain a rhythmic succession of weak and strong syllables. These strategies are located in the rhythmic component.

In chapter 6 I show how the separation of the postlexical domains may serve to distinguish phrase-based languages and word-based languages. In phrase-based languages PPhs are constructed on the basis of syntactic phrases and rearrangement is constrained by conditions on length, non-branchingness, etc, whereas in word-based languages PPhs are constructed on functional grounds, above all, focus-background structure.

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16 See also section 4.1.2.

1.3.2.2 The Segmental (Prosodic) Component

The prosodic component contains the segmental rules. A list of the ones that are relevant in the present study is given in (32). They are written out and illustrated in section 4.1.2. Their application to the recursive PWd is made explicit in section 4.3.5. There I show that the rules do not change with speech rate and style, rather their input changes.

(32) Segmental postlexical rules
resyllabification
final devoicing
r-vocalization
vowel reduction
schwa deletion
deletion of a monophthong
nasal assimilation
voicing assimilation
degemination
t-deletion

The change of the input domain depends on the interaction of the prosodic and the segmental component (see (29)).

1.4 Approaches to the Phonology/Syntax Interface

The model I use is a revised version of the prosodic hierarchy. In the past, two kinds of objections have been raised against this approach. One type was raised by phonologists who assume no prosodic hierarchy at all (see section 1.4.1), the other one was raised by phonologists who suggest other ways of deriving the constituents of the prosodic hierarchy (see section 1.4.2).

1.4.1 Direct-Syntax

Phonologists who use the Lexical Phonology (LP) framework in order to account for the interaction between phonology and morphology tend to do without prosodic constituents in the postlexical phonology (cf. the work by Kaisse).

There are two reasons for this. First, in LP, the organization of the lexicon into separate morphological levels was used to account for rule domains of different sizes instead of the prosodic categories *word* and *clitic group*. It would then be inconsistent to assume that - while in the lexicon there is no prosodic hierarchy - some of its categories are needed postlexically. Second, in many languages one can

observe that a subclass of phonological rules refers directly to some kind of syntactic information, that is, syntactic bracketing, categorial information and the results of movement rules: traces and empty categories (cf. chapter 2). In (33) this is schematized.

(33) Direct

Syntax
↓
Postlexical
Phonology

indirect access to syntax

Syntax
↓
Prosodic
hierarchy
↓
Postlexical
Phonology

An example from English that indicates that phonology may be organized as in the schema in (33)(a) rather than (33)(b) is given in (34) below. According to Kaisse, English *wanna*-contraction cannot be accounted for if the syntactic information is deleted.

(34) English *wanna*-contraction (cf. Kaisse 1985)

(a) I want to win. → I wanna win

(b) What do you want to win Ø? → What do you wanna win?

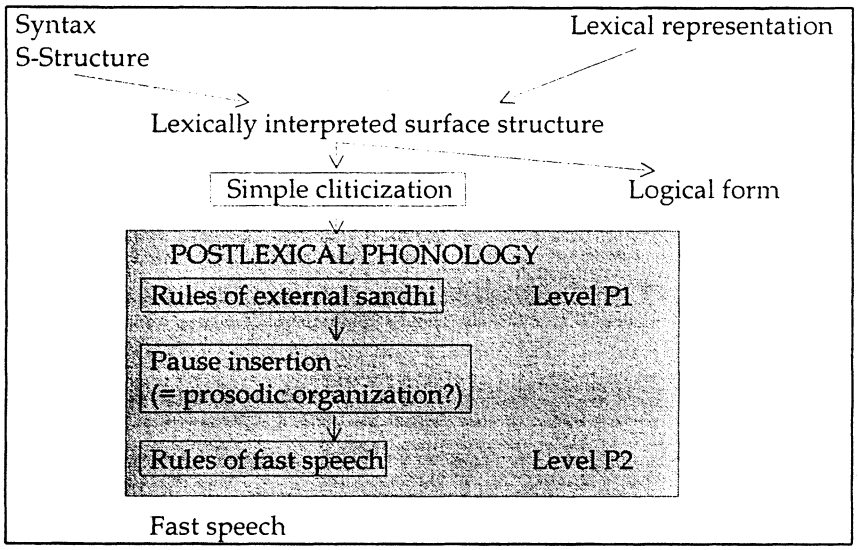
but:

(c) Who do you want Ø to win? → *Who do you wanna win?

In (34)(a), the infinitive marker and *want* are contracted. The same holds for (34)(b), where the wh-word has been moved. In (34)(c), however, wh-movement has left a trace between the infinitive marker and the auxiliary. Only then, *wanna*-contraction is ungrammatical.

A different type of a phonological rule that depends on the syntax is palatalization in English (cf. chapter 2: 2.4.6 for details). Rules like these motivate Kaisse's claim that a subset of the phonological rules refer to syntactic structure rather than to prosodic structure, the so-called "Direct Reference Hypothesis" (Kaisse 1985). These rules, the "external sandhi" or P1-rules, refer to syntactic information, whereas the fast speech rules (P2-rules) apply completely independently of the syntax. Kaisse's model is sketched in (35).

(35) Direct phonology-syntax interface (only the postlexical part) (Kaisse 1985: 20)



Instead of the prosodic hierarchy (which is explained below), there is a pause insertion algorithm that creates the flat prosodic structures that serve as input to the fast speech rules.

The P1-level contains all phonological rules that make reference to syntactic structure directly, such as the well-known English *wanna*-contraction.

Contrary to the P2 (fast speech) rules, which are said to be universal in the sense that each language has a set of fast speech rules,[17] the existence of a P1-level is language-specific. Interestingly, languages which lack level P1 are the unmarked case.

P2-level rules apply without any syntactic constraints. A good example for such a rule is the American English flapping rule, which turns an intervocalic /t/ into a tap [ɾ].[18] This rule applies across all syntactic boundaries, it is only sensitive to pauses. It can even apply between sentence boundaries, if there is no intervening pause.

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17 The rules themselves are then language-specific.

18 The conditions of this rule are more complex (see Kahn 1980: 94ff), which is of no relevance here.

(36) American English Flapping

waiter	wai[ɾ]er
wait until I come	wai[ɾ] until I come
Wait. I'll come.	wai[ɾ] I'll come
Please don't wait. I won't be back today.	Please don't wai[t] I won't be back today *Please don't wai[ɾ] I won't be back today

Only in the last example, where the insertion of a pause is inevitable, the flapping rule cannot apply. Syntactic information doesn't seem to play a role.[19]

Besides its function as a domain for rules like (36), the level P1 is needed in order to account for "interim" forms, i.e. forms which originated as the result of P2 rules, but are subject to a grammaticalization process, i.e. they will be separate lexical items with certain syntactic conditions.[20] The P1 level can be interpreted as an intermediate diachronic stage, a stage, where a certain form can still be identified as the result of a productive phonological rule but is already subject to some non-phonological restrictions.

1.4.2 Indirect Mapping

More or less at the same time as Kaisse (1985), other phonological theories were developed that are based on the assumption that the groupings that serve as input to phonology are not necessarily isomorphic to the syntax (among them most influencing the work by Nespor & Vogel, Hayes, Selkirk). The basic argument for this are the fundamental differences between syntax and phonology: despite the data in (36) phonologists agree that phonology is insensitive to most information contained the syntactic output. For example, phonology does not care about remote syntactic structure.[21] Also, while syntactic structure allows for several levels of embedding, phonology is flat.

The fact that phonology systematically refers only to a subset of the syntactic input gave rise to the assumption of an intervening stage between syntax and phonology that mediates between the two levels and generates an appropriate input to phonology. Additional motivation for such a level comes from prosodic mismatches, that is, phonological rule domains that cannot be derived directly from the syntactic input. Some examples are given in (37) and (38).

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19 Or, more precisely, syntax only indirectly plays a role: syntactic information is necessary for the rule of pause insertion which then constrains the flapping.

20 See section 4.2.3 for German examples.

21 With the exception of the distinction between lexical and functional categories.

The words in (37) illustrate that the domain of Hungarian Vowel Harmony (VH) cannot be accounted for with reference to any morphological formative.

(37) Hungarian Vowel Harmony (Vogel 1990: 450)

(a) kert - em-ben *garden my in*	'in my garden'	+ *VH between stem & suffix*
(b) fel - bukkan *up appear*	'appear suddenly'	- *VH between prefix & stem*
(c) nyak - kendó *neck tie*	'necktie'	- *VH between members of compounds*
(d) kerék - pár - ok *wheel pair pl.*	'bicycles'	+ *VH between second member of compound & suffix to its right*

Within words, VH applies between stem and suffix, as in (37)(a), but it fails to apply between a prefix and a stem (37)(b) and between members of compounds, as in (37)(c). Between the second member of a compound and an affix to its right, there is again VH. In "classical" Lexical Phonology (LP) (i.e. Kiparsky 1982), the domain of VH could be accounted for by exploiting lexical levels. For example, prefixes and compounds are formed at level 1 and vowel harmony applies at level 2. In contrast to LP, the theory of prosodic phonology (cf. Nespor & Vogel 1986, Inkelas 1989), presupposes that the domain of VH is a constituent of the prosodic hierarchy, namely the Phonological Word (PW) where the PW in Hungarian is defined as (i) the prefix and (ii) the stem plus suffix(es).

(38) Prosodic mismatches in German

Syntactic boundaries	prosodic boundaries	
(a) [enterben]	[ent] [ɛrben]	'disinherit'
(b) [fɪnd] [ən]	[fɪn.dən]	'find him'

(38) are examples of mismatches in German: in (38)(a) one syntactic word constitutes two prosodic words, since *enterben* 'disinherit' is syllabified *ent.erben*, never *en.terben*, as it would be if it was a single prosodic word.[22] In (38)(b) we find the reverse case, where two syntactic words constitute one prosodic word. Evidence for the cliticization of the pronoun *ihn* 'him' is the blocking of final devoicing which indicates that resyllabification has applied. In other words, the two syntactic words form a single prosodic word.[23]

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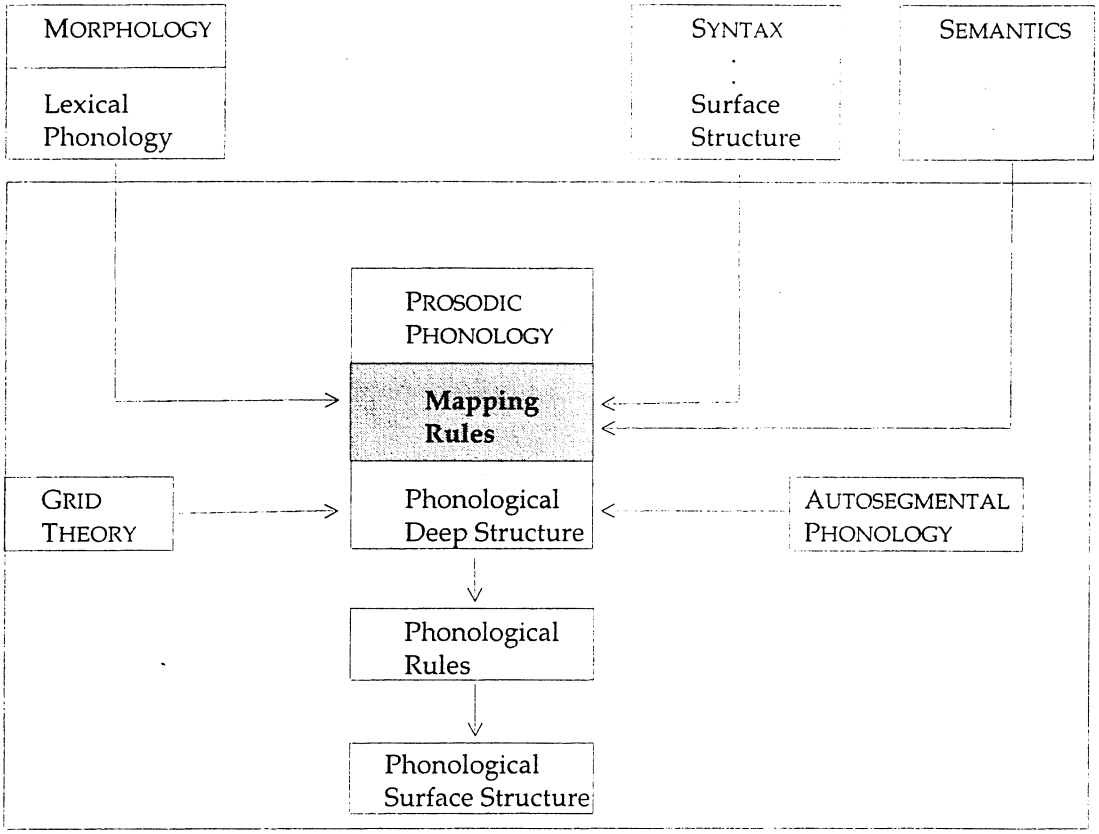
[22] Following the claim made by numerous authors (cf. Booij (1996)) that the prosodic word is the domain of syllabification.

[23] This is a rather simplified version of the story. In fact, there is a number of factors such as the kind of pronoun, speech rate and dialectal variation. These will be dealt with in chapter 6.

Cases like (37) or (38) indicate that some intervening phonological module prepares the lexical input for the phonology. In (39), the standard model of such an intervening module is illustrated.

(39) The syntax-phonology interface (Nespor & Vogel 1986: 302)[24]



(39) shows the model by Nespor and Vogel, but its basic assumptions are shared by other models of prosodic phonology. In these models, syntax and phonology are autonomous. Phonology cannot apply to the syntactic input. Instead, syntax is interpreted by a set of mapping rules. These mapping rules convert the syntactic phrasing into a prosodic one (i.e. phonological phrases, phonological words, etc). They are assumed to be universal with some parametrized variation. The output of the mapping rules is then interpreted by phonological rules. The phonological rules are not ordered into different levels. Levels are obsolete in this model since the information about the required boundaries is encoded in the prosodic phrasing.

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24 I have added the highlighting (UK).

In the past years different assumptions about the nature of this intervening structure have been made. The first generation of approaches was developed in the eighties; the relation-based prosodic mapping (cf. Nespor & Vogel (1986) and (Hayes (1989)) is the most well-known among them. According to the standard model by Nespor & Vogel which is given in (39), phonology applies on prosodic domains which are the result of mapping rules. These mapping rules take the grammatical relations of the adjacent constituents as their input and reduce them to the information that is relevant for phonology. The prosodic domains are organized hierarchically in the prosodic hierarchy (see section 1.4.2.1).

Criticism against the relation-based approach came from people such as Selkirk, who switched to the edge-based approach (see section 1.4.2.3), Hayes who proposed the precompilation theory (see section 1.4.2.4) and Inkelas who argued in favor of prosodic subcategorization frames (see section 1.4.2.3). Below, these approaches are briefly introduced. Later criticism concerns the inviolability of the constraints that govern the prosodic hierarchy and the derivational characteristics of the approaches (see section 1.4.2.5).

1.4.2.1 The Prosodic Hierarchy

Numerous authors have argued that phonological rules can only indirectly refer to syntactic information. Formally, this means that the syntactic structure is deleted through Bracket Erasure or during the derivation of the prosodic hierarchy.

Bracket Erasure (BE) was assumed in the theory of lexical phonology. BE deletes all internal brackets of a formative at the end of a lexical level and at the output of the lexicon. Accordingly, the syntactic surface structure is overwritten by the phonological mapping rules (cf. (39). Phonological rules can only refer to this prosodic hierarchy (see Hayes 1990; Nespor & Vogel 1986; Selkirk 1984). This is expressed in the following constraint set up by Hayes (1990: 85).

(40)
Syntax has phonological effects only insofar as it determines phonological phrasing.

This constraint is incorporated implicitly or explicitly in all indirect reference approaches. For example, in (39) the mapping rules do this job. (41) lists the categories that are commonly assumed to constitute the prosodic hierarchy.

(41) Prosodic hierarchy according to Nespor & Vogel (1986: 16)
syllable
foot
phonological word
clitic group
phonological phrase
intonational phrase
utterance

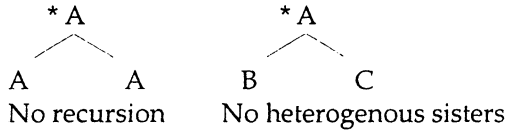
Details about this are introduced in section 3.3.

The prosodic hierarchy is constrained by some well-formedness conditions, which were first stated as the Strict Layer Hypothesis (SLH), given in (42).

(42) The strict layer hypothesis (cf. Ladd 1992)
Principle 1. A given nonterminal unit of the prosodic hierarchy, XP, is composed of one or more units of the immediately lower category, XP^{-1}.
Principle 2. A unit of a given level of the hierarchy is exhaustively contained in the superordinate unit of which it is part.
Principle 3. The hierarchical structures of prosodic phonology are n-ary branching.
Principle 4. The relative prominence relation defined for sister nodes is such that one node is assigned the value strong (s) and all the other nodes are assigned the value weak (w).

Some prosodic representations which will be discussed in this thesis are ruled out by the SLH (cf. (43).

(43) SLH-effects



Later research (such as Ladd's (1992) work on compound prosodic domains) has shown that the SLH is violable. Prosodic domains may be recursive and they may immediately dominate elements more than one level lower. These two cases will be the subject of chapter 4. As a consequence, Ladd suggests to replace the SLH by conditions on ranking and uniformity, given in (44).

(44) Ranking and Uniformity Conditions ((Ladd 1992: 18f)
Prosodic Rank
a. Every language has an ordered set of prosodic types $P_0...P_n$, where P_0 is the type of the terminal nodes of a prosodic tree and P_n is the type of the root, and *n* is a language-specific variable.
b. The place of each type in the ordered set is its *rank*: the terminal nodes are of rank 0 and the root is of rank n.

Ranking condition
No node of a prosodic tree may dominate any node of a higher rank.

Uniformity condition
In a prosodic tree, all the nodes immediately dominated by a given node N must be of uniform rank.

These allow for some language-specific variation in the prosodic hierarchy as well as for compound prosodic domains. Still, the conditions constrain prosodic representations: e.g., according to the uniformity condition in (44), heterogeneous sisters are still ruled out. However, there are cases of heterogeneity. E.g. in some languages function words directly incorporate into the PPh, in other words, a foot is then the sister of a PWd, both dominated by the PPh (see (49)).

As a consequence of these and other cases, Selkirk (1995) proposes to replace the SLH by a set of universal constraints that are violable and can be ranked differently.

(45) Constraints on prosodic domination (Selkirk 1995: 5)
(where Cn = some prosodic category)
(i) *Layeredness* No C^i dominates a C_j, $j > i$,
e.g. "No σ dominates a Ft."
(ii) *Headedness* Any C^i must dominate a C^{i-1} (Exept if $C^i = \sigma$),
e.g. "A PWd must dominate a Ft."
(iii) *Exhaustivity* No C^i immediately dominates a constituent C_j, $j < i-1$,
e.g. "No PWd immediately dominates a σ."
(iv) *Nonrecursivity* No C^i dominates C_j, $j = i$,
e.g. "No Ft. dominates a Ft."

The constraints in (45) reflect the conditions of the SLH. But contrary to the conditions set up by Ladd, they allow for minimal violations of the SLH, depending on the language specific ranking of the constraints. Chapter 4 will deal with constraints on prosodic representations (e.g. the PWd) in greater detail.

1.4.2.2 Prosodic Subcategorization

Criticism against the prosodic hierarchy model by Nespor & Vogel does not only come from the supporters of the direct syntax approach but also from the defenders of the prosodic hierarchy model. One criticism of the prosodic hierarchy concerns the huge number of constituents proposed. Accordingly, efforts were made in order to minimize this number. A good target for this is the category clitic group. Its necessity is often doubted in the literature, especially since it is only re-

quired to account for one phenomenon, the prosodic integration of clitics into a host word.

An alternative account which I make use of in this thesis has been proposed by Inkelas (1989). According to Inkelas the lexical representation of an item includes a subcategorization frame that contains information about its prosodic status. E.g. clitics are subcategorized for the fact that that they are prosodically dependent. This is the so-called "lexically encoded postlexical dependence" (Inkelas 1989: 241).

A prosodic subcategorization frame (as in (47) for a clitic) contains the following information:
- the kind of constituent the clitic attaches to (PWd, PPh or else)
- the kind of prosodic constituent resulting form this attachment
- the linear ordering of clitic and host (proclitic, enclitic, bi-directional).

In that account, clitics fit into the pattern of prosodically and morphologically dependent forms given in (46)

(46) Typology of dependencies (Inkelas 1989: 81)

	morphologically dependent	phonologically dependent
prosodically dependent	affix	**clitic**
not pros. dependent	root	stem

(47) Subcategorization frame for an enclitic element (Inkelas 1989: 238)
[[ ]$_{PWd}$ __]$_{PWd}$

(47) requires that a constituent which carries this frame attaches to a PWd to its left. Together they form a PWd rather than a clitic group.

Zec & Inkelas (1991) compare the prosodic subcategorization to the notion of the clitic group and provide additional arguments against this category. According to them, assuming the clitic group leads to some wrong predictions. The most important one concerns the restriction of the host category. The constraints on the prosodic hierarchy incorrectly predict that clitics only attach to phonological words.

In (48) examples from Hausa are given that show that clitics may attach to the PPh. Similarly, Zec & Inkelas show that in other languages clitics may attach to the Intonational Phrase. The emphatic particle *fa* in Hausa never occurs utterance-

initially, but utterance-finally or utterance-medially if certain conditions are met. The exact conditions show that *fa* attaches utterance-medially to the right edge of a PPh, as can be seen in (48).

(48) Cliticization to the PPh in Hausa (Zec & Inkelas 1991: 509ff)

(a) Ya sayi fa babban tebur
he bought big table
'He bought a big table'

(b)*Ya sayi fa teburin
he bought table-def
'He bought the table'

(c) Ya sayi fa **teburin**
he bought table-def
'He bought the table'

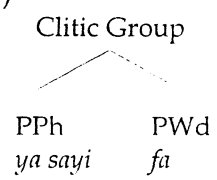
In (48)(a) *fa* precedes a branching constituent, whereas in (48)(b) *fa* cannot occur in the same position in the sentence if the following constituent is nonbranching. In (48)(c) however, cliticization is possible. The difference between (48)(b) and (48)(c) is that in (48)(c) the material following *fa* is intonationally emphasized (which induces a PPh-boundary).

According to Zec & Inkelas, this provides additional evidence in favor of the hypothesis that the constituent following *fa* must be a PPh. In order to capture the environments where *fa* can occur its prosodic subcategorization frame requires a PPh boundary to its right (as in (49))

(49) Prosodic representation of Hausa *fa* (Zec & Inkelas 1991: 510)
[[ ]$_{\Phi}$ fa]$_{\Phi}$

Cases like this cannot be represented in the classical prosodic hierarchy approach. A representation as in (50) would violate the SLH since it contains two nodes that are not sisters and, even worse, one node is dominated by a node lower in the prosodic hierarchy.

(50)



1.4.2.3 Edge-Based Prosodic Domains

Another type of criticism against the prosodic hierarchy concerns the way it is derived form the syntactic input. Evidence, e.g. from tone sandhi in Chinese dialects, indicates that the domains of this rule are derived by referring to only one of the edges of syntactic phrases. In Selkirk 1986 this approach is called "edge-based". Its basic assumption is that languages are parametrized for taking either the left of the right edge of a syntactic phrase as the starting point for the derivation of phonological domains (see also Chen (1987, 1990)). Two parameters determine the development of prosodic domains: the level of projection (word or X^{max}) and the direction (from left to right or from right to left).

(51) The edge-based theory (cf. Selkirk 1986, Chen 1990, among others)
The Syntax-Phonology Mapping

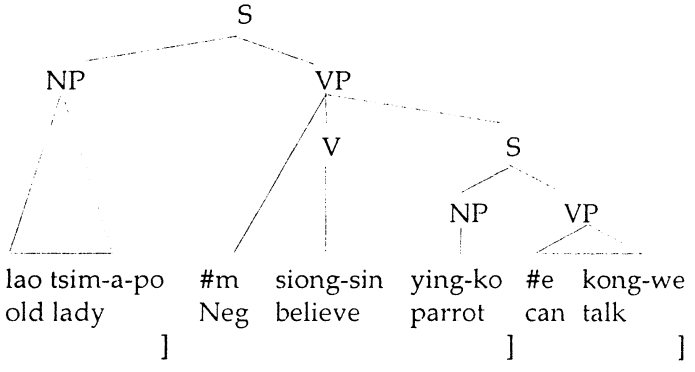
For each category C^n of the prosodic structure of a language there is a two-part parameter of the form

C^n: {Right/Left; X^m}

where X^m is a category type in the X-bar hierarchy.

The different predictions this approach makes, especially compared to the prosodic algorithm by Nespor & Vogel are illustrated in (52), taking the domain of tone sandhi in the famous Chiamen sentence *The old lady doesn't believe that parrots can talk* as an example. According to Chen (1990), Chiamen tone groups are derived by demarcating the right edge of X^{max}. As a result, the tone groups are derived as in (52)(a).

(52) Tone sandhi domains in Chiamen (Chen 1990: 27)
(a) End-based prosodic domains



(53) shows how the same sentence would be phrased if the phrase-span approach by Nespor & Vogel was applied.

(53) PPh algorithm (Nespor & Vogel 1986)

old lady	Neg	believe parrot	can	talk
[ ]	[	] [		]

The phrasing they would predict cannot account for the actual application of tone sandhi rules. In fact, the noun *parrot* has to be grouped together with the preceding constituent that is part of the VP instead of the intuitive grouping within its syntactic phrase. This can be seen from the fact that *parrot* belongs to the same domain as its preceding phrase as far as tone sandhi is concerned. It interacts with the tones from the preceding VP and ignores the tones of its (syntactic) sister constituents.

Data such as in (52) suggest that the edge-based approach is superior to the other ones. However, there are similar disadvantages as in the other approaches, that is, there exist counterexamples which show that starting at one edge of a phrase deletes information that is required for some rule domain.

For example, Odden (1990) argues that the edge-based theory misses information on syntactic dominance that is required in order to account for Makonde high tone deletion. Makonde possessive pronouns have a floating high tone which triggers H-deletion on the preceding word. Informally, Odden (1990: 167) states this as follows:

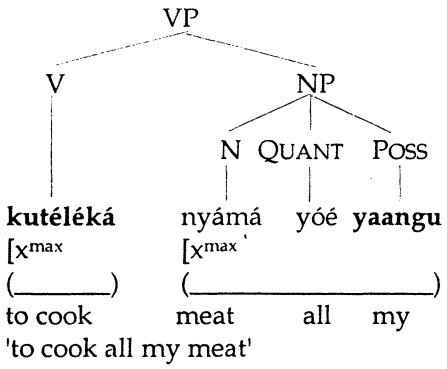
(54) Makonde H-deletion

Delete H in a word if a following possessive pronoun is in the same phrase.

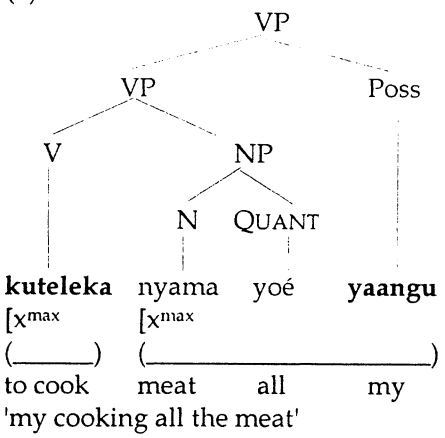
The direct-syntax and the edge-based approach make different assumptions on the domain of high tone deletion in (55). (55) is an example that may serve as a test for the two approaches since they make different predictions about the domain of deletion.

(55) Domains of Makonde high tone deletion (Odden 1990: 165f)

(a)



(b)



The edge-based approach would predict that H-deletion applies within the phonological phrase, and in Makonde this category would be built starting at the left edge of a maximal projection, as illustrated in (55)(a). Then, a H-deletion rule applies to the domain of the PPh.

(56) H-deletion within the PPh (Odden 1990: 167)

$H \rightarrow \emptyset$ / [..._...[PossPro]...]$_{\Phi}$

But in fact the edge-based theory fails to account for the contrast in (55)(a) and (b): while there is a phrase boundary after the verb in (55)(a), in (55)(b) the verb is inside the domain of H-deletion. The reason for the failure cannot be a wrong application of the edge-based derivation of the PPhs, since the left edge of a maximal projection does derive some of the domains of H-tone deletion (as in (52)(a)). It only fails to account for a subset of the domains.

Contrary to that, in the direct-syntax approach the difference between the two structures can be captured since the domain of H-deletion is connected to syntactic dominance relations. Odden proposes a phonological rule that refers directly to the syntactic m-command relation:

(57) H-deletion referring to m-command (Odden 1990: 167)

$H \rightarrow \emptyset$ / [$_a$... – ...[$_b$ PossPro]...] b max-commands a

However, the rule as stated in (57) is exceptional, since it accounts for a tone change in only one single grammatical formative. It is questionable whether phenomena like these should be accounted for by a productive rule or whether they

should be part of the lexical information of the element. The latter assumption is the background for the precompilation theory.

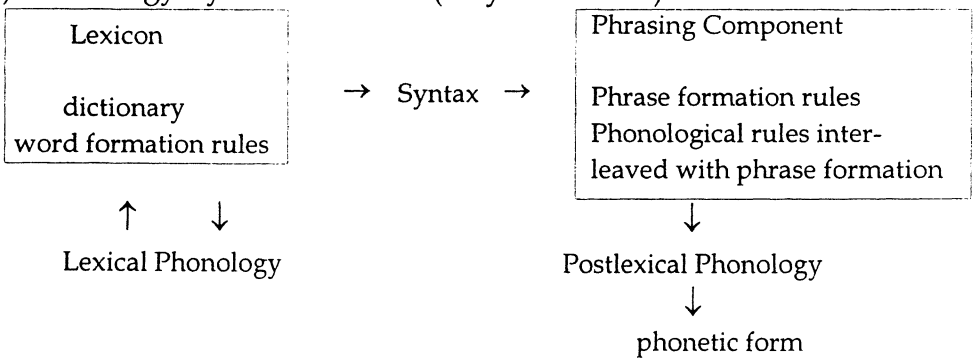
1.4.2.4 Precompilation

Comparing the counter-arguments against the other approaches, we can conclude that they all suffer basically from the same problem: questionable cases that involve category-specific information, such as the H-deletion rule in (57), that only affected a possessive pronoun. These cases are always a problem to account for, since they require statements on where and how this information is accessible.

Another example well-known from the discussions above is cliticization. Attempts to relate cliticization to the prosodic hierarchy suffered from the fact that the attachment of clitics often violates the constraints on prosodic representation. The direct-syntax approach required the assumption of an additional postlexical level in order to account for the various types of clitics.

One way of improving this and still maintaining the prosodic hierarchy (the prosodic subcategorization) was discussed in 1.4.2.4. A different approach that was developed at the same time is the precompilation theory (Hayes 1990). Hayes suggests to treat these problematic cases as allomorphs. He assumes that at the interface between syntax and phonology, a phrasing component inserts lexically "precompiled" allomorphs into certain syntactic contexts. In other words, there are no productive phonological rules that refer to the syntax in the sense of categorial information. Rather, the syntactic context is prescribed in the lexical entry of the forms, the results being "phrasal allomorphs".

(58) Phonology-Syntax-Interface (Hayes 1990: 88)



The following case is an example taken from Prinz (1991), who applied precompilation to German clitics. Prinz argues that the lexicon is the place where the prop-

stored. Thereby he can avoid the assumption of a P1-level by reanalyzing clitics as precompiled lexical entries. The German pronoun *du* has (at least) two allomorphs, the full form *du* and the reduced form *də* (cf. (59)).

(59) Instantiation rule for the German pronoun *du* 'you' (Prinz 1991: 124)

(a) $N \rightarrow /d/$ Instantiation rule

(b) E

σ

|

[du:]

(59) accounts for the allomorphy as follows: allomorphs are generally stored in the lexicon separately. Each lexical entry has its index, which is represented by an individual number. For each number, a phonetic realization is precompiled. In (59), *N* stands for a lexical index, that is, a number plus a corresponding precompiled phonetic output. Postlexically, the index is replaced by the appropriate precompiled form (or one of them, if there are more than one) via an instantiation rule, unless a rule intervenes.

One of the rules that may intervene and hence, block the replacement of the indices is the instantiation in focused positions. As formalized in (60), in focused positions the replacement is constrained: only the full form occurs.

(60) Instantiation for focused positions (Prinz 1991: 123)

P^i

σ

|

[...]

Fok: $X(P)^N$ → Fok: X(P)

cond: $P^i \geq E$

The instantiation rule in (60) blocks the reduced form from occurring in focused positions. According to the condition in (60), only forms that are dominated by a foot can be inserted in focused positions. Thus, the lexical index N can only be replaced by lexical entries which are dominated by a foot. In other words, the reduced allomorph is blocked from being inserted.

The precompilation has the advantage that the problematic question of how to translate categorial syntactic information (which is required for some phonological processes) into the postlexical phonology can be avoided.

However, if this approach is applied consistently to all postlexical alternations that somehow refer to the syntax, we lose interesting generalizations about the respective language. In chapter 4, this is shown in greater detail with respect to German clitics. As I am going to argue, three classes of reduced pronouns have to be distinguished in German. If all reduced forms were assumed to be precompiled in the lexicon, the systematic differences between the three classes would be lost.

The prosodic subcategorization (Inkelas 1990), which has the same advantages as the precompilation, additionally has the effect that the individual lexical items can be classified according to their prosodic representations and requirements. This information is obscured in the precompilation notion.

1.4.2.5 Phonology-Syntax Mapping as Alignment

The emergence of constraint-based theories in phonology also influenced the concepts of syntax-phonology-mapping. The application of constraint-based theories on this part of the grammar goes back to McCarthy & Prince (1993). They proposed the theory of *Generalized Alignment (GA)*, a family of constraints that govern the mapping of edges of constituents.

(61) Generalized Alignment (McCarthy & Prince 1993: 80)
Align(Cat1, Edge1, Cat2, Edge2)=def
∀Ca1 ∃Cat2 such that Egde 1 of Cat1 and Edge2 of Cat2 coincide.

Where
Cat1, cat2 ε PCat ∪ GCat
Edge1, Edge2 ε {Right, Left}

PCat and GCat consist of (prosodic and grammatical) categories. The constraints that govern the alignment of edges of prosodic and grammatical categories interact with other ranked and violable constraints of the grammar. According to (61) GA requires that any edge of a given type coincides with a "designated edge" of some other constituent. In this respect it converges with earlier approaches that simultaneously refer to phonology and morphology (cf. McCarthy & Prince 1983: 81), such as the prosodic subcategorization (see section 1.4.2.2). The basic difference to the other approaches is that the GA account allows for a separate treatment of left and right edges. This has already been expressed in the "prosodification constraint" (cf. Rubach & Booij 1990).

(62) Prosodification constraint (Rubach & Booij 1990)
Derivation of prosodic constituency is blocked by the constituency bracket [

In languages that obey this constraint, the left edges of stems are a barrier to syllabification. An example of such a language is German. It is well-known that in German left edges of stems are a barrier to syllabification. Some examples for this are given in (62).

(63) Left stem edge as barrier for syllabification (Hall 1992: 101)

[[Ab][art]]	[ʔapʔaRt]	*modification*
[[Ver][ein]]	[fɛʊʔain]	*union*
[[Tag][arbeit]]	[ta:kʔarbait]	*day labor*

As discussed in greater detail in 1.3, both the insertion of a glottal stop and final devoicing show that the left edge of a stem blocks syllabification. Following the assumption that the Prosodic word is the domain of syllabification, the left stem edge aligns with the edge of a prosodic word.

McCarthy & Prince account for the German data by assuming the interaction of three constraints. They are introduced below.

(64) ALIGN-LEFT (McCarthy & Prince 1993: 116)
Align(Stem, L, PrWd,L)

ALIGN-LEFT demands that the left edge of a stem coincide with the left edge of a prosodic word.

(65) ONSET (Itô 1989: 223, cited in McCarthy & Prince 1993))
*[σV

ONSET thus requires that syllables have onsets. The problematic case in languages such as German are vowel-initial stems, like *essen* 'eat'. They violate ONSET.

There are two strategies in order to assign an onset to a syllable. The first is epenthesis of material. Epenthesis is a violation of DEP.

(66) DEP (McCarthy & Prince 1995: 250)
No epenthesis

The second strategy is syllabification of a preceding consonant into the onset of the syllable. If this is done to a German vowel-initial stem, the result is a violation of

ALIGN-LEFT, since the left edge of the stem does not align with the left edge of the corresponding prosodic word.

In German, these constraints must be ranked ONSET >> ALIGN-LEFT >> DEP in order to account for the facts. This is shown in (67), taking the sequence of consonant-final prefix + vowel-initial stem *auf+essen* 'eat up' as an example.

(67) C [V in German (McCarthy & Prince 1993: 131)

Candidates	ONSET	ALIGN-LEFT	DEP
a. auf [.essen	*!		
b. ☞ auf [.ʔessen			*
c. au [.fessen		*!	

The tableau in (67) shows how ALIGN-LEFT interacts with other constraints in German. The epenthetic consonant in *[aufʔɛssen]* violates only the lowest ranked of the relevant constraints, DEP.

The separate treatment of left and right edges of constituents can also account for an asymmetry in German: the right edges of lexical items are far less protected. Therefore, cliticization backwards (encliticization) is possible in German while procliticization is very restricted. This is the subject of chapter 4.

Concerning the interface of syntax and phonology, McCarthy & Prince state that Generalized Alignment (GA) is most directly related to the edge-based approach (1993: 81). Consequently, Selkirk (1995) was the first to apply the requirements of GA to higher prosodic constituents, i.e. function words. She proposes to replace the rules of syntax-phonology mapping (cf. (51)) by ranked and violable Alignment Constraints. In (68) and (69), the two types of constraints she proposes for the alignment of lexical and prosodic words are given.

(68) Word alignment constraints (Selkirk 1995: 7)
(i) Align (Lex, L; PWd, L)
(ii) Align (Lex, R; PWd, R)

According to (68), the edges of lexical categories have to coincide with the edges of prosodic words.

(69) Prosodic word alignment constraints (Selkirk 1995: 7)
(i) Align (PWd, L; Lex, L)
(ii) Align (PWd, R; Lex, R)

(69) requires that the edge of a prosodic word must coincide with the edge of a lexical word. These constraints and their application are explicated in section 4.2.3.

Truckenbrodt (1995a) applied these constraints to the construction of phonological phrases. He showed that alignment constraints alone do not suffice in order to account for the relation between syntactic phrases and phonological phrases. Languages differ with respect to the relative ranking of phrase boundary alignment and other factors, such as the relation of main stress placement and phrase boundaries. These factors are dealt with in chapter 3.

1.4.2.6 Final Remarks

To summarize, there seems to be no universal algorithm for the derivation of PPhs. An account that is suitable for a certain language or a certain language type fails if applied to another one. The derivation of PPhs therefore has to be accounted for language-individually: either by a different ranking of the alignment constraints or through language-specific modifications of the prosodic algorithm.

1.5 Speech Rhythm Typologies

In this thesis I relate two topics: the domain formation in the postlexical component as outlined above on the one hand and the different ways in which languages realize speech rhythm on the other hand.

That this connection exists can be concluded from the results of experimental work (see sections 1.5.2 and 3.2.1) that has shown that the timing of speech into rhythmic units is a matter of speech perception rather than of its actual production.[25] I assume that speakers classify languages into certain speech rhythm types, based on their perception. From this, other properties of the languages can be predicted. This assumption can be connected to the postlexical domains: the choice whether words or phrases are the domain of postlexical phonology is not accidental, but a consequence of the speech rhythm properties of the language. A word-based language takes the PWd as the basis of their phonology; a phrase-based language the PPh.

In this section I summarize examples of the existing speech rhythm typologies and the most important arguments that were raised in the discussions about them.

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[25] The experimental basis for this comes from Grabe & Warren (1995) and Scott *et al.* (1985, cited in Nespor 1990a).

They are all discussed in greater detail in chapter 6, where I compare them to my proposal.

1.5.1 Isochrony

Pike (1945) and Abercrombie (1967) claim that languages organize their speech units into isochronal intervals. According to them, two types of languages have to be distinguished: syllable-timed and stress-timed languages. In the former languages syllables recur at regular intervals, i.e. the length of the syllables is predicted to be constant. In the latter languages stresses recur at equal intervals, i.e. the duration of the foot is predicted to be constant. Examples for syllable-timing are French, Spanish, and Yoruba. Typical stress-timed languages are German, English, Russian, and Arabic.

Several arguments have been raised against isochrony by phoneticianc.[26] The first criticism was that neither Pike nor Abercrombie have conducted any experiments on what they concluded from their perception of the speech types. According to subsequent experiments (e.g. Dauer 1983, cf. section 6.3.1) on the production of rhythm it turned out that in both language types the intervals between stresses vary depending on the number of intervening syllables. In other words, there is no significant acoustic correlate for the predictions of isochrony. Dauer concludes that the distinction between stress-timed and syllable-timed languages is a matter of perception: they are perceived differently, because only in stress-timed languages there is a significant contrast between stressed and unstressed syllables.

1.5.2 The Phonological Interpretation of Isochrony

In phonetics, Pike's statement about the language types was thus weakened. Phoneticians instead spoke of a strong tendency towards two ways of rhythmic organization of languages and isochrony was interpreted as a continuum between the two extremes.

But the different phonological properties of these extremes still remain to be accounted for. The first approaches were made by typologists. For example, Donegan & Stampe (1983) assumed that phrase-initial versus phrase-final stress is the factor that distinguishes the language groups. According to Hyman (1978), this factor is the domain of syllabification. Later, Auer (1991) argued in favor of a phonological distinction between syllable-type and word-type languages. He ar-

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[26] See Mooshammer (1994) for a summary.

gues that the rhythmic properties of these languages are primarily repair mechanisms in order to maintain the rhythm type. This, however, raises other problems. The most important one is that Auer predicts the syllable to be irrelevant in word-type languages.

As a consequence of the discussion (see chapter 6 for a detailed discussion of all the approaches) about speech rhythm I am going to claim in this thesis that the dichotomy between the rhythm types can best be accounted for if the domains of the PWd and the PPh are taken as the basis of comparison. Languages are then classified according to which of the two is the domain of postlexical phonology.

The proposed classification has two advantages. First, the problems of the other speech rhythm types (i.e. edge effects, the role of the syllable etc.) can be avoided. Second, since I assume that the motivation for the classification of the two groups is the coherence of phonological domains, the language groups that result from this classification contribute new insights to problems of the phonology-syntax interface.

1.6 Focus

Since the beginning of the nineties, the attention in the literature has shifted away from the derivation of prosodic constituents to the effects that focus - as a syntactic feature - has on prosodic structure.

1.6.1 Preliminaries

In this section I am going to introduce the terms I use in this thesis in order to describe focus and intonation patterns: the concept of focus on the one hand and the types of intonation contours on the other.

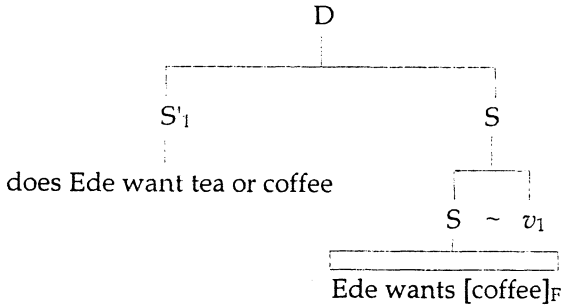
1.6.1.1 Alternative Semantics

I use the concept of focus of alternative semantics, following Rooth (cf. Rooth 1996). This is relevant for section 5.1.1, where the concepts of neutral prominence and focus prominence are required. Rooth claims that the function of focus is to evoke alternatives. An operator '~' introduces a set of (presupposed) alternatives.

(70) Focus interpretation operator '~' (Rooth 1996: 279)
Where ø is a syntactic phrase and C is a syntactically covert semantic variable, ø ~ C introduces the presupposition that C is a subset of $[ø]^f$ [27] containing $[ø]^o$ and at least one other element.

In (71) this is illustrated with the focus interpretation of a question-answer paradigm.

(71) Focus interpretation of a question-answer paradigm (Rooth 1996: 279)



According to Rooth (1996: 279) the variable (here: v_1) denotes a set of alternatives. Focus interpretation here introduces the constraint that v_1 is a set of propositions 'Ede wants y' . This set contains 'Ede wants coffee' and some alternatives. The content of the set of propositions depends on the location of the focus. Whenever a constituent is focused, a variable is inserted. Thus, focus on *Ede* or on *want* would introduce different sets of alternatives in (71).

1.6.1.2 Intonation Contours

In this section I give a short survey on those intonation contours in German that are relevant in this thesis. I use the framework of the tone-sequence model,[28] especially because it allows for the assumption that tonal contours are associated with a meaning (see 5.1.1).

In this model tonal contours consist of three types of tones (in the notation of Féry 1993): pitch accents, i.e. a single High (H*) or Low (L*) tone or two tones combined, for example H*L (a falling tone), phrase accents (H or L), which are realized after the pitch accent, and boundary tones (H% or L%). The contours carry

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27 $[ø]^f$ means an additional focus semantic value, $[ø]^o$ an ordinary semantic value.

28 Cf. Pierrehumbert 1980 (an introduction of this model for English); Beckman & Pierrehumbert (a revision, taking Japanese as an example); Féry 1993 and Uhmann 1991 (for descriptions of German focus intonation).

different meanings with them, and besides, the combination of contours with respect to one another is grammatically relevant in this model.

According to Féry (1993: 78), the standard declarative sentence intonation is realized as a bitonal falling tone.

(72) Standard declarative intonation (Féry 1993: 67)

H*L
Mein ZAHN tut weh
my tooth hurts

The starred H*-tone is associated with the stressed syllable and the unstarred part, called "trail tone" is associated with the immediately following syllable.

A sequence of L*H indicates a question or a similar context, where some answer or a completion of something is expected from the hearer (Féry 1993: 85).

(73) Question intonation

L*H
Tauschen Sie auch BRIEFmarken?
swap you also stamps?
'Do you also swap stamps?'

As Féry observes, such a rising contour is also typical of topicalized constituents, like the one in (74).

(74) Topic accent (Féry 1993: 129)

L*H H*L
geSCHLAfen hat KEIner von uns
slept did none of us
'None of us slept'

Note that the topic accent L*H is followed by the nuclear accent H*L, a combination that yields in a contour called "hat pattern". This pattern is characterized by a rising tone (like the topic accent) preceding the nuclear accent. It often indicates that ellipsis has taken place (cf. chapter 2).

1.6.1.3 The Influence of Focus on the Prosodic Phrasing

In this section I summarize the influence that focus may have on the prosodic phasing. First of all, let's have a very general look at the relation between the fo-

cus/ background information and the "unmarked"[29] accent pattern of an utterance. In (75) below, some consequences of this are shown. The noun *Maria* can have various stress patterns, depending on its informative value (syllables with main stress are written in capitals, syllables with secondary stress are marked with a '):

(75) Stress patterns of the noun *Maria*

(a) Neutral stress (no context)
Háns hat María einen BALL gegeben.
Hans has María a Ball given.
'Hans has given a ball to Maria'

(b) Focus accent:
(WEM hat Hans einen Ball gegeben?) Hans hat MaRIa einen Ball gegeben.
To whom has Hans given a ball? *Hans has Maria a ball given.*
'Hans has given a ball to Maria'

(c) Destressing: (Was hat Hans Maria gegeben?) Hans hat Maria einen BALL gegeben.
(What has Hans given to Maria?) *Hans has Maria a ball given.*
Hans has given a ball to Maria

In each of the cases the whole sentence constitutes a single IP, the domain of intonation and nuclear accent. In the out-of-the-blue utterance under (75)(a), only the direct object bears nuclear stress.[30] The secondary stresses are due to rhythm and are subject to the eurythmic constraints. Under these neutral stress conditions, a sentence is ambiguous between a reading with narrow focus on the stressed constituent and various focus projections, such as focus on the VP or broad focus on the whole clause. This can only be tested by inserting sets of alternatives, since there is no significant difference between the realization of the pitch accent of broad focus as opposed to narrow focus (cf. Féry 1993: 63)

Recall (71). In (71), neither 'Hans wants coffee' nor 'Ede drinks coffee' would be an acceptable alternative in the set of propositions evoked by the focus on *coffee*.

In (75)(a) however, there are different sets of alternatives: *Hans hat Maria y gegeben* 'Hans has given y to Maria'; *Hans hat y getan* 'Hans did y'; and so on. If a constituent other than the "neutral" focus exponent bears the pitch accent, it can only be interpreted as narrow focus. This is the case in (75)(b). *Maria*, the indirect object is focused and bears pitch accent. Here, there is only one set of alternatives

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29 Note that not all authors believe in neutral stress patterns (cf. Uhmann 1988). Under a neutral stress pattern I understand the pattern of an "out-of-the-blue" utterance, without any given context.

30 The selection of the focus exponent in German is well-investigated. I will follow Uhmann (1988: 263) and others, who derive it from a language-specific rhematic hierarchy.

induced, *Hans hat y einen Ball gegeben* 'Hans has given a ball to y'. In (75)(c) *Maria* is given in the immediate context. In this case, the constituent is completely deaccented. All these processes have a significant influence on prosodic phrasing.

Each IP must have a focus, mostly realized as a pitch accent which can take any position within the IP. One function of prominence within an IP is to interpret the syntactic focus feature. This is expressed in numerous constraints, such as the *Intonational Phrase Relative Prominence*:

(76) Intonational Phrase Relative Prominence (Nespor and Vogel 1986: 191)
Within I (=IP), a node is labeled *s* on the basis of its semantic properties

It is thus commonly assumed that focus is a characteristic of IPs, which must then have access to syntactic and semantic information such as the focus features. But this is all that focus has to do with IPs. The focus feature can be posited anywhere within an IP without affecting its edges, as can be seen in (77).

(77)
[HANS hat Maria einen Ball gegeben]$_{IP}$
[Hans HAT Maria einen Ball gegeben]$_{IP}$
[Hans hat MARIA einen Ball gegeben]$_{IP}$
[Hans hat Maria EINEN Ball gegeben]$_{IP}$
[Hans hat Maria einen BALL gegeben]$_{IP}$
[Hans hat Maria einen Ball GEGEBEN]$_{IP}$

Therefore, the only remarkable consequence of the relation focus-IP is that each IP has at least one focus. In cases with more than one focus involve correction forms, gapping, and ellipsis:

(78) Multiple Foci
Maria trinkt BIER und [KLAUS]$_F$ Ø [SAFT]$_F$
Maria drinks BEER and [KLAUS]$_F$ Ø [JUICE]$_F$

María trinkt MIlch im KELler, [Karl-HEINZ]$_F$ [SAFT]$_F$ [DRAUssen]$_F$
Maria drinks milk in the basement, Karl-Hein z juice outside

However, there are dramatic effects of focus on smaller prosodic units like the Phonological Phrase. According to data and experimental evidence supplied by numerous authors (such as Beckman & Pierrehumbert (1986), Hayes & Lahiri (1989), Kenesei & Vogel (1993)), in many languages, focus induces a prosodic

boundary (i.e. a PPh boundary) either before or after the focused constituent. In chapter 2 I provide further arguments for their observation that these effects are language-specific.

German allows for focus in situ and constituents with a focus feature are special in several respects. First, there is a prosodic boundary after them, i.e. they block resyllabification (cf. chapter 2) and second, they are never subject to external sandhi.[31] Below, the interaction of focus and phonological domains is illustrated.[32]

(79)

(a) neutral stress

kann márkus dem pául einen BALL geben?	'Can Markus give a ball to Paul?'
can Markus Paul a ball give	

(b) narrow focus

formal speech	casual speech
i. [KANN] [markus] [dəm paul] [eiṇ ball gebṃ]	**[KANN] [markusəm pauln** ball ge:m]
ii. [kann markus] [dəm PAUL] [eiṇ ball gebṃ]	**[kammarkusəm]** [PAUL] **mball** ge:m]
iii. [kann markus] [dəm paul] [eiṇ BALL gebṃ]	[KANN] [markusm pauln ball ge:m]

From the examples in (79) the different phrasing strategies become visible.[33] Note that some connected speech rules apply at both, the formal and the casual speech level, but the sizes of the domains vary. For example, the inflectional schwa in *einen* and *geben* is syncopated (see (14) and the nasal assimilates, if it shares the domain with a trigger consonant. The other rules show that the domains of their application at casual speech depend first on the degree of monitoring and second on the focus-background structure. While formal speech considers the syntactic input, casual speech sees only the output of the phrasing component, i.e. focus-background information. First, the final nasal in *kann* assimilates to the following one if they are in the same PWd-domain. Second, the function words *dem* and *einen* cliticize to the left, regardless of the syntactic context. The exception to that is shown in (79)(b.ii) for *einen*: since the preceding PWd *paul* is focused it is not available as a host for cliticization. In that case, the following item is chosen as a host.

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31 This also holds for focused function words (cf. chapter 4).

32 The domains in (79) are not what I actually claim to be the representation of clitics in prosodic terms. I leave this matter for chapter 4.

33 The examples in (79) have not been gathered from actual recordings. Rather, they are somewhat idealized in order to illustrate what I am going to show in chapters 2 and 4.

The prosodic highlighting of words in situ is a characteristics of German and it is one reason why I assume that PWds in German have a different function than in languages like Italian or French. In German, the prosodic bracketing and the acoustic impression is a consequence of the strong contrast between a focused and a non-focused word. Phonological rules sever to disambiguate and to indicate focused constituents.

In French the effect of highlighting and disambiguating always involves the syntax. Non-focused material cannot be reduced like in German (see (79) and section 3.5.1.1 for French).

1.7 Comment

In the preceding sections I have introduced the most relevant approaches to the interface between syntax and phonology. They all have some assumptions in common. E.g. they all acknowledge that there is a distinction between a lexical and a postlexical level. This also holds for the constraint-based approaches, which, either implicitly or explicitly assume different evaluations for the lexical and the postlexical level.

In the eighties, the nature of the input to phrasal phonology was a big issue. However, as it turned out, there are more similarities between the approaches than contrasts. For example, in most cases, the prosodic grouping of syntactic constituents is equal in the edge-based and the PPh-algorithm. All these approaches capture the intuition that - language-specifically - either the left or the right edge of both words and phrases are strongly protected.

There are some languages for which one particular approach suits better than the others. The tone sandhi domain in Chinese dialects can be derived in a more straightforward way in an edge-based approach. Still, the restructuring options in the Nespor & Vogel approach can derive these domains as well.

On the other hand, there are real counterexamples for each theory such that in order to show how a phonological rule applies, information is required that is either deleted by the application of the theory or that is not derived in this theory.

For the purposes of this thesis, most of the differences between the approaches are irrelevant. It is more important that all approaches lack some options which would be required in order to account for the problems that will be discussed later. For example, the systematic differences between the phonological phrasing at connected speech as opposed to formal speech remain to be accounted for. Another problem is the fact that, while there is a significant number of languages that

refer to the PPh as a domain, another group of languages makes no or limited use of this domain and this group has further properties in common that make this behavior non-accidental. Accordingly, the question whether all constituents of the prosodic hierarchy are universal is given priority over the details of their derivation.

2. The Status of the Phonological Phrase in German

2.1 Introduction

The different versions of the prosodic hierarchy as introduced in chapter 1 have several assumptions in common. First they implicitly or explicitly assume that there is a universal prosodic algorithm. Second, since the algorithm for the assignment of Phonological Phrases (PPh) refers to syntactic constituency, the resulting prosodic phrases are closely related to the syntactic ones. Third, although most authors are not explicit on this point, they assume that the algorithm assigning PPhs is universal in the sense that it applies in all languages. For example Hayes (1990: 220) claims that the prosodic hierarchy is universal, even though there are languages which lack evidence for one of its units. According to him, languages need all prosodic constituents in order to organize their timing for phonetic implementation.

But it has been noted that not all languages have phrasal phonology. As Odden (1995: 40) observed, the literature on PPhs basically deals with tone languages. This is no coincidence. Many languages remain do not fit into the claims, the prosodic hierarchy makes regarding PPhs.

I assume that only a subset of languages makes use of this category in their segmental phonology. In this, the PPh differs from most other categories, e.g. syllables, feet. The different functions of the PPh are a point worth considering and should be considered part of the phonological system of a language. I claim that there are two types of languages, one that has PPhs as a domain of both, rhythmic and segmental rules and one that has no segmental rules at the phrasal level. In the present chapter I look at German, which is a typical language of the latter type. These languages may have PPhs, but only in the rhythmic component. I show that the PPh in German does not function as a domain that way it predicted by the prosodic hierarchy. To start with, (1) lists some phonological processes, the PPh can be involved in.

(1) The PPh as a domain

Prosodic (segmental) Component	Rhythmic Component
-Consonant Gemination (Italian) -Tone Sandhi (tone languages)	Tonal structure, tone association Downstep Rhythm rule

In the Rhythmic Component the PPh is probably universal. For example, it is uncontroversial that there is some sort of a "rhythmic principle" that is common to all speakers of a language. Among others, Hayes (1989: 220) has recognized this principle. According to him, the PPh, as all other categories in the prosodic hierarchy, must be universal, even in languages which lack evidence for it, since languages need the PPh in order to organize their timing for phonetic implementation.

The same holds the other way round: speakers "know" where a phrase boundary can be placed in speech, just as they are aware of syllable boundaries or else.

However, in word-based languages the PPhs are much harder to detect, since this category has not the same clear characteristics as in the phrase-based languages. Besides the fact that there are no segmental phenomena at this domain, also tonal phenomena at the border of PPhs are often optional. Usually, these languages can be distinguished from phrase-based languages simply by the auditory impression they conceive. For example, their phrasal stress is not significantly more prominent than the word stresses, unless the speech is very formal.

The present chapter is organized as follows: first, I explain how PPhs are derived from the syntactic input using the algorithm by Nespor & Vogel (1986). I then reexamine evidence previously assumed in the literature as a support of the PPh in German, i.e. coordination reduction, prosodic constraints on extraposition, the rhythm rule, and focus restructuring. I conclude that the prosodic categories above the PWd have some characteristics in common that distinguish them from the smaller ones. Only the latter are universal, whereas languages can differ with respect to their larger prosodic categories have. This constitutes the basis for the next chapters, where crosslinguistic evidence for this assumption is discussed.

Thereafter I reject the arguments that are given in the literature that the PPh is a rule domain in German. My conclusion is that the prosodic hierarchy is not universal but that languages tend to delimit the use of prosodic categories as domains to either the PPh or the PWd. The prosodic hierarchy still is a universal option, even if languages lack a category, because, as will be shown in chapter 5, languages may diachronically switch to another domain. As indicated in section 1.5 I argue that there is a typological distinction between languages that choose the

PWd as their basic unit in postlexical phonology and languages that have the PPh as their basic unit.

2.2 The Phonological Phrase

In the prosodic hierarchy, Intonation Phrases are divided into smaller units, the PPhs. In principle, PPhs correspond to the maximal projections of the lexical categories NP, VP, AP, (and PP according to some authors). However, Nespor & Vogel and many other linguists show that the prosodic phrases (as domains of phonological rules) may differ from syntactic phrases and therefore, a separate level of representation in phonology has to be assumed.

According to the approach by Nespor & Vogel, a PPh consists of a lexical head plus its modifiers. A simple example is given in (2). These sequences of words in Italian are analyzed as PPhs. Nespor & Vogel (1986) argue that the change in the word stress patterns operates only when the two adjacent words belong to the same PPh.

(2) PPh in Italian (cf. Nespor & Vogel 1986)

metá	tórta	→	méta tórta
half a	*cake*		
si presènterá	béne	→	si preséntera béne
will be presented.3SG	*well*		
'it will be well presented'			

Before I discuss the functions of the PPh, I describe how this constituent is derived from the syntax. There are two principled ways of deriving PPhs. First, according to the edge-based approach (cf. chapter 1), there is evidence (e.g. from Chinese dialects) that PPhs are generated by aligning either the right or the left edges of a syntactic phrase with the corresponding brackets of prosodic phrases. Languages are parametrized for which edge, the left or the right one, is relevant. Either the left edge or the right edge of a syntactic phrase coincides with a left or a right bracket of a phonological phrase. The counterparts of these brackets are inserted afterwards by default.

Second, according to the PPh algorithm by Nespor and Vogel 1986, a PPh consists of a lexical head plus additional items[1] on their nonrecursive side, up to the next lexical head.

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[1] For Nespor & Vogel, this 'item' is the clitic group. In chapter 3 I argue against this category. For the purposes of the present chapter it is not relevant and, for the sake of simplification, I have

In order to illustrate the derivation of PPhs I have chosen the Nespor and Vogel algorithm. However, the problems I turn to later concern very basic points most of which hold for the other theories as well.

The algorithm for PPhs by Nespor & Vogel consists of two steps. First, the "Phonological Phrase Formation" applies.

(3) Principles of the PPh formation (Nespor & Vogel 1986: 168)

I *Φ domain*
The domain of Φ consists of a CG [=Clitic Group] which contains a lexical head (X) and all CGs on its nonrecursive side up to the CG that contains another [lexical] head outside the maximal projection of X.

II *Φ construction*
Join into an n-ary branching Φ all CGs included in a string delimited by the definition of the domain of PPh.

III *Φ relative prominence*
In languages whose syntactic trees are right branching, the rightmost node of Φ is labeled *s*; in languages whose syntactic trees are left branching, the leftmost node of Φ is labeled *s*. All sister nodes of *s* are labeled *w*.

The principles in (3) generate a large number of PPhs. According to the second step, "Phonological Phrase Restructuring" the number of these phrases is reduced.

(4) Phonological Phrase Restructuring (Nespor and Vogel 1986: 173)
A nonbranching PhP which is the first complement [or adjunct] of X on its recursive side is joined into the PhP that contains X.

PPh-restructuring joins nonbranching PPhs to an adjacent PPh if they modify its head and are on its nonrecursive side. Regarding the application of the principles sketched above on syntactic heads, Nespor & Vogel point out that prepositions do not behave as a head in phonology (Nespor & Vogel 1986: 168). Since there are arguments that they are lexical heads in the syntax, Nespor & Vogel suggest re-stating the principle of the PPh domain as in (5).

(5) The application of (3)(I) on PPs
The domain of PPh consists of a CG which contains a lexical head (X) with at least one positive specification according to the categorial feature system, and all CGs on its nonrecursive side up to the CG that contains another [lexical] head outside the maximal projection of X.

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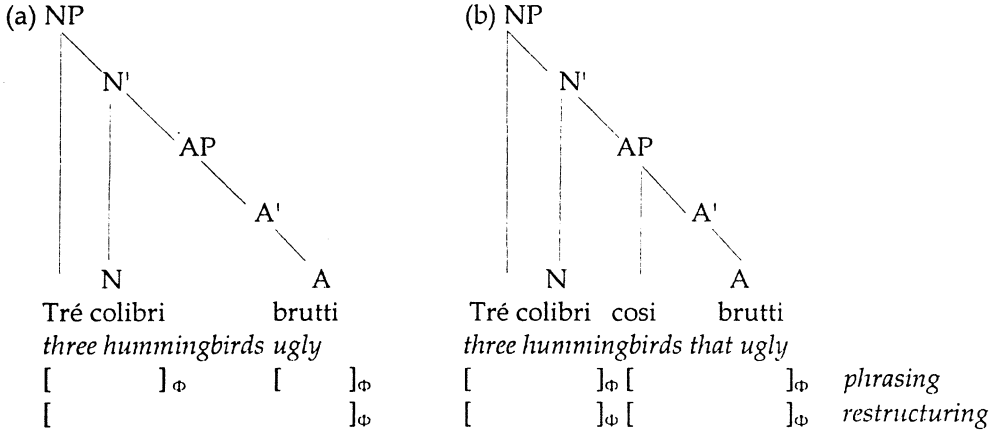
only chosen examples where the "clitic groups" correspond to the category "phonological word".

Since they only have negative specifications in the categorial feature system (i.e. [-N, -V] prepositions are prevented from being the head of a PPh by (5).

The effects of the principles of PPh formation are illustrated in (6) below, taking PPhs in Italian as an example.

(6) PPhs in Italian (cf. Nespor & Vogel 1986: 171)



(6)(a) illustrates the phrasing and the subsequent restructuring of an NP with a nonbranching complement, *brutti* 'ugly'. (6)(b) shows the phrasing of an NP with a branching complement, *cosi brutti* 'that ugly'. Since Italian is right recursive, phrasing goes from the head to the left.. The number of PPhs is reduced through restructuring of nonbranching complements in (6)(b). According to Nespor & Vogel, nonbranching complements are in many languages, among them Italian, incorporated into the preceding PPh through restructuring. Branching complements, as in (6)(b), cannot be restructured. Therefore, in (6)(b) the two PPhs remain whereas in (6)(a) they are collapsed into a single PPh.

The PPh in Italian is phonologically relevant because several segmental rules apply within this domain. One example of such a segmental rule that applies within the domain of the PPh is southern Italian Radoppiamento Sintattico (cf. (7)).

(7) Radoppiamento Sintattico (Nespor & Vogel 1986: 170)

$$C \rightarrow [+long] \,/\, [...[... \underset{[+DTE]}{V}]_{PWd} [\_\_ \begin{bmatrix} +son \\ -nas \end{bmatrix}]_{PWd} ...]_{PPh}$$

Radoppiamento Sintattico (RS) geminates word-initial consonants under certain conditions, for instance that the preceding word has to end in a stressed syllable (the "designated terminal element", DTE). Other conditions depend on region and

other factors that are not relevant here.[2] The important point is that the consonant in question is only lengthened if it is in the same PPh as the preceding word (which has to end in a stressed vowel).

That the crucial factor in gemination is the phonological and not the syntactic phrasing can be illustrated by comparing the bold-faced consonant in (8)(a) and (b).

(8) The application of Radoppiamento Sintattico

(a)	Ho	visto	tré	[k:]olibrí	**[b:]**rutti	
	I	*saw*	*three*	*Hummingbirds*	*ugli*	
(b)	Ho	visto	tré	[k:]olibrí	**[k]**osi	[b:]rutti
	I	*saw*	*three*	*Hummingbirds*	*that*	*ugli*

The initial consonant in *brutti* is lengthened in (8)(a) since its environment meets the structural description of RS. In (8)(b) however, the initial consonant after *cosi* is not lengthened, even though the segmental environment fits the input for RS. That the syntactic relation between *colibri / brutti* and *colibri / cosi* is the same can be seen in (9).

(9) Syntactic phrasing of (8) (Nespor & Vogel 1986: 40)

a. [tré [colibrí [brutti]]]
b. [tré [colibrí [cosi [brutti]]]]

The sentences in (9) illustrate that syntax provides no way of accounting for the domain of gemination. The sequences *brutti* and *cosi brutti* are both APs but in phonological terms they have a different structure because *cosi brutti* branches into two PWds, as can be seen from (10). In (10)(b) the second PPh is blocked from restructuring, as I noted above, since it branches and the two PWds remain a separate PPh. This shows that the domain of application of RS is the phonological phrase.

(10) Phonological Phrasing of (8)

a. [tré colibrí brutti]$_{\Phi}$
b. [tré colibrí]$_{\Phi}$ [cosi brutti]$_{\Phi}$

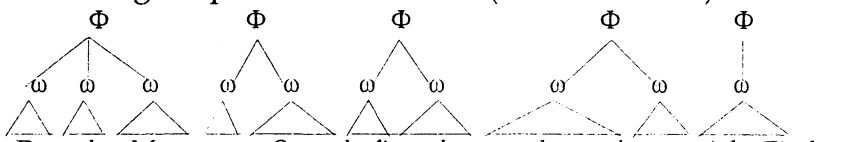
---

2 Note, however that there is a difference between the northern and southern varieties of Italian with respect to their postlexical domains. This is discussed in chapter 5.

Were RS to apply within the category NP, then one could not account for its application to the *[b]* in *brutti* in (10)(a) and its non-application to the *[k]* in *cosi* in (10)(b).

Several authors have argued that German has phonological phrases (see Féry (1993), Truckenbrodt (1995), Wiese (1996). (11) is an example of how the phonological phrasing of a German sentence could look like.

(11) Phonological phrases in German (Wiese 1996: 71)



According to Wiese, (11) shows the derivation of a PPh if the Nespor & Vogel approach is applied. However, there are some problems with this.

If Nespor & Vogel's proposal was consequently applied, it would result in (12) rather than in (11). First, since German restructures to the left,[3] the modifier *heute* 'today' would end up in the following PPh, not in the preceding one. *am Strand* 'at the beach' is a PP. Second, according to Nespor & Vogel (1986: 168) the heads of PPs do not function as heads in phonology. This is stated in the revised PPh formation principle given in (5). According to (5), the PP *am Strand* 'at the beach' is not a PPh on its own.

(12)

[Der alte Mann am Strand]$_{PPh}$ [fing]$_{PPh}$ [heute besonders viele Fische]$_{PPh}$
the old man at the beach caught today especially many fish

My intuitions as a native speaker about the phrasing of this sentence would result in something like *[Der alte Mann am Strand]*$_{PPh}$ *[fing heute besonders viele Fische]*$_{PPh}$. However, other speakers do not agree on that. The important point is that one can never be sure. Even a case like (11) which has been chosen for explanatory purposes, has several options of how to be divided into PPhs. This is a first hint at how hard it is to detect this category in German.

Even phonetic evidence for phonological phrases in German is difficult to find. Féry mentions (1993: 77) the trail tone of a bitonal tone, which can be compared to

[3] This is shown in the next section.

the optional tone in European Portuguese (EP, cf. chapter 5). Only in very careful speech, PPhs are separated by boundary tones. Similar to the EP examples, in German Rhythm Rule may apply, but it has some idiosyncratic properties which make it hard to use it as evidence in favor of the PPh. As shown below, other factors are more important than the PPh.

The phonological evidence that is argued to count in favor of the category PPh in German comes from various sources: speech rhythm (Rhythm Rule), the syntax-phonology interface (Coordination Reduction and constraints on extraposition), and focus. Apparently, some of the effects that focus induces apply at the PPh level, which would make the category PPh necessary. In the following sections examples of this evidence are introduced and examined.

2.2.1 Defining and Deriving Phonological Phrases in German

According to Nespor & Vogel (1986), the algorithm in (3) correctly parses sequences of words into prosodic units that form the domain for phonological rules. While this is not problematic for Italian, (3) is not applicable straightforwardly to German, as the data below show. In fact, (3) is problematic in general for languages with no single recursive side, a problem which Nespor and Vogel mention in a footnote (Nespor & Vogel 1986: 186). They ultimately leave the question open.

In Nespor *et al.* (1996), these puzzling cases are addressed again. While most of the data there are taken from Dutch, the authors argue that their analysis holds for German as well. In other words, the fact that German has no single recursive side is not an argument against the PPh because the PPh formation can be applied even to such languages.

In languages like German or Dutch the syntactic head-complement relation depends on the category of the phrase (see (13)). NPs and APs in Dutch and German are generally head-initial, while VPs (in subordinate clauses) are head-final and the head position in PPs may vary (Nespor et al. 1996: 18). Note that, contrary to Nespor & Vogel 1986, this analysis presupposes that prepositions function as heads for the purposes of phonology.

In (13), data from German are given. The respective heads are in bold. (13) shows the result of the algorithm. In (14) - (15) I show how (3) derives this from the syntactic input.

(13) Head-initial and head-final word phrases and corresponding PPhs in German

(a) VPs (head-final)
daß Artemis [ein Gedicht **schreibt**]$_{\Phi}$
that Artemis a poem writes
'that [Artemis writes a poem]'
versus

(b) NPs (head-initial)
[**der Aufbau** Ost]$_{\Phi}$
the building-up East
the building-up of the East

(c) PPs
[**auf** dem Tisch]$_{\Phi}$
on the table

[die Treppe **herauf**]$_{\Phi}$
the staircase up
'up the staircase'

The data above pose some potential problems for the algorithm in (3). The first problem are the inconsistencies of the head position of VPs compared to the other categories (see (13)(a) and (13)(b). (3) requires that a language distinguishes a recursive and a nonrecursive side. The latter is the direction of PPh formation and the former the direction restructuring aims at. German and Dutch make it necessary to assume category-specific recursive sides. The second problem is that there are phrases of the same category with inconsistent directionality, such as in (13)(c). This again does not conform to the requirements of (3).

Notice that these cases would pose a problem for the edge-based approach of Selkirk and others as well. These authors assume that languages are parametrized for forming their PPhs either to the left side or to the right side of a maximal projection. The inconsistencies of directionality in (13) would require additional assumptions in their model as well.

Nespor *et al.* (1996) discuss cases like the ones in (13) in connection with the acquisition of directionality by children. They assume that all languages have at least an unmarked word order. Nespor *et al.* correctly state that the head-final PPs in (13)(c) are exceptional cases. Learners of languages with inconsistent directions learn to distinguish between these marked and unmarked orderings[4] and they acquire the exceptional cases by a lexical learning mechanism. Exceptions are either categorial (in the case of VPs) or lexical (in the case of exceptional PPs).

---

4 According to Nespor *et al.* the unmarked ordering can be identified by prosodic evidence.

Under these assumptions, PPhs in German can be derived in accordance with (3). This is illustrated in (14) - (16) below. (14) shows the initial labeling of the heads of the PPhs[5] and (15) the complete PPhs. In (16) it is illustrated, how the PPhs are restructured, if possible.

(14) PPh-head labeling[6]

(a) noch [ein **Gedicht**]$_{\Phi}$
a poem
'a poem'

(b) [ein Gedicht]$_{\Phi}$ [**schreibt**]$_{\Phi}$
a poem writes
'writes a poem'

(c) [der **Aufbau**]$_{\Phi}$ [Ost]$_{\Phi}$
the building-up East
'the building-up of the East'

(d) [**auf**]$_{\Phi}$ [dem Tisch]$_{\Phi}$
on the table
'on the table'

(e) [die Treppe]$_{\Phi}$ [**herauf**]$_{\Phi}$
the staircase up
'up the staircase'

(14)(a) is the most simple case, where a lexical head is preceded by a function word. In this case the PPh can be derived straightforwardly according to the algorithm in (3). In (14)(b) a lexical head is preceded by its complement. This sequence is predicted to form a single PPh. (14)(c) is the same case with an NP, i.e. it is head-initial. (14)(d) and (14)(e) are examples of inconsistent directionality within PPs: (14)(d) is head-initial and (14)(e) is head-final. The head-final PP is the marked case in German and has to be acquired separately according to Nespor *et al.* (1996). (14)(d) and (e) also illustrates the application of PPh restructuring (cf. (3)) The sequences of PPhs are subject to restructuring because the complement PPh does not branch.

PPh formation and PPh restructuring are illustrated in (15) and (16). In the second step of the algorithm, PPhs are expanded. The nonrecursive sides of their heads are checked (i.e. to the left in the unmarked case and to the right when the phrases are marked for this) and leftover material is adjoined to the phrase.

---

5 In Nespor & Vogel's account clitic groups are labeled as heads. This is why the determiners are included.

6 The bold-faced items are the heads of the resulting PPhs in (16).

(15) PPh formation

(a) [noch ein **Gedicht**]$_{\Phi}$
more a poem
'one poem more'

(b) [ein Gedicht]$_{\Phi}$ [**schreibt**]$_{\Phi}$
a poem writes
'writes a poem'

(c) [**der Aufbau**]$_{\Phi}$ [Ost]$_{\Phi}$
the building-up East
'the building-up of the East'

(d) [**auf**]$_{\Phi}$ [dem Tisch]$_{\Phi}$
on the table
'on the table'

(e) [die Treppe]$_{\Phi}$ [**herauf**]$_{\Phi}$
the staircase up
'up the staircase'

As a third step the PPhs might be restructured, that is, adjacent nonbranching PPhs to the recursive side of their heads can be added to these heads. This is illustrated in (16).

(16) PPh restructuring

(a) [noch ein **Gedicht**]$_{\Phi}$
more a poem
'one poem more'

(b) [ein Gedicht **schreibt**]$_{\Phi}$
a poem writes
'writes a poem'

(c) [**der Aufbau** Ost]$_{\Phi}$
the building-up East
'the building-up of the East'

(d) [**auf** dem Tisch]$_{\Phi}$
on the table
'on the table'

(e) [die Treppe **herauf**]$_{\Phi}$
the staircase up
'up the staircase'

Thus, under the assumptions that exceptional head-complement relations are learned separately and that at least some prepositions function as phonological heads, (2) generates PPhs also for languages like German.

2.3 Evidence in Favor of Phonological Phrases

I now discuss the arguments that German has phonological phrases. First, these arguments are summed up. Then I introduce my counter-arguments and after that I make two proposals. The first one concerns the level of validity of the PPh. It will turn out that PPhs in German are only relevant at the level of rhythmic rules. The second argument concerns the actual groupings that behave as PPhs. The phonological phrasing in German depends to a large degree on discourse factors that cannot be foreseen by an algorithm that is restricted to the sentence level. My conclusion is that in some languages, the PPh only has the function to fulfill discourse requirements, but no grammatical functions. Consequently, the PPh has different properties in German, as opposed to Italian. These properties are discussed in detail in chapter 6.

Several phonologists have argued that the PPh is an overt prosodic constituent in German, since it is said to be the domain of a domain edge rule, namely the *coordination reduction* and a domain span rule, the *rhythm rule*. In addition, a puzzling *constraint on extraposition* seems to refer to the phonological phrasing.

Another rule, *Focus Restructuring* (discussed for English by Kenesei & Vogel 1993) can be transferred to German and might serve as a candidate for a domain edge rule that applies at the edge of a PPh.

In the following sections, I will take a closer look at these four rules. I will show that arguments can be raised against them. I will consequently conclude that the PPh is not visible at the segmental level and only to a certain degree at the rhythmic level. These observations form the basis for chapter 3, where I discuss several parallel cases from other languages.

2.4 Coordination Reduction

Coordination reduction is an example of a rule at the syntax-phonology interface that is said to refer to phonological phrasing, more specifically, to the edges of the PPh.

2.4.1 The data

In German, as well as in Dutch, parts of complex words can be deleted under certain conditions (see Booij 1985; Höhle 1982; Wiese 1993).

(17) Coordination reduction in German (taken from Booij (1985) and Höhle (1982))

Herbstblumen und Frühlingsblumen
fallflowers and Springflowers

Herbst~~blumen~~ und Frühlingsblumen
Fall~~flowers~~ and springflowers
but:
*Herbstblumen und Frühlings~~blumen~~
Fallflowers and spring~~flowers~~

Freundschaft und Feindschaft
friendship and enmityship
'friendship and hostility'

Freund~~schaft~~ und Feindschaft
friend~~ship~~ and enmityship
but:
*Freundschaft und Feind~~schaft~~
friendship and enmity~~ship~~

I show below that deletion is also possible in contexts that do not include a coordinate structure, but I refer to deletions like the ones in (17) as 'coordination reduction' for convenience.

Not all identical words can be deleted. The conditions of the deletions are usually employed as an argument in favor of the PWd (cf. Booij 1985) in that this is the constituent to be deleted. This can be seen from (18) (taken from Höhle 1982):

(18) Ungrammatical deletion of non-PWds

salz + ig und mehl + ig
* salz~~ig~~ und mehlig
saltADJ and flourADJ
'salty and floury'

kind + isch und bäur + isch
* kind~~isch~~ und bäurisch
childADJ and farmerADJ
childisch and provincial

In (18) the deletion of the suffix *-ig* is impossible, although other suffixes can well be deleted if they are coordinated with an identical one, as the ones in (19)

(19) Coordination reduction of suffixes
haar~~los~~ und zahnlos
hair~~less~~ and toothless

Freund~~schaft~~ und Feindschaft
friend~~ship~~ and enmityship
'friendship and hostility'

According to Booij, the difference between the suffixes in (18) and those in (19) is that only the latter ones are phonological words. He concludes that, in Dutch and German, some suffixes are marked lexically for their PWd-status. According to Wiese (1996), the generalization is that, in German, consonant-initial suffixes are PWds while vowel-initial suffixes are not.[7]

Notice that some vowel-initial 'suffixes' license Coordination Reduction, as in (20) below. These examples illustrate that suffixes such as *echt* '-fast' *ähnlich* '-like' *-artig* '-ly', etc. rather behave like compounds as *Wanduhr* 'wall-clock' in (20)(b) (see Höhle 1982: 90):

(20)
(a) farb + ~~echt~~ und licht + echt
colour fast(ADJ) and light fast (ADJ)

---

7 Additional support for Wiese's assumption comes from the fact that the suffixes in (18) trigger a resyllabification of stem-final consonants into the onset of the affix. This resyllabification results in a non-isomorphy between phonological and morphological structure, which can be seen from the data below, where the morphological (first line) and syllabified (second line) structures of such forms are given.

salz + ig und mehl + ig
sal.zig und meh.lig
* salz~~ig~~ und mehlig
saltADJ and flourADJ
'salty and floury'

kind + isch und bäur + isch
kin.disch und bäu.risch
* kind~~isch~~ und bäurisch
childADJ and farmerADJ
childisch and provincial

However, as C. Féry (p.c.) points out, this is not a necessary condition since it is also impossible to delete a vowel-initial suffix which follows a vowel-final stem and does not trigger resyllabification, as in *ruh+ig und bö+ig* 'quiet and windy'. The suffix -ig cannot undergo deletion.

kind + ~~ähnlich~~ und jugend + ähnlich
child like *and* *youth like*

gleich + ~~artig~~ und verschieden + artig
alike -ly *and* *diverse -ly*
similar and diverse

(b) Wand + ~~uhr~~ und Armband + uhr
$wall_N$ + $watch_N$ *and* $wrist_N$ + $watch_N$
'wall-clock and wrist-watch'

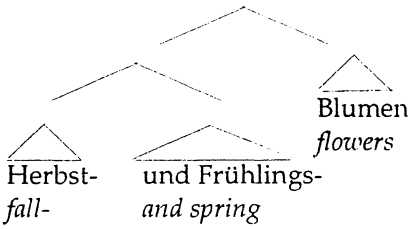
But these cases cannot serve as counter-arguments. Elements such as *echt* or *ähnlich* differ in two respects from affixes like *-ig* in (18). First, they can occur in isolation as independent words. *Echt, ähnlich* and so on have been called 'pseudo-affixes' in the traditional grammars, due to their word-like behavior. Second, they can be stressed. The forms in (20)(a) therefore have the metrical structure of compounds as in (20)(b).

For these reasons the items have to be PWds of their own and I agree with Wiese who claims that the fact that they can undergo coordination reduction is additional evidence for the category PWd. In other words, there is little or no reason to doubt that the prosodic constituent that is the target of deletion is the PWd.

2.4.2 Syntactic Accounts

The exact factors that trigger coordination reduction are far less clear. The question I discuss here is whether these deletions are syntactically or prosodically conditioned. The first assumption has been made by syntactitians such as Höhle (1982). Höhle argues against a potential analysis according to which coordination reductions are instances of a syntactically conditioned Right Node Raising process, as schematized in (21):

(21) Coordination reduction or Right Node Raising?



(21) cannot be correct, since there are data like the ones in (22) (taken from Höhle 1982) that show that besides backward deletion (as in (17)), forward deletion is also possible. Forward deletion cannot be accounted for as Right Node Raising.

(22)
(a) Herrenmantel und ~~Herren~~schuhe
man's coat and ~~man's~~ shoes
(b) Pseudoargumente und ~~Pseudo~~lösungen
pseudoarguments and ~~pseudo~~solutions

Backward deletion, as in (17) is frequent, in fact, one would rarely hear the unreduced varieties at all. Compared to that, forward deletion, as in (22) is less common, but still it is a grammatical option.[8]

Since the reduced forms in the above cases are the unmarked ones, one might guess that the latter are the basic forms. However, Booij (1985) argues that coordination reductions cannot be base-generated in the syntax, since the result of coordination reduction often is no syntactic constituent, as the data in (23) show, using a similar example from German.

(23) Remnant is not a syntactic constituent (taken from Höhle 1982)
ein Dreigangfahrrad und ein Sechsgangfahrrad
ein Dreigang~~fahrrad~~ und ein Sechsgangfahrrad
a threespeed gear ~~bicycle~~ and a sixspeed gear bicycle
* [ein Sechsgang]

Ein Sechsgang 'a sixspeed' in (23)(a) is not a constituent in German. In the syntax, however, only constituents can be coordinated.

Another type of example is given in (24).

(24)
[[Süßkirsch][kuchen]] und [[Sauerkirsch][kuchen]]
Süß~~kirschkuchen~~ und Sauerkirschkuchen
Sweet cherry pie and sour cherry pie

---

8 I assume that the reason, forward deletion is less common, has nothing to do with its syntactic context but is a performance phenomenon: In order to be parsed in spoken language, constituents have to be marked prosodically for the fact that they are going to be involved in a deletion. For example, in the backward deletion

L*H H*L
Orangen~~saft~~ und Apfelsaft 'orange ~~juice~~ and apple juice'

it is clear from the rising contour on *orangen* that something has been deleted and all the listener has to do in order to parse the sequence is to wait for the remaining part of the coordinate structure. It is much harder to reconstruct the deleted word *Herren* from a coordinate form like *Herrenmantel und ~~Herren~~schuhe*, since the overt counterpart has already been mentioned.

Kirschkuchen 'cherry pie' does well exist, but in (24) the deletion ignores the internal structure of the compound. *Kirsch-* 'cherry' is bracketed together with *süß* 'sweet' rather than with *Kuchen* 'pie'.

Reduction is also possible if a constituent is left over on the surface that is not an existing free morpheme in German, such as *Him-* in (25).

(25)
Him- und Brombeeren 'rasp~~berries~~ and blackberries'

This kind of reduction may apply also to entities of different morphosyntactic categories, as the coordinated forms in (26) show:

(26)
Verband Geburts~~behinderter~~ und anderer Behinderter
Society birth~~handicapped~~.GEN and other handicapped.GEN
'Society of people handicapped at birth and other handicapped people'

Here, *Behinderter* 'handicapped person' can be subject to the deletion rule, even though it is a member of a compound in the first part of the conjunction and an independent word in the second part. Prosodically, these constituents are of the same kind, namely phonological words.

A final argument that hints at the fact that the reduced forms are the result of a deletion and are not base-generated can be seen in (27).

(27) Deletion and not base-generation
(a) Brüder~~chen~~ und Väterchen
brother.DIM and father.DIM
'little brother and little father'

(b) * Bruder~~chen~~ und Väterchen
brother.DIM and father.DIM
'little brother and little father'

There is a clear contrast between (27)(a) and (b). The difference between them is the umlaut in the stem vowel of *bruder-* 'brother' which is triggered by the suffix *-chen*. If the reduced form was base-generated we would not expect it to carry umlaut. However, the reduced form with umlaut in (27)(a) is much more acceptable. This indicates that the suffix must once have been there.

Examples like these imply that the deletion is prosodically conditioned and applies on syntactically complete forms.

The first prosodic account for the deletions came from Booij (1985). On the basis of data from Dutch that are similar to (18), he concludes that the deletion of a constituent always requires a remnant that can be focused. The assignment of focus, however, requires an intact metrical structure.[9] Therefore, the constituents involved must be prosodic words. Accordingly, he posited the coordination reduction rule in (28).

(28) Coordination reduction (optional; cf. Booij 1985)

Delete y. Conditions: (i) $Y = w^m$ $m \geq 0$
(ii) Y is adjacent to a conjunction
(iii) There is a remnant that, like its counterpart, can function as focus constituent.

Coordination reduction is problematic since it refers to both syntactic and prosodic domains at the same time (Booij 1985: 156). On the other hand, (28) cannot be reformulated in purely prosodic terms. This is due to contrasts such as the ones in (29)

(29) Coordination reduction in Dutch

(a)
[de landbouw]$_\Phi$ [en de tuinbouw]$_\Phi$ → [de land~~bouw~~]$_\Phi$ [en de tuinbouw]$_\Phi$
the land + cultivation and the garden + cultivation
'the agriculture and the horticulture'
but
(b)
[de landbouw]$_\Phi$ [met de tuinbouw]$_\Phi$ → *[de land~~bouw~~]$_\Phi$ [met de tuinbouw]$_\Phi$
the land cultivation with the garden cultivation
'the agriculture with the horticulture'

In (29), there is a contrast between (29)(a), where the identical forms are syntactically coordinated and (29)(b), where they are not coordinated. One can see that in Dutch, reduction is only possible in cases as in (29)(a), that is, when the two identical forms are coordinated. Note that the prosodic labeling cannot be the deciding factor, since there is no difference in the prosodic constituency of (29)(a) and (b).[10]

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9 See Selkirk (1995) who shows that, for the same reasons, reduced function words cannot be focused; or Wennerstrom (1993) on prosodic conditions for the focusing of prefixes.

10 Again, the different prosodic approaches would make the same predictions about the phrasing here.

2.4.3 A Prosodic Account

In a prosodic phonology framework, the assumption that the deletion of a phonological word applies in a syntactic context would pose a problem. Therefore, prosodic phonologists have tried to re-interpret coordination reduction in prosodic terms, as can be seen in the following section, which deals with German.

Note that German differs from Dutch in that coordination reduction can also apply on non-coordinated forms, as Booij (1985, 1988) and Wiese (1993, 1995) show. Some of their examples are given in (30).

(30) Reduction of non-coordinated forms
(a) Sie ersetzen Ofen~~heizung~~ durch Zentralheizung.
They replace stove-heating by central-heating
(b) übernahm zum Fraktions~~vorsitz~~ auch noch den Landesvorsitz.
took besides the party-chairmanship also even the state-chairmanship'

Like Booij, Wiese (referring to German) claims that the deleted element in examples like the ones in (30) is a phonological constituent, namely the PWd, rather than a syntactic one. He argues that coordination is not the context required for deletion. Instead, the context of the rule has to be a prosodic one: according to him, a PWd can be deleted if it is adjacent to the boundary of a phonological phrase and an identical PWd can be found in an adjacent phrase.

These conditions are expressed in Wiese's rule which I have presented in (31). (31) deletes a PWd if there is an identical PWd in an adjacent PPh and if the word to be deleted is located at the edge of a PPh.

(31) Deletion of a PWd as a domain-edge rule (Wiese 1993: 146)
a. $...\omega_i\ ]_{\Phi}\ _{\Phi}[...\omega_i...$
$\downarrow$
ø
(see *Apfel- und Orangensaft*)

b. $...\omega_i...]\ _{\Phi}\ _{\Phi}[\omega_i...$
$\downarrow$
ø
(see *Ostersonntag oder -montag*)

Two reasons suggest that the PPh is an overt constituent in German. First, the PPh is needed as a domain for coordination reduction in (31). And second, the prosodic structure that is assumed in (31) reveals a mismatch between the syntactic and the phonological bracketing at the phrasal level. This mismatch can be illustrated in (32). Syntactically, the conjunction particle *und* belongs to the second conjoined

phrase, but phonologically, it phrases together with the first one (in Wiese's representation).

(32) Syntax-phonology mismatch (Wiese 1993)
syntax: [Ostersonntag] [und ~~Oster~~montag]
phonology: [Ostersonntag und]$_\Phi$ [~~Oster~~montag]$_\Phi$
Easter Sunday and Easter Monday

This example illustrates that the phonological bracketing is distinct from the syntactic one. Since only the prosodic boundary is relevant, (31) can also account for reductions in a context like (30), where the syntactic condition of coordination is not met (see (33) below, taken from Booij 1985).

(33)
Sie ersetzten Ofen~~heizung~~]$_\Phi$ [durch Zentralheizung]$_\Phi$
they replaced stove-~~heating~~ by central-heating

Wiese argues that an account based on the syntactic relation of the trigger and the target for deletion, such as Booij's rule for Dutch (cf. (28)), could only account for (17) but not for (33).

In the following section I argue against Wiese's claim that the domain for coordination reduction in German is a prosodic constituent.

2.4.4 Problems with the Prosodic Account

In this section I examine the prosodic approach to coordination reduction described in the preceding section. I reject Wiese's analysis for two reasons. First, Wiese's treatment can only account for a subset of the data, and second, some counterexamples exist, that is, deletions that would be licensed according to (31), but are in fact ungrammatical (cf. (38)).

The first point concerns the position of the conjunction particle within the PPh. Assuming that the conjunction particle in examples like *Apfel- und Orangensaft* 'apple ~~juice~~ and orange juice' phrases together with the second conjunct, the result is the prosodic phrasing in (34)(a), which serves as an input for coordination reduction. The constituent to be deleted (here *"heizung"* is at the edge of a PPh and backward deletion is licensed.

The problematic cases are the ones involving forward deletion as in (34)(b). The reason forward deletion in *Ostersonntag und -montag* cannot be accounted for in Wiese's model is that the conjunction particle *und* would be a barrier between the

phrase boundary and the constituent to be deleted. Then the environment for deletion would not be met.

(34) (a) Particle in the second PPh

[Apfel~~saft~~]$_{\Phi}$ [und Orangensaft]$_{\Phi}$

↓

ø OK

[Ostersonntag]$_{\Phi}$ [und ~~Oster~~montag]$_{\Phi}$

↓

ø ?

(b) particle in the first PPh

[Apfel~~saft~~ und]$_{\Phi}$ [Orangensaft]$_{\Phi}$

↓

ø ?

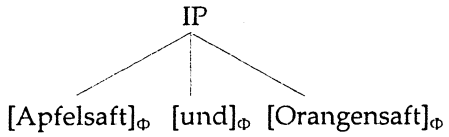
[Ostersonntag und]$_{\Phi}$ [~~Oster~~montag]$_{\Phi}$

↓

ø OK

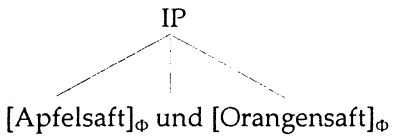
In order to account for deletions like the ones in (34)(a) and in (34)(b) one would have to arbitrarily move the conjunction particle to either one of the PPh-edges depending on what structure is required for the deletion. It would be equally ad hoc to assume that the conjunction particle has special prosodic properties, i.e. that it is a separate PPh or that it is adjoined directly to the IP.

(35)



(35) would require a reformulating of the environment of coordination reduction. In order to account for the fact that the two identical forms in (35) are not in adjacent PPhs, coordination reduction would have to allow for a PPh between the two. This is not confirmed by the German data which require that the two PPhs are adjacent in order to be subject to deletion.

(36)



In (36), the conjunction particle is directly adjoined to the IP, in violation of the Strict Layer Hypothesis (see section 1.4.2.1). The same problem occurs as with the proposal in (35): both (35) and (36) are ad hoc, since they would only serve the purpose to provide a prosodic environment for the application of coordination reduction without independent evidence.

The phrasing suggested in (34) is problematic for independent reasons, since it would also contradict the tonal facts. There can optionally be a boundary tone between the first conjunct and the particle, but never between the particle and the second conjunct (see (37)). If native speakers of German were asked to read these examples carefully, they would pause before the particle, but never after it.

(37) Potential prosodic breaks

Apfelsaft / und Orangensaft	*Apfelsaft und / Orangensaft	'apple juice and orange juice'
salzig / und mehlig	*salzig und / mehlig	'salty and floury'

But since I argue that the PPh is not relevant in this context, I cannot employ the contrast in (37) as an argument against the prosodic approach. However, there is yet another problem with the prosodic approach as shown in (38).

(38)

(a) [eine elf~~jährige~~]$_{\Phi}$ [und eine zwölfjährige]$_{\Phi}$
an eleven ~~year old~~ and a twelve year old

(b)* [eine elf~~jährige~~]$_{\Phi}$ [bewundert eine zwölfjährige]$_{\Phi}$
an eleven ~~year old~~ admires a twelve year old

* [Peter]$_{\Phi}$ [hat einen elf~~jährigen~~]$_{\Phi}$ [einem zwölfjährigen]$_{\Phi}$ [vorgestellt]$_{\Phi}$
Peter has an eleven ~~year old~~ to a twelve year old introduced
Peter has introduced an eleven year old to a twelve year old.

The cases in (38) are the reverse of the ones in (30). In (38), the only difference between the phrases in question is a syntactic one: the forms in (38)(b) are not coordinated.[11] Under the prosodic approach, we would expect (38)(a) and (38)(b) to be equally deletable. However, there is a significant difference concerning the grammaticality of the deletions: in fact, only the coordinated forms in (38)(a) can undergo deletion.[12]

If we now take another look at the data in (30), we see that they are 'coordinated', although not with the conjunction particle *und*. What this means is that there is still a semantic coordination relation between the constituents in contrast to the cases where reduction is ungrammatical (i.e. (38)(b)). If we assume that the

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11 Due to PPh-restructuring, the verb *bewundert* 'admires' is phrased together with the following PPh.

12 One informant (from Northern Germany) out of a total of about 12, accepted both the deletions in (38)(a) and in (38)(b).

examples in (30) are underlyingly coordinated forms, then the coordination, and not the phonological phrasing seems to constrain coordination reduction.

A different kind of counterexample is given in (39). These examples show that, while members of compounds can be deleted if they are not literally conjoined with the conjunction particle *und* (cf. (30)), the same deletion is not possible with affixes:

(39)

(a) [Man kann dort]$_\Phi$ [freund~~liches~~]$_\Phi$ [und feindliches Verhalten]$_\Phi$ [beobachten]$_\Phi$
One can there friend.ADJ and enemy.ADJ behaviour observe
One can observe there friendly and hostile behaviour.

(b) * [sie wechselten]$_\Phi$ [von freund~~lichem~~]$_\Phi$ [zu feindlichem]$_\Phi$ [Benehmen]$_\Phi$
they switched from friend.ADJ to enemy.ADJ behaviour
they switched from friendly to hostile behaviour

(b) *[sie ersetzten]$_\Phi$ [freund~~liches~~]$_\Phi$ [durch feindliches]$_\Phi$ [Benehmen]$_\Phi$
they replaced friend.ADJ by enemy.ADJ behaviour
they replaced friendly behaviour with hostile behaviour

In (39)(a) the environment for deletion of the affix *-lich* is met. However, the same affix cannot be deleted in (39)(b) and (c), although these examples have the same phonological phrasing as (39)(a).[13]

In the examples in (39) deletion is more restrictive than in the previous examples. Again, deletion does not depend on the presence of a PPh-boundary, but instead requires syntactic coordination in the stricter sense. The objections raised by Wiese against the syntactic approach only hold for a limited type of coordination reductions, that is, compounds. Only members of compounds can be deleted if they are not syntactically coordinated (see (30)). In all other cases, coordination is required.

I conclude that an analysis along the lines of Booij (1985) is required for the German data, that is, coordination reduction is a syntactically conditioned phonological rule.

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[13] The phonological phrasing would again be the same for (39)(a)-(c) in all prosodic approaches since the categorial syntactic input is identical.

2.4.5 Discourse Factors

In this section I discuss an additional problem with Wiese's treatment of coordination reduction. I show below that some data can only be explained when one considers discourse factors.

Consider the examples in (40) below. These sentences show that deletion is less acceptable the more material is standing between the two interacting identical forms. For the coordination reduction in Wiese's terms this should not matter as long as the two forms are in adjacent phonological phrases.

(40)

(a) [Er hat]$_\Phi$ [den Apfel~~saft~~]$_\Phi$, [aber auch]$_\Phi$ [den Orangensaft]$_\Phi$ [vergessen]$_\Phi$
he has the apple juice but also the orange juice forgotten

(b) ? [Er hat]$_\Phi$ [den Apfel~~saft~~]$_\Phi$ [aber natürlich auch]$_\Phi$ [den Multivitaminsaft]$_\Phi$ [vergessen]$_\Phi$
he has the apple juice but of course also the mulit-vitamin juice forgotten

(c) ?? [Er hat]$_\Phi$ [den Apfel~~saft~~]$_\Phi$ [aber natürlich auch]$_\Phi$ [den verdammten Multivitaminsaft]$_\Phi$ [vergessen]$_\Phi$
he has the apple juice but of course also the bloody multi-vitamin juice forgotten

Notice that the exeptability of the examples in (40) is gradient. Therefore, they do not express a categorial grammatical restriction, but rather a discourse requirement. I return to this point in section 2.5.2.

The discussion of the constraints on extraposition in section 2.5 provides further examples of discourse requirements in the phonological phrasing.

2.4.6 Coordination Reduction as Evidence for my Proposal

In this section I argue that coordination reduction does not depend on the phonological phrase. Accordingly, coordination reduction cannot serve as evidence for the PPh as a grammatical category in German. Rather, this process shows that the postlexical phonology of German is organized into sequences of PWds that are limited by the focus-background structure (cf. chapter 1).

Recall the contrast of acceptability of the deletions in (38)(a) compared to (38)(b). The only way to account for these examples in a prosodic framework would be to introduce a different kind of boundary at the coordination particle *und*. By doing so, the possible coordination reduction in (38)(a) could be distinguished formally from the ungrammatical ones in (38)(b).

An additional factor has to be considered, namely the ease of parsing. Deletion is more likely to be accepted if other factors than prosodic ones make the parsing easier. A sequence reduced by coordination reduction is easier to parse if the rem-

nant of the deletion is either not an existing word or if it results form backward deletion, which is more frequent than forward deletion. To parse a forward deletion, the listener needs some acoustic signal that introduces a deletion in a coordinate structure.

The fact the deletion has to leave behind a focus constituent has already been pointed out by Booij (1985:150). Concerning the role of the PWd, Wennerstrom (1993) has shown (for English) that focusabiltiy may serve as a diagnostics for the prosodic word. Any constituent which may have a pitch accent as a result of focus must, in her account, be a prosodic word. Since deletion always assigns focus to the remnant of the deletion process, Coordination Reduction is only possible if the remnant of the deletion is a PWd. Otherwise it could not bear stress and would not be focusable.

This can be accounted for in Booij's rule, if a condition is added according to which a "remnant that can serve as a focus constituent" is the PWd. This is given in (41).

(41) Revised Coordination Reduction (final version)

(a) (cf. Booij 1985)
Delete a prosodic ω iff:

- it fulfills the general conditions on coordination reduction:
  - if ω is a suffix, it must be in a coordination relation to its remnant
  - if ω is the member of a compound, it must be in the same clause as its remnant
- it bears no focus
- it leaves a remnant which can serve as a focus constituent

(b)
Assign focus to its remnant

(41)(a) was discussed above. (41)(b) was - less explicitly- noted by Booij. According to him, deletion always requires a remnant that can be focused. In languages like German, i.e. word-based languages, the generalization is even stronger: deletion requires the assignment of focus to its remnant. In other words, a prosodic boundary is inserted after a focused constituent. This makes language parsing more easy. Consider the data in footnote 8, which shows that the frequency of deletions depends on how easily they can be parsed.

Something similar holds for ambiguous sentences, where the intonation decides between two possible interpretations. Related cases from contrast and gapping have been introduced in Féry (1993).

(42) Gapping ambiguities (Féry 1993: 136)

(a) Gapping reading

L*H H*L

Martin bedauert; [$_{IP}$ [$_{IP}$ Maria/] nicht\]]

'Martin regrets; Maria does not'

(b) Non-gapping rading

H*L

[$_{IP}$ [$_{ip}$Martin bedauert Maria\ nicht]]

'Martin does not pity Maria'

The sentence in (42) is ambiguous. In the first reading the verb *bedauern* 'regret' is intransitive and both *Martin* and *Maria* are both the subjects of *bedauern*, but after *Maria*, the verb is gapped. As a result of the gapping, the sentence is intonated with a hat pattern (cf. chapter 1). The hat pattern here signalizes that some deleted element has to be reconstructed.

The same holds for the examples in (43). On the surface (43)(a) differs from (43)(b) only with respect to intonation: in (43)(a), where deletion has taken place, the remnant of deletion is focused. Together with the fall on the following constituent this results in a "hat pattern". The same clause without a deletion has neutral focus that is realized on the last constituent as predicted by the Nuclear Stress Rule (see (43)(b)).

(43)

Was willst du einkaufen? 'What are you going to buy?'

(a) H* H*L

Ich kaufe [Orangen]$_F$ ~~saft~~ und Apfelsaft

I buy orange ~~*juice*~~ *and apple juice*

'I am going to buy orange juice and apple juice'

(b) H*

[Ich kaufe Orangen und Apfelsaft]$_F$

I buy oranges and apple juice

'I am going to buy oranges and apple juice'

The intonation of the reduced form in (43)(a) is a signal to the listener that some deleted element has to be reconstructed.

An independent yet related case is gapping. Gapping has often been employed as an argument in favor of the direct syntax approach. The example below illustrates the application of palatalization in English in interaction with the syntax. Coronal stops are usually palatalized when followed by a [j], as in (44)(a). The problem is the contrast between (44)(a) and (44)(b): under the same segmental

conditions, palatalization is blocked from application in (44)(b), where the target and the trigger segment are separated by a syntactic gap.

(44) Palatalization blocked by a syntactic gap (see Kaisse 1985)
(a) The bus driver will take your brother and then **guide your** sister.
[dʒj]
(b) The bus driver will take your brother and the **guide Ø your** sister.
[d j]

If we agreed that this contrast is due to the syntactic gap, we would have to concede that fast speech phonology may have access to syntactic structure. Assuming this, Kaisse argues that English palatalization preferably applies when no syntactic gap intervenes between the constituents involved. In "traditional" prosodic phonology (44)(a) and (b) would be phrased in the same fashion. Then the fact that palatalization of the final consonant in *guide* is much more likely in (44)(a) could not be accounted for. [14]

However, considering that gapping of a constituent assigns focus to the leftover adjacent constituent, both the contrast in (44) as well as other fast speech rules can be accounted for. The fact that rules of external sandhi, like palatalization, are blocked, is then predicted by the focus (see section 1.6.1.3). In (44)(b) *guide* is focused as a result of gapping. Deaccented constituents on the other hand, as *guide* in (44)(a) are subject to external sandhi at casual speech.

2.5 Constraints on Extraposition

This section deals with another argument in the literature for the PPh in German. This evidence comes from a restriction on extraposition that is argued by Truckenbrodt (1995b) to be prosodically conditioned. I describe this proposal and then argue in favor of a solution that is based on performance constraints and does not require the category PPh. My solution operates under the assumption that a sequence of speech is parsed into single information units. It argues that the purpose of the constraints on extraposition is to protect these units.

2.5.1 The Constraints

Truckenbrodt (1995b) argues that support for phonological phrases comes from independent syntactic evidence, namely two constraints on extraposition that refer

[14] Later versions of the prosodic hierarchy that take focus under consideration could explain the contrast in (44). Those versions of the prosodic hierarchy were not available in the eighties.

to PPhs in the following respects. The first one says that the extraposed phrase is assigned separate PPh-boundaries and the second constraint that extraposition is only grammatical if there is exactly one PPh-boundary intervening between the extraposed constituent and its trace. Consider the contrast in (45)(a) and (45)(b).

(45) Constraints on the extraposition of PPs in German (Truckenbrodt 1995b: 510)

(a) [Peter]$_\Phi$ [hat einem Kollegen]$_\Phi$ [ein Buch gekauft $\mathbf{t}_i$]$_\Phi$ [von Chomsky $_i$]$_\Phi$
Peter has a-DAT collegue a book bought by Chomsky

(b) * [Peter]$_\Phi$ [hat einem Kollegen $\mathbf{t}_i$]$_\Phi$ [ein Buch gekauft]$_\Phi$ [aus Italien $_i$]$_\Phi$
Peter has a-DATcollegue a book bought from Italy

In (45)(a), extraposition is possible, whereas in (45)(b), extraposition of the PP is impossible. According to Truckenbrodt, the reason for this is that a prosodic constraint prohibits more than one PPh boundary from intervening between the extraposed PP and its trace. In this case, the movement would be too long.

The second constraint on extraposition is intended to account for the opposite case, "movement that is too short". The data go back to an observation made by Haider (1993), which cannot be accounted for in syntactic terms: in a sequence of head-final VPs as in (46), only the final one is a possible landing site for extraposition.

(46)
Daß der Peter [oft Bücher von Anaïs Nin gelesen haben soll]$_{VP}$
that NOM Peter often books by Anaïs Nin read have should
'... that Peter often should have read books by Anaïs Nin'

Consider the contrast between (47)(a) and (47)(b). The extraposed phrase *[von Anaïs Nin]* can only show up in the outmost VP, as in (47)(a). The problematic data are the ones in (47)(c): if one of the inner VPs is extraposed, it may well serve as a landing site.

(47) Haider's puzzle (Truckenbrodt 1995: 507)

(a) Daß der Peter [[oft Bücher $\mathbf{t}_i$ gelesen haben soll]$_{VP}$ von Anaïs Nin$_i$]$_{VP}$ ...
that NOM Peter often books read have should by Anaïs Nin

(b) * Daß der Peter [[oft Bücher $\mathbf{t}_i$ gelesen]$_{VP}$ [haben von Anaïs Nin$_i$]$_{VP}$ soll ...
that NOM Peter often books read have by Anaïs Nin should

(c) [Bücher $\mathbf{t}_i$ gelesen]$_{VP}$ von Anaïs Nin$_i$]$_{VP\text{-}k}$ [hat$_m$ der Peter oft $\mathbf{t}_k$ $\mathbf{t}_m$]
books read by Anaïs Nin has NOM Peter often

Truckenbrodt argues that these data can be accounted for in prosodic terms. In this case, the restriction on movement is a prosodic one. Consider the prosodic representations of (47) which I have presented in (48).

(48) Prosodic representation before extraposition[15]

(a) Daß der Peter [oft Bücher t_i gelesen haben soll]$_{PPh}$ **von Anaïs Nin** $_i$
that NOM Peter often book s read have should by Anaïs Nin

(b) * Daß der Peter [oft Bücher t_i gelesen haben **von Anaïs Nin** $_i$ soll]$_{PPh}$
that. NOM Peter often books read have by Anaïs Nin should

(c) [Bücher t_i gelesen]$_{PPh}$ **von Anaïs Nin** $_i$ [hat der Peter oft]$_{PPh}$
books read by Anaïs Nin has NOM Peter often

In order to illustrate Truckenbrodt's proposal, the phrase to be extraposed appears in (48) at its intended landing site in bold. Truckenbrodt's prosodic account states that exactly one PPh boundary intervenes between the phrase to be extraposed and its intended landing site. Therefore, it correctly predicts both the ungrammaticality of (47)(a) as well as "Haider's puzzle", i.e. the unexpected grammaticality of the extraposition in (47)(c). The inner VPs in (48)(a) and (b) are not followed by a PPh-boundary, but the outmost VP is. The extraposition in (48)(a) is grammatical since it crosses the final VP. In contrast, in (48)(b) the landing site of the constituent to be extraposed and its trace are in the same PPh. This violates Truckenbrodt's constraint on extraposition. Since extraposition assigns a PPh boundary to the extraposed constituent, such a constituent can then serve as a landing site, as can be seen in (48)(c).

2.5.2 A Performance Account

In this section I argue against the assumption that the phonological phrasing is the factor that governs extraposition.

In principle, the restrictions on extraposition have the same characteristics as those governing coordination reduction which were discussed in section 2.4: prosodic constraints on the phrasing interact with the syntax.

However, the interacting factors can be used in two ways. It is not self-evident, which of them is the ultimate trigger of the constraint. Both the prosody as well as thematic structure are constraints that govern the processing of speech sequences. In Truckenbrodt's account, the prosody is the crucial factor, i.e. it may block syn-

15 Note that these representations are only meant to illustrate Truckenbrodt's proposal. They refer to the stage in the derivation before extraposition. After extraposition, the extraposed phrase is its own PPh, according to Truckenbrodt.

tactic movement. But there is an alternative candidate, a well-known pragmatic constraint on prosodic constituents such as the PPh. It states that prosodic units of phrase size have to coincide with an information unit. More generally, only one piece of new information should be presented for parsing at a time. This restriction is known from discourse analysis (see Chafe 1985) as well as from Selkirk's Sense Unit Condition (see Selkirk 1984). In this view, the coherence of the prosodic pattern is mainly a cue that helps decoding the thematic structure of the utterance. A violation of the constraints on thematic structure therefore results in a violation of prosodic well-formedness. Note that the ill-formed extrapositions all violate this constraint of thematic structure, as shown below.

Consider again the examples in (47) which I present in (49), including their thematic structuring. (49)(d) shows the sentence without extrapositions: the whole sentence is background information '(the fact) that Peter is said to often have read books by Anaïs Nin (surprises someone)'. It can be parsed as one chunk. But extraposition out of this chunk changes this. Extraposition focuses the extraposed constituent and by this, not only the prosodic structure but also the thematic structure of the chunk is affected. This can be seen from (49)(a) -(d): each new piece of information is represented in round brackets.

(49)

(a) (Daß der Peter oft Bücher gelesen haben soll) (von Anaïs Nin) (...)
that NOM Peter often books read have should by Anaïs Nin

(b) * (Daß der Peter oft Bücher gelesen haben (von Anaïs Nin) soll)) (...)
that NOM Peter often books read have by Anaïs Nin should

(c) (Bücher gelesen) (von Anaïs Nin) (hat der Peter oft) (...)
books read by Anaïs Nin has NOM Peter often

(d) (Daß der Peter oft Bücher von Anaïs Nin gelesen haben soll) (...)
that NOM Peter often books by Anaïs Nin read have should

'that Peter is said to often have read books by Anaïs Nin'

Forms like (49)(b) violate two levels of grammar: in the prosody, the Strict Layer Hypothesis is not maintained. However, (49)(b) is also ungrammatical for performance reasons: consider the constraint according to which new information is restricted to one at a time. (49)(b) violates this constraint because a unit of information is interrupted by another one, which blocks the parsing of this unit. Since PPh boundaries coincide with new information in the discourse, one has to decide which of the two factors is the deciding one.

I assume that the pragmatic constraint comes "first" and that both the prosodic bracketing as well as the extraposition are both the result of focus-background structure rather than one constraining the other. The constraint on extraposition

would then state that extraposition is only possible across one unit of information. This formally coincides with the prosodic constraint (one PPh-boundary), but the motivation of the constraint is a different one: it is a performance or pragmatic restriction.

That the constraint is rather a pragmatic one than a grammatical one can also be seen from (50). (50) differs from (45) only with respect to its object: in (50) it is only a pronoun and therefore (50) is parsed as three (and not four) PPhs.

(50)

*[Peter]$_{\Phi}$ [hat mir t_i ein Buch gekauft]$_{\Phi}$ [vorgestern]$_{\Phi}$
Peter has me a book bought the day before yesterday

The extraposition in (50) is acceptable to the prosodic approach, because it crosses exactly onre PPh-boundary, yet the sentence is ungrammatical. I suppose that the reason for this is that in terms of information structure (50) is like (45)(a), i.e., extraposition is impossible because it would cross two units of information.

2.6 The Rhythm Rule

In this section I take a closer look at the Rhythm Rule (RR), which is often cited to result form a universal constraint that holds within the PPh. In this chapter I argue against this assumption. Subsequently I introduce data from German that provide further evidence the two separate postlexical components, i.e. the segmental and the prosodic one.

I conclude the phrasal level in the rhythmic component of German is required in order to account for the occurrence of phrase stress, but it is not a prosodic domain. Thereafter I return to my statement according to which the phrasal level in German is not derived from syntactic phrases, but instead from information structure: German intonation phrases are split up into units that are terminated by focused elements.

With respect to the notation, I have adopted metrical representations of the *Grid Theory* (although some authors I cite below use the tree structure in their work). I do so in order to make the relevant points easier to compare. Although the differences between trees and grids are not relevant in the context of this chapter, I should mention that the two representations are not equal: in the metrical tree theory stress is represented through trees with binary branching nodes in a strong-weak relation. Rhythm is represented by the fact that identical sister nodes (two strong or two weak) are ruled out. Metrical grids represent stress by the

number of grid beats. Rhythm is captured by constraints on this representation such as the "minimal clash" (see below).

2.6.1 The Rhythm Rule as Evidence in Favor of PPh

The Rhythm Rule is a phenomenon that has been observed in many languages (see Giegerich 1985; Kenesei and Vogel 1993; Nespor and Vogel 1986; Selkirk 1978). Intonation languages, like English and German, tend to avoid a close occurrence of stressed syllables (stress clashes, cf. chapter 1). When two main stresses are adjacent by morphological or syntactic concatenation, one of them is either moved away (by a rule called *stress shift*) or eliminated by a rule usually called *beat deletion* or *rhythm rule*. The subject of this section is the beat deletion which is said to be the common strategy to avoid stress clashes in German (cf. Giegerich 1985).

While the eurythmic constraints behind RR and Stress Shift are shared by all intonation languages, the level of the metrical grid where it applies is language-specific. This is called the "minimal clash" level (cf. Nespor (1990: 252)). Also, there are different ways of repairing unrhythmic sequences of stressed syllables, shown in (51) and (52).

(51) Beat Deletion (or Stress Retraction) (English; cf. Inkelas & Zec 1995: 544)[16]

```
       *                     *
*      *     but:  *      *  *
*    * *           *   *  *  *  *
Ànnmaríe          [Ánnmarìe  ate it]Φ
```

Beat deletion (51) repairs a stress clash by removing one metrical grid position.

(52) Stress Shift (Italian, cf. Nespor & Vogel 1986: 174)

```
  *           *    *
 * *         * *   *
 * *         * *   *  *
metá    →    méta  tórta
```

Here Stress Shift moves the stress away from the final syllable of *metá* to the preceding syllable when it precedes a word with an initial stressed syllable.

Cases of beat deletion in German are shown below:

16 I have added a metrical grid in order to illustrate this example.

(53) Beat deletion in German (Giegerich 1985: 218)

```
         *                                 *
   *     *       but:      *      *      *
   *  *  *                 *   *   *   *  * *
  Paderborn               Paderborner  Uni        University of Paderborn
```

Using examples like the one in (54) (Féry 1988: 53), Féry argues that syllable adjacency is not a necessary condition for the application of RR.

(54)

```
   *                                  *
   *    *       but:       *  *       *
   *    *                  *  *  *    * *
  Konstanz                Konstanzer Uni          University of Constance
```

Here, beat deletion applies, even though the accented syllables are not adjacent.

On the other hand, RR does not always apply on two adjacent stressed syllables. Concerning English, this can be seen in (55), taken from Kenesei & Vogel (1993):

(55)

```
            *  *
     *      *  *
     *   *  *  * *
 the  racketeer acted innocent
```

To account for contrasts like the ones in (51) vs. (55) for English, several authors have concluded that the RR applies only within the PPh. Across the boundaries of this domain, adjacent stressed syllables are allowed. Thus, the sentence in (55) would then have the prosodic structure in (56) according to Vogel & Kenesei.

(56) Stress clash tolerated (English)

```
            *     *
      *     *     *
      *  *  *     *
```

[[the racketeer]$_{\Phi}$ [acted innocent]$_{\Phi}$]$_{IP}$

Something similar can be observed in German: some stress clashes are tolerated, as illustrated in (57).

(57) Stress clashes tolerated (German)

```
          *     *
    *     *     *
    *  *  *     *
[in Paderborn]Φ [weiß  man es]Φ
 in Paderborn   knows one  it
```

People know it in Paderborn (place name)

Again, a category of the prosodic hierarchy smaller than the IP and larger than the Phonological Word seems to be the domain of the RR. This is said to be the Phonological Phrase (cf. Wiese 1996).

2.6.2 Counter-arguments

In this section I look at two arguments against the claim that beat deletion applies at the level of the phonological phrase.

The first one concerns the domain of RR. I give arguments that in word-based languages, such as German, the domain of RR not a grammatical one but a functional one.

The second argument against the PPh as the domain of RR is based on a proposal by Nespor (1990b). She claims that RR is located at the segmental phonological level and does (for independent reasons) not refer to PPh-boundaries. Therefore, it is expected not to depend on the PPh as a domain. This claim is explicated in section 2.6.2.2.

2.6.2.1 The Domain of the Rhythm Rule

The RR has always received a great deal of attention in the discussion of phonological phrasing. It is assumed to be a constraint holding throughout intonation languages.

But if we take a closer look at more data from German, we can see that this is not always the case. First, is an apparent contrast between proper names and other words. Apparently, in the former cases, RR applies more systematically. Consider the contrasts in (58):[17]

---

17 Stressed syllables are written in capital letters.

(58) Stress clash contrasts

* * * * * Karl-HEINZ	* * * * * * * Karl-Heinz MÜLler	*name*
* * * * * DeKAN 'dean'	* * * * * * * * * DeKAN MÜLler	'Dean Müller'

In the same environment the stress from the name *Heinz* is reduced, as expected, while the final stress on the nonnative word *Dekan* 'dean' remains. This is strange, because prosodically there should be no difference between these two examples, since both are subject to the same phrasing, i.e. in a prosodic approach they would both constitute a single prosodic phrase.[18]

In (59), I have summarized my observations concerning alternations in phonological phrasing independent of syntactic head-complement relations.

(59)

(a) RR applies	
hellBLAU	hellblaue BLUmen
lightblue	*lightblue flowers*
FRITZ	Fritz MÜLler
given name	*given name & family name*
(b) RR applies optionally	
mattSCHWARZ	mattsSCHWARzes GLAS / mattschwarzes GLAS
groundblack	*groundblack glas*
bäckeREI	bäckeREI Müller / Bäckerei Müller
bakery	*bakery Müller*
(c) RR never applies	
HYpermodèrn	HYpermodèrnes deSIGN
trendy	*trendy design*
ökoNOM	ökoNOM MÜller
economist	*economist Müller*

All sequences in (59) would have the same status in the prosodic hierarchy that is, they would be PPhs. Nevertheless they behave differently with respect to Rhythm

[18] Alternatively, one could argue that *Dekan Müller* differs from *Karl-Heinz Müller* in that the former consists of two PPhs, despite the general assumptions on this category. However, this would equally weaken the prosodic theory: one would have to assume that certain words can be marked lexically for being their own PPh. This contradicts the requirement that PPhs have to be built postlexically.

Rule. In (59)(a), RR applies as expected and deaccents the word stress of the non-phrase-final constituent. In (59)(b), two pronunciations are possible - one in which RR applies and the other where RR does not apply. The words in (59)(c) never undergo RR.

In other cases, the application and nonapplication of RR is equally likely. In some of these cases, the application or nonapplication of RR may even be an idiosyncratic property of the word, or more likely, the quality of the stressed vowels involved. In the cases in (60), the number of syllables between the two stressed syllables might be the deciding factor for the application or nonapplication of eurythmic constraints. These sequences again would have the same status in the prosodic hierarchy: they are all heads plus nonbranching complements or adjuncts and would obey the PPh-restructuring (cf.(3)).

(60)

(a) RR applies		
PaderBORN	Paderborner UNi	* PaderBORNer UNi
place name	*University of Paderborn*	
(b) RR applies optionally		
PaderBORN	Paderborner DekaNAT /	PaderBORner DekaNAT
place name	*dean's office of Paderborn*	
(c) RR does not apply		
DÜsseldorf	*Düsseldorfer DekaNAT	DÜSseldorfer DekaNAT
Place name	*dean's office of Düsseldorf*	
PaRIS	*Pariser Uni	PaRISer UNi
Paris	*University of Paris*	

In (60), the number of the syllables intervening between the two stressed syllables plays a role: *Paderborner Uni; Paderborner Dekanat; Düsseldorfer Dekanat*. The more syllables that separate the two main stresses, the less likely is the application of RR, all other things being equal. If RR was a domain span rule within the PPh, this factor should play no role, as long as both, the trigger stress and the target stress of RR are in the same PPh.

Consider now the data in (61): I argue below that these contrasts can be accounted for by taking the nativity vs. nonnativity of the word into consideration.

(61)

(a) RR applies	
Karl-HEINZ	Karl-Heinz RAmers
(name)	

riesenGROSS	riesengroßer FISCH
giant-bigNOM	*giant-big fish*
(b) RR applies optionally	
KapiTÄN	Kapitän MÜLer / KapiTÄN MÜLler
captain	*captain Müller*
PhiloSOPH	Philosoph KANT / PhiloSOPH KANT
philosopher	*philosopher Kant*
(c) RR does not apply	
SekretariAT	Sekretariat MÜller
secretary	*sectretary Müller*
CLAIRE	CLAIRE MÜLler
(name)	
PhiloSOPH	PhiloSOPH DeCARTES
philosopher	*philosopher Decartes*
PhiloSOPH	PhiloSOPH ArisTOteles
philosopher	*philosopher Aristoteles*
PhonoLOgin	PhonoLOgin FÉry
Phonologist	*Phonologist Féry*
komPLETT	komPLETT AUSgestattet
completely	*completely equipped*

These data show that RR applies in (61)(a), is questionable or at least optional in (61)(b) and does not apply in (61)(c).[19] In the first column, where RR applies throughout, we typically find names and native words, non-derived or derived by native suffixes which bear no stress, like the nominative case suffix *-er*.

The doubtful examples in the second column consist of various cases. Again, the distance between the two stressed syllables plays a role. Another factor is the nativity of the words: in *Bäcker+ei Müller* (which has a nonnative suffix, but a native stem), RR applies rather than nonnative words, such as *Ökonom* or *Philosoph*.

The third column contains sequences which would count as PPhs, but still do not undergo RR. Typically, these are sequences of nonnative words, or at least the

[19] It is hard, if not impossible, to get neutral judgments from native speakers on data like these: even if the data are presented in a wider context, like a text, people will assign contrastive focus to the similar examples. Focus, of course, is always stronger than the regular application of RR. The data in this chapter were presented to several audiences. Several native speakers raised objections against the data above. These objections, however were always of the kind that they did even less confirm a consistent application of eurhythmic constraints within a certain domain. This again supports my assumption that something else must be at work here.

first part - the potential target of RR - is nonnative. Also, names do not undergo RR if they are nonnative.

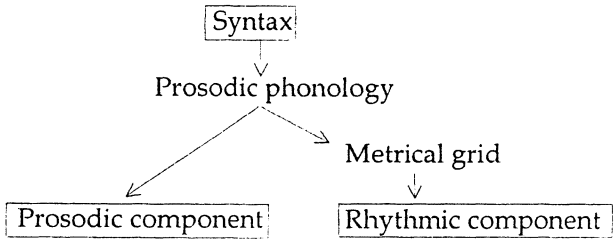
I conclude that the domain of Rhythm Rule in German cannot be captured in terms of the prosodic constituents. RR is instead triggered by the interaction of a eurythmic constraint with other factors that as a result triggers the deletion of a metrical grid position. The characteristics of this process hint at an observation made by Nespor, which is the subject of the next section.

2.6.2.2 How is RR Connected to the Prosodic Hierarchy?

Contrary to the standard assumption, Nespor (1990b) argues that beat deletion applies independently of the PPh. In this section I summarize her proposal and I show how it matches the German data.

According to Nespor, the rule has nothing to do with the prosodic hierarchy but it applies at the rhythmic level, without referring to the phonological phrase. Recall her model of the two domains which I have repeated in (62) for convenience

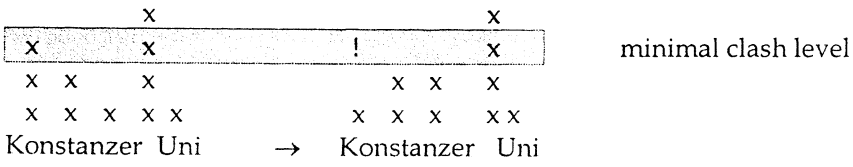
(62) The postlexical phonology according to Nespor (1990b: 244)



According to (62) the prosodic component mediates between syntax and phonology and organizes the material hierarchically while the rhythmic component applies eurythmic constraints on sequences of more or less prominent syllables.

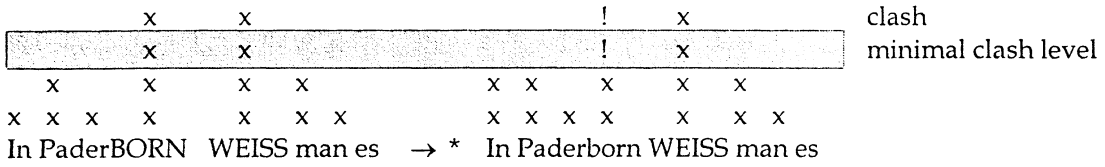
According to Nespor, RR removes a beat only at the minimal clash level, a level which has to be specified language-specifically. This can be seen from the contrast between (63) and (64).

(63) Application of beat deletion at the minimal clash level



Only the minimal clash level (it is highlighted here) - in German the level of the third beat - is subject to beat deletion. Beat deletion reduces the leftmost of clashing stresses but only at this minimal clash level. Clashes at higher levels (which would be some phrasal level) are never affected by beat deletion anyway. This can be seen in (64).

(64) Beat deletion blocked at non-minimal clash level



In (64) stress clash is effective at the fourth level, which is not the minimal clash level in German, but one level higher. Accordingly, the syllable that would be the target of RR remains stressed.

German stressed syllables lose their prominence under certain conditions. In Nespor's account, the metrical part of this condition is the minimal clash level. The beat deletion can be stated as follows:

(65) Beat deletion in the rhythmic domain
A metrical grid position can be removed
- if it is located leftmost of a minimal clash

The PPh is neither required as a domain, nor could the PPh boundaries be identified by application of beat deletion.

Nespor has to assume that RR is not located in the rhythmic component for independent reasons in order to maintain her assumption that the prosodic (segmental) and the rhythmic component are distinct in phonology. This is supported by the data discussed in this chapter and the following one.

2.7 Focus Restructuring

Since a couple of years, a great deal of attention in the literature on phonological phrasing has been devoted to the influence of focus on the phrasing. This has been shown for in various languages (Beckman and Pierrehumbert 1986 for Japanese; (they call the same constituent "Intermediate Phrase"); Hayes and Lahiri 1991 for Bengali; Kanerva 1990 for Chichewa and Kenesei and Vogel 1993 for English, Italian and Hungarian). In (66) the basic idea of focus restructuring is given.

(66) Focus Marking (Hayes and Lahiri 1991:89)
A focused constituent must be followed by $]_{PPh}$

According to (66) there is always a right PPh boundary after a focused constituent. In some languages, there is considerable evidence in favor of this focus marking, since the environment of many rules that depend on PPhs changes through the focusing.

2.7.1 Evidence from Stress Clash

According to (66), focusing causes a restructuring effect on a prosodic domain in such a way that a right PPh boundary is situated after the focused constituent. For example, as Kenesei & Vogel (1993) show, focus on a constituent changes the conditions for the application of the Rhythm Rule (see (68)). Recall the English examples from section 2.6.1 where a stress clash was tolerated, as repeated in (67).

(67)

```
        *   *
    *   *   *
    *  *  *   *
```

[the racketeer]$_{\Phi}$ [acted innocent]$_{\Phi}$.

According to the standard theories (e.g. Nespor & Vogel 1986), RR is blocked from applying on *racketeer* in (67), because the PPh is the domain of RR, while in (67), the stresses are separated by a PPh boundary.

Consider now (68): although in (67) *racketeer* and *acted* both retain their stress, in (68), with narrow focus on *acted*, *racketeer* must be deaccented.

(68)
the racketeer ACted innocent, but he really wasn't

Kenesei & Vogel account for the deaccenting of *racketeer* in (68). They claim that the focus feature that *acted* carries in (68) changes the prosodic phrasing in that it forces the PPh-boundary to move behind the focused constituent. The accenting and deaccenting facts are reflected in language specific focus restructuring rules, such as the one in (69) for English.

(69) Focus Restructuring: English (Kenesei and Vogel 1993: 24)

If some word in a sentence bears focus, place a PPh boundary at its right edge, and join the word to the PPh on its left. Any items remaining in a PPh after the item bearing focus has been regrouped retain their PPh status.

Formally, this can be expressed in the following scheme, also taken from Kenesei & Vogel 1993: 25.

(70) Focus Restructuring scheme

$[X_1 \quad X_2]_\Phi \quad [X_3 \quad X_4 \quad X_5]_\Phi \quad \rightarrow \quad [X_1 \quad X_2 \quad X_3]_\Phi \quad [X_4 \quad X_5]_\Phi$

$\qquad\qquad\qquad\quad +F \qquad\qquad\qquad\qquad\quad +F$

If a focused constituent occurs in a phrase, restructuring must apply. For example, the sentence in (69) would then have the prosodic structure sketched in (71):

(71)

```
          *
    *     * *
    * * * * *
```

[the racketeer acted]$_\Phi$ [innocent]$_\Phi$, but he really wasn't

The same phenomenon can be observed in German. Observe the following contrasts. In (72)(a) there is a neutral stress pattern whereas in (72)(b) there is narrow focus on *weiß* ('to know' 3rd SG).

(72)(a)

```
        *     *
    *   *     *
    * * *     *
```

[in Paderborn]$_\Phi$ [weiß man es]$_\Phi$

in Paderborn knows one it

in Paderborn, one knows it

(b) Narrow focus on *weiß*[20]

```
          *
    *     *   *
    *  *  *   *     *  *
```

[in Paderborn weiß]$_{\Phi}$ [man es]$_{\Phi}$ (anderswo vermutet man es nur)
in Paderborn knows one it (somewhere they just guess it)
in Paderborn, one knows it

This restructuring could count as evidence in favor of the PPh, whose right edge seems to be the domain of this rule. Before I argue against this hypothesis (below in 2.7.3) I introduce two further pieces of evidence: a discovery related to focus restructuring, i.e., a restructuring resulting from extraposition and a revision of focus restructuring itself.

2.7.2 Restructuring Resulting from Extraposition

Additional evidence for focus restructuring in German comes from extraposition (cf. Truckenbrodt (1995b)). Truckenbrodt uses the contrasts (73) and (74) in order to show that in German, the phonological phrasing interacts with focus (Truckenbrodt 1995b: 511).

Truckenbrodt argues that, depending on the focus-background structure, the VP either phrases separately as in (73)(a), or phrases with the preceding subject as in (73)(b), where the subject is focused.

(73) Interaction of focus and phonological phrasing in German[21]

(a)
Hast du etwas über das Theaterstück gehört? 'Did you hear anything about the play?'
[Das Theaterstück]$_{\Phi}$ [hat eine Journalistin]$_{\Phi}$ [verrissen]$_{\Phi}$
the play *has a journalist* *torn into pieces*
'a journalist has torn the play into pieces'

(b)
Wer hat das Theaterstück verrissen? 'Who has torn the play into pieces?'
[Das Theaterstück]$_{\Phi}$ [hat eine Journalistin verrissen]$_{\Phi}$
the play *has a journalist* *torn into pieces*
'a journalist has torn the play into pieces'

Recall from 2.5 that Truckenbrodt accounts for extraposition with a prosodic constraint: extraposition is only possible across exactly one PPh boundary. Accord-

---

20 According to C. Féry (p.c.), in this context it is still possible to have a pitch accent and a pause after *Paderborn*. The only context, where this is completely ruled out, may then be contrastive focus on *weiß*.

21 The example is taken form Truckenbrodt (1995b); I have added the focus domain brackets.

ingly, one finds contrasts in the grammaticality of extraposition (see 2.5.1) depending on the influence of focus on the phrasing. Examples are given below.

(74) Contrast with respect to extraposition (Truckenbrodt 1995b: 512)
(a)
Hast du etwas über das Theaterstück gehört? 'Did you hear anything about the play?'
* [Das Theaterstück]$_{\Phi}$ ([hat eine Journalistin t_i]$_{\Phi}$ [verrissen]$_{\Phi}$ [vom Globe$_i$]$_{\Phi}$)$_F$
the play has a journalist torn into pieces of the Globe
'a journalist of the Globe has torn the play into pieces'
(b)
Wer hat das Theaterstück verrissen? 'Who has torn the play into pieces?'
[Das Theaterstück]$_{\Phi}$ [hat eine (Journalistin t_i)$_F$ verrissen]$_{\Phi}$ [vom Globe$_i$]$_{\Phi}$
the play has a journalist torn into pieces of the Globe
'a journalist has torn the play into pieces'

According to Truckenbrodt, contrasts such as in (74)(a) and (b) show that focus changes the phonological phrasing.

Structurally, (74)(a) and (b) differ only with respect to their phonological phrasing. In his account, extraposition is sensitive to the phonological phrasing. Hence, Truckenbrodt interprets the difference in grammaticality between the two extrapositions as external evidence for the phonological phrasing he assumes: in (74)(a), extraposition is possible because the extraposed is moved exactly one PPh away.

2.7.2.1 Revised PPh-Restructuring

Even more complex phrasings occur in connection with disambiguation, as shown below concerning the disambiguation of scope ambiguities. Consider the example in (75).

(75)
Er blieb nicht in Stuttgart, um das Fußballspiel zu sehen
he stayed not in Stuttgart for the soccer game to watch

Depending on the scope of the negation *nicht*, (75) has at least three different readings, which are disambiguated by the stress patterns given in (76)

(76)

(a) Er blieb nicht in STUTTgart, um das Fussballspiel zu sehen
he stay.IMP not in STUTTgart for the soccer game to watch
a soccer game took place somewhere and he left S. to go and see the game (if he was in S. at all)

(b) Er blieb nicht in Stuttgart, um das FUßballspiel zu sehen
he stay.IMP not in Stuttgart for the SOccer game to watch
a soccer game took place in Stuttgart and he stayed in Stuttgart, but not for the game

(c) Er blieb NICHT in Stuttgart, um das Fußballspiel zu sehen
he stay.IMP NOT in Stuttgart for the soccer game to watch
a soccer game might have taken place in S but he did not stay there to see it

Consider the deaccented constituents. Especially in (76)(c), there is a large number of totally deaccented postfocal elements which are not prosodic constituents and cannot be derived by a prosodic algorithm.

One way of maintaining the prosodic algorithm is by re-revising it, as Hayes & Lahiri (1991) did. They posit a restructuring rule for Bengali, which shows a similar behavior with respect to extra-large PPhs:

(77) PPh-Restructuring in Bengali (Hayes and Lahiri 1991: 91)
Where X und Y are consecutive permissible P-phrases, [XY] may form a P-phrase, provided one of the following conditions are met:
i. Rapid speaking rate
ii. X or Y is a non-initial constituent constituting old information in the discourse.

With such a rule one can create all PPhs up to the length of a full IP, under certain discourse conditions. For Bengali, this rule is necessary since in this language otherwise all lexical heads would be PPhs.

2.7.3 Discussion

To sum up, focus seems to provide indirect evidence in favor of the prosodic category PPh: since it can be effected by focus, it has to be available as a domain. In the remaining part of this section I show how I account for this.

Recall that I assume that the most crucial difference between word-based languages and phrase-based languages lies in their segmental component (i.e. vowel reduction). However, the PPh is also less dominant in the rhythmic component of word-based languages. This does not mean that it is not there at all, but it is less systematic. This can be illustrated by some objections I have against the assumptions above for languages like German.

First, the phonetic realization of these forms with narrow focus as in (68) or (72)(b) is not simply a rephrasing. Rather, the postfocal part is completely deaccented. Therefore, from the point of view of rhythm, the result of focus restructuring is not a phonological rephrasing, rather a de-phrasing.

Second, the deaccenting of the postfocal part is predictable from the focus-background-structure of the larger discourse. E.g., the deaccenting of *Paderborn* in (72)(b) is predictable from the focus-background information and does not require a restructuring rule. *Paderborn* has to be deaccented no matter where focus will then be realized, since it is given information. Accordingly one could imagine a context with narrow focus on *in*, as in (55.c), which precedes *Paderborn*. But there is no focus restructuring after the focused preposition: in the sequence *in Paderborn* deaccenting applies.

(c) Narrow focus on *in*

```
*           *
*   *   *   *
*   *   *   *   *   *
```

Nicht [BEI]$_F$ Paderborn; [IN]$_F$ Paderborn weiß man es
not near Paderborn in Paderborn knows one it
Not near Paderborn, in Paderborn, one knows it

Thus *[in Paderborn]* would be one PPh, if we accepted that the Rhythm Rule applies within this domain. This case looks as if a prosodic boundary is inserted *before* the focused constituent (what Beckman & Pierrehumbert (1986) have observed for Japanese). Again, we cannot account for this by a prosodic algorithm. Any hierarchical approach would force us to arbitrarily insert boundaries. But if we assume that the deaccenting of *Paderborn* is due to the focus-background stress pattern, we can account for this without the PPh.

Still, focused constituents are special in the prosody. This can be seen from the fact that they are less accessible for fast speech reduction (see chapter 4). In other words, in the postsyntactic phonology, focused words must differ in some way from other prosodic words. But notice that can be represented on the level of the PWd. In chapter 4, the consequences will be discussed in greater detail.

2.8 Comments

In the preceding sections I have raised a number of objections against the assumption that the PPh serves as a rule domain in German. I have argued that there are neither segmental rules nor syntactic constraints that refer to the PPh. Yet the PPh is present at the rhythmic level. It is interesting that all types of evidence for the

PPh in German have to do with the prosodic highlighting of a PWd i.e. with focus and background structure.

This prosodic highlighting of single PWds is a characteristic difference between the language-types: languages that have obligatory focus marking elsewhere tend to have PPhs rather than PWds as rule domains in their grammar.

On the other hand, language like German that mark focus with a single pitch accent on a PWd tend to have the PWd as segmental domain instead of the PPh. The phonological phrasing has a discourse function, namely to highlight the focus-background structure.

In German, the prosodic boundaries are affected by the following phenomena.

(78) "Boundary phenomena" in German
focused constituents
ellipsis
coordination reduction
topicalized constituents
enumerations[22]

The processes in (78) enforce a prosodic marking of a PWd and a deaccenting of the remaining PWds. (78)(a) - (d) have been provided in chapter 1. An example of the phrasing of an enumeration is given in (79). (79), taken from Féry (1993: 79) shows an enumerated question that is realized as an overall rising contour with three pitch accents, one on each member of the set of alternatives.

(79)

L*H L*H L*H
[IP [ip Wollen Sie oRANgensaft] [ip APfelsaft] [ip oder lieber KafFEE?]]

The environments that require IP-internal phrasing all have something to do with focus. They either point out the site of a deletion or they introduce sets of alternatives. Therefore, I assume that German has phonological phrases, but their use is restricted to this marking and parsing of information structure. Their boundaries are determined by metrical grid structure and not by the mechanism that derives the prosodic hierarchy.

There are two advantages to eliminating the PPh from the segmental component in German. First, the phrasing can be separated from the prosodic algorithm.

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22 See Beckman & Pierrehumbert (1986) for English and Japanese and Féry (1988: 75) for German.

This supports Nespor's account on the two postlexical components (see section 2.6.2.2), to which I agree for independent reasons. Second, an explanation is provided for the fact that in languages some constituents are recursive while in others they are not (cf. chapter 1).[23] In a word-based language like German, the "PPh" consists of linear sequences of PWds. It is not part of the prosodic hierarchy (i.e. it is not derived by the prosodic algorithm; it cannot be recursive; it is no rule domain).

Compared to the PPh, the PWd is of much importance: the phonological word-level is the domain of several rules, both in the lexicon as well as postlexically. In word-based languages it is the prosodic reflection of the syntax-phonology interface. This is the subject of chapter 4.

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[23] If one allows for recursion, remarkable cross-linguistic differences can be found: In word-based languages either the PWd is recursive (German) or the IP (European Portuguese). In phrase-based languages, the PPh often is recursive.

3. Phrase-Based Languages

3.1 Introduction

In the preceding chapters I argued that German provides evidence for the assumption that rhythmic and segmental phonology are in separate domains. Evidence for this is that the PPh is only relevant in the rhythmic phonology of German. Thus, German has phonological phrases only in its rhythmic component and even there they are to a large extent optional.

This observation alone would not deserve further attention, given that one language alone cannot count as a serious counter-evidence against a category of the prosodic hierarchy. For the sake of maintaining the prosodic hierarchy as a parametrized option of universal grammar, one could assume that the PPh is present in German in one way or the other. However, as I show in this chapter, the observations above are connected to more general points: besides the fact that there are other languages like German in which the PPh does not play a crucial role, there is a contrasting class of languages which takes the PPh as their central unit. These languages are the subject of this chapter. I argue that, for several reasons, languages should be classified according to the way in which they refer to the PPh. This classification is necessary in order to account for my observations. At the same time, it can contribute to some current issues in phonological theory, such as problems concerning speech rhythm typology and the organization of the postlexical component.

The present chapter is organized as follows: first I sum up the properties of the phrase-based languages compared to word-based ones. Thereafter, I add those types of evidence for the constituent PPh that have not been introduced in chapter 2. Then I turn to some representative, otherwise unrelated languages (i.e. French, Chi Mwi:ni, and two Chinese dialects) and I argue why they are a coherent group. In this section I also address some potential problems for the classification and I these should be dealt with.

3.2 Claims

The basic concern of this section are the cross-linguistic aspects of the assumptions sketched above. I introduce other languages that pattern like German and I show

that this group of languages has more apparently unrelated properties in common, which make them a coherent group.

This correlates with the observations Odden (1995: 40) made concerning some Bantu languages. Odden notes that there is a correlation between the lack of phrasal phonology in a language and certain segmental properties. Languages that lack phrasal phonology also lack tone and vowel length contrasts. (1) and (2) illustrate the claims I make in this chapter

(1) Prosodic domains in postlexical phonology

	Word-based languages	Phrase-based languages
lexical	PWd	PWd
postlexical	PWd	PPh

According to (1), word-based languages refer only to PWds, both lexically and postlexically. In contrast, phrase-based languages only refer to the PPh at the postlexical level and lexically assigned prosodic and metrical structure is overridden.

In chapter 4 I look at the concept of the "phonological word" in more detail. The only point which is important in this chapter is that in the model of the prosodic hierarchy I adopt, there is no clitic group, but a recursion of the PWd is assumed instead (cf. chapter 4 for discussion and references). (2) sums up the different uses of the PPh in different language types.

(2)

	Word-based	Phrase-based
rhythmic component	(PPh)	PPh
segmental component		PPh

The distinction between the rhythmic component and the segmental (or 'prosodic') component was first suggested by Nespor (1995b) and introduced in chapter 2 of this thesis.[1] The dichotomy proposed in this chapter may serve as further evidence for these components. In this and the following chapter, several concrete examples will be shown to support this proposal.

It is important to note that the term "word-based" in (2) does not mean that these languages have no phonological phrasing at all (cf. chapter 2). It is well-known that there is a universal rhythmic principle; that is, all languages have well-

1 Note, however that Nespor did not propose any language-specific variation within these components.

formedness rules of speech rhythms, and speakers of all languages have intuitions on how to phrase a speech sequence. But this does not necessarily imply a grammatical function. Rhythmic well-formedness of a sequence is often only due to perception (see below).

3.2.1 Properties of Phrase-Based Languages

An observation related to my claim that not all languages have phrasal phonology has been made by Ladefoged (1993: 248). He raises the question whether rhythmic differences among languages might be accounted for by considering the positing of word stress and phrase stress. In this chapter, show that existence of the phonological phrase coincides with other phonological and syntactic properties.

(3) provides a summary of the crucial contrasts between word-based languages and phrase-based languages.[2] In section 6.5.1 I show why these properties coincide.

---

2 Some of the segmental phonological criteria in (3) are borrowed from the work on stress-timed and syllable-timed languages (especially the work from Auer). But there are some basic differences between the his classification and mine. In chapter 6 I compare Auer's and other speech rhythm typologies to my proposal.

(3) Properties of word-based languages and phrase-based languages

	word-based languages	phrase-based languages
Segmental rules	The phonological word is the domain There are no segmental rules that refer to the phonological phrase.	The phonological phrase is the domain There are no postlexical rules that refer to the phonological word.
Syntax	Focus in situ is standard. Coordination reduction is possible.	Focus only through syntactic movement. No coordination reduction.
Focus and phrasing	Either no rephrasing triggered by focus or optional insertion of a boundary.	Focus enforces restructuring of the phonological phrasing.
Prosodic hierarchy	Recursion of PWd or IP The phonological phrasing varies.	Recursion of PPh There is one phrasing obligatory.
Syllables	Typically complex codas. The PWd is the domain of syllabification.	Basically CV-syllables. The PPh is the domain of syllabification.
Stress	Unstressed vowels are reduced. RR applies optionally, its domain varies.	Unstressed vowels retain their quality. RR applies throughout, the PPh is its domain.

As I argue in 5.2.4, the most important feature that distinguishes the language types in (3) is vowel quality: if a language does not reduce its unstressed vowels, then the it is perceived as a phrase-based language. Other properties of this language type follow from this. My argument throughout this chapter is based on two assumptions. The first one is of a functional nature: I assume that many phonological rules have the function of delimiting domains. That is, in the discourse the application or nonapplication of a rule indicates the continuation or the limit of a domain to the listener.

The second argument concerns the perception of speech rhythm and weak and strong constituents in the prosodic hierarchy, here, phrasal stress and the rhythm rule. The standard assumption is that there are universal rules of eurhythmy, which trigger the application of rhythm rules (stress shift and beat deletion) during speech production. In contrast to this, I agree with Grabe & Warren (1995), who claimed that eurhythmic phenomena are a matter of perception rather than of speech production, at least in some languages.

The basis for their claim are perception tests with words that are expected to undergo stress shift, i.e. stressed words followed by another stressed item, for example *TV* in *TV soaps*. For each of these sequences, contrasting sequences without

a potential stress clash were presented to native speakers. In these sequences of words, everything was equal but there was a clause boundary intervening between the two stress shift items. Examples of such contrasts are given in (4). The potential stress shift item (i.e. *TV*) and its trigger (i.e. *soaps*) are in bold.

(4) Sample contrasts, tested by Grabe & Warren

(a) Stress shift expected
When John watches **TV soaps**, they're his favorite
Whenever Sky News contacts the **UN envoys**, they're out for lunch.

(b) Stress shift expected to be blocked by the intervening clause boundary
When John watches **TV, soaps** are his favorite
Whenever Sky News contacts the **UN, envoys** are out for lunch.

The speakers were asked whether they perceived any stress contrasts. The experiments[3] showed that the contrasts between shifted and unshifted stresses were only perceived if the items were presented in their full environment. This can be seen from the table in (5).

(5) Effect of the context on the perception of stress shift (Grabe & Warren 1995: 104)

	Shifted	Unshifted	Not sure
Complete sequence	100%	0%	0%
Without trigger e.g. *When John watches TV ...*	67%	13%	20%
Without any context e.g. ... *TV* ...	38%	20%	42%

The result of the experiment shows that in a sequence of two stressed syllables the first one is perceived as shifted only if the full context is given. Speakers who identify a stressed item as shifted have difficulties in identifying the same stress pattern if its context is removed. Thus, the less context is presented, the harder the task gets. Although the target syllable was never presented in complete isolation but always together with the one that was supposed to trigger the stress shift, no clear contrast between the syllables was perceived, unless the full environment was given. Therefore, Grabe & Warren conclude that the acoustic evidence for stress shift is not convincing. They argue that stress shift seems to be not a matter

3 42 of these contrasting pairs were presented to 4 native speakers, 2 female and 2 male.

of speech production but rather of speech perception: if listeners hear two equally stressed items, they perceive the first one as less stressed. The assumption of a stress shift rule might then be obsolete.

Grabe & Warren's observation is important for my proposal since I am going to argue that - by a similar process - the distinction between certain speech rhythm types is made by the perception of speakers rather than by the facts of the languages themselves.[4] That is, if listeners are confronted with reduced vowels they will associate this with a different speech rhythm type than listeners who are confronted with unreduced vowels.

As a consequence, languages that change in this respect, i.e. languages that develop a vowel reduction will show further changes. The result is an increase of the properties listed in the first column of (3). This perception-based assumption will be illustrated in chapter 5 where the historical development of German speech rhythm is looked at and European Portuguese and Brazilian Portuguese are compared.

3.3 The Status of the Phonological Phrase

Generally, phonologists assume that there is a universal prosodic hierarchy like the one in (6) (recall chapter I), where each category is contained in one of the next level.

(6) Prosodic hierarchy
- syllable (σ)
- foot (Σ)
- clitic group (CG)
- phonological word (ω)
- phonological phrase (PPh)
- intonational phrase (IP)
- utterance (U)

Although this hierarchy is the basis of most analyses, several constituents have been doubted in the past. For example, the notion of the clitic group which was introduced by Nespor & Vogel (1986) has been criticized by many authors (see Zec & Inkelas (1991, as introduced in 1.4.2.2, and Peperkamp (1996b) for a summary).

But the prosodic hierarchy has also been extended by some authors. I.e. other categories have been added to the prosodic hierarchy for individual languages

[4] Cf. chapter 6.

(such as the mora (cf. Auer 1991) or minor phrases (cf. Selkirk 1995) for Japanese). Since the present study is concerned with the phonology-syntax interface, I will not comment on subsyllabic categories. Instead, I am going to focus on the prosodic word, the clitic group, and the phonological phrase.

For the purposes of this chapter it is crucial to assume that there is no single algorithm deriving the whole prosodic hierarchy as a unit, as it is often assumed (see Selkirk 1984; Nespor & Vogel leave this question open). Instead, it is necessary to distinguish between lexical and postlexical prosodic domains. The question, of which constituents the prosodic hierarchy consists is not trivial, given the fact that the hierarchy is claimed to be universal. Evidence for its constituents comes from rules that refer to this domain in a significant number of languages.

3.4 Evidence in Favor of the Constituent PPh

Crosslinguistically, the PPh is assumed to be the domain of segmental as well as rhythmic rules. In this section I give an overview on this evidence. The parts that have already been introduced in chapter 2 (with respect to German) are only mentioned here briefly.

3.4.1 Tonal Evidence

The edges of phonological phrases are the association domain of boundary tones. E.g. in Japanese, PPhs are obligatorily separated by a L boundary tone (Beckman & Pierrehumbert (1986) & Pierrehumbert & Beckman (1988: 26ff).[5] PPhs in Japanese are characterized by an obligatory initial L tone followed by a H tone which results in an "initial rise" that separates the PPhs.

3.4.2 Phrasal Prominence

A well-known generalization about sentence stress distribution is that the most prominent syllable within the phrase is located at its right edge. The basis for this assumption is the Nuclear Stress Rule (NSR) (cf. Chomsky & Halle 1968) which requires that the most prominent syllable be on the rightmost lexical category of

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5 Beckman & Pierrehumbert call their category corresponding to PPh "accentual phrase". Their prosodic hierarchy contains the elements: utterance → intermediate phrase → accentual phrase → word → syllable → mora.

S.[6] Selkirk (1995b) has extended this generalization to smaller phrases. Evidence for them are conflicting principles assigning phrasal stress, Rhythmic Alternation versus Edge Prominence (see 3.4.3 below for an example)).

(7) Phrase Edge Prominence (Selkirk 1995b: 565)
The most prominent syllable of an edge constituent is more prominent than that of a constituent not located at an edge.

3.4.3 Rhythmic Rules

Recall the rhythmic principles by Liberman (1975) introduced in chapter 1. Several authors have claimed that the phonological phrase is the domain of those rhythmic principles that delete or move metrical grid positions in order to maintain a rhythmic succession of weak and strong syllables, the "ideal" rhythm.

(8) Rhythm (illustrations from Selkirk 1995: 564)

(a) Ideal	(b) Clash	(c) Lapse
x x	x x	
x x x x x	... x x...	...x x...

Languages favor the "ideal" rhythm and avoid the "clash" and "lapse" rhythm types. Therefore, Liberman (1975) proposed the rhythmic principles "Avoid Clash" as well as "Avoid Lapse", which trigger language specific rhythmic rules. Since the rhythmic principles are usually restricted to the PPh-domain, they can serve as evidence for this category. If a Stress Clash occurs, the syllables involved must be separated by a PPh boundary.

3.4.4 Focus restructuring

Additional evidence for phonological phrasing can be gained from the fact that in many languages, a PPh boundary is inserted either before of after a focused constituent. This has been observed (among others) by Hayes & Lahiri (1991) for Bengali and was confirmed by experimental data in Kenesei & Vogel (ms) for English. In (9) (taken from Kenesei & Vogel), *racketeer* and *acted* retain their respective stress, since they are at the edge of a phonological phrase.

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6 Additional factors are ignored here: e.g. narrow focus, which made Rochemont (1986: 25) develop the *NSR''*, which accounts for this by restricting the domain of accent to focused constituents.

(9)

```
          *     *
    *     *     *
    *  *  *     *
[the racketeer]Φ  [acted innocent]Φ
```

Contrasting with this, in (10), where *acted* has narrow focus, *racketeer* was destressed by the speakers they tested.

(10)
the racketeer ACted innocent, but he really wasn't

The details of this experiment have been discussed in chapter 2 in connection with the PPh in German.

3.4.5 Syntax

Syntactic constraints may refer to phonological items. A famous example are syntactic alternations in English as in (11), called heavy NP shift (cf. Ross 1968; Zec & Inkelas 1990).

(11) Heavy NP shift (Ross 1968, cited in Zec & Inkelas 1990: 376)
(a) He threw *the letter which he had not decoded* into the wastebasket.
(b) He threw into the wastebasket *the letter which he had not decoded.*

While in (11) the NP can be shifted, the same process yields an ill-formed result if the NP is "shorter" and hence, "light", as in (12).

(12) Ill-formed NP-shift
(a) He threw *the letter* into the wastebasket.
(b) *He threw into the wastebasket *the letter.*

These alternations pose a problem within syntactic theory since the length condition that apparently governs NP shift cannot be captured in syntactic terms.

As Zec & Inkelas have noted, these alternations can be accounted for with a prosodic condition according to which a shifted NP must be of a minimal prosodic size. Zec & Inkelas suppose that the moved constituent cannot adequately be captured as a syntactic constituent but only as an Intonational Phrase. According to them, this is supported by the fact that NPs that can be shifted are associated with the prosodic properties of Intonational Phrases.

Similar syntactic evidence has recently been argued for concerning PPhs. An example comes from 'O'odham, discussed in Truckenbrodt (who cites Hale (1975)).[7] In 'O'odham, a complement of a postposition can be extraposed, as in (13)(a).

(13) Constraints on extraposition in 'O'odham (Truckenbrodt 1995b: 506)

(a) $(H_\Phi$ (L L HH HL H L)$_\Phi$
gogs 'o [['am t_i weco]$_{PP}$ wo'o]$_{VP}$ [g misa]$_i$
dog AUX LOC under lie DET table
'the dog is lying under the table'

(b) * $(H)_\Phi$ (L L HH HH H L)$_\Phi$
gogs 'o [['am t_i weco]$_{PP}$ [g misa]$_i$ wo'o]$_{VP}$
dog AUX LOC under DET table lie
'the dog is lying under the table'

However, under similar syntactic conditions in other constructions, extraposition is not possible. For example in (13)(b), where, extraposition is licensed in the syntax, it is ungrammatical. According to Truckenbrodt, extraposition underlies a prosodic restriction: it must go across exactly one PPh boundary.[8] This condition i not fulfilled in (13)(b).

3.4.6 Segmental Effects

Another type of evidence that shows that a language has PPhs can be provided by segmental phonological rules. Phonological phrasing often constrains the application of these rules. An example of a segmental rule that applies within the PPh is voicing assimilation in Quechua. In this language, word-initial consonants assimilate to the preceding segment with respect to voicedness, as in (14).

(14) Quechua voicing (Muysken 1977, cited in Nespor & Vogel 1985: 184)

(a) gana-k *ka*-rka-ni 'I used to earn'
(b) Pedro-mi *ga*-ni 'I am Pedro'

---

7 In 1975 the language was called *Papago*, nowadays it is referred to by its traditional native name *'O'odham*.

8 But recall chapter 2 where I have raised doubt against a similar constraint in German.

The verb form *ka* 'to be' has an initial consonant that is underlyingly voiceless, as in (14)(a). (14)(b) shows that the consonant is voiced if preceded by a voiced segment. However, voicing assimilation does not apply in all contexts. Consider the example in (15), where a voiceless consonant follows a voiced segment (15)(a) and vice versa (15)(b).

(15) Quechua voicing assimilation blocked

(a)

papa-da *kara*-ni	*papa-da *gara*-ni
potatoes serve	
'I serve potatoes'	

(b)

sumuk *gushta*-ni	* sumuk *kushta*-ni
nice enjoy	
'I enjoy myself very well'	

The reason why voicing assimilation applies in (14) but is blocked in (15) is that in (15) it would have to apply between a verb and its complement. As Nespor & Vogel argue, Quechua does not allow for PPh restructuring (cf. section 2.2). In other words, unlike in other languages, for example in Italian, in Quechua the verb and its complement are not in the same PPh. Therefore, in contexts like the ones in (15) the trigger segment of voicing assimilation and the target consonant are separated by a PPh-boundary. The phonological phrasing of the examples above is given in (16).

(16) Quechua phonological phrasing (cf. Nespor & Vogel 1985: 184)

[gana-k *ka*-rka-ni]$_{PPh}$	'I used to earn'
[Pedro-mi *ga*-ni]$_{PPh}$	'I am Pedro'
[papa-da]$_{PPh}$ [*kara*-ni]$_{PPh}$	'I serve potatoes'
[sumuk]$_{PPh}$ [*gushta*-ni]$_{PPh}$	'I enjoy myself very well'

The phonological phrasing in Quechua looks different compared to the other languages discussed in this chapter. The reason is that Quechua is a left recursive language.

3.5 Phrase-Based Languages

This section deals with languages that organize their postlexical phonology with respect to phonological phrases. I discuss some (genetically unrelated) languages in which the PPh plays a much greater role than in word-based languages. I show

that these languages have some further properties in common that justify classifying them all as phrase-based languages.

Recall (1), where I state that all languages have phonological rules that are word-based (such as lexical stress assignment and lexical syllabification). But I show below that in the phrase-based languages, such rules are restricted to the lexicon and they are overridden by the effects of phrasal phonology. Word-level effects do not occur at the surface in these languages, unless words are spoken in isolation.

3.5.1 French

In the following subsections I argue that unlike other romance languages (e.g. Portuguese, Spanish) French is representative of the phrase-based type. After giving some data in defense of this claim I discuss French Glide Formation, a rule that poses a potential problem therefor.

As in all phrase-based languages, the phonological phrase and not the phonological word is the central unit in French phonology. In the traditional literature, a unit of phrase size is referred to as the "phonetic word" ("le mot phonétique", cf. Klein (1963: 37)). Several arguments from French phonology can be adduced in support of the PPh.

3.5.1.1 Phrasal prominence

First, the PPh in French always has final stress regardless of its length (cf. Tranel 1987). This can be seen from (17).

(17) Phrasal stress in French (Klein 1963: 37)

nous y allONS
[nu.zi.a.lɔ̃]
we there go
we are going there

nous y allons enSEMBLE
[nu.zi.a.lɔ̃.zɑ̃s'ɑ̃bl]
we there go together
we are going there together

nous y allons ensemble à huit heures de SOIR
[nu.zi.a.lɔ̃.zɑ̃.'sɑ̃.bla.ɥi.tœr.də.swa:r]
we there go together at eight hours of the evening
we are going there together at eight p.m.

In French, final stress is always realized on the last constituent of the phrase, even on pronouns. In (18) this is compared to German.

(18) Final stress on Pronouns (Klein 1963: 38)

French	German
DIS	SAG
dis-LE	SAG es
say it	*say it*

Contrary to German, French vowels are never reduced. Therefore, phrasal stress can even be realized on a pronoun.

3.5.1.2 Postlexical syllabification

A second import function of the phonological phrase in French is that it is the domain of postlexical syllabification, i.e. syllabification in this language ignores phonological word boundaries. This can be seen from the data in (19). In French, syllable-final consonants are resyllabified to the onset of a following syllable within the PPh (enchaînement). Many syllable-final consonants are not even realized phonetically, unless they are resyllabified and thus appear in an onset position (liaison). Both enchaînement and liaison are blocked by PPh boundaries. For example in (19), the PPh-final consonant in *allés* does not undergo liaison. Since it is a latent consonant, it is not realized phonetically.

(19) French final consonants

(a)
les enfants sont allés à l'école
[le: .zõf'õ]$_\Phi$ [sõ.ta.'le:]$_\Phi$ [ʔa.le.'kOl]$_\Phi$
the children have gone to the school (Nespor & Vogel 1986)

(b)

quatre	quatre officiers	tu chantais encore
[katx]	[ka.tRO.fi.sje]	[ty.ʃã.tE.zã.kOR]
four	*four officiers*	*you were still singing* (Tranel 1987)

tous les hommes sont mortel
[tu.le:.zɔm]$_\Phi$ [sɔ̃mɔrtɛl]$_\Phi$
all the people are mortal
'Everybody is mortal' (van Daele 1927)

(19)(a) is an example frequently cited in the literature on phonological phrases. However, the cases in (19)(b) show more clearly that liaison (and enchaînement, as in the case of *quatre* 'four') applies across the boundaries of two independent

phonological words (note that the PPhs in (19)(b) derive independent evidence from the stress pattern). What the examples in (19) therefore show is that syllable-formation in French ignores PWd boundaries, but it is blocked by PPh-boundaries. This point is made explicit in (20), where '=' indicates the application of liaison and '#' its nonapplication.

(20) Liaison in French (Tranel 1987)

[ses anciens étudiants]$_{NP}$ [[annoncèrent]$_{V}$ [un grand exploit]$_{NP}$] $_{VP}$

= = # #/= =

his former students announced a great achievement

Since the domain of liaison coincides with syntactic phrase boundaries in cases like the first phrase in (20), one could conclude that this rule applies within syntactic phrases. But the environment for this rule may deviate from the syntactic phrasing. According to Tranel, liaison may apply only optionally depending on the speech style between *annoncèrent* and the following NP. In other words, the domain of liaison has to be a phonological phrase which can be restructured, regardless of the syntactic boundaries.

3.5.1.3 Restricted Access to the PWd

There is ample evidence for the category phonological word in French, i.e. processes applying within words but not across word boundaries (see Hannahs 1996). Most of this evidence is based on lexical rules. According to Hannahs, the PWd in French is defined as in (21).

(21) French Phonological Word (Hannahs 1995: 22)

a. Stem plus all suffixes
b. Prefix (productive ones)

The PW in French is enriched by a prosodic subcategorization frame to which phonological rules refer (see Inkelas 1989).[9] Evidence for the PWd comes from rules such as nasalization. Prenasal vowels in French nasalize under certain conditions that refer to both, phonology and morphology. For example, the vowel of the prefix *in-* nasalizes, if the actual suffix is productive. Otherwise the nasal assimilates to the following consonant. Hannahs accounts for this by assuming two pre-

9 The prosodic subcategorization theory is outlined in section 1.4.2.2.

fixes *in-* each with a different prosodic status. Examples are given in (22), with < > indicating morpheme boundaries.

(22) Prosodic frames in the representation of the *in-* prefixes (Hannahs 1995: 27)

(a)

in^{A}-	illégal	'illegal'
{[<in> <legal>]PW }Lexical Word		

(b)

in^{N}-	inlavable	'unwashable'
{[<in>]PW [<lav> <able>]PW}Lexical Word		

(22) illustrates how Hannahs accounts for the different behavior of the in^{A}- and the in^{N}- prefix with respect to the nasalization rule. Hannahs assumes that the "historical" prefix in (22)(a) differs from the synchronic productive prefix in (22)(b) in that it is not a PW of its own. Since nasalization applies at the right edge of the PW, it is blocked from applying in (22)(b).

According to Hannahs nasalization is one out of two word level rules in French that apply postlexically. Such rules are potential problems for my proposal that French has the typical properties of a phrase-based language. In section 3.5.1.5 I am going to look at these rules (i.e. nasalization and glide formation) and I argue that this assumption is dependent on the model that Hannahs defends. There is evidence that suggests that they are in fact lexical.

3.5.1.4 Focus

Another piece of evidence in favor of the proposed status of French is focus. Focusing in French always involves syntactic processes which result in rephrasing, normally at the IP-level. It is not possible to mark focus simply on the word stress level.[10]

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[10] The only exception is emphatic or contrastive focus, which may be realized in situ, i.e. *c'est IMpossible!* ' this is impossible' or *je parle de l'IMportation et non pas de l'EXportation* 'I am talking about import, not about export' etc.

(23) Focusing in French

(a) est-ce que Charles fume? Oui, il fume
does Charles smoke? *Yes he smokes*

(b) C'est JAQUES qui ne fume pas *non, JAQUES ne fume pas
It's Jaques who does not smoke *no Jaques does not smoke*

The constituent to be focused, here, *Jaques* has to be topicalized. Focus in situ, as in (23)(b) would be ill-formed.

3.5.1.5 Two Potential Problems

Hannahs argues that nasal vowels as in (22)(b) have to be derived by a postlexical rule. Since they are not underlyingly present in the French lexicon, a lexical rule that nasalizes vowels would violate structure preservation (Hannahs 1995: 18). Structure preservation demands that the output of lexical rules be only underlying segments of the respective language. If nasalization actually was a postlexical rule, it would undermine my assumptions, since it is a word-level rule.

For two reasons I find Hannah's argument not convincing. First, the fact that nasalization has the exceptions described in 3.5.1.3 indicates that it matches the characteristics of a lexical rule. Second, the structure preservation's status as a universal principle has long been under dispute. Several studies have shown that lexical rules in various languages introduce nonphonemes in violation of the original version of structure preservation proposed by Kiparsky (1985) (c.f. Hall (1989), Harris (1987)). Since lexical rules in some languages are non structure preserving there is no a priori reason for assuming that nasal vowels in French must be derived postlexically.

Another apparent counterexample is glide formation (GF). According to Hannahs (1995a) GF is a postlexical rule with the PWd as a domain. If this was true, the rule would likewise contradict my statements about phrase-based languages, at least about French being a prototypical one.

First some facts about GF. It turns high vowels into glides, if they are followed by another vowel in the same PWd, as shown in (24).

(24) Glide formation in French (Hannahs 1995a: 28f)

(a) colonie [kɔlɔni]	colonial [kɔlɔnjal]
'colony'	'colonial'
(b) j'envie Alain [ʒãvialɛ̃]	* [ʒãvjalɛ̃]
'I envy Alain'	

From (24) one can see that the PWd is indeed the domain of GF: it applies between a stem plus suffix as in (24)(a) but not across PWds, as in (24)(b).

Additional evidence for this comes from the fact that GF is not only blocked between separate words but also between members of compounds as in (25)(a) and across sequences of prefix plus stem as in (25)(b).

(25) Blocking of glide formation in compounds (Hannahs 1995: 30f)

(a) tissu-éponge [tisyepɔ̃ʒ]	*[tisɥepɔ̃ʒ]
'terry cloth'	
(b) antialcoolique [ãtialkɔlik]	* [ãtjalkɔlik]
'antialcohol'	

Recall that Hannahs proposes that productive prefixes (as opposed to suffixes) are PWds of their own (see (21)).

(26) The domain of GF in prosodic terms (Hannahs 1995: 31)

[kɔlɔnj-al]$_{PW}$	'colonial'
[j'envie]$_{PW}$ [Alain]$_{PW}$	'I envy Alain'
[anti]$_{PW}$ [alcoolique]$_{PW}$	'antialcohol'
[tisssu]$_{PW}$ -[éponge]$_{PW}$	'terry cloth'

As argued above, there is independent evidence for the PWd in French from other - lexical - rules.

Hannahs argues subsequently that GF is a postlexical rule (1995: 91). In his approach this has the advantage that he can keep his model of the lexicon quite simple: there is no segmental phonological rule in the lexicon. The only phonological rule that applies lexically is PWd-formation.

Hannahs' claim (a domain-span rule on the PWd such as GF applying postlexically) is a challenge for my assumption on the characteristics of phrase-based languages such as French.

Considering the examples in (24) and (25) there is no doubt that the domain of GF is the PWd. However, Hannahs' argument in favor of the postlexical application of this rule is less convincing (cf. also Kleinhenz 1997b).

Assuming that prefixes, in contrast to suffixes, are their own PWd, the application of GF correctly follows from the prosodic representation of the forms in question if the trigger and target of GF lie within the same PWd. According to Hannahs, the advantage of the prosodic approach is that the phonological rule can be separated from the morphological processes, thereby allowing one to analyze GF as a postlexical rule. Citing Halle & Mohanan (1985), Hannahs argues that GF should be in the postlexical component, because this is the domain of unmarked rule application. However, Halle & Mohanan proposed that a rule is postlexical unless there is evidence to the contrary. And, as can be seen below, there is such evidence in French.

The problem with analyzing GF as a postlexical rule is that the rule has idiosyncratic exceptions. For example, in a footnote (Hannahs 1995: 28) Hannahs acknowledges that GF does not apply after a sequence of stop or labiodental fricative + liquid, as in *cruel* [kʀyɛl] 'cruel'. In another footnote (Hannahs 1995: 31) Hannahs refers to some "speaker-individual variation" in connection with GF. What he means is that some speakers allow for exceptions to GF in certain suffixes in combination with certain stems, such as *-esque; iste* (i.e. the *y* in *revuiste* [ʀəvyist] 'author' surfaces as *y* and not as ɥ, at least for a number of speakers). Again, such exceptions are typical of lexical rules.

Given the properties of GF mentioned above (i.e. the existence of idiosyncratic exceptions), one would have to characterize GF as a lexical rule. As a consequence, GF is no counterexample to the generalization made here, according to which French is a phrase-based language.

3.5.1.6 Summary

French has some striking characteristics. For example, the PPh is the domain of the postlexical phonological processes. PPh-formation can be predicted from the syntax and there is only little variation. This was shown in connection with the domain of liaison. The PWd is only relevant in the lexicon. Processes that require access to the PWd, e.g. focus in situ, are not possible. Lexical syllabification and lexical stress are overridden by phrasal syllabification and phrasal stress.

In chapter 5 I am going to look at these and further properties of French with respect to its classification as a phrase-based language and I will compare them with German, a word-based language.

3.5.2 Chi Mwi:ni

Although Chi Mwi:ni (Bantu) is not genetically related to French, both languages have some phonological properties in common, which make them a closer related group with respect to prosodic phonology than, for example, French and the romance language Portuguese. Chi Mwi:ni is well-known for its vowel shortening rule, which provides clear evidence for the existence of the phonological phrase (see Hayes 1989, Selkirk 1986, Truckenbrodt 1995a).

As in French, rules constructing speech rhythm in Chi Mwi:ni systematically ignore word boundaries. For example, Kisseberth & Abasheikh (1974), as well as many other authors, have shown that in Chi Mwi:ni the phonological word plays no role in stress assignment (see the data below). Some stress-related phenomena pointed out by Selkirk show that the category word plays no role in foot-assignment in Chi Mwi:ni.

In Chi Mwi:ni, the position of a long vowel alternates as can be seen from the data in (27) that have been taken from Selkirk (1986: 378).

(27)

soma:ni	somani: chuwo
(pl)don't read!	*(pl)don't read this book!*
chi:ntu	chintu shpiya
thing	*something new*

The minimal pair in (28) shows that long and short vowels are phonemic.

(28) Underlyingly long vowels in Chi Mwi:ni

xt̲ufa *to spit*	xt̲u:fa *to go along the 'ka'aba'*

As Selkirk concludes, the vowel-length alternations in (27) can only be explained with reference to a constituent larger than the phonological word. The generalization is that vowels are phonetically only realized as long if they are in the penultimate syllable of the PPh, or in the antepenultimate syllable of the PPh, if the penultimate is underlyingly short.

(29) Vowel lengthening positions in Chi Mwi:ni (Truckenbrodt 1995: 47)
- the penultimate syllable in PPh
- the antepenultimate syllable, if the penult is short.

These two environments are illustrated in (30)(a) and (b) and (31)(a) and (b) respectively, which have been taken from Truckenbrodt (1995a).

(30) Vowel length in Chi Mwi:ni

(a)		(b)	
	x		x
[	x]$_{\Phi}$	[	x]$_{\Phi}$
μ μ]$_{Ft}$	μ	[μ μ μ	μ]$_{Ft}$
soma <n i>		somani	chu <wo>
soma:ni		somani: chuwo	
'(pl)don't read!'		'(pl)don't read this book!'	

(31)

(a) [[ma:yi]$_{PWd}$]$_{\Phi}$ *water*

(b) [[mayi]$_{PWd}$ [malada]$_{PWd}$]$_{\Phi}$ *fresh water*

The data in (30) and (31) are the result of a rule shortening long vowels rather than one lengthening underlyingly short vowels. This can be deduced from the data in (32), which show alternations between long and short vowels before certain suffixes (all taken from Truckenbrodt 1995a: 46, who cites Kisseberth and Abasheikh 1974).

(32) Morphologically conditioned vowel length alternations

(a) chili	chili:-ni
bed	*bed-LOC*
madrasa	madrasa:ni
school	*school-LOC*
(b) oloshele	oloshele-pi
he went	*where did he go*

If the alternations in (32) were attributed to a rule of vowel lengthening (e.g. V → V: / _ {suffix}), then one could not account for the fact that certain vowels are not lengthened in the same environment (32)(b). If one were attempted to analyze the length alternations in cases such as in (32) as shortening rules the generalization cited in (29) would be lost.

The forms in (30)(a) and (31)(a) are PWds of their own, where the long vowel is in the penultimate syllable. Data like these alone would suggest that vowel length is related to the PWd. However, in (30)(b) and (31)(b) the same PWds have a different position in prosodic terms: they are not phrase-final. The vowels in penultimate position of the PWd are then not realized as long any more. Instead, vowel length is moved away to a position related to the PPh. In (30)(b) vowel length is moved to the antepenultimate syllable of the phrase, since the penult is short. In (31)(b), the length is realized on the next PWd.

To sum up these data, Chi Mwi:ni is another candidate for the phrase-based language type. Besides the PPh as a domain of postlexical phonology it shares the lack of vowel reduction and the constrained syllable structure with French.

3.5.3 Chinese

In the following sections I argue that the dialects of Chinese, at least the ones I look at, are phrase-based languages. Hints at this are again the lack of vowel reduction. I argue that prosodification further supports this assumption. After that I examine a potential counter-argument, i.e. the domain of tone sandhi, a rule that has been claimed to be a postlexical rule at the PWd level.

3.5.3.1 Prosodification

The dialects of Chinese pose examples of typical phrase-based languages. For example, they have rules that span two words in a syntactic phrase - a domain Chen (1990) and others argue to be the phonological phrase. An example of a phonological rule in Mandarin Chinese that has the PPh as its domain is prosodification, i.e. foot formation.

As in Chi Mwi:ni, Mandarin foot formation crosses word boundaries (cf. Chen 1990: 31). This can be seen in (33), where the two metrical feet consist of two PWds, respectively.

(33) Mandarin foot formation
[gou yao]$_F$ [xiao-ma]$_F$
dog bite small horse
the dog bit the pony

As Chen points out, Mandarin foot formation is not determined by syntactic tree geometry, but rather by some condition similar to Selkirk's Sense Unit Condition. The resulting structure is a constituent of PPh size, which serves as the domain of tone sandhi rules.

In this respect Mandarin behaves like French: postlexical prosodification does not consider the PWd.

3.5.3.2 Tone Sandhi Domains

In this section I discuss the tone sandhi domains in Shanghai Chinese, a language whose prosodification facts are comparable to Mandarin Chinese. The domains of

Tone Sandhi in Shanghai Chinese pose a problem for my claim that phrase-based languages have no PWd in their postlexical phonology.

Shanghai Chinese has five surface tones (Selkirk & Shen 1990: 314): *HL, MM´, LM´, H,* and *LM.* In the underlying representation, only three tones are distinguished that all appear as contour tones: *HL, MH,* and *LH.*

In order to derive the surface tones from the underlying representation, Selkirk & Shen assume two tone sandhi domains. The first one is the Major Phrase, a category that corresponds to the PPh in other theories. As can be seen from (34) it is derived from a maximal lexical projection.

(34) Major Phrase Formation in Shanghai Chinese (Selkirk & Shen 1990: 332)
Major Phrase: {Left; Lex^{max}}

The Major Phrase domain is necessary in order to account for some rules of tonal structure, such as tonal realization of function words or the post-focus tone deletion.

The second tone sandhi domain Selkirk & Shen postulate is the Prosodic Word, which corresponds to the PWd, i.e. it is a Lex^0. In Shanghai Chinese the left edge of a lexical item coincides with the left edge of a PWd. Accordingly, in terms of the edge-based theory (cf. chapter 1) the Shanghai PWd can be defined as follows:

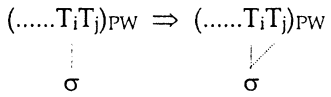
(35) Shanghai Chinese Prosodic Word rule (Selkirk & Shen 1990:320)
Prosodic Word: {Left, Lex^0}
where Lex^0 stands for word belonging to the lexical categories N, V, A.

According to Selkirk & Shen (1990: 319) Shanghai Chinese has a tone sandhi rule which consists of three parts that all depend on the PWd. They are given below in (36).

(36) Tone structure rules in the PWd domain (Selkirk & Shen 1990: 319)
(i) Obligatory tone deletion
$(T_iT_j \ldots T_k \ldots)_{PW} \Rightarrow (T_iT_j \ldots\ldots)_{PW}$

(ii) LR association
$(T_iT_j \ldots\ldots)_{PW} \Rightarrow (T_iT_j \ldots\ldots)_{PW}$
$\sigma \qquad\qquad \sigma\ \sigma$

(iii) Contour tone insertion



The tone deletion rule (36)(i) removes underlying tones until only the leftmost remains. The left-to-right tone association rule (36)(ii) distributes this contour over the first and the second syllable of the PWd. Finally, the contour tone insertion ensures that the contour is realized if the PWd consists of a single syllable. According to Selkirk & Shen, these tone sandhi rules apply in phrasal contexts but are restricted to the PWd. Rule domains like these would be a problem for my assumption that there is no PWd in the postlexical phonology of languages like Chinese.

However, in another context[11] Bao (1996: 40) argues against the prosodic word parameter. According to him, the PWd is not relevant for constructing Tone Sandhi domains in Shanghai Chinese. Instead, the PWd parameter and the Major phrase parameter come up with the same domains for tone sandhi. (37) is an example for this, taken from Selkirk and Shen (1990).

(37)

[NP N] [AP A]] PRT [NP N]]
zhima # da de # bing
sesame *big* *DE* *bun*
( ) ( ) ( ) Prosodic Word
( ) ( ) ( ) Major Phrase
( ) ( ) ( ) Surface
'buns with large sesame seeds'

In cases as in (37), i.e. whenever a lexical head is phrase-initial, both the PWd and the major phrase are potential domains for tone sandhi. This is the majority of cases. Cases that - according to Bao - decide between the two domains are given in (38) and (39). (38) is an ambiguous phrase. Its first reading in (37) is predicted by both PWds and major phrases.

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11 Bao argues in favor of a revised analysis of the major phrase algorithm in OT-terms in order to allow for a crosslinguistic comparison of the ALIGN constraints in major phrase formation. The details are not relevant here. The interesting point is that he concludes that the PWd has no relevance for tone sandhi.

(38) The Major Phrase as Tone Sandhi domain (Bao 1996: 39)

[NP N]	A] PRT [NP N]]	
zhima	da de # bing	
sesame	*big DE bun*	
*( ) ( ) ( )		Prosodic Word
( ) ( )		Major Phrase
( ) ( )		Surface

'buns as big as sesame seeds'

If (38) is parsed into PWds, the resulting structure does not correspond to the actual tone sandhi domains (cf. Bao 1996: 39). However, at the next level of the prosodic hierarchy, the parsing of Major Phrases, the correct phrasing is achieved.

(39) Tone Sandhi domain contrasts (Xu *et al.* 1981, cited in Bao 1996: 40)

	(a) [NP V N]	(b) [VP V [NP N]]	
	chao fan	chao fan	
	fry rice	*fry rice*	
	'fried rice'	'to fry rice'	
i.*	( ) ( )	( ) ( )	Prosodic Word
ii.	( )	( ) ( )	Major Phrase
iii.	( )	( ) ( )	Surface

(39) shows ambiguous sequences that are disambiguated at the surface by a different tonal structure. (39)(i) and (ii) show the PWd and major phrase structure of the sequences while the actual surface structure is given in (39)(iii). Again, the PWd cannot parse the actual surface contrast. I agree with Bao that the examples above show that the Major Phrase rather than the PWd is the domain of Shanghai tone sandhi.

3.5.4 Italian Dialects

Probably the most often cited examples in favor of the PPh as a rule domain come from Italian: a rule of consonant gemination, the so-called *radoppiamento sintattico* (RS), requires this domain. Since Italian has several typical "phrase-based" properties, I assume that it is a candidate for this language type. However, as in the other languages I looked at so far, there are potential counter-arguments against this, i.e. postlexical phenomena that refer to the PWd. In this section I first sum up the arguments in favor of the PPh. Then I comment on the potential problem, the s-voicing and I offer an explanation for it.

In some southern Italian variants, word-initial consonants are geminated if certain conditions are met.[12] Historically, this rule originated from compensatory lengthening. In Italian, many Latin syllable-final consonants have been deleted, a process which must have triggered compensatory lengthening, both word-internally as well as across word boundaries. This can be seen in (40). (40)(a) shows cases of word-internal compensatory lengthening and (40)(b) illustrates lengthening across word boundaries.

(40) Compensatory lengthening of initial consonants in Tuscan (Rohlfs 1949: 290ff)

(a)			
advenire	→	a[v:]enire	'arrive'
(b)			
ad Venetiam	→	a[v:]enezia	'to Venice (LOC)'
terra et mare	→	terra e [m:]are	'earth and sea'

According to Rohlfs, this process applied even more regularly across word boundaries than word-internally. This can be seen from the contrasts in (41) where potential targets to deletion are given. (41)(a) shows examples of word-internal consonants that were not deleted, whereas the consonants in (41)(b) are in similar environments, except for the intervening word boundary. The consonants in (41)(b) have been deleted (cf. Rohlfs 1949: 290).

(41) Word-internal and external gemination

(a)			
campo		*ca[p:]o	'camp'
nasco		*na[k:]o	'I am born'
(b)			
jam passatus	→	gia [p:]assato	'already happened'
tres caprae	→	tre [k:]apre	'three capers'

Note that in fact, the input to consonant deletion in (41)(a) and (41)(b) is similar, but not identical as Rohlfs suggests: Rohlfs did not consider the fact that stressed syllables were excluded from consonant deletion. However, this does not matter in contemporary Italian. RS is productive in certain prosodic environments, regardless of a previous consonant deletion. RS is restricted to a domain which must be a prosodic one, as can be seen from the contrast in (42)(a) and (42)(b).

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12 For example, the consonant has to be preceded by a stressed vowel.

(42) Radoppiamento Sintattico in the PPh (Nespor & Vogel 1986: 40)

(a)	Ho	visto	tré	[k:]olibrí	**[b:]**rutti	
	I	*have seen*	*three*	*hummingbirds*	*ugly*	
(b)	Ho	visto	tré	[k:]olibrí	**[k]**osi	[b:]rutti
	I	*have seen*	*three*	*Hummingbirds*	*that*	*ugly*

In (42)(a) the two initial consonants in *kolibri* and *brutti* are both geminated whereas in (42)(b) the initial consonant in *cosi* is prevented from gemination.

The reason for this must be due to the prosodic phrasing, since the syntactic constituency of (42)(a) and (42)(b) is equal. Also, in both cases the segmental triggers for RS are present. The only difference is the length of the AP [*cosi brutti*]: in (42)(b) it branches. In other words, in (42)(b) *cosi brutti* is a separate PPh, as illustrated in (43) (cf. also chapter 2).

(43) Prosodic phrasing of (42)

a. [tré colibrí brutti]$_{\Phi}$
b. [tré clibrí]$_{\Phi}$ [cosi brutti]$_{\Phi}$

RS can be accounted for accordingly: the consonant that undergoes RS and the stressed vowel that is the trigger of RS have to be in the same PPh.

From a rule like this as well as from its other properties, one could hypothesize that Italian is a phrase-based language. Assuming this, one has to account for the s-voicing rule in Italian. s-voicing is a word-based rule that definitely applies postlexically since it is sensitive to speech rate. In standard northern Italian, an intervocalic *s* is voiced within the domain of the PWd.[13]

(44) Italian s-voicing (Nespor & Vogel 1986: 125)

(a)	a[z]ola		'button hole'
	a[z]ilo		'nursery school'
	re[z]istenza		'resistence'
(b)	hanno [s]eminato	*hanno [z]eminato	'they have seeded'
	la [s]irena	*la [z]irena	'the siren'

(44)(a) shows the application of s-voicing, whereas (44)(b) illustrates that PWd boundaries are a barrier for the rule. Since s-voicing is more likely to apply with increasing speech rate it has to be a postlexical rule.

However, there is an interesting complementary distribution of these rules among the Italian dialects. It is well-known that RS is restricted to Southern Italian

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[13] Cf. Nespor & Vogel (1986: 125ff) for the exact conditions of the mapping of morphemes into phonological words in Italian.

varieties (cf. Nespor & Vogel 1986). On the contrary, s-voicing is restricted to the Northern parts of Italy. There is no dialect that has both rules.[14] A possible explanation for this complementary distribution would be that the Northern Italian dialects develop into another language type. But I have no other data from that would support this.

3.6 Summary

In this section I sum up the properties, phrase based languages have in common. The main characteristics of these languages are due to the fact that the phonological phrase is the domain of postlexical phonology. Syllabification goes across PWd boundaries and leaves only the PPh as a domain for postlexical rules. The languages basically have CV-syllables. The syllables in this domain are all equally prominent in perception since the unstressed vowels retain their quality. Due to this, these languages lack the option of prosodic highlighting a PWd which is typical the word-based languages. In phrase-based languages, focusing requires syntactic movement and there is no coordination reduction possible.

The parsing of syntactic structure into prosodic units is more restrictive in phrase-based languages : the phonological phrasing can be predicted. The PPh and not the word is the domain of focus marking, which can be deduced from the fact that focus enforces a restructuring of the phonological phrasing. I.e., a PPh boundary is obligatorily inserted after the focused constituent. Eurhythmic rules, for example the RR, apply throughout, the PPh is their domain.

Chi Mwi:ni, French, and the Chinese dialect share further characteristics which illustrate the concept of "phrase-based" languages. The existence of the PPh as a rule domain coincides with segmental properties the two languages share. First, unstressed vowels are not reduced. Both languages have basically CV-syllables. In Chi Mwi:ni, consonant clusters exist only in the onset; coda consonants are always sonorants. In French both do exist (i.e. *travail* [travaj] 'work'; *quatre* [katx] 'four'), but like other phrase-based languages, French has strategies to avoid them (for example the tendency towards latent consonants).

These are usually assumed to be typical properties of tone languages, but the French example shows that this is not a necessary condition. French is an extreme case, since the PWd is not recognizable any more in the postlexical phonology.

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14 Thanks to Marina Nespor for pointing this out to me.

Lexical word stress is taken away in favor of the phrase stress, etc. Other phrase-based languages are not that extreme, i.e. Italian, which in many ways corresponds to the phrase-based type, still has word stress etc.

In chapter 5 I discuss the question which is the trigger and which is the target, i.e. do these phonological properties give the listener the impression of a certain speech type, or are the phonological properties the result of rules that are triggered by the speech rhythm type?

4. The Word in German Postlexical Phonology

In this chapter, I give an account of the phonological processes that result in a restructuring of word boundaries, that is, cliticization and connected speech reduction. I look at these processes and their relation with prosodic structure and I argue that they can best be accounted for if one assumes that the PWd and not the PPh is the relevant domain for both processes.

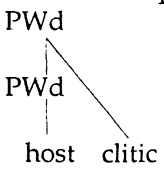
In the previous chapters I have argued against the PPh as conceived of in the literature. Also, I have given arguments from unrelated languages which show that the postlexical component consists of a rhythmic and a segmental part as proposed by Nespor (1990b). Concerning the domains of postlexical phonology, I have argued that languages should be divided typologically into word-based languages and phrase-based languages. This proposal was thoroughly discussed and illustrated by the example of German PPhs which do not have the same function in the grammatical system as in other languages. It was also argued that a class of languages to which French belongs take the PPh as the basis of their postlexical phonology. In this chapter and the next one I look more closely at the word-based languages. Here, I look at the PWd in the word-based language German, and in chapter 5 I introduce further word-based languages. The basic questions are (i) what are the prosodic characteristics of the PWd and (ii) how can they best be accounted for?

In the phonological literature on German, the fast speech level is not taken into account and variations due to speech rate are not considered to be phonologically conditioned (but rather phonetically). In contrast to that, I argue that there are both phonological and phonetic aspects of fast speech and that I can account for the phonological ones. I show that cliticization and fast speech reduction are both the result of the same postlexical rules. The differences between them are due to (i) the interaction between the prosodic and the segmental component and (ii) the fact that the PWd is extended at fast speech.

The chapter is organized as follows: in the first sections data on the different types of clitics and fast speech reductions are given. I argue that cliticization in German requires a special prosodic domain. Subsequently, I comment on the question which kind of domain is needed. I.e. the Clitic Group, adjunction to the PPh, stray elements, or a recursion of the PWd? I demonstrate that among the po-

tential representations only the recursion of the PWd as in (1) can account for the data.

(1) The recursive prosodic word (cf. Selkirk 1995)



Next I discuss the factors that constrain the recursive PWd. On the basis of the material gathered in this chapter I consider again the phonological differences due to speech rate and show how I can account for them.

I finally summarize the characteristics of the PWd in German. I conclude that I can account for the phonology of reduced forms, supposing that German has a rhythmic and a segmental component. The phonological processes around the PWd in German are additional evidence for this proposal.

4.1 Introduction

According to a widely used assumption in phonological theory, which I employ in this chapter, content words have all properties of PWds assigned to them when they leave the lexicon. This means that they have been assigned metrical structure and syllable structure. At this stage, PWds are prosodically independent and can stand on their own. And conversely, items that are prosodically independent are PWds.

In this chapter I deal with those forms that have a defective prosodic structure, i.e. clitics and other reduced forms. The former are no PWd when they leave the lexicon, while the latter are lexical words that became destressed in the discourse. These words may lose their PWd-status at fast speech rate.

Clitics are of a hybrid nature. They concern all grammatical domains - morphology, semantics, syntax, and phonology. Theories on how these components are related to each other can be tested by looking at the proposals they make for clitics. In this thesis I will not go into any details concerning the syntactic licensing of clitics. I only discuss cases where cliticization is syntactically licensed. I focus on a striking feature of the prosody of German clitics: at a formal speech level they cliticize to the host that is the closest to them in syntactic terms. At a more casual speech level, however, clitics always attach to a preceding word. In fast speech, reductions occur which I do not call cliticization since they are not restricted to

function words but include content words, too. An example illustrating this point is given in (2).[1]

(2) Formal speech vs. casual speech cliticization

(a) syntax (lexical phrases only)
ich muß [[**einen Fehler**]$_{NP}$ gemacht haben]$_{VP}$
I must a mistake made have
'I must have made a mistake'

(b) formal speech phrasing
ich [mus] [(ə)**n fe:lɐ**] (~ [ʔaɪnən **fe:lɐ**]) gemacht haben
I must a mistake made have

(c) casual speech phrasing
ich [mu.zən]$_{PWd}$ [**fe:lɐ**]$_{PWd}$ gemacht haben
I must a mistake made have

The syntactic bracketing of the example appears in (2)(a). In (2)(b) and (c) examples of cliticizations[2] at different speech styles are given. The relevant NP *[einen Fehler]* 'a mistake' is in bold print. The direction of cliticization of the determiner in (2) depends on the degree of monitoring and the rate of speech. In the theories of prosodic phonology introduced in chapter 1, the noun and its determiner are expected to phrase together in prosody. But as can be seen in (2)(b), this is only happens in formal speech. In more casual speech the determiner cliticizes to the preceding word. The two major syntactic boundaries do not block this.

Data like these show that the distinction between the two levels of speech monitoring lies in the way syntactic information is mirrored in the prosodic phrasing: at a formal speech level the syntactic phrasing has priority over the smoothness of spoken language. This is evident from, for example, the devoicing of the consonant preceding the NP in (2)(b). At a casual speech level, the demands of spoken language take priority over syntax and speech is divided into larger sequences. This is evident from the resyllabification of word-final *s* to syllable-initial *z* in (2)(c).

I am going to argue that this is evidence for the model of the phonology-syntax interface assumed in this thesis. The model is reproduced in (3) for convenience:

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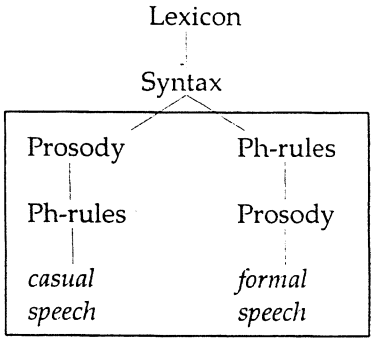
1 See section 4.3.5 for actual data and a detailed discussion.

2 These differences can only be illustrated with bi-directional clitics. They are special in some respects (e.g. the proclitic forms do not syllabify with their host). I ignore these special features for the moment and I return to them in section 4.3.4.

(3) The phonology-syntax interface (of word-based languages)



According to (3) prosody and segmental phonology are modules which can interpret the syntactic input. This makes two relevant predictions: besides the assumed separation of the prosodic and the segmental domain, (3) claims that the different speech styles are derived by the same rules. There is only one component which contains a set of segmental phonological rules (see 4.1.2).

These rules refer to a specific kind of domain in their in structural description. In German this domain is the PWd. The syntactic input which is usually assumed to undergo prosodification first can in (3) either be interpreted directly by the segmental phonology or be subject to phonological rearrangement prior to the application of the set of rules. The different output forms result from the fact that the input to the segmental component can be organized in domains of different sizes (see 4.3.5).

Not all languages work like that. (3) only holds for the word-based languages which have both sequences of segmental and prosodic component while the phrase-based languages always have the prosodic phrasing prior to the segmental part. The domain for their segmental phonology is always the PPh. The fact that the rule domains always retain their PPh size explains these languages do not have the same dramatic acoustic changes at fast speech.

The present chapter deals with the predictions of (3) in German and gives support for them. In particular, it will be shown how this model can be employed to account for the prosody of clitics and reduced forms. I argue that one has to distinguish between two types of reduced forms: "simple" clitics which only exist at the formal speech level (see (4)) on the one hand and reductions that are due to fast speech rate on the other hand. The formal speech level is generated by applying the phonological rules before prosodification. In this case, the phonology is constrained by syntactic boundaries. This level is used for disambiguation. At the casual speech level, syntactic information is deleted before phonology applies.

Both levels are distinct from fast speech, where even the left edges of PWds (i.e. content words) are irrelevant, unless the PWd is stressed.

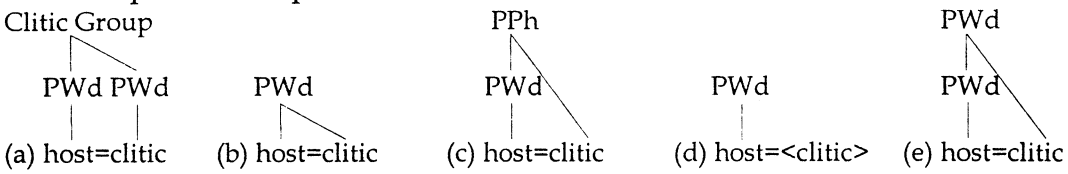
As I mentioned in section 1.2.2, "weak" forms are all reductions due to casual speech rate. The present approach predicts that in casual speech there are no syntax-sensitive rules. Weak forms at this level phonologically correspond to the cliticized forms in formal speech, but they are located in different domains. In (4) I have repeated the table from 1.2.2.

(4) Types of reduction in spoken language

	Formal speech	Casual speech
Slow speech rate	Function words appear as separate PWds, proclitics, or enclitics, depending on the syntactic relation to their host. Left edges of lexical items are unviolable.	Clitics are incorporated to any item to their left, regardless of their syntactic relation. Restrictions on syllable structure apply (see (22). Left edges of lexical items are unviolable.
Fast speech rate	As above (if possible at all)	As above, but all unstressed forms are fused, even lexical items. No restrictions on syllable structure. Left edges of lexical items can be violated.

When using the term "clitic" I refer to reduced forms at slow speech rate. The potential prosodic representations of these clitics are given in (5).

(5) Potential prosodic representations of clitics[3]



The representations in (5) have been assumed for either German or languages other than German (references are given below in the respective sections).

In the following sections I argue against (5)(a)-(d) for enclitics. I show that German requires a recursion, as in (5)(e) in order to account for the standard case of cliticizations, i.e. enclitic forms of the type (2)(c).

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3 I employ the notion "=" for cliticization (as introduced by Zwicky 1977).

4.1.1 Preliminaries on clitics

I assume that the PWd in German has the properties listed in (6) and that one purpose of cliticization is to maintain them in the prosody of forms that do not fulfill the requirements of (6).

(6) Properties of the German PWd
- (a) The PWd is the domain of syllabification
- (b) The PWd is assigned metrical structure in the lexicon
- (c) The PWd never begins with a schwa (Hall 1997b, see (74))

(6)(a) has been proposed by several authors (e.g. Booij 1996) to be a universal property. However, concerning postlexical syllabification, this claim has to be restricted to the word-based languages: the PWd is the domain of postlexical resyllabification in word-based languages only. Consider now the prosodic word status of the items in (7).

(7) The PWd in the German lexicon
- prefixes
- class 1 suffixes
- stem + class 2 suffixes

Some examples are given in (8):

(8) PWds in German[4]

prefixes	stem+class 2 suffixes	stem+ class 1 suffixes
[ab+]$_{PWd}$ [art]$_{PWd}$	[red+en]$_{PWd}$	[leb]$_{PWd}$ [los]$_{PWd}$
of- species	*talk.INF*	*live less*
'variety'	'talk'	'liveless'
[ver+]$_{PWd}$ [ein]$_{PWd}$	[kind+isch]$_{PWd}$	[eigen]$_{PWd}$ [tum]$_{PWd}$
re- one	*child+ish*	*proper dom*
'union'	'childish'	'property'

The prosodic bracketing in (8)(a) mirrors the prosodification constraint (Rubach & Booij (1990), cf. chapter 1): the left edges of stems (such as *Art* 'species') tend to be unviolable, i.e. they are a barrier for syllabification.[5] Only in fast speech, this lexi-

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4 Data are taken from Hall 1992: 101ff, who looks at the morphophonological status of these items.

5 This is a strong tendency among languages but by no means universal (cf. Hall 1992: 101). Even in some German dialects, for example Franconian, exceptions can be found. *Verein* 'union' is then realized as a single PWd *[vɔ.ʀain]$_{PWd}$*. See also section 4.2.4.

cally assigned syllable structure can be changed through fast speech resyllabification.

Below, I summarize the properties of clitics that are presupposed here. I adopt the widely accepted typology of clitics by Zwicky (1977). According to Zwicky there are three types of clitics. They are provided in (9).

(9) Types of clitics according to Zwicky (1977)

simple clitics: they are the result of a phonological regularity (for example vowel reduction) triggered by syntax. They can be substituted by the full form.

special clitics: they differ to a larger extent from their full form, in both phonology (the rules that derive them are less transparent) and syntax (they may occupy different syntactic positions than the full forms.

bound words: morphemes that have the usual restrictions concerning stress and boundedness, but show a greater freedom concerning syntactic distribution than common morphemes are called *bound words* by Zwicky. An example for a bound word is the Latin particle *-que*.

Most of the cases discussed in this chapter are simple clitics. Bound words are not relevant here. An example of the third group, the special clitics, is given in (10).

(10) French special clitics

(a)

Tu **te** laves		
You you 2.SG.ACC wash		'You wash yourself'

(b)

Lave - **toi**.	
Wash you 2.SG.ACC	'Wash yourself'

The French accusative pronoun *te / toi* in (10) is a special clitic, since the clitic form *te* and the nonclitic variety *toi* cannot substituted for one another but their occurrence is required by their syntactic position as can be seen from the contrast in (10)(a) and (10)(b). In German there are some grammaticalized function words that behave like this (see (39)).

As most of the clitic pronouns in German, the ones that are discussed here are "simple" clitics in the typology of Zwicky (1977) (cf. (9)). They can freely be substituted by their full forms. Also, they occupy the same syntactic position as the corresponding full form. Finally, they are related to their full forms by productive rules (see 4.1.2). A list of German clitic pronouns is given below in (11).

(11) Clitic pronouns in German

	1. Sg		2. Sg		3. Sg	
	strong	weak	strong	weak	strong	weak
Nom.	ɪç *I*	ç[6]	du *you*	də	eʁ/ zi:/ʔɛs *he/she/it*	ʁ/ zə/ s - əs
Dat.	miʁ *me*	mə	diʁ *you*	də	i:m/i:·/i:m *him/her/it*	m/ɒ/m̩
Acc.	mɪç *me*	—	dɪç *you*	—	i:n/ zi:/ ɛs *him/her/it*	n̩/ zə/ s - əs
	1. Pl		**2. Pl**		**3. Pl**	
Nom	ʊi: ɐ *we*	vɐ	ʔi.ɐ *you*	ɐ	zi: *they*	zə
Dat	ʔʊns *us*	—	ɔɪç *you*	—	inən *them*	in̩ - in
Acc	ʔʊns *us*	—	ɔɪç *you*	—	zi *they*	zə

Two generalizations can be concluded from this list, which both have been noted before in the literature: first, cliticization is the result of productive phonological rules (cf. Prinz 1991; see also 4.1.2).[7] Second, lexical information is needed in order to license cliticization, because not all German pronouns have a clitic form. There is some confusion in the literature about its exact conditions. It is generally accepted that all nominative pronouns cliticize, as well as some of the accusative pronouns, but none of the genitive ones do. The dative pronouns are problematic. Most authors deny that they can cliticize (cf. Prinz 1991; Wiese 1988), but others mention some dative weak forms, which are claimed to have the same distribution as the nominative ones.

These generalizations also hold for the other function words that cliticize. These include, for example, determiners like *eine* → [nə] 'a.FEM', *ein*, 'a.MASC' and *einen* 'a.MASC.ACC → [ən, n, n̩], etc.

In section 4.2.4 I introduce diagnostics for clitics which show that the dative forms should be counted as clitics: the weak dative forms are constrained by the same prosodic conditions as the other weak forms. The forms in bold have been

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6 The reduction may depend on the syntactic category of the host. See the discussion after example (22) below.

7 Notice that there are exceptions to this, i.e. forms that have to have separate lexical entries for the full form and the reduced one. The determiner *eine*, for example is reduced to *ne* and not to *ən*. On the other hand, there are content words that are reduced in a more extreme way than the rules would predict, for example the word *guten* in *guten abend* is reduced to [**n** abənt] instead of [gʊtn] or [gʊn] (see Rehor & Pätzold 1996: 6). These exceptions have to be separate lexical entries (cf. Prinz 1991).

attested as clitics in various studies[8] (ignoring minor deviations in the phonetic transcriptions). The underlined forms have additionally been attested by Wiese 1988.

Above I mentioned that the German clitics are related to their full forms by rules. As shown in the next section, the same or related rules have been employed in phonetic descriptions of fast speech.

4.1.2 The Segmental Component

I argue in this chapter that the differences between cliticization and fast speech reduction are not due to different rules but to different domains of rule application. The PWd-domain changes with increasing speech rate (see section 4.3.5). To be more explicit: if a PWd serves as a host for a prosodically dependent element, it becomes recursive. At slow speech, only function words trigger such a recursion. At fast speech, the outer domain of a recursive PWd is further expanded: even lexical items (like *geschichte* 'story' in (13)) get prosodically dependent. This is a gradual process and some parts of it are purely phonetic, but it is relevant for phonology, too: there is a categorial distinction between cliticization (at different registers) on the one hand and fast speech reduction on the other hand. In this section I only briefly introduce the relevant rules. In the next sections I discuss their domain of application. In 4.3.5 I return to the rules and I show how they account for the different levels of speech.

To do so, I have to anticipate in (12) the results of the discussion on the recursive PWd in 4.3.3. It is important to mention them here, because otherwise the segmental rules introduced below would not work.

(12) The recursive PWd-domain
The inner PWd is the domain of word stress, i.e. the outer parts of the PWd are not dominated by the foot.
The outer PWd is the domain of syllabification.
The edge between inner and outer PWd is the domain of dialectal intervocalic voicing.

In (13) I illustrate how the prosodic bracketing of a sequence of words changes with increasing speech rate. The bracketing will be justified in 4.3.

8 Abraham & Wiegel 1993; Prinz 1991; Wiese 1988; Wiese 1994; Young-Scholten 1993.

(13) Prosodic bracketing at different speech rates

(a) Formal speech: either no cliticization or cliticization to the syntactically closest element

{ [hat]$_{PWd}$ **[prompt]**$_{PWd}$ [eine]$_{PWd}$ [ge'schichte]$_{PWd}$ [erzählt]$_{PWd}$ → [prɔmt]$_{PWd}$ [ʔaɪnə]$_{PWd}$
[hat]$_{PWd}$ **[prompt]**$_{PWd}$ eine [ge'schichte]$_{PWd}$ [erzählt]$_{PWd}$ → [**n**ə gəschichte] }

(b) Casual speech: cliticization to the right[9] → [prɔmpm̩]
[hat]$_{PWd}$ **[[prompt]**$_{PWd}$ **eine]**$_{PWd}$ [ge'schichte]$_{PWd}$ [erzählt]$_{PWd}$

(c) Fast speech: PWd expansion even across left boundaries
[hat **[prompt eine** [ge'schichte]$_{PWd}$ [erzählt]$_{PWd}$ → [ha prɔmpm̩]~[ha prɔʔŋ̩]

(13)(a)-(c) represent the three categories of postlexical speech.[10] Note that in (13)(a) the proclitic is "stray", i.e. it is not adjoined to a higher category in the prosodic hierarchy. This is discussed in 4.3.4.

Both, (slow speech) cliticization and (fast speech) reduction have the same phonological effects: unstressed vowels are reduced and, if possible, deleted. Consonants are assimilated in place or manner or get deleted, depending on the environment. Below, the rules that derive the reduced forms are given. The rules that I am summing up below are taken from either phonological descriptions of German[11] and or from phonetic descriptions of fast speech. Notice that they apply only in the outer part of the recursive word, which is formally expressed as not being dominated by the foot.

(14) and (15) account for the fact that in spoken German, vowels that are not dominated by a foot reduce to schwa or are deleted.

(14) Vowel reduction

PWd
|
V → ə e.g. [[hat]$_{PWd}$ es]$_{PWd}$ → [hatəs]; [[gib]$_{PWd}$ ihm]$_{PWd}$ → [gibəm]

(14) applies only to vowels that are not dominated by a foot. This condition excludes the vowels within the inner PWd from undergoing reduction.[12] The different application of (14) at the levels of speech is due to the input: At the formal

---

9 (13)(b) is the form that actually occurred.

10 Each of the categories in (13) has phonetically conditioned varieties. For example, the glottalization of the *p* in (13)(c). As stated in Kohler (1996: 12), obstruents may be glottalized at a very high speech rate if a nasal follows. This choice is a gradual process and not predictable in phonology.

11 The phonological descriptions of German deal with the slow speech level only.

12 The occurrence of schwa within PWds is due to lexical processes of schwa-insertion (cf. Hall 1992).

speech level, the function words are often a PWd. I.e. all or nearly all syllables are within feet. In fast speech, the reduction also concerns those content words that lost their PWd-status. Recall the examples in chapter 2, where long sequences of German postfocal PWds were destressed.

ɐ following a vowel in the same PWd is always deleted. This is expressed in the *deletion of a monophthong* in (15).

(15) Deletion of a monophthong (cf. Rehor & Pätzold 1996: 10)

PWd
|
ɐ → Ø / V __ e.g. [[gib]$_{PWd}$ **miɐ**]$_{PWd}$ → [gib**mə**]

Both the inflectional schwas as well as those that result from (14) can be subject to *schwa deletion*. In slow speech, well-formedness-conditions are obeyed (see (22)). i.e. schwa is not deleted if that would result in an ill-formed syllable.

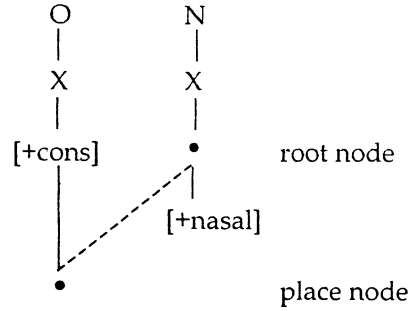
(16) Schwa deletion

PWd
|
ə → Ø e.g. [[gib]$_{PWd}$ **i:m**]$_{PWd}$ → [gibəm] ~ [gibm̩] ~ [gibm]

Notice again that all rules apply only on segments that are not dominated by a foot, i.e. the inner PWd is not reduced. Schwa deletion may trigger a compensatory sonorant syllabification as in [gibm̩], but this is not a necessary condition. Schwa deletion results in adjacent consonants and feeds rules of consonant assimilation. Additionally, final devoicing applies (cf. (45)) and in some dialects intervocalic voicing. This is the subject of section 4.3.

As to the assimilation of coronal nasals to the place of articulation of an adjacent consonant, Hall set up two postlexical rules. The *progressive nasal assimilation* (PNA) should account for assimilations like in *legen* [leg**ŋ**] 'to lay'.

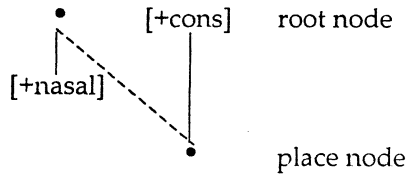
(17) Progressive nasal assimilation (Hall 1992: 193)



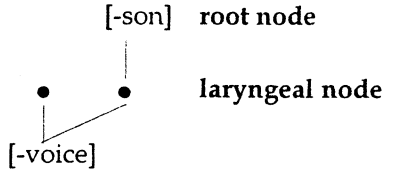
According to Hall (1992: 194), PNA has to be restricted to the onset and nucleus positions in the syllable in (17), since in other positions, nasals do not assimilate (like in *reg.nen* 'to rain' or *Gnade* 'mercy'). This version of PNA does not only account for monomorphemes as Halls examples suggest: at the same time it provides the prosodic environment for the assimilation of nasals in cliticized structures as in (13) *prompt eine* [pʀɔmpm̩].

The *regressive nasal assimilation* (RNA) derives sequences of homorganic n+consonant, like *in Köln* [ɪŋkœln] 'in Cologne'. RNA is more frequent and less constrained.

(18) Regressive nasal assimilation (Hall 1992: 197)



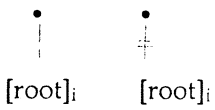
(19) Progressive voicing assimilation (adopted from Kohler 1977: 217)



e.g. *frisch sein*: [ʃz] → [ʃs] 'to be fresh'
wegbringen: [kb] → [kb̥] 'to take away'

If PVA results in identical consonants, it interacts with Degemination.

(20) Degemination



e.g. *das Siebengebirge*: [sz] → [ss] → [s] 'name of area'

Degemination reduces sequences of identical segments.

The last two relevant rules are consonant deletions.

(21) t-deletion

PWd

|

ə → Ø / C__ C(C) e.g. **guten**[Abend]$_{PWd}$ → [gʊn] (after ə-deletion)

According to Kohler (1977: 216) a /t/ which is the second of three consonants is deleted in connected speech. Kohler does not mention it explicitly, but from his data it can be concluded that t-deletion also applies to [d̥] resulting from voicing assimilation (Kohler 1977: 226)), or even to all coronal obstruents.

There are additional segmental conditions that constrain t-deletion. But at fast speech they are overridden. According to my observations, the third consonant is not even required (see section 4.3.5). Therefore, I put it in brackets.

t-deletion also applies to consonants resulting from postlexical assimilation. For example, in the recursive PWD in (81) *[[markus]$_{PWd}$ dem]$_{PWd}$* 'Markus the', the clitic-initial consonant is devoiced by (19) and can then undergo t-deletion resulting in *[markusəm]*.

The postlexical rules apply on domains of different sizes. As mentioned above, some of them are optional. The faster speech is, the more likely they are to apply.

4.1.3 More Data

The data in this chapter come from the following sources: dialectal data from Rhineland German are mostly taken from a corpus that I transcribed from tape-recordings of 4 different conversations at a casual speech level. The fast speech forms have been taken form phonetic descriptions. Another source are the files by Heike (1964) who tape-recorded people telling jokes in the Cologne dialect.[13] Most of the data used in this chapter come the Rhine - Franconian area. One might object to generalizing from these dialects to Standard German. Especially since it has been observed for languages other than German that dialectal differences might occur with respect to the prosodic status of clitics. Peperkamp (1996a, b) has shown that Italian dialects differ in this respect: in some dialects clitics can bear primary stress while in other dialects they cannot.

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[13] The data taken from Heike are given in the original semi-phonetic orthography.

However, such evidence is lacking in German and I therefore assume as the default case that all German dialects incorporate their clitics in an identical fashion. I have chosen the dialectal material to illustrate cliticization, because in Standard German, there is less visible evidence for it: in the dialects I look at (Rhineland German and Franconian) vowel deletion in cliticization does not apply to the same extent as in Standard German. Vowel deletion makes the phonological effects of many cliticizations invisible. To give an example: the sequence *erkläres* 'explain it' would surface as *erklärəs* in the dialects that I look at, whereas in Standard German the vowel of the clitic would be deleted, resulting in *erklärs*. This is an example where cliticization is evident in both Standard German and in the dialect. In most cases however, vowel deletion cannot apply in Standard German for external reasons, e.g. constraints on syllable structure. For example, the sequence *find ich* 'do I find' could not be reduced in Standard German, since vowel deletion would result in the impossible sequence *find'ch*. In the dialectal forms that I cite below, cliticization is realized as vowel reduction rather than as vowel deletion and accordingly, *find ich* can be reduced to *findəç*. That the pronoun is cliticized in the latter case is also evident from the lack of devoicing of the stem-final consonant in *find*. In (22) these segmental constraints on cliticization in Standard German are systematized, taking the pronoun *ich* 'I' as an example.

(22) Segmental constraints on clitics in Standard German

(a) reduction of the pronoun OK

V:	steh+en	'to stand'	steh' ich	→	[ʃte:ç]	'stand + I'
V:+r/ɐ	hör+en	'to listen'	hör' ich	→	[hœɒç]	'listen + I'
V:+n	wohn+en	'to live'	wohn' ich	→	[vo:nç]	'live + I'
V+l	soll+en	'to have to'	soll' ich	→	[sɔlç]	'have to + I'

(b) reduction of the pronoun marginal

p	schnapp+en	'to grab'	schnapp' ich	→	[ʃnapç]	'grab + I'
t	bitt+en	'to ask'	bitt' ich	→	[bɪtç]	'ask + I'
k	pack+en	'to pack'	pack' ich	→	[pakç]	'pack + I'
m	komm+en	'to come'	komm' ich	→	[kɔmç]	'come + I'
ŋ	sing+en	'to sing'	sing' ich	→	[ziŋç]	'sing + I'
V:+l	fühl+en	'to feel'	fühl' ich	→	[fy:lç]	'feel + I'
V+n	sonn+en	'to bask'	sonn' ich	→	[zɔnç]	'bask + I'
V+r	starr+en	'to stare'	starr' ich	→	[ʃtarç]	'stare + I'

(c) reduction of the pronoun unattested

f	schlaf+en	'to sleep'	schlaf' ich	→	*[ʃla:fç]	'sleep + I'
s	hass+en	'to hate'	hass' ich	→	*[hasç]	'hate + I'
ß	nasch+en	'to nibble'	nasch' ich	→	*[naʃç]	'nibble + I'
ç	stech+en	'to prick'	stech' ich	→	*[stɛçç]	'prick + I'
x	mach+en	'to make'	mach' ich	→	*[maxç]	'make + I'

(22)(a) lists reduced forms that result in syllable codas that are accepted by German speakers. Not all of them appear in codas of German monomorphemes, but the sonority decreases and they thus satisfy the well-known 'Sonority Sequencing Principle' (see Jespersen 1904). Some of the German speakers I asked found the forms in (22)(b) better than the forms in (22)(c) but there is a clear contrast to the forms in (22)(a). The reason for the acceptability seems to be the sonority cline in the final syllable, or the fact that a sequence of two fricatives is prohibited, but a more detailed examination with more data would be required in order to clarify this point. Since I am concerned with the dialectal data, I will not go into further details here.

In (23), I present the assumptions concerning clitics that form the basis of this chapter.

(23) Properties of clitics
- (a) They are prosodically deficient (they are no PWd of their own).
- (b) Their reduction does not depend on speech rate.
- (c) They have to meet certain syntactic requirements:
  first, they have to be members of a closed class,
  second, they are in a clitic position.

I will now discuss each of these properties in turn. With respect to prosodic deficiency, (23)(a) needs to be modified slightly. Peperkamp (1996a, 1996b) points out that two clitics behave as a PWd with respect to stress in Italian. This is shown in (24).

(24) Stress on clitics in Italian (Peperkamp 1996)

fá	'do.INF'	cónte	'tell.INF'
fá=lle	'do it'	cónta=lle	'tell it'
fá=ttí=lle	'do it yourself'	cónta=tí=lle	'tell it yourself'

The problem in (24) is that a sequence of two clitics following a host has two main accents. In other words, one of the clitics has main stress. Peperkamp accounts for this by assuming a recursive PWd as in (25).

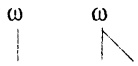
(25) The recursive PWd in Italian (Peperkamp 1996)

tell yourself it 'tell it yourself'

By this, the special prosodic behavior of Italian clitics can be accounted for without assigning them the status of a PWd: the stem is the head of the PWd and is assigned initial stress. The first clitic is assigned an additional stress at the level of the first recursion.

Hall (1997a) argues that a recursion is not necessary if one allows for a sequence of clitics to gain PWd-status.[14] This process is part of a PWd-assignment algorithm Hall assumes for independent reasons. The representation proposed by Hall is given in (26).

(26)



tell yourself it 'tell it yourself'

Contrary to the proposal in (26), phonologists usually assume that clitics are never a prosodic word of their own, they rather somehow have to be prosodically licensed. Therefore, clitics should attach to a member of a higher level of the prosodic hierarchy. This and other prosodic conditions that have to be met in order for cliticization to take place are discussed in section 4.2.

With respect to the second property of clitics, I have claimed in (23)(b) that cliticization is independent of speech rate. A priori, this should not be a controversial point but this view is not shared by all phonologists (cf. Baumann 1995 for the opposing view). In section 4.3.5 I show that the standard cliticization and the casual speech reduction are two sides of the same coin: reduction processes either respect syntactic information (in that case only the forms that meet the conditions in (23) are subject to them). Or, at faster speech, all unstressed forms are subject to these reduction processes.

Clitics have to be member of the closed class of function words. But functional categories do not necessarily cliticize. They can also get prosodic word status by

14 See also Monachesi (1996).

their syntactic properties. Recall from chapter 2 that focused forms, extraposed forms, and remnants of coordination reduction are always PWds of their own. Examples are given in (27).

(27) PWd assignment through syntactic properties

(a) IHM$_i$ habe ich t$_i$ das Buch gegeben (topicalization)
HIM have I the book given
'It was him who I gave the book to'

(b) Ich habe IHM und nicht IHR das Buch gegeben (contrastive focus)
I have HIM and not HER the book given
'I gave the book to HIM, not to HER'

(c) Ich habe [SEIN ø] und [IHR Buch] gelesen (remnant of ellipsis)
I have HIS and HER book read
'I have read his book and her book'

The pronouns in capital letters in (27) cannot be reduced to [əm] or [sən]. Selkirk (1995) formulates this generalization (with respect to English) as in (28):

(28) Focused fnc (Selkirk 1995: 447)
Focussed fnc When focussed, a function word always appears in strong form.

Examples from English are given in (29).

(29) Examples of focused fnc in English (Selkirk 1995: 447)
She spoke AT the microphone, not WITH it.
Bettina CAN speak, but refuses to.
We need HER, not HIM.

This correlates with an earlier observation by Wennerstrom (1993) who noticed that there is a correlation between the prosodic word status and the assignment of a focus accent on prefixes in English. Examples are given in (30).

(30) Focus on English prefixes (Wennerstrom 1993: 311)
That country has both INternal and EXternal problems.
Grades for this class are either satisfactory or UNsatisfactory.
A national health plan and an INTERnational trade policy.

From data like these, Wennerstrom concludes that grammatical categories that can potentially be focused are always PWds. This is not a necessary conclusion. One

might as well assume that the PWd-status is assigned to these forms under focus (see section 1.4.2.4).

4.1.4 Summary

In this section, I summarize the prosodic shapes in which clitics appear in German. (31) is a list of examples and (32) sums up their assumed internal prosodic structure.[15] The relevant forms are in bold type.

(31) Prosodic shapes of clitics in German

(a) Enclitic function word

hab=**ich** 'have I'
[ha.biç]
have I

(b) Proclitic function word

ein=auto 'a car'
[n̩ ʔauto] but also: [**aɪn** ʔaʊto]
a car

(c) Focused function word

(Sie kann es wissen) aber sag **IHM** das nicht!
[za:k.ʔ**i:m**] *[za:.gəm]
she may it know but say him it not
'She may know it but don't tell HIM anything'

(d) Fossilized function word

Damit gehe ich **zu dem** Anwalt
*with this go I **to the** lawyer*
'I take this to the lawyer' (referential meaning)

Damit gehe ich **zum** Anwalt
*with this go I **to a** lawyer*
'I take this to a (any) lawyer' (generic meaning)

---

15 See section 4.2 for the phonological evidence in favor of the proposed prosodic representations.

(e) Lexical word
Ist da eine **AUSstellung**?
is there an ***exhibition****?*

(f) Destressed lexical word (fast speech only)
Q: Ist da eine Ausstellung? 'Is there an exhibition going on?'
A: In EINem Geschoß ist noch=**Ausstellung**
[nɔ.ɤau.ʃtɛ.luŋ]
at ONE level is still exhibition
'At one level there is still an exhibition going on'

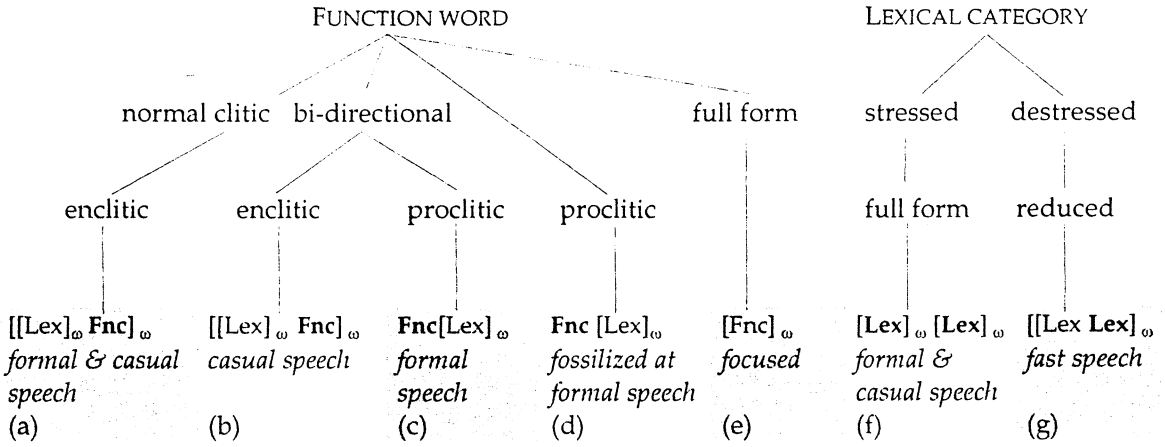
These forms pose a challenge for prosodic phonology since they do not behave homogeneously with respect to word-level regularities, such as syllabification. The most important distinction is between function words in (31)(a)-(d) as opposed to lexical items in (31)(e)-(f). Besides this, one has to consider differences within these groups: function words behave differently at casual speech level and formal speech level and when focused. Notice that the difference between enclitics and proclitics (as in (31)(a) and (b)) does not only lie in their direction. Contrary to enclitics, proclitics do not syllabify together with their assumed host. Their clitic nature can be concluded from the fact that they often only consist of a syllable with a schwa. Such syllables can never be PWds in German. Hence, they must be represented otherwise.

A case that has to be treated separately are the "fossilized" varieties of function words. While the other cliticizations are simple clitics (see below for arguments), the clitic and its corresponding full form in (31)(d) cannot be exchanged freely since they have different meanings.[16]

Concerning lexical items, there is a difference in their prosodic status before and after the focus within the utterance. This can be seen from the contrast between (31)(e) and (f). In (31)(e) the standard case is given. The noun *Ausstellung* 'exhibition' carries the final rise of the question intonation. It is stressed. The same noun is background information in the context of (31)(f) and it follows the focus. In casual speech, lexical items in this context behave like function words, e.g. they are destressed. The prosodic representations that I assume can account for this. They are given in (32).

16 See section 4.2.3 for the details.

(32) Summary of prosodic words in German



(32)(a) is the prosodic representation of the common enclitic forms. As, for example, in *[[hab]*$_{PWd}$ *ən]*$_{PWd}$ 'got him' function words are usually hosted by a PWd to their left. Thereby, they cause a recursion. At a casual speech level, bi-directional clitics also attach leftwards, as shown in (32)(b). Proclitic forms, as in (32)(c), are less common. Only in formal speech, bi-directional pronouns are proclitic, because the grammatical relation to the noun they determine is relevant. This is usually the case in determiner + noun sequences, for example *ein auto* 'a car' [ən ʔaʊto] (see section 4.3.4).

Another special case are the "fossilized" forms in (32)(d), for example *zum*, which is a cliticization from *zu* + *dem* 'to the'. Although they appear to be simple clitics, these forms have their own lexical entries (see section 4.2.3). In (32)(e) the representation for a focused function word is given. Focused forms are always a PWd.

(32)(f) and (g) illustrate the prosody of lexical forms. They have PWd-brackets when they leave the lexicon, but it they do not always remain PWds. Depending on speech rate, destressed PWds can be incorporated into other PWds, as illustrated (32)(g). This is shown in section 4.3.

4.2 Clitics in Standard German and in some Dialects

I now discuss to the types of clitics in turn. After that I introduce the diagnostics I use in order to identify cliticization and to distinguish cliticization from fast speech reduction.

The model of postlexical phonology in (3) accounts for the different classes of weak forms, that is simple enclitics and proclitics, as well as casual speech reductions. (3) allows for two kinds of domains in the postlexical phonology: they may

either mirror the syntax, or they may consist of larger chunks. Depending on the input to prosody, postlexical domains are smaller or larger. Let us first have a closer look to one type of weak forms, i.e. simple enclitics.

4.2.1 Enclitics

In the unmarked case, a clitic incorporates into the preceding PWd in German. (33) shows some of these typical cliticizations. They all show resyllabification, i.e. the final consonant of a preceding word is resyllabified as the onset of the clitic. For this reason, I analyze the forms in (33) as enclitics.

(33) Clitics in Rhineland German (enclitic)

(a) [erklä.**ret]** mal
erklär=es mal
*explain **it** for once*
'explain it please'

(b) dat [fin.**dich]** auch
das find=**ich** auch
*this think **I** as well*
'I agree to that'

As can be seen from (34), resyllabification restricted to the PWd. The sequence *C.V* is not resyllabified to *.CV* in, for example, adjective-noun sequences or object-verb sequences, which form two separate PWds.

(34)

n roten kreuz [sac**k**]$_{PWd}$ [**a**ufgeschlitzt]$_{PWd}$
[k.ʔa]
a Red Cross bag torn apart
'(he) has torn apart a bag from the Red Cross'

The insertion of the glottal stop between the noun and the verb shows that resyllabification has not taken place there.

The question these data raise concern the prosody of the clitic forms. How are they constrained and what does the resulting structure look like?

4.2.2 The Factors Governing Enclisis

Cliticization is a problem for all prosodic hierarchy accounts, since it yields a prosodic structure where two non-identical forms (a PWd and a non-PWd) are sisters. Nespor & Vogel (1986) proposed the category clitic group in order to account for

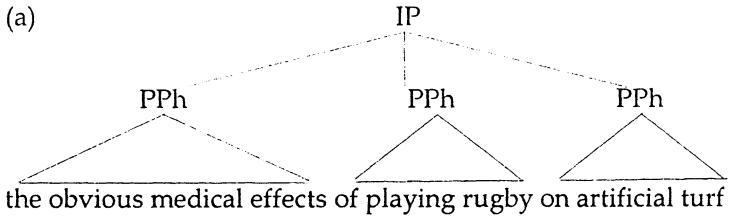
this structure. However, this category has not been unrestrictively accepted in the literature for two reasons. First, there is little independent evidence for this constituent and, second, some cliticization phenomena cannot be accounted for with the clitic group.[17] A famous example is the Hausa particle *fa* that attaches to the Phonological Phrase (see section 1.4.2.2).

For these reasons, most authors do without the clitic group. Instead they assume that the clitic and its host form a PWd.[18] This proposal, however, faces a different problem, namely a violation of the Strict Layer Hypothesis (SLH, see section 1.4.2.1). Since the host is usually a PWd, the result of cliticization is that this PWd is dominated by another PWd, i.e. a recursion, which is ruled out by the SLH.

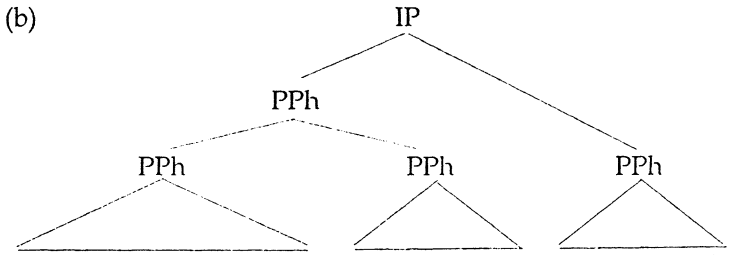
This kind of violation has first been discussed by Ladd (1996), based on evidence in favor of recursive PPhs like the one given in (35)(a).

(35) Recursion of the PPh (Ladd 1996: 5)

(a)



(b)



Experimental data on the prosodic disambiguation of the otherwise ambiguous structures in (35)(a) and (b) showed that for (b), a recursion of a PPh has to be assumed. As a consequence, Ladd proposed in several papers a weakened version of the SLH, the ranking and uniformity conditions which allow for recursions like in (35)(b).

However, even the weakened version of the SLH cannot account for cliticization, because heterogeneous sisters are excluded by the ranking condition: "*In a prosodic tree, all the nodes immediately dominated by a given node N must be of uniform*

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17 Cf. also Peperkamp (1996b) who argues convincingly that the notion of the clitic group is not even necessary in order to account for the cases used as its support by Nespor & Vogel (1986).

18 In 4.3 other representations for clitics are discussed.

rank." (Ladd 1992: 18). Since clitics are no PWds, cliticization results in heterogeneous sisters: [[host]$_{PWd}$ [clitic]$_{\sigma}$]$_{PWd}$.

Revising the traditional prosodic hierarchy by allowing for heterogeneous sisters is impossible since then the hierarchy would permit all kinds of ungrammatical structures. As a consequence, Selkirk (1995) proposes to split up the SLH into ranked and violable constraints, among them the so-called constraints on *prosodic domination* which have been mentioned in 1.4.2.5. They are explained below.

(36) Word Alignment constraints
ALIGN (LEX, L; PWD, L), *short: ALIGN LEXL*
ALIGN (LEX, R; PWD, R), *short: ALIGN LEXR*

The word alignment constraints in (36) demand that the edges of lexical items coincide with the corresponding boundary of a PWd, i.e. a right edge of a lexical item should coincide with a right PWd boundary. The prosodic word alignment constraints in (37) take care of the PWd-edges: they demand that a PWd boundary coincides with the boundary of a lexical category (rather than with the boundary of a function word).

(37) Prosodic word Alignment constraints
Align (PWd, L; Lex, L), *short: Align PWdL*
Align (PWd, R; Lex, R), *short: Align PWdR*

These constraints can be violated, for example if a function word is incorporated into a phonological word. A cliticization structure such as [Lex clitic]$_{PWd}$ violates both (36) and (37). (36) is violated since the right edge of the lexical word does not coincide with a prosodic word edge. (37) is violated since the right prosodic boundary coincides with a function word instead of a lexical word.

In German, enclisis is preferred over proclisis. This corresponds to the assumption that the left edge of a PWd is cross-linguistically well-protected (cf. Selkirk 1995). In terms of Optimality Theory, as Selkirk put it, enclisis satisfies the constraint ALIGNLEXL which militates against a violation of left word edges and which is often unviolable (see 1.4.2.5). Enclisis results in a prosodic structure where the left edge of a lexical category coincides with the left edge of a prosodic word: LEX, L; PWD, L.

As mentioned above, proclitics do not syllabify together with their host, i.e., they are not incorporated into the PWd they precede. The reason is that it would produce a lexical category that has no prosodic word boundary at its left edge. In

other words, ALIGNLEXL would be violated. This can be seen in (38). *[Lexapfel]* requires a left boundary of a PWd coinciding with its left lexical boundary, thus *[PWd; Lexapfel]*. If ən forms a PWd together with its host, this condition is not fulfilled any more. The following mismatch appears *[PWd ən [Lex apfel]]* in which the left boundary of the PWd and the Lexical category do not coincide. I assume that the blocking of syllabification is the reason why proclitics are so rare. They probably require more articulatory effort.

(38) Enclisis

{ ha.b } LEX {einen}FNC {apfel}LEX	{hab}LEX{einen}FNC {apfel}LEX	(morph. bracketing)
gegessen	gegessen	(phon. bracketing)
Enclisis	proclisis (formal speech)	
[hab=ən]PWd apfel gegessen	[hap] [ən ʔapfəl][gegessen]	* [napfəl]
I have an apple eaten	*I have an apple eaten*	*an apple*

While enclisis is a good strategy to preserve the left edge of a lexical form, it still generates a mismatch between the phonological and the morphological structure at its right edge, as illustrated in (39).

(39) Phonology-Morphology mismatch

erklär=**es** mal	dat find=**ich** auch	
explain it for once	*this think I as well*	
{erklär} {et} mal	dat {find} {ich} auch	(morphological bracketing)
[[erklä]$_\sigma$ [**ret**]$_\sigma$]PWd mal	dat [[fin]$_\sigma$ [**dich**]$_\sigma$]PWd auch	(phonological bracketing)

(39) shows how cliticization affects phonology: vowel-initial clitics trigger a resyllabification of a stem-final consonant into the following syllable. This is in accordance with the constraints of Selkirk: the syllabification shows that the function word (in bold) forms a PWd with the preceding host. The resulting structure violates the low-ranked constraint ALIGN PWDR since the right edge of the PWd does not coincide with a lexical category. However, if cliticization had not taken place and the function word was its own PWd, i.e. *[ich]PWd*, this constraint would be violated similarly: the right edge of the PWd *[ich]PWd* does not coincide with a lexical category, but with a function word. In addition, *[ich]PWd* would violate Align PWdL, since the left edge of the PWd does not coincide with a lexical item either.

4.2.3 Special cliticizations

Apart from the enclitic forms above, other cliticizations occur in German that I do not consider, because they are part of the lexicon. For the sake of completeness, I list them here.

(40) Clitic and full form as allomorphs

(a) damit gehe ich **zu dem** Anwalt
with this I will go ***to the*** *lawyer* (*zu dem* has a referential meaning)

(b) damit gehe ich **zum** Anwalt
with this I will go ***to a*** *lawyer* (*zum* has a generic meaning)

(c) Karl ist Weltmeister **im / *in dem** Schwimmen (Prinz 1991: 106)
*Karl is world champion in / *in the swimming*
'Karl is the world champion of swimming'

(d) Jemanden **hinters / *hinter das** Licht führen (Prinz 1991: 106)
someone behind the light lead
'to fool someone'

The allomorphs in (40)(a) and (b) are historically related: *zum* used to be a "simple clitic" in Zwicky's (1977) typology. In (40)(c) an example is given where the full forms is ungrammatical and (40)(d) shows the same with an idiomatic expression. All the forms have been derived by phonological rules from the full form *zu dem; in dem, hinter das*. However, at a certain stage in the development, the reduced form (or, more precisely, one of them) fossilized: it became more frequent and finally was assigned a meaning that differed from the full form. In the case of (40)(a) and (b) the referential meaning 'a certain X' as opposed to the generic meaning in 'some X' (40)(b) (cf. Kaisse 1985 for details on the grammaticalization of cliticized forms). This "semantic split" results in lexicalization (cf. Raffelsiefen 1987).

The clitic forms can be related to their full forms by productive rules, but nevertheless, one has to assume that these clitics are separate lexical entries (cf. Schellinger 1988). Their full form, for example *zu dem* 'to the' can never be cliticized. Since the full form and the cliticized form cannot be substituted for one another, they have separate lexical entries.[19]

A debate some years ago concerned the question whether clitics have to be specified individually for a certain direction (cf. Klavans 1985), or whether languages have a preferred direction for cliticization (cf. Booij 1996). In German,

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19 Cf. Selkirk (1995: 447).

clitics clearly prefer to cliticize to the left, but there is a small number of bi-directional clitics.[20] An example of a bi-directional clitic is given in (41).

(41) Bi-directional clitics
ich hab (ə)n apfel gegessen
I have an apple eaten
'I have eaten an apple'

(a) ich [ha.b=ən apfəl] gegessen (enclitic)

(b) ich [hap ən=ʔapfəl] gegessen (proclitic)

The determiner *ən* (reduced from *einen* 'a/an.MASC') cliticizes either to the left or to the right.

Bi-directionality is restricted to determiners. This is no coincidence, but rather the consequence of two conflicting principles concerning them: on the one hand, as described above, the left edge of a PWd is strongly protected. Proclisis as in (42) however, yields a structure that violates this left edge.

(42) Violation of left PWd-edge
[kauf]$_{LEX}$ einen [Apfel]$_{LEX}$ → [kauf]$_{PWd}$ [einen Apfel]$_{PWd}$ → Left edge of PWd not a LEX
buy an apple buy an apple

On the other hand, determiners always precede the noun they modify. Enclisis therefore results in a mismatch between the prosodic and the syntactic structure, as illustrated in (43).

(43) Phonology-syntax mismatch
[[kauf] [einen Apfel]$_{NP}$]$_{VP}$ → [kauf einen]$_{PWd}$ [Apfel]$_{PWd}$ → Syntax-Phonology Mismatch
buy an apple buy an apple

The enclitic structure in (43) creates a mismatch between the syntactic and prosodic structure, whereas the proclitic structure in (42) preserves the syntactic bracketing, but at the cost of a violation of the left edge of the PWd *Apfel* 'apple'.

The less formal and faster speech becomes, the less relevant is syntactic constituency and forms such as in (43) (the phonetic realization is given in (44)) are then strongly preferred. This has already been observed by Selkirk (1986) for languages other than German.

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[20] There is no clitic that occurs only as a proclitic form.

(44) Casual speech reduction (cf. 4.2.4 for diagnostics for clitics)
hat prompt eine geschichte erzählt
hat [prɔmpm̩]PWd geschichte erzählt
has immediately a story told
'...has immediately told a story'

Casual speech reductions have some characteristics that distinguish them from cliticization. In casual speech, all unstressed forms are reduced, regardless of their syntactic status. Besides, casual speech reduction is typically backwards, regardless of the syntactic relation of the reduced form and its host. Therefore, I argue that these cases cannot be regarded as cliticization. This is the topic of section 4.3.5.

I claim here that the types of reduced forms described above have to be accounted for separately: enclisis differs from proclisis with respect to the way it is prosodically licensed and they both differ from casual speech reduction due to the different role syntax plays.

If for the reasons mentioned above, data such as the ones in (41) can be excluded from consideration, cliticization in German supports Booij's (1996: 17) assumption according to which languages have a preferred direction for cliticization. On the basis of Dutch he concludes - contrary to Klavans (1985) - that directionality does not have to be stored in the lexicon for each clitic individually. As we will see from 4.3.3, German differs from Dutch with respect to the types of prosodic representation, but the basic idea is the same: the (rare) proclitic forms are a limited exceptional category. Proclisis is limited to determiners.

4.2.4 Diagnostics for Clitics

There are some - although not many - diagnostics that show that a host plus clitic form a syllabification domain. Below they are introduced.

Based on the assumption that the PWd is the domain of syllabification, two types of evidence from German phonology show that cliticization results in the prosodic pattern in (1). First, some segmental phenomena refer to the PWd and should therefore apply on a clitic plus its host if they form a PWd. This is shown below. The second type of evidence are phenomena that directly refer to the recursive structure resulting from cliticization. I show in section 4.2 that there is a rule in German that applies only to the boundary between a host and clitic.

The first rule that illustrates that a clitic and its host are in the same PWd is common to both Standard German and dialectal forms. In German, syllable-final obstruents are devoiced.[21]

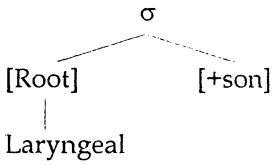
(45) Final devoicing in German (Hall 1992: 53, Vennemann 1972)
[-son] → [-voice] / __]$_\sigma$

(45) says that a syllable-final obstruent devoices. Since the PWd is the domain of syllabification, the application or nonapplication of final devoicing indicates the boundaries of this domain.

Recent literature on voiced and voiceless obstruents takes the opposing view, according to which it is more economic to state the places where a voiced obstruent is licensed in German (cf. Lombardi 1991, 1995; Jessen 1996). These proposals assume that laryngeal features such as [voice] are privative, i.e. only the positive specification of this feature plays a role in the phonology and they have no negative specification to refer to. Therefore, a rule as in (45) that introduces a negative specification for [voice] is impossible.

According to Lombardi, a laryngeal node in a consonant is only licensed if a tautosyllabic [+son] segment follows. She expresses this formally in the Laryngeal Constraint, given in (46) below.

(46) Laryngeal Constraint (Lombardi 1995, see also Jessen 1996)



In the data under consideration repeated in (47), a laryngeal node (here, a specification for [voice]) is licensed in a stem-final consonant if it precedes a vowel-initial clitic in the same syllable. This is the case, since the stem-final consonant has been resyllabified to the onset of the following syllable.

(47)
dat fin.**d**ich auch
das finde=ich auch
this think I as well
'I agree with that'

---

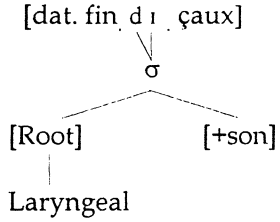
21 Cf. Hall (1992) for arguments against other domains proposed for final devoicing.

dat [ɪ.zən]runder Turm
das is=ein runder turm
this is a round tower

In both accounts, the absence of final devoicing of the host-final obstruents shows that the clitics form a PWd together with their host. The obstruent has been resyllabified to the onset of the following vowel-initial clitic with whom it shares a PWd. The structure resulting from cliticization and resyllabification is presented in (48).

(48)

dat find=ich=auch 'I agree with that'
[dat. fin. d ɪ . çaux]



(48) fulfills the Laryngeal Constraint in (46) because the laryngeal feature [voice] of the *d* is licensed by the following vowel (which is [+son] by default).

Another piece of evidence for the prosodic integration of a function word into a PWd is nasal assimilation. The PWd is the domain of nasal assimilation (see (6))[22]. This can be concluded from the fact that there are no word-internal sequences of nasal plus non-homorganic consonant. E.g. there are sequences like *Anker* [ʔaŋkɐ] 'anchor'; *ampel* [ʔampəl] 'traffic light' and so on within a single PWd, but no PWd contains sequences like *[ʔankɐ] or *[ʔanpəl]. An example for this is given in (49).

(49) The domain of nasal assimilation at formal speech

(a)	(b)
ich hab n apfel gegesssen	ich hab neun äpfel gegessen
ich [hapm̩]$_{PWd}$ apfel gegesssen	ich [hap]$_{PWd}$ [neun]$_{PWd}$ äpfel gegessen
I have an apple eaten	*I have nine apples eaten*
'I have eaten an apple'	'I have eaten nine apples'

The sequence *bn* in *hab n̩* 'have an' is realized with agreement of the place of articulation [*habm̩*] in (49)(a). The same sequence, however, in two independent

22 This claim is only true if one assumes that at fast speech the PWd is expanded.

PWds such as in *hab neun* in (49)(b) does not trigger assimilation. **hab meun* would be ill-formed.[23]

The same restriction concerning the domain holds for *r*-vocalization. A sequence of V+*r* is realized as [ɐ], unless the segments are separated by a syllable-boundary. In a sequence of a word-final *r* followed by a vowel-initial constituent, the occurrence of [ɐ] indicates that no resyllabification has taken place. This can be illustrated with the data I mentioned in footnote 5 already. In Franconian, some prefixes syllabify together with the following stem, in other words, they are no PWd. This can be seen from the prefix *ver-* in (50).

(50) The prosodic status of prefixes: dialectal variation

Standard German	Franconian
[vɐ.(ʔ)aɪn]	[və.ʀaɪn]
[ver-]$_{PWd}$ [ein]$_{PWd}$	[verein]$_{PWd}$
re- one	
'union'	

From the phonetic forms in the first line, especially from the occurrence of prefix-final *[ɐ]* in Standard German and *[ʀ]* in Franconian, it can be concluded that in Franconian the prefix *ver-* is no PWd. Instead, it syllabifies together with the following stem. Accordingly, sequences of host plus clitic can be judged by the phonetic realization of *V+r* sequences, as in (51).

(51) V+*R* sequencs

(a)
erklä.ʀ**et** mal
erklär=**es** mal
explain it once

(b)

ɔɐ [ʔant]wortet nicht	*[e.ʀant]wortet nicht
er antwortet nicht	
he replies not	
'he does not reply'	

From the contrast between (51)(a) and (b) one can see once again that proclitics do not syllabify with their potential host. Yet the clitic is no independent PWd either, because it is only a schwa-syllable (see (6).

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[23] The ill-formed sequence in (49)(b) could well occur at a high speech rate. But this level is not the level of cliticization. I am here dealing with cliticization in the strict sense, not with fast speech reductions.

There is evidence in favor of the recursion, i.e. a rule that refers to this structure after cliticization. This rule is dialectal and typical of the Rhinelandian / Franconian area. In these dialects intervocalic obstruents are voiced, but only if the obstruent is stem-final and followed by a clitic. This can be seen from the contrasts in (52)(a) and (b):

(52) Intervocalic voiceless obstruents in Rhinelandian / Franconian dialects

(a) obstruents become voiced

dat=is doch**[x]**=en guter raum da[24]	jof dä strik=op (Heike 1964)
[dɔɣən]	jof dä [ʃtRɪ.gɔp]
this is but a good room there	*gave the argument up*
'but this is a good room there'	'gave up the argument'

(b) obstruents remain voiceless

n roten kreuz sack **a**ufgeschlitzt...	musstja zwei **t**ürn haben
n roten kreuz [sac**k**]$_{PWd}$ **[a**ufgeschlitzt]$_{PWd}$...	musstja [zwei]$_{PWd}$ [**t**ürn]$_{PWd}$ haben
a Red Cross bag torn apart	*have to 3SG two doors have*
'(he) has torn apart a bag from the Red Cross'	'you got to have two doors'

In (52)(a) the proposed environment for the rule is met. It applies between a clitic and its host. In (52)(b) it can be seen that the rule is blocked if the target consonant and the trigger vowel are separated by a left prosodic boundary. Like nasal assimilation, intervocalic voicing is an indicator for prosodic constituency, since the voicing rule is restricted to the environment between clitic and host word. It shows that a recursion is needed. In section 4.3.3 I look at intervocalic voicing again and I demonstrate that the other representations for clitics fail to account for it.

4.3 The Prosody of Cliticization

In this section, the various proposals that have been made in the literature to account for the right prosodic structure of clitics are compared. (5) is repeated here for ease of presentation.

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[24] The voiced velar fricative resulting from intervocalic voicing does not exist in Standard German, but in the Cologne dialect it also appears in monomorphemes, such as *Wagen* [ʋaɣən] 'car'.

(53) Potential prosodic incorporations of clitics

(a) $[host]_{\omega}clitic_{\omega}]_{CG}$	(cf. Hayes 1989, Nespor & Vogel 1983, 1986 and later)
(b) $[[host]_{\omega}$ clitic $]_{\omega}$	(cf. Booij 1996, Peperkamp 1995)
(c) [host clitic] $_{\omega}$	(cf. Booij 1996)
(d) $[[host]_{\omega}$ clitic$]_{\Phi}$	(cf. Peperkamp 1997, Selkirk 1995, Wiese 1996)
(e) $[host]_{PWd}$ <clitic>	(Hall p.c., Grijzenhout 1997)

4.3.1-4.3.3 deal with enclitics, while 4.3.4 is devoted to proclitics. In 4.3.5 I turn again to the characteristics of clitics and fast speech and I show how my approach accounts for them. The result of the discussion will be that encliticization yields a recursive PWd as in (53)(b), while the (rare) proclitics remain unassociated as in (53)(e).

4.3.1 The Clitic Group

It has often been assumed in the literature that cliticization results in a new prosodic constituent, since cases of mismatches between phonological and morphological constituency similar to those shown in (54), occur in many languages.

(54) Mismatches resulting from cliticization

{dat}{suggeriert}={et} {doch}	dat [find]=[ich] auch	(morphological bracketing)
[dat] [zʊgəri:ɐ] [det] [dɔx]	dat [fin] [dich] auch	(phonological bracketing)
this suggests it well	*this think I as well*	
'But this does it suggest'	'I think this, too'	

In cases like these, phonological and morphological boundaries do not match and at the same time, domains are created that are larger than the PWds. Hayes (1990) and Nespor & Vogel (1986) were the first to propose that clitics and their host form a special kind of prosodic constituent, the clitic group. According to Nespor & Vogel, the clitic group (CG) is a prosodic constituent between the Phonological Word and the Phonological Phrase.

(55) The Clitic Group in the Prosodic Hierarchy (Nespor & Vogel 1986)

Phonological Phrase
|
Clitic Group
|
Phonological Word

CGs are derived from the syntax by an algorithm reproduced in (56) and (57) (see Nespor and Vogel 1983; Nespor and Vogel 1986: 154-155).

(56) Clitic Group Formation

i) Clitic Group Domain
The domain of CG consists of a PW containing an independent (i.e. nonclitic) word plus any adjacent PWs containing

a) a DCL, or

b) a CL such that there is no possible host with which it shares more category memberships.

(DCL = Directional Clitic; CL = Clitic)

ii) Clitic Group Construction
Join into an n-ary branching CG all PWs included in a string delimited by the definition of the domain of CG.

The CG-algorithm was later revised by Vogel in order to account for compounds, which in some languages (but by far not all) behave as clitic groups.

(57) Clitic Group Domain (revised) (Vogel 1990: 453)
The domain of CG consists of a PW or PWs containing any independent word(s)

dominated by the $\left\{\begin{matrix}\text{highest}\\ \text{lowest}\end{matrix}\right\}$ X^0 node plus any adjacent PWs (...)

The evidence for revising the Clitic Group Domain in this way may at the same time serve as evidence in favor of the Clitic Group itself. In languages which choose the second option and form their CGs based on the lowest X^0 nodes, a mismatch between syntax and phonology can be observed: syntactically, the two members of a compound behave as one single constituent, phonologically, the first member of the compound plus the determiner behave as a single constituent (in that the determiner cliticizes to the first member of the compound). This can be seen from the behavior of these constituents with respect to phonological rules, such as stress assignment.

Several linguists have argued that the clitic group is not necessary in order to account for the data (e.g. Inkelas (1990); Zec & Inkelas (1991)). Peperkamp (1996b) takes a detailed look at some of the famous evidence in favor of this category and offers alternative proposals. In her account, clitics can be prosodically licensed in three ways: they either incorporate into the preceding PWd or into the proceedings PPh or they can incorporate into the host word, resulting in a compound PWd. For German, Prinz (1991) and Wiese (1996) have argued against the clitic group.

But there is a dialectal phenomenon in German that - at first sight - gives rise to the assumption of a CG, i.e. the voicing of intervocalic obstruents. Examples are provided in (58).

(58)

(a) k → g

jof dä [ʃtRɪ.gɔp] (Cologne dialect; see Heike 1964)
jof dä stri.**k**=op
gab den Streit auf (Standard German)
gave the argument up
'gave up the argument'

das [meɐ.gich]
das merk=ich
this notice I
I notice that

(b) t → d

von [doɒ.**d**aus] (Franconian)
von dor**t**=aus
from there on

wie jei.[**d**ət] dann? (Cologne dialekt; see Heike 1964)
wie jei**t**=et denn?
how is it going?

[staɪ.**d**ənsˌ] (Cologne dialekt; see Heike 1964)
stei**t**=ens
stands once
'once there stood...'

Ich [braː.**d**ən]
ich bra**t**=ihn
I bake him

(c) /p/ → [b]

das [ti.**b**içˌ] noch mal neu
das tipp=ich noch mal neu
that type I once again new
'I am going to type this again'

(d) /f/ →[v]

das [hɔ.**v**ɪçˌ] auch
das hoffe=ich auch[25]
this hope I too
'I hope this as well'

Between a clitic and its host word, intervocalic obstruents regularly become voiced, even at slower speech rates.[26] These data seem to require the clitic group

[25] After schwa-deletion.

as a domain, since this is where intervocalic voicing takes place. The rule could then be stated as follows:

(59) Intervocalic voicing (to be revised)
[-son] → [+voice] / V __ V]$_{CG}$

The rule in (59) is constrained by Clitic Group boundaries, a so-called domain span rule (cf. chapter 1). Assuming that clitics are represented as in (60), (59) correctly voices obstruents at the boundary between clitic and a host word.

(60) Intervocalic voicing in the Clitic Group

von dort=aus	
von [[dor**t**] aus]$_{CG}$	Prosodic representation
[dɔɐ.**d**aʊs]	Phonetic form
from there on	
wie jeit=et dann?	(Heike 1967)
wie [[jei**t**] et] $_{CG}$ dann	Prosodic representation
[jaɪ**d**ət]	
how is it going?	

The problem with respect to a rule applying in the clitic group is that it overgenerates voiced obstruents. It would consequently voice all intervocalic obstruents within the domain of a clitic group. However, as can be seen from (61), voiceless intervocalic obstruents can occur within the clitic group.[27] In (61)(a), a voiceless obstruent occurs intervocalically before an inflectional ending, in (61)(b) within a single morpheme and in (61)(c) between the two members of a compound.

(61)

(a) inflected form	(b) monomorpheme	(c) compound	
(a) bra[**t**ə]n	(b) Bra[**t**ə]n	(c) bra**t**apfel	
[brat + en]	[Braten]	[Brat] [Apfel]	(morphological bracketing)
roast.INF	*roast(N)*	*roast apple*	
'to roast'	'roast'	'roasted apple'	

---

26 This can only be illustrated with stems ending in *-t* plus clitic or with the first person singular pronoun following, since the other pronouns require inflectional endings that cannot be deleted (in contrast to the first person singular ending *-e*, which is deleted in non-formal speech).

27 The cases in (61) are chosen in order to illustrate the various morphological options. Therefore, they are all single PWds, which does not weaken my argument: they are either CGs at the same time or they are contained in a (larger) CG, but in any case the voiced obstruents are PWd-internal and CG-internal at the same time.

Besides this, in combinations of host words plus clitics, intervocalic obstruents in positions other than the one at the boundary between host and clitic are not voiced (cf. (62)).

(62)
reitest=du
[reiteste]$_{CG}$
ride you
do you ride?

From these date I conclude that intervocalic voicing does not take the CG as its domain (see below for my analysis). Since this is the only rule in German that was a potential candidate for such a rule, I agree with Wiese (1988) and Prinz (1991) that there is no CG in German.

An additional problem for a constituent CG is the proclitic realization of bi-directional determiners like *einen* 'a'. Although usually enclitic, in formal speech (as in (63)(b)) it is not syllabified with the preceding word. The final obstruent of the preceding word *hab* 'have.1SG' is devoiced. This shows that it has not been re-syllabified to the onset of the following clitic.[28]

(63) Bi-directional clitics

(a) enclitic:					(b) proclitic:				(c)
ich [{ha.b}$_{LEX}$ ən]$_{W}$		[apfel]$_{LEX+W}$		gegessen	ich hap [$_{W}$ ən { $_{LEX}$ ʔapfəl] $_{LEX+W}$				* [nap.fəl]
I	*have*	*an*	*apple*	*eaten*	*I*	*have*	*an*	*apple*	*an apple*

According to Prinz (1991: 80) the proclitic forms must be prosodically licensed by incorporating into the following PWd for theoretical reasons, since other representations would violate the Strict Layer Hypothesis (see section 1.4.2.1).

Incorporation into the PWd would then result in the prosodic structures in (64).

(64)

(a) enclitic					* (b) proclitic			
[ich]$_{PWd}$ **[habən]$_{PWd}$**		**[apfel]$_{PWd}$**		gegessen	[ich]$_{PWd}$ **[hap]$_{PWd}$**		**[napfəl]$_{PWd}$**	gegessen
or:								
[ich]$_{PWd}$ **[[hab]$_{PWd}$ ən]$_{PWd}$**		**[apfel]$_{PWd}$**		gegessen	[ich]$_{PWd}$ **[hap]$_{PWd}$**		**[n[apfəl]$_{PWd}$]$_{PWd}$**	gegessen
I	*have an*	*apple*	*eaten*		*I*	*have*	*an apple*	*eaten*

28 The fact that the final consonant of *hab* 'have.1SG' is voiceless cannot be due to lexical final devoicing, because the form leaves the lexicon with a final schwa *habe*. The deletion of inflectional ə in spoken German is postlexical(see section 1.2.2).

(c) syllabification:

ich **ha. bən. ap.fel** gegessen	ich **hap. n. ap.fəl** gegessen
I have an apple eaten	*I have an apple eaten*

But the ill-formed representation of proclitics in (63) and (64) suggests that enclitics and proclitics have to be treated separately. The syllabification of enclitics shows that they form a PWd with the preceding one: an enclitic determiner syllabifies together with its host word as in (63)(a). But the proclitics cannot be represented likewise. Both of the representations for proclitics suggested in (64)(b) are wrong, because they would predict the output in (64)(c). In fact, this syllabification does not occur. As one can see from (63)(b), proclitics never syllabify with their host. Instead, the initial *a* in *apfel* is preceded by a glottal stop.

To sum up this section, the assumption of a prosodic constituent of the size of a CG is not tenable for German, since it does not account for the fact that enclitics and proclitics behave differently.

4.3.2 Incorporation into the Phonological Phrase?

Like Prinz (1991), most authors have argued that clitic and host in German constitute one single phonological word. But recall the phonological rule of obstruent voicing which occurs only between a clitic and its host word, at least in some dialects of German. This shows a clitic and its host are not simply a Pwd but that something else must be involved.

A proposal that has been made before is to analyze cliticization as an incorporation into the PPh. This would be a would be a problem for me, because then the PPh would be a segmental domain in German. An example of an analysis along these lines is Wiese (1996: 108), who argues that cliticization to the phrase can serve as evidence for PPhs. Wiese's proposal can be tested by looking again at the critical data, the distribution of voiceless and voiced obstruents in some dialects, as summarized in (65).

(65) Distribution of voiced and voiceless obstruents in Rhine - Franconian dialects

	[p, t, k]	[b, d, g]
$\_\_\ \sigma$	+	–
V __ V	+	+
$[[V\ \_\_\ ]_w V]_w$	-	+

(65) shows the occurrence of voiced and voiceless obstruents in the dialects in question.[29] As in all German dialects, syllable-final obstruents are devoiced, while both voiced and voiceless obstruents occur between vowels. The problematic cases are given in the last line: if located between a host and a clitic, only the voiced obstruents occur. One possible way to account for this distribution would be to assume that clitics incorporate directly into the preceding PPh, as Peperkamp (1996b) suggests for Standard Italian. The data in (60) would then be represented as in (66).

(66)

von d[ɔɒ.**d**]aus	
von [[dort] $_{PWd}$ aus] $_{PPh}$	(phonological representation)
from there on	
wie jei.[**d**]et dann?	
wie [[jeit] $_{PWd}$ et] $_{PPh}$	(phonological representation)
how is it going?	

If one assumed a rule that voices obstruents in the particular environment in (67), the voicing of the obstruent could be accounted for.

(67) Intervocalic voicing (to be revised)
[+obstr] → [+voice] / V __]$_{PWd}$ V] $_{PPh}$

However, representing enclitics in that fashion is problematic for the following reason. Word boundaries are barriers for syllabification in German. If (67) was assumed, it could not be explained why the PWd-final consonant re-syllabifies to the onset of the clitic. Yet, while enclitics must not be contained outside the Pwd-domain of their host, proclitics are different: they do not syllabify with their host (see 4.3.4).

---

[29] In Standard German the distribution is as follows:

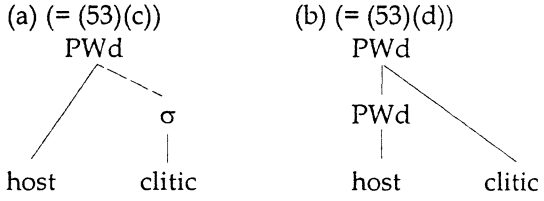
	[p, t, k]	[b, d, g]
__ σ	+	–
V __ V	+	+
[[V __ V] $_w$]$_w$	+	+

4.3.3 Cliticization as PWd-Recursion

So far I have argued that clitics - at least the enclitic ones - have a special relation to their host that makes a special prosodic representation necessary. I have argued against all but two of the potential representations. In this section I argue that enclitics are incorporated into a PWd.

Before I turn to the details, I should mention that I do not assume that enclitics remain unassociated as in (5)(e). The reason is that the interaction between clitic and host could then not be captured. Resyllabification and intervocalic voicing require a prosodic environment for their application. The situation is different for proclitics, though. I return to them below. Assuming that proclitics and their hosts form a Pwd together, there are two potential representations, as sketched in (68):

(68) Two ways of incorporating enclitics into the PWd



In (68)(a), the clitic is literally incorporated. This violates one of the adjunction principles, according to which only identical constituents can be adjoined (cf. chapter 1). In (68)(b), clitic and host form a recursive Pwd, a representation which equally violates an assumption of prosodic phonology, because it assumes a recursion of a constituent.

In (69), the data that decide between the two options in (68) are repeated for convenience. Only a recursion of the word (i.e. (68)(b)) results in a domain that can account for the intervocalic voicing rule.

(69) Prosodic incorporation of encliticized forms in German[30]

von [doɒ.**d**]aus

von [[dort]$_w$ aus]$_w$ (phonological representation)

from there on

[30] Note that in Dutch there is a voicing rule similar to the one described here. However, while the voicing in German is restricted to the particular edge within the recursive PWd, voicing in Dutch is a domain span rule within the clitic group (cf. Baumann 1995).

wie [jei.**d**]et dann?
wie [[jei**t**]$_{w}$ et]$_{w}$ (phonological representation)
how goes it
'how is it going?'

By using the recursive prosodic word, both the domain of syllabification and intervocalic voicing can be accounted for. As all prosodic structure building processes, postlexical resyllabification obeys the constraint on prosodification (as in Rubach & Booij 1990; Selkirk 1995, see chapter 1) according to which syllabification is blocked by a left constituency bracket. Syllabification and postlexical resyllabification are blocked by a left constituency bracket. In case of a PWd followed by a clitics, syllabification proceeds, since there is no left bracket intervening. In other words, syllabification in a recursive PWd takes the outer PWd as its domain. This explains why Final Devoicing is blocked in (69): the final consonant is in an onset position.

Yet, the sequence of host plus clitic cannot be a single PWd, since intervocalic voicing does not apply in any other position within the PWd than at the boundary between host and clitic. A prosodic frame within its structural description is required, which refers to this position. Intervocalic voicing thus has to be formulated as in (70).

(70) Intervocalic voicing (final version)
[+obstr] → [+voice]/ V __]$_{PWd}$ V...]$_{PWd}$

Because of the right prosodic bracket in its environment, intervocalic voicing takes the inner PWd as a domain. Also, intervocalic voicing cannot apply if not a clitic but another PWd follows the obstruent, because (70) demands that the second vowel is not contained in another PWd. As a result, only the final obstruent of the inner PWd in a recursive PWd undergoes intervocalic voicing.

In (71) the assumptions on the recursive PWd are repeated for convenience.

(71) The recursive PWd-domain
The inner PWd is the domain of word stress, i.e. the outer parts of the PWd are not dominated by the foot (see 4.3.5).
The outer PWd is the domain of syllabification.
The edge between inner and outer PWd is the domain of dialectal intervocalic voicing.

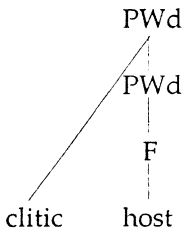
4.3.4 The Representation of Proclitics

I have shown that a host plus a following clitic form a recursive PWd. But what about the prosody of proclitics? I.e. the small group of determiners that group together with the noun they modify instead of cliticizing to their left. There are data like in (72) that show that proclitics are often not a PWd on their own: they may undergo the same reductions as proclitics and do then not fulfill the minimality requirements for PWds.

(72) Reductions of proclitics
[aɪn] baguette bitte → [ən] baguette ~ [n] baguette

The function word in (72) is reduced, which gives rise to the assumption that this proclitic might simply mirror the representation of enclitics. This is illustrated in (73).

(73)



In this representation the proclitic is not dominated by a foot and is therefore subject to the reduction rules (see sections 4.1.2 and 4.3.5). A mirror-representation like this would be a straightforward account for all cliticized forms, but several facts show that (73) is wrong. First, (73) violates a generalization on PWds in German: they never begin with a schwa (see Hall 1997b). I.e. forms like the ones in (74) do not occur in German.

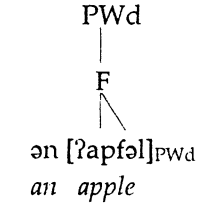
(74)
*[ənton] *[ərbaɪt]

Second, syllabification is blocked between the proclitic and its host. This can be deduced from the fact that in (72) the nasal does not assimilate to the following obstruent.[31] Besides, vowel-initial hosts as in (75) are (as always optional) preceded by a glottal stop.

(75)
[ən ʔapfəl]
an apple

Both facts indicate that proclitic forms and their host do not syllabify together. I conclude that they cannot be in a single PWd-domain. There are two representations of proclitics that express this. Proclitics either attach to the next higher prosodic constituent, as illustrated in (5)(c).[32] or alternatively they remain unassociated, as in (5)(e). There is no external evidence for either one of the representations. Since I claim that the PPh is relevant only in the rhythmic domain, I have to allow for stray elements as in (76).[33]

(76) Proclitics as stray elements



Since the function word is not linked to a foot, it undergoes reduction (cf. Prinz 1991). Notice that the schwa in the PWd is the result of lexical schwa insertion.[34]

4.3.5 Clitics and Speech Rate

In the standard model of prosodic hierarchy, postlexical phonology is considered as one single level. It is the domain of casual speech rules after syntactic insertion. A different assumption, first introduced by Kaisse (1985) proposes a division of this level into syntax-sensitive and syntax-insensitive rules (cf. chapter I).

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31 The fact that the assimilated form *[mbagɛt]* does well occur at fast speech is not relevant here (but see section 4.3.5).

32 This has been suggested for English by McCarthy, Peperkamp, and Selkirk.

33 See Grijzenhout (1997) and Hall (1997b).

34 See Hall (1992) and Wiese (1996).

Both approaches have problems with the realization of cliticized forms at the different speech rates. Simple clitics are characterized by their straightforward relation to their corresponding full form. They are derived from them by postlexical phonological rules. These are the same rules that are needed to derive casual speech reductions and therefore, cliticization and casual speech reduction should be located in the same domain. But there are some differences to reductions that characterize casual speech:

(77) Clitics as opposed to casual speech reductions in German

- Clitics appear at all speech rates.
- They concern only a subset of the unstressed function words.
- They require grammatical information, e.g. on the syntactic relation to their potential host.
- Cliticization is constrained by phonotactic restrictions (see (22).
- Clitics and their host constitute a prosodic domain with special properties, while at casual speech, the reduced forms are simply incorporated into the preceding PWd.
- Additionally, depending on the rate of speech, casual speech reductions may even violate the left edges of (unstressed) lexical items.

The following table sums this up.

(78)

	Information on syntactic category & bracketing	Phonotactic restrictions	Left edge of PWd protected
Formal speech	yes	yes	yes
Casual speech	no	no	yes
High speech rate	no	no	no

A model of postlexical phonology should account for these differences. In the "classic" prosodic approach, Nespor & Vogel (1986) assumed the clitic group, an additional category in the prosodic hierarchy for the purpose of clitics only. Below in section 4.3.1 I argue why the assumption of a clitic group cannot account for all the differences sketched in (77).

One would assume that clitics were easier to handle in the direct-syntax-approach (which is not used here for the reasons given in section 1.4.1). However, this is not the case. Clitics are a problem for this approach, too: on the one hand, cliticization has all phonological properties of a casual speech process. That is, it would have to be part of the P2 phonology. On the other hand, cliticization requires a syntactic licensing. This would demand it to be located at the P1-level, where the phonology refers to such syntactic information as a clitic position.

Therefore, Kaisse (1985) assumes a special cliticization module which mediates between the P1 and P2 level.

I argue in below that these special properties can be captured by exploiting the proposed model in (3), which subdivides the postlexical phonology into a segmental and a rhythmic component. The timing between them results in domains of different sizes. These are the input for the postlexical phonology.

But let us first turn to an example sentence. Consider the CP in (79).

(79)

[kann	[[markus]$_{NP}$	[dem	[paul]] $_{NP}$	[[einen	[BALL]] $_{NP}$	geben] $_{VP}$	$_{CP}$
can	*markus*	*the.DAT*	*paul*	*a*	*ball*	*give*	

(79) has been given in section 1.6.1.3 in order to illustrate the influence of focus on the prosodic phrasing. I use this example again (with the neutral stress pattern only) to illustrate the consequences of the domain formation at different speech rates and styles.[35] (80), (81), and (82) below illustrate the differences of the phonetic realizations of (79) in formal speech and casual speech at different speech rates.

To account for the three categories of postlexical domains, I make two assumptions. The first one is the model in (3), which differs formal from casual speech and second, different well-formedness constraints for the different speech rates. As I mentioned before, there are always conflicting demands in spoken language. On the one hand, the smoothness of spoken language requires that items be connected and on the other hand the coherence of the PWd demands that the words be spoken in isolation. In word-based languages, the coherence of the PWd is a strong demand. The following consequences for domain formation can be observed in the word-based language German. Regarding the demarcation of word edges, the left edge of a PWd has to be maintained and a PWd should begin with a stressed syllable (i.e. no proclisis). The smoothness of articulation requires that syllabification should ignore word boundaries for the sake of an optimal syllable structure.

The formal speech level gives priority to the demands of the demarcation of word edges. A very simple example to illustrate this can be found in (80). The postlexical rules apply on the syntactic input. At this level, no lexical PWds have lost their prosodic frames. All items that leave the lexicon with metrical feet (i.e. all content words and focused function words) are blocked from reducing. The basic

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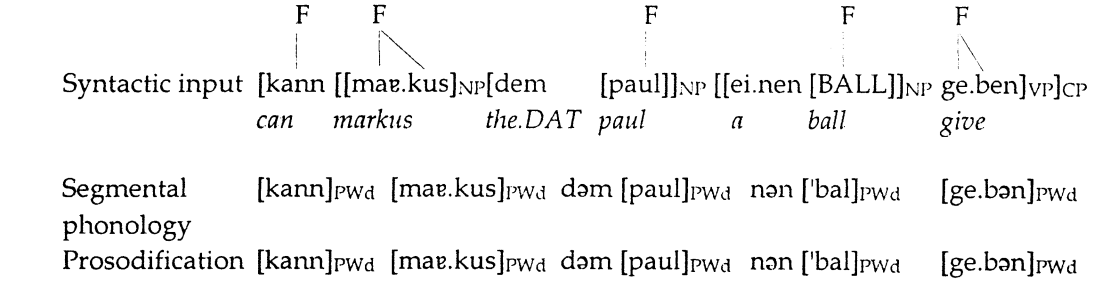
35 See (83) and (84) for actual speech data.

function of formal speech is to disambiguate and to stress the syntactic relations of the input string.

(80) Formal speech

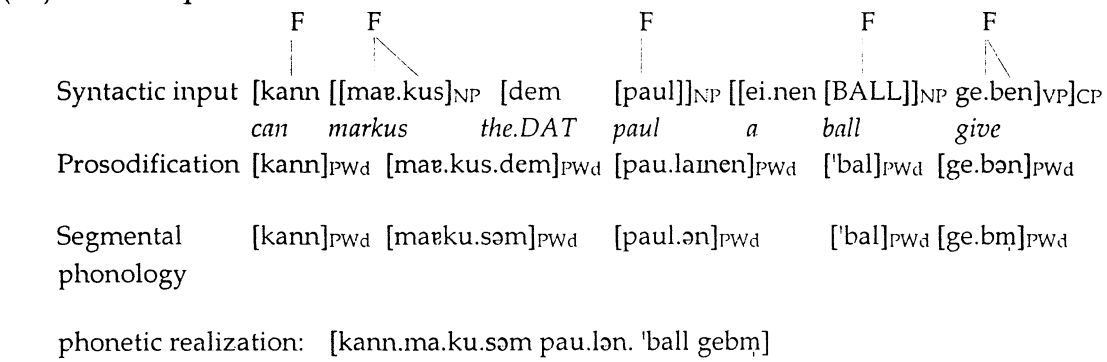


Formal speech is characterized by the relevance of syntactic phrase boundaries. They are maintained in the phonology, i.e. cliticization is impossible across them. For example, the determiner *einen* 'a' remains stray instead of associating to the preceding PWd.

Lexically assigned left PWd-boundaries are violated neither in formal speech, nor in casual speech. As a result, the word is very prominent and only function words can end up as clitics.

Casual speech is characterized by the irrelevance of syntactic brackets. Function words always cliticize to the left, no matter to which syntactic phrase they belong. This can be concluded from the direction of the determiners in (81). They are now incorporated into the preceding noun.

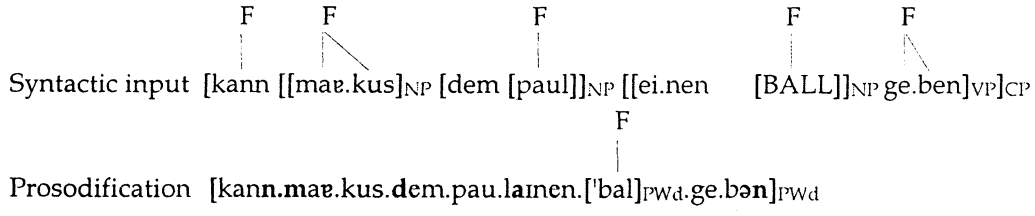
(81) Casual speech



The following rules are relevant: *[maʁ.kus.dɛm]PWd* is realized as *[maʁku.səm]PWd* after the clitic-initial /d/ is devoiced by voicing assimilation (see (19)). Voicing assimilation feeds t-deletion (see (21)). The vowels of the unstressed pronouns undergo vowel reduction ((14)). ʁ is deleted by (15).

Fast speech differs from (80) and (81) in that the PWd-boundaries are not relevant. Prosodification is centered around the PWd that carries the focus. This can again be deducted from the application of the postlexical rules (the relevant segments are in bold print).[36]

(82) Fast speech



Segmental phonology	[kamaku.səm.paʊlən['bal]PWd.gebm]PWd *(i.e. regressive nasal assimilation (n→m), degemination (mm → m), ɐ - deletion, vowel reduction, voicing assimilation (d→t), t-deletion, ə-deletion)*
phonetic realization	[ka.**m**a.ku.səm.pau.lən.'ball.gebm]PWd

There are some systematic differences between the cliticization of the pronouns in (81) and the casual speech reductions in (82). Some concern the prosodification. At fast speech, unstressed content words are defooted and attached to the preceding PWd, if there is any. Unlike the proclitics, in fast speech items never remain stray. When there is no host to the left, they attach to the right, thereby violating the left PWd-boundary. Consider the verb *kann* 'can' in (82)). It undergoes regressive nasal assimilation (18) and degemination (20) which both shows that the verb is inside the PWd of the following noun. Below, this is supported with data from spoken German.

The result of fast speech domain formation are long chunks of items that are one domain for the segmental phonology. (82) illustrates the claim of chapter 2: prosodic domains in German may be of the size of a PPh at fast speech, but they have nothing to do with the syntactic phrases. Their built-up only refers to stress.

That unstressed content words at fast speech are prosodically incorporated like clitics can be deduced from the verb *geben* 'give' and *kann* 'can'.

I conclude that there is a categorial distinction between casual and formal speech, and between speech rates. The levels differ with respect to potential viola-

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36 As most of the times I mention only one potential phonetic realization of the sequence. The variations within the speech levels are due to the fact that the rules are optional.

tion of lexically assigned prosodic structure they tolerate. In chapter 1, I summarized the constraints that govern this mapping (see Selkirk 1995) and I pointed out that in word-based languages, the left edge of lexical items is strongly protected. However, in casual speech, there is an opposing tendency, i.e. the ease of articulation. If the speech rate is high, even the left edges of unstressed PWds are violated and they syllabify together with the preceding word. This results in domains that contain all elements until a stressed item is reached. The resulting sequence is still a PWd and not a PPh, because it is the domain of the word-level rules that have been outlined in 4.2.4.

The model in (3) combines the assumptions of different approaches to the phonology-syntax interface. It predicts that the postlexical phonology applies on domains of different sizes, depending on the level of speech and the speech rate.

Below, examples from actual speech recordings are commented on and their assumed phonological bracketings are given.

(83) Casual speech clitics

	... **[prompt]**$_{PWd}$ **ne**[37] [Geschichte]$_{PWd}$ [erzählt]$_{PWd}$
	immediately a story told 'has immediately told a story'
Prosody:	[[**prompt**]$_{PWd}$ **ne**]$_{PWd}$ [Geschichte]$_{PWd}$
Segmental	[[**promp**]$_{PWd}$ **m̩**]$_{PWd}$ [Geschichte]$_{PWd}$ [erzählt]$_{PWd}$
rules	*i.e. t-deletion & schwa deletion with sonorant syllabification*

[37] Recall that I had to assume that *eine* and *einen* have the weak allomorphs *ne* and *nen* which are inserted in the clitic positions.

(84) Fast speech reductions

(a) *jof dä **strik op*** 'gave up the argument' (Cologne dialect, cf. Heike 1964)

Input	[jof]$_{PWd}$ dä [ʃtʀik]$_{PWd}$ op
	gave the argument up
Prosody:	[[jof]$_{PWd}$ dä]$_{PWd}$ [[ʃtʀik]$_{PWd}$ ɔp]$_{PWd}$
Segmental	[[jof]$_{PWd}$ d̥ä]$_{PWd}$ [[ʃtʀig]$_{PWd}$ ɔp]$_{PWd}$
rules	*i.e. voicing assimilation (fd → fd̥), intervocalic voicing (k → g)*
output	[[jof.d̥ä.ʃtʀig.ɔp]$_{PWd}$

(b) *das sind Be'lichtungsschächte* 'these are holes for illumination'[38]

Input	das zɪnt **[belichtungsschächte]**$_{PWd}$
	this are holes for illumination
Prosody:	[das zɪnt [belichtungsschächte]$_{PWd}$]
Segmental	[dassɪm[bəlɪçtuŋʃɛçtə]$_{PWd}$]$_{PWd}$
rules	*i.e. voicing assimilation (sz → ss), degemination (ss → s), t-deletion (sɪnt→sɪn), regressive nasal assimilation (nb→mb)*
output	[da.sɪm.bə.lɪç.tuŋ.ʃɛçtə]

(83) and (84) show that the size of the input domain to the segmental component can account for the variations due to speech rate.

4.4 Summary

In this chapter I have addressed three questions on the phonology of German function words and I have shown how the proposals I make in this thesis can help in order to account for them: how are function words represented in the lexicon? How are they represented in the prosody? How can the variations due to speech style and rate be accounted for?

I have argued that function words have no syllabic and metrical structure when they leave the lexicon. In the prosody they attach to the preceding PWd, resulting in a recursive PWd. The direction of cliticization follows from the speech style. The variations due to speech rate follow from the different size of the input to phonology. The variations of speech styles are due to the fact that in different speech styles, different violations of lexically assigned prosodic structure are tolerated. This can be accounted for with the model of postlexical phonology that I assume.

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[38] *sind* is devoiced by lexical final devoicing.

5. Word-Based Languages

In this chapter, the classification I propose is further established. I introduce the features of word-based languages and I compare them to the properties of the phrase-based languages. Thereafter I look at languages that appear to be problematic and show how to deal with them.

In the preceding chapters I have shown that the phrase-based take the phonological phrase as the central unit of their postlexical phonology, thereby obscuring the word boundaries. These languages have all the constituents of the prosodic hierarchy at their disposal, but they make use of the PWd only in the lexicon. Thus postlexical syllabification and especially onset maximization apply throughout the PPh. I claimed that these have a functional motivation, i.e. in these languages the smoothness of connected speech has priority over the demarcation of the word boundaries

In chapter 4 I discussed German, a language that belongs to the opposing language type, i.e. it takes the word as its basic unit.

In this chapter I describe further languages that have these properties and argue that they constitute a second type of languages, the word-based languages. They have an opposing functional motivation. Hyman (1978: 454) calls this the "coherency of the phonological word". Coherency of the phonological word, for example, prevents languages from extending onset maximization across word boundaries. It has different degrees of importance in different language types. I argue that the importance of the PWd can be predicted from the segmental phonology as well as from the syntax. Languages which tend to enhance their PWds form a coherent group that can be distinguished typologically from languages that put less emphasis on their word boundaries.

This chapter is organized as follows: first some examples of word-based languages, i.e. Portuguese, German, and Dutch are introduced. It is shown that one consequence of the emphasis on word boundaries is that the phonological phrase has no function in the phonology of such languages. Then I introduce further features these languages have in common. In the next section I contrast two languages, a phrase-based one (French) and a word-based one (German). I show that several, otherwise unrelated properties of these languages can be drawn back to their different speech rhythms. I show that the speech rhythm types undergo different processes of language change

Thereafter I turn to a potential counter-argument against the distinction proposed: there are languages that have properties of both types. In the course of this

section I argue that these languages are not a counter-argument but do in fact support my assumption. This effect is due to language change. The fact that the two forces, the coherency of the word as well as the smoothness of spoken language are always active in a language can cause a shift from one type of language to the other, i.e. word-based languages may develop out of phrase-based ones diachronically. Finally, the properties of word-based languages are summarized.

5.1 Some Word-Based Languages

Remember that word-based languages do not have PPhs in their segmental component, i.e. the PPh is never the domain of segmental rules. Instead I assume that the phonological system makes a different use of them. Below, I repeat the corresponding table from chapter 1.

(1) The PPh in word-based languages and phrase-based languages

	Rhythmic component	Segmental component
phrase-based language	PPh	PPh
word-based languages	PPh	no PPh

Contrary to phrase-based languages, word-based languages do not require the PPh to be an obligatory part of postlexical phonology. Therefore, phonological processes do not refer to it. PPhs are not the result of a systematic mapping from syntax to phonology but rather what has been called "pause domain" in traditional descriptions (cf. Hyman 1968). They are domains that contain one focal stress, i.e., they are functional domains.

The difference between these domains and a PPh in a phrase-based language is that the former are less connected to syntactic structuring and, as a result, their structure (i.e. size etc.) is much less restricted.

In (2) the organization of the postlexical domain in these languages is sketched.

(2) Word-based languages

(a) Casual speech
Syntax
↓
Prosody
(domains according to focus-background structure)
↓
segmental rules

(b) Formal speech
Syntax
↓
Segmental rules
(apply on lexically assigned structure)
↓
Prosody

(2)(a) shows how domains are created at casual speech. I assume that in word-based languages, at casual speech the phonological phrasing is based on the information structure of the given utterance. According to the conclusions of chapter 4, word-based languages are characterized by a recursive domain that takes over some of the functions of the PPh. This can be either the PWd (as in German) or the Intonation Phrase (as in Portuguese; see below).

5.1.1 European Portuguese (EP)

Portuguese is a noteworthy example of a word-based language, since it is genetically related to the phrase-based language French. However, its rule domains refer to the PWd and not to the PPh. According to Frota (1995a; 1995b) there is in EP no segmental rule that has the phonological phrase as its domain.

For example, the word-final fricative *s* in EP is voiced if a vowel-initial word follows. As can be seen from (3), this process is not limited by PPh boundaries, e.g. the final fricative in *africanas* is voiced even though a PPh boundary separates it from the following vowel-initial word. s-voicing applies to all the fricatives in bold print.

(3) *s*-voicing in EP (Frota 1995b: 4)

As alunas africanas ofereceram canetas aos amigos

[[Az alunaz africanas]$_{PPh}$ [ofereceram canetas]$_{PPh}$ [aos amigos]$_{PPh}$]$_{IP}$

the students african.PL gave pens to-the friends

'The african students have offered pens to their friends'

From data like this and other external sandhi rules Frota concludes that the PPh plays no role in the segmental phonology of EP (Frota 1995b: 8).

However, at the rhythmic component, some effects of PPh-boundaries can be found. For example, PPh-boundaries affect stress clash resolution. According to Frota (1996b: 10ff) stress clash in EP is resolved by lengthening the first of the stressed syllables,[1] which is the acoustic correlate of beat deletion. Examples are given in (4). Sentences like these were the subject of a reading experiment conducted by Frota in order to find cues to stress clash resolution in EP. The syllable that is lengthened is in bold print.

---

1 Other strategies, for example stress movement (as known from Italian), are never used in EP (Frota 1996b: 9).

(4) Stresses in the same PPh

(a) stress clash
[O ca**FÉ** LUso]$_{PPh}$ contém cevada de boa qualidade
The Lusitanian coffee contains barley of good quality

(b) no stress clash
[O caFÉ lusiTAno]$_{PPh}$ contém grãos de várias qualidades
The Lusitanian coffee contains grains of various qualities

If the two clashing stresses are separated by a PPh boundary, no lengthening occurs.

(5) PPh boundary between the stresses

O caFÉ]$_{PPh}$ LUta pelo prémio do produto mais qualificado
The café disputes the award of the best product

O caFÉ]$_{PPh}$ luTOU pelo prémio do produto mais qualificado
The café disputed the award of the best product

From this it can be concluded that there is an environment where a PPh-boundary in EP can be identified: a lack of stress clash resolution occurs if a PPh-boundary intervenes between two clashing stressed syllables.

It has often been shown that the phonological phrasing is affected by focus. However, Frota's experiment revealed that focus does not effect the phonological phrasing in EP. Consider the data in (6), which have been obtained by asking a question that resulted in a narrow focus on *café* as an answer. The effect of focus can only be found at the intonational level: it is realized with a pitch accent. The focused item is in bold print.

(6) Focus and stress clash in EP

(a) stress clash
Também vendo **caFÉ** LUso]$_{I}$

(b) no stress clash
Também vendo **caFÉ** lusiTAno]$_{I}$

The results of the pairs of tested items with a narrow focus turned out comparable to the ones without focus with respect to stress clash resolution: a stress clash as in (4)(a) was resolved through lengthening in (6)(a), too. If focus effected the phonological phrasing (i.e. if it triggered the insertion of a PPh-boundary after the focused item) it would be expected that no differences in lengthening occurred between (6)(a) and (b) since the PPh boundary would in both cases block stress

clash resolution. From the results of the experiment, Frota concludes that the PPh in EP is only relevant for the rhythmic structure of a language (Frota 1996b:12).

She sums up the peculiarities of the PPh in EP as follows:

(7) The Phonological Phrase in EP (Frota 1996b)
- May not be tonally marked
- Apparently, there are no segmental rules bounded by PPh (see (3))
- PPh plays a role in rhythmic restrictions: a difference between within-PPh and across-PPh (see (5))

Two other related observations of Frota are the existence of compound Intonational Phrases in EP and the fact that PPh boundaries may restructure and turn into IP boundaries (Frota 1996b: 6). The domains that Frota labeled I_{min} are domains within an Intonation Phrase, which can be seen from the fact that they are followed by a pause and they are the domain of *s*-voicing. The bracketing would then be as in (8)(a).

(8) PPh-restructuring: domains of *s*-voicing (Frota 1995a: 6)

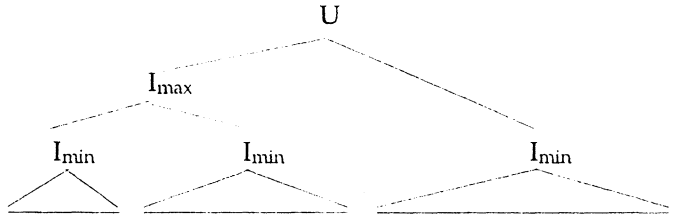
(a)
[As alunas] [até onde sabemos] [obtiveram boas avaliacões]
'The students, as far as we know, have got good marks'

(b)
[As aluna**[z]** até onde sabemos] [obtiveram boas avaliacões]

However, as shown in (8)(b) these domains can optionally restructure, which can be seen from the fact that s-voicing may apply between the NP and the embedded sentence. Still, like in (8)(a), three different domains can be identified in (8)(b) that meet the characteristics of an Intonation Phrase, because each of them has its own intonation contour.

From these contradictory facts Frota (1995a) concludes that in EP, IPs are compound domains, IP_{min} and IP_{max}, each domains of distinct segmental rules.
The prosodic phrasing of the embedded sentence is given in (9).

(9) Compound Intonational Phrase in EP (Frota 1995a)



As alunas, até onde sabemos, obtiveram boas avaliações.
'The students, as far as we know, have got good marks'

The domains that Frota labeled I_{min} are domains within a compound Intonation Phrase, which are the domains of the intonation, whereas I_{max} is the domain of s-voicing. The different phrasing in (9)(a) and (9)(b) is then due to the fact that in (9)(b) two I_{max} domains have been restructured into a single one

According to Frota, these facts as well as the stress clash resolution data in (6) show that the PPh is an "invisible" domain in Portuguese, since otherwise it would be available for segmental rules such as vowel adjacency resolution, which are used at IP level, if a stress clash occurs.[2]

Since there are no phrase-based phenomena, the word is very prominent in the perception of EP. The prominence of the PWd is supported by additional properties of EP, as listed below.

In EP, as in other word-based languages, focusing is in situ. Focus is realized by associating a H*+L sequence with the syllable carrying the word stress of the focused constituent. In case there is no narrow focus, the NSR applies and the main prominence is on the last phrase in the IP, as in (10).

(10) Neutral prominence in EP (Frota 1995b: 15)
(a)

	w		w		w		s
w	s		s	w	s	w	s
[[As americanas]$_{PPh}$	[ofereceram]$_{PPh}$		[a enciclopédia]$_{PPh}$		[ao journalista]$_{PPh}$]$_{IP}$		
'The american girls	have given		the encyclopedia		to the journalist'		

Narrow focus moves the stress away from the IP-final phrase. This can be seen from the examples in (11) and (12).

---

2 According to Vigário (1995), the PPh in EP can be the domain of H-tone insertion. But since this rule is optional, it alone cannot serve as evidence for a systematic use of the category PPh in EP.

(11) Focus in situ in EP (Frota 1995a)

(a)

w S w

w s w w S w s

[[As alunas]$_{PPh}$ [ofereceram]$_{PPh}$ **[as rosas]**$_{PPh}$ [ao monitor]$_{PPh}$]$_{IP}$

the students *have* given **the roses** *to the teacher*

'The students have given the roses to the teacher'

In (12) an additional effect can be observed at the PPh-level: since the verb is focused, the PPh prominence is moved from its last constituent to the first one.[3]

(12)

w S w

w s S w w s

[[As alunas]$_{PPh}$ **[ofereceram** flores]$_{PPh}$ [ao monitor]$_{PPh}$]$_{IP}$

the students ***have given*** *flowers* *to the teacher*

'The students have given flowers to the teacher'

All those cases have in common that focus is signaled by word stress and not by extraposition, cleft, or other syntactic means. The effect of focus in situ is that the word stress is the only way to identify the focus. Since word stress is at the same time the place where neutral stress is realized, a problem occurs if the last word of the IP carries a narrow focus.

Compare for example the narrow focus (13) to the neutral stress in (10).

(13) Focus prominence in EP (Frota 1995b: 15)

w w w S

w s s w s w s

[[As americanas]$_{PPh}$ [ofereceram]$_{PPh}$ [a enciclopédia]$_{PPh}$ **[ao journalista]**$_{PPh}$]$_{IP}$

'The american girls have given the encyclopedia to the journalist'

The two sentences are different with respect to their semantics. As is illustrated in (14), they have different sets of presupposed alternatives (cf. Rooth 1996).

(14) Alternatives to (10) and (13)

Alternatives to (10) 'The american girls did y'

As americanas

ofereceram a enciclopédia ao journaLISta	'offered the encyclopedia to the journalist'
andavam o merCEdes	'drove the Mercedes'
vendem as azeiTOas	'sell the olives'

---

3 As noted above, focus in EP does not effect the phonological phrasing, hence, the verb and its complement remain in the same PPh (see (6)).

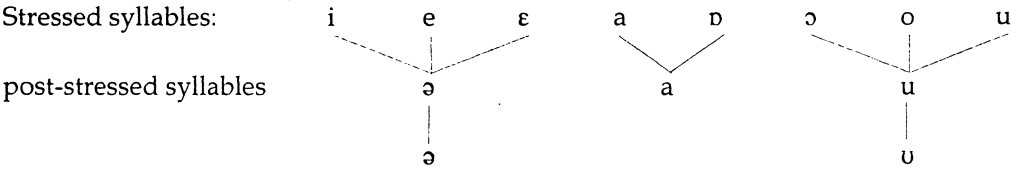
Alternatives to (13) 'The american girls offered the encyclopedia to y'
As americanas ofereceram a enciclopédia á[4]

o journaLISta	'the journalist'
o poEta	'the poet'
a maRIa	'Mary'

In both cases the same constituent carries the pitch accent. In (10) the pitch accent is assigned via the Nuclear Stress Rule, whereas in (13) the pitch accent is due to narrow focus. However, as Frota points out, in EP the two cases are always distinct, both perceptually and acoustically. This distinguishes EP from other languages (e.g. German), where narrow focus on the category that is the designated neutral focus yields an ambiguous structure. In this respect, EP is similar to Bengali (cf. Hayes & Lahiri 1991). In order to account for this, Frota distinguishes between *neutral prominence* and *Focus prominence* (Frota 1995b: 17)

The observations made so far about EP support the hypothesis that it is a word-based language. Additional support comes from vowel reduction rules in EP, which affect all vowels but the one carrying the word stress. The reduction of the vowel system as described in Barbosa (1994b) is illustrated in (15) and examples are given in (16).

(15) The vowel inventory of EP



This picture is somewhat simplified: not all of the neutralizations mentioned in (15) always occur. but it is a fact that there is a strong tendency in EP to reduce unstressed vowels in all positions. This can be seen in (16).

(16) Examples of vowel reduction in EP

románo	[Ruma:nu]	'Roman' cf: róma [Roma] 'Rome' (Dörig 1961)
lápis	[lápəʃ]	'pen'
lave	[lávə]	'wash.1SG'

4 I ignore here the fact that in EP the preposition plus determiner sequences merge and are phonetically realized as *ao* resp. *á*.

The underlying vowels tend to be reduced if unstressed, back vowels are then realized as [ʊ], front vowels as [ə]. As a next step, triggered by vowel reduction, reduced vowels can even delete. This can be seen from the alternations in (17). Vowel reduction has further effects on the phonological properties of EP, since the deletion of final vowels yields syllable codas (as in (17)(a)) or even complex codas (as in (17)(b)).

(17) Deletion of unstressed vowels in EP (Barbosa 1994b: 137)

(a)

lave	[lávə] ~ [lav]
'wash.1SG'	
lava	[láva] ~ [lavə] ~ [lav]
'wash.3SG'	

(b)

lápis	[lápəʃ] ~ [lápʃ]
'pen'	

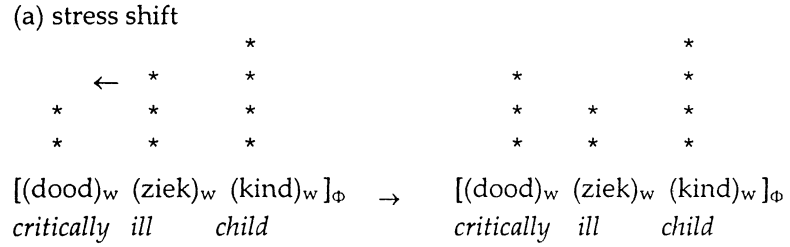
The two properties of EP sketched above (reduction and deletion of unstressed vowels and focus prominence on a PWd in situ) have in common the effect of assigning a greater prominence to the stressed syllable of a word. As a consequence, in the perception the PWd is the prominent constituent. Below I examine how these features interact and result in a certain speech rhythm type.

5.1.2 Dutch

According to Booij (1995), Dutch has two rules referring to the phonological phrase,[5] obligatory Stress Retraction and optional Stress Shift. Examples of both are given in (18).

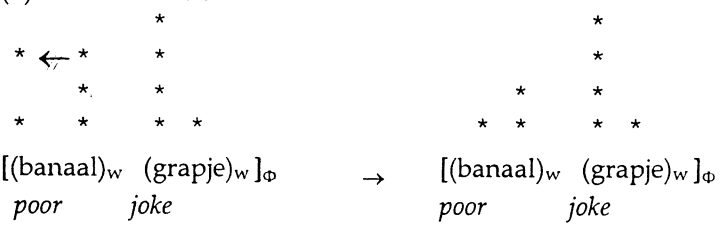
(18) Stress shift and stress retraction in Dutch (Booij 1995)

(a) stress shift



5 Booij does not explicitly state that these are the only rules of this type in Dutch. However, no other rule is known to me from the phonological descriptions of Dutch.

(b) stress retraction



Both rules are stress clash resolutions. In (18)(a), a beat is moved to the first part of the compound in order to avoid a stress clash within the PPh. (18)(b) shows the application of stress retraction. Stress retraction applies optionally in cases where a beat cannot be moved since there is no target syllable available. For example, in *banaal* (which is phonetically [bəna:l]), stress shift cannot apply, since the first syllable [bè] is unstressable. In such a case, stress clash is avoided by Stress Retraction (deletion of a beat). These rules apply within the domain of the PPh.

However, as far as tonal structure is concerned, Booij (1995: 295, citing van den Berg *et al.* (1992)) points out that in Dutch, the phonological phrase[6] is subject to variation. Consider the examples in (19), where two possible phrasings of the same sentence are given.

(19) Phrasing differences in Dutch (van den Berg *et al.* 1992: 338f)

(a) (H* L)AD (H* L L%)AD
leeuwarden wil meer mannen
Leeuwarden (place name) needs more men

(b) (H* L H* L L%)AD
leeuwarden wil meer mannen

According to van den Berg *et al.*, boundary tones between PPhs can optionally be moved away to the following PPh, thereby obscuring the boundaries. Although there is variation, the slower and more formal speech is, the more boundaries can be expected.

Like EP, Dutch reduces and deletes many of its unstressed vowels.

5.1.3 Properties of Word-Based Languages

In word-based languages the PWd is the basic unit in phonology. Within the word, syllable boundaries are often hard to detect. All syllables but the stressed one are marginal, vowel reduction and deletion (thereby creating complex codas) are common.

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6 Or, in their terms, an *association domain* (AD), as they call a unit of PPh size.

Concerning the PPh, although this category exists as a concept (i.e. speakers know when they may insert a PPh phrase break), there is no systematic use of the PPh in phonology. Instead, these languages take some other constituent, either smaller ones or larger ones and allow them to be complex by recursivity. German and Dutch have a recursive phonological word, EP has recursive Intonational Phrases.

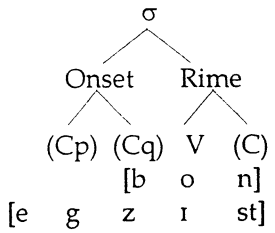
5.2 French and German compared

In this section the classification I propose is illustrated by contrasting the phrase-based language French and the word-based language German.

5.2.1 Syllables and Segments

Some differences between the two language types can be found in the constraints on syllables and segments as well as the phonological processes they trigger. The most striking differences between German and French syllables concern the number consonants and the restrictions in the coda. At the surface, French allows no more than two consonants in the coda, while German permits up to five. (see (24)). French and German also differ in the number of C-positions after the nucleus in a non-linear representation.

(20) French syllable template (Noske 1988: 46) and possible codas



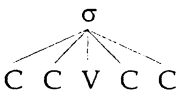
bonne 'beautiful.FEM'
existe 'exist.3.SG'

Noske analyzes sequences of s+obstruent as in *[egzist]* 'exist.3.SG' as a single consonant. In French, CV-syllables are by far the most common and several processes at the PPh level result in CV-syllables. These are described below.

Like Noske did for French, one might analyze sequences of homorganic consonants in the German coda as a single C-slot. In addition, the number of coda consonants in German might be reduced, as some of them are irrelevant to syllable-related processes and are sometimes considered extrasyllabic.

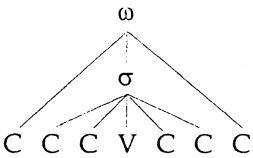
(21) German syllable template (Wiese 1988)

(a)



[ʔ a k st] *Axt* 'axe'

(b) Extrasyllabic consonants



[ʃ t R a ɪ ç st] *streichst* 'paint.2SG'

In German, sequences of two coda consonants are extremely common and there are nearly no co-occurence restrictions.[7] Sequences of three (see (22)) or four consonants (see (23)) are common, too, but they are more constrained. According to Hall (1992), codas with three consonants always end in *[st]* or *[ts]*, and besides, in four consonant codas, the first consonant is always a sonorant.

(22) Three member codas (Hall 1992: 119)

pumpst	[pumpst]	'pump.1.SG'
Axt	[ʔakst]	'axe'

(23) Four member codas

Arzt	[ʔaʀtst]	'doctor'
horchst	[hɔrçst]	'listen.2.SG'

Note that the final consonants in (23) never trigger syllable-related processes such as epenthesis. Some authors, for example Wiese (1996: 47ff) analyze them as extrasyllabic (i.e. they are associated with the PWd and not with the syllable in a non-linear representation as in (21)(b)).

Additional evidence for my claim that the differences between French and German syllable structure are due to the different language types is the fact that many of the German syllable clusters occur only word-finally, but not word-internal. For example, only at the end of a word, even five-consonant codas are possible.

---

7 Besides the restrictions on sonority, Hall (1992: 118) notes that in obstruent+obstruent sequences the latter one has to be coronal.

(24) Five-consonant codas in German (Hall 1992: 121)

Herbsts	[hɛRpsts]	'autumn. GEN.SG'
Ernsts	[ɛRnsts]	'seriousness.GEN.SG'
Arzts	[aRtsts]	'doctor.GEN.SG'

But these cases are marginal, the list above is exhaustive.

A typical feature of phrase-based languages such as French are processes that yield a CV-syllable pattern, i.e. the avoidance of final consonants. If spoken is isolation, final consonants in French tend to be deleted.

(25) Final consonants

French			German		
tro**p**	[tro]	'very'	hal**b**	[halp]	'halve'
mai**s**	[mɛ]	'but'	au**s**	[aʊs]	'from'

As shown in (25) German has nothing like the French latent consonants. German final consonants always surface.

Another segmental property of phrase-based languages are geminates. Auer (1991) argues that gemination is a feature typical of syllable-timed languages, but, as can be seen below, this process has the phrase as its domain. Unlike other phrase-based languages, for example Italian, French has no phonemic geminates[8] but there is a strong tendency towards phonetic gemination: identical consonants are geminated across words (Klein 1963: 110).

(26) Identical consonants across words

(a) French		German	
je ne frappe pas 'I do not beat'	[frap:a]	ich hab Paul getroffen 'I met Paul'	[hɔ.paʊl]

The French example is realized as a geminate consonant. This yields a smoother speech stream. Since the closure of the plosive is lengthened across the two words, the boundaries between them are obscured.

In German the two consonants merge, but the first one of them is deleted (degemination, see chapter 1). This yields clear word boundaries.

8 There are a few cases of phonemic geminates in French: some verb forms like *il mourrait* 'he would have died' are pronounced with a geminate consonsonant if there exists a non-geminate form with which it could be confused (cf. *il mourait* 'he died').

5.2.2 Diachronic changes

In this section I sum up a few examples from the history of both languages that illustrate that different speech rhythms trigger different ways of development.

I argue that the phrase-type languages don't care for phrase-internal word boundaries. In spoken language there are hardly word-final consonants, because there is often a transition from the consonant to a following vowel. As a the consequence, word-final and generally, syllable-final consonants became unusual. This is a motivation for the suppression of coda consonants (see Vaissiere 1996: 70ff) characteristic of French and other phrase-based languages.[9]

(27) Suppression of Latin coda consonants in French (Vaissiere 1996: 70)

Latin	French		
rupta	route	[rut]	'road'
factu	fait	[fɛ]	'fact'
advenire	avenir	[av'nir]	'happen'

The word-type languages are characterized by an opposing drive: the protection of the boundaries of prosodic words. This triggers processes leading to the opposite results sometimes, i.e. vowel reduction, consonant clusters.

(28) Emergence of consonant clusters in the German coda

OHG	MHG	MSG	
herbist	herbəst	herbst	'fall'
angust	angest	angst	'fear'

Nowadays, the maximal syllables are quite different for French and German, as it was shown in (20) and (21).

5.2.3 Phonological Domains

The segmental processes of French never take the word as their domain, but rather the PPh.[10] An example for this is the gemination of consonants across word boundaries in spoken French (see (25)). In (25) it was shown that word-final consonants are often deleted if spoken in isolation. However, the real domain for the deletion is the PPh. This can be seen from the data in (29), taken from Vaissiere, who calls a constituent of PPh-size "sense group".

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9 See section 3.6.4 for corresponding examples from Italian.

10 In section 3.5.1.5 I refute potential counterexamples.

(29) Coda consonants in the French PPh

(a) French		German	
trop cher	[trɔ.ʃɛr]	halb trocken	[halp.trɔ.kən]
'very expensive'		'half dry'	
mais cher	[mɛ.ʃɛr]	aus Köln	[aʊs.kœln]
'but expensive'		'from Cologne'	
(b)			
trop aimable	[trɔ.pɛ.ma.bl̥]	halb aufgegessen	[halp.ʔauf.gə.gɛ.sən]
'very charming'		'half eaten'	
mais ensemble	[mɛ.zã.sã.blə]	aus Essen	[aʊs.ʔɛssən]
'but together'		'from Essen'	

Within the "sense group" or PPh, consonants tend to be deleted if followed by another consonant. If followed by a vowel they undergo enchaînement, as in (29)(b).

The German consonants in the same environment differ from the French ones in two respects. First, they always surface, and second, they do not resyllabify to a following non-function word. In other words, the word boundaries are maintained.

5.2.4 Other Grammatical Properties

The fact that not all constituents of the prosodic hierarchy are available has consequences for other grammatical processes. For example, processes that require the PWd as their target are only possible in word-based languages. Focus in situ requires a PWd to function as a focus constituent, i.e. it has to carry a pitch accent.

(30) Focus in situ

French	German	
* [Pierre]$_F$ est marié	[PEter]$_F$ ist verheiratet	'Peter is married'
[Peter]$_F$ is married		
* [Pierre]$_F$ est intelligent.	[PEter]$_F$ ist intelligent	'Peter is intelligent'
[Peter]$_F$ is intelligent		

French requires focus marking either through extraposition as in (31) or through focus particles as in (32).

(31) Extraposition

French	German
C'est [Pierre]$_F$ qui est marié	Es ist [PEter]$_F$ der verheiratet ist
it's Peter who is married	*it's Peter who is married*
C'est [Pierre]$_F$ qui est intelligent.	Es ist [PEter]$_F$ der intelligent ist
it's Peter who is intelligent	*it's Peter who is intelligent*

Extraposition for the purposes of focusing is common in French. Since extraposition induces a PPh-boundary,[11] the focused constituent is highlighted prosodically. In German, this strategy is possible too, but only for strong contrastive focus. Otherwise it sounds odd.

(32) Focus particles

French	German	
Meme Pierre est marié	Sogar [PEter]$_F$ ist verheiratet	'Even Peter is married'
even Peter is married		
Seul Pierre est intelligent.	Nur [PEter]$_F$ ist intelligent	'Even Peter is intelligent'
only Peter is intelligent		

Focus particles in combination with the obligatory pitch accent are quite common in German, since they have their own semantics and cannot be replaced by a more economic focus strategy, as a pitch accent alone. In French, focus particles can be used too, but they do not trigger a phrase break after the focused constituent.

To conclude this section, from the several strategies for focusing a constituent, the most economic one in a word-based language like German is to place a pitch accent on the syllable that already carries the word stress, whereas in a phrase-based language like French, some additional focus marking is required.

5.3 Potential Problems

This section deals with languages which might pose a problem for my account, since they have both phrase-based and word-based properties. At first sight, they are a counter-argument against the classification proposed here. However, I offer two explanations for the phenomena described: either they are properties of different dialects of these languages or they refer to different components of the same language, i.e. a word-based language refers to the PPh in the rhythmic component.

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11 See section 2.7.2.

5.3.1 Italian

An example of such a problematic language is Italian, which appears to be of the phrase-based type, which can be shown from rules such as raddoppiamento sintattico (RS) (c.f. Nespor & Vogel 1986 and section 3.5.4). On the other hand, Italian has an *s*-voicing rule, which applies at the word level. However, it was shown in section 3.5.4 that the rule only applies at the lexical level, not postlexically, at least in those dialects that have RS. Only in the northern dialects that have no RS, s-voicing may apply postlexically.

A different kind of rule, the RR, appears to refer to the PPh. But, as was shown in section 2.6.2.2 Nespor (1995b) developed a framework in which the Rhythm Rule applies at the segmental level of the grammar without referring to the PPh. By this, she can maintain the distinction between rhythmic and segmental phonology. If my assumptions about Portuguese as a word-based language are correct, then the application of the RR would serve as additional evidence for Nespor's proposal. And, the other way round, the application of the RR would not count as evidence for PPh in a given language since the PPh is not required as a domain for it.

However, there are languages that have both phrase-based and word-based rules at the postlexical level, such as Bengali or Chichewa. These languages show that the distinction between the language types is not without exceptions, but rather a strong tendency.

5.3.2 German

Since German was discussed thoroughly in chapter 3, the arguments which were used to analyze this language as word-based will not be repeated here. In this section, I am only interested in an apparent problem for my proposal. German has one type of rule which has been repeatedly argued in the literature to require the PPh, namely the eurythmic rules (see also Booij's similar arguments for Dutch). These rules consist of both beat retraction and deletion in order to maintain a certain speech rhythm. These processes have already been described in chapter 1. The example in (33), taken from (Féry 1988: 53) shows that, in German, adjacency of the stressed syllables is not a necessary condition for the application of RR. This is the reason, why the rule is often referred to as a domain-span rule within the domain of the PPh.

(33)

*								*	
*	*	but:		*	*			*	
*	*			*	*	*		*	*
Konstanz				Konstanzer				Uni	
Constance				*University of Constance*					

However, under different circumstances, two stressed syllables are allowed in the same environment, e.g. in the sentence *die Uni von Konstanz* 'the university of Constance', both stressed syllables, *Uni* and *Konstanz* are separated by one syllable. Usually, examples like these serve as evidence in favor of PPh (see Féry, Wiese 1996): while in *[Konstanzer Uni]*, there is only one PPh, *[die Uni] [von Konstanz]* consists of two PPhs.

Since eurythmic rules are very common in German it must be stated that the PPh should be a part of the rhythmic component. However, its role in this language is quite limited, as shown below.

First, the rhythmic phenomena have a clearly different status from the segmental ones. They are always optional and depend on many external factors, as it was shown in detail for German in chapter 3. Anyone who ever listened to a native speaker of a phrase-based language speaking a word-based language can confirm this: the language is then assigned a true phonological phrasing which makes it sound odd.

Second, the rhythmic phenomena do not have to be viewed as rules applying at the PPh level but can be derived from the phrasal stress. This proposal was made by Nespor (1990a) for independent reasons. According to her, RR applies with reference to a language specific minimal clash level that triggers RR. In German that would be three grid beats, such as in (33), whereas the two stresses *in die Uni von Konstanz* do clash at one grid level higher and do therefore not trigger RR.

To sum up this section, even if German seems to require the PPh as a domain for the eurhythmic rules, this is not a serious argument against the proposal to consider this language as word-based.

5.3.3 Background

As already said, languages with the properties of word-based languages but with eurythmic rules at the PPh-level are not problematic for my proposal, as long as PPhs are restricted to the Rhythmic component. The fact that such languages occur follows from Nespor's (1990b) proposal to separate the rhythmic and the segmental component.

A remaining question is why the different language types occur. In this section I list some potential motivations for phrase-basedness. Several typologists have observed that rhythmic and segmental properties interact and that languages may differ from each other with respect to these properties. In chapter 6 I describe these proposals in detail and compare them to my own proposal. However, I should like to mention an observation that cross-linguistically, phonological phenomena tend to either narrow down or move up until they reach the word level. (1968: 465).[12] According to him, a crosslinguistic tendency can be observed that phonological phenomena (such as distributional constraints, boundary phenomena etc.) either narrow down or move up until they reach the word level. Recall also the observation made by people like Grabe & Warren (1995), according to whom speech rhythm is not a trigger for phonological rules, but rather a perceptual phenomenon. The properties of speech rhythm depend on phonological properties of the respective language which give the listener the impression of a certain speech rhythm type.

These two observations can be related to the data discussed here. Languages like northern Italian (and to a smaller extent also German) may have properties of both language types because they develop from a phrase-based type to a word-based type. Such a development does not affect both the segmental and the rhythmic component at the same time but instead an intermediate stage occurs, in which rhythmic rules behave differently from segmental rules. This is doubly supported by observations made the literature: first, a rhythm type may change in the history of a language, as Hyman observed. Second, if a language is assigned a certain speech rhythm by the speakers on the basis of the perceived phonological properties, it is likely that a small change in these properties would trigger a switch from one language type to the other in the next generations of speakers.

In the next section I examine some cases where such a process might have taken place and in section 6.5.1 the motivations for the language types are defended.

5.3.4 The Emergence of Rule Domains

In this section, I want to discuss the question of how the group of languages that has properties of both types arises as a result of language change. I argue that these languages originated from one language type and are in a changing process

12 And other linguists, cf. chapter 6.

towards the other type. The factor that triggers this process is the treatment of unstressed vowels. If speakers of a language begin to reduce them, this may trigger further changes in the language. The data below illustrate some sound change processes.

In Old High German (OHG) only full vowels occured in all positions, i.e. it has the pattern of a phrase-based language. During the development of Middle High German (MHG) a reduction of unstressed vowels took place, as illustrated in (34) and (35). In (34), examples of vowel reduction are given: prefix vowels are reduced to [è]. (35) shows examples of vowel loss, which was the preferred strategy.

(34) Reduction of prefix vowels

OHG	ga- gi- za- zi- zə-	
MHG	gə- zə-	

(35) Loss of internal unstressed syllables

OHG	MHG	
geba:rida	gebaerde	*gesture*
he:rio	hêrre	*Lord*

Both processes effected the perception of the German speech rhythm. For the listeners the word appeared to be more prominent. Since the syllable carrying the word stress became prominent compared to the unstressed ones, the individual words became more prominent. At the same time, German developed the final devoicing rule, which gives more prominence to the word endings.[13]

(36) Final devoicing

OHG	MHG	
[ta:g]	[ta:k]	*day / day PL*
[ra:d]	[ra:t]	*wheel*

Vowel reduction was never completed and is not productive any more. In Modern Standard German, vowel reduction and deletion depends on speech rate and register and is optional. This gives the listener a confusing image of the speech rhythm. German is in this respect in a stage between phrase-based and word-

[13] Final devoicing applies at the syllable coda. However, due to resyllabification, word internal consonants are mostly excluded from final devoicing, as in [tak] /[ta.gə] 'day / day PL', which makes the rule appear as a rule at the word edge (and in fact this is the way the rule is stated in many phonology textbooks). The exact domain of final devoicing is an interesting question that remains for further investigation. It is likely that the domain is subject to a change.

based languages. However, in the typology that I argue for, German counts as word-based language, since it has no segmental rules applying on the PPh.

Similar processes have occurred in Dutch. As in German, unstressed vowels in Old Dutch were reduced to schwa in Middle Dutch. In of the development of Modern Dutch, schwas were deleted, as illustrated in (37) (cf. Goossens 1974: 41ff).

(37)

Middle Dutch	Modern Dutch	
ic scrive	ik schrijf	'I write'
oghe	oog	'eye'
neve	neef	'nephew'

However, this process is more restricted than in Modern Standard German. For example, word-internal schwas were not deleted. Since the result of such a deletion are two adjacent consonants, Modern German appears even less "phrase-based" in this respect. Examples are given in (38).

(38) Word-internal schwa[14] in German and Dutch

Dutch	German	
de kinderen	den kindern	'the kids (DAT)'
wandelen	wandeln	'to walk'

A different example of an intermediate stage between word and phrase domains is Northern Italian (see above).

The cases discussed so far all have one property in common: the change of speech rhythm type started from a phrase-based type and changed it towards the word-based type (Old High German → Modern Standard German; Old Dutch → Modern Dutch; Latin + Italian → Northern Italian). This seems to be the more common case, in fact, the opposite direction of development is hard to find. I return to this observation in chapter 6.

One example for a development away from the word-based type is Brazilian Portuguese (BP). BP was recognized as an independent language in the middle of the nineteenth century, as a result of processes that separated the language from European Portuguese (EP). Among these language change processes are some phonological processes that result in a lesser relevance of the PWd in BP compared

[14] The question whether the occurrences of schwa in German and Dutch are synchronically to be analyzed as epenthesis or deletion has not yet been resolved, but does not matter here.

to the word-based language EP. Above all, BP does not reduce its unstressed vowels to the extent EP does. Examples are given in (39).

(39) Unstressed vowels in Brazilian vs. European Portuguese

	Brazilian Portuguese	European Portuguese
o fato	[o fáto]	[ʊ fátʊ]
o porto	[o póʀto]	[ʊ póʀtʊ]
a flama	[a fláma]	[ə flámə]

The fact that the unstressed vowels in BP retain their quality[15] yields a completely different acoustic image of this language. This property corresponds with other "phrase-based" properties in BP as can be seen from (40) below.

(40) Vowel epenthesis in Brazilian Portuguese (Kröll 1994: 567)

Brazilian Portuguese	European Portuguese	
adevogado	advogado	'lawyer'
obiter	obter	'to gain'

As can be seen from (40), unlike EP, BP does mind consonant clusters and tries to avoid them by vowel epenthesis.[16]

Considering the properties sketched in this section, it can be concluded that BP behaves more like a phrase-based language than a word-based language like EP.

As stated above, BP is an exception to what seems to be the general case, namely that phrase-based languages tend to develop word-based properties rather than the other way round. A look at other languages with a similar history might help to capture the exceptional cases. In its history, BP was to a large extent influenced by the Yoruba speaking African slaves who entered the community from the early 16th century till the 19th century.

Another example of such a language is Cuban Spanish. Cuban Spanish is - besides other influences - determined by Yoruba, the native language of the majority of the slaves who came from Nigeria and were forced to speak a lingua franca, a Creole Spanish with lots of Yoruba influences. Since the beginning of the 19th cen-

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15 Note that BP has the option of neutralizing its unstressed mid vowels (van de Weijer 1996: 4)
non-final: ɛ → e final: e → i
ɔ → o o → u
However, compared to EP, the inventories in all environments are much richer.

16 As in languages like German or Dutch, it is not easy to tell whether the occurrence of the vowels is due to epenthesis or lack of deletion. However, compared to EP, as well as German and Dutch, BP characterized by an avoidance of consonant clusters.

tury the Afro-Cuban people switched to Spanish which triggered the changes in the Cuban Spanish sketched below.

In Cuban Spanish, a sequence of two consonants often undergoes assimilation and gemination, as in (41).

(41) Consonant Gemination (Perl 1980:114)

Castillian Spanisch	Cuban Spanish	
espere	**epp**ere	'hope'
mis**m**o	mi**mm**o	'same'
estampa	**ett**ampa	'stamp'

Another strategy to delete the first of two adjacent word-internal consonants in Cuban Spanish as in (41).

(42) Consonant deletion (Perl 1980: 112ff)

Castillian Spanisch	Cuban Spanish	
eléctrica	elétrica	'elektric'
algún	agún	'some'
estoy	etoy	'I am'

The tendency towards a CV syllable shape is completed by cases of deletion of word-final consonants in Cuban Spanish, as can be seen from (43).

(43) Consonant deletion (Perl 1980: 112ff)

(a) word-final

arro**z**	arró	'rice'
más	má	'but'

(b) both internal and final

usted	uté	'you.2.PL'
verdad	vedá	'truth'

Cuban Spanish is not as good an example as BP, since Castillian Spanish itself is a language with features of both speech rhythm types. However, Cuban Spanish differs from it in that it has further developed into a phrase-based language.

The reason for both the development of Cuban Spanish and Brazilian Portuguese into phrase-based languages lies, I suppose, in the fact that the Yoruba speaking Afro-Cuban and Afro-Brazilian people maintained the Yoruba speech rhythm when they acquired the Roman languages via their lingua franca.

5.4 Summary

Above I have argued that there is a type of languages that takes the PWd as the basis of its postlexical phonology, the word-based languages. Below, the properties of word-based languages are summarized.

Concerning segmental rules, the PWd is the domain of both lexical and postlexical rules in these languages. PWd boundaries are barriers to all rules. Ideally, no rules at all refer to the phonological phrase. In fact, this only holds for the segmental component. As was said in chapter 2, in the prosodic component, RR may refer to the PPh, but unlike phrase-based languages, the domain of its application may vary. Besides, the application of RR itself is often optional and depends on various factors.

The most important feature of word-based languages is the reduction of unstressed vowels. Vowel reduction in the historical development of a language always coincides with an increase of word-based phenomena (see (34) - (36)).

In word-based languages, the PWd is the domain of syllabification. Syllables with complex codas occur and there are neither strategies to get rid of them word-internal nor word-final. This is the opposite behavior compared to phrase-based languages, which have vowel epenthesis and consonant deletion in order to achieve a sequence of CV-syllables.

Some syntactic properties have turned out to be characteristics of word-based languages. They all have something to do with the fact that the PWd and the boundaries thereof are more salient in these languages. Accordingly, they can be highlighted in speech by simply changing their stress pattern or their pitch. This option is not available in phrase-based languages where all syllables are prominent.

Only word-based languages allow for focus in situ (see (11)).

Focus either has no effect on the phonological phrasing in word-based languages at all, as for example in European Portuguese (cf. EP in (6) and the following discussion). Alternatively, it may optionally trigger rephrasing (cf. German). As typical of word-based languages, the phonological phrasing has different options of phrasing a given utterance.

6. A Classification of Postlexical Domains

In this thesis I have compared the postlexical domains of several languages and I have concluded that there are two classes of languages that make different use of their prosodic domains. I further argued that these languages have other properties in common and I proposed a classification which is repeated in (1).

(1) Summary of word-based languages and phrase-based languages

	word-based languages	**phrase-based languages**
Segmental rules	The phonological word is the domain There are no segmental rules that refer to the phonological phrase.	The phonological phrase is the domain There are no postlexical rules that refer to the phonological word.
Syntax	Focus in situ is standard. Coordination reduction is possible.	Focus only through syntactic movement. No coordination reduction.
Focus and phrasing	Either no rephrasing triggered by focus or optional insertion of a boundary.	Focus enforces restructuring of the phonological phrasing.
Prosodic hierarchy	Recursion of PWd or IP The phonological phrasing varies.	Recursion of PPh There is one phrasing obligatory.
Syllables	Typically complex codas. The PWd is the domain of syllabification.	Basically CV-syllables. The PPh is the domain of syllabification.
Stress	Unstressed vowels are reduced. RR applies optionally, its domain varies.	Unstressed vowels retain their quality. RR applies throughout, the PPh is its domain.

In the present chapter I compare this classification to other ones and I show why it is needed. The chapter is organized as follows. After some introductory remarks I turn to the prosodic word and the prosodic factors that influence its boundaries. I show that they are connected to speech rhythm typology. It is well-known that these factors vary cross-linguistically. In 6.3 I sum up the phonetic accounts for them and in 6.4 I present various phonological accounts and I point out some remaining problems. Thereafter I comment on the question whether the proposed language types are parametrized. In 6.5 I summarize the facts that a classification of speech rhythm should account for and finally, I return to my proposal and

show that it can account for these facts. I list the properties I assume for the two language types and I show why they coincide.

6.1 Introduction

Two facts about prosodic domains have been recognized independently. First, it has often been noticed in the typological literature (e.g. Bybee *et al.* 1997, Gil 1986, Hyman 1978) that intonation languages develop word stress out of the intonation. More precisely, word stress develops when speakers reinterpret the domain of intonation pattern as the word. Second, several authors have pointed out that certain rhythmic properties of a language correlate with other properties. This has already been observed by traditional phonologists such as Trubetzkoy (1939). Later, this idea has been exploited in several comparative studies. The results are various speech rhythm typologies The most important influence for (1) has been the study by Auer (1991), which is the subject of section 6.4.3.

In this chapter I relate these two observations to the properties of word-based and phrase-based languages as I proposed them.

Two kinds of proposals have been made in order to account for different speech rhythm types. The traditional typological approaches did already acknowledge the importance of the way languages use the category PWd and they related this to other properties of these languages, for example rhythm, tone etc. Later, when phoneticians proposed the syllable-timing and stress-timing distinction, phonologists began to relate some of the phenomena in (1) to the distinction between word-based languages and syllable-based languages.

6.2 The "Balance between Forces"

In chapter 5 I argued that phrase-based languages may develop into word-based languages. Before I go into the details below, I give some background on the motivation for the language types and for changes they undergo.

According to both, phoneticians and phonologists, there are two opposing forces in language. Ladefoged (1993[3]: 267ff) interprets them as an interaction between speaker and listener. Speakers of a language are required to follow a principle called the *ease of articulation*, which triggers coarticulation. At the same time the listeners expect the sound pattern to follow the *principle of perceptual separation.*

These principles and their contradicting demands have a counterpart in phonology. According to linguists like Hyman (1978), there are two principles, one is the urge to maintain the *smoothness of spoken language*. Smoothness of spoken lan-

guage is supported by, e.g. an optimal syllable structure. On the other hand a force can be observed that Hyman calls the *coherency of the phonological word.* This force aims at the autonomy of each single word.

Contrary to the phonetic principles, the phonological ones are independent from the individual speaker and listener. I argue that they are mirrored in the language classification I propose. If smoothness of spoken language is given priority, processes such as resyllabification or assimilation go across word boundaries. This is the case in phrase-based languages. Phrase-based languages have the PPh as the domain of their postlexical phonology in all speech rates and registers. If the coherency of the phonological word has priority, the PWd-boundaries are a barrier for postlexical phonology. This is a feature typical of word-based languages. As I pointed out in chapter 4, the PWd is the domain even of postlexical phonology and only at a fast speech rate, left PWd-boundaries are overridden by syllabification. In chapter 1 I gave an example for this which is repeated here for convenience.

(2) Domains of syllabification in German & French

(a) German	(b) French
[vier]$_{PWd}$ [Offiziere]$_{PWd}$	[quatre]$_{PWd}$ [officiers]$_{PWd}$
[fi:ɐ.ɔfi.tsi:.Rə] *[fi:.Rɔ.fi.tsi:Rə]	[ka.tRO.fi.sje]
four officers	*four officiers*

The syllabification of the /R/ preceding the vowel-initial PWd in (2)(a) and (b) shows that the domain of postlexical re-syllabification is the PWd in German and the PPh in French. In the German example, the /R/ is not resyllabified to the onset of the following PWd but undergoes r-vocalization. In the French example, it is resyllabified across the PWd-boundary. This has some consequences for the perception of the respective languages. In German (unless the speech rate is very fast) rules of connected speech are blocked by PWd boundaries. As a result, the PWd (its edges and the stressed syllable) is very prominent. In contrast, in French, the PWd-boundaries cannot be identified in a string of speech.

An important observation was made by Bybee *et al.* (1997) and Hyman (1978). As many others,[1] they recognized that speech rhythm types undergo diachronic changes. But additionally they found out that the changes are directed always towards the PWd (see 6.4.2) and not the other way round.

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1 For phonetics see Dauer 1982: 59.

6.3 Isochrony

All linguistic approaches to speech rhythm are somehow connected to the work by Pike (1945). Pike was one of the first (and probably the most cited) linguists who recognized two language types according to their speech rhythm. Pike (1945) and later Abercrombie (1967) claimed that languages organize their speech units into isochronal intervals and that two types of languages have to be distinguished: syllable-timed and stress-timed languages. In the former languages syllables recur at regular intervals, i.e. the length of the syllables is predicted to be constant. In the latter languages stresses recur at equal intervals, i.e. the duration of the foot is predicted to be constant. Examples for syllable-timing are French, Spanish, and Yoruba. Typical stress-timed languages are German, English, Russian, and Arabic.

Many of the phrase-based languages described in this chapter correspond to the syllable-timed language type. The reason for this is that the most prominent feature of this language type also motivates the phrase-based features: languages which ignore word boundaries during postlexical syllabification also have the CV-syllables, which is a characteristic feature of syllable-timed languages. The isochrony hypothesis claims that CV-syllables occur because the languages tend to make their syllables equally long. I (following Hyman 1978) claim that CV-syllables are phonologically motivated and result from onset maximization across word boundaries which serves the smoothness of spoken language.

6.3.1 Problems

Pike and Abercrombie set up the isochrony-hypothesis on the basis of their acoustic impression. However, it has never been manifested in experiments. On the contrary, subsequent experiments showed that there is no significant acoustic correlate for the predictions of isochrony. For example, when (Dauer 1983) measured the production of rhythm, it turned out that in both language types the intervals between stresses vary depending on the number of intervening syllables. Dauer concludes that the distinction between stress-timed and syllable-timed languages is a matter of perception: they are perceived differently, because only in stress-timed languages there is a significant contrast between stressed and unstressed syllables. According to her, the perception of speech rhythm depends on further factors, i.e. the syllable structure, the reduction of vowels, and stress.

Dauer's and other people's experiments revealed that the isochrony effects perceived by Pike & Abercrombie are not mirrored in the data in a significant way.[2] I.e. in both language types, the intervals between stressed syllables vary depending on the number of intervening syllables. Also, in both language types, the syllable length varied, which was expected only for stress-timed languages. As a consequence, phoneticians nowadays abandon at least the strong version of the stress-timed versus syllable-timed distinction. The "weak" version of isochrony recognizes a "tendency" towards the two language types.

In phonology, objections against the isochrony hypothesis were raised, too. The most famous one is that Pike and Abercrombie did not consider the existence of independent motivations for effects that they claim to be due to isochrony. To give an example: in English, monosyllabic forms as *sleep* or *stick* are longer if spoken in isolation than in polysyllabic sequences like *sleep heals*. This has been employed as an evidence for the tendency towards isochrony. Bolinger 1978 assumes that the forms are reduced in order to keep the interval between stresses equal. However, Beckman (1992: 458) convincingly argues that it is the other way round: the forms are lengthened if spoken in isolation, due to an edge-effect that lengthens phrase-final syllables. This sort of edge-effect is known in both types of languages, not only the stress-timed ones (Beckman mentions French and Japanese as examples for syllable-timed languages).

Another problem phonologists have with Pike's (1945) typology is that many languages cannot be classified according to its measures. Languages like Catalan, Polish, or Portuguese have been classified as being stress-timed by some linguists and syllable-timed by others, or neither of them. Therefore, isochrony has been modified by phonologists according to the requirements of phonology. For example, Nespor (1990a: 164) who argues that isochrony should allow for intermediate stages and that languages like Polish or Catalan are intermediate languages between the two extremes. Other phonological modifications of isochrony are introduced below.

Despite this criticism, the weak version of the stress-timed vs. syllable-timed dichotomy is still popular in phonology. Phonology needs a typology of speech

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2 Recall from section 3.2.1 that significant discrepancies between perception and actual acoustic measurements were also attested for another rhythmic phenomenon, namely the rhythm rule, by Grabe & Warren (1995). Both, rhythm rule as well as isochrony are apparently perceptual phenomena. This fits into my observation from chapter 2, according to which the rhythm rule is not a systematic rule of German.

rhythm to motivate certain otherwise inconceivable phonological properties of languages. The basic assumption behind the "weak" version in phonology is that languages tend to be either stress-timed or syllable-timed and that phonological rules serve the purpose of maintaining and optimizing this speech rhythm. If it is true that only syllable-timed languages tend to make their syllables uniform, one can predict that they have other phonological properties than those languages which tend to make the distances between their stressed syllables uniform. For example, resyllabification across word boundaries is more likely to occur in the former type while deletion or reduction of unstressed vowels is more likely in the latter.

6.4 Phonological Accounts of Rhythm Types

In the following sections I look at speech rhythm typologies which are based on the idea that the prosodic boundaries of a language and speech rhythm interact.

6.4.1 Classification according to Phrasal Stress

Since speech rhythm is closely related to sentence prosody and the syntax-phonology interface, phonologists attempted to find the motivation for the speech rhythm types in different syntactic and semantic properties. The most famous example of such an attempt is Donegan & Stampe (1983).

Donegan & Stampe's proposal is intended as a contribution to a discussion about whether the Munda languages and the Mon-Khmer languages are genetically related as it is commonly assumed, since a number of cognates exist (Donegan & Stampe 1983: 337). The problem with these two languages is that, despite these cognates, they have a maximum of typological dissimilarity.

Donegan & Stampe suggest to compare both languages on the basis of a new typology. They claim that the speech rhythm types are motivated by the position of phrasal stress. In their typology, Donegan & Stampe (1983) distinguish between "falling" and "rising" languages, i.e. languages with phrase-initial stress versus language with phrase-final stress. The position of the stress correlates with the sequencing of "given and new" - information in syntax and semantics.

Some of the properties they propose can be compared to the distinction I propose, i.e. the "falling" type can be compared to the phrase-based languages and the "rising" type can be compared to the word-based languages. This can be seen from the table in (3) below.

(3) Properties of the Munda and Mon-Khmer families (Donegan & Stampe 1983)

	Munda	Mon-Khmer
Phrase Accent	Falling (initial)	Rising (final)
Word Order	Variable - SOV, AN, Postpositional	Rigid - SVO, NA, Prepositional
Syntax	Case, Verb agreement	Analytic
Word Canon	Trochaic, Dactylic	Iambic, Monosyllabic
Morphology	Agglutinative, Suffixing, Polysynthetic	Fusional, Prefixing or Isolating
Timing	Isosyllabic, Isomoric	Isoaccentual
Syllable Canon	(C)V(C)	(C)V or (C)(C)V'(G)(C)
Consonantism	Stable, Geminate Clusters	Shifting, Tonogenetic, Non-Geminate Clusters
Tone/Register	Level Tone (Korku only)	Contour Tones/Register
Vocalism	stable, Monophthongal, Harmonic	Shifting, Diphthongal, Reductive

The most important similarity to my proposal is the vocalism. As Donegan & Stampe observed, there is a group of languages that reduce their vowels while the other group doesn't. This corresponds to other features, for example the syllable shapes and the occurrence of geminates.

However, there are some problems with the phrase-stress typology. The first one is due to the fact that Donegan & Stampe (1983) compare only two languages: the properties they assume to be characteristic of the two languages are much too language-specific. For example, both languages are tone-languages and therefore, very detailed predictions about their syllable structure are made, which excludes other languages that might otherwise match one of the speech rhythm types.

The second problem is the "deadly" one. It concerns the correlation between the position of the phrasal stress and the phonological properties that it is assumed to trigger. As Auer (1991: 21) convincingly argues, the proposed classification does not even hold for other languages of the same language groups that Donegan & Stampe (1983) looked at. Mundari (a Munda language) and Vietnamese (a Mon-Khmer language) do not match their typology at all.

Despite these drawbacks, there are some observations in Donegan & Stampe (1983) which are important for the following three reasons. First, the fact has been recognized that the properties of different levels of linguistic representation are all somehow connected to the rhythmic properties of a language. Second, their approach is intended to contribute to a debate on whether these two language families are genetically related despite their opposing properties. Therefore, they look at these properties from the point of view of language evolution and draw some important conclusions: first, languages tend to develop into one of these two ex-

tremes and intermediate stage are assumed to be subject to diachronic changes. Finally, they assume that the features of the language can be drawn back to a small number of factors that are responsible for the evolution of a language. According to Donegan & Stampe (1983), the Munda languages developed away from the Mon-Khmer languages when they changed their rhythmic pattern to a "falling" one, where the word accent was given up. I comment on this latter point in 6.4.2.

6.4.2 Classification according to Word Stress

According to Hyman, there is a factor that allows for a quasi binary classification of language according to which of the two "opposing forces" the language prefers (1978: 454). This factor is syllabification. Languages that syllabify across PWd boundaries are said to take the "pause environment", that is, the PPh (in a pretheoretical sense) as their basis. The other languages take the PWd as their central unit.

Ideally, all languages should match one of the two categories proposed by Hyman. But according to him, there is also evidence that the relevance of word boundaries in languages is a continuum. This would pose a problem for a phonological account, but, as can be seen below, the problematic data are rather phonetic than phonological (see the end of this section).

Hyman claims that languages may gradually put more or less emphasis on the PWd as a phonological unit. How a language protects its word boundaries can be seen from the way, a sequence of two vowels with a word boundary in between is handled (Hyman 1978, citing Delattre 1963). This is illustrated in (4).

(4) Continuum of voice interruption between vowels (Hyman 1978:455)

French	là aussi	'there too'	"smooth onset"
Spanish	una isla	'an island'	"smooth onset", but first vowel tends to fall
English	stay out		"sharp or smooth onset"
German	die Uhr	'the watch'	"sharp onset"

The second of the subsequent vowels can either have a "sharp" onset (i.e. it is separated from the preceding vowel with a glottal stop or glottalization) or a "smooth" onset (i.e. there is no voice interruption between the vowels, only an increase in intensity). In (4), French represents one extreme and German the other.

"Boundary narrowing" phenomena[3] like (4) indicate that the protection of the PWd in languages is a continuum rather than the binary grouping that most phonologists assume. Another example is word-final devoicing which, according to

[3] With this term Hyman characterizes processes of re-interpretation of a rule domain.

Hyman (1978) started as a phonetically motivated devoicing before a pause. Later, this rule was generalized to all word boundaries and, by this, became a phonological rule. The same trend towards the PWd is also possible from the opposite direction, i.e. starting from smaller constituents like the syllable or even the segment: Hyman gives several examples from languages that developed "word prosody". This has been the case in, for example Desano or Guaraní, where an initial nasal consonant now has a nasalizing effect on the whole word. This nasalization is stopped by a word boundary.

Both types of processes indicate that rule domains change along a continuum. They would be problematic for a phonological classification which requires a clear-cut division. But as Hyman notes, the rules originated from phonetic processes, which then turned into binary options at the phonological level. An obvious solution is to distinguish the continuum, that Hyman observed and which concerns the phonetic part, from the binary division that shows up in phonology.

An interesting question is the predicted direction of development. Recall my observation according to which languages may develop from the phrase-based type to the word-based type, but that the opposite direction is exceptional (see section 5.3.4). This observation seems to be confirmed by Hyman. According to him the word is the central linguistic unit in prosody and there is a strong tendency among languages to either narrow down larger domains or build up smaller ones until they reach the word level.

Contrary to that, Donegan & Stampe (1983) have observed that the development may head in both directions. According to them, many European languages have shifted from the "falling" accent to the "rising" accent type, which would roughly correspond to Hyman (1978). However, the Munda languages in their typology have shifted the other way round, from the "rising" to the "falling" type.

But recall Auer's argument against Donegan & Stampe's typology from 6.4.1. Having in mind that their typology might only hold for the two languages they looked at, their observation about a reverse development can be left aside. The fact that the diachronic relation between the two language types Donegan & Stampe (1983) assume is so exceptional, is an additional argument against their typology.

6.4.3 The Functional Approach

Ladefoged (e.g. 1996) was the first who suggested that not only the rhythm type may change. In contrast, there are phonological rules that have the function to maintain a given speech rhythm. He called that a "conspiracy".

A phonological approach in this spirit comes from Auer (1991). As a reaction to the evidence against isochrony, he replaces the syllable- vs. stress-timed dichotomy with a division into "syllable-type" and "word-type" languages and introduces a functional explanation for the two types. Stress-timed languages make the phonological word their most important category, and as a consequence, word boundaries block the application of segmental rules in these languages. Syllable-timed languages, on the other hand, have phonological rules that go across word boundaries in order to achieve an equal syllables length. Some of the properties of syllable-type and word-type languages are given in (5).

(5) typology of speech rhythm & phonological properties (see Auer 1991)

syllable-type rhythm	*word-type rhythm*
rules do not refer to the phonolog. word	rules refer to the ph. word
rules refer to the syllable	rules do not refer to the syllable
no reduced vowels	reduction of unstressed vowels
CV-syllables	complex syllables
liaison	no liaison
resyllabification across word boundaries	ambisyllabic consonants
rather a tone language	tone language not likely

According to these criteria Auer (1991) and Auer & Uhmann (1988) have established a scale of languages, illustrated with the following examples.

(6)

syllable-type languages				stress-type languages
Yoruba	Mandarin	French	Uzbek	English
Vietnamese	Japanese	Korean	!xóo	German
	Hausa			Arabic

Auer's proposal is important for phonologists, first, because he relates otherwise unrelated languages according to the different functions of their prosodic categories. Second, he recognized the word stress as one basic factor. Despite this, I do not use this distinction and in the next section I argue why.

6.4.3.1 Problems

There are two problems with Auer's approach. The first one concerns a general point and the second has to do with the topics addressed in this thesis.

The first problem concerns the role of the syllable in typology. As a consequence of his assumptions Auer has to reject the syllable as a potential rule domain in all types of languages. He has to do so because the basic factor of comparison of the language types it the opposition of the syllable and the word as a rule domain. This is a serious drawback, since there are many languages he classifies as being of the word-type which make no less use of this domain. Famous examples are English (see Kahn 1976) and German (see Hall 1992).[4] Since the typology in (6) aims at distinguishing languages by syllable-related criteria, Auer's typology sometimes fails to identify languages that should belong to one single type. For example, a language like French cannot be classified according to Auer's typology, whereas, the PPh is taken into consideration French can be shown to be a prototype of a coherent class of languages (this is claimed by the other typologies introduced here).

Another problem is that Auer's basis of comparison (i.e. the syllable and the word domain) does not account for the influence of language change on the prosodic types. This point is not intended as a criticism against Auer, because he did not plan to take language change into consideration. Still, having the data from chapter 5 in mind, I need another basis of comparison, one that can account for the shift from Old High German to Modern German, from European Portuguese to Brazilian Portuguese, and so on.

As I suggested in chapter 5, making the behavior of unstressed vowels the basic parameter for the division of the language types can capture changes concerning the speech type of a language. An additional assumption I make concerns the relevance of perception. Unlike Auer, I do not assume that languages develop their characteristic phonological rules in order to maintain their speech rhythm type. Rather, I assume that speakers - in the long run - define and redefine the speech rhythm type through their perception. As I said, unstressed vowels are the deciding factor. If for some reason (e.g. language contact) speakers of a phrase-based language start to reduce their unstressed vowels, the speech rhythm is predicted to be reinterpreted into a word-based one.

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4 The supporters of Auer's theory would not agree to that. Anyway, the (external) factor that one needs a category that can oppose the word-type, seems to be the triggering argument against the syllable as a category in many of the word-type languages.

This is supported by two arguments: First this type of language change is in fact frequent and second there is an experiment on the acquisition of speech rhythm by Nespor (1990a). This is described in the next section.

Finally I should like to point out that, although I do not take over Auer's (1991) typology, it has been of great influence on the present study and many phonological regularities of the syllable-type languages correspond to what I would call the phrase-type and they have first been proposed by Auer.

6.4.4 Are the Rhythm Types Parameterized?

An interesting question would be whether the rhythm types are parametrized. To my knowledge, nobody has ever claimed this, although the phonological classifications appear to be parametrized: they all claim that the groups of languages have coherent features that are correlated with other properties of the language, for example syntactic ones. It seems obvious that in language acquisition, one of these properties (in my classification for example the behavior of the unstressed vowels) might trigger the acquisition of the other ones.

But, as an experiment by Nespor (1990a) revealed, this is probably not the case. Taking the stress-timed vs. syllable-timed distinction as a basis, Nespor assumed the parameterization as a working hypothesis. However, it turned out that in language acquisition, the phonological processes of a certain language seem to trigger the acoustic effects of stress-timed vs. syllable-timed languages in the perception of the learner. If it had been the other way round, namely that the children had the option of setting a "rhythm" parameter to "stress-timed" or "syllable-timed", then one would expect that the acquisition of this parameter triggered further properties of the language.

Since this was not the case, Nespor concludes that speech rhythm is not parametrized, but that all speech rhythm properties follow independently from the phonological rules of a language.

6.5 Classification according to Postlexical Domains

In the preceding sections I have argued in how far I agree or disagree with formerly made assumptions on speech rhythm typology. I conclude this chapter by returning to the alternative classification I propose. It chooses the postlexical domains as the deciding factor. This classification has been summed up in (1). In the first part of this section, I list the assumed properties of (1) and I argue why they coincide. Thereafter I comment on the consequences of (1).

6.5.1 Why the Properties Coincide

In this section I look at each of the properties in (1) in turn. Before I start, I briefly sum up observations and conclusions, which were defended in the last chapters and are presupposed now. (7) is important because it motivates why the properties listed in (1) coincide.

(7) Presuppositions

i. The prosodic hierarchy is not necessarily universal. Languages may skip domains in their segmental phonology.
ii. Phonological rules often have the function of delimiting domains acoustically.
iii. Language change is often triggered by casual speech reductions and the perception thereof (cf. Dauer 1983, Ladefoged 1996[3]).
iv. Spoken language is characterized by the opposing forces of smoothness of connected speech versus the coherency of the PWd. They have different priorities in both cross-linguistically as well as language-internally at different speech styles.

The most important property concerns the *domains of postlexical rules*, which I claim are the basis for the distinct types. Word-based languages have the phonological word as the domain of postlexical segmental rules, while phrase-based languages have the phonological phrase. This has to do with (7)(i) and (ii). Languages choose either the PWd or the PPh as the central unit of their phonology and delimiting segmental rules to this domain underlines them. The same holds for the fact that there are no segmental rules that refer to the PPh in word-based languages, and, the other way round, there are no such rules that refer to the PWd in phrase-based languages.

Next I turn to the syntactic properties of the opposing language types. In word-based languages, *focus in situ* is standard and coordination reduction is possible, whereas in phrase-based languages, coordination reduction is unknown and focus has to be expressed by syntactic means. This has to do with (7)(ii) and (iv). While the smoothness of connected speech demands that focus be realized in situ, since this is less articulatory effort, the PWd is in phrase-based languages not available as a domain for focal stress. The same holds for coordination reduction. *Coordination reduction* allows for dropping identical PWds in coordinate structures, which again reduces articulatory effort. But at the same time coordination reduction requires a remnant to be focused (cf. Booij 1985). The notion of the PWd however, is not available in phrase-based languages, neither for deletion nor for focusing of PWds.

Word-based languages and phrase-based languages also differ with respect to the *effects, focus has on the phonological phrases*. The former have either no rephras-

ing triggered by focus or an optional insertion of a boundary (i.e. at narrow focus). In the latter, focus enforces a restructuring of the phonological phrasing. This is due to (7)(ii): the fact that focus and phonological phrases do not interact in word-based languages indicates that the PWd and not the PPh is the target level of focusing.[5] In phrase-based languages, the PPh is the target domain of focus and, as expected, focusing may radically rearrange the phonological phrasing in these languages.

The *recursivity* of PWds or IPs in word-based languages as opposed to the recursivity of the PPh in phrase-based languages is a consequence of (7)(i), which states that the prosodic hierarchy is not universal. If a language lacks a certain category, the next higher or lower one may become recursive in order to host prosodically dependent elements.

The fact that the *phonological phrasing* (in the sense of the universal rhythmic domain) varies in word-based languages but not in phrase-based languages, where there is one phrasing obligatory, has to do with perception ((7)(iii)). In languages where the PPh has no grammatical function, it only exists as a rhythmic concept. Since it is not a rule domain, its boundaries in spoken language cannot be determined. As a consequence, the distribution of PPh boundaries has more options.

The *well-formedness of the syllables* results from (7)(iv). Word-based languages typically have a strong preference for the coherency of the PWd. Accordingly, the PWd is the *domain of syllabification* in these languages and they prefer complex syllable codas over a resyllabification across the boundaries of a PWd. Resyllabification would result in CV-syllables, which serve the smoothness of spoken language. Phrase-based languages give up the coherency of the PWd in spoken language. Accordingly, these languages have the PPh as the domain of syllabification and CV-syllables as a characteristic feature.

A consequence of both perception ((7)(iii)) and the ease of articulation ((7)(iv)) is the *treatment of unstressed vowels*. Unstressed vowels retain their quality in phrase-based languages while they are reduced in word-based languages. Reduced unstressed vowels occur in the same languages that block syllabification across the word. These properties interact with each other through the perception: each is a feature that gives more prominence to the PWd, the syllabification to its boundaries and the vowel reduction to the word stress. I agree with Hyman (1978)

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5 Recall that in chapter 4 I gave arguments that showed that the optional boundary after a narrow focus in German is a word boundary, too.

who supposes that these rules started in connected speech and were reanalyzed as a word-based rule. As outlined in chapter 5, a phrase-based language like Old High German may develop into a word-based language, starting with a reanalysis of vowel reduction.

A last consequence of perception ((7)(iv) and prosodic hierarchy ((7)(i)) is the application of *rhythm rule*. It applies optionally in word-based languages and obligatorily in phrase-based languages. Rhythm rule is due to a feature common to all languages, i.e. a eurhythmic constraint that prohibits subsequent stressed vowels. However, due to the lack of the PPh as a domain, there is no target for this constraint in word-based languages. Accordingly, it is applied optionally or, as Grabe & Warren (1995) suggested, the shift of stress is rather perceived than actually pronounced.

6.5.2 Consequences for Prosodic Domains

From the proposals that have been made on speech rhythm I draw the following conclusions. First, the rhythmic and the segmental component have to be looked at separately, since they are both autonomous systems. Their interaction motivates a classification of the two speech rhythm types described in this thesis.

The perception of speech rhythm (i.e. word stress, full and reduced vowels, etc.) can influence the prominence of boundaries that constrain the segmental phonology. Both diachronic changes and language acquisition start with the perception of segmental rules. Therefore, speech rhythm should be accounted for as an epiphenomenon which is influenced by the perception of phonological properties (see Grabe & Warren (1995), against Auer (1991)).

The category PPh is not universal in the segmental component: PPh boundaries can gain or loose their function as a prosodic barrier depending on changes in the rhythmic component. Despite the typological differences, the PPh has to be a universal category to which the rhythmic rules of all languages may refer to. This can be accounted for with the separation between the two phonological components.

The rhythmic component only has access to the grid beats, which suffices to describe prosodic constraints on the syntax.[6] The segmental component refers to the phonological domains. Under these assumptions, rhythmic rules cannot serve as evidence for constituents in the prosodic hierarchy.

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6 Recall that in chapter 2 I have argued against most phonological accounts for syntactic puzzles. I need to assume that phonology does not constrain the syntax. My model can only account for constraints that have to do with focus-background structure.

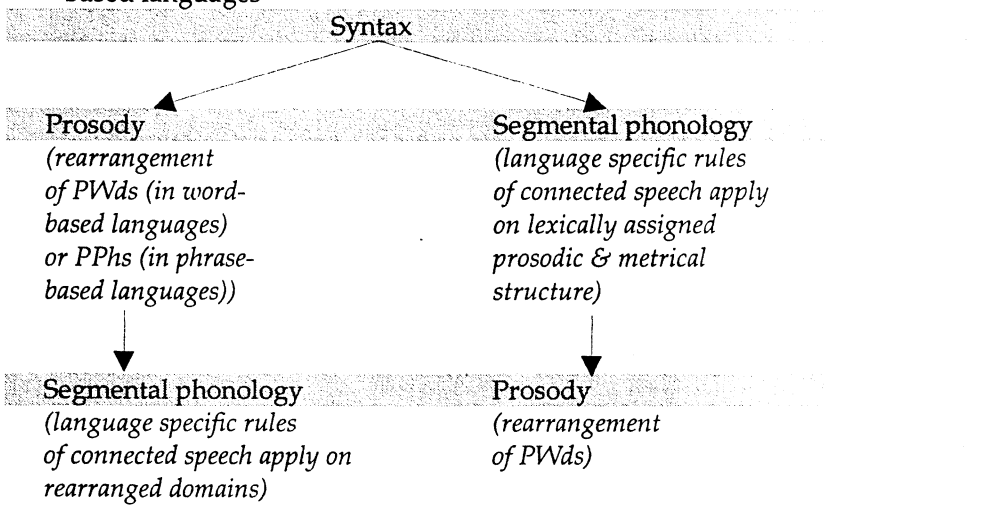
6.5.3 Consequences for the Phonology-Syntax-Interface

The distinction between word-based and phrase-based languages predicts that in these types of languages the postlexical phonology refers to different inputs. As I argued in chapter 3, phrase-based languages always have PPhs as the domains of postlexical phonology. Contrary to that, word-based languages may have domains of different sizes. Yet, a closer examination of these domains showed that, no matter how long they are, they always have the characteristics of a single PWd. This can be accounted for with the model of the syntax-phonology interface model according Nespor (1990b), to which I have added my own observations. It is repeated in(8).

(8) The interaction of the postlexical domains

(a) Phrase-based languages
Casual speech in word-based languages

(b) formal speech in word-based languages



This model provides the information that is needed in order to classify languages according to their prosodic domains. At the same time it motivates why the same rules have different outputs at different registers and speech rates.

Summary

In this thesis I have looked at some aspects of postlexical phonology, i.e. the organization of the postlexical component and the role of the phonological domains, and the correlation between them.

My analysis started with a look at the role of the PPh in German. I showed that this constituent is not relevant in the segmental phonology of German and only marginally present in its rhythmic phonology. Thereafter I looked at some - genetically unrelated - languages in which the PPh plays a central role in phonology. I concluded that they form a coherent class that shares other properties, regarding both phonology and syntax. Then I turned to German again, focusing on the role of the PWd. I showed that the PWd is the central unit in German postlexical phonology. I compared German to languages in which the PWd is equally important. It turned out that these languages are also a coherent group with regard to a number of properties.

From this I concluded that there are two groups of languages, word-based and phrase-based ones. I argued next that - synchronically - the language types are due to a different organization of the postlexical component. I assume this component to be subdivided into a prosodic and a segmental component. In contrast to Nespor (1990b), who assumed this distinction first, I provided arguments showing an interaction of these components, at least in the word-based languages. As a result of this interaction, different domains are the input to formal and casual speech style and for slow and fast speech. No different rule orderings have to be assumed.

I argued further that these two groups of languages originate diachronically from a reanalysis of the PWd as being the domain of vowel reduction. In support of this, I presented data from earlier stages of German and other languages.

I added some remarks on the already existing speech rhythm classification which, to some extent, influenced my proposal. For example, it has already been noted that there are two domains in charge of the speech rhythm types and several authors have recognized the PWd to be one of them. Other authors found out that languages might switch from one language type to the other. However, I showed that there are some difficulties with all of them when accounting for the synchronic and diachronic features of PWds and PPhs.

I concluded by showing how my proposal, i.e. the correlation of word-based languages and phrase-based languages with the specific organization of the lexicon that I assume can account for the problematic synchronic and diachronic features of PWds and PPhs.

List of Abbreviations

BP	Brazilian Portuguese
EP	European Portuguese
FD	final devoicing
FNC	functional category
LEX	lexical category
LP	Lexical Phonology
OV	obstruent voicing
OT	Optimality Theory
PPh	phonological phrase
PWd	phonological word
RR	Rhythm Rule
RS	Raddoppiamento Sintattico
SLH	strict layer hypothesis

A stressed syllable is usually marked with a preceding '.
Only if a contrast between main stress and secondary stress is expressed, the syllable carrying main stress is in capital letters and the syllable with secondary stress is marked with a ` over the vowel.

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