AN APPLICATION OF AUTOSEGMENTAL MORPHOLOGY TO SOME NONCONCATENATIVE PHENOMENA IN GERMANIC LANGUAGES

by

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ABSTRACT

This study is an attempt to apply the theory of autosegmental morphology, as proposed by McCarthy (1979, 1981), to some nonconcatenative phenomena in three languages with otherwise concatenative morphological systems, namely Dutch, German and English.

The main features of the theory of autosegmental phonology, which provides the basis for McCarthy's theory, are described. The literature on autosegmental studies of tone and harmony is reviewed, with particular attention paid to the Well-Formedness Condition, Association Conventions, and the Obligatory Contour Principle.

The theory of autosegmental morphology is then introduced, and an application of autosegmental morphology to reduplication, as put forward by Marantz (1982), is detailed.

After a brief discussion of some major differences between the morphological systems of Dutch, German and English on the one hand, and the languages to which autosegmental morphology has so far mainly been applied on the other, attempts are made to apply the theory of autosegmental morphology to the Dutch and German past participle morphemes, a circumfix in Dutch, and reduplication in English and German.

It is found that neither the past participle morphemes nor the Dutch circumfix benefit from an autosegmental treatment. Rather more success results from the reduplication data, and some interesting theoretical issues are discussed in the light of this data.

It is concluded that autosegmental morphology is of use only for those languages, or those parts of languages, which manipulate the skeletal tier. It is further concluded that as the morphologies of Dutch, German and English overwhelmingly do not manipulate the skeletal tier, and as the description of the entire morphologies of

these languages autosegmentally would moreover result in some disadvantages, this should not be attempted. Doubt is cast on any implied universality for the theory of autosegmental morphology.

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This thesis is dedicated to Clive and Claire.

CONTENTS

Chapter 1
INTRODUCTION

1.1. Background

In 1979, McCarthy proposed that the highly nonconcatenative morphology of Arabic could be treated by an adaptation of the theory of autosegmental phonology, as outlined in Goldsmith (1976a,b). McCarthy's proposal was called prosodic morphology, or autosegmental morphology. It has proved to be very useful in describing Arabic morphological phenomena and has provoked a large amount of subsequent research (for example Marantz 1982, Hoberman 1988, Haile and Mtenje 1988). Some of the reasons for its success are as follows.

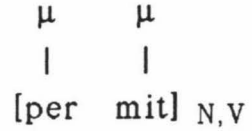
Languages which can be adequately described by traditional morphological theories such as structuralist or generative morphology are those languages which exhibit largely concatenative morphology. That is, in these languages, 'morphemes are discrete elements linearly concatenated at the right or the left end of the base of the morphological operation' (McCarthy 1981:373). In nonconcatenative morphological systems, on the other hand, 'morphemes may be segmentally discontinuous' (McCarthy 1982:191), and morphological operations may involve more than the simple joining of discrete 'building blocks'. Nonconcatenative operations include for example internal modification (such as ablaut), infixation, subtractive morphology, and reduplication. Reduplication is regarded as nonconcatenative because morpheme boundaries are often ignored by reduplication processes; Marantz (1982:438) notes that 'well-attested reduplication rules do copy sequences of consonants and vowels from a morpheme which form no constituent of the morpheme.'

Languages with nonconcatenative morphological systems cause problems for theories which are designed to operate with discrete, continuous morphemes. For example, many nonconcatenative processes can only be treated under a standard generative analysis

by relying on an undesirable transformational power in the morphological rules (McCarthy 1981:373). (There are other problems; for example discontinuous morphemes provide problems for some versions of generative morphology because they are incompatible with the Binary Branching Hypothesis (Schultink 1987:481)). In many frameworks, nonconcatenative phenomena are largely ignored: '[the] residual status accorded nonconcatenative morphology in structuralist analyses extends to generative theories as well' (McCarthy 1981:373).

Languages which contain large amounts of nonconcatenative morphology appear, therefore, to be better treated by the autosegmental method as proposed by McCarthy (1979, 1981), which involves a definition of morpheme whereby the string of elements constituting the morpheme does not have to be continuous. McCarthy's theory enables a description of nonconcatenative phenomena with a reduction in the transformational power of morphological rules (McCarthy 1981:405-406), and captures a number of generalisations with 'a simple and elegant set of language-particular rules and representations and with the mostly independently motivated universal apparatus of autosegmental phonology' (McCarthy 1981:404).

As all languages are not homogeneous with respect to the concatenativity of their morphology, the question arises of how nonconcatenative phenomena in languages which are basically concatenative should be treated. McCarthy himself implies that the autosegmental method could be applied, though perhaps trivially, to all languages: 'Any basically concatenative morphological system, like ordinary English morphology, has a very simple translation into this notation' (McCarthy 1981:377). McCarthy gives the example of English <u>permit</u>, claiming that it may be represented autosegmentally, without requiring a boundary between the two morphemes. This is shown in (1) (where μ represents a morpheme node):

1.


Note that no boundary symbol is even implied between the two morphemes per and mit in this representation, as such notions are unnecessary in autosegmental theory. The linear separation of morphemes from one another is unnecessary because

> The grammar can refer to per and mit as separate morphemes with special phonological and morphological properties, without reference to boundary symbols. Because separate nodes μ dominate per and mit, they are necessarily interpreted as distinct morphemes (McCarthy 1981:377).

In a later article, McCarthy again implies that autosegmental theory may be universally applicable, claiming that *'All* words of *all* languages have two synchronous layers or tiers' (in other words, are represented autosegmentally) (McCarthy forthcoming:5; my emphasis). Yip, Maling and Jackendoff (1987) also assume universality of autosegmental theory in their autosegmental analyis of case phenomena, which is proposed with a view to 'provid[ing] some insight into how case might be characterized in Universal Grammar' (1987:217).

The possibility of the application of autosegmental theory to basically concatenative languages, and especially the relative lack of previous work in this area, have led to the research presented in this thesis. The aim is to attempt to apply the theory of autosegmental morphology to various nonconcatenative phenomena in three basically concatenative languages: Dutch, German and English.

1.2. Structure of the Thesis

Chapter 2 contains an introduction to autosegmental theory. I begin the chapter by discussing autosegmental phonology, and then show

how autosegmental theory has been applied to harmony, morphology, and, within morphology, specifically to reduplication.

Chapter 3 contains a brief discussion of some differences which exist between the languages I investigate in this thesis and the languages to which autosegmental theory has so far mainly been applied. The differences discussed have major consequences for the form of representations and derivations.

Chapters 4, 5 and 6 deal with nonconcatenative phenomena which I attempt to describe autosegmentally. In Chapter 4 I look at Dutch and German past participles. Chapter 5 contains an investigation of a discontinuous affix in Dutch, and Chapter 6 concerns reduplication in English and German.

Finally, Chapter 7 is a conclusion which includes an assessment of the amount of success the attempt has had.

The aim throughout the thesis is obviously not simply to translate Dutch, German and English morphology into an autosegmental notation, but to determine whether the autosegmental method provides an elegant and simple analysis of the phenomena, and whether an autosegmental treatment of these languages provides any benefits over other methods of description more traditionally used for them.

The topics discussed in this thesis do not exhaustively cover the range of nonconcatenative phenomena in Dutch, German and English. Umlaut in German, for example, is a candidate for an autosegmental treatment; a discussion of this phenomenon can be found in Lieber (1987:99-111). Nor is it the aim of the thesis exhaustively to describe an autosegmental approach to any one of these languages, but merely to ascertain whether such an approach is desirable. Many details of analysis will therefore be sidestepped; for example, I do not investigate the question of whether the Obligatory Contour Principle applies in Dutch, German and English. Such questions would be the topic of a later study.

1.3. Note on Typographical Conventions

Throughout the thesis, cited lexical items, word forms or parts of word forms are underlined. This is the case also in quotations, even where in the original the author uses some other form of identification for such items, for example italics.

Chapter 2
AUTOSEGMENTAL PHONOLOGY AND MORPHOLOGY

2.1. Background

In traditional generative phonology, tones are treated as 'feature[s] on a segment, exactly parallel to other phonological features' (Williams 1976:463). The behaviour of tones, however, has always denied a simple treatment under such a model. Wang (1967:95), for example, notes that in many cases 'the interaction of tones in a sequence is independent of the nature of the segments which occur with the tones.' He suggests that 'Phonetically, of course, the domain of the tone is over the entire voiced portion of the syllable ... it is preferable to formalize the tone features differently from the segmental features and regard them as features of individual syllables.'

Data which demonstrates the inadequacy of a traditional segmental approach to tone is provided by Williams (1976). He notes that various phenomena in Margi require complex and ad hoc rules if they are to be treated in a segmental manner, such as the behaviour of rising tones on verbs upon addition of a suffix. In (1), the toneless suffixes ani and na are added to verbs with rising tones (in this and subsequent examples, ` represents a low tone, ´ a high tone, and ˇ a rising tone):

1. a.	fǐ	+	ani	→	fyàní	
	to swell		causative		to make swell	
b.	bdlě	+	na	→	bdlèná	
	to forge				to forge	(Williams 1976:464).

Williams states that under a segmental theory, fǐ and bdlě must be represented as having geminate vowels, and the derivations in (2) result:

2. a. fìí + ani → fyàní (Degemination and Glide Formation)
   b. bdlèé + na → bdlèná

The analysis for (2b) is relatively simple; 'the second e̱ deletes and transfers its tone to the following syllable' (Williams 1976:464). Example (2a), however, presents complications. The second i̱ deletes and the first devocalises, but 'the tone of the deleted i̱ shows up not on the next syllable, but two syllables away', and 'Since devocalization must precede deletion, when the first i̱ devocalizes, its tone shows up not on the following i̱ but on the syllable after it' (Williams 1976:465). Ad hoc rules can be written to produce these effects, but these rules in turn face problems when applied to other forms (see Williams 1976:465).

In an early attempt to deal with 'suprasegmental' features such as tone - so called because their values may extend over more than one tone-bearing segment (van der Hulst and Smith 1982:5) - Leben (1971, 1973) first proposed the concept of separate sequences for these features. Goldsmith (1979:204) characterises Leben's arguments thus: underlying representations 'could consist of two separate and quite independent sequences of phoneme-type segments, one sequence providing the tonal information, the other sequence containing everything else.' Leben's theory also includes 'feature mapping', which 'join[s] two separate sequences of segments into one single linear sequence' (Goldsmith 1979:204). The surface phonological representation is thus one-dimensional under Leben's model.

At about the same time, Williams was discussing the same problems. Many of the ideas put forward by Williams and Leben have been adopted by subsequent researchers, so I outline here some of the details of Williams' model.

2.1.1. Williams (1976)

Williams proposes, like Leben, that 'suprasegmental' features such as tone should be initially represented on a separate level from all other phonological features. He suggests that 'in the deepest

representation, tones are not associated with segments or with syllables, but rather with morphemes ... each morpheme has as a part of its phonological representation a string of tones' (1976:483).

He proposes a Tone Mapping Rule which then maps the tones onto the segments at some stage in the derivation. This explains the fact that some rules apply either only to the sequence of tones or only to the sequence of segments, while some rules apply to both segment and tone together; the former type of rule applies before Tone Mapping, the latter after Tone Mapping. Of course, the former type of rule constitutes evidence for the separate sequences being proposed; Williams notes that 'important laws of tone can be stated only on the representations that precede the application of Tone Mapping' (1976:483), and Clements and Ford (1979:180) mention 'the mutual independence of most tonal and nontonal processes' as being evidence for independent sequences of tones and tone-bearing units. The Tone Mapping Rule functions as follows:

> It maps from left to right a sequence of tones onto a sequence of syllables. It assigns one tone per syllable, until it runs out of tones, then it assigns the last tone that was specified to the remaining untoned syllables to the right, that is, until it encounters the next syllable to the right belonging to a morpheme with specified tone (Williams 1976:469).

No automatic assignment of more than one tone to a syllable is provided for in the event that there are more tones than syllables; such an event must be specified on a language-particular basis. This is shown by Williams' statement that 'An idiosyncratic fact about the rule in Margi is that if there are two tones and only one syllable, then both tones may be assigned to that syllable' (1976:469).

2.2. Autosegmental Phonology: Goldsmith (1976a,b)

Problems remain with tone and other 'suprasegmental' features which Leben's and Williams' models are unable to solve, and these problems have led to further theoretical innovations. Goldsmith

(1979:204-5) states that 'The autosegmental approach arose out of certain inadequacies that were brought to light explicitly and implicitly by Williams' and Leben's work. The most glaring problem was the nature of "contour-toned" vowels' (vowels whose tone is not level). Similarly, van der Hulst and Smith (1982:13) state that 'A major argument against [Leben's and Williams'] model comes from contour tones'.

To deal with such problems, Goldsmith (1976a,b) proposed the theory of autosegmental phonology, which involves for the first time not a mapping of the tiers into a single linear representation, but only *association lines* between the separate tiers. Representations thus remain multi-tiered throughout the derivation.

Goldsmith (1979:203) characterises this new model as follows:

> we let go of the assumption that phonological and phonetic representations consist of a single string, or concatenation, of segments. Instead, we set up underlying and surface forms consisting of parallel strings of segments arranged in two or more tiers.

He suggests that 'the phonetic representation is composed of a set of several simultaneous sequences of these segments, with certain elementary constraints on how the various levels of sequences can be interrelated or "associated."' (1976a:23).

The association lines which connect tones with tone-bearing segments represent 'simultaneity in time', according to Goldsmith (1990:10). Sagey (1988:110-111), however, claims that it is 'incorrect phonetically' to claim this for contour and geminate structures. The phenomena of contours and geminates mean that association lines can only represent 'partial simultaneity, or overlap in time' (1988:111).[1]

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[1] See also an interesting article by Hammond (1988), who rejects both the simultaneity and the overlap approaches in favour of an analysis whereby autosegments 'are seen as issuing articulatory instructions to the slots or nodes they are linked to' (1988:319).

The suprasegmental approach to tone is thus replaced by an autosegmental one. Goldsmith notes that the term 'suprasegmental' is misleading, implying as it does that features such as tone can not be 'segmental' in their own right. He claims that 'a more accurate picture ... is parallel sequences of segments, none of which "depend" or "ride on" the others. Each is independent in its own right; hence the name, *auto*segmental level' (Goldsmith 1976a:28). Or, as Clements and Ford put it, 'some phonological units, including tones, function as *autonomous segments*' (1979:180).

2.2.1. Advantages of Autosegmental Phonology

This section contains examples, taken from Goldsmith (1976a, 1990), of the use of autosegmental phonology in dealing with various problems encountered by either a standard generative theory or a 'suprasegmental' theory.

Goldsmith notes that the standard theory, involving what he terms the 'Absolute Slicing Hypothesis' (1976:24), is unable to deal with various tonal phenomena. The Absolute Slicing Hypothesis is summarised by van der Hulst and Smith (1982:5) as: 'A representation of the sound flow starts with exhaustively splitting it up in 'slices'. The slices or *segments* are linearly ordered and defined as having no ordered subparts.' Among the phenomena which cannot be dealt with under a theory which includes this hypothesis, and involves only one level of representation, are the following:

Contour tones. These are regarded as sequences of two or more level tones, such as LH or HL. Goldsmith (1990:39-44) and Durand (1990:245-247) provide evidence to support the analysis of contour tones as sequences of level tones; Goldsmith, for example, cites rules which normally apply to certain level tones, but which also apply to parts of contour tones. A rule applying to a level 2 tone, for example, also affects the second half of a 3-2 contour tone in the Soyaltepec dialect of Mazatec (Goldsmith 1990:40).

Where contour tones appear on short vowels, the standard theory fails, because in it tones are regarded as features of vowels, and it is impossible for a single vowel to have two different feature specifications for tone (see Goldsmith (1976a:28-32).[2] Contour tones also exhibit some regular behaviour patterns which can be simply explained only under an autosegmental analysis, a notable case being assimilation patterns. For example, in Igbo, as in many tonal languages, 'the tone associated with a vowel on the right ... may associate with a vowel neighboring on the left, causing a change in the righthand side of the latter vowel. Thus we find processes like [3a], but not as in [3b], just as the notation predicts' (Goldsmith 1976a:35).

3. a. V́ V̀ → V̂ V̀
   b. V́ V̀ → V̌ V̀ (Goldsmith 1976a:35).

In (3a), the low tone of the second vowel spreads leftwards, causing an association line to be added and the first vowel to possess a contour tone. This is shown in (4):

4.
```
V  V       V  V
|  |   →   | \ |
H  L       H  L
```

And a real example from Igbo is given in (5):

5.
```
Ekw e c i akhw a        Ekw e c i akhw a
|   |  | |   |   →     |   | \ | |   |
H   H  L L   H          H   H   L L   H
```
(Goldsmith 1976a:34).[3]

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[2] Similar problems arise with affricates and diphthongs, and also with prenasalized stops (Goldsmith 1976a:27).

[3] It was noted above that Williams' and Leben's 'suprasegmental' models are unable to deal satisfactorily with contour tones. Interestingly, Williams himself does not appear to notice any problem with his analysis of contour tones (cf. Williams 1976:469). Perhaps the problems for a segmental analysis of contour tones discussed in Goldsmith (1976a,b) arise also with Williams' and Leben's models after Tone Mapping has applied.

Stability. This term refers to the phenomenon that 'when a tone-bearing vowel is deleted by a phonological rule, the accompanying tone does not also delete, but rather shows up elsewhere on a neighboring syllable' (Goldsmith 1976a:27). It is impossible to delete a segment and leave some features of that segment behind in the standard theory, yet stability phenomena are treated quite simply under an autosegmental analysis. For example, in KiRundi, a word-final vowel is deleted when followed by a word-initial vowel, but the tone of the deleted vowel remains and is reassociated:

6. a. underlying: ùmùgòré aràrìmà
   surface: ùmù-gòr á-rà-rìm-à

   b. umu gor ɛ a r a r i m a
   \/ | / | | |
   L L H L L L

(adapted from Goldsmith 1990:29).

(Word-initial vowels in KiRundi have no underlying tone associated to them; the word-initial /a/ in this example is therefore free to associate to the high tone).[4]

Floating tones. A floating tone is 'a segment specified only for tone which, at some point during the derivation, merges with some vowel, thus passing on its tonal specifications to that vowel' (Goldsmith 1976a:57). Such tones may be elegantly described under the autosegmental method; in fact, as Goldsmith (1990:20) notes, the existence of such entities is predicted by autosegmental theory, for 'the theory predicts the existence of morphemes that exist on just one tier.' An example is provided by a dialect of Mixtecan, in which some words have a suffix consisting of an underlying floating

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[4] It has been pointed out to me by Liz Pearce (personal communication) that the problem of stability also arises in processes such as palatalisation, where for example Ci + V → C[pal] + V. Palatalisation and similar processes are treated in generative phonology by assimilation rules; no problem is perceived if the vowel which causes the assimilation subsequently deletes. It is an interesting point, however, and it is perhaps significant that the process of umlaut, which can be regarded as paralleling the palatalisation example given here (assimilation followed by deletion of the motivating vowel for the assimilation) is amenable to an autosegmental treatment (see Lieber 1987:99-111).

high tone (Goldsmith 1990:20). This high tone is realised on a following word, remaining unrealised if the word is utterance-final (Goldsmith 1990:21). When the underlying forms in (7a) and (7b) are combined, (7c) results, involving the association of the underlying high tone suffix to the first vowel in the following word:

7. a. k e e
   | | 'eat'
   M M H

   b. s ù č í
   | | 'child'
   L H

   c. k e e s ú č í
   | | / | 'the child will eat'
   M M H L H

(adapted from Goldsmith 1990:21-22).

Finally, **spreading** of features such as tone 'over segments unspecified for those features', and especially the fact that spreading can be bidirectional and ungoverned, provide support for autosegmental theory (Goldsmith 1976a:28;62). Its ungoverned nature suggests that 'the spreading is not due to a specific phonological rule, but rather to the geometry of autosegmental representations' (Goldsmith 1976a:62).

An example of how speading can operate is given in (8). The high tone in this hypothetical example could spread leftward to V_1, and rightward to V_3 and V_4. It could not, however, spread to V_5 or V_6, as V_5 is already associated to a tone, and association of H to V_6 would violate a constraint against crossing association lines (this constraint is discussed below in section 2.3.1.).

8. C V_1 C V_2 C V_3 C V_4 C V_5 C V_6
   | |
   H L

(adapted from Goldsmith 1990:30).

Since Goldsmith (1976a,b), many modifications to the theory of autosegmental phonology have been proposed, some of which have been assumed to be valid for the theory as a whole, and some of which have been language-specific modifications proposed to deal with some language-specific phenomena. The theory has also been applied to other areas apart from tonal phenomena, again necessitating certain theoretical modifications; for example, there have been autosegmental treatments of intonation, length, harmony, and nonconcatenative morphology (see van der Hulst and Smith 1985:18-27). In the following section I briefly review the literature on autosegmental phonology, investigating the major principles of the theory and the debate surrounding them. The principles I look at are the Well-Formedness Condition, Association Conventions, and the Obligatory Contour Principle. In section 2.4 I show how autosegmental theory has been applied to harmony, and in section 2.5 I look at the literature specifically relating to autosegmental morphology.[5] It will be seen that very few modifications are required to apply the theory to morphology.

2.3. Principles of Autosegmental Theory

Van der Hulst and Smith (1985:16) state that the question of how different tiers are related to each other in autosegmental phonology consists in fact of two questions:

9. a. What constitutes a wellformed relation between the tonal tier and the segmental tier?
   b. How does this relation come into being?

They claim that the first question is answered by a Well-Formedness Condition (WFC), and the second by a set of Association Conventions (ACs). The WFC defines the set of wellformed

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[5] Note that although harmony sometimes has morphological results, such as allomorphy, it is always phonologically conditioned, and is thus a phonological process.

representations, while the ACs dictate the manner in which mapping of the tonal tier on to the segmental tier takes place.[6] It appears to be debatable, however, whether both a WFC and a set of ACs is required; especially since, as will be demonstrated below, the WFC is in most cases considered to have the power to alter representations (thus also at least partly answering van der Hulst and Smith's question (b) above). So while I discuss WFCs and ACs separately, it must be born in mind that the two sets of principles are dependent on each other, and the tasks they perform overlap in some cases.

2.3.1. The Well-Formedness Condition

The majority of versions of autosegmental theory include a list of conditions defining the set of well-formed representations. Goldsmith originally proposed the following WFC:

10. a. All vowels are associated with at least one tone
       All tones are associated with at least one vowel
    b. Association lines do not cross (Goldsmith 1976a:36).[7]

It is generally accepted that the WFC has the power to effect changes in representations which do not meet its specifications; for example, Goldsmith (1976a:37) states that

> A derivation containing a representation that violates [the WFC] is not thereby marked as ill-formed; rather, the condition is interpreted so as to change the representation minimally by addition or deletion of association lines so as to meet the condition maximally.

Clements and Goldsmith (1984:10) state that the WFC is not a principle which rules out representations, but rather 'a neutral state from which any deviation is automatically corrected by convention.'

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[6] It is generally assumed that the various tiers are unassociated with each other in the lexicon; for example, Clements and Ford (1979:180) state that 'in the regular case, tones and tone-bearing units are underlyingly unassociated.'

[7] Note that although the WFC is worded in terms of tones and vowels, the principles expressed in it extend to areas other than tone, such as nasality features (Goldsmith 1976a:63).

Subsequent researchers have proposed various modifications of the original WFC. There is widespread support for eliminating the clause of Goldsmith's WFC which states that all tones are associated with at least one vowel. Williams' original model does not include such a principle, as we have seen; for him, the linking of more than one tone to a vowel in the case where there are more tones than vowels is an idiosyncratic fact about particular languages, not part of the universal component as it is for Goldsmith. Halle and Vergnaud (1982:67) follow Williams and claim that 'more than one tone may be assigned to the last vowel only if the grammar of the language includes a stipulation to that effect.' Laughren's (1984:187) WFC also lacks the compulsory association of all tones.

Other researchers reduce the WFC even further, rejecting also the clause which states that all vowels must be associated with at least one tone (the clause which produces automatic spreading of tones in the event that more tone-bearing units than tones are present). For example, Pulleyblank (1986:11) states that 'multiple linkings of a single tone to more than one tone-bearing unit also occur only as the result of language-specific rules.' For some researchers, then, the WFC is reduced to a constraint against crossing association lines (for example van der Hulst and Smith (1985:18), Pulleyblank (1986:11), Hammond (1988:319)).

This last remaining constraint, that association lines may not cross, is agreed upon by everybody - or rather, by almost everybody. Sagey (1988) argues against the existence of such a constraint, claiming that crossing association lines are ruled out by extralinguistic knowledge. She suggests that 'a line-crossing representation is ill-formed because the relations it encodes are contradictory' (1988:115). The contradiction referred to is a logical contradiction 'among the precedence and overlap relations encoded in the representation' (1988:117). Durand (1990:249-250) notes that a constraint against crossing lines is 'a general principle of generative grammar', and compares it to the constraint against crossed lines in syntactic tree diagrams.

So debate is still in progress about the details of well-formedness conditions on representations, and yet the WFCs which are proposed bear considerable similarity to one another. The major force of the debate appears to be to what extent parts of the conditions are universal or to be stated only as language-specific rules.

2.3.2. Association Conventions

As mentioned above, there is some overlap between the task the WFC is supposed to perform and the task the ACs are supposed to perform. Goldsmith (1976a,b), for example, does not appear to have any separate ACs; see for example 1976a:44, where, in an example showing the stages of a derivation including mapping, the mapping is actually done by the WFC.[8] Williams (1976), on the other hand, has only ACs (his 'Tone Mapping Rule') and no separate WFC.

Some researchers propose Association Conventions which they explicitly state are only for cases where the WFC is not sufficient to define exclusively the form a particular mapping should take. For example, Clements and Ford (1979:182) claim that the well-formedness principles apply, and govern associations to a certain extent, but that sometimes there is more than one way to satisfy the WFC, and in these cases one needs to know which of the possible representations to choose. They therefore propose three conventions, paraphrased in (11), which for any input representation 'determine a unique set of associations.'

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[8] Clements and Goldsmith (1984:11) imply that Goldsmith (1976) does in fact have some separate ACs; however, they do not mention where he lists them and I have been unable to find any.

11. a. associate free tones to free tone-bearing units from left to right
    b. associate remaining free tones with each of remaining free tone-bearing units (= spreading preference to unassociated tones)
    c. remaining free tone-bearing units receive an association
        (a) giving precedence to segments linked to unaccented elements, otherwise
        (b) giving precedence to segments on the left.

(paraphrasing taken from Clements and Goldsmith (1984:11) and McCarthy (1982:194)).

There have been many other sets of association conventions proposed, differing however in most cases only slightly from each other. Clements and Goldsmith (1984), for example, have similar association conventions to Clements and Ford (1979), but insert the extra condition 'Add the minimal number of association lines necessary to eliminate the violation' (1984:11). Pulleyblank (1986:11) claims that the universal ACs consist only of the convention 'Map a sequence of tones onto a sequence of tone-bearing units, (a) from left to right (b) in a one-to-one relation.' According to Pulleyblank, a linked tone is not subject to further linking unless stipulated by a language-specific rule. He shows that an analysis of Tiv is more complicated if automatic spreading is assumed (1986:82-89), and he also claims that automatic spreading does not exist in Margi, although rightward spreading is widespread in that language. He claims that if spreading were automatic, it would be bidirectional, and that Margi has a specific rule producing rightward spreading. Halle and Vergnaud (1982:73) also prevent automatic spreading, in their case by adding the constraint:

12. The Tone Mapping Rules ... apply only to floating (=unlinked) tones.

They argue that in cases where more tone-bearing units than tones exist, rather than spreading taking place, vowels may surface with a tone value which is 'redundantly specified in the phonemic core'

(Halle and Vergnaud 1982:72). Pulleyblank similarly claims that default rules exist which 'supply feature values to segments that are not completely specified' (1986:81).

Goldsmith (1990) has an Association Convention which applies only after some initial association has already taken place; it states that 'when unassociated vowels and tones appear on the same side of an association line, they will be automatically associated in a one-to-one fashion, radiating outward from the association line' (1990:14). Goldsmith, like Pulleyblank (1986) and Halle and Vergnaud (1982), adopts a 'weak' association convention (one with no automatic spreading), but does it 'primarily for ease of exposition', and claims that 'a number of points ... arise which suggest that a different, stronger position is preferable' (1990:15).

2.3.2.1. Initial Association

In the above examples of ACs, with the implied exception of Goldsmith's (1990), association uniformly begins with the leftmost tone and the leftmost tone-bearing unit. While this is accepted as the unmarked place for association to start, there are languages where this is not, or not always, the case. For example, Laughren (1984:186-7) claims that there are three Initial Tone Association Rules (ITARs). Under ITAR (1), initial association takes place between the first tone and the first tone-bearing unit. This is 'the unmarked or most widely applicable rule'. Under ITAR (2), initial association takes place between the first tone and the second tone-bearing unit. And ITAR (2a), which applies (along with ITARs (1) and (2)) in Zulu and Xhosa, states that the first tone initially associates with the first and second tone-bearing units.

Laughren's ITAR (2) is also claimed by Goldsmith (1990:13) to operate in Kikuyu. He also notes that in Hausa, association appears to start with the rightmost elements (taken from Newman 1986). Van der Hulst and Smith (1982:15) mention a rule initially connecting the starred (*) segments on each tier in languages with 'pitch-accent' systems (the stars presumably being present in the lexicon on the relevant segments). Clements and Ford (1979:181)

claim that 'Initial tone association results from the application of rules which are language specific, but drawn from a narrowly-defined set of rule schemata.'

2.3.3. Application of WFCs and ACs

With both the WFCs and the ACs, the question arises as to the timing of their application. Clements and Goldsmith (1984:12) note that it has been assumed that the WFC applies at all stages of derivations; Odden (1984), on the other hand, claims that the WFC 'come[s] into effect after the last rule in the grammar which refers to an unassociated vowel in its structural description.'

With ACs, the most common theory is that they apply throughout the derivation. Pulleyblank (1986:11) states that

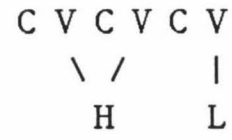
> The basic approach that has been adopted with respect to this issue since Goldsmith (1976) is that the conventions apply whenever possible throughout the derivation ... One alternative approach would be to assume that the Association Conventions apply only at the beginning of a derivation, but not automatically elsewhere.

This would give different results in cases where floating tones are created during a derivation (by deletion of a tone-bearing segment), according to whether these floating tones are automatically reassociated or not. Pulleyblank claims that usually automatic reassociation does take place, but in cases where rules have applied specifically to de-link tones, re-linking is not automatic (1986:12). Also relevant here is the assigning of default values, mentioned above. Pulleyblank claims that 'such default rules can apply quite late in a derivation. That is, representations including tone-bearing units that have no tone must be considered well-formed through much of the derivation, since they are only assigned default tones at a late stage.'

2.3.4. The Obligatory Contour Principle

The Obligatory Contour Principle (OCP) was originally proposed by Leben (1973), and states that 'at the melodic level of the grammar,

any two adjacent tonemes must be distinct. Thus HHL is not a possible melodic pattern; it automatically simplifies to HL' (Goldsmith 1976a:47). It is important to realise that the OCP does not rule out, for example, a sequence of two adjacent high tones within a word form; it refers only to the tonal melody (on the tonal tier). A single high tone on the tonal tier may spread its value to many tone-bearing units. For example, in a word form containing three tone-bearing units, of which the first two receive a high tone and the last a low tone, the representation will be as in (13a), rather than (13b):

13. a.


b.


In Williams' work we also find reference to something like the OCP (although Williams does not call it that). He claims that a monotonal word-form like ndèbè (Margi) can be represented as Lndebe, meaning that 'words that are monotonal have a simpler underlying representation than polytonal ones' (Williams 1976:467).

Goldsmith (1976a:47) states that the OCP 'leads to unnecessary complications, and ... should be abandoned.' He notes that in Etung the tonal melody HL (which may spread to HLL) contrasts with HHL; and LH (which may spread to LHH) contrasts with LLH. He claims that 'the melodies HHL and LLH make it clear that the Obligatory Contour Principle is too strong' (1976b:133).

Van der Hulst and Smith (1985:16) agree, stating that 'it seems that Goldsmith is correct in saying that the OCP can't be maintained as a universal principle.' They claim that 'This reduces the OCP to a principle that *allows* one to collapse identical autosegments if there is no reason to leave them separate.' As 'collapsing identical autosegments reduces the complexity of the representation', some

phonologists say the OCP is part of 'the evaluation metric' (1985:16) (cf. Williams above).

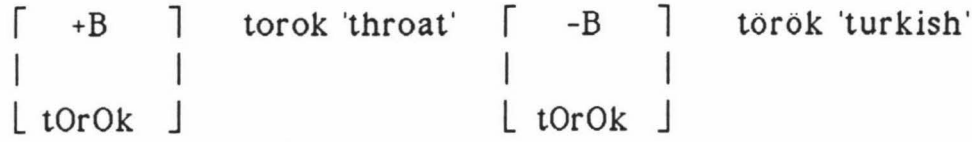
The debate on the OCP continues, with support coming from for example McCarthy (1986) and Yip (1988a), and rejection from Odden (1988).

2.4. Harmony

Autosegmental theory has also been applied to harmony, and it has been found in many cases to provide a successful way of dealing with what were formerly problems of analysis. For example, Clements and Sezer (1982:251) claim that the autosegmental theory 'has proven capable of explaining a relatively complex and intricate set of forms in Turkish with no essential modification.' Lieber (1987:131) claims that *'all* harmonies should be treated autosegmentally.'

Vowel harmony is defined by van der Hulst and Smith (1982:19) as the case 'when all vowels in a particular domain (usually the word) have to agree for one or more features.' Goldsmith (1990:304) describes it thus: 'a vowel harmony system is what arises when a vocalic feature starts to lose its strict one-to-one association with the skeletal [segmental] tier, and begins to behave more like tone.' He gives the example of Turkish, where the feature [±back] spreads to a suffix whose vowel is itself specified only for the feature [±low]. Thus, the [±back] features are displaying typical autosegmental characteristics, and are represented on a separate tier (Goldsmith 1990:305-6).

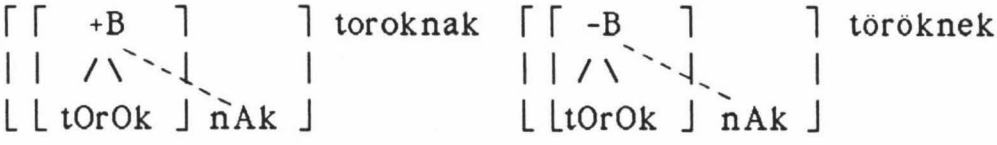
A simple example of the application of autosegmental theory to harmony is given by van der Hulst and Smith (1982:20-21). It is from Hungarian, where the harmonising feature is [±back]. Lexical entries are of the form:

14. 

Association conventions produce:

15. 

And the feat [±back] also spreads to affixes which undergo harmony processes:

16. 

There are some differences between tone and harmony which are reflected in the details of the autosegmental analysis. Halle and Vergnaud (1981:4) state that there are 'no analogous phenomena' to contour tones and stability in harmony, and they therefore propose the following, modified WFC, where many-to-one associations are noticeably absent:

17. i. Each (vowel) slot is linked to at most one (harmony) autosegment.
    ii. Floating autosegments are linked automatically to all accessible vowel slots.
    iii. Unlinked autosegments are deleted at the end of the derivation

(Halle and Vergnaud 1981:4).

In harmony, we do not find sequences of features on the harmony tier, but merely one value for a feature (eg [+back]). As van der Hulst and Smith (1982:20) write: 'a major difference between tone and vowel harmony is that in the former (sic) case one never finds 'melodies', i.e. sequences of unassociated segments at the level of the harmonizing features.'

Durand (1990:256) claims that the autosegmental treatment of harmony is superior to a standard (SPE) treatment. He notes that

> A typical way of handling harmony processes in the *SPE* framework was to mark the first or last vowel for a given domain for the harmonic feature and then spread this latter iteratively from left to right or right to left. But in many cases, harmonic features are the property of a whole stem ... or a whole word without any need for a given vowel to be privileged ... or even, more controversially, a given direction.

2.5. Autosegmental Morphology

The autosegmental theory was first applied to morphology by McCarthy (1979, 1981), where he used it to deal with various nonconcatenative phenomena in Semitic languages. An outline of his analysis follows in this section; sections 2.5.1 to 2.5.3 examine the major principles of autosegmental theory as they apply to morphology.

In Arabic, verbal roots consist of a group of three or four consonants which are segmentally discontinuous. Interspersed among the root consonants are vowels which provide derivational and inflectional information. The number and pattern of consonants and vowels in any verb form is determined by which *binyan*, or derivational class, that particular verb form is a member of. For example, any verb with a triliteral root appearing in the second binyan, perfective active, always has the pattern CVCCVC. The various *binyanim* impart meaning; for example 'the third triliteral binyan is usually reciprocal, while the sixth is usually the reflexive or effective of the reciprocal' (McCarthy 1981:384). So the various forms derived from the root /ktb/, meaning 'write', in the third binyan carry the meaning 'correspond', and in the sixth 'write to each other'.

McCarthy claims that by treating Arabic autosegmentally a simple and elegant analysis of a previously complex and troublesome morphology can be achieved. The consonantal (root) morphemes are separated from the vocalic morphemes (that is, they are placed on different autosegmental tiers), and both consonant and vowel tiers are associated with a central tier consisting of slots marked only for the feature [± syllabic] (called the skeletal tier, the CV skeleton, or the prosodic template). The shape of the CV skeleton is determined by the morphology, as noted above, each binyan having a set of characteristic CV patterns for the various moods and tenses. For this reason, and because the shape of the CV skeleton imparts meaning in much the same way derivational affixes do in languages like English, the skeleton is itself regarded as a morpheme in Arabic (see for example Yip (1988b:556)).

An example of a representation is given in (18) for the form kaatab ('correspond'):

18.

(where μ represents a morpheme node). It is instantly apparent that although the root and vowel morphemes are both discontinuous, this causes no problems of representation; in particular, association lines do not cross, because of the separation of consonants and vowels onto separate tiers. Apart from the discontinuity of morphemes in Arabic, there are other features which lend it to an autosegmental treatment, perhaps the major of which is the large amount of spreading which occurs. An example of spreading is provided by the vowel morpheme in (18).

McCarthy states that the main difference between his theory and that of autosegmental phonology lies in the 'somewhat richer notion of autosegmental tier presupposed here' (1981:383). He explains that

> It has been assumed that the autosegmentalization of some feature or bundle of features defines a single tier on which all and only those features are represented. I will claim instead that each language has the option of restricting every tier to autosegments which are members of a particular morpheme or morpheme class (McCarthy 1981:383).

Thus, while in autosegmental phonology any phonological feature (such as tone) can only appear on one tier, under McCarthy's analysis phonological features may appear on two or more different tiers, as long as the different tiers represent different morphemes.[9] So all phonological information about the consonants forming the root morpheme of a particular verb appears on one tier, all phonological information about the vowel morpheme appears on another tier, and both morphemes are associated to the skeletal tier (itself a morpheme). In the Arabic form ktatab ('write, be registered'), for example, the features specifying the first /t/ (an affix) appear on a different tier from those specifying the other consonants /k/, /t/ and /b/ (the root), while the features specifying the vowel /a/ (derivational information) appear on yet another tier.

It was mentioned in Chapter 1 that McCarthy claims that his description of the morphology of Arabic does not require transformational power. He proposes a constraint on rules called the Morphological Rule Constraint (MRC):

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[9] Even among phonologists there is some support for relaxing the restriction. For example, Halle and Vergnaud (1982:72) claim that 'The fact that a feature is specified on a separate autosegmental tier does not preclude it from also being specified in the phonemic core. Whenver a given phoneme is linked to an autosegment, the autosegmental feature specification supersedes the specification in the core.' Lieber (1987) examines in depth the question of the duplication of features on different tiers, and claims that there is no difference between phonology and morphology in this respect. She suggests that duplication of features is allowed, subject to severe restrictions (1987:3).

19. All morphological rules are of the form A -> B/X, where A is a single element or zero and B and X are (possibly null) strings of elements (McCarthy 1981:405).

This constraint, which means in other words that 'morphological rules must be context-sensitive rewrite rules affecting no more than one segment at a time' (McCarthy 1981:405), restricts considerably the generative power of the morphology.

2.5.1. The WFC in morphology

McCarthy (1982:195) states that in autosegmental morphology 'the tier to template association is subject to two further conditions, neither of which has a direct counterpart in the autosegmental theory of tone.' Firstly, 'there must be a matching in major-class membership between any melodic element and the template position with which it is associated.' (The 'major classes' referred to are the classes [+vocalic] and [-vocalic], and this constraint is a direct result of the factoring out of this feature onto a separate tier). Secondly, McCarthy adds a prohibition against many-to-one associations (that is, associations of many melodic elements to one element on the skeletal tier). This is because

> each position in the string corresponding to a conventional segment is specified for one and only one value of each feature ... the usual circumstance is that a vowel does not have multiple specifications for the feature [back] nor a consonant for the feature [coronal], and so on (McCarthy 1979:128).

McCarthy states that 'no provision is made for automatic association of an unassociated melodic element with a melody-bearing element that already has an association' (McCarthy 1981:382). So (20) is wellformed according to McCarthy (where w, x, y and z are melodic elements):

20.


McCarthy's claim that his constraint against many-to-one associations has no direct counterpart in studies of tone is interesting, as I have already mentioned several autosegmental phonologists working with tone who exclude the clause of Goldsmith's WFC which provides for many-to-one associations (for example Halle and Vergnaud 1982, Laughren 1984). McCarthy goes further than those working with tone, however, in that while others may exclude many-to-one association as an automatic universal feature, they allow it when required by specific languages. McCarthy, on the other hand, claims that

> The ordinary case in nontonal autosegmental systems like the one to be developed for Arabic is that floating melodic elements like *z* in [20] are never anchored. I will refer to this characteristic informally as the *prohibition against many-to-one associations* (1981:383).

(Incidentally, it transpires that McCarthy also has to allow for many-to-one association in marked cases; McCarthy (1982:195) admits that 'Since such complex segments do arise, as with the short diphthongs ..., we will permit the stipulation of dispensations from this requirement').

An interesting fact to note is that the prohibition against many-to-one associations means that it is impossible to have a morphological equivalent of contour tones (which were, as we have seen, a major reason for the proposal of autosegmental treatments in the first place).

2.5.2. ACs in Morphology

In the research on autosegmental morphology, there have been widely varying proposals as to the manner in which mapping may take place. McCarthy originally claimed that the following association conventions were universal:

21. i. If there are several unassociated melodic elements and several unassociated melody-bearing elements, the former are associated one-to-one from left to right with the latter.

ii. If, after application of the first convention, there remain one unassociated melodic element and one or more unassociated melody-bearing elements, the former is associated with all of the latter.

iii. If all melodic elements are associated and if there are one or more unassociated melody-bearing elements, all of the latter are assigned the melody associated with the melody-bearing element on their immediate left if possible.

(McCarthy 1981:382).

There are however those in morphology who join with their phonologist counterparts in rejecting universal spreading (McCarthy's conventions (ii) and (iii) above). For example, Smith (1985) looks at the morphology of Sierra Miwok, and concludes that spreading is rule-governed and not automatic (1985:379).

Then there are more radical departures from the usual association conventions. Yip (1988b) proposes that a (possibly universal) method of association available to languages is 'Edge-In Association,' which is governed by the following principles:

22. i. Associate the outermost unassociated melodic elements with the outermost unassociated skeletal slots, until either all melodic elements or all skeletal slots are associated.

ii. Association is one-to-one, except in the case of one remaining free melodic element and two remaining free edge slots (in which case the melodic element associates to both slots). (Yip 1988b:553; 554).

Yip notes that Edge-In Association has been claimed to be the unmarked type of association for reduplicating affixes (for example by Marantz 1982), and proposes that this is the case for stems also (1988b:551).

Yip's work is interesting because she points out possible differences in methods of association between tonal systems and morphology. For example, one diagnostic she uses to determine direction of association is whereabouts in a word form default values appear, because this is one method of providing unassociated skeletal slots with a value (1988b:553). She notes that tonal systems show evidence of default low tones on the right edge (eg Tiv, Pulleyblank 1986). Morphological 'segments, however, show evidence of default values in the middle (cf. Arabic mutakaatib..., with default vowel /a/)' (Yip 1988b:556). Yip writes that 'Whether this is a real difference between tone and segments, or a language-specific difference, I am not yet able to say' (1988b:556).

Hoberman (1988) adds a constraint to the association conventions. He claims that there is a preference for *local spreading*; that is, that there is a preference for 'the multiple association of a consonant with two C slots that are adjacent, forming a geminate cluster,' as opposed to *long distance spreading* ('multiple association across a V slot' (1988:541)). Hoberman's theory (along with Yip's) thus predicts universally such forms in Arabic as the second binyan perfective active kattab (rather than katbab), unlike McCarthy's theory, which requires a language-specific rule (second, fifth binyanim erasure rule, McCarthy 1981:392) to account for these forms (Hoberman 1988:546).

It is interesting in passing to note yet another method of dealing with the infamous kattab, this time put forward by Goldsmith (1990). He suggests marking the first C slot of the geminate as invisible or 'inert' for the purposes of the Association Convention; the t is later associated to this slot by a 'Geminate Formation' rule (1990:88;94), and he suggests that 'it may not be necessary to make the rule language specific: it may be possible to derive this result from more general principles' (1990:95).

Other examples of variations on the ACs are provided by Smith (1985) and Noske (1985). Smith (1985:379) claims that, at least in Sierra Miwok, there are two restrictions on association: a 'restriction against association across a morpheme boundary', and a 'restriction

to one association from the vocalic melody tier per syllable, even if two successive V-slots [are] available.' Noske (1985) looks at Yawelmani and rejects universal association in any form. He claims that 'in many languages elements on the consonantal and vocalic melodic tiers are underlyingly linked [to the skeletal tier], and that if any association takes place in these languages, it takes place by rule' (1985:358).

2.5.3. The OCP in morphology

The OCP, as McCarthy (1986:207) notes, has enjoyed more success in areas other than tone than it has in tonal studies. McCarthy (1981:383) makes two changes to the OCP. Firstly, he makes the OCP a constraint on elements *in any given autosegmental tier*. The restriction of the OCP's application to elements in the same tier means that adjacent identical melodic elements are permitted, as long as the identical melodic elements are on different autosegmental tiers (McCarthy 1979:131). His second adjustment to the OCP is that he states the principle more weakly: 'in view of Goldsmith's (1976) demonstration that such a constraint alone is too strong for some aspects of Tiv conjugation, I will make the weaker claim that it operates as part of the evaluation metric rather than as an absolute universal principle' (McCarthy 1981:383).

So McCarthy's revised OCP is: 'A grammar is less highly valued to the extent that it contains representations in which there are adjacent identical elements on any autosegmental tier' (1981:384; note as above that adjacent identical elements within the *word form* are not addressed by the OCP).[10]

An example of an application of the OCP is found in McCarthy (1985). He discusses a language game in Amharic where the CV skeleton for the output is provided by the game. There are three

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[10] In later works, however, McCarthy argues differently, claiming that although '[t]he tonal literature seems to argue for a relative interpretation' (1986:255), the OCP should be taken as expressing 'an absolute prohibition, but ... one that grammars will deviate entirely from given evidence to the contrary'. That is, the OCP should be considered 'a parameter of Universal Grammar whose unmarked value is "on."' (1986:256).

possible CV skeletons for the output, depending on the number of *different* consonants in the original Amharic word (1985:307). Thus the Amharic words listed in (23) are all treated identically by the game, because they all have two different consonants, although the number of surface consonants differs:

23.

	Amharic form	disguised form	gloss
a.	man	maynən	'who'
b.	bəlla	bayləl	'eat'
c.	wəddədə	waydəd	'love'

(McCarthy 1985:306).

By virtue of the OCP, McCarthy is able to refer easily to the number of different consonants in the surface form of words, as 'any reference to the number of *different* consonants in a surface form is equivalent to referring to the number of consonants in the root itself' (1985:308). This is demonstrated in (24):

24.

```
C V C     'man'    C V C C V     'bəlla'
|   |              |   \/
m   n              b    l

C V C C V C V     'wəddədə'
|    \\  /
w       d
```

2.6. Reduplication

Marantz (1982) shows how the autosegmental treatment of morphology can be extended to deal with another nonconcatenative phenomenon, reduplication, and claims that this can be achieved with very little extra 'machinery'. He claims that reduplication can be treated as normal affixation - the one difference being that in reduplication 'the material attached to the stem ... resembles the stem phonologically' (1982:436). Under his analysis of reduplication a CV skeleton with no corresponding phonological information of its own is affixed to a stem. The shape of this CV skeleton is uniform

and independent of the phonological make-up of the base.[11] The phonological material for the affixed CV skeleton is then copied over from the stem to the affix. Crucially, (to avoid crossing association lines; see Marantz 1982:446) 'the entire phonemic melody of the stem is copied over' (1982:437); association conventions (including the discarding of left-over segments) then produce the correct output. An example is given in (25):

25.

```
                t a k k i          t a k k i      t a k k i
                | | | | |    ->    | | |          | | | | |
    C V C   +   C V C C V          C V C      +   C V C C V
```

= <u>taktakki</u> 'legs' (Agta; Marantz 1982:446).

This copying over of the complete phonological tier of the stem to supply phonological information for the affixed skeleton is 'The one mechanism added to the grammar specifically for reduplicative processes' (Marantz 1982:456-7).

An advantage of Marantz's treatment of reduplication, he claims, is that it does not have transformational power. He writes that 'By avoiding the exploitation of a full transformational notation, the present analysis explains why reduplicative processes like those illustrated in [26] are not found in any language ... [they] would require crossing association lines in violation of the fundamental constraint on autosegmental representations' (1982:457).[12]

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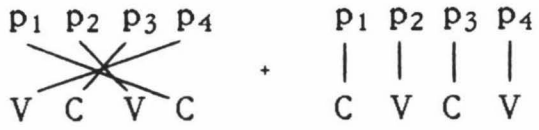
[11] Actually, while Marantz claims that reduplication can always be 'characterized by a "skeleton" of some sort', this is not always a CV skeleton; a syllabic skeleton, or a 'skeleton of morpheme symbols' may also be affixed (1982:439).

[12] Lieber (1981:156) claims that Marantz's theory *does* involve transformational power. The transformational power, or lack of it, of the various theories appears to be a matter of debate. Hudson (1986), for example, argues that McCarthy's analysis of Arabic is highly transformational, claiming that 'the usual tranformational rule-types of deletion, movement and feature-changing are required, though expressed autosegmentally' (Hudson 1986:117). It is in any case true that autosegmental theory rules out the result in (26), one which could be produced by transformational rule.

26. 

(Marantz 1982:457).

2.6.1. The WFC and ACs of Reduplication

Marantz rejects the universality of any part of the WFC except for the prohibition on crossing association lines. He assumes that any additional conditions must be specifically stated; this is shown by his statement 'In the Arabic verbal system, another principle requires that ... each slot in the skeleton is linked to at least one segment in the phonemic melody' (1982:441). It is in fact crucial for Marantz's treatment of reduplication that many to one associations in either direction are excluded. His Condition B (1982:446) states that

> After as many phonemes as possible are linked to C-V slots one-to-one in accordance with other conditions and principles, extra phonemes and C-V slots are discarded. There is no multiple attachment of phonemes to C-V slots or of C-V slots to phonemes.

This raises the question of whether Marantz is forced to postulate two sets of association conditions for languages with reduplication; possibly he is, as he states that 'although it does not appear to be a general constraint on autosegmental linking, Condition B does find ample motivation in the analysis of particular reduplication processes' (1982:446).

It is also necessary for Marantz's analysis that association is *phoneme driven*, and he includes a condition to this effect (1982:447). This means that for each phoneme the CV skeleton is scanned to find an appropriate slot to which it can be associated, rather than the other way around. This produces different results in the following example, where association is phoneme driven in (27a) and skeleton driven in (27b).

27. a. t a l ī n o h + t a l ī n o h = talītalīnoh
'rather intelligent'

C V C C V C V C V C V C V C
[+long]

b. t a l i n ō h + t a l ī n o h = *talnōtalīnoh

C V C C V C V C V C V C V C
[+long]

(Tagalog; Marantz 1982:452).[13]

Marantz's theory of reduplication is not without critics. Clements points out in an interesting article that there are some problems for Marantz with the transfer of 'relevant aspects of syllable organization from the base to the affix' (Clements 1985:45). Clements proposes that the reduplicated affix is not added to the left or right of the base, but is adjoined in parallel with the base. After transfer of the melody of the base to the reduplicated affix the affix is sequenced in the appropriate place within the word form. As Clements' account 'preserves the essence of Marantz's claim that reduplicative affixes are uniform CV-skeleta whose form is independent of the phonological properties of the base', and differs only in the 'mechanism by which the melody is assigned to the [affixed] skeleton' (Clements 1985:46), it is unlikely that any differences between the two methods will be crucial to the attempt to deal with English and German reduplication. None of the problems of transfer cited by Clements arise in the English and

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[13] Davis (1988) argues that for infixing (or internal) reduplication (IR), association is template driven rather than phoneme driven. His claims do not extend to prefixing or suffixing reduplication, however; he notes for example that

> all C slots and V slots of reduplicative affixes in IR have to be associated. In prefixing and suffixing reduplication, on the other hand, it is not unknown for C slots and V slots of the reduplicative affix to be left unassociated (1988:316).

As I do not deal in this thesis with any cases of infixing reduplication, association in examples of reduplication given is always phoneme driven.

German case, and I use Marantz's theory in my attempt to describe them autosegmentally.

It can be seen, then, that there is considerable discussion about the details of autosegmental theory. The object of this thesis is not to determine which proposal (or proposals) out of the many outlined in this chapter is (or are) correct. The differences between the various proposals are in any case usually minor; it was pointed out above, for example, that the debate about the Well-Formedness Condition concerns for the most part the universality or otherwise of the various parts of the Condition, rather than a choice between conditions which differ substantially in content. In this thesis I take the theory as proposed in McCarthy (1979, 1981) and Marantz (1982) as a basis and suggest modifications or language-specific conditions where these appear necessary to deal with the data from Dutch, German and English. I do not expect that the results which arise when McCarthy's and Marantz's theories are tested against the Germanic data would differ in any major respect if another version of the theory was used.

Chapter 3
AUTOSEGMENTAL THEORY AND CONCATENATIVE LANGUAGES

There are some basic differences between Dutch, German and English and the languages to which autosegmental morphology has generally been applied. One major difference between Semitic languages and the languages with which I am dealing is that the latter type 'do not have CV skeleta provided independently by the morphology' (McCarthy 1986:254). While in the Arabic verbal system, for example, the shape of each verb form is determined by the morphology, with melodic segments filling a predetermined arrangement of C and V slots, in Germanic languages the patterning of consonants and vowels is non-meaningful and is never provided by the morphology.

The skeletal tier in the latter type of language must therefore be produced in some other way. McCarthy (1986:254) implies that such a language has the ability to project the CV skeleton from the phonemic melody. Yip (1988b:552) also claims that the CV skeleton is projected from the phonemic melody.

The production of a CV skeleton by the melodic tier is possible because melodic segments in languages like Dutch, German or English must contain values for the feature [± syllabic]; from these feature specifications a skeletal tier can easily be created. Marantz (1982:444-5) points out that McCarthy's (1979; 1981) analysis of Arabic does not involve specifications for the feature [± syllabic] on the melodic tier. This is because consonants and vowels appear in different sorts of morphemes in Arabic, and consequently always occur on separate tiers which have predictable [± syllabic] values. Melodic elements of inflectional morphemes, for example, are all vowels, and McCarthy is able to specify that elements in such morphemes may only attach to V slots (Marantz 1982:444).[1]

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[1] Note that affixes such as 2 or 1, discussed by McCarthy (1981:388-390), are derivational as they distinguish one binyan from another. Marantz's claim that all inflectional morphemes consist of vowels may not be completely

Languages where vowels and consonants appear together on the same tier, on the other hand, must specify for each element a value for the syllabicity feature.

The reduplication data dealt with by Marantz (1982) includes languages which lack 'the characteristic Semitic segregation of vowels and consonants onto separate tiers' (McCarthy 1986:214), and hence Marantz must include specifications for [± syllabic] on the melodic tier. Most of the languages he discusses, however, do manipulate pieces of predetermined CV skeleton, and hence cannot involve the simple projection of the CV skeleton from the melodic tier. Marantz's data therefore requires him to include a rule ensuring that elements with the feature [+syllabic] attach only to V slots in the predetermined CV skeleton, and elements with the feature [-syllabic] attach only to C slots (Marantz 1982:444; the rule is taken from Halle and Vergnaud 1980).

Interestingly, then, there are at least three types of languages with respect to the production of the skeletal tier and the association of melodic elements with that tier. Languages of the Semitic sort involve predetermined CV skeleta, separation of vowel morphemes and consonant morphemes onto separate tiers, and general rules specifying the subset of skeletal slots to which various morphemes may attach. A second group of languages intermingles consonants and vowels within tiers, includes values for every melodic element for the feature [±syllabic], and requires a rule specifying that elements with the feature [+syllabic] attach to V slots, and elements with the feature [-syllabic] to C slots. A third group of languages, which includes Dutch, German and English, never utilises predetermined patterns of C and V slots, and as such always allows the melodic tier to produce the CV skeleton.[2] Incidentally, it would

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correct, however, for McCarthy (1981:390) mentions 'the ⊥ of ... the agreement system.'

[2] I claim that there are *at least* three groups of languages because Goldsmith's (1990) discussion of Miwok suggests that in that language there is yet another situation with respect to vowels and consonants. V's and C's in Miwok do not form separate morphemes, and yet there are separate V and C tiers (see Goldsmith 1990:98).

appear that Semitic languages are exceptions in having their CV configurations determined by the morphology, and that most languages of the world belong to either the second or the third group.

If the skeletal tier in Germanic languages is always predictable from the melodic tier, one may ask if it is even necessary to separate out the feature [±syllabic] and represent it by means of C and V slots. Pulleyblank (1986:18-19) claims that the skeletal tier may be viewed as consisting of either 'slots that are inherently [±syllabic]' or, alternatively, completely empty slots (X-slots). The notion of featureless X-slots in the skeletal tier has also been used, according to Pulleyblank, by Kaye and Lowenstamm (1981) and Levin (1983). Pulleyblank himself makes use of C and V slots in the skeletal tier, but remarks that 'it should be kept in mind that if such labeling is derivative, this will not affect the issues discussed here' (1986:1919). The same is true for the languages I discuss, and I use C and V slots throughout.

Whether or not the skeletal tier for languages like English consists of C's and V's or X's, it should be obvious that it cannot be present in the lexicon but *must* be projected from the melodic tier. This follows from the principle of avoiding redundancy in the lexicon, as stated by Yip (1988b:552): 'Only unpredictable information is present in lexical entries.' McCarthy (1986:254) also states that 'the CV skeleton would exact no cost in evaluating the lexicon since it would be purely redundant information.' A possible exception to this state of affairs arises if Dutch, German or English obey the Obligatory Contour Principle. If the OCP is obeyed, geminate consonants and long vowels are represented underlyingly as single consonants or vowels, and in such cases some information about the shape of the skeleton will have to be provided in the lexicon to produce the correct output (see McCarthy 1986:254-5 and Goldsmith 1990:65). This issue, however, is incidental to the aims of this thesis and I shall not address the question of whether Dutch, German and English obey the OCP or not.

Chapter 4
PAST PARTICIPLES IN DUTCH AND GERMAN

In this chapter, affixes and examples of past participles are usually given in orthographic form. Phonemic symbols are however used where these are appropriate. The phonemic transcription systems used for Dutch and German may be found in Appendix 1.

Glosses for cited Dutch forms are taken from Cassell's (1981), and for German forms from Messinger (1973).

4.1. The Form of the Past Participle
4.1.1 Dutch

The Dutch past participle is formed as follows. For weak (regular) verbs the stem of the verb is isolated by deleting the suffix -(e)n (phonemically -/(ə)(n)/)[1] from the infinitive. To this stem ge- (/xə/-) is prefixed and -t (-/t/) is suffixed. An example is kloppen (infinitive) - geklopt (past participle) ('knock'). However, if the stem of a verb ends in -t, no further -t is added, giving for example zetten - gezet ('set') (taken from Donaldson's (1984:117) orthographic description of the formation of the past participle).

For strong (irregular) verbs, ge- is prefixed to a root 'that may or may not have the same vowel as the stem ... (depending on the ablaut series)', and -en is suffixed (Donaldson 1984:118). An example is binden - gebonden ('bind').

In certain environments, however, the ge- does not appear. For those verbs, both weak and strong, which contain any of the unstressed prefixes given in (1), ge- is not prefixed in the past participle, but the verbs behave otherwise as normal.

1. be-, er-, ge-, her-, ont-, ver-

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[1] The word-final -/n/ is usually omitted in spoken Dutch (Maria Stubbe, personal communication).

(This is the set of those prefixes which are 'bound', or always inseparable, in Dutch (Donaldson 1984:182; de Rooij-Bronkhorst 1980:161)).[2] Donaldson (1984:117) claims that the non-occurrence of ge- before these prefixes is the result of a constraint against two unstressed prefixes occurring in the same word. An example of the non-appearance of ge- is beduiden - beduid ('signify').

Finally, for verbs with separable prefixes, the ge- is inserted between the prefix and the verbal stem, giving for example opgraven - opgegraven ('dig up') (Donaldson 1984:181).

4.1.2. German

The German past participle is formed in a similar, though not identical, manner. Heidolph et al (1984:567) state that the past participle in German is formed by a stem in conjunction with the formative ge-...-(e)t/-en (phonemically /gə-...-(ə)t/-ən/). For weak verbs, the stem is obtained by removing -(e)n from the infinitive, and the past participle suffix is -(e)t, as in leben - gelebt ('live'), landen - gelandet ('land'). The alternation between -t and -et is phonologically conditioned and depends on the stem-final consonant or consonant cluster (Borgert and Nyhan 1976:130); the details of the phonological rule which produces this alternation are not relevant here.

For strong verbs, ablaut of the stem vowel takes place, and the past participle suffix is -en, as in finden - gefunden ('find'), sprechen - gesprochen ('speak'). For mixed verbs, (including modals), the weak suffix -(e)t is used, but the stem vowel undergoes ablaut, as for a strong verb (Borgert and Nyhan 1976:129). An example of a mixed verb is bringen - gebracht ('bring').

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[2] In both Dutch and German there are two types of verbal derivational prefixes, separable and inseparable. Separable prefixes separate from the verb in certain situations, shown in the following example from German containing the separable prefix auf-:

i. Ich muß auf die Kinder **aufpassen** 'I must look after the children'
Ich **paß** auf die Kinder **auf** 'I look after the children'

The ge- is again, as in Dutch, missing in certain situations. Borgert and Nyhan (1976:129) state that 'Verbs not stressed on the first syllable - disregarding separable prefixes - take no ge- in the past participle.'

Aronoff (1976:98), following Kiparsky (1966), also claims that ge- is present in German past participles only 'when the first syllable of the participle [excluding the past participle prefix ge- itself] is stressed.' He notes, however, that 'there is a class of exceptions to this simple generalization' (Aronoff 1976:98), namely participles such as mißverstanden ('misunderstood'), in which the stress falls on the first syllable, but in which no ge- appears. Aronoff notes that Kiparsky deals with this problem by ordering the ge- deletion rule before the rule which assigns stress to the prefix miß- (miß- is stressed only before an unstressed stem syllable; Aronoff 1976:98). The operation of these rules is shown in (2), where the symbol ' indicates stress on the following syllable:

2. infinitive:	miß'brauchen	mißver'stehen
gloss:	'abuse'	'misunderstand'
addition of past participle formative:	gemiß'braucht	gemißver'standen
ge- deletion before unstressed syllable:	miß'braucht	mißver'standen
miß- receives stress before unstressed syllable:	–	'mißverstanden
past participle:	miß'braucht	'mißverstanden

Again, as in Dutch, the ge- appears between a separable prefix and the stem, as in abholen - abgeholt ('pick up').

4.1.3. Differences between Dutch and German

The major difference between the Dutch and German past participle morphemes lies in the differing situations in which the prefix is absent. German ge- does not appear before *any* unstressed syllable, while in Dutch the presence of an unstressed prefix is crucial: 'Dutch prefix ge- is deleted immediately before an unstressed syllable only if this unstressed syllable is part of a prefix' (Schultink 1978:229). This difference between the two languages manifests itself in, for example, the class of verbs containing primary stressed -ier- (German)/-er- (Dutch), or in other verbs where the initial syllable lacks primary stress but is not a prefix. This is shown in (3).

3.		infinitive	past participle	gloss
a.	German	mar'schieren	mar'schiert	'march'
	Dutch	mar'cheren	gemar'cheerd	'march'
b.	German	trom'peten	trom'petet	'trumpet'
	Dutch	trom'petten	getrom'pet	'trumpet'

(examples from Schultink (1978:226; 229)).

There is, however, some debate on the exact conditions which produce deletion of the prefix, particularly in Dutch. This debate will be addressed in section 4.2.3.

4.2. An Autosegmental Treatment of Dutch and German Past Participles

The past participle morpheme in both Dutch and German is a discontinuous one, consisting of a suffix, in some cases ablaut, and in some cases a prefix. It is therefore a candidate for an autosegmental approach. In this discussion of a possible autosegmental treatment I refer for convenience initially only to German past participles. I look at each part of the morpheme in turn, dealing in section 4.2.1. with the suffix, in 4.2.2. with ablaut, and in 4.2.3. with the prefix; then in section 4.3. I look at the morpheme as a whole.

4.2.1 The Suffix

The past participle suffix, -(e)t or -en in German, is obligatorily present in all past participles. This suffix, then, could perhaps be treated in the same manner as McCarthy (1981) treats Arabic affixes; that is, it could be preattached to the lexeme in question. In the Arabic verbal system, of course, affixes are preattached on the left rather than the right; McCarthy (1981:389) writes that

> If we suppose that material on an affixal tier is applied to the prosodic template before material on any root tier, then, as an automatic consequence of this ordering and of the conventional left-to-right association, affixes will without further stipulation appear on the leftmost consonantal slots of the prosodic template.

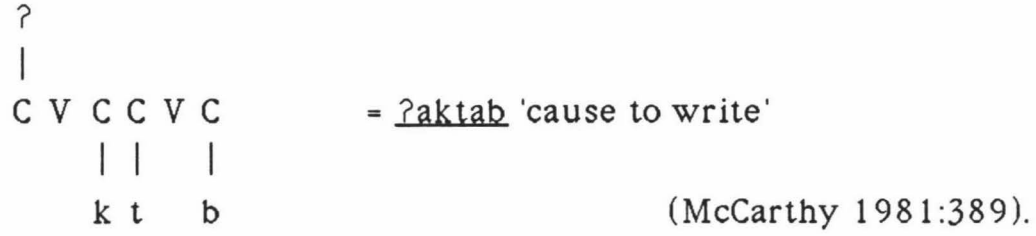
It has been claimed on at least one occasion that association in German operates from right to left, rather than from left to right, as in Arabic. Lieber's (1987) autosegmental analysis of umlaut involves the claim that the Initial Association Rule in German operates from right to left, ensuring that the floating [-back] segment attaches to the rightmost possible vowel (Lieber 1987:104). If association does operate from right to left in Germanic, the automatic consequence of preattachment would be that affixes attach word-finally, giving the correct result in this case. Unfortunately, however, the German and Dutch verbal systems make use not only of suffixes, but also prefixes, thereby making it impossible to claim that the position of affixes proceeds directly from the direction of association. In other words, affixes must be marked in the lexicon as being either prefixes or suffixes.

German and Dutch may not in fact differ too much from Arabic in this respect. While McCarthy's analysis, in which the position of affixes within the word follows from general principles of association, produces correct results for the data he examines (except for some 'very rare conjugations' where the position of the affix is not predictable (McCarthy 1981:393)), it must be remembered that his study does not deal with inflectional affixes. In at least one version of Arabic (Moroccan Arabic) inflectional information is often provided by suffixes (Harrell 1962:40).

Whether or not the positioning of Arabic affixes is in fact as straightforward as McCarthy claims, it is certain that in German and Dutch position within the word must be stipulated. The autosegmental approach resembles traditional analyses of these languages completely in requiring this.[3]

There is one major advantage of McCarthy's analysis of Arabic affixes which cannot be transferred to German and Dutch. It results from the fact, mentioned in Chapter 3, that CV skeletons are not provided by the morphology in German and Dutch as they are in Arabic. In Arabic, due to this prespecification of word shape, affixation affects the configuration of other segments in the word form. For example, if an affix is preattached to a certain skeletal C slot, the root consonants associate in a modified but predictable manner with the other C slots in the skeleton. This is demonstrated in example (4), where the affixation of /ʔ/ causes the root consonants /ktb/ to begin association at the second C slot rather than the first, association proceeding as normal from there onward:

4. binyan IV



= ʔaktab 'cause to write'

(McCarthy 1981:389).

In Germanic languages, on the other hand, where CV skeletons are projected from melodic elements and not predetermined, the 'preattachment' of an affix simply involves the addition of one or more melodic elements, which generate a corresponding piece of CV

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[3] It might be possible to make a generalisation that verbal *derivational* affixes in German and Dutch are overwhelmingly prefixes (an exception in German is -ern, as in er-neu-ern 'renew', from neu 'new'), while *inflectional* affixes are overwhelmingly suffixes (an exception is past participle ge-). This would necessitate clear definitions of inflection and derivation, a not always unproblematic matter (see for example Bauer 1983:22-29), and such a generalisation would in any case produce similar simplifications for an autosegmental and for a traditional analysis.

skeleton. In effect, the use of autosegmental notation is trivial in such cases; we simply add a melody which acquires a CV skeleton rather than adding a melody.

The concept of preattachment, as it is understood by McCarthy (1981), Marantz (1982) and others, is in fact not even applicable to the German and Dutch situation. At the stage when preattachment occurs, the CV skeleton must already be present, as an independent entity. Marantz (1982:444) characterises preattachment in Arabic as occurring 'within the lexical entry of the skeletal morpheme itself', and Lieber (1987:63) calls preattachment 'lexical linking'. Yet in Dutch and German there is no separate skeletal morpheme; the CV skeleton is not present in the lexicon, but projected from the melodic tier. In other words, preattachment requires the CV skeleton (including slots for the affix) to be present at the point of affixation, while the nature of Dutch and German does not permit the CV skeleton to be formed at this stage. (Note that this is true even if the CV skeleton for Dutch and German consists only of X-slots, unspecified for syllabicity).

The only way preattachment could occur in the case of the German and Dutch past participle suffix would be if the skeletal slots for the suffix were created in a different way from, and at an earlier stage than, the skeletal slots for the rest of the word form. Such a solution would involve many obvious drawbacks for no gain, as it is in fact irrelevant for the Germanic situation at what stage in the derivation affixation occurs. The concept of preattachment is not only inapplicable, it is unnecessary; since affixation in these languages, unlike in Arabic, has no effect on the shape of the base it attaches to, it can theoretically occur at any stage.

For the past participle suffix, then, an autosegmental approach does not provide the advantages it does for similar processes in Arabic. Nor does it appear to provide any advantages over more traditional methods of treating affixation in concatenative languages. Instead of a melody being affixed, a melody which creates a piece of CV skeleton is affixed. The position of the affix in the word must be stipulated.

4.2.2 Ablaut

In spite of the lack of success so far, let us persevere for the moment with the attempt to describe Dutch and German past participles autosegmentally. The suffix (which is marked in the lexicon as attaching word-finally) is obligatorily present. The presence or otherwise of ablaut, as noted above, is dependent on whether a particular verb is strong (or mixed), or weak. This feature is determined lexically, as it is phonologically unpredictable whether any particular verb is strong or weak (compare the following pairs of verbs):

5.	backen	'bake'	- strong	cf.	packen	'pack'	- weak
	weisen	'show'	- strong		reisen	'travel'	- weak
	denken	'think'	- mixed		senken	'sink'	- weak
	stecken	'stick'	- mixed		decken	'cover'	- weak
	senden	'send'	- mixed		spenden	'donate'	- weak

If a verb is lexically determined as weak, no ablaut takes place. If a verb is strong or mixed, information about what specific vowel mutations take place must also be given in the lexicon, as these mutations are unpredictable (compare the vowel mutations in the following pairs of verbs):

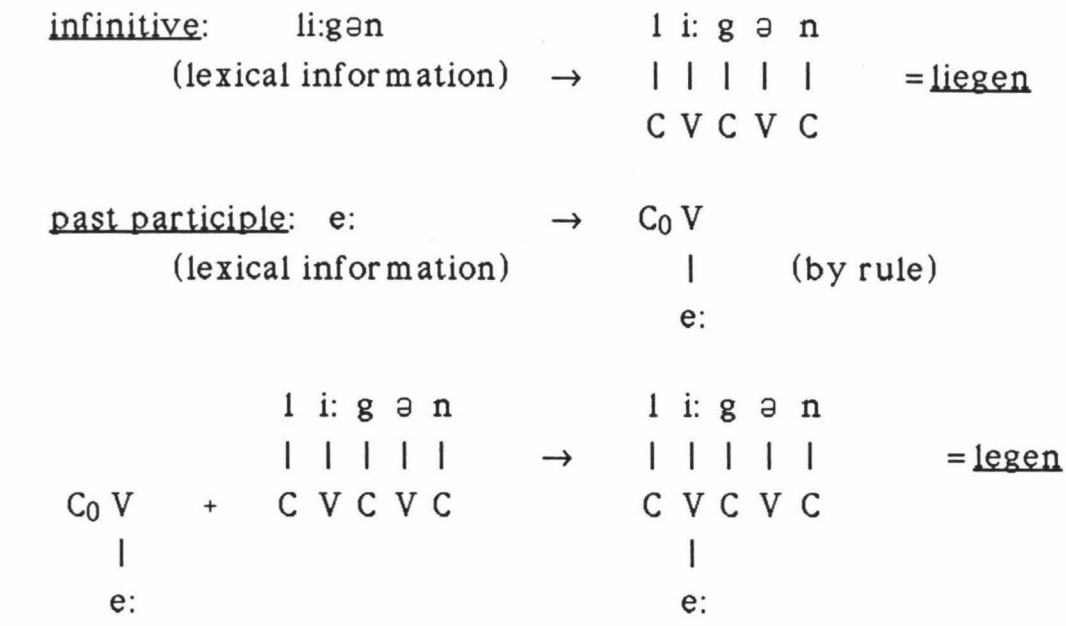
		infinitive		past participle		gloss
6.	a.	liegen	/i:/	gelegen	/e:/	'lie'
		biegen	/i:/	gebogen	/o:/	'bend'
	b.	meiden	/aɪ/	gemieden	/i:/	'avoid'
		schneiden	/aɪ/	geschnitten	/ɪ/	'cut'
	c.	singen	/ɪ/	gesungen	/ʊ/	'sing'
		bringen	/ɪ/	gebracht	/a/	'bring'

Although there is obviously a lack of total predicability as to mutation, it is possible that there are some sub-regularities (Laurie Bauer, personal communication). It could be the case, for example, that the mutation undergone by singen is predicted by rule from its phonological form, but that the mutation for bringen must be listed

in full as an exception to that rule. This does not alter the analysis significantly, as it is still necessary to state in the lexicon the vowel mutations for a large proportion of strong and mixed verbs.[4]

Ablaut could then be achieved (for the past participle as well as for the preterite) by the preattaching of the mutated vowel (whether predicted by rule or specified in the lexicon) to the relevant V slot in the skeleton - the relevant V slot being the first stem vowel of the verb. This is shown in example (7) for the verb liegen and its past participle gelegen (omitting the prefix from the past participle at present).

7.



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[4] It is certainly the case that in earlier stages of German mutations were predictable from the phonological form of the infinitive (see for example Schmidt et al 1984:179-183). Without researching the situation in modern German (as it is not crucial to the analysis I am attempting), I consider it likely that sound changes have reduced significantly the number of such regularities. There are various groups of verbs which mutate in identical fashions over the preterite and the past participle, and these may be remnants of the old ablaut groups; these modern groups often contain different vowels in the infinitive, however. Examples are:

	infinitive		preterite		past participle		gloss
i.	denken	/e/	dachte	/a/	gedacht	/a/	'think'
	bringen	/I/	brachte	/a/	gebracht	/a/	'bring'
ii.	saugen	/aU/	sog	/o:/	gesogen	/o:/	'suck'
	ziehen	/i:/	zog	/o:/	gezogen	/o:/	'pull'

(In this example I ignore the question of whether schwa is underlyingly present in the infinitival ending -en; according to Lieber (1987:109-110) this is a debatable issue).

Note that in this case preattachment is a possibility, as the CV skeleton for the base has already been produced. I assume at this stage that the preattached /e:/ for the past participle in this example overrides the /i:/ which is provided by the base; a more detailed discussion of the precise mechanism of preattachment in Germanic languages is given in Chapter 6, section 6.3.2.

Ablaut is a typical nonconcatenative process and other processes like it have been successfully treated autosegmentally (for example Lieber's (1987) analysis of German umlaut). The autosegmental theory also has the advantage of being more restrained in terms of transformational power than many other ways of treating ablaut. Another point to note is that the autosegmental method does not distinguish ablaut as a 'strange' operation; it is an entirely expected process within the theory. The theory is for this reason so appropriate for a language like Arabic, which involves multiple ablaut (Kilani-Schoch and Dressler 1984:53), and in which internal modification 'seems to be more basic' than affixation (Kilani-Schoch and Dressler 1984:58)). In Germanic languages, however, ablaut is an unexpected process; most word-formation in Germanic languages is achieved not by internal modification, but by concatenative affixation. In a standard generative theory of morphology the rarity of internal modification in such languages is reflected by a corresponding markedness in the rules which produce it; in autosegmental theory, on the other hand, affixation is not preferred in any way as a method of word formation over internal modification. The relevance of these points for the application of autosegmental theory to Dutch and German past participles will be discussed, along with similar arguments for other phenomena, in Chapter 7.

4.2.3. The Prefix

The German prefix ge-, as noted above, is present in certain phonologically defined environments, namely whenever the first syllable of the verbal stem is stressed. There are two possiblities for its derivation - either it is generated in all past participles and subsequently deleted (or the association lines between it and the skeleton are delinked), or it is only generated (or linked) in appropriate conditions.

According to Schultink's (1978) discussion of the German and Dutch past participle prefix, previous analysts (eg Kiparsky (1966) for German), as well as Schultink himself, prefer to generate the prefix in all past participles and delete it in the appropriate environments. For example, Kiparsky (1966:70-75) 'gets rid of ge- later on in the phonological component' by means of three precyclic rules, a stress rule, and two word-level rules (Schultink 1978:225). De Rooij-Bronkhorst (1980) also generates Dutch ge- in all cases and deletes it later. This option is, I believe, preferable to one where the prefix is only generated in certain environments, as it allows us to attach the prefix in the same manner, and at the same stage in the derivation, as we do the past participle suffix. The prefix may then subsequently be deleted in the phonological component, in the appropriate phonological environments.

The position of ge- within the word must be stipulated in the lexicon (whether or not this is so for inflectional *suffixes*; see section 4.2.1., fn 3). The lexical entry for ge- under an autosegmental treatment would not differ from its lexical entry under a standard generative analysis, as the CV skeleton is, as always, projected by the melodic tier rather than being present in the lexicon. The affixation process would, as for the past participle suffix, differ from ordinary affixation only in this production of a CV skeleton.

In cases where ge- does not surface, the association lines between its two segments on the melodic tier and the corresponding slots on the skeletal tier have simply been removed; 'deletion' is simply 'delinking'. Delinking has the same effect as deletion because any

unlinked phonological material is not realised; this notion is formally expressed by Goldsmith (1990:53) as his Linkage Condition. Although in this case there are no empirical consequences which would indicate that delinking rather than deletion has occurred, the numerous cases where 'deletion' of a feature or segment is followed by reassociation indicate that delinking is a preferable notion. According to Lieber (1987:64-65), numerous researchers make use of delinking rules, including McCarthy (1979, 1981), Pulleyblank (1983) and Laughren (1980), as well as Lieber herself (1987). And the notion of manipulating association lines rather than segments is strongly supported by Goldsmith (1990). This is made clear by, among other things, his analysis of compensatory lengthening as the addition of an association line rather than the change of a feature (1990:73), his claim that there is a preference for reassociation rather than the changing of a feature, (1990:37), and his statement that

> It would not be wrong, in fact, to summarize the entire goal of autosegmental analysis as being the reduction of natural phonological processes to changes that can be expressed in the minimal autosegmental notations, a notation that includes at its core just deletion and reassociation (1990:74; where 'deletion' in context clearly refers to 'delinking').

The precise conditions under which ge- is delinked in Dutch are debated. Don (1989:3) notes that there is apparently a non-phonological constraint on the structural description of deletion, as ge- is only deleted before an unstressed prefix in Dutch *verbs*. He goes on to claim, however, that this restriction on ge- deletion is illusory. He notes that a group of nouns containing the prefixes be-, ont-, ver-, and (derivational) ge- share certain properties, and he proposes that all these nouns involve an underlying ge- prefix, which is deleted by the same rule which deletes ge- in some past participles (Don 1989:5). The ge- deletion rule is thus not restricted to verbs, but applies wherever the relevant criteria are met. It should be noted, however, that the relevant criteria are in any case not purely phonological, shown by the fact that the presence of a prefix is relevant to delinking.

De Rooij-Bronkhorst (1980:168) makes the interesting claim that 'in Dutch, inflectional ge-deletion is a purely morphological phenomenon.' She notes that there are two main classes of complex verbs with respect to structure, prefixations and *samenkoppelingen*,[5] and claims that there are correlations between morphological structure, stress patterns and inflectional forms of verbs (1980:160). The morphological classes of prefixations and *samenkoppelingen* each have characteristic stress patterns and inflectional forms, so that what appears to be a rule relating to stress is in fact a rule relating to the presence of a derivational affix (1980:168) (present in a prefixation such as vervoegd 'conjugated', causing ge- to delete, but absent in a *samenkoppeling* such as ingevoegd 'inserted', allowing ge- to remain).

The discussion of under exactly what circumstances ge- deletes in either language is an interesting one, and must be resolved for any definitive analysis of the phenomenon of past participles. I would like to leave the question here, however, as the precise conditions under which ge- deletes are not crucial to the aim of this chapter, which is to determine whether or not the autosegmental approach is an appropriate one to deal with the phenomenon. It can of course be claimed that any conclusions about the usefulness of an autosegmental approach to the past participles cannot be made until the precise conditions for ge- deletion are resolved. This may be so, although I am inclined to believe that the question of whether delinking of ge- is a phonologically or morphologically determined occurrence is irrelevant to the usefulness or otherwise of autosegmental theory, as either possibility should be able to be accomodated within it. Lieber (1987:5) claims that

> autosegmental phonology and morphology are not distinct theories ... such labels as *harmony* and *mutation* do not imply distinct sorts of rules, the former phonological and the latter morphological. Instead, both will turn out to be

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[5] Samenkoppelingen are verbs which have 'a structure that is not a *word* syntactically, but a *phrase*' (de Rooij-Bronkhorst 1980:160). They often contain 'what traditionally have been called "separable prefixes"' (de Rooij-Bronkhorst 1980:162). Examples are overlopen 'defect, overflow', vlamvatten 'catch fire'.

surface manifestations of a few simple and general autosegmental processes.

Unfortunately, however, whatever the exact conditions for ge- deletion in Dutch may be, autosegmental theory appears to have little to offer in describing the deletion (either in Dutch or in German, where the rules for deletion appear to be straightforward). A rule or set of rules describing the circumstances under which ge- deletes (or delinks), is necessary, whatever framework is used. The only difference between an autosegmental treatment of the prefix and a standard generative treatment of the prefix is notational; an autosegmental analysis involves two tiers instead of one and delinking instead of deletion. As the melodic elements ge- are never reassociated to any skeletal slots, no advantage is gained by utilising delinking rather than standard deletion of segments.

4.3. The Past Participle Morpheme

It has been established that all portions of the past participle morpheme, namely the suffix, the process of ablaut and the prefix, can be represented autosegmentally, although there appears to be very little to be gained by such an approach. But what of the morpheme as a whole? It is the fact that three separate operations take place to produce one morpheme, rather than the individual operations themselves, which gives us the most reason to believe that the morpheme might be amenable to an autosegmental analysis (although ablaut is in itself a nonconcatenative operation).

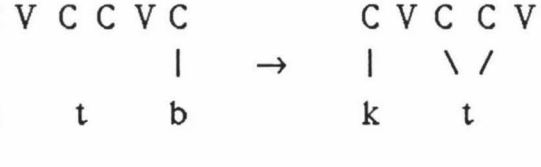
If the discontinuous past participle morpheme is to be treated along the lines of the discontinuous morphemes in the Arabic verbal system, it must be represented on a single tier, separate from the stem morpheme. Unlike the root or inflectional morphemes in Arabic, however, the past participle morpheme does not associate straightforwardly with the skeletal tier. On the contrary, the prefix must associate in front of all stem material, the suffix after all stem material, and the ablauted segment on the first stem vowel. The behaviour of the prefix and suffix might suggest that Yip's (1988b)

notion of edge-in association (mentioned above in Chapter 2) is relevant; yet again, however, the nature of Dutch and German means that a notion exploited by previous researchers is inapplicable to our situation.

Edge-in association joins the outermost unassociated melodic elements to the outermost skeletal slots, and repeats the process 'until either all melodic elements or all skeletal slots are associated' (Yip 1988b:553). Leftover skeletal slots may be filled either by spreading or by insertion of default values (Yip 1988b:553). Examples are given in (8) for the association of consonants in the Arabic forms katab ('write') and kattab ('cause to write'):

8. a.


(Yip 1988b:553)

b.


(Yip 1988b:554)

The notion of edge-in association would only be applicable to the past participle morpheme in Dutch and German if the skeletal slots corresponding to the prefix and suffix were already present before association begins; this is of course impossible as the skeletal tier is produced by the melodic elements making up the affixes. This is demonstrated in (9) for the past participle of the German verb singen 'sing'. The stem is isolated, and the past participle morpheme waits to be associated:

9.

There are no skeletal slots to which the melodic slots of the affixes could attach. Although the affixes appear to attach in an edge-in manner, they do not *associate* in an edge-in manner; and even if Yip's notion were modified to read 'attach affixes in an edge-in manner', it would not provide sufficient information to produce correct results. For example, in any word form where a single affix is attached, the question would remain of whether it attaches word-initially or word finally (in fact, the notion would need modification even to prevent the separation of single affixes, with part of an affix attaching word-initially and part attaching word-finally).

The same problem which arises when the affixes are viewed separately thus also applies when the morpheme is viewed as a whole - the position of the affixes must be stipulated, and the existence of a skeletal tier, because it does not exist as a separate entity from the melodic tier, neither helps nor hinders the process.

It is not feasible to place the three parts of the past participle morpheme on a single tier and attempt to treat them as a unit. Each part has specific requirements regarding position in the word, and needs a stipulation of those requirements. It is difficult to see how the position of each of the three parts can be specified, except independently of each other.

4.4. Conclusions

The only positive result, and it is a very minor one, to come out of this chapter concerns the process of ablaut. It is a process which at least exploits the existence of two tiers.

As far as the past participle morpheme goes, however, the attempt to describe it autosegmentally has been unsuccessful. This is due, I believe, both to the failure of autosegmental theory for affixation in Dutch and German, (directly related, as we have seen, to the generation of the skeletal tier by the melodic tier), and to the independent behaviour, in terms of position within the word and operation, of the three parts of the past participle morpheme. It is possible that in languages where CV skeletons are not provided by the morphology, autosegmental theory is of little advantage for concatenative operations such as affixation, but is of real advantage only for such operations as might exist which involve some manipulation of the CV skeleton. One such operation is reduplication, and reduplication in English and German will be examined in detail in Chapter 6 to determine whether this hypothesis is correct.

Chapter 5
DUTCH GE-TE

5.1. A Circumfix in Dutch?

There is a group of nouns in Dutch which are neuter, which have a collective meaning, and which begin with the prefix ge- (/xə/-) and end with the suffix -te (-/tə/). The analysis of this group of words is problematic, different researchers classifying instances of nouns containing ge- and -te differently and offering differing interpretations as to whether the prefix and suffix in question are distinct affixes or form a single discontinuous affix. In this section I review the literature on the subject, and defend the position that ge-te is a circumfix.

Donaldson (1984) mentions the following two groups of nouns (among many others) as always being neuter:[1]

1. a. 'all collective nouns with the prefix ge- and suffix -te : het gebergte (mountain range), het gebladerte, (foliage), het geboomte (trees)' (1984:30)
   b. 'Collective nouns with the prefix ge- and no suffix: het gebroed (brood), het gepeupel (populace, rabble)' (1984:31).[2]

It is important to note that these two groups of nouns are distinguished semantically (as 'collectives'), for Donaldson, from other nouns containing one of the affixes ge- or -te.

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[1] The definite article which appears with singular neuter nouns in Dutch is het. The definite article used with singular non-neuter (common gender) nouns is de, and de is also used for the plural of both genders (Donaldson 1984:22).

[2] This second group appears to be a very small one; a search of de Vries (1971) reveals a mere handful of such words. Moreover, as for example peupel is not to be found in de Vries (1967), de Vries (1971), Cassell's (1981) or Jansonius (1950), it is questionable whether gepeupel is formed in a similar manner to the collectives in (1a). I shall concentrate in this chapter only on the words containing ge-te.

Schultink (1987), in his discussion of the status of ge-te, classifies ge-X-te words into four groups, as follows.

Group (a) contains nouns of the form het ge-NOUN-te, with a collective meaning. All group (a) nouns are of the neuter gender; a change of gender is thus often involved in their derivation, as in het gebloemte 'sea of flowers', from de bloem 'flower'. It is not unusual for affixes in Dutch to determine the gender of the output of their affixation (see for example Schultink (1987:487)); whether one considers that the neuter gender in collectives is produced by ge-te as a whole or by the prefix on its own obviously depends on the status one assigns ge-te (as a circumfix or otherwise).[3]

Schultink's group (b) is, on the basis of his description, difficult to distinguish from group (a); he claims that the group (b) words are 'More or less similar [to group (a)] according to morphological structure, and sometimes also semantically' (1987:484). This group contains (again always neuter) nouns like het gebladerte 'foliage' (from het blad 'leaf'), het gedeelte 'part' (from het deel 'part'), and het gestoelte 'pulpit' (from de stoel 'chair'). Group (c) contains just three nouns of the form ge-X-te, which are, however, non-neuter and are formed from corresponding adjectives in ge-:

2. de gemeente 'the community' from gemeen 'common'
   de gewoonte 'the habit' from gewoon 'ordinary'
   de gezindte 'the creed' from gezind 'inclined'
   (Schultink 1987:484).

The fourth group of ge-te nouns Schultink describes simply as 'Other de words beginning in ge- and ending in -te' (1987:485). Examples are de geboorte 'birth' and de gebuurte 'neighbourhood'.[4] Thus we have the four groups as follows:

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[3] The suffix is excluded as a possibility for gender determination as there appears to be no independently occuring -te suffix which produces neuter nouns (see for example Schultink's (1987:487-488) discussion of the affixes ge- and -te).

[4] Note that, contrary to Schultink's implication, de gebuurte may be formed from de buur 'neighbour' or de buurt 'neighbourhood' (Reiner 1982), thus making it similar to the members of groups (a) and (b) (presenting a

3. a. het + ge-NOUN-te + collective meaning
   b. het + ge-NOUN-te + (sometimes) collective meaning
   c. de + [ge-X]$_{adj}$-te
   d. de + miscellaneous ge-X-te

A list of the words in each of Schultink's four groups may be found in Appendix 2.

Schultink is not of the opinion that ge- and -te together form a single, discontinuous, morpheme. A summary of his reasoning follows.

Schultink notes that the Binary Branching Hypothesis (BBH), which states that all branching within a word is binary, is incompatible with the existence of discontinuous morphemes. He equates - following Scalise (1984:146) - the BBH with Aronoff's (1976) 'one affix, one rule hypothesis' (Schultink 1987:481), and claims that Booij (1977), who treats ge-te as a discontinuous morpheme, is trying thereby to save the 'one affix, one rule hypothesis'. Schultink holds that Booij (1977, 1982) 'cannot eliminate the incompatibility of his proposal with the Binary Branching Hypothesis' (Schultink 1987:485).

I find Schultink's objection here irrelevant. If ge-te is regarded as a discontinuous affix, the BBH cannot be saved, although the 'one affix, one rule hypothesis' can, as Booij (1977:32) states (in spite of the claimed equivalence of the two hypotheses). It is obvious that the 'one affix, one rule hypothesis' only leads directly to the BBH if the 'affix' referred to is not discontinuous. If discontinuous affixes are a possibility, one affix can be added and the BBH will still be violated (or lines will cross in trees, an undesirable result). Therefore it is irrelevent to criticise Booij's analysis for being incompatible with the BBH. As Bauer (1988a:25) points out, 'A strictly binary tree structure is ... likely to be insufficient to allow for the representation of synaffixes' (morphemes consisting of more

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problem when compared to these groups, however, by virtue of its different gender).

than one formative) - but as synaffixes do undoubtedly exist, 'morphological theory must ... have a mechanism for dealing with them' (Bauer 1988a:24).

Schultink next notes that Scalise (1984) does not consider Italian words like im-brutt-ire 'to make ugly',[5] which on the surface are similar to the ge-te words, to be a problem for the BBH, as these words can in fact be derived binarily - although not from *existing* words. Scalise claims that a word like imbruttire is formed on the basis of the *possible* word bruttire (Schultink 1987:483). This notion of 'possible word' is discussed by Aronoff (1976), where he claims that 'in derivational morphology there is a distinction to be made between the classes of possible words and actual words,' because 'there are many words which a grammar can generate in a language which, accidentally and unsystematically, never appear' (1976:18). 'Possible words', therefore, are forms which are the output of word-formation rules, which are distinguished from actual words only by their non-existence in the language (in other words, by their absence from the lexicon of the language).

Schultink follows Scalise's reasoning and claims that ge-te words in Dutch also involve binary branching, with various roots consisting of *possible* but non-existing words.

He claims that the group (c) words are derived by the suffixation of -te onto an adjective, (this much is supported by de Vries 1971), and that the suffix -te involved here is 'identical to the similar suffix in words such as hoogte' ('height') (1987:487) (a suffix which forms de nouns from adjectives or verb roots; Schultink 1987:485-6). Groups (a) and (b) are supposedly formed by the prefixation of ge- to the roots beente, bladerte, etc. Schultink claims that ge- here is 'identifiable with the nominalizing prefix ge- which forms neuter nouns with roots of various categories: gehoor 'hearing', etc' (1987:487). He claims further that these roots beente, bladerte, etc are formed by suffixation of the same -te suffix mentioned above. This in turn 'broadens the subcategorization domain of the suffix - now following nominal roots as well!' (1987:487). Finally, Schultink

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[5] im- here is a realisation of the prefix in- (Scalise 1984:148).

claims that the group (d) words are formed from roots of the form ge-X, by addition once again of the -te suffix mentioned above (1987:488).

The objections I have to Schultink's reasoning are as follows.

Schultink admits that a form such as boefte is 'not a possible, let alone an existing word' (1987:486), and yet later claims that boefte is the root, formed from boef + -te, to which ge- attaches to form geboefte 'scoundrels' (group (a)). He achieves this latter result by changing the subcategorisation of 'the well-known -te' (1987:486), allowing it to attach to the nominal root boef 'scoundrel'. In other words, there is no previously-defined set of possible words in Dutch which restrains the analysis; it is possible to postulate new subcategorisations for affixes, thus changing the set of possible words, with no other motivation than to achieve the desired binary-branching structure.

Schultink is not, in fact, even operating under a 'possible word' analysis, but appears rather to be applying Wells' (1947) diagnostic:

> Given a constitute consisting of three continuous sequences A, B, and C, then, if no reason can be found for analyzing it as AB/C rather than A/BC, or as A/BC rather than AB/C, it is to be analyzed into three correlative ICs, A/B/C (Wells 1947:103; cited in Schultink 1987:482).

According to this statement all one needs for classification purposes is *any* reason to choose one binary-branching option over the other; there is no requirement that AB or BC need to be possible words. Thus Schultink is actually operating under a system which is less restrained than the 'possible word' one.

There are two other points to note about Schultink's use of this statement by Wells in his analysis of words such as geboefte. Firstly, and perhaps relatively unimportantly, Wells is discussing sentence constituents, not word constituents. Secondly, Wells' diagnostic is not intended for the purpose of determining where *discontinuous* constituents exist; the possibility that A and C might be parts of the same constituent does not even arise out of Wells'

statement, mainly because it is designed for recognising *multiple* constituents (in other words, for recognising ternary structures) (Wells 1947:103). So while Schultink may use it to rule out a ternary branching structure with three separate constituents, it cannot be used to rule out a discontinuous affix ge-te.

The final reason I consider Schultink to have reached a false conclusion regarding ge-te is a semantic one. Schultink claims that all instances of -te in his examples are realisations of the same single suffix, which forms non-neuter nouns from adjectives, verb roots and nominal roots. There is a prefix ge- which forms neuter nouns, and a (presumably different) prefix ge- forming the adjectives which are the base of the group (c) words. Neither the ge- nominalising prefix, nor the -te nominalising suffix, therefore, have any semantic effect which could produce the collective meaning of the words in groups (a) and (b). Nor, of course, could the prefix and the suffix together have any such semantic import under Schultink's analysis, as they are considered completely separate entities. Questions therefore arise as to why the majority of words in (het) ge-te do have this collective meaning, why neologisms are formed in ge-te with the collective meaning (Schultink 1987:484), and why a Dutch native speaker recognises an unfamiliar ge-te word as having collective meaning (Maria Stubbe, personal communication). The ge-te case differs in this respect from the case discussed by Scalise, for in Italian the combination of affixes in-ire imparts no distinctive meaning; -ire is an infinitive morpheme and in- has 'spatial', 'conceptual', or 'intensive' value (Scalise 1984:149; from Tekavçcic 1972). Meaning is regarded as crucial to the definition of discontinuous morphemes by Harris (1945:122); this is shown by his statement that

> the fundamental criterion which determines that the whole of a sequence of phonemes constitutes one morpheme rather than two, is the fact that the whole sequence occurs together in a certain class of positions and with certain meanings, and that parts of the sequence don't occur separately with parts of the total meaning of the sequence.

Similarly, Bauer (1988a:23-24) claims that

> When that compositionality [of semantics] is broken if the affixes involved in a synaffix are taken individually, but preserved if the affixes involved in a synaffix are taken as representing a single unit, this is *prima facie* evidence for a synaffix.

The semantic argument for regarding ge-te as a single morpheme is in my opinion the strongest. The failure of Schultink's 'possible word' analysis, for example, while it demonstrates inconsistencies in his arguments, is not definitive, as Allen (1978) claims that morphology must be 'overgenerating' to an infinite extent: 'rules of word-formation must generate an infinite set of possible well-formed words, only some of which are actual or occurring words' (Allen 1978:185). If the set of possible words is infinite, boefte could indeed be a possible word from which geboefte is formed, as Schultink claims. Boefte would presumably be parallel to Allen's example *handed, from which handedness is formed (Allen 1978:185). Yet the semantic relationship between pairs of words like de boef 'scoundrel' - het geboefte 'scoundrels' is regular enough to preclude such an analysis and to require one whereby ge-te is a single, collective affix.

Schultink's arguments fail in my opinion, therefore, to show that ge-te in Dutch should be regarded as two distinct affixes, attached independently of one another. A final interesting indication that ge-te should be regarded as a single affix is provided by Plank (1986), who argues for the existence of a similar circumfix even in German, where the corresponding collective is usually indicated merely by the prefix Ge-, and only occasionally by Ge- combined with the suffix -e. Plank notes that Ge-, if it were regarded simply as a prefix, would be a significant exception in being the only prefix in German to cause modification of the base to which it attaches (1986:49). (The affixation of collective Ge- in German produces umlaut in the stem vowel if this vowel is capable of undergoing umlaut, and causes /e/ to become /i/, as for example in Wasser/Gewässer 'water/waters', Stern/Gestirn 'star/star(s)' (Plank 1986:49-50)). Plank notes that 'prefixes, even when they contain /e/ or /i/, never otherwise produce umlaut or /e/ raising'

(1986:51).[6] He argues that the postulation of underlying -ɐ, even in forms where this -ɐ does not surface, solves both the problem of umlaut and also the problem of gender and declination class determination - otherwise necessarily performed by the prefix Gɐ-, making Gɐ- again exceptional in this respect (1986:53). He thus claims that Gɐ-ɐ in German is a 'discontinuous affix or a circumfix' (1986:53).

Although Plank's arguments relating to umlaut are not relevant to Dutch, it is interesting to see an analysis of German collectives as containing a circumfix, when there is far less surface evidence for a circumfix in this language than in Dutch.

5.2. An Autosegmental Treatment of gɐ-tɐ

There has been no attempt, as far as I am aware, to describe circumfixes such as Dutch gɐ-tɐ within autosegmental theory. Lieber (1987) also mentions no such treatment of the corresponding German collective circumfix when she writes:

> Exactly how this is represented autosegmentally depends upon how we choose to treat affixes which appear to be discontinuous. Since I have nothing to say about this issue here, I will leave the representation of this affix open (Lieber 1987:127, fn 23).

The circumfix gɐ-tɐ, by definition discontinuous, is a possible candidate for autosegmental methods similar to those used to deal with discontinuous root and vowel morphemes in Arabic. Yet the major differences, discussed in previous chapters, which exist between Semitic and Germanic languages again raise doubts as to the usefulness of such an attempt. In particular, any attempt to exploit the most important innovation of autosegmental theory, namely the existence of separate tiers, falters. For example, the existence of separate melodic and skeletal tiers is exploited by McCarthy (1985) in his interesting discussion of optional skeletal

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[6] 'Präfixe, auch wenn sie /e/- oder /i/-haltig sind, bedingen ansonsten nie Umlaut oder /e/-Hebung.'

slots; and it may appear possible to attempt a treatment of the circumfix in terms of these. Optional skeletal slots 'are expanded only when some phonemic material would otherwise remain unassociated; in effect, the necessity of expressing all lexical material phonetically forces association with optional slots' (McCarthy 1985:309). (Yip 1988b:554-5, fn 2, discussing Broselow (1984), also mentions optional template slots, which 'do not surface if there are not enough consonants available to fill them'). It could possibly be proposed that there are optional skeletal slots on all Dutch nouns, a CV at the beginning and a CV at the end of the noun, which become associated with melodic material only in the event that the melodic string ge-te is added to the noun. It is immediately obvious, however, that the concept of optional skeletal slots is simply not applicable to a language where the skeletal tier is projected from the melodic tier, rather than pre-defined by the morphology. In Dutch, an example of the former type of language, the notion of optional skeletal slots would involve unnecessary redundancy. We would have to add the melodic material ge-te in any case, and this melodic material is capable of projecting its own CV skeleton.

Another example of the inapplicability of Semitic solutions to Dutch is provided by Marantz's (1982) discussion of the skeletal patterns provided for the various binyanim in Arabic. He claims that

> The binyanim, considered as C-V skeletal morphemes, operate in a manner similar to derivational affixes in other languages. Although, as McCarthy notes, they do not always impart the same meaning to the roots with which they associate, they possess a usual semantics which allows their extension, for example, to borrowed roots (Marantz 1982:441).

Marantz in this statement directly compares the binyanim skeletal patterns of Arabic to derivational affixes in other languages, and thus also, one might imagine, to the Dutch circumfix ge-te. If we apply the Arabic method of dealing with binyanim to the Dutch circumfix, adding a CV ... CV skeleton to a noun could be the way in which a derivation is performed. Yet again we find that such a

method would involve redundancy. Either the melodic material ge-te must subsequently be added to associate with the CV slots (redundantly, as the melodic tier in Dutch creates its own CV skeleton), or else it must be postulated that all nouns in Dutch have as part of their melodic tier the segments ge-te, which only associate with the CV tier in those instances when a derivational rule has applied to create the skeletal slots CV ... CV. This latter option involves as much redundancy as the former, as the addition of a piece of skeleton to associate with a piece of melody already present has no advantage over the addition of a piece of melodic tier to associate with skeletal slots already present.

The failure of this approach is predicted by part of the discussion in McCarthy (forthcoming). The previous paragraph contained an attempt to treat the circumfix in Dutch as if it was an instance of 'shape invariance'. McCarthy describes this notion:

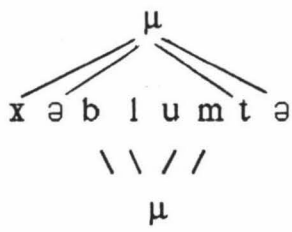
> root-and-pattern, reduplicative and some subtractive morphology share a basic characteristic called shape invariance. In ordinary concatenative moprphology, the 'invariant' mark of a particular morphological formation is an affix like -ness in kindness. In shape-invariant morphology, though, the invariant is a fixed syllabic structure that is imposed on varying inputs ... shape-invariant morphology specifies a morpheme consisting of just a skeleton, with no melody (McCarthy forthcoming: 4-5).

The circumfix, however, is not an instance of an invariant shape to which various melodies are associated; it is simply a morpheme consisting of a melody and a skeleton (which is projected from that melody). Interestingly, McCarthy puts forward as an opposite to a shape-invariant morpheme 'an ordinary, concatenative morpheme like -ness', which 'has both a skeleton and a melody' (forthcoming:5). The Dutch circumfix demonstrates that it is not just concatenative morphemes which fall into this category of failing to observe shape invariance.

While the affixation of ge-te receives no benefits from an autosegmental treatment, there is one obvious advantage of

representing the circumfix autosegmentally. This is that its discontinuity is not a problem for the definition of morpheme in that theory. McCarthy (1981:376-381) demonstrates that discontinuous morphemes provide a problem for a standard morphology in which morphemes are separated by boundary nodes. On the other hand, discontinuous morphemes are absolutely no problem for the autosegmental method. A word containing ge-te would be represented as in (4).

4.



= gebloemte 'sea of flowers'

5.3. Conclusions

The suggestion made in the previous chapter that autosegmental morphology may only be useful for those languages, or those parts of languages, which utilise some manipulation of the skeletal tier, seems to be gaining support. We cannot claim that the circumfix ge-te should be treated in the same way as affixes of the verbal system of Arabic are treated by McCarthy (1981) - that is, preattached to the noun. It was shown in Chapter 4 that preattachment in the case of affixation in a language like Dutch simply does not work. For preattachment to work for ge-te we would have to claim that the CV ... CV slots corresponding to the circumfix are somehow present at an early stage of the derivation, allowing the melodic material ge-te to preattach. These CV ... CV slots would either have to be produced by a different mechanism from the one which produces the CV skeleton for the rest of the lexical item, (an option which involves obvious drawbacks, one being that the CV skeleton for the rest of the word form would not be present at the stage when ge-te preattaches, producing obvious problems), or we would have to abandon completely the notion that the CV skeleton is projected from the melody in Dutch. This second option is ruled out for the reasons given in Chapter 3.

Preattachment is thus impossible for the circumfix, and while the morpheme ge-te can be represented autosegmentally, it must project its own CV skeleton. A consequence of this is that the position within the word of the melodic segments which make up the circumfix cannot be predicted by Yip's (1988b) edge-in association, as might have been hoped. It was shown in Chapter 4 that edge-in association requires the CV skeleton to be already present as a separate entity, an impossible option in Dutch affixation. We therefore still require stipulation to state where in the word the melodic segments appear. Nothing has been explained about the nature of the circumfix, and its unusual (for Dutch) positioning in the word must unfortunately still be achieved by stipulation, as it would be in a standard generative account.

Nor is the ability to represent ge-te without problems for the definition of morpheme an overwhelming advantage. While it is desirable to be able to represent the collective morpheme without theoretical problems, this in itself would not be sufficient reason for proposing an autosegmental treatment of Dutch morphology. If this were the only advantage of an autosegmental analysis, it would amount to little more than a notational trick to escape crossing lines in trees. More substantial advantages must be shown to exist to justify extra tiers in the representation of Dutch morphology.

Finally, the ease with which discontinuous morphemes such as ge-te can be represented, (which is due to the fact that the autosegmental notation shows no preference for continuous morphemes over discontinuous ones), may clash with the extreme rarity of discontinuous morphemes in Dutch, if we were to describe that language autosegmentally. While autosegmental theory is desirable for languages (such as Arabic) where discontinuous morphemes are extremely common, it may be inappropriate for a language where discontinuous morphemes are rare exceptions to a basically concatenative morphology. This issue is discussed further in Chapter 7.

Chapter 6
REDUPLICATION IN ENGLISH AND GERMAN

In this chapter an attempt is made to apply Marantz's (1982) autosegmental theory of reduplication to data from English and German. In section 6.1 the data is introduced, and the later sections look in turn at the three types of reduplication in these languages, attempting to provide an autosegmental analysis of each.

6.1. Reduplicating Compounds in English and German

In English and German there are a number of compounds whose formation involves reduplication. As well as compounds involving straight reduplication, there are others formed by reduplication combined with ablaut, and others formed by reduplication combined with a change in the initial consonant of the reduplicated element ('rhyme combinations'). Some examples of each of the three types of compound follow in (1):

1. a. **reduplication**
   German: Pinkepinke 'money', Wauwau 'dog'
   English: chuff-chuff 'train', choo-choo 'train'

   b. **reduplication with ablaut**
   German: Krimskrams 'odds and ends', Schnickschnack 'chit-chat', Wirrwarr 'confusion, chaos', Zickzack 'zigzag'
   English: dilly-dally, fiddle-faddle, tittle-tattle, knick-knack

   c. **reduplication with change in initial consonant**
   German: Klimbim 'fuss', Kuddelmuddel 'confusion', Larifari 'nonsense', Techtelmechtel 'flirtation'
   English: boogie-woogie, fuzzy-wuzzy, hoity-toity, heebie-jeebies

(German examples from Fleischer 1974:235; English examples from Marchand 1960:46; 346; 348).[1]

The straight reduplications occur with the lowest frequency of the three types. Fleischer states that of 1900 examples of reduplication in German gathered by Bzdega (1965), approximately 17.5% were straight reduplications (Fleischer 1974:235). Moreover, the straight reduplications consist mainly of 'nursery language'. I shall mainly be concerned with the compounds which involve changes to the reduplicated element.

There are various formal regularities to be found in the compounds involving ablaut or rhyme. With regard to ablaut formations, Fleischer notes that in German they usually involve an alternation between /i/ and /a/ (Fleischer 1974:235), while Marchand states that ablaut combinations in English usually involve either /I-æ/ or /I-ɔ/, with the great majority belonging to the former type (which 'corresponds to earlier /i-a/ which is a well known form of apophony in Indo-European languages') (Marchand 1960:345). Marchand claims that apart from these two, 'no other productive forms of apophony have developed' (Marchand 1960:347).

For the English rhyme combinations, Marchand notes that a high number of first elements in the compounds begin with /h/ (Marchand 1960:350), while this tendency does not extend to second elements (Marchand 1960:351). 'Favourite initials with second elements are [p] and [w]' (Marchand 1960:351). Another feature of rhyme combinations is that they often contain 'the endearing suffixes -y and -sie as well as the playful suffix -dy, -ty' (Marchand 1960:350).

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[1] There are also sporadic examples of similar reduplication in Dutch, although a Dutch native speaker reports that these reduplications appear not to produce actual lexical items, but to occur only in phrase form, for example in children's nursery rhymes or songs. An example is a St. Nicholas song containing the lines:

trippel trappel trippel trap
stippe stappe stippe stap

(Maria Stubbe, personal communication).

It is sometimes the case that the elements of the compounds exist separately as morphemes or lexemes, but this is not always true. Marchand claims that with rhyme combinations both elements are 'most often two pseudo-morphemes, i.e. fanciful, meaningless sound clusters' (Marchand 1960:348). Ablaut combinations, on the other hand, usually have a real morpheme for a basis; only very few do not (Marchand 1960:351). Fleischer (1974:236) does not discuss this point for German, but merely gives two examples of compounds where neither element is an independent morpheme, (both of which are rhyme combinations).

For both types of combination, the three logical possibilities with regard to motivation are attested:

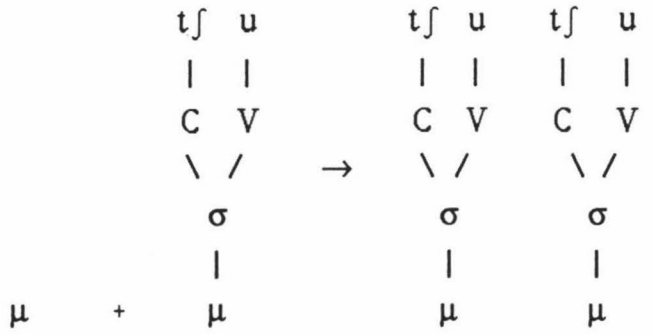
2. a. sing-song, walkie-talkie: motivation by two signs
   b. chit-chat, super-duper: partial motivation by the significate [content] plus motivation by rhythm and ablaut (or rime).
   c. flim-flam, boogie-woogie: motivation by rhythm and ablaut (or rime) only. (Marchand 1960:352).

According to Marchand, in more than half the ablaut combinations the second element is the basis (eg crisscross, dilly-dally); a much smaller number have the first element as the basis, and the rest are motivated by both elements or unmotivated by either (Marchand 1960:347-348).

6.2. Straight Reduplication: An Autosegmental Treatment

The compounds formed by straight reduplication, such as choo-choo or Wauwau, can be analysed along the lines of Marantz (1982) as involving full morpheme reduplication. Marantz describes full morpheme reduplication as 'the addition of a morphemic skeleton to a stem. The morphemic skeleton, lacking a syllabic skeleton, a C-V skeleton, and a phonemic melody, borrows all three from the stem to which it attaches' (Marantz 1982:456). The form choo-choo would have the derivation in (3):

3.



Applying Marantz's (1982) theory of reduplication to these compounds is not as simple as it might seem, however. Marantz in his article does not specifically refer to compounding, but discusses only affixation, (making such statements as 'reduplication is simply affixation' (1982:480); 'reduplication rules ... *are* normal affixation processes' (1982:436)). Yet some attested reduplication processes are obviously best regarded not as affixation, but as compounding. Bauer (1988b:25), for example, states that 'if the entire base is reduplicated, reduplication resembles compounding', and gives examples from Afrikaans of compounds formed by reduplication such as amperamper 'very nearly' from amper 'nearly'.[2] If the reduplication processes being discussed here do form compounds, perhaps it should not be a morpheme node which is copied over, but a lexeme node. Alternatively, the result of the reduplication could be regarded not as a compound, but as a lexeme formed from the joining of two obligatorily bound morphs. It is interesting to note here that Marchand refrains from calling the results of reduplication compounds, instead referring to them consistently as 'combinations'; however, discussion of exactly what sort of node is copied over in the reduplication will be postponed until a later section.

The CV skeleton for the reduplicated element is obtained, not by projection from the melodic tier, but by copying over from the base, as in Marantz's examples. This is not unexpected, as reduplication is one operation in German and English where tiers other than the melodic tier are manipulated. Reduplication is one of the processes

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[2] Although note that Botha (1988:78) claims that 'Afrikaans reduplication does not represent a process of compounding'. (Neither does Botha consider Afrikaans reduplication to be affixation, however).

mentioned by McCarthy (forthcoming:4) as involving shape invariance. This is clear especially for the ablaut and rhyme combinations, where the melodic material changes in the reduplication, but other tiers remain constant.

6.3. Reduplication with Ablaut

The attempt to explain English and German reduplication with ablaut within Marantz's theory raises several questions not addressed in Marantz's work. In the course of this section I am obliged to alter some details of his analysis, or add new features to it, to deal with the Germanic data. I do not claim, on the basis of my limited data from two related languages, to have discovered matters of such importance as to necessitate modification of Marantz's theory. Rather, the attempt is simply made to find an analysis, differing from Marantz's only in matters of detail, which adequately describes ablaut combinations. The section is divided into subsections which deal with individual problems of analysis. I deal for convenience only with English examples; as the processes are so similar in both languages, it may be assumed that similar arguments apply also to the German combinations.[3]

6.3.1 Preattachment of /I/ and /æ/

In all English ablaut combinations, as we have seen, the first vowel of the first element is /I/. This effect should be able to be achieved by the prefixing of a reduplicated skeleton, with /I/ preattached to its first V. Marantz (1982:444) notes that 'the preattachment of phonemes or features to skeletal morphemes is a widespread feature of reduplication.' For example, in Yoruba, nouns are formed from verbs 'by prefixing a CV reduplication skeleton whose V is fixed to i' (Marantz 1982:449). This is shown in (4):

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[3] Although the German and English ablaut reduplications contain different vowels, the process involved is the same, and the vowels in the alternations are historically related (cf. Marchand (1960:345), mentioned above, and Hansen (1964:21), who states that /a/ in English became /æ/ at the end of the 16th century).

4.

```
l ọ    l ọ
| |    | |    = lílọ
C V + C V
   |
   i
```

lọ 'to go'
lílọ (nominalised) (Marantz 1982:449)

Marantz states that 'Although a vowel [ọ] from the stem's phonemic melody links to the V slot in the reduplicating prefix, ... all of its features are overridden by preattached features [those of i]' (Marantz 1982:449).

The mechanism therefore exists to ensure that the first vowel in the first element of the ablaut combinations is always /I/. This is shown in (5) for dilly-dally (stated by Marchand (see above) as being formed from the base dally):

5.

```
d æ l i     d æ l i
| | | |     | | | |    = dilly-dally
C V C V  +  C V C V
   |
   I
```

Our situation is slightly more complicated than the Yoruba example, however, in that the first vowel in the second element of the combinations must also be prespecified as /æ/ (or /ɒ/).

We could, of course, take the same approach as with the /I/ in the first element, and claim that the phoneme in question is preattached to the first V slot, overriding any other vowel previously in that slot:

6.

= dilly-dally

Such reduplication with preattachment to both the stem and the copied over element is, as far as I know, without precedent in Marantz's work, yet it may be justified in this case. It is interesting, however, that (at least in English) more than half of the compounds have the second element as a base; so in the majority of cases the second element is a morpheme in its own right, which (by definition, naturally) *already* contains the necessary vowel. We might thus be tempted to take the approach that the compounds are generally formed from second-element bases - these bases being morphemes which fit a constraint limiting what their first vowel may be.[4]

There are several problems with this approach. If the elements *are* compounds, they would be unusual in having limitations on the base, as limitations on bases, while normal in derivation, do not usually exist for compounding (Laurie Bauer, personal communication). Having such a limitation on the base would also be an extremely uncommon way for reduplication to operate. McCarthy (1981:411) expresses doubts that a rule which allows reduplication only if a certain phonological constraint is met by the base is 'possible at all'; he notes that 'one result of Moravcsik's (1978) survey of a number of reduplication phenomena is that no phonetic specification of the reduplicated string is ever necessary except its composition in terms of V and C' (McCarthy 1981:411). He further claims that '[t]he template cannot refer to the whole rich set of

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[4] This raises interesting questions to do with the Righthand Head Rule (Williams 1981). The definition of the head of a compound given in Bauer (1988b:244) includes the statement that the head is 'that element which denotes a superordinate of the whole compound'; in English this is almost always the righthand element. One would, however, expect the head to be also the base of the compound. The reduplicating combinations cause problems because of the large numbers of them where neither element is a superordinate of the whole compound, and the large group where the second element is not a pre-existing form.

phonological features. It is therefore impossible to restrict reduplication to forms sharing some other properties, short of additional arbitrary restrictions on the mapping rules' (1981:411).

Such an approach would also obviously be inelegant, simply because a mechanism must exist anyway to ensure that the vowel in question is /æ/ (or /ɒ/) for all those compounds which are *not* formed from existing morphemes as the right-hand element. It therefore appears to be more desirable to preattach the required phoneme to the first vowel in the second element in all cases. This is not to say that there is not a tendency for pre-existing lexemes containing the appropriate initial vowel to become part of such a compound. Marchand, for example, claims that in all cases, even those formed from two previously-existing lexemes, the compounds are 'basically motivated by rhythm and ablaut or rime' (Marchand 1960:352). He argues that 'singsong is not really a combination of two signs comparable to rainbow.' And in walkietalkie the elements are 'attracted to each other, so to speak, by the esthetic element of rime while the putting together of logical contents is more or less incidental' (Marchand 1960:352). Similarly, Bauer (1983:212-213) states that 'in these compounds, the rhyme between the two elements (one of which may not even be an independently existing form in English) is the major motivating factor in the formation.'

Due to the fact that limitations on bases is not an appropriate method of obtaining the correct vowels in the ablaut combinations, some form of preattachment remains the only option within an autosegmental treatment for producing the /I/ - /æ(ɒ)/ alternation. The following section takes a closer look at preattachment, and discusses some differences between the mechanism for preattachment between English and German on the one hand, and the languages discussed by McCarthy (1981) and Marantz (1982) on the other.

6.3.2. The Mechanism of Preattachment

The condition which allows preattachment in Marantz's theory is Condition C:

> The slots in a C-V skeleton may be preattached to distinctive features. These features take precedence over the features of any phonemes from a phonemic melody which may link to these slots (Marantz 1982:446).

Marantz notes that one could *either* treat the case of a preattached phoneme as 'a limiting case of preattached features,' with all of the features of the phoneme from the stem's phonemic melody being overriden by preattached features (Marantz 1982:449), *or* one could say that 'when a full set of features is preattached to a slot, no phoneme from a phonemic melody may associate with the slot' (Marantz 1982:449-450). Marantz states that he has found no real-language data which would help him decide between these two approaches. Reduplicating compounds with ablaut in English appear to provide such real-language data.

Take for instance the compound dilly-dally. If we allow the /æ/ from the phonemic melody of the second element to associate with the relevant V slot of the copied over element, and then override its features with those of the preattached /I/, we obtain the correct result (shown above as (5)):

7.

d	æ	l	i		d	æ	l	i			
|	|	|	|		|	|	|	|	=	dilly-dally	
C	V	C	V	+	C	V	C	V			
	|										
	I										

If, however, we do not allow the /æ/ to associate with the initial V slot, we obtain the output in (8) (assuming, following Marantz (1982:447), that association is phoneme-driven).[5]

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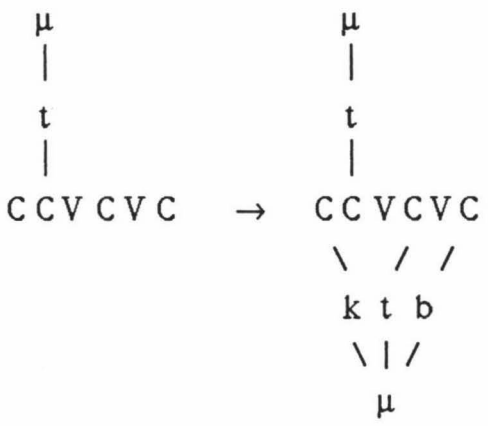
[5] If the skeletal tier were to consist merely of X slots, a different, but still incorrect, result would be obtained, namely *dialdally.

8.

It must therefore be concluded that the phoneme /æ/ *is* linked to the V-slot, and that all its features are subsequently overridden by those of /I/. Note that, as Marantz (1982:450) points out, it is the other approach which is taken by McCarthy (1981) for Arabic morphology. The following example from Arabic, involving the preattached affix t in the eighth binyan, demonstrates this:

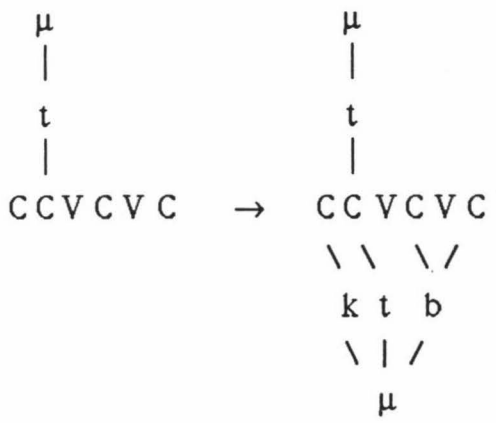
9.



= ktatab ('write, be registered') (McCarthy1981:390).

If the t in the root associated with the second C slot and subsequently had its features overridden, the following incorrect result would obtain:

10.



(*ktabab)

English preattachment thus operates in a different manner to Arabic preattachment. The English compounds, incidentally, also disprove a claim made by Pulleyblank (1986). He proposes a constraint (1986:17) against double linkings to the same skeletal slot, and notes that apparent couterexamples to this constraint are provided by cases such as the Yoruba reduplication (given above as (4)). Pulleyblank claims that Marantz's examples 'could be reformulated so as not to violate the convention ... by simply assuming that prelinking blocks subsequent conventional linking' (Pulleyblank 1986:25, fn 12). While this solution may work for an example, like the Yoruba one, where the reduplicated material consists of a single CV, longer reduplicated elements such as the elements in dilly-dally show that blocking of subsequent linking does not produce the correct result. Hence double linking to a single lexical slot seems inevitable for our data.[6]

More serious problems arise concerning preattachment. If the CV skeleton is projected from the melodic tier for the base (usually the second) element of the compounds, there is no pre-existing CV skeleton to which to attach the /æ/. Preattachment of the /æ/ would need to involve a *pre-existing* skeleton for the second element which is at least partially specified for syllabicity, with /æ/ preattached to the first V slot, as in (11):

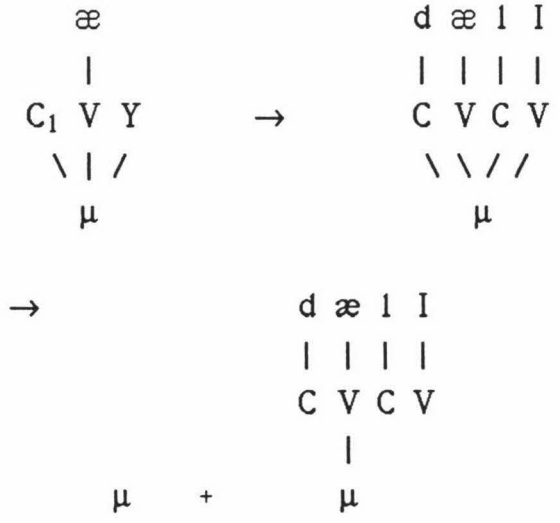
---

[6] Note that double linking to a single slot, and overriding by preattached material of other material linked to that slot, occurs also in ablaut in German (see Chapter 4, section 4.2.2., example (7)).

11.

(Where Y denotes any strip of skeleton; X being avoided for this purpose as it could cause confusion with Pulleyblank's Ẋ-slots). Melodic material is inserted into this skeleton, with the unspecified C and V (or X) slots being projected from the melodic elements. Reduplication then proceeds, as for the straight reduplication above, with the adding of a morpheme node. This is shown in (12) for dilly-dally.

12.



The CV skeleton and melodic information for the added μ node must now be copied over from the base, as the added μ node lacks melodic or skeletal information of its own. Yet we want the CV skeleton for the added morpheme to have an /I/ preattached to its first vowel. In a language such as Yoruba, the process of such preattachment is straightforward. The representation in the lexicon for the reduplicative affix in this language would involve the CV skeleton CV, with its V fixed to i:

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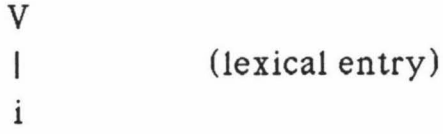
[7] The node μ is used to represent the unit which is reduplicated. As indicated above, it is not clear whether this is the correct node; this issue is addressed below in section 6.3.3.

13.


(lexical entry)

The English case, however, would require the affixation of a morpheme node, with an extra rule stating that when the CV skeleton is borrowed from the base, its first vowel is preattached to /I/. The English derivation is significantly more complex than the Yoruba one, or any others discussed by Marantz (1982).

McCarthy and Prince (1990) similarly observe problems with the attempt to combine preattachment (which they call prespecification) with reduplication. They claim that 'the phenomenon of melodic invariance in reduplicative affixes cannot be reduced to prespecification' (1990:244). They thus reject prespecification, as it is proposed by Marantz (1982), even for such examples as the Yoruba one given above in (4). Part of their evidence comes from echo word formation in Kolami, where 'the entire word is reduplicated with the initial CV of the second copy fixed at gi' (McCarthy and Prince 1990:244). Examples from Kolami are:

14.	pal	pal + gil	'tooth'
	kota	kota + gita	'bring it!'
	iir	iir + giir	'water'
	maasur	maasur + giisur	'men'
	saa	saa + gii	'go (cont. ger.)'

(McCarthy and Prince 1990:244; data taken from Emeneau 1955).

McCarthy and Prince claim that since the entire word is copied in Kolami, the reduplicative affix must be the prosodic word (W), and ask, (as must also be asked for English):

> To what ... would the melodic invariant gi be prelinked in the reduplicative affix, as prelinking theory requires? The grammar does not enumerate the terminal elements of the reduplicative affix W ... it cannot, since W has infinitely

> many terminal elements - yet it is exactly to those terminal elements that the melodic invariant gi would have to be prelinked (McCarthy and Prince 1990:244-245).

The solution proposed by McCarthy and Prince to this problem is to treat the melody gi as an autonomous sequence, on a separate autosegmental tier. The gi is thus treated

> like ktb or a_i in the Arabic verbal system; the difference is that ktb and a_i are mapped to empty templatic slots in a "feature-filling" fashion, whereas the melody gi is applied in a "feature-changing" manner, overwriting the original melodic material of the base (1990:245).

'Prespecification' is, in effect, 'postspecification' (my term).

Applied to English, McCarthy and Prince's theory would work in the following manner. The node which is affixed borrows its CV skeleton and melodic tier from the base. A separate melodic tier consisting of /I/ also exists; this /I/ attaches to the first vowel in the affixed element, either by straightforward rules of association if association operates from left to right in English, or by stipulation if association operates from in some other fashion. The initial vowel of the second element, which was shown above also to result from preattachment, would be treated in the same manner; that is, it would exist on a separate autosegmental tier, and be associated with the initial vowel of the element in a 'feature-changing' manner. Such an approach was also used, without being overtly discussed, in Chapter 4 above for ablaut. The autosegment e; for example, is entered in the lexicon for the past participle of the verb liegen; this is then attached to the first vowel in the participle (section 4.2.2., example (7)).

McCarthy and Prince's reanalysis of the mechanism of prespecification has interesting implications when it is tested against the parameter discussed above (examples (7) - (10)) regarding the different possible mechanisms of preattachment (whether preattached material overrides subsequently linked material, as in English, or whether it blocks subsequent linking altogether, as in Arabic). McCarthy and Prince claim that the

autosegments containing material to be 'postspecified' link to the skeleton in a 'feature-changing' manner. As no mention is made of other effects on previously linked material, this operation must produce the same results as Marantz-style preattachment which *overrides* subsequent linking (as in examples (7) and (10) above), rather than blocking it completely (as in examples (8) and (9)). The new theory thus appears to involve double linking to a single skeletal slot, hence still providing a problem for Pulleyblank's constraint.

The Arabic mechanism for preattachment is not inconsistent with McCarthy and Prince's theory, however. Significantly, McCarthy and Prince claim that their mechanism for 'postspecification' is valid only for reduplication processes. It is therefore unsurprising that a difference was noted between the English and German prespecification and the Arabic prespecification, as the latter did not involve reduplication. What is perhaps surprising is that operations like ablaut in German and Dutch, while *not* involving reduplication, appear nevertheless to fit with McCarthy and Prince's 'postspecification' mechanism.

6.3.3. Nature of the Affixed Node in Reduplication

The nature of the node which represents the base in the English and German combinations, and which is affixed to the base in reduplication, has yet to be determined. Note first that it is not acceptable simply to copy over the CV skeleton provided by the base - it is not possible, for example, for a compound with the base clack (/klæk/), and hence the CV skeleton CCVC, simply to copy over the CV skeleton CCVC. Marantz allows copying over only of a skeleton which is 'independent of the constituent being reduplicated' (1982:453), whether this skeleton is a CV skeleton, a syllabic skeleton, or a morphemic skeleton. With ablaut and rhyme combinations it is obviously not an independent CV skeleton which is copied over, as the copied over elements exhibit varying patterns of Cs and Vs (for example CVC (riprap), CCVC (snipsnap), and so on). Nor could it be a a syllable skeleton which is copied over, as the

compounds involve elements with varying syllabic structure (riprap, minglemangle, ricketyrackety).

One possibility for the node in question, and the one which I have for convenience utilised so far in this chapter, is the morpheme node μ, one which is used extensively in early works on autosegmental morphology such as McCarthy (1981) and Marantz (1982). This option is easily dismissed, however, by the fact that in some cases the reduplicated element actually consists of two morphemes. For example, the rhyme combination handydandy is formed either from the base hand, or from the 'childish diminutive' handy (OED). The diminutive handy contains two morphemes, the root hand and the suffix -y, and it is therefore obviously not a morpheme node which is affixed in reduplication. Another possibility might be a lexeme node, as mentioned above in section 6.2. The main problem with this option (and, incidentally, also with the morpheme node option) would be that the term 'lexeme' implies semantic content; lexemes are traditionally regarded as being units carrying a constant meaning. Yet many of the elements in the ablaut and rhyme combinations carry no meaning at all (and are called 'pseudo-morphemes' by Marchand; see above). This is not an insurmountable problem: we could argue, following Aronoff (1976:9-15), that a morpheme does not have to have a constant meaning, and could therefore justify at least a morpheme node, and possibly by extension even a lexeme node, for the elements in the combinations. Or we could claim that semantic notions should be disregarded in representations of this sort. I shall not, however, attempt to defend either of these positions, as there is another option for the nodes in question which I consider to be a superior one. Apart from being descriptively accurate, it provides the correct result without any justifying argument, and has the added advantage of fitting in with the latest developments in the theory.

6.3.3.1 Prosodic Morphology

McCarthy (1981:410) states that 'we might conjecture that reduplication of the prosodic category foot (Selkirk [1984]) is responsible for sporadic English formations like higgledy-piggledy.'

He does not expand this suggestion further, but the concept of utilising prosodic units in the description of reduplication, or of other morphological processes, is developed further in McCarthy and Prince (1990). A central principle of McCarthy and Prince's (1990) framework (Prosodic Morphology) is the Prosodic Morphology Hypothesis, which states that 'Templates are defined in terms of the authentic units of prosody: mora (μ), syllable (σ), foot (F), prosodic word (W), and so on' (McCarthy and Prince 1990:209). (Note the change in meaning for the symbol μ, which in earlier versions of the theory represents a morpheme). Another principle, the Prosodic Circumscription of Domains, states that 'The domain to which morphological operations apply may be circumscribed by prosodic criteria as well as by the more familiar morphological ones' (1990:209-210).

With regard to reduplication, McCarthy and Prince propose that the base to which reduplicating affixation takes place is prosodically circumscribed, and furthermore that 'The prosodic criterion always selects the *minimal base* of the language' (McCarthy and Prince 1990:231). The minimal base, or 'minimal expansion of the category word,' is equivalent to a single foot, according to the following reasoning:

> In the examples ... the minimal base is descriptively coextensive with the foot. This is no accident. The prosodic hierarchy, as a principle of representational well-formedness, guarantees that words are made of feet, feet of syllables, syllables of moras. The minimal expansion of the category word, which we will denote by W_{min}, therefore consists of a single foot (McCarthy and Prince 1990:231).

McCarthy's (1981) suggestion, that the base for the English reduplications is a single foot, is thus predicted by general principles in the latest version of the theory. And investigation of the bases for the English and German reduplications reveals that they do consist in all cases of a single foot. Hogg and McCully (1987:78) define a foot as 'In English, at least, ... a string containing as its first element a stressed syllable which is followed by zero or

more unstressed syllables', and examination of the ablaut and rhyme combinations listed in Appendix 3 shows that the base for reduplication has in all cases initial stress, with no other stressed syllables.

As McCarthy and Prince's (1990) prosodic analysis of reduplication predicts the correct result for the English and German ablaut and rhyme combinations (and also for the straight reduplications), I henceforth adopt it in my analysis of them. The bases for the combinations are prosodically circumscribed as W_{min}. It follows, since the entire base is reduplicated, that the affixed node is also W_{min}. (McCarthy and Prince discuss a similar case of reduplication in Yidiny, where 'the reduplicative affix can be regarded as W, or total reduplication, a form of compounding' (1990:233-234)). In addition, there are two autosegments, an /I/ and an /æ/ or /ɒ/, which must attach to the initial vowels of the elements.

6.3.4. /æ/ vs /ɒ/

The general principles of the analysis are becoming clear, and a remaining detail may now be addressed, namely how to deal with the alternation, in the second element of the English ablaut combinations, between /æ/ and /ɒ/. Hansen (1964:21-22) claims that the existence and spread of /ɒ/ was helped by the raising of /a/ to /æ/ in English. This raising reduces the phonological distance between the first element and second element vowel in /I/ - /æ/ combinations, and the use of second element /ɒ/ represents an attempt to increase the phonological distance between the two elements (or retain the original distance) (Hansen 1964:21; the argument was previously put forward by Koziol (1942)). Whatever the reason for the *existence* of second-element /ɒ/, however, the *alternation* between /æ/ and /ɒ/ is not governed by phonological factors. This is shown by the pairs of combinations containing an alternation between /æ/ and /ɒ/ in identical phonological environments: flipflap vs. flipflop, slipslap vs. slipslop, and ticktack vs. ticktock. Nor is the alternation between /æ/ and /ɒ/ random. The vast majority of combinations contain /æ/ rather than /ɒ/, and the occasions when /ɒ/ occurs are almost all formed from pre-

existing second-element bases. Of the 12 combinations containing /ɒ/ listed in Appendix 3, 7 are described by the OED as being based upon the second element. In only two cases is the element containing /ɒ/ not a pre-existing word with a relevant meaning (pingpong and ticktock). This implies that /ɒ/ only occurs when lexical factors require, rather than by virtue of the existence of an autosegment /ɒ/ which freely 'postspecifies' to the first vowel in the second element.

Given that the use of /ɒ/ is so marginal, and initiated not by general rule but by individual lexical situations, the production of it is not central to the analysis. It must, however, be stated that if lexical circumstances permit, /ɒ/ may appear in the second element (as it is the only other vowel which may appear in this position).

6.4. Rhyme Combinations

The rhyme combinations are in major respects similar to the ablaut combinations, but present several additional problems. While for the ablaut combinations the initial vowels in each element are relatively constant, with only one variation (that between /æ/ and /ʊ/ in the second element), the initial consonants in the rhyme combinations exhibit considerable variation. The list of rhyme combinations in Appendix 3 confirms that a wide variety of initial consonants is possible for both first and second elements.

An example which demonstrates the relative freedom of choice for the initial consonants in the rhyme combinations is the lexeme handydandy, which is listed in the OED as being derived from hand or its childish diminutive handy. That the /d/ which introduces dandy in this form is variable is shown by the several alternatives available for its position; the OED lists handybandy, handypandy, and handyspandy as variations.

There appear to be no absolute restrictions on position for consonants in the rhyme combinations, contrary to the ablaut combinations, where the /I/ - /æ(ɒ)/ order is obligatory. This lack

of restriction in the rhyme combinations is shown by pairs such as ragtag and tagrag, peepiecreepie and creepiepeepie (where both members of each pair of words have the same meaning).

The choice of initial consonant for the rhyme combinations is not, however, entirely arbitrary. In a certain group of words, at least, there is a distinct preference for bilabial consonants in the second element. Hansen (1964:13-14) discusses 'expressions of the nursery' ('Ausdrücke der Kinderstube') and 'pet names' ('Kosenamen'), and of the 23 examples given by him, all with the exception of one (Roddy-doddy) have second-element initial /p/, /b/, or /w/. In rhyme combinations which are not nursery expressions or pet names, many other second-element-initial consonants appear, but even here a slight preference for bilabials may be observed. Of 115 examples of English rhyme combinations in Appendix 3, 22 have a first element beginning with a bilabial, while 50 have a second element beginning with a bilabial (and note that the list in the Appendix excludes Hansen's (1964) examples of 'nursery language'). Of the admittedly small sample of German rhyme combinations given in Appendix 3, exactly half (6 out of 12) have a second-element-initial bilabial. This preference for bilabials is evidenced in many other languages. Spitzer (1952:230, fn 5) mentions a 'prediliction for variation by labial', and gives examples of reduplication with substitution of an initial bilabial consonant in Turkish and the Judeo-Spanish of Bulgaria (1952:229). He also states that 'the m-reduplication type is not unknown in other languages (Arabic, Abyssinian, Basque, Neo-Greek, the Finno-Ugrish languages and also in our Western European languages ...)' (1952:229). Spitzer further claims (1952:229-230) that 'The m-variants, spread out as they are over many unrelated languages, are obviously elementary utterances of the type used in onomatopoeias ... or in the jabbering speech of children, the labial nasal being the consonant most easily at hand for them.' It thus appears possible that bilabial consonants are the least marked, or most natural, option for such substitutions (in the sense of Mayerthaler (1981), Dressler et al (1987) and others). This is suggested by their occurrence across a variety of languages, their frequency within the English compounds, and their use in child language.

There is, in addition to this preference for bilabials, a preference (noted above in section 6.1) for first elements in English to begin with /h/- (31 out of 115 English rhyme combinations have first-element-initial /h/-). In spite of these tendencies, however, there is a considerable range of consonants and no way to predict which consonant (or consonant cluster) will appear in any situation. It is not, as might be imagined, the case that 'less-preferred', or more marked, consonants occur only in elements which are existing words (in other words, that no marked elements are created in the process of reduplication). This is shown by examples such as hoity-toity (cited by Collins as being formed from hoit), or razzle-dazzle (cited by the same dictionary as a rhyming compound based on dazzle). Similarly, I have been able to discover no correlation between environment and choice of consonants; examples such as handydandy and its variations, or handydandy compared with hanky-panky, indicate that the initial consonant cannot be predicted from the following vowel. Vowels occurring in the rhyme combinations tend to co-occur with a wide range of consonants; for example, /æ/ is preceded by first-element /b/, /h/, /n/, /p/, /r/, /hw/, and /kl/, and by second-element /b/, /d/, /j/, /p/, /t/, /bl/, and /tr/.

An additional problem for analysis of the rhyme combinations is posed by the fact that a single consonant is not always replaced by another single consonant in the reduplicated element. The examples in (15) demonstrate this:

15. a. ø - C_1: argy-bargy, even Stephen
    b. C - CC: copper dropper, humdrum, hurry-scurry, hy spy, peepiecreepie
    c. CC - C: flibberty-gibberty, frame-dame, brag rags, drape shape, scope dopes
    d. CC - CC: claptrap, stickly prickly, stubble trouble

Where an element begins with a consonant cluster, that element in the great majority of cases is an existing word (an exception is flibberty-gibberty); yet the combinations containing these elements

are not always formed from the element containing the consonant cluster. For example, Collins states that humdrum is 'probably based on hum.'

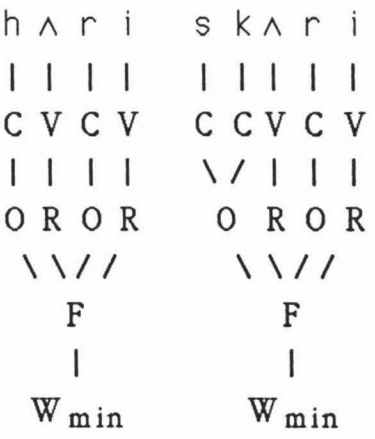
The alternation within individual compounds between initial single consonants and consonant clusters presents a problem; it is inconsistent with the analysis proposed so far, which requires that the CV skeleton of the reduplicated element be obtained by copying over from the base element. In the examples in (15), base and reduplicated element have differing CV patterns. In hurry-scurry, for example, (according to Collins, a reduplication of hurry), the reduplication process adds consonant slots. (Argy-bargy and humdrum are others where this occurs). Information about the CV pattern for scurry (CCVCV) cannot be obtained by the normal reduplication process, which would involve addition of a minimal word node which copies over of the CV pattern of the base (CVCV).

As the melodic tier is capable of producing a CV skeleton in English, we could say that when a consonant cluster appears in the reduplicated element, the appropriate number of C slots will simply appear. In other words, the initial consonant (cluster) does not, as previously supposed, attach to a slot in the CV skeleton provided by the reduplication process. Instead it must create its own piece of CV skeleton. (Reduplication is, after all, the exception for English in being the only operation which involves production of the CV skeleton by some other means than projection from the melodic tier). Yet it is essential, if the basic principles of Marantz's theory of reduplication are to be retained, that some independent piece of skeleton is affixed to the base, which obtains *all* the tiers it lacks from copying over of the relevant tiers *in their entirety* from the base. If a minimal word node is affixed to a base, all other information concerning the structure and melody of the affixed minimal word should be obtained by copying over that information in its entirety from the base (and from the linking of prespecified autosegments).

There is one way, as far as I can determine, to preserve the basic principles of Marantz's theory in the light of the examples in (15). It

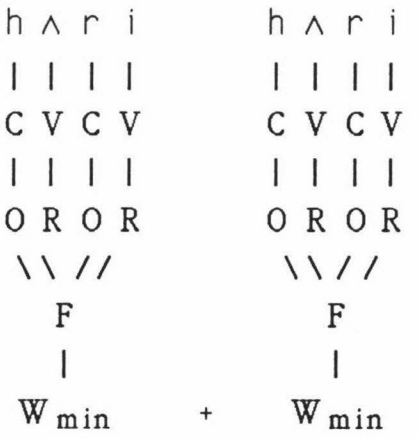
involves exploitation of the units *onset* and *rhyme*, a possibility which was suggested to me by Laurie Bauer (personal communication). The onset of a syllable is the 'initial consonant sequence' (Hogg and McCully 1987:36); the rhyme is the rest of the syllable (including the nucleus and the coda; Hogg and McCully 1987:37). The examples in (15) demonstrate that it is in fact the initial onset, rather than the initial consonant, which is replaced in the formation of the rhyme compounds. A tier consisting of nodes representing onsets and rhymes could therefore be introduced. This would result in a representation like (16) for hurry-scurry (where 'O' represents an onset, 'R' a rhyme and 'F' a foot):

16.



The derivation of a word like hurry-scurry is as previously detailed for the rhyme combinations, differing only in one respect. A W_{min} node is first affixed to the base, and all information from the base is copied over, giving (17):

17.



The 'postspecified' segments /sk/ are specified as making up an onset:

18.

and link directly to the first onset of the second element in a 'feature-changing' manner. The difference to normal postspecification lies in the fact that not only is the previously linked melodic tier changed, but also the previously linked CV skeleton. This produces the output given above in (16).

I have stated that the onset for the rhyme combinations is *specified*. I have in fact no way of determining how the onset for the rhyme combinations is determined; random generation could well play a role, along with the preferences outlined above. Whether or not the onset is randomly generated, the simplest way to treat it within autosegmental theory is still that detailed in the previous paragraph. If necessary, a 'random-generation rule' could be included, saying something like 'randomly generate an onset autosegment, and attach in a feature-changing manner to the reduplicated element.'

Another example of onset substitution is provided by Yiddish-English rhyming compounds (moon-schmoon, quick-schmick, etc). /ʃm/ replaces the initial onset, rather than the initial consonant, shown by examples such as ʃmegetz (from ʃegetz) and ʃmeiz (from kreuz) (Spitzer 1952:232).

6.5. Additional Problems for Ablaut and Rhyme Combinations

There are several remaining problems and details of analysis which are beyond either the scope or the space limitations of this thesis.

One problem which arises does not have to do with the derivation of ablaut or rhyme combinations, but with which lexemes should be regarded as belonging to this class of words. Many of the combinations are formed from two existing words, and it becomes difficult in some cases to determine the motivating factor for the joining of the two elements. Hansen (1964:7-9) discusses this question, and agrees that the boundaries are unclear. For rhyme combinations composed of two existing words he holds that it is not possible to determine in every case whether the rhyme is a motivating factor of the compounding or is coincidental. The rhyme is coincidental, he claims, for coinages such as band-stand, bed-stead, cook-book or night-light, 'normal, purely semantically motivated compounds, to which consequently the designation *rhyme combination* is not really applicable'[8] (Hansen 1964:7). True rhyme combinations (such as brag rags) are those which 'are influenced by the rhyme at least in terms of word choice and which obtain their special stylistic effect (and hence finally also their raison d'être) largely from the rhyme'[9] (Hansen 1964:7).

It is not necessary, given the aims of this study, to attempt here to answer the question of which words are formed because of ablaut or rhyme, and which are formed for other reasons. (Indeed, there may not be two distinct groups, but a cline from total sound motivation to no sound motivation). My aim is merely to determine whether an autosegmental analysis of English and German reduplication is possible, not whether particular 'problem' words are instances of this phenomenon.

Another feature of the rhyme combinations which has not been discussed is the appearance in a proportion of them of the suffixes -y, -sie, -dy, and -ty (mentioned above in section 6.1., from Marchand 1960:350). The simplest way to deal with this is to assume that suffixation takes place before reduplication; this would produce correct results as in all cases except one (flibberty-gibbet)

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[8] 'normale, rein begrifflich motiveirte Komposita, für die folglich auch die Bezeichnung *Reimkomposita* wenig sinnvoll wäre.'

[9] 'zumindest hinsichtlich der Wortwahl vom Reim beeinflußt sind und ihre besondere stilistische Wirkung (und damit letztlich auch ihre Existenzberechtigung) weitgehend aus eben diesem Reim ... beziehen.'

the suffix appears in both elements of the combination. Interestingly, there are other derivational affixes which appear in both elements of a combination, implying that affixation has preceded reduplication, while the inflectional plural morpheme appears only on the second element of the combination, implying that inflectional affixation follows reduplication. Examples are given in (19).

19. a. copper dropper, raggle taggle
    b. heebiejeebies, tootsie-wootsies

6.6. Summary and Conlusions

This chapter has shown that an application of autosegmental morphology to English and German reduplication requires several adjustments to Marantz's (1982) theory of reduplication. In spite of this, however, and in spite of the fact that many details are still missing which would be necessary for a complete analysis of the reduplicating compounds, the chapter nevertheless indicates that an autosegmental treatment of English and German reduplication is possible. And if it is possible to treat English and German reduplication along the lines of Marantz (1982), it is desirable, as Marantz's theory avoids transformational power, and hence is superior to previous analyses of reduplication:

> a theory of this type is superior to earlier, transformational accounts of reduplication on grounds of restrictiveness. The use of transformational rules allows the linguist to state virtually any imaginable type of reduplication rule, including many that have never been recorded and which should be excluded in any reasonable universal theory of reduplication processes; Marantz's account excludes such rule types without the need for special stipulation (Clements 1985:41).

Section 6.2 of this chapter showed that straight reduplications of the type choo-choo or Wauwau are easily dealt with by Marantz's (1982) theory, and subsequent discussion indicated that they

should be analysed as instances of minimal word reduplication. A minimal word node is added to the base, and all other tiers for that minimal word are copied over from the base.

The ablaut and rhyme combinations raise more interesting questions. It was shown for the ablaut combinations that the initial vowel of both elements should be achieved by specification, rather than by restrictions on the bases which make up the compounds. The nature of pre- or postspecification was shown to be different from that required for Arabic by McCarthy; in the English and German reduplications it must involve double linking to a single skeletal slot, while in Arabic it may not involve double linking. Whether attachment of the specified material in English and German occurs before other linking but overrides all features of subsequently linked segments, or occurs after other linking in a feature-changing manner, double linking is still required and the end result is the same. Other factors may point to a choice between the two options, however. The latter option, which I have termed 'postspecification', appears to work better for the reduplications, as prespecification has been shown by McCarthy and Prince (1990) to be unworkable for the added element of minimal word reduplication.

An extra layer of structure was found to be necessary for the rhyme combinations, namely a tier consisting of onset and rhyme nodes. This is not a major problem, given that other prosodic units such as mora, syllable and foot have a place in the theory (McCarthy and Prince 1990:209), and that there are other operations which testify to the substitution of syllable onsets (such as Yiddish-English /ʃm/- substitution).

None of the points raised in this discussion of English and German reduplication indicate to me that English and German reduplication is not able to be dealt with adequately by Marantz's (1982) theory of reduplication. The problems encountered in previous chapters of this study are not applicable to reduplication, as in reduplication the CV skeleton for the added element is not projected from the melody, but obtained by copying over from the base. In this respect

the reduplication discussed in this chapter resembles completely other reduplication processes discussed by Marantz (see for example Marantz 1982:456).

Chapter 7
CONCLUSION

7.1. Summary of Findings

An introduction to autosegmental theory, as proposed by Goldsmith (1976) and McCarthy (1979, 1981) among others, was followed by three attempts to apply that theory to nonconcatenative phenomena in Dutch, German and English. Before any applications were attempted, some major differences between the morphological systems of Dutch, German and English and the languages to which autosegmental morphology has usually been applied were noted. The main difference found was that while in Arabic and similar languages the CV skeleton is provided by the morphology, in Germanic languages it must be projected from the melodic tier. This difference was found to have far-reaching consequences.

The first phenomenon examined was Dutch and German past participles. These are discontinuous morphemes, consisting of an obligatory suffix, ablaut in strong (or mixed) verbs but not in weak verbs, and a prefix whose presence or otherwise is determined phonologically in German, and either phonologically or morphologically in Dutch. It was discovered that the preattachment of an affix, while useful and explanatory in McCarthy's (1979, 1981) treatment of Arabic, is inapplicable to the Dutch and German situation. Because the CV tier is not present in the lexicon or anywhere else as a separate entity from the melodic tier, there is nothing to which the melodic segments making up the affix could preattach. It was also discovered that the position of the affixes within the past participles must be stipulated, as position does not proceed from general principles as in McCarthy's (1981) treatment of Arabic derivational affixes (although it was noted that Arabic inflectional affixes may provide similar problems of positioning as are encountered in Dutch and German). It was concluded that while affixes such as the past participle prefix or suffix can be represented in autosegmental notation, this would bring no advantage over a linear (single-tier) theory.

The process of ablaut, also present in the past participle morpheme, is a typical nonconcatenative operation and processes like it have successfully been treated autosegmentally (for example Lieber's (1987) treatment of umlaut in German and other mutations). It was shown that ablaut can be achieved by the association of the relevant vowel (present in the lexicon) to the relevant vowel slot. The features of the vowel thus associated override the features of the stem vowel otherwise occupying that slot. It was noted that ablaut is not an unexpected or dispreferred operation in autosegmental theory, and this was contrasted with ablaut's rarity as a process in Dutch and German (further discussion of this point follows in section 7.2.).

Finally, as the three processes which make up the past participle morpheme behave independently of each other and require separate stipulations as to their placement within the word, it was concluded that it would be unfeasible to attempt to treat the past participle morpheme as a discontinuous morpheme similar to the root or vowel morphemes in Arabic.

The second phenomenon examined was the Dutch collective circumfix ge-te. It was first argued that ge-te is a circumfix, contrary to claims made by Schultink (1987). The main reason for regarding ge-te as a circumfix is a semantic one; the combination of the prefix and the suffix imparts a collective meaning which cannot be explained by the meanings of the prefix and the suffix themselves. With regard to the affixation of ge-te, the same problems were encountered as with the past participle prefix and suffix. Affixation of a melody which projects a skeletal tier differs from linear affixation of a melody only by the presence of extra notation. The possibility that at least the positioning of ge-te within the word could be explained by autosegmental theory was discounted, and it was concluded that the only advantage of an autosegmental representation of the morpheme ge-te was that its discontinuity is not unexpected.

Finally, reduplication in English and German was discussed, and here rather more success resulted. The straight reduplications were found to fit easily into Marantz's (1982) theory of reduplication, involving addition of a minimal word node to a minimal word base. The reduplications with ablaut and rhyme raised several questions not encountered in Marantz's work. It was found necessary, for example, to preattach material to both the base and the added element, a situation which does not arise in Marantz's examples. It was shown that preattachment in English and German must involve double linking to a single slot and overriding of the features of other linked material, contrary to the situation in Arabic and to Pulleyblank's (1986) constraint against double linking. It was shown that there is in fact a problem with preattachment in English and German reduplication, namely that affixation of a word node does not provide an appropriate node to which preattached material could link. This problem was solved by applying McCarthy and Prince's (1990) theory of 'postspecification' for reduplication. And finally, for the rhyme combinations it was demonstrated that an initial onset is substituted, necessitating another layer of structure involving onset and rhyme nodes.

On the whole, the English and German reduplication did not seem to differ in *major* respects from other examples of reduplication discussed by Marantz (1982), and I claim that they are able to be represented autosegmentally with the same advantages enjoyed by Marantz's examples. A major advantage of Marantz's account is the restriction of transformational power it involves.

7.2. Conclusions

The question remains of whether these findings have any implication for the representation of Dutch, German and English morphologies. The fact that one operation in English and German can be treated autosegmentally with some advantage does not automatically imply that the entire morphologies of those languages should be treated autosegmentally. On the contrary, I consider it would be undesirable to do so. Not only would it involve a great

amount of extra notation for the benefit of a tiny proportion of the morphology, it would enable unrestrained production of word forms totally alien to the morphologies of the languages in question.

With regard to the extra notation, it should be recognised that in all cases except for reduplication, umlaut and possibly ablaut, a separate skeletal tier is completely superfluous in Dutch, German and English. In cases where the skeletal tier is not exploited, but merely projected from the melodic tier, it is totally redundant. By far the majority of word formation processes in Dutch, German and English involve concatenative affixation, and while ignoring unusual word formation types is unproductive if a truly adequate theory is to be devised, it is similarly undesirable to base the entire morphological description of a language upon catering to a small minority of cases, especially if catering to those cases involves complication of the description.

A stronger argument against the autosegmental representation of Germanic languages involves the consequences for morpheme continuity and word formation processes which would occur. It was noted in Chapter 5, for example, that the discontinuity of the circumfix ge-te in Dutch is entirely unremarkable in an autosegmental analysis; and yet discontinuity of morphemes *is* remarkable within Dutch, German and English. Autosegmental theory displays no preference for continuity of morphemes, and if Dutch, German and English were represented autosegmentally the almost total lack of discontinuous morphemes in these languages would need to be achieved by strong constraints - constraints which would negate the purpose of autosegmental theory, and which are not necessary in a theory where continuous morphemes are the norm and discontinuous ones the exception. Similarly, it was noted in Chapter 4 that internal modification such as ablaut is a rare occurrence in Germanic languages (unlike in Semitic languages), and yet ablaut is not dispreferred by autosegmental notation. Severe constraints would again be required, to prevent the possible production of many internal modification processes.

I would thus claim that although individual phenomena in Dutch, German and English may be amenable to an autosegmental treatment (most convincingly the English and German reduplications), an autosegmental representation of the entire morphologies of these languages should not be attempted, as the autosegmental method displays no preference for concatenative affixation, the major method of word-formation in these languages. Additional support for not describing Germanic languages autosegmentally is provided by the theory of natural morphology, as proposed by Mayerthaler (1981), Dressler et al (1987), and others. Natural morphology shows that internal modification and discontinuous morphemes are not just rare in Germanic languages; they are in fact relatively marked, or unnatural, cross-linguistically. It would, I claim, be undesirable to base the whole description of a language around the most marked, or least natural, patterns in languages which are otherwise unmarked, such as Dutch, German or English. The relevance of natural morphology to the current situation is demonstrated in the following paragraphs.

With regard to internal modification, Mayerthaler (1981:24) claims that additive codings (affixations) are more constructionally iconic, and hence more natural, than modulator codings (mutations), as additive codings represent more iconically the semantic relationship between the base and the derived form. Similarly, Kilani-Schoch and Dressler (1984:51) claim that 'a morphosemantically derived form (be it in inflection or word-formation) is best represented by ... affixation'; and that 'the diagrammatic relation between meaning and form is diminished if there is just modification (e.g. sing → song: derivation has still an overt expression but does not parallel the change of the meaning).' Cross-linguistically, additive codings are altogether dominant over modulator codings (Mayerthaler 1981:24). With regard to discontinuous morphemes, Kilani-Schoch and Dressler (1984:52) claim that 'among morphemes continuous morphemes are better [more natural] than discontinuous ones. Therefore also prefixes or suffixes are better than infixes or circumfixes, and transfixes are worst.'

It follows from the relative markedness of both internal modification and discontinuous morphemes that Semitic languages, which contain large amounts of both and in which modification 'seems to be more basic' than affixation (Kilani-Schoch and Dressler 1984:58), are overall relatively marked in these respects. Within Semitic languages, therefore, (a generally marked environment), *markedness inversion* takes place (cf. Mayerthaler 1981:48-58). Thus, *within Semitic*, it is *unmarked* for morphemes to be discontinuous and for internal modification to take place. Consequently, it is entirely appropriate for the entire morphologies of Semitic languages to be treated by autosegmental theory, a theory which caters extremely well to these generally more marked phenomena. Within Germanic languages, however, it is unmarked for morphemes to be continuous and for word-formation to be concatenative. For this reason it would be questionable to describe the entire morphologies of these languages with a theory designed for the generally more marked situations. It can finally also be repeated that even the Dutch and German past participle morphemes and the Dutch circumfix presented problems when the attempt was made to apply autosegmental theory to them. The case for representing Germanic languages autosegmentally thus loses even more ground, as even the processes within these languages which should be most amenable to autosegmental theory are not unproblematic when treated by it.

The fact remains, of course, that reduplication in English and German *is* dealt with satisfactorily by autosegmental theory. I do not know whether reduplication in English and German should be the exception within those languages by being treated autosegmentally, while the rest of the language is not, or whether autosegmental theory must be abandoned altogether for Germanic languages, and reduplication must after all be treated by transformational rules. Both options have drawbacks, and perhaps some as yet unknown third option is preferable. Yet in the light of the research presented in this study, I would seriously take issue with McCarthy's (forthcoming:5) claim that 'All words of all languages have two synchronous layers or tiers'.

APPENDIX 1
Phonemic Transcriptions of Dutch and German

1. Phonemic Transcription of Dutch

p	pand	i	zie
t	tand	I	zit
k	kant	e:	mee
b	band	ɛ:	zet
d	dans	a:	ja
g	goal	ɑ	zat
f	fee	ɔ	zot
v	vee	o:	zo
s	sier	u	moe
z	zier	ʉ	nut
x	goochel	y	nu
ɣ	kogel	ø:	reu
m	mat	ə	makkelijk
n	nat	ɛi	mei
ŋ	bang	œy	lui
l	laat	ɑu	kou
r	raar		
ʋ	waar		
j	jaar		
h	hoed		

This transcription is based largely on Collins and Mees (1981).

[r], [R], [ɾ], and [ʁ] are all heard as varieties of /r/ in Dutch, the trills being used mostly in formal speech, and the uvular pronunciations being in the ascendant at the moment.

2. Phonemic Transcription of German

p	Pier	i	Stil
b	Bier	I	still
t	Tier	e	Beeren
d	dir	ɛ	Länder
k	Kiel	æ	Bären
g	Gier	a	Kamm
f	fein	ɑ	kam
v	Wein	ɔ	offen
s	reißen	o	Ofen
z	reisen	U	Nuß
ʃ	schön	u	Fuß
ʒ	Geni	ə	Gedicht, Dichter
ç	Löcher	y	fühlen
x	Loch	Y	füllen
m	Hummer	ø	Höhle
n	Hunne	œ	Hölle
ŋ	Hunger	aI	nein
l	Land	aU	blau
r	Ruh	ɔY	neun
j	ja		
h	Hilfe		
p͡f	Pferd		
t͡s	Zeit		

[ç] and [x] are usually analysed as allophones of /x/ since minimal pairs like Kuchen [kuxən], Kuhchen [kuçən] are distinguished by morpheme boundaries.

[ɛ] and [æ] are distinguished principally by length, and could be transcribed [ɛ] and [ɛː] respectively.

There is dialectal variation in German between [r], [ʁ] and [ʀ].

APPENDIX 2
List of Dutch Nouns in ge-te

This list of Dutch nouns is taken from Schultink (1987), and is divided up according to Schultink's groupings.

Group a. (neuter gender):

gebeente	'skeleton'	gebergte	'mountains'
gebinte	'beams'	gebloemte	'sea of flowers'
geboefte	'scoundrels'	geboomte	'trees'
gedarmte	'entrails'	gedierte	'animals'
geduinte	'dunes'	gemuurte	'walls'
gepluimte	'plumage'	gesteente	'stones'
gevederte	'feathers'	gevogelte	'poultry'
gewolkte	'clouds'	gewormte	'crawlies'
gebilte	'rump'	gebuikte	'belly'
getwijgte	'shrubs'	gezaalte	'zaal'

Group b. (neuter gender):

gebladerte	'foliage'	gedeelte	'part'
gedoente	'routine'	gehalte	'content'
gehemelte	'palate'	geraamte	'skeleton'
gestarnte	'zodiacal sign'	gesternte	'zodiacalsign'
gestoelte	'pulpit'	getimmerte	'carpenting'
gevaarte	'colossus'	(voor)geborchte	'limbo'

Group c. (non-neuter gender):

gemeente	'community'	gewoonte	'habit'
gezindte	'creed'		

Group d. (non-neuter gender):

geboorte	'birth'	gebuurte	'neighbourhood'
gedaante	'shape'	gelofte	'oath'
geneugte	'pleasure'	gestalte	'figure'

APPENDIX 3
Ablaut and Rhyme Combinations in English and German

Words listed in this Appendix are taken from the following sources: Hansen (1964), Fleischer (1974), Marchand (1960), Collins, Feinsilver (1970), the OED, Laurie Bauer (personal communication), Joi Matthewson (personal communication).

1. English
1.1. Ablaut Combinations

bibble babble, chitchat, clickclack, clinkclank, clitterclatter, dillydally, dingle dangle, drizzledrazzle, fiddlefaddle, flimflam, flip-flap, gibblegabble, higglehaggle, jimjam(s), jinglejangle, kitcat, knickknack, minglemangle, mishmash, pitpat, pitterpatter, prittle prattle, ricketyrackety, rickrack, riffraff, riprap, shillyshally, skimbleskamble, slipslap, snipsnap, spitter-spatter, ticktack, tittletattle, whimwham, wish(y)wash(y), zigzag.

click-clock, clipclop, crisscross, dingdong, dripdrop, flipflop, pingpong, singsong, slipslop, ticktock, tip-top, wibble wobble.

dribs and drabs, tit for tat.

1.2. Rhyme Combinations

argy-bargy, back pack, boogie-woogie, brag rags, bum numb, chug-drug, claptrap, clicknick, copper dropper, cop-shop, court-short, creepie-peepie, the Crump Dump, culture vulture, curl girl, date bait, date mate, drape shape, easy peasy, even Stephen, face lace, fag hag, finger-wringer, flibberty-gibbet, flibberty-gibberty, flicflac, flubdub, fuddy-duddy, fuzzy-wuzzy, gang-bang, Georgie Peorgie, habs-dabs, handydandy, hankypanky, hardy-dardy, harum-scarum, hedley medley, heebie-jeebies, helter-skelter, hen-pen, henny penny, hibber-gibber, higgledy-piggledy, hobnob, hocus-pocus, hokey-pokey, hodge-podge, hoity-toity, holus-bolus, hootchie-

kootchie, hot pot, hot shot, hotchpotch, hotsy-totsy, hubble-bubble, hugger-mugger, humdrum, hurdy-gurdy, hurly-burly, hurry-scurry, hustle-bustle, hy-spy, incy wincy, jelly-belly, killer-diller, kit split, loco-foco, lovey-dovey, may day, muddle puddle, mumbo-jumbo, namby-pamby, nit wit, okey-dokey, patchy-blatchy, paxwax, pay day, pee-hee, peepie-creepie, peg leg, pell mell, pog-wog, polly wolly, popsy-wopsy, pokemoke, pow-wow, ragbag, ragtag, raggle-taggle, ram-jam, ramstam, razzle-dazzle, roister-doister, roly-poly, rowdy-dowdy, rumble-jumble, rumble-tumble, rusty-fusty, sacky-dacky, scope dopes, silly billy, sin bin, slang-whang, squee-pee, stickly-prickly, stubble trouble, super-duper, tagrag, teensy-weensy, teeny-weeny, thuzzy-muzzy, titbit, tootsie-wootsies, walkie-talkie, wham-bam, willy-nilly.

2. German

2.1. Ablaut Combinations

Hickhack, Mischmasch, Krimskrams, Schnickschnack, Singsang, Tingeltangel, Wirrwarr, Zickzack.

2.2. Rhyme Combinations

Äthergezeter, Dauerschauer, Heckmeck, Hokuspokus, Klimbim, Kuddelmuddel, Larifari, Namendramen, Picknick, Rummelbummel, Scheckschreck, Techtelmechtel.

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