THE PHONOLOGY–MORPHOLOGY INTERFACE

Cycles, Levels and Words

Jolanta Szpyra-Kozłowska

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Contents

Introduction

The vigorous development of morphological and phonological theory within the broad framework of Generative Grammar poses a number of significant questions concerning the mutual relationship between phonology and morphology.

Do morphology and phonology constitute two separate components with morphological processes preceding phonological ones, or are phonological rules integrated with word formation rules?

What is the place of morphophonology? Is it a part of morphology, a part of phonology, or does it constitute a separate component?

What types of phonological information are needed in morphology? Are they present in underlying structures, or are they supplied by phonological rules?

What types of morphological information are needed in phonology? How are they encoded? To what extent can morphological structures influence the application of phonological rules?

Are morphological and phonological structures identical or are they different? Is there any need for some kind of an adjustment apparatus? What is its scope and form?

The present study is an attempt to answer some of these questions. On the basis of mainly Polish and English language material we endeavour to examine what we consider the most

important aspects of the phonology–morphology interaction as well as trying to find the best model with which to describe these phenomena.

There are, it seems, two ways of approaching the interface of phonology and morphology. The first, which might be dubbed 'morphophonological', examines the issue from the morphological perspective and focuses on types of phonological information needed for the operation of word formation rules (WFRs). The other view, the 'phono-morphological', is mainly concerned with phonological aspects of the problem, i.e., it investigates in what ways phonological rules interact with morphology. Ours is basically the phonologist's approach. Therefore, in this book, with the exception of Chapter 4, we shall examine various phonological issues to a considerably greater extent than specifically morphological questions.

This is not the only limitation, unavoidable in a work of this sort. Thus, numerous problems which properly belong to the area of the interaction between phonology and morphology will be given only a brief consideration or even be bypassed altogether. It will, for instance, be assumed without any detailed discussion that phonological rules are morphophonological in character, in accordance with the traditional generative approach. This, in consequence, means that we shall not be concerned with those frameworks (such as, for example, natural generative phonology of Hooper 1976) in which the focus is on phonetically governed regularities. Various other models, although undoubtedly interesting, will not be treated at any length either. As a matter of fact, the discussion will centre mainly on the issues raised by lexical phonology and prosodic phonology, such as the integration of morphology and phonology in the lexicon, the validity of postulating derivational levels, the cyclicity of phonological rules, the nature of inputs to WFRs and the role of prosodic units in the application of phonological processes. Briefly, we shall deal with the phenomena which can be subsumed under the terms of cycles, levels and words.

The languages of exemplification are Polish and English. This means that in this book we rarely tread upon entirely virgin territory, for the phonologies of both languages have been thoroughly described within a variety of generative frameworks. Since the choice from among different viewpoints can only be

made after a detailed scrutiny of each, much thought will be devoted to the discussion of the already existing analyses, their strong points as well as inadequacies. Only then will the necessary modifications be introduced. The restriction of our data base almost entirely to Polish and English necessitates testing the validity of various theoretical proposals which will be put forward here, against the ground of other languages. This remains a task for future research.

Chapter 1 is introductory in character and presents an overview of major generative approaches to the phonology–morphology interface, which fall into two types, termed 'separational' and 'integrational' respectively. The reader familiar with the SPE model and its further development will not find much new here, but someone less versed in various phonological and morphological frameworks will be provided with the necessary background.

In Chapter 2 we ask whether phonological rules should be combined with morphology in a single component, as suggested by lexical phonology, or whether phonology and morphology should be viewed as distinct and separate, as assumed in the traditional generative model. Particular attention is paid to the issue of derivational levels and the phonological consequences of their recognition. Finally, we consider whether phonological processes are strictly cyclic or non-cyclic.

The problem of rule cyclicity is taken up in Chapter 3, in which the inability of the existing frameworks to describe the derivation of complex verbs in Polish necessitates the introduction of the multiple application of phonological rules. This leads to a total reanalysis of the relationship between the morphological and the phonological components.

Chapter 4 provides more evidence for the organization of grammar proposed in Chapter 3. We deal with the issue of the nature of inputs to word formation rules, of which three possibilities are considered: phonological, intermediate and phonetic.

The relation between the morphological and the phonological hierarchies constitutes the major subject of Chapter 5. We return to the problems involved in describing the phonology of English affixation and Polish prefixation and demonstrate how the prosodic categories, such as the phonological word, can be successfully employed in solving them.

In the Final Remarks we close our investigation, restating the most important findings of the previous chapters and presenting the model of the phonology–morphology interaction that has emerged in the course of our analysis. Additionally, the issue of morphological boundaries and their role in phonology is addressed in some detail.

A few technical comments are also in order. For the sake of clarity, we transcribe only those segments that are directly relevant to the discussion. In other instances conventional orthography is used. Below we list the symbols used in the transcription of Polish words, as well as the most important correspondences between letters and sounds.

[c, dz] – dental affricates, spelled *c* and *dz*, as in *cena* 'price', *dzwon* 'bell'
[č, dž] – postalveolar affricates, spelled *cz* and *dż*, as in *czas* 'time', *drożdże* 'yeast'
[š, ž] – postalveolar fricatives, spelled *sz* and *ż/rz*, as in *szynka* 'ham', *żaba* 'frog', *rzeka* 'river'
[ś, ź] – palatal fricatives, spelled as *ś* and *ź*, as in *śnieg* 'snow', *mroźny* 'icy', and *si*, *zi*, as in *siano* 'hay', *zima* 'winter'
[ć, dź] – palatal affricates, spelled as *ć* and *dź*, as in *ćma* 'moth', *dźwig* 'crane' and *ci*, *dzi*, as in *cicho* 'silently', *dzień* 'day'
[ń] – the palatal nasal, spelled as *ń*, as in *koń* 'horse', or *ni*, as in *nie* 'no'
[x] – the velar fricative, spelled as *h*, as in *hotel* 'hotel' or *ch*, as in *chyba* 'perhaps'
[w] – the bilabial glide, spelled *ł*, as in *koło* 'wheel'
[j] – the palatal glide, spelled *j*, as in *ja* 'I'
[v] – the voiced labio-velar fricative, spelled as *w*, as in *woda* 'water'
[p', b', m', f', v', t', d', s', z', k', g', x'] – palatalized consonants, spelled *pi*, *bi*, *mi*, *fi*, *wi*, *ti*, *di*, *si*, *zi*, *ki*, *gi*, *chi*, *hi*, as in, for example, *kino* 'cinema', *pies* 'dog', *wiatr* 'wind', *miasto* 'town', *tiul* 'tulle', *hiena* 'hyena'.

As clusters of obstruents must agree in voicing, letters are pronounced as voiced or voiceless, depending on the neighbouring segments, for example, *ławka* 'bench' – [wafka], *liczba*

'number' – [lidžba]. Word-finally all obstruents are devoiced, for example *sad* 'orchard' – [sat], *jeż* 'hedgehog' – [ješ].

[ɨ] – the high retracted unround vowel, spelled *y*, as in *ryba* 'fish'

[u] – the high back rounded vowel, spelled *u*, as in *lud* 'people' or *ó*, as in *lód* 'ice'

[ẽ,õ] – nasal vowels, spelled *ę* and *ą*, as in *kęs* 'morsel', *wąs* 'moustache.' The letters *ę* and *ą* are pronounced as nasal vowels only before fricatives. Before other consonants they are sequences of oral vowels followed by a nasal consonant homorganic with the following obstruent, for example *ząb* 'tooth' – [zomp], *ręka* 'hand' – [reŋka]. Before *ł* and *l*, *ę* and *ą* are pronounced as oral vowels, for example, *wziął* 'he took' – [vźoł], *wzięli* 'they took' – [vźeli].

The letter *i* stands for the high front vowel, for example, in *igła* 'needle', except for the cases when it follows consonants and precedes vowels, in which instances it marks the palatalization of the preceding consonant and is not pronounced, for example *ciocia* 'aunt' – [ćoća], *nie* 'no' – [ńe], *ziemia* 'earth' – [źem'a]. In the remaining cases there is one-to-one correspondence between letters and sounds, for example, *troska* 'worry' – [troska], *krokus* 'crocus' – [krokus].

The present study is a revised version of my doctoral dissertation. I should like to take this opportunity to thank some people who have contributed to its final shape. First and foremost, I wish to express my sense of deep personal and professional debt to my advisor Professor Edmund Gussmann, whose hearty encouragement as well as eager and extensive co-operation made this book possible. My warmest thanks are also extended to the referees of my thesis, Professors Jacek Fisiak and Walerian Świeczkowski, and to two reviewers for the publishers, for their comments and suggestions for improvement. I am also very grateful to Mr Jonathan Price, the linguistics editor for Routledge, for his valuable help. None of them, however, is to be blamed for any errors, which remain my sole responsibility.

Abbreviations and symbols

AOG	– affix ordering generalization
DI	– derived imperfective
NGP	– natural generative phonology
SPE	– *The Sound Pattern of English* by N. Chomsky and M. Halle (1968)
TSL	– trisyllabic laxing
VS	– verb suffix
VST	– verb suffix truncation
A, Ad, ad	– adjective
acc.	– accusative
augm.	– augmentative
comp.	– comparative
dat.	– dative
dim.	– diminutive
exp.	– expressive
fem.	– feminine
gen.	– genitive
imper.	– imperative
instr.	– instrumental
loc.	– locative
masc.	– masculine
N, n	– noun
nom.	– nominative
pl.	– plural
Pref.	– prefix
sg.	– singular
V, v	– verb
v̆	– lax vowel

$\bar{v}$	– tense vowel
ω	– the phonological word
ω'	– the phonological compound
ϕ	– the phonological phrase
σ	– the syllable
F	– the foot
μ	– the morpheme

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Chapter one

Separation versus integration – major approaches to the phonology–morphology interaction

Although several books and papers espousing the model of generative phonology appeared in the late 1950s and the early 1960s (most notably Halle 1959), the publication of Chomsky and Halle's *The Sound Pattern of English* (henceforth SPE) marked 1968 as 'the year in which generative phonology was substantiated and legitimized' (Anderson 1985:328). This event can be claimed to have determined the development of phonological theory and practice for many years afterwards. It is rightly said that the majority of phonological works that have appeared since 1968 have been either a positive or a negative reaction to SPE, which in itself demonstrates the outstanding significance of this study. We shall therefore start our sketchy presentation of the most influential approaches to the phonology–morphology interaction with a brief summary of the relevant claims and assumptions put forward in *The Sound Pattern of English*.

One of the major features of the SPE analysis and of generative phonology in general is its morphophonemic character. This means that no distinction is made between the alternations conditioned purely phonologically and those which are, to some extent, morphologized; a set of ordered phonological rules derive all the allomorphs from a single underlying form set up for every morpheme. In other words, SPE rejects the need for a separate morphophonemic component (in the structural sense) as well as the taxonomic phonemic level. As a result, in the SPE type of approach many instances can be found of what structural linguists would regard as the 'mixing of levels', i.e., cases in which phonological rules must refer to non-phonetic information.

There are several types of non-phonetic information relevant to the application of phonological processes. They fall into two groups: extragrammatical and grammatical (Kenstowicz and Kisseberth 1977). The former comprise such factors as the tempo and the style of speech, and will not be discussed here. The latter involve syntactic, morphological and lexical features. Of these morphological information in phonology will be our primary concern.

As is well known, in the early days of Generative Grammar morphology did not exist as a separate component. A part of it was assigned to syntax and a part to phonology. Thus, in SPE phonological rules operate on syntactic rather than on morphological structures. Nothing is said about the system of rules that generate words. Therefore, the question of the phonology–morphology interaction does not, in fact, arise. Rather the issue at stake is that of mapping syntactic structures onto phonological ones. The syntax-phonology mapping is effected by means of three different devices: labelled bracketing, morphological boundaries and readjustment rules. We shall now discuss them briefly one by one.

According to SPE, the syntactic component assigns to each sentence a surface structure which consists of a string of formatives with labelled bracketing. Brackets refer to such categories as 'sentence', 'noun phrase', 'noun', 'verb', 'adjective'. Labelled bracketing of syntactic structure has several functions. One of them is to delimit the domain of application of phonological rules by restricting them to certain lexical and grammatical categories. An example of a phonological process that refers to such distinctions is stress in English, which operates in a different fashion depending on the lexical category of words. The word *torment*, for instance, is stressed on its first syllable if it is a noun (*'torment*), and on its second syllable if it is a verb (*tor'ment*).

Another significant function of labelled bracketing is to determine the mode in which phonological rules apply. SPE classifies them into two types: transformational phonological rules and non-transformational or word-level rules. The presence of bracketing is essential to the operation of the former; 'transformational phonological rules first apply to the maximal strings that contain no brackets, and after all relevant rules have applied the innermost brackets are erased, the rules then reapply

to maximal strings containing no brackets, and again innermost brackets are erased after this application; and so on, until the maximal domain of phonological processes is reached' (SPE:15).

In English transformational rules relate basically to such phenomena as stress and vowel reduction. Consider the placement of stress in the compound

$$\overset{1}{\text{blackboard}}\ \overset{3}{}\ \overset{2}{\text{eraser}}$$

where the numbers refer to the degree of stress. The structure of this compound can be presented in the following way (SPE:21)

$$[_N\,[_N\,[_A\ \text{black}]_A\,[_N\ \text{board}]\ _N]_N\,[_N\ \text{eraser}]_N]_N$$

On the first cycle the adjective *black* and the noun *board* receive stress

$$[_A\ \overset{1}{\text{black}}]_A \qquad [_N\ \overset{1}{\text{board}}]_N$$

The same happens with the noun *eraser*

$$[_N\ \overset{1}{\text{eraser}}]_N$$

Now the innermost brackets between *black* and *board* are erased and the compound stress rule applies

$$[_N\ \overset{1}{\text{black}}\ \overset{2}{\text{board}}]_N$$

Then the next pair of brackets is erased and the compound stress rule reapplies

$$[_N\ \overset{1}{\text{black}}\ \overset{3}{\text{board}}\ \overset{2}{\text{eraser}}]_N$$

Word-level rules are not cyclic, i.e., they apply only once and are not dependent on bracketing in the way cyclic rules are. An example is the rule of palatalization exemplified in

gra[d]e – gra[ǰ]ual
depar[t] – depar[č]ure

Here the alveolar obstruents are turned into the corresponding palato-alveolars with the subsequent deletion of the conditioning palatal glide. In SPE transformational phonological rules and word-level rules are interspersed although their mutual ordering raises some doubts (Fischer-Jørgensen 1975:249).

The second device employed in SPE is the use of morphological boundaries. They are of several kinds:

1. The internal word boundary, expressed by #, which is inserted at the beginning and end of every string dominated by a major lexical category (such as noun, verb or adjective). For example, the word *differ* can be presented as

   $[_V$ # differ #$]_V$

2. The full word boundary, ##, which is assigned in agreement with the convention specified under 1. The word *differing* has thus the following structure

   $[_V$# [$_V$ # differ #$]_V$ ing #$]_V$

   It should be added that the full word boundary plays an important role in defining the notion 'word', which can now be described as a unit bound with ## _____ ##, with no internal occurrences of ##.
3. The morpheme boundary, symbolized by +, which separates two formatives (morphemes), for example *tele+graph*. These three boundaries are syntactically motivated.
4. The prefix boundary, marked by means of =, which separates the prefixes from the stems in words such as *per=mit*, *com=bat*, *con=de=scend*. This juncture has no syntactic justification and is postulated for the sake of phonological rules only. It is introduced by the readjustment apparatus.

Morphological boundaries are very important for the operation of phonological rules. They have either an inhibiting function, which means that a phonological process is blocked when a certain boundary intervenes, and a conditioning function when

the application of a phonological rule is contingent on the presence of some boundary. Boundaries differ in terms of their strength (Kenstowicz and Kisseberth 1977).

The morpheme boundary is the weakest of all and cannot block any phonological rule. This means that a rule which, for example, applies in the context

____ V

can also operate in three other environments:

____ + V ____ V + ____ + V +

An example of an SPE rule which operates regardless of the presence or absence of + is velar softening, which turns velar plosives /k, g/ into /s/ and /ǰ/ respectively. It is claimed to affect the phonological voiceless plosives in *recite* and *electricity* in the context of the following non-low front vowel

/re=kīt/ /elektrik+iti/

although in the first case the conditioning vowel is in the same morpheme as the plosive while in the other example the two segments are separated by +. In some cases, however, the morpheme boundary can condition a phonological process. For instance, spirantization, which converts alveolar plosives into the corresponding spirants, takes place, among other things, in the context of the palatal glide preceded by the morpheme boundary (SPE:229):

____ + y

This ensures the application of spirantization in

democra[s]y from /demokræt+y/

and, at the same time, disallows it in

novel[t]y from /novel+ty/

in which there is no morpheme boundary between /t/ and /y/ (in both cases the phonological glide undergoes later vocalization to [i]).

The prefix boundary can, in turn, both condition and block a phonological rule. For example, it is necessary in order to trigger the rule of s-voicing in prefixed forms (when the voiceless spirant is preceded and followed by a vowel, of which the second one must be stressed), for example

re=[z]ume vs as=[s]ume
de=[z]ign vs as=[s]ign

This is expressed by means of an appropriate condition placed in the rule itself (SPE:228):

V = ____ V́

On the other hand, the presence of = in the words such as *per=mit* prevents the shift of stress to the first syllable, since the process in question is not allowed to cross the prefix boundary.

The word boundary, whether word internal or full, is the strongest of all and its presence prevents a phonological rule from applying unless this boundary is explicitly mentioned in the structural description of the rule. Thus, velar softening never applies across word boundaries, for example

bi[g] egg *bi[ǰ] egg

which means that the boundary in question delimits the domain of application of word-level processes. An example of a process that is triggered by the word boundary is sonorant syllabification, which inserts the vowel schwa in the following context (SPE:85),

C ____ [+sonorant] #

e.g., in *hinder* from /hindr/, *cylinder* from /silindr/, *remember* from /remeNbr/.

Nevertheless, the presence of the word boundary in certain contexts becomes problematic. Consider the word *hindrance*, for example

$[_N$ # $[_V$ # hindr #$]_V$ ance #$]_N$

Since # is present after the sonorant, the schwa vowel should be inserted. This, however, yields the incorrect form

*hind[ə]rance

To avoid such undesirable consequences, SPE proposes to replace certain occurrences of # by +. This is effected by readjustment rules, which in this particular case modify the initial structure in the following manner:

$[_N$ # $[_V$ # hindr #$]_V$ ance #$]_N \rightarrow$
$[_N$ # $[_V$ # hindr +$]_V$ ance #$]_N$

The change of this sort must be restricted to certain affixes only since other formatives behave as if they were associated with the word boundary. Take the word *hindering* as an example. The attachment of the suffix *-ing* has the same phonological effect as the word-final position: the schwa is inserted

hind[ə]ring

Consequently, the word boundary before *-ing* must be retained for the sake of some phonological rules. This is additionally supported by the fact that appending *-ing* does not cause any shift of stress, i.e., the stress rule operates as if the suffix in question were not present at all. We shall deal more extensively with the issue of boundaries in other chapters of this book.

Thus, SPE distinguishes two classes of affixes in English, which differ in terms of their phonological properties. The first group, the word boundary affixes, block the application of those word-level rules in which # has no conditioning function. Such affixes do not affect the placement of stress in a word, for example

'délicate – 'délicately 'démonstrate – 'démonstrating

and are often referred to as 'stress-neutral' (for example, *-ness*, *-less*, *-ing*, *-ly*, *un-*, etc.). The second type, the morpheme boundary affixes, lie in the domain of almost all phonological

rules and, first of all, the stress rule, for example

'lucid – lu'cidity 'atom – a'tomic

Such affixes are known as 'stress-determining' (for example, *-ic*, *-ion*, *-ate*, *in-*, etc.). What is important is the fact that both groups of affixes in SPE are identical at the syntactic level, i.e., prephonologically. The differentiation is introduced by readjustment rules, which we shall briefly present here.

Chomsky and Halle note that surface structure is two things at once: it is both the output of the syntactic component and the input to the phonological component. Although these coincide to a significant degree, there are also certain discrepancies. These discrepancies are removed by means of readjustment rules, which relate syntax to phonology and modify surface structure in a number of ways. First of all, they divide surface structures into phonological phrases. This is necessary since although sometimes the whole sentence is a single phonological phrase, in other cases it might consist of several such units. Phonological phrases constitute the maximal domain for the application of phonological rules. Secondly, readjustment rules may change the syntactic categorization of a constituent (for example from 'noun phrase' to 'noun'), replace some occurrences of # by + or = and assign to abstract grammatical formatives strings that have phonetic content, for example

past → /d/

Finally, readjustment rules effect some changes which take place in certain idiosyncratic morphological contexts, for example, (SPE:238)

$$t \rightarrow [+\text{voice}] \; / = \begin{Bmatrix} \text{mi} \_\_\_\_ + \text{ive} \\ \text{ver} \_\_\_\_ + \text{iVn} \end{Bmatrix}$$

(*inversion*, *permissive*).[1]

Apart from syntactic/morphological information, phonological rules must sometimes refer to the features of words or morphemes which are specified in the lexicon. For instance, some processes appear to be sensitive to such lexical features as

[foreign], [romance] etc. The best-known example of this sort is velar softening, which operates exclusively within items marked as [+latinate], but is blocked in native English words, for example

criti[k]al – criti[s]ism	vs	bla[k] – bla[k]ish
ri[g]our – ri[ǰ]id		do[g] – do[g]y

Moreover, other categories such as 'present tense', 'masculine', 'animate', etc. may also be referred to by phonological rules. An example of this sort can be found in Polish. The process known as second velar palatalization converts velar consonants into affricates and fricatives in the following grammatical contexts: dative and locative singular of feminine nouns, nominative plural of masculine personal nouns, nominative plural of masculine personal adjectives, and deadjectival adverbs, for example

mu[x]a 'fly' – *mu[š]e* 'id. dat. sg.'
ryba[k] 'fisherman' – *ryba[c]y* 'id. nom. pl.'
na[g]a 'naked, fem.' – *na[dz]y* 'id. nom. pl.'

Finally, an issue that deserves at least a brief mention is the treatment of exceptions in SPE. Since Chomsky and Halle's analysis of English has attempted to cover almost all morpho-phonological alternations, it comes as no surprise that numerous exceptions to general rules must be noted. Basically two ways of dealing with exceptions are employed in SPE. One method consists in marking idiosyncratic items with exception features in the lexicon. Another way is to postulate underlying forms which allow for regularizing exceptions (for instance by setting up phonological geminates, adding phonetically nonexistent segments, etc.). For example, to account for the penultimate stress in the words such as *vanilla*, *umbrella* and *gorilla* Chomsky and Halle suggest that these items should contain a cluster of two laterals at the phonological level (SPE:83).

However much approbation the SPE framework received, the year of its publication was also the time from which, as Anderson (1985:328) notes, the reaction against the theory must be dated. In fact, none of the claims and assumptions which have just been summarized has survived in an unmodified form. In the following

pages we intend to trace the most significant developments of the relevant concepts.

First, the SPE idea of the transformational cycle has been heavily criticized. Some linguists (for example Ross 1972) attempted to demonstrate that English stress rules can be formulated in such a way that no phonological cycle is required at the word level. The Goyvaerts and Pullum (1974) volume illustrates well this critical tendency (especially the papers by Langendoen and Lee) of the years following the appearance of SPE. It has been claimed that the concept of the transformational cycle is of little usefulness in the description of languages in which stress plays no important role. Consequently, numerous generative descriptions of the phonologies of various languages have been produced in which no recourse to the cycle was made. The idea of cyclic phonological rules can be said to have started falling into decline. Labelled bracketing lost its function of determining the mode of application of phonological rules and retained its role of indicating grammatical categories to which phonological rules could refer.

With Chomsky's (1970) 'lexicalist hypothesis' and the subsequent works on word structure (Halle 1973, Siegel 1974, Aronoff 1976, Booij 1977, Allen 1978 – to mention just a few contributions from the 1970s) it has become clear from the SPE assumption that there is nothing between syntax and phonology could no longer be maintained. Early generative attempts at reducing morphology to other domains have proved largely unsuccessful and it has gradually become evident that word structures are governed by different properties than syntactic structures. In brief, an autonomous morphological component has been postulated. A crucial issue has now been to establish the degree of its independence or, to put it differently, its interaction with the remaining components. The problem of the morphology–syntax overlap has become most prominent and resulted in a number of still unresolved debates concerning, for instance, the nature of morphological operations (the 'transformationalist' versus the 'lexicalist' approach), their scope (does inflection belong to morphology or to syntax?), the nature of derivational units (word-based versus root-based morphology), etc. (for an introduction to these issues see Scalise 1986).

Another issue, initially considered of less relevance, has been

the relationship between morphology and phonology. Now, as word structures and not only syntax structures have become important in phonological analysis, more significance has begun to be attached to the morphological justification of phonological descriptions.

One of the first aspects of the SPE framework that came under criticism was Chomsky and Halle's theory of boundaries. It has been pointed out (for example, by Aronoff 1980) that the boundaries in SPE resemble the structural 'juncture phonemes', that is, they are treated as sequential units on a par with underlying segments. For example, such 'distinctive features' as [segment], [formative boundary] and [word boundary] serve to describe them, which is objectionable since properties of this sort have no phonetic contents and are phonetically arbitrary. Second, and more important, boundaries have been criticized for their morphological arbitrariness. Recall that all affixes in SPE appear with the word boundary at the syntactic level and are later modified by means of readjustment rules for the sake of phonological processes. In other words, they are phonologically, but not morphologically motivated. A typical example of a morphologically suspicious juncture is the prefix boundary, which acts as a diacritic for the mere purpose of triggering or blocking some phonological rules.

It has been generally felt that the use of boundaries must somehow be constrained. As Kenstowicz and Kisseberth (1977:105) observe, 'the concept of boundary is rather vacuous unless some restrictions on positing boundaries in a string of morphemes and referring to boundaries in phonological rules can be established'. In other words, boundaries must be justified by the morphological structure of a given language. Otherwise they become mere tricks, likely to increase in number, that the phonologist uses to make his analysis work. If phonology is the sole reason for postulating boundaries, this might lead to total arbitrariness. In brief, SPE has been accused, and rightly so, of an inadequate approach to English morphology. Consequently, it has been assumed that an adequate morphological analysis is a necessary prerequisite to an adequate phonological description. In view of numerous morphological controversies and the lack of comprehensive morphological analyses of various languages, however, this requirement has remained largely theoretical and

actual phonological practice had little or almost no recourse to morphology.

Needless to say, the concept of readjustment rules has also undergone considerable revisions since now it is not the syntactic structure, but rather morphological structure that serves as input to the phonological component. This means that there is no longer a need for the SPE rules such as

$$[_V\ [_V \text{ mend}]_V \text{ past}]_V \rightarrow [_V\ [_V \text{ mend}]_V \text{ d}]_V$$
$$[_V\ [_V \text{ sit}]_V \text{ past}]_V \rightarrow [_V \text{ sæt}]_V$$

since the past tense ending of *mended* has earlier been introduced by morphological rules, and suppletive forms such as *sat* can simply be listed in the lexicon. Furthermore, there seems to be no need to replace certain occurrences of # by + as affixes are represented in the lexicon with either of the boundaries, which is their lexical property.

Nevertheless, morphological structures must be frequently modified in a number of ways before they can be subject to phonological processing. The most detailed, and at the same time the most influential treatment of readjustment has been proposed by Aronoff (1976). Aronoff's theory of (re)adjustment is considerably more constrained than the SPE approach; according to him adjustment rules are those which are restricted to specific morphemes and which take place only in the environment of other specific morphemes. Aronoff isolates two types of such rules, i.e., allomorphy and truncation.

An allomorphy rule (Aronoff 1976:88), 'adjusts the shape of a designated morpheme or class of morphemes in the immediate environment of another designated morpheme or morpheme class'. Clearly, the SPE readjustment rule which concerns the voicing of the alveolar plosive in *mit-* before *-ive* and in *vert-* before *-ion* can be treated as an allomorphy rule. Allomorphy might refer either to the base or to the suffix. An example of the first kind is verbs in *-fy* and *-ply* which nominalize in *-ication*, for example

amplify – amplification imply – implication

SPE (p. 201) suggests the following rule