

Geert Booij  
Jerzy Rubach

## Postcyclic versus Postlexical Rules in Lexical Phonology

The theory of Lexical Phonology (Kiparsky (1982)) represents a major improvement upon the standard theory of generative phonology. In Lexical Phonology two kinds of rules are distinguished: cyclic rules and postlexical rules. Cyclic rules apply in the lexicon and interact with morphological rules, whereas postlexical rules apply in the phonological component, which is ordered after the syntactic component.

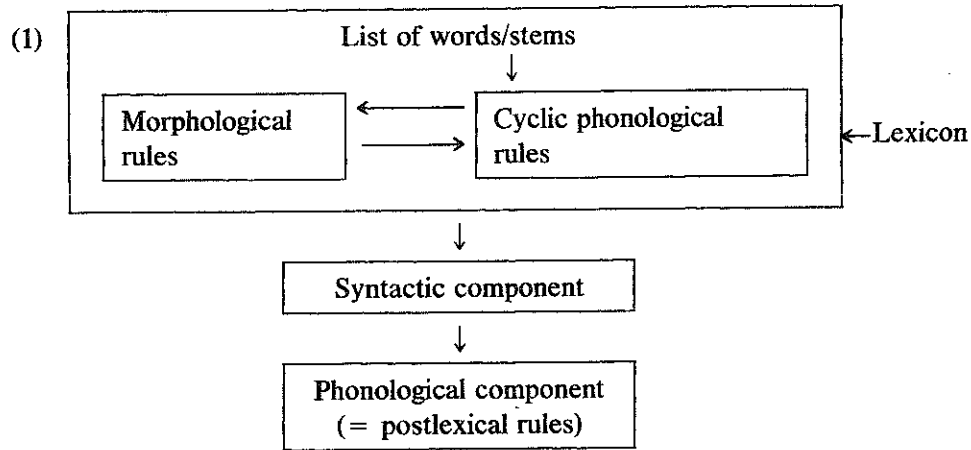
In this article we will argue for an important refinement of this model, namely, that two kinds of lexical rules need to be distinguished: cyclic and postcyclic. Cyclic rules interact with morphology, whereas postcyclic rules apply after morphology. By distinguishing between cyclic and postcyclic rules *within* the lexicon, the traditional and important distinction between word phonology and sentence phonology can be maintained as the distinction between lexical and postlexical rules.

This article is structured as follows. In section 1 we give a detailed outline of the organizational model we propose and its basic claims and predictions. Supporting evidence is adduced from French and Dutch. In section 2 we discuss word-level rules and show how they fit into our theory. In section 3 we demonstrate how our theory predicts a number of complicated facts of Polish, and in section 4 we discuss morphological and prosodic rule environments. We then proceed to an extension of our model after having considered Halle and Mohanan's (1985) analysis of English (section 5). We explore alleged counterexamples (clitics) from Dutch and Polish in section 6 and summarize our findings in section 7.

### 1. General Framework and Basic Claims

The basic model proposed by Lexical Phonology is shown in (1). We simplify this model by leaving out the subtheory of level ordering:

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The basic idea expressed by this organizational model is that a lexical phonological rule applies as soon as either morphology or phonology has created a form that meets the requirements of its structural description. That is, in the derivation of a complex word morphological and phonological rules may be interspersed. This conception of the lexicon is supported by both empirical and theoretical considerations.

First, the application of a morphological rule may depend on phonological information, that is, on a prior application of a phonological rule. For instance, in Dutch the choice between the two denominal adjectival suffixes *-isch* and *-ief* is determined by the stress patterns of the base nouns: nouns ending in a stressed syllable take *-isch*, and nouns ending in an unstressed syllable take *-ief*, as illustrated in (2):<sup>1</sup>

(2) a.	psychologie <sup>1</sup>	'psychology'	psychologisch	'psychological'
	hysterie <sup>1</sup>	'hysteria'	hysterisch	'hysterical'
	analogie <sup>1</sup>	'analogy'	analogisch	'analogical'
b.	agressie <sup>1</sup>	'aggression'	agressief	'aggressive'
	inventie <sup>1</sup>	'invention'	inventief	'inventive'
	actie <sup>1</sup>	'action'	actief	'active'

Second, as shown in Booij (1981), in the derivation of a multiply complex word a morphological rule may remove the conditions of application of a phonological rule that has yet to be applied. A relevant example is the Dutch word *ambassadrice* 'female ambassador', derived from *ambassadeur* 'ambassador' by replacing the suffix *-eur* with *-rice*. *Ambassadeur* in turn is derived from *ambassade* 'embassy'. In sum, the word is derived as follows (where *WFR* stands for *word formation rule*):

<sup>1</sup> Strauss (1983, 422) provides a similar example from English. The attachment of the suffix *-ic* is subject to a certain requirement on the stress pattern of the base word: "*-ic* may attach to an *X + ist* base, provided that the final syllable of *X* is not primary stressed if *X* is a lexical item." In this way, Strauss wants to exclude \**sexistic*, derived from *sexist*, where *X* is the lexical item *sex*, while allowing *sadistic* (*sad* is not an independent lexical item), *fatalistic*, and *masochistic*.

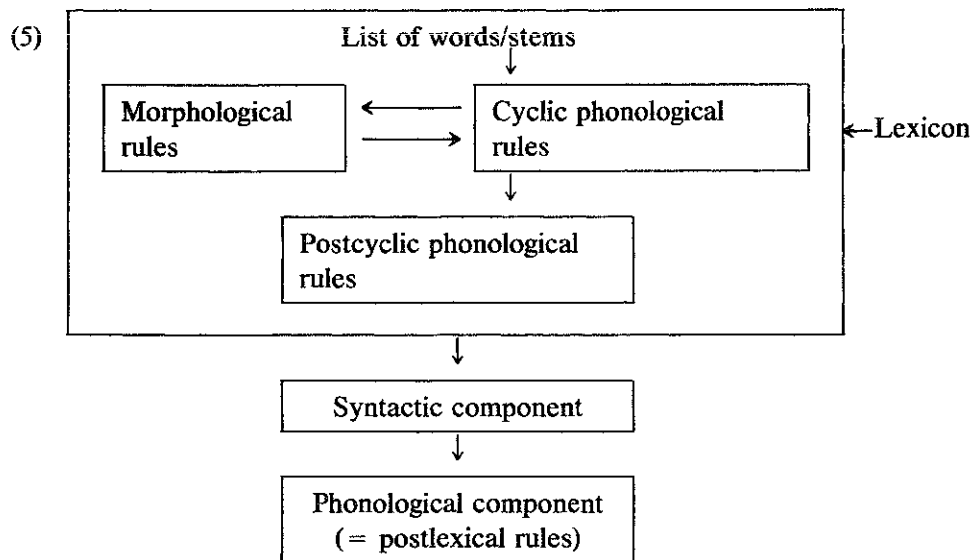
- (3) Cycle 1 /ambasadə/  
 Cycle 2 +ōr WFR: -*eur* Affixation  
           ∅           Prevocalic Schwa Deletion (ə → ∅/\_\_\_\_V)  
 Cycle 3           risə WFR: -*eur/-rice* Substitution  
                     [ambasadrisə]

Applying all morphological rules before all phonological rules would produce the wrong phonetic form \*[ambasadərisə], because the conditioning vowel for Prevocalic Schwa Deletion would have been removed by -*eur/-rice* Substitution:

- (4) /ambasadə/  
           +   ōr       WFR: -*eur* Affixation  
                     risə       WFR: -*eur/-rice* Substitution  
                     \_\_\_\_\_       Prevocalic Schwa Deletion  
                     \*[ambasadərisə]

One of the important theoretical advantages of model (1) is that the cyclicity of lexical phonological rules is no longer an inherent property of the rules themselves but instead follows from the organization of the lexicon: each application of a rule of the morphological component creates a potential domain for the application of the rules of (lexical) phonology.

The claim we want to defend is that, with respect to phonological rules, once the basic distinction has been made between lexical and postlexical rules, the class of lexical rules itself should be divided into two subclasses: cyclic rules and postcyclic rules. That is, we propose the following model:<sup>2</sup>



<sup>2</sup> The idea that there is a word level where rules that can only apply word-internally are no longer subject to Strict Cyclicity can now also be found in Kiparsky (1985) and in Halle and Mohanan (1985). See section 5.

In other words, we distinguish three phonological rule components in a grammar:

(i) Cyclic lexical rules that interact with morphological rules in a direct fashion: they reapply after every word-forming operation. These rules are subject to the Strict Cyclicity Condition (Kiparsky (1982; 1985), Rubach (1984), Halle and Mohanan (1985)).

(ii) Postcyclic lexical rules. These do not interact with morphology, and they are not subject to Strict Cyclicity (they apply freely both inside morphemes and across morpheme boundaries).

(iii) Postlexical rules that apply after sentences have been derived by the syntactic component. These rules apply both inside words and across word boundaries (in the traditional sense), unless they have been restricted in some special way (for instance, to apply only at constituent edges).

The revised model of Lexical Phonology proposed in (5) makes interesting predictions with respect to the relation between rule ordering and rule domains. First, the domain of a rule may determine its location in either the lexicon or the postlexical phonological component and hence its ordering with respect to other rules. For instance, a rule that applies across word boundaries can only be located in the postlexical phonological component, whereas a rule that does not mention word edges in its structural description will be located in the lexicon (at least in the unmarked case). An example is the Dutch rule of syllable-final devoicing of obstruents that does not mention word edges in its context and hence is lexical.

A further advantage of our theory is that the location of a rule in a certain block in combination with ordering statements predicts new orderings. We discuss this issue in section 2.

As far as the distinction between the blocks of cyclic and postcyclic rules is concerned, we think that it is in principle an empirical matter whether a rule is cyclic or postcyclic. This follows from the evidence given by Rubach (1981; 1984) that, for instance, the Polish rule of Coronal Palatalization has changed diachronically from a postcyclic rule into a cyclic rule without any change in its structural description. This does not mean, however, that component assignment is always unpredictable. For instance, Rubach (1981) shows that context-free rules cannot be cyclic and hence are postcyclic.

We will now illustrate the importance of the distinction between lexical and postlexical rules with certain data from French, a language that is of particular interest here because of the frequent claim that the notion "word" does not play any role in its phonology. However, Rochet (1977; 1982) has convincingly shown that the notion "word" does have important functions in French phonology, though they come to light at a more abstract level of phonological structure.

The mid vowels of Bordeaux French exhibit an interesting alternation referred to as the *Loi de Position*, which in a more restricted form applies also to standard French (the so-called Closed Syllable Adjustment). The *Loi de Position* says that the mid vowels /e ø o/ in open syllables alternate with the mid vowels /ɛ œ ɔ/ in closed syllables, or in open syllables followed by a syllable with a schwa. With the assumption that French

feet consist of one syllable, or two if the second contains a schwa (Selkirk (1980)), the alternation can be described as follows: mid vowels are [+tense] at the end of a foot, and [-tense] otherwise. The following examples (from Rochet (1982, 79)) illustrate this alternation:

- (6) a. je cède [sɛdə] nous cédon[s] [sɛdō] 'I/we yield'  
 je cueille [kœjə] nous cueillon[s] [kœjō] 'I/we pick'  
 je donne [dɔnə] nous donnon[s] [dɔnō] 'I/we give'
- b. mauvais/mauvaise [mɔvɛ] / [mɔvɛzə] 'bad' (masc./fem.)  
 heureux/heureuse [øʁø] / [øʁøzə] 'happy' (masc./fem.)  
 sot/sotte [sɔ] / [sɔtə] 'mad' (masc./fem.)
- c. aveugle [avœglə] 'blind' - aveugler [avɔglɛ] 'to make blind'  
 embauche [ãboʃə] 'work' - embaucher [ãboʃɛ] 'to engage'

The rule that accounts for these alternations is as follows:<sup>3</sup>

$$(7) \begin{bmatrix} V \\ -\text{high} \\ -\text{low} \end{bmatrix} \rightarrow \left\{ \begin{array}{l} [+ \text{tense}] / \text{---} \\ [- \text{tense}] \end{array} \right\}_{\text{Foot}}$$

At first sight the following phrases seem to contradict rule (7), since they have the [-tense] variant of the mid vowels in open syllables (that is, foot-finally):

- (8) a. chose intéressante (ʃɔ)<sub>σ</sub> (zɛ̃)<sub>σ</sub> (te)<sub>σ</sub> (re)<sub>σ</sub> (sɑ̃)<sub>σ</sub> (tə)<sub>σ</sub> 'interesting thing'  
 b. cette amie (sɛ̃)<sub>σ</sub> (ta)<sub>σ</sub> (mi)<sub>σ</sub> 'this friend' (fem.)  
 c. bonne amie (bɔ̃)<sub>σ</sub> (na)<sub>σ</sub> (mi)<sub>σ</sub> 'good friend' (fem.)

This apparent contradiction between rule (7) and the data in (8) disappears, however, as soon as we make the assumption that (7) is a lexical rule. In the lexicon the vowels of *chose*, *cette*, and *bonne* are followed by consonant plus a schwa; hence, they are not foot-final and will be [-tense]. After the syntax, in the postlexical component, the rules of Prevoallic Schwa Deletion and *Enchaînement* apply. *Enchaînement* is the process of resyllabification across word boundaries that is characteristic of French phonology. Thus, on the phonetic level [-tense] vowels are found in foot-final position.

The assumption that rule (7) is in the lexicon also allows correct predictions with respect to the interaction of rule (7) and *Liaison*. *Liaison* is the well-known phenomenon that in French latent consonants surface if the next word starts with a vowel and there is a close syntactic relation between the two words (see Booij (1984) for a detailed analysis):

- (9) a. premier ami (prɛ̃)<sub>σ</sub> (mjɛ̃)<sub>σ</sub> (ra)<sub>σ</sub> (mi)<sub>σ</sub> 'first friend' (masc.)  
 b. première amie (prɛ̃)<sub>σ</sub> (mjɛ̃)<sub>σ</sub> (ra)<sub>σ</sub> (mi)<sub>σ</sub> 'first friend' (fem.)

<sup>3</sup> Rule (7) has two subcases because we assume that mid vowels are not specified for the feature [±tense] in underlying representations. The second subrule is the "elsewhere" case. However, this assumption is not crucial for the argument we present here. The same reasoning would hold if rule (7) were a feature-changing rule. Also, it is not relevant here whether the rule is cyclic or postcyclic. The only assumption that is crucial is the lexical status of this rule.

In (9a) Liaison and the concomitant resyllabification—the latent /r/ that surfaces forms one syllable with the first vowel of the second word—have applied; in (9b) Enchaînement has applied. In *premier* the vowel of the second syllable is foot-final in the lexicon; hence, rule (7) renders it [+tense] (the latent /r/ is extrasyllabic (Clements and Keyser (1983)) and hence does not close the foot). However, in *première* the /r/ is already in the lexicon: after the addition of the feminine suffix *-e* the /r/ has lost its extrasyllabicity. Thus, the second vowel of *première* is not foot-final and will be specified as [–tense] by rule (7).

Additional support for the lexical status of rule (7) is provided by certain subtle phonetic differences between regular phrases and their lexicalized counterparts. We assume that these lexicalized phrases are stored in the lexicon. The data are again from Rochet (1982, 82):

- (10) a. C'est une bonne heure [bɔncœrə] pour travailler.  
 'It is a good time to work.'  
 Il s'est levé de bonne heure [bɔncœrə].  
 'He got up early.'
- b. C'est une bonne amie [bɔnami] de la famille.  
 'She is a good friend of the family.'  
 C'est la bonne amie [bɔnami] de mon frère.  
 'She is my brother's sweetheart.'

The phrases *de bonne heure* 'early' and *bonne amie* 'sweetheart' are lexicalized phrases: their meanings are unpredictable, and *bonne amie* also behaves like one word with respect to plural formation (*trois bonne amies* 'three good friends'). Since the lexicalized phrases are stored in the lexicon, they undergo lexical rules such as (7), and thus the mid vowels of the first syllables are correctly predicted to be [+tense].<sup>4</sup>

A parallel phenomenon occurs in Canadian French (Rochet (1977, 194–195), Tranel (1981, 268)), where high vowels alternate between [+tense] in open syllables and [–tense] in closed syllables (for example, *petit/petite* [pəti]/[pətiti] 'small' (masc./fem.)). Resyllabification across word boundaries does not bleed this vowel alternation:

- (11) Il est petit (pti)<sub>σ</sub> 'he is small'  
 petit ami (pti)<sub>σ</sub> (ta)<sub>σ</sub> (mi)<sub>σ</sub> 'little friend' (masc.)  
 petite amie (pti)<sub>σ</sub> (ta)<sub>σ</sub> (mi)<sub>σ</sub> 'little friend' (fem.)

Again, these facts are predicted if we assume that the phonological rule that accounts for these vowel alternations belongs to the lexicon. The effect of such a lexical rule can then be made opaque by the resyllabification across word boundaries. In this example the lexical rule of Laxing is not structure-preserving because it creates a type of segment,

<sup>4</sup> See Rubach (1985) for similar observations on the phonological differences between regular phrases and their lexicalized counterparts.

lax high vowels, that does not occur in the inventory of underlying segments. Since, according to Kiparsky (1985), structure preservation is a distinctive property of cyclic rules, this rule cannot be cyclic, although it is lexical. Therefore, we conclude that two subclasses of lexical rules must be distinguished, cyclic and postcyclic rules.

A good specimen of the type of rule that we want to introduce—the category of postcyclic lexical rules—is the rule devoicing syllable-final obstruents in Dutch:

- (12) *Syllable-final Devoicing*  
 $[-\text{son}] \rightarrow [-\text{voice}] / \text{ \_\_\_\_ } ]_{\sigma}$

On the one hand, this rule must be ordered after all morphology; on the other hand, it must precede postlexical rules. If Syllable-final Devoicing were cyclic, it would (for example) derive the wrong phonetic form for *heldin* ‘heroine’, a female noun derived from *held* ‘hero’ by means of *-in* Suffixation:

- (13)
- |         |                                      |                             |
|---------|--------------------------------------|-----------------------------|
|         | /held/                               |                             |
| Cycle 1 | (held) <sub>σ</sub>                  | Syllabification             |
|         | t                                    | Syllable-final Devoicing    |
| Cycle 2 | + m                                  | WFR: <i>-in</i> Suffixation |
|         | (hɛl) <sub>σ</sub> (tm) <sub>σ</sub> | Resyllabification           |

Derivation (13) results in the incorrect phonetic form \*[hɛltm] instead of the correct [hɛldm], which is derived as follows:

- (14)
- |            |                                      |                             |
|------------|--------------------------------------|-----------------------------|
|            | /held/                               |                             |
| Cycle 1    | (held) <sub>σ</sub>                  | Syllabification             |
| Cycle 2    | + m                                  | WFR: <i>-in</i> Suffixation |
|            | (hɛl) <sub>σ</sub> (dm) <sub>σ</sub> | Resyllabification           |
| Postcyclic | —                                    | Syllable-final Devoicing    |

The rule of Syllabification must apply on each cycle because the application of the Dutch Stress Rule, which is cyclic, depends on syllable structure (recall the facts summarized in (2)). Yet the rule of Syllable-final Devoicing in Dutch must precede both the postlexical rule of Voice Assimilation that applies across word boundaries and the rule of Resyllabification across word boundaries that is characteristic of more casual speech. This is illustrated by the phonetic realizations of the phrases *moed vatten* ‘to take courage’ and *een hoed opzetten* ‘to put on a hat’:

- (15) /mud vətən/  
 (mud)<sub>σ</sub> (vɑ)<sub>σ</sub> (tən)<sub>σ</sub> Syllabification  
 t Syllable-final Devoicing  
 f Progressive Voice Assimilation

(16)	/ən hud ɔpzetən/	
	(ən) <sub>σ</sub> (hud) <sub>σ</sub> (ɔp) <sub>σ</sub> (zɛ) <sub>σ</sub> (tən) <sub>σ</sub>	Syllabification
	t	Syllable-final Devoicing
	s	Progressive Voice Assimilation
	(ən) <sub>σ</sub> (hu) <sub>σ</sub> (tɔp) <sub>σ</sub> (sɛ) <sub>σ</sub> (tən) <sub>σ</sub>	Resyllabification

The crucial point of (15) is that although the sequence /dv/ in this phrase consists of two segments that agree in voicing, yet the two segments are voiceless on the phonetic level. This is predicted only if Syllable-final Devoicing applies before Progressive Voice Assimilation. Derivation (16) shows that Syllable-final Devoicing must also be crucially ordered before Resyllabification across word boundaries. The latter process makes the effect of Syllable-final Devoicing opaque, since on the phonetic surface we find voiceless obstruents that are voiced underlyingly in syllable-*initial* position.

Summarizing, Syllable-final Devoicing is bled by the resyllabification that occurs in the course of morphological operations in the lexicon. However, it is not bled by style-specific resyllabification across word boundaries. Therefore, it must be considered a lexical, yet postcyclic, rule.<sup>5</sup>

Thus, we conclude that the revised model of Lexical Phonology proposed in (5) is a well-motivated theory of the organizational structure of phonology. In the next two sections we will look at this model in some detail and show that it makes correct predictions with respect to certain complicated rule interactions in the phonology of Polish.

## 2. Word-level Rules

In this section and in following sections we will primarily be concerned with Polish. Since this language is known for its highly complex phonological structure, we begin by introducing certain background facts and phonological rules.<sup>6</sup>

### 2.1. Descriptive Background

Central to an understanding of Polish phonology are the rules that govern vowel-zero alternations. In surface terms some *e*'s alternate with zero and/or with *i/i* (the latter spelled *y*) and some do not:

(17) a.	sech + ł	sch + ł + a	wy + sych + aj
	'he dried'	'she dried'	(derived imper-
	win + ien [v'ín + en] <sup>7</sup>	win + n + a	factive, imper.)
	'guilty' (masc., nom.sg.,	'guilty' (fem., nom.	
	short form)	sg.)	

<sup>5</sup> Kiparsky (1985) provides an analogous example from Catalan: the rule of Cluster Simplification is bled by the resyllabification that goes with morphological operations. However, it is not bled by resyllabification at the phrase level.

<sup>6</sup> For a detailed discussion of all the major issues in Polish phonology, see Rubach (1984).

<sup>7</sup> We use the following transcription symbols:



- |  |  |
|--|--|
| b. pech<br>'bad luck'<br>cień[ćeń]<br>'shadow' | pech + a<br>(gen.sg.)<br>cien + ia[ćeń + a]<br>(gen.sg.) |
|--|--|

As is well established in the generative literature on Polish, the *e*'s that alternate with zero and/or *i/i* derive from the underlying high lax vowels //i̯ i̯/, one of which is palatalizing and the other not.<sup>8</sup> These vowels, which we call *yers*, lower to [e] when followed by a *yer* in the next syllable. Otherwise, they delete context-free:

(18) *Lower*

$$\left\{ \begin{array}{c} \text{i̯} \\ \text{i̯} \\ \text{i̯} \end{array} \right\} \rightarrow e / \text{--- } C_0 \left\{ \begin{array}{c} \text{i̯} \\ \text{i̯} \\ \text{i̯} \end{array} \right\}$$

(19) *Yer Deletion*

$$\left\{ \begin{array}{c} \text{i̯} \\ \text{i̯} \\ \text{i̯} \end{array} \right\} \rightarrow \emptyset$$

Now let us look at the derivation of the alternating vowels in (17). The morphological structure of our examples is as follows:

*sech + t*

'he dried': root + past tense //t/ + masculine gender morpheme //i̯/ (for reasons leading to this representation, see Gussmann (1980), Rubach (1984), and section 6.2.2)

- [c ʒ] - alveolar affricates
- [č ʒ̣] - postalveolar affricates
- [š ʒ̣] - postalveolar fricatives
- [ć ʒ̣] - prepalatal affricates
- [ś ʒ̣] - prepalatal fricatives
- [ń] - prepalatal nasal

In terms of phonetic features the distinctions are as follows (for a complete chart, see Rubach (1984, 26)):

	c	ʒ	č	ʒ̣	š	ʒ̣	ć	ś	ś	ź	ń
coronal	+	+	+	+	+	+	+	+	+	+	+
anterior	+	+	-	-	-	-	-	-	-	-	-
delayed release	+	+	+	+	-	-	+	+	-	-	-
high	-	-	-	-	-	-	+	+	+	+	+
back	+	+	+	+	+	+	-	-	-	-	-
nasal	-	-	-	-	-	-	-	-	-	-	+
voiced	-	+	-	+	-	+	-	+	-	+	+

<sup>8</sup> We use double slashes to denote underlying representations, single slashes for intermediate stages, and square brackets for phonetic representations. We find such a distinction to be useful in the analysis of Polish data since, for example, it allows us to leave out certain allophonic details that have no bearing on problems discussed at the moment.



(Following the practice of Halle and Mohanan (1985), we use double square brackets  $\llbracket \ \rrbracket$  to indicate the beginning and end of constituents and regular square brackets  $[ \ ]$  to enclose phonetic representations and distinctive feature complexes.)

Raising applies after Yer Deletion (see footnote 10):  $m\acute{o}g + t // m\acute{o}g + t + \check{y} //$  'he could', where the final yer is the masculine gender morpheme (recall  $sech + t$  'he dried' in (20)), which becomes  $/m\acute{o}g + t/$  by Yer Deletion and finally  $/mug + t/$  by Raising. The ordering of Raising after Yer Deletion (feeding order) assigns it to the class of postcyclic rules, since Yer Deletion is postcyclic. This follows from our concept of blocks of rules, which we discuss in section 2.2. Also, the end-of-constituent bracket  $\rrbracket$  must crucially denote "the end of a word" and not the end of some other constituent, as could have been the case in the cyclic component.

With respect to the categories of postcyclic lexical rules and postlexical rules, Raising clearly belongs to the former. Given the criterion that lexical but not postlexical rules may have exceptions (Halle and Mohanan (1985), Mohanan and Mohanan (1984)), Raising should be regarded as lexical since it abounds in exceptions: *kod* 'code', *skrob* 'scratch' (imper.), and many others.

## 2.2. Blocks of Rules

What formal relationships hold between the system of phonological rules and the system of components (cyclic lexical, postcyclic lexical, and postlexical)? More specifically: do rules "belong" to one of the three components or are they rather "independent" of the components? The latter view has been articulated most clearly by Mohanan and Mohanan (1984); it is also the view taken by Kiparsky (1985). These authors assume that components (strata or levels, in their terminology) function as domains for rule application. Rules carry a specification signaling the domain in which they apply.

Our view is different (in fact, it is very much in keeping with Kiparsky's earlier (1982) position): components do not merely function as domains of rules; rather, rules belong to a component.

This view of the relationship between rules and components allows us to make the following further assumption about the organization of phonology: a set of rules belonging

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close /o/. The close /o/ is only later spelled out as [u]. For the purposes of this article we simplify matters by omitting these details of derivation. (Note: we will henceforth transcribe the open /o/ as /o/.) More important, we have restated the environment of Raising by leaving out the yers. Gussmann's rule applies in the context of yers (p. 124):

$$(i) \begin{bmatrix} + \text{back} \\ - \text{high} \\ - \text{low} \end{bmatrix} \rightarrow [+ \text{tense}] / \text{--- } C_0 \begin{bmatrix} - \text{syll} \\ + \text{voice} \end{bmatrix} \begin{bmatrix} + \text{syll} \\ + \text{high} \\ - \text{tense} \end{bmatrix} \#\#$$

However, this is clearly wrong. Counter to Gussmann's assurances (p. 53), yers play no role in the application of the rule. More specifically, there are no cases on record that would be excluded from the application of Raising by virtue of not having the yers in the context specified in the rule. In other words, the class of inputs to Gussmann's Mid Back Vowel Tensing and the class of inputs to our Raising (21) are exactly the same. Including yers in the environment of Raising only leads to an unmotivated complication in the statement of the rule.



In the case of some languages the predictions that follow from the concept of blocks must be somewhat weakened. Recent work in Lexical Phonology has uncovered some instances of rules that apply in more than one component. Halle and Mohanan's (1985) Basic Accentuation Principle in Vedic is one such instance. The rule applies both cyclically and postcyclically. Given our view, we will say that in the case of Vedic no prediction is made regarding the status of rules that are critically ordered with respect to the Basic Accentuation Principle, since such rules could be either cyclic or postcyclic. The relevant predictions are made with respect to the rules that apply in one component only and do not interact with the Basic Accentuation Principle.

Our inspection of the phonologies of Polish and Dutch shows that there are no instances of rules that would need to apply in more than one component.<sup>13</sup> In these languages, then, the predictions that follow from the concept of blocks of rules are absolute and have far-reaching consequences, as indicated here and in section 3.

### 2.3. Word-level Rules

The usefulness of recognizing the postcyclic block of rules as a component independent of the postlexical block comes to light when we consider word-level rules. One such rule is Noncontinuant Depalatalization in Polish. Rubach (1984, 101) formulates it as follows:

(23) *Noncontinuant Depalatalization*

$$\begin{bmatrix} + \text{high} \\ + \text{cor} \\ - \text{cont} \\ - \text{lat} \end{bmatrix} \rightarrow \begin{bmatrix} - \text{high} \\ - \text{del rel} \\ + \text{ant} \end{bmatrix} / \text{---} \begin{bmatrix} + \text{cons} \\ + \text{cor} \\ + \text{son} \end{bmatrix}$$

The rule turns prepalatals /ć ǰ ń/ into dentals [t d n] before coronal sonorants (nasals and liquids):

(24) wilgoć	wilgot + n + y
'moisture'	(adj.)
czeladź	czelad + n + y
'household'	(adj.)
koń	kon + n + y
'horse'	(adj.)
napaść	napast + liw + y
'aggression'	(adj.)

Noncontinuant Depalatalization cannot be a cyclic rule. One reason is that it must apply after Yer Deletion. The alternation *wiń + ien* [viń + en] 'guilty' (masc.) ~ *wiń + n + a* 'guilty' (fem.) shows that the adjectivizing morpheme is //iń//. The *e* alternates with zero, which is explicable only in terms of Lower and Yer Deletion, as demonstrated in the

<sup>13</sup> Apparently, there is a case where the postcyclic rule and the postlexical rule are functionally similar (Strident Assimilation in Polish). However, they are formally different and they show no more than a partial overlap in their structural descriptions. We will address this problem on a separate occasion.

derivation in (20). Consequently, the underlying representation of the right-hand words in (24) contains a yer between the prepalatal consonant and the nasal. Thus, *wilgot + n + y* 'moist' is //vilgoć + ĩn + i//. The yer must be deleted prior to the application of Noncontinuant Depalatalization. This is effected by Yer Deletion. Since Yer Deletion is postcyclic, Noncontinuant Depalatalization must also be postcyclic.

At the same time Noncontinuant Depalatalization cannot be allowed to apply across word boundaries. This is clearly demonstrated by the following examples:

(25)	<i>dobroć</i>	<i>dobrot + liw + y</i>	<i>dobroć ludzka</i>
	'goodness'	'good-hearted'	'human goodness'
	<i>jesień</i>	<i>jesień + n + y</i>	<i>jesień naszego życia</i>
	'autumn'	(adj.)	'the autumn of our life'

How do we stop Noncontinuant Depalatalization from applying across word boundaries? In the SPE framework (Chomsky and Halle (1968)) this would have been done by not mentioning the word boundaries in the structural description of the rule (plus a general convention). Since Lexical Phonology has done away with the boundaries (and for good reason; see Halle and Mohanan (1985)), this possibility is no longer open.

The standard version of Lexical Phonology, which does not recognize the postcyclic block as a component, would have to assign Noncontinuant Depalatalization to the class of postlexical rules. This is evidently undesirable, however, since the rule would apply not only to *dobrotliwy* but also to *dobroć ludzka*, producing an incorrect *t* in the latter. To remedy the situation, standard Lexical Phonology would have to write into the rule environment the information that Noncontinuant Depalatalization is a word-level rule. The environment would then be as follows:

$$(26) \quad / \text{---} \left[ \begin{array}{l} + \text{cons} \\ + \text{cor} \\ + \text{son} \end{array} \right] \text{X}]$$

Condition: X is an arbitrary string of segments

Such a move not only obscures the facts; it misses a significant generalization. The same procedure would have to be repeated in the case of every single rule that is a postcyclic word-level rule and, like Noncontinuant Depalatalization, does not include the independently motivated "edge of a word" information in its structural description. For example, Polish has ten such rules (some of which have been discussed in Rubach (1984)).<sup>14</sup> A further unfortunate consequence is that a number of predictions concerning the status of rules would be forfeited. A theory that does not recognize a postcyclic rule component would operate with two blocks of rules only: cyclic and postlexical. It would therefore be impossible to predict that a noncyclic rule that is ordered before a word-level rule must itself of necessity be a word-level rule. Also, it would be an accident

<sup>14</sup> A word of caution: Rubach (1984) did not draw a distinction between postcyclic and postlexical rules. Consequently, not all the rules given as postcyclic on page 244 could now preserve this status. For example, we show in section 3 that Surface Palatalization and Voice Assimilation are postlexical rules.

that the list of ordered postlexical rules would have in its top positions rules with environments such as the one in (26): X]].

In our theory the dilemma posed by Noncontinuant Depalatalization can be solved easily. Noncontinuant Depalatalization is a postcyclic rule (in the sense developed here). It belongs to the postcyclic component that we place in the lexicon. The lexical status of the postcyclic component has the desirable consequence of making postcyclic rules unavailable at the level of phrase phonology. This concept deserves further discussion.

From the empirical point of view, and given our analysis so far, it would be perfectly possible to assume that the postcyclic component is the first component of the postlexical phonology. In other words, the postlexical phonology (the after-syntax phonology) would include two components: the postcyclic word-level component and the truly postlexical phrase-level component.

We think that placing the postcyclic component in the lexicon is conceptually a more satisfying solution. First, the fact that postcyclic rules are word-level rules follows from the assumption that postcyclic rules apply in the lexicon. Phrase phonology cannot be open to such rules since phrases and sentences are generated by the syntax, hence outside the lexicon. Second, by linking the notions "postcyclic" and "lexical," we exclude the logical possibility that the block of postcyclic rules could be ordered after postlexical rules.

As a final point, let us state clearly that the compelling argument for recognizing the postcyclic word-level component cannot be made on the basis of those rules that include in their structural descriptions the independently motivated information "edge of a word." Such rules can be, and in fact sometimes are, postlexical (see Final Devoicing in section 4).

This issue deserves further clarification. "Edge of a word" rules that refer to morphological constituency—that is, to the bracket ]—should preferably be regarded as postcyclic rather than postlexical. The point is that ] may also mean 'edge of a phrase' or 'edge of a sentence', which may cause empirical difficulties if a given rule must crucially refer to the word and not to the phrase bracket. However, a rule in whose structural description "edge of a word" refers to prosodic constituency (edge of *mot*, a phonological word) can never apply incorrectly, even when it is postlexical. This follows from the assumption that prosodic constituents (syllables, *mots*, phonological phrases, etc.) are regarded as distinct entities that are not obliterated in further derivational stages (unless rules are postulated to erase these constituents). That is, one can always refer to prosodic constituents in a unique way even at the end of postlexical phonology.

### 3. Predictions

In earlier models of Lexical Phonology (such as those in Kiparsky (1982), Mohanan (1982), Rubach (1984)) no distinction was drawn between what we call postcyclic lexical rules and postlexical rules. Both types of rule were assumed to belong to one class. In

this section we wish to demonstrate that such a distinction is necessary to predict complex patterns of rule interaction in Polish phonology.

### 3.1. Retraction vs. Surface Palatalization

Polish has a rule of vowel retraction that turns */i/* into [i̠] after the so-called "hard" (that is, nonpalatal and nonpalatalized) coronal consonants */s z t d r c ʒ š ž č ʒ/*.<sup>15</sup> We quote the rule as given in Rubach (1984, 203):

#### (27) Retraction

$$\left[ \begin{array}{l} + \text{syll} \\ + \text{high} \end{array} \right] \rightarrow [+ \text{back}] / \left[ \begin{array}{l} + \text{cor} \\ + \text{back} \\ - \text{lat} \end{array} \right] \text{---}$$

Retraction plays a central role in Polish phonology since the outputs of some cyclic palatalization rules are hard consonants */c ʒ š ž č ʒ/*. These rules are triggered by */i/*, which must subsequently be changed into [i̠] in order to comply with phonetic facts.

Let us look at *strasz+y+ć* [straš+i+ć] 'frighten' and *woz+i+ć* [vož+i+ć] 'carry'. They are both verbalizations, deriving from the nouns *strach* //strax// 'fright' and *wóz* //voz// 'cart', respectively. The verbalizing suffix is */i/*, as indeed found in the phonetic representation of *woz+i+ć* 'carry'. The 3sg. present forms *strasz+y* 'he frightens' and *woz+i* 'he carries' are derived as follows:

(28)	strax+i	voz+i	
	straš+i	---	Velar Palatalization
			$x \rightarrow \text{š} / \text{---} \begin{Bmatrix} i \\ e \end{Bmatrix}$
	---	vož+i	Coronal Palatalization
			$z \rightarrow \text{ž} / \text{---} \begin{Bmatrix} i \\ e \end{Bmatrix}$
	Postcyclic strāš+i	---	Retraction

(On Velar and Coronal Palatalization, see Rubach (1984, rules 160 and 103).) The facts of ordering are such that Retraction applies after some postcyclic rules.<sup>16</sup> Therefore, it must be postcyclic itself. Let us observe in passing that the consequences of excluding

<sup>15</sup> In other words, there is no vowel retraction after palatal consonants that are produced by Coronal Palatalization (e.g.  $z \rightarrow \text{ž} / \text{---} i$ ; see Rubach (1984, 70)). Nor is there any retraction after palatalized consonants, where the term *palatalized* refers to the allophonic modifications introduced by Surface Palatalization (see rule (29)); for instance,  $t \rightarrow t' / \text{---} i$ . Note that */š ž č ʒ/* are postalveolar and not palatal consonants. They are sometimes called *functional palatals* in the sense that they can alternate with plain consonants */k g x/*. From the phonetic point of view [š ž č ʒ] as well as [s z t d r c ʒ] are [+back], since during their production the body of the tongue has the same position as during the production of [a]. See footnote 7 and Rubach (1984, 23).

<sup>16</sup> As argued in Rubach (1984, 202), Retraction applies after *r*-Spell-out, which in turn is ordered after Yer Deletion (a postcyclic rule).



Retraction from the class of cyclic rules are all fortunate. Retraction, which now does not fall under Strict Cyclicity, is free to apply morpheme-internally, as indeed required to explain the assimilation of borrowings (Rubach (1984, 204)). To give just one example, Retraction changes /i/ into /i/ in *optym + al + n + y* 'optimal', which is a "nativized" adjective derived from *optim + um* 'optimum'. Note that *optim + um* is an exception to Retraction. This is not surprising, since the word is an obvious borrowing. For example, it is not a declinable noun, it has the ending *-um* that is found only in a few borrowings, and so forth.

Assuming with Halle and Mohanan (1985) and Mohanan and Mohanan (1984) that lexical but not postlexical rules may have exceptions, we are led to the conclusion that Retraction must be a (postcyclic) lexical rule. This indeed is confirmed by all available evidence. Retraction is a word-level rule, and it must be prohibited from applying across word boundaries; that is, it cannot be a postlexical rule. Thus, we find [i] rather than [i] in such phrases as *kosz Iren + y* 'Irene's basket', *brat i siostra* 'brother and sister'.

Apart from Retraction, Polish has a rule of Surface Palatalization (rule (34) in Rubach (1984)):

(29) *Surface Palatalization*

$$[+ \text{cons}] \rightarrow \left[ \begin{array}{c} + \text{high} \\ - \text{back} \end{array} \right] / \text{---} \left[ \begin{array}{c} - \text{cons} \\ + \text{high} \\ - \text{back} \end{array} \right]$$

Unlike other palatalization rules, Surface Palatalization does not produce changes in the place of articulation. It merely "softens" consonants (an allophonic type of effect) if they stand before /i j/ either inside words or across word boundaries:

- (30) /p/ → [p']: *piw + o* 'beer', *sklep jarzyn + ow + y* 'greengrocer's'  
 /s/ → [s']: *sinus* 'sine', *pas i* 'belt and . . .'  
 /r/ → [r']: *rizotto* 'risotto', *dyrektor instytut + u* 'director of institute'  
 etc.

Surface Palatalization must be a postlexical rule since it applies in sentence phonology (across word boundaries): the relevant structures are derived syntactically, hence outside the lexicon.

Retraction and Surface Palatalization perform incompatible operations. The former retracts /i/ to /i/, whereas the latter applies precisely before /i/. Furthermore, there are words in which both rules could potentially apply; compare *sinus* 'sine', *optim + um* 'optimum', *dzins + y* 'jeans', *Chicago*, and so forth. In fact, Retraction and Surface Palatalization are in a mutually bleeding relationship. The phonetic facts are such that whenever both rules could potentially apply, Surface Palatalization applies only if Retraction has failed to apply. That is, word-internally Surface Palatalization applies only to those words that are exceptions to Retraction.

In a theory that does not recognize the distinction between postcyclic lexical rules and postlexical rules, Retraction must be ordered extrinsically before Surface Pala-

talization. In the theory developed here no extrinsic ordering is required. The difference in the domain of application predicts the assignment of these rules to different components.

We sum up our discussion by looking at a few sample derivations. Our examples are the words and phrases cited earlier: *strasz* + *y* 'he frightens' (see the derivation in (28)), *Chicago*, and *kosz Iren* + *y* 'Irene's basket':

(31)	Postcyclic	straš+i	šikago	koš iren+i	
		straš+i	exception	- -	Retraction
	Postlexical	-	š'ikago	koš' iren+i	Surface Palatization

### 3.2. Voice Assimilation

Since the facts of voice assimilation in Polish are complex, we will begin with an overview of data and some basic generalizations, turning later to consider how the principles of Lexical Phonology permit a coherent description of the facts. This description brings to light two theoretical problems: resolution of extrinsic orders (section 3.2.2) and prosodic rule environments (section 4).

*3.2.1. The Data and the Rules.* The basic generalizations are that obstruent clusters must agree in voicing and only voiceless obstruents occur before a pause. Consider the data in (32):

(32) a.	listw + a [l'istf + a]	listew + ek [l'istev + ek]
	'board'	(dimin., gen.pl.)
	pochw + a [poxf + a]	pochew + ek [poxev + ek]
	'sheath'	(dimin., gen.pl.)
	bitw + a [b'itf + a]	bitew + n + y [b'itev + n + i]
	'battle'	'warlike'
b.	Piotr	Piotrz + e [p'jotš + e]
	'Peter'	(voc.sg.)
	wicher	wichrz + e [v'ixš + e]
	'wind'	(loc.sg.)
	kufer	kufrz + e [kufš + e]
	'trunk'	(loc.sg.)

It is clear that we are dealing here with progressive devoicing, since in Polish the voiced-voiceless contrast is maintained between sonorants (compare *traf* + *i* + *é* 'hit' ~ *traf* + *n* + *y* 'well-aimed' with *spraw* + *i* + *é* 'cause' ~ *spraw* + *n* + *y* [vn] 'efficient'). The data in (32b) require some explanation. The underlying source for the surface [š] is //r//. The //r// is turned into /ž/ by palatalization (Rubach (1984, 202)): for example, *kobr* + *a* 'cobra' ~ *kobrz* + *e* [kobž + e] (loc.sg.). When preceded by a voiceless obstruent, the /ž/ devoices to [š] by Progressive Devoicing:

(33) *Progressive Devoicing*

$$\begin{bmatrix} + \text{obstr} \\ + \text{cont} \end{bmatrix} \rightarrow [- \text{voice}] / [- \text{voice}] \text{ \_\_\_\_}$$

Progressive Devoicing is restricted to applying to fricatives. If the obstruent is a stop or affricate, the result is voicing rather than devoicing: *licz+y+ć* [-č-] 'count' ~ *licz+b+a* [l'iʒ+b+a] 'number'.

As is evident from the underlying representation of the words in (32), Progressive Devoicing cannot be a cyclic rule. For example, the underlying representation of *listw+a* [-tf-] 'board' is //listiv+a//. The yer is postulated on the strength of the zero-*e* alternation in *listw+a* (nom.sg.) ~ *litew+k+a* (dimin., nom.sg.). Progressive Devoicing becomes applicable only after the yer of //listiv+a// has been deleted. Consequently, Progressive Devoicing applies after Yer Deletion. The latter is noncyclic; hence, Progressive Devoicing is noncyclic as well. In fact, Progressive Devoicing is a postcyclic lexical rule, since it should not apply across word boundaries (see section 3.2.2).

Voicing assimilations also take place in regressive contexts, where the second member of the cluster decides what value the cluster should carry for voicing:

## (34) a. Devoicing before voiceless obstruents

## i. Inside words

<i>ryb+a</i> 'fish'	<i>ryb+k+a</i> [rip+k+a] (dimin.)
<i>Warszaw+a</i> 'Warsaw'	<i>warszaw+sk+i</i> [-f+sk'+i] (adj.)

## ii. Across word boundaries

<i>zakaz+y</i> 'prohibitions'	<i>zakaz [s] postoj+u</i> 'no parking'
<i>szereg+i</i> 'rows'	<i>szereg [k] krzesel</i> 'row of chairs'

## b. Voicing before voiced obstruents

## i. Inside words

<i>pros+i+ć</i> 'ask'	<i>proś+b+a</i> [proź+b+a] 'request'
<i>licz+y+ć</i> [-č-] 'count'	<i>licz+b+a</i> [-ʒ-] 'number'

## ii. Across word boundaries

<i>kryzys [z] gospodarczy</i> 'economic crisis'
<i>sklep [b] warzywny</i> 'greengrocer's'

These facts are accounted for by postulating the following rule, which we adapt from Bethin (1984):

(35) *Voice Assimilation*

$$[+obstr] \rightarrow [\alpha voice] / \text{---} \left[ \begin{array}{c} +obstr \\ \alpha voice \end{array} \right]$$

It is immediately clear that (35) must be a postlexical rule; it applies both inside words and across word boundaries.

The general picture is made even more complex by the fact that devoicing also occurs in the following two contexts:

## (36) a. Before a pause

sad + y	sad [sat]
'orchard' (masc., nom.pl.)	(nom.sg.)
żaba	żab [ʒap]
'frog' (fem., nom.sg.)	(gen.pl.)

## b. Before sonorants but only across word boundaries

sad + y	sad [sat] owocowy
'orchards'	'fruit tree orchard'
głaz + y	głaz [gwas] lodowcowy
'stones'	'glacier stone'
but	
wład + n + y [vɰad + n + i]	
'entitled'	
moż + liw + y [moʒ + liv + i]	
'possible'	

To capture the facts in (36), Bethin (1984) postulates the rule of Final Devoicing:

(37) *Final Devoicing*

$$[+obstr] \rightarrow [-voice] / \text{---} \#$$

This rule calls for a slight modification, since the word boundary # is not available in Lexical Phonology. We undertake the necessary revision in section 4.

To see how the voicing assimilation rules handle the facts in (34) and (35), consider the derivation of *sad wiśniowy* 'cherry tree orchard' and *sad owocowy* 'fruit tree orchard':

(38)	sad wiśnovi	sad ovocovi	
	sat wiśnovi	sat ovocovi	Final Devoicing
	sad wiśnovi	—	Voice Assimilation

*3.2.2. Progressive Devoicing vs. Voice Assimilation.* Progressive Devoicing and Voice Assimilation are incompatible with respect to forms in which both rules are potentially applicable. That is, a sequence of a voiceless obstruent followed by a voiced fricative

is an input to both rules. Thus, Progressive Devoicing and Voice Assimilation stand in a mutually bleeding relationship. To see this, consider the following derivations, both of which are possible from the theoretical point of view. The example is *listw + a* 'board', with underlying representation //list<sup>̥</sup>v + a//:

(39) a.	list <sup>̥</sup> va		b.	list <sup>̥</sup> va	
	listva	Yer Deletion		listva	Yer Deletion
	*lizdva	Voice		listfa	Progressive
		Assimilation			Devoicing
	—	Progressive		—	Voice
		Devoicing			Assimilation

Only derivation (39b) is correct.

In the classic model of generative phonology as well as in the model of Lexical Phonology that does not distinguish between postcyclic lexical and postlexical rules, the ordering of Progressive Devoicing before Voice Assimilation must be extrinsic. However, in the model of Lexical Phonology proposed here no such ordering statement is needed at all. The ordering of Progressive Devoicing before Voice Assimilation follows from the theory. As pointed out in section 3.2.1, Voice Assimilation is postlexical. On the other hand, Progressive Devoicing is a postcyclic lexical rule, applying at the word level. Structures produced by the syntax should not be affected by Progressive Devoicing. Thus, *listw + a* 'board' /listv + a/ becomes [listf + a] by Progressive Devoicing, but in *but Wojtk + a* 'Wojtek's shoe' /-t v-/ becomes [-d v-] by Voice Assimilation. The ordering of Progressive Devoicing before Voice Assimilation is predicted by our model of Lexical Phonology.

#### 4. Morphological vs. Prosodic Environments

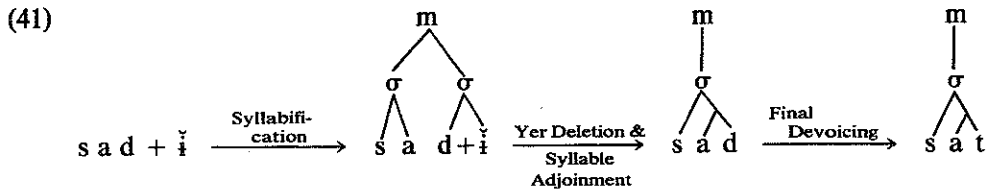
We now return to the formal statement of Final Devoicing. Since in Lexical Phonology the traditional word boundaries are not available, two options remain:

(i) Final Devoicing may refer to the context "edge of a word" in the morphological sense. We then replace (37) by (40) and refer to the bracket  $\llbracket$ , as used in Halle and Mohanan (1985):

(40) *Final Devoicing*  
 $\llbracket +\text{obstr} \rrbracket \rightarrow \llbracket -\text{voice} \rrbracket / \text{—} \llbracket$

(ii) Alternatively, Final Devoicing may be interpreted to apply in the context "edge of a word" in the phonological sense. Such a move would not be surprising, since the notion *mot* (phonological word) in its application to Polish phonology is motivated from several independent sources (stress and a number of segmental phonological rules; see Rubach and Booij (1985) and Rubach (1984, chap. 8)). The basic principle is quite obvious: syllables are organized into phonological words in accordance with their prosodic structure. Thus, *sad* //sad + ɨ// 'orchard' has the following prosodic derivation (where

//i̯// is the nom.sg. ending and *m* stands for *mot*):



The /d/, which is at the input to Final Devoicing, is final in the phonological word. The formal statement of Final Devoicing is now revised as follows:

- (42) *Final Devoicing*  
 [+obstr] → [-voice] / \_\_\_\_\_ )<sub>mot</sub>

At first glance it may seem that (40) and (42) are exactly equivalent and there cannot be any principled way of choosing between them. Indeed, in most cases the effect of (40) and (42) must obviously be the same. However, the two versions of the rule may make different predictions with regard to prepositions.

The generalization in (36b) that obstruents devoice before sonorants across word boundaries does not apply to prepositions if they are followed by complements:

- (43) *sad owocowy* [sat] 'fruit tree orchard'  
 vs.  
*pod owocem* [pod] 'under the fruit'<sup>17</sup>  
*nad rowem* [nad] 'over the ditch'  
*bez namysłu* [bez] 'without thinking'  
*od mleka* [od] 'from milk'

At the same time prepositions devoice regularly if the following word begins with a voiceless obstruent; that is, they devoice in the environment of Voice Assimilation: *pod stawem* [pot] 'under the pond'.

The obvious question is how to guarantee that the prepositions in (43) can escape Final Devoicing. It seems that the answer should be sought in prosodic structure.

The prepositions in (43) function as proclitics. This is shown independently by the fact that they carry no inherent stress of their own. Rather, they receive a secondary stress as if they were not separate phonological words (see Rubach and Booij (1985)). This fact, coupled with these prepositions' peculiar behavior with regard to Final Devoicing, leads us to suggest the following rule:

<sup>17</sup> There is no doubt that *pod* 'under', as indeed all the other prepositions, has the voiced obstruent at the underlying level: //d//. As is well known, Polish prepositions end in a yer. Thus, *pod* 'under' is underlyingly //pod̩i̯//. One reason for postulating such representations is the vowel-zero alternation in lexicalized phrases that are derived by Lower (18): for example, *patrzył spode* [pode] *łba* 'he looked with anger' (literally: 'he looked from under (his) head') (see Rubach (1985)).

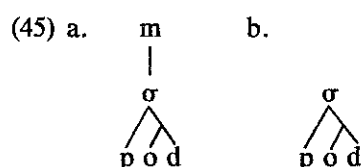
Note further that prepositions form one class with prefixes; compare *bez owoc + u* 'without the fruit' with *bez + owoc + n + y* 'fruitless'. See also Booij and Rubach (1984).

(44) *m-Erasure*

Erase the node *m* in a proclitic preposition.

*m-Erasure* must be a postlexical rule, since it is only after the syntax that we can determine whether the preposition is a proclitic—that is, whether it is followed by a complement (see the examples in (46), where prepositions are not proclitics).

Rule (44) does precisely what we would like it to do: it allows the prepositions in (43) to escape Final Devoicing. For instance, structure (45a) is transformed postlexically into structure (45b):



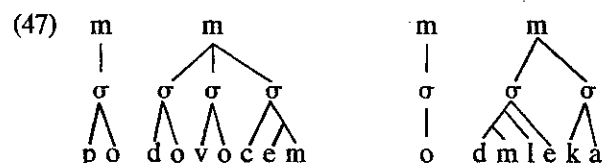
If we now assume that Final Devoicing is rule (42) rather than (40), then *pod* in *pod owocem* ‘under the fruit’ can escape the rule, as required. The /d/ is not word-final in *mot*, the phonological word, even though it is word-final in the morphological word: [[[pod]] [owocem]]. We will discuss this problem further below.

Considering next the implications that follow from *m-Erasure*, note that it predicts that prepositions do undergo Final Devoicing if it itself has not applied. This happens when prepositions are not proclitics—for example, when they stand before a pause or when they are not followed by a complement in a sentence. The prediction is borne out:

- (46) *pod* [pot] ‘under’  
*nad* [nat] ‘over’  
 Powiedziałem *pod* [pot] a nie *nad* [nat] ‘I said *under* and not *over*’

It may seem that postulating *m-Erasure* is not the only alternative. There are at least two others: (i) suggesting a rule of resyllabification, and (ii) deleting the ] bracket in proclitic prepositions. In the latter analysis Final Devoicing would be the morphologically oriented rule (40) rather than the prosodically oriented rule (42).

The first alternative would claim that, for example, *pod owocem* ‘under the fruit’ and *od mleka* ‘from milk’ undergo a rule of resyllabification that moves the /d/ of *pod* and *od* to the first syllable of *owocem* and *mleka*, yielding the following structures:



The /d/ is no longer *mot*-final and hence correctly escapes Final Devoicing (42). However, this solution is unacceptable because it runs afoul of phonetic facts. Polish never permits resyllabification across word boundaries: the /d/ in (47) must stay in *pod* and *od*, re-

ardless. As shown by Rubach (1984), syllable structure assignment is cyclic. The post-cyclic component has only rules of adjunction that apply to consonants that have been stranded by Yer Deletion (see (41)). The prepositional phrases in (47) arise only after the syntax; hence, they become available as phrases for the first time in the postlexical component. By then the syllable structure has been fixed and cannot change.

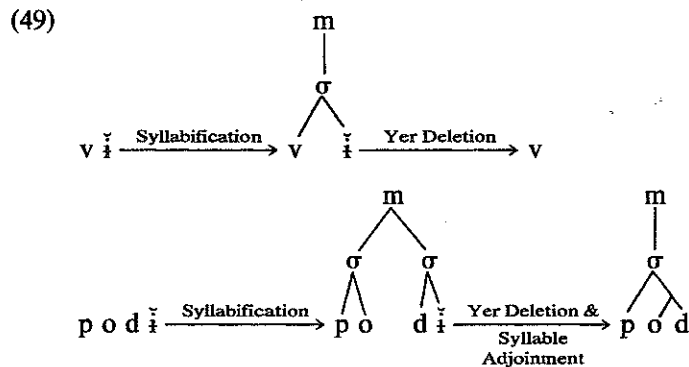
The other alternative, that the bracket  $\llbracket$  is deleted in proclitic prepositions, seems to be a viable proposal. It requires a rule that is exactly like *m*-Erasure except that it deletes the bracket rather than the *m* node:

$$(48) \llbracket \llbracket \text{pod} \rrbracket \llbracket \text{owo cem} \rrbracket \rrbracket \rightarrow \llbracket \text{pod} \llbracket \text{owo cem} \rrbracket \rrbracket$$

Final Devoicing is now the morphologically constrained rule (40).

Given the data inspected so far, the results of the two theories—(i) *m*-Erasure plus Final Devoicing (42), and (ii) bracket deletion plus Final Devoicing (40)—are exactly the same. This is a somewhat disappointing conclusion.

There are, however, two other prepositions we have not yet considered: *w* //v̥// 'in' and *z* //z̥// 'with' (for reasons that lead us to postulate a yer here, see footnote 17). From the derivational point of view, *w* and *z* are different from the prepositions discussed so far in that they lose their status as phonological words in the postcyclic rather than in the postlexical component and the rule responsible for the loss of the *m* node on *w* and *z* is Yer Deletion rather than *m*-Erasure. After Yer Deletion (a postcyclic rule) *w* and *z* lose their prosodic structure because they have lost their only vowel.<sup>18</sup> In the case of the other prepositions, such as *pod* 'under' and *nad* 'over', Yer Deletion does not remove all vowels. Consequently, they preserve their status as phonological words, and they may lose it only by *m*-Erasure in postlexical phonology. Thus, in the lexicon the derivation of *w* and *pod* is as follows (see footnote 17):



It is in the case of *w* and *z* that the two versions of Final Devoicing make different predictions. Observe that the testing examples cannot involve the proclitic use of prep-

<sup>18</sup> The loss of prosodic structure follows from the general principle that the syllable must have a rime and the phonological word must consist of at least one syllable. Consonants that are unassociated with a syllable node play an important role in the application of phonological rules in Polish; see Rubach (1985).



ositions, since in such situations the hypothetical bracket deletion (the morphological equivalent of *m*-Erasure) will apply, and all the prepositions will have the same structure, regardless of whether they have emerged from the lexicon with the *m* node (like *pod*) or without it (like *w* and *z*). The correct testing context is the same as in (46): before a pause or when *w* and *z* are not followed by a complement:

- (50) *w* [v] 'in'  
       *z* [z] 'with'  
       Powiedziałem *w* [v] a nie *z* [z] 'I said *in* and not *with*'

Thus, the prepositions *w* and *z* do not devoice, whereas *pod* and *nad* do (see (46)).

The correct structures can be derived only if Final Devoicing is the prosodically oriented rule (42). From the point of view of their grammatical structure, *w* and *z* in (50) are exactly the same as *pod* and *nad* in (46): they are enclosed in [ ]]. The relevant difference comes to light when we consider the prosodic structure: *w/z* have lost their status as phonological words in the postcyclic component, as a result of Yer Deletion, whereas *pod/nad* have not. Consequently, *w* and *z* can never be *mot*-final. Final Devoicing (42) cannot apply.

We record Final Devoicing (42) as an example of a postlexical word-level rule. It is postlexical because it is ordered after *m*-Erasure, which is postlexical. Notice, however, that Final Devoicing (42) belongs precisely to the subclass of word-level rules that may be postlexical: the information "edge of a word" is expressed in prosodic terms, and it is an integral part of the rule environment.<sup>19</sup>

##### 5. Extension of the Model: Halle and Mohanan's Analysis

There are some interesting parallels between our model and the one developed for English by Halle and Mohanan (1985). In this section we will examine these parallels and suggest that Halle and Mohanan's system can in fact be reduced to the three-component approach developed here.

Halle and Mohanan's system includes five ordered strata:

- Stratum 1 (cyclic): class I derivation, irregular inflection
- Stratum 2 (noncyclic): class II derivation
- ↻ Stratum 3 (cyclic): compounding (a loop to stratum 2)
- Stratum 4 (cyclic): regular inflection
- Stratum 5 (noncyclic): postlexical phonology

<sup>19</sup> Neither version of Final Devoicing can accommodate the imperative plural suffix *-my* that causes devoicing in the dialects of central and northern Poland: *skrob + a + ć* 'scratch' ~ *skrob + my* [skrop + mi] 'let's scratch'. From the point of view of devoicing, *-my* acts as if it were a separate word (devoicing before a sonorant across word boundaries). However, from the point of view of stress, *-my* behaves like a suffix. For example, in *protest + ij + my* 'let's protest' the stress is penultimate, as predicted by the general rule of penultimate stressing. One way of solving the problem would be to assign to *-my* the status of a phonological word after the stress rule has applied. At the stage where Final Devoicing comes into play, the *b* of *skrob + my* 'let's scratch' would thus be *mot*-final and would devoice, as required. We have not investigated this problem.

The parallels are obvious:

Stratum 1 corresponds directly to our cyclic component (see (5)).

Stratum 5 is equivalent to our postlexical component.

Stratum 2 is a variant of our postcyclic lexical component.

It is strata 3 and 4 that make the two models different. If these two strata are eliminated, Halle and Mohanan's system reduces to the three-component model developed here. An attempt at eliminating strata 3 and 4 is certainly worthwhile, since we will then arrive at a much more restrictive organization of the grammar than that proposed by Halle and Mohanan. Our theory predicts that noncyclic strata must in fact be postcyclic (that is, they must follow the cyclic stratum), whereas Halle and Mohanan's allows cyclic and noncyclic strata to be interspersed.

Let us begin with stratum 4, which Halle and Mohanan motivate by consideration of both morphology and phonology. On the morphological side stratum 4 accounts primarily for the fact that the left-hand member of a compound is not inflected in English: for example, *\*railroad station*, *\*railroads station*, but *railroad stations*. Halle and Mohanan point out that this follows automatically from the assumption that compounding takes place at stratum 3, whereas inflection is added at stratum 4. The internal brackets of the compound will by then have been erased, and inflectional suffixes can only be added to the compound as a whole and not to its internal constituents.

However, Sproat (1985) has adduced evidence that the left-hand member of a compound may in fact be inflected. His examples (ascribed to Hammond (1984)) are compounds such as these:

- (51) systems analyst  
 human subjects committee  
 ratings book  
 parts department

Sproat argues that the correct generalization can only be captured by a constraint and not by postulating two separate strata: one for compounding and the other for inflection. The constraint is the following:

- (52) The left member of a compound must be unmarked for number, unless the plural is interpreted collectively or idiosyncratically.

If Sproat is right, then there is no morphological motivation for stratum 4 in English.

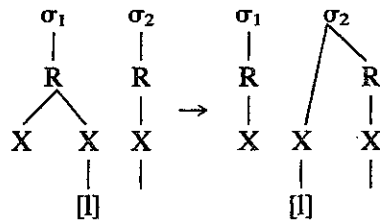
On the phonological side, stratum 4 accounts for the distribution of the "dark" and the "clear" /l/ in English. Halle and Mohanan's generalization is that the /l/ is velarized (dark) in the rime position—that is, in words such as *lull* (second *l*) and *belt* but not in *belly*, where the *l* is in the onset position. Thus, the distributional facts derive from the principles of syllabification.

The evidence for stratum 4 comes from the comparison of compounds and phrases: the /l/ is "clear" in compounds and "dark" in phrases (p. 65):

- (53) a whale edition [ɪ] vs. the whale and the shark [ɪ]  
 the seal office [ɪ] vs. the seal offered a doughnut [ɪ]

To account for these facts, Halle and Mohanan propose a rule of *l*-Resyllabification (p. 65):

(54) *l*-Resyllabification



*l*-Resyllabification bleeds *l*-Velarization because it transfers the // from the rime to the onset position. Crucially, *l*-Resyllabification applies at stratum 4 since, on the one hand, it affects not only compounds but also inflected forms such as *dealing* and *wheeling*, and, on the other hand, it should not apply to phrases such as those on the right in (53).

Halle and Mohanan’s generalization about the domain in which *l*-Resyllabification applies can be expressed in our model without any difficulty. *l*-Resyllabification is a postcyclic lexical rule; hence, it can never apply in phrase phonology. We thus account for the same facts without postulating stratum 4.

Eliminating stratum 3 is more difficult. Let us begin by observing that the motivation Halle and Mohanan adduce for stratum 3 is not as compelling as the motivation they adduce for the other strata.

Halle and Mohanan point out that stratum 2 and stratum 3 provide inputs to each other: [neighborhood] [gang], [re[air] [condition]]. They suggest that there is a “loop” between strata 2 and 3. That is, compounds formed at stratum 3 may return to stratum 2 for further affixation (p. 64). Thus, on the morphological side, there is no motivation for distinguishing stratum 2 and stratum 3. However, certain interesting phonological facts indeed seem to argue for such a distinction.

Halle and Mohanan note that English dialects fall into four groups with regard to Stem-final Tensing, as shown in table 1 on page 28. Dialect D has no rule of Stem-final Tensing. In dialect A vowels are tensed in all the diagnostic positions. This dialect must therefore have rule (55) (Halle and Mohanan’s (2), p. 59):

- (55) *Stem-final Tensing*  

$$\left[ \begin{array}{c} V \\ -low \end{array} \right] \rightarrow [+tense] / \text{---} ]$$

In our system Stem-final Tensing is simply a postcyclic lexical rule.

Complications arise when we consider the facts in dialect C in light of our model:

How can Stem-final Tensing be made inapplicable to *happiness*?

How can it be made applicable to *city hall* and *cities*?

**Table 1**  
Dialectal variations in stem-final tensing (Halle and Mohanan (1985, 59))

<i>Environment</i>	<i>Example</i>	<i>Underlying</i>	<i>Dialect</i>			
			<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
Word-final	city	ɪ	i	iy	i	ɪ
Before inflection	cities	ɪ	i	iy	i	ɪ
Stem-finally in compounds	city hall	ɪ	i	iy	i	ɪ
Before <i>-ness</i> , <i>-hood</i> , etc.	happiness	ɪ	i	i	ɪ	ɪ

Halle and Mohanan's answer is that in dialect C Stem-final Tensing is a stratum 3 rule. The /ɪ/ of *happiness* is no longer available for tensing, since the internal brackets have been erased at stratum 2. On the other hand, *cities* is an input to rule (55) because *-s* has not yet been added (recall that regular inflection is added at stratum 4).

In a way, we could disclaim responsibility for reanalyzing these facts, since there are reasons to believe that stratum 4 does not exist; if so, the analysis provided by Halle and Mohanan for the derivation of *cities* no longer holds. However, disclaiming responsibility is clearly an unsatisfying move. Let us therefore consider the available alternatives.

In our analysis of Polish we have shown that significant generalizations can be stated by distinguishing two different concepts of the word: the morphological word and the prosodic word (*mot*). Let us assume that there is no stratum 3. This means that compounding and regular inflection are done at stratum 2. Thus, the phonological rules of stratum 2 act on the following structures (we assume Halle and Mohanan's bracketing system):

- (56) [[city]]  
 [[[citi]] [es]]  
 [[[city]] [hall]]  
 [[[happi]] [ness]]

How can we exclude *happiness* but include *city* and *city hall* in the domain of Stem-final Tensing in dialect C? It is clear that appealing to morphological structure (the brackets) is the wrong approach. The relevant differences come to light when we consider prosodic structure. *City* by itself and in the compound *city hall* is a phonological word, whereas *-ness* in *happiness* is not. (Note the difference in stress between *city hall* and *happiness*.) Consequently, the generalization is that /ɪ/ tenses at the end of *mot*. In dialect C the Stem-final Tensing is rule (57), rather than (55):

(57) *Stem-final Tensing (dialect C)*

$$\begin{bmatrix} \text{V} \\ -\text{low} \end{bmatrix} \rightarrow [+ \text{tense}] / \text{---} )_m$$

In *happiness* /s/ rather than /t/ stands in *mot*-final position; hence, the rule does not apply.

Notice, however, that *cities* cannot be derived by rule (57): the /t/ is not *mot*-final. To handle this form, we propose that the inflectional suffix has a vocalic representation at the underlying level. That is, it is //t/ rather than //z/, as has indeed been proposed (a long-standing controversy in the 1970s). Now, instead of *t*-insertion after strident segments (for example, *buses*, *bushes*) the relevant rule will be *t*-deletion after nonstrident segments (for example, *cities*, *beds*). The advantage of assuming //t/ rather than //z/ is that *cities* can now be handled by the rule of Prevocalic Tensing that applies in words such as *radio*, *patio*.

Dialect B presents the greatest difficulty. The tensing is not a problem. It is effected by rule (55) of dialect A. The lengthening in *city* and *city hall* is also straightforward. The rule is exactly as in dialect C, but it produces lengthening rather than tensing. The problem involves the word *cities*. There is no obvious way of effecting lengthening in such structures, unless by resorting to an ad hoc rule:

(58) *Prevocalic Lengthening (dialect B)*

$$\begin{array}{c} \text{X} \\ | \\ \text{X} \end{array} \rightarrow \begin{array}{c} \text{X} \\ \vee \\ \text{X} \end{array} / \begin{bmatrix} \text{---} \\ + \text{tense} \\ - \text{back} \end{bmatrix} [- \text{cons}]$$

At the price of postulating rule (58) we can eliminate stratum 3 from the grammar of English.

With these modifications Halle and Mohanan's system becomes almost identical to ours:

There are one cyclic stratum (or component) and two noncyclic strata (components).

The cyclic stratum precedes the noncyclic strata.

Word-level phonology is done in the noncyclic lexical stratum: Halle and Mohanan's stratum 2, our postcyclic component.

However, there is one significant difference between the two models. In the analysis of English, stratum 2 (postcyclic component) interacts with morphology. This interaction is indirect since, unlike in the cyclic component (stratum 1), all word formation rules precede all phonological rules.

There is no doubt that Halle and Mohanan are right in proposing that some word formation should be done in the postcyclic component (stratum 2). In this way they capture the well-established distinction between class I and class II affixation in English. To accommodate Halle and Mohanan's findings, we must modify our model. The insight that we draw from Halle and Mohanan's analysis is that the link between the postcyclic

component and the word formation rules is a parameter along which languages vary. Some languages, such as Polish and Dutch, do not permit any link between the postcyclic component and the word formation rules. This follows from the fact that all word formation rules, regardless of what type of affixes they attach (derivational or inflectional), trigger the same set of phonological rules (see Rubach (1984)). Had word formation been divided between the cyclic and the postcyclic components, as it is in English, it would have become an accident that all cyclic phonological rules (or almost all of them) would have to be repeated in the postcyclic component. Also, these phonological rules would have to obey Strict Cyclicity, regardless of the component in which they would apply. The obvious conclusion is that Polish (and Dutch) belong to the class of languages that require that all word formation be done in the cyclic component. In these languages inputs to the postcyclic rules have no internal morphological structure, since all internal brackets have been erased at the end of the cyclic component. Thus, for example, *straszyć* 'frighten', whose morphological structure in the cyclic component is  $[[[strax]] [i]] [ć]$ , now enters the postcyclic component as  $[[strašić]]$ .

There are also languages, such as English, where some word formation is done in the postcyclic component. In these languages word-internal morphological structure is available to phonological rules but only inasmuch as it has been assigned in the postcyclic component. The word-internal morphological structure of the cyclic component will by then have been erased. Thus, *divinity* is  $[[divinitɪ]]$ , whereas *longing* is  $[[[long]] [ing]]$ , reflecting the fact that *-ity* attaches in the cyclic component whereas *-ing* attaches postcyclically.

## 6. Alleged Counterexamples: Clitics

In this section we discuss the phonological behavior of certain clitics in Dutch and Polish. These clitics seem to argue against the proposed rigid division of phonological rules into two components (lexical and postlexical). We will argue, however, that these clitics are derived in the lexicon. This assumption accounts for the phonological properties of these clitics and enables us to maintain the "three blocks" approach to phonological rules advocated in the preceding sections.

### 6.1. Subject Pronouns in Dutch

Most of the subject pronouns of Dutch have a strong and a weak form. The forms of interest here are the vowel-initial weak forms. The clearest example is *ie* /*i*/, the weak counterpart of the pronoun *hij* /*hei*/ 'he'. The weak pronoun is cliticized to the preceding word in Comp position and fuses phonologically with this host word, as shown by the resulting syllabification patterns:

(59) a. *Main clauses*

[. . . [vraagt]<sub>v</sub> [ie]<sub>ci</sub>]<sub>comp</sub> 'lit. asks he' (vrax)<sub>σ</sub> (ti)<sub>σ</sub>

b. *Subordinate clauses*

[. . . [dat]<sub>Comp</sub> [ie]<sub>Cl</sub>]<sub>Comp</sub> 'that he \_\_\_\_' (da)<sub>σ</sub> (ti)<sub>σ</sub>

A second example is [ək], a weak variant of *ik* [ɪk] 'I' that behaves like *ie*. For instance, *dat-ək* is syllabified as (da)<sub>σ</sub> (tək)<sub>σ</sub>.

Since these clitics induce obligatory resyllabification of the host plus clitic combination, they provide another argument for locating the rule of Syllable-final Devoicing (rule (12)) in the lexicon: Syllable-final Devoicing must apply before cliticization and its concomitant resyllabification take place. This is illustrated in the following derivations for *vond-ik* (lit. 'found I') and *vond-ie* (lit. 'found he'):

(60)		vond-ik	vond-ie	
	Lexical	/vɔnd/	/vɔnd/	Underlying form
		(vɔnd) <sub>σ</sub>	(vɔnd) <sub>σ</sub>	Syllabification
		t	t	Syllable-final Devoicing
	Postlexical	(vɔnt) <sub>σ</sub> ək	(vɔnt) <sub>σ</sub> i	Cliticization
		(vɔn) <sub>σ</sub> (tək) <sub>σ</sub>	(vɔn) <sub>σ</sub> (ti) <sub>σ</sub>	Resyllabification

If Syllable-final Devoicing applied after cliticization, the wrong phonetic forms \*[vɔndək] and \*[vɔndi] would be derived.

However, Berendsen (1983) argues that Syllable-final Devoicing applies after cliticization because of the existence of phonetic forms such as [hɛbək] for *heb-ik* 'lit. have I':

(61)	/hɛb/ /ək/	
	(hɛ) <sub>σ</sub> (bək) <sub>σ</sub>	Cliticization and resyllabification
	—	Syllable-final Devoicing
	[hɛbək]	Phonetic form

Since this analysis obviously conflicts with the analysis of Syllable-final Devoicing in Dutch given above, it requires closer consideration. We begin with a survey of the relevant facts:

(a) Word-final /d/ is always devoiced before a vowel-initial clitic, except for *had-ik* 'lit. had I', where the /d/ can remain voiced:

(62) a.	bind-ik/ie	'lit. bind I/he'	[bɪntək]/[bɪnti]
	raad-ik/ie	'lit. guess I/he'	[ratək]/[rati]
b.	had-ik/ie	'lit. had I/he'	[hətək, hədək]/[hati, *hadi]

(b) There are only a few verbs with stem-final /b/, such as *tobben* 'to toil', *krabben* 'to scratch', *schrobben* 'to scrub', and *hebben* 'to have'. Although intuitions are not very clear here, it is at least certain that the variant with voiceless obstruent occurs: *heb-ik* [hɛpək], *krab-ik* [krapək].<sup>20</sup>

<sup>20</sup> Berendsen (1983, 27) mentions only the variant [krɒbək] as the phonetic realization of *krab + ik*.

(c) A similar situation holds for verbs with stem-final voiced fricatives. We know for certain that phonetic forms with a voiceless stem-final fricative are correct (for example, *gaf-ie* [ɣafi] 'lit. gave he'), but forms like [ɣavi] may also occur.

Given these data, Berendsen's analysis runs into the following problems: (i) it cannot derive the phonetic forms with voiceless stem-final obstruents; (ii) it predicts the wrong phonetic form for phrases like *vond-ik*. Noting that the correct phonetic form of, for instance, *vond-ie* is [vɔnti], not [vɔndi], Berendsen proposes to derive it in the following way:

(a) The clitic *ie* is derived phonologically from the 3sg. pronoun *die* that also occurs after verbs. For instance, *kwam-die* 'lit. came he' is possible alongside *kwam-ie*.

(b) The initial [d]'s of Dutch pronouns and determiners have the special property that they behave like fricatives with respect to the rule of Progressive Voice Assimilation that devoices fricatives after a voiceless obstruent. To account for this, Berendsen assumes that these [d]'s are dental fricatives underlyingly /ð/.

(c) There is a phonological rule that turns /dð/ into [t].

Thus, the phonetic form of *vond-ie* is derived as follows:

(63)	/vɔnd ði/		
	∅ t	d ð → t	
	—	ði → i	
	vɔnti	Phonetic form	

This analysis has the disadvantage of postulating two ad hoc rules: one to derive *t* from *dð*, the other to derive *-ie* from *die*. Generally, the weak forms of pronouns of Dutch cannot be derived from their strong counterparts by means of independently motivated phonological rules. On the other hand, the analysis outlined in the preceding sections predicts forms like [vɔnti] straightforwardly, without any additional assumption, both from the variant *ie* and from the variant *die*, as shown in (64):

(64)	/vɔnd/	/vɔnd/	
Lexical	(vɔnd) <sub>σ</sub>	(vɔnd) <sub>σ</sub>	Syllabification
	t	t	Syllable-final Devoicing
Postlexical	+ i	+ di	Cliticization
	(vɔn) <sub>σ</sub>	(vɔnt) <sub>σ</sub>	Resyllabification
	—	t	Progressive Voice Assimilation <sup>21</sup>
	—	∅	Geminate Deletion
	[vɔnti]	[vɔnti]	Phonetic forms

The problem that remains is how to derive phonetic forms such as [hebək] and [hadək]. We propose to consider such phonetic variants of *heb-ik* and *had-ik* as lexi-

<sup>21</sup> We assume that the /d/'s of the Dutch pronouns and determiners are positive exceptions to the rule of Progressive Voice Assimilation, which normally applies to fricatives; but nothing hinges on this assumption.



calized verb plus clitic combinations that are stored in the lexicon. That is, we assume that a vowel-initial weak pronoun can be reinterpreted as a kind of suffix that is attached to the verb before Syllable-final Devoicing applies. Since many combinations of verb plus vowel-initial clitic have only the voiceless obstruent in their phonetic form, this lexical cliticization is not to be seen as a productive rule. Only certain frequent verbs have such cliticized forms in the lexicon.

Interestingly, there is independent evidence for the assumption that certain verb plus clitic combinations have to be stored in the lexicon, since we find even more reduced phonetic forms of such combinations with very frequent verbs like *hebben* 'to have', *zijn* 'to be', and the modal auxiliaries. These strongly reduced variants occur in casual and substandard varieties of Dutch:

(65) <i>Verb plus clitic</i>		<i>Reduced form</i>
heb-ik	'have I'	hek
ben-ik	'am I'	benk
kan-ik	'can I'	kanj
wil-ik	'want I'	wik
zal-ik	'will I'	zak
moet-ik	'must I'	muk
mag-ik	'may I'	mak

It is impossible to derive such reduced forms by means of independently motivated phonological rules of Dutch. For instance, *ren-ik* 'run I' (parallel to *ben-ik*) cannot be realized as [renk], nor *val-ik* 'fall I' (parallel to *zal-ik*) as [vak]. Hence, these phonetic forms must be listed in the lexicon. A similar behavior is shown by the complementizer *dat* 'that'. For instance, *dat-ik* can be reduced to [dak].<sup>22</sup>

What are the syntactic consequences of the hypothesis that certain clitics originate in the lexicon? One possibility is to assume that lexical insertion takes place at the level of S-Structure, because these cliticized forms can be seen as lexicalizations of verb plus clitic configurations that arise through the application of a syntactic rule of cliticization. Den Besten (1976) has pointed out that thanks to the enrichment of S-Structure with traces, lexical insertion can take place at this level.<sup>23</sup>

Another possibility is to insert such verb plus clitic combinations in D-Structure. We then need some principle that marks those sentences as ungrammatical in which the subject position is also filled with a lexical item. Such an analysis could proceed along the lines of current generative analyses of the so-called pro-drop languages, in particular the analysis of Modern Irish in McCloskey and Hale (1982). In Modern Irish, unlike the Romance pro-drop languages, the presence of a synthetic verb form that is marked for number and person excludes the lexical filling of the subject position.

However, we will not opt for a particular solution here, since that would take us

<sup>22</sup> Nonstandard varieties of Dutch also exhibit such "compressed" forms for the complementizer *dat* and certain frequent verbs with other subject pronouns.

<sup>23</sup> Anderson (1982) also presupposes that lexical insertion takes place at the level of S-Structure.

far beyond the scope of this article. The only point we wish to emphasize here is that our assumption that clitics may originate in the lexicon does not conflict with current syntactic theories.

In conclusion, the lexical status of the Dutch rule of Syllable-final Devoicing of obstruents is confirmed by the data concerning the interaction of vowel-initial subject clitics with this rule. Thus, the importance of the distinction between lexical and post-lexical phonological rules is once more supported.

## 6.2. Polish Clitics

6.2.1. *The Problem.* In this section we will be concerned with five Polish clitics:

- m*: 1sg. preterite ending, e.g. *rob+i+t+e+m* 'I did'
- ś*: 2sg. preterite ending, e.g. *rob+i+t+e+ś* 'you did'
- śmy* [śmi]: 1pl. preterite ending, e.g. *rob+i+l+i+śmy* 'we did'
- ście* [ście]: 2pl. preterite ending, e.g. *rob+i+l+i+ście* 'you did'
- by* [bi]: 'would', e.g. *rob+i+t+by* 'he would do'

These morphemes are clitics in the sense that they exhibit a low degree of selection with respect to their hosts (see Zwicky and Pullum (1983)). Although most often they are attached to verbs, they may also attach to other constituents that precede the verb. For instance:

- (66) a. Pronouns  
       ja to rob+i+t+e+m 'I did this'  
       = ja+m to rob+i+t  
       = ja to+m rob+i+t
- b. Interrogative pronouns and particles  
       co ja rob+i+t+e+m 'what did I do'  
       = co+m ja rob+i+t  
       czy ja tam by+t+e+m 'was I there'  
       = czy+m ja tam by+t
- c. Conjunctions and complementizers  
       nie kazali mi ale rob+i+t+e+m 'they didn't tell me to but I did (it)'  
       = nie kazali mi ale+m rob+i+t  
       myślał, że tam by+t+e+m 'he thought I was there'  
       = myślał, że+m tam by+t
- d. Adverbs  
       szybk+o to rob+i+t+e+ś 'you did it fast'  
       = szybk+o+ś to rob+i+t
- e. Nouns  
       dla Stefan+a rob+i+t+e+ś 'you did (it) for Stefan'  
       = dla Stefan+a+ś rob+i+t

Ordinarily, one would want to assume that the mobile inflection exhibited in (66) should

be accounted for by postulating a rule of Movement (see Gussmann (1980), Sussex (1980)). Movement would front the clitic, disassociating it from the verb and attaching it to one of the preceding hosts. However, as pointed out by Dogil (1984), such an analysis creates a number of difficulties for the correct application of phonological rules. As we will show, this analysis is in fact unacceptable in the framework of Lexical Phonology. To be exact, it is unacceptable for four of the five clitics that we discuss.

For purposes of exposition, let us divide the clitics into three groups—(i) *-m* and *-ś*, (ii) *-by*, and (iii) *-śmy* and *-ście*—reflecting their different phonological behavior. Let us observe further that whatever is true about *-m* is also true about *-ś* and whatever is true about *-śmy* is also true about *-ście*.

6.2.2. *The Clitics -m and -ś.* Three phonological rules interact with the clitics *-m* and *-ś* in crucial ways: Stress, Raising, and Lower.

Polish has a clear pattern of penultimate stress (see Rubach and Booij (1985) for an analysis within the framework of phonological grids). The stress rule has the word as its domain, and it applies after postcyclic Yer Deletion. Consequently, it is a postcyclic lexical rule. Consider now the placement of the main stress in (67):

- (67)                   <sup>1</sup>                   <sup>1</sup>  
 jak robi<sup>1</sup>em = jakem robi<sup>1</sup>t  
 'as I did'

Given the theory that *-m* (here: *-em*) is attached to *jak* by Movement, a complication arises for the placement of stress. We seem to need a rule of stress retraction that applies in postlexical phonology (hence after Movement) and stresses the first syllable of *robi* in (67).

As pointed out in section 2.1, Polish has a rule of Raising (21) that changes /o/ into /u/ before voiced consonants in the word-final syllable. Dogil (1984) has drawn attention to the fact that Raising applies after the clitic has been removed from the verb:

- (68) jak mog+ł+e+m = jakem mógl [mugł]  
 'how could I'

If *-em* is detached from the verb by Movement, which happens in the syntax rather than in the lexicon, Raising cannot apply since it is a (postcyclic) lexical rule. We have a problem of how to account for the change of //o// to [u] in (68).

Next, consider the *e*-zero alternations in the clitics *-m* and *-ś*:

- (69) a. [em]: robi<sup>1</sup>em 'I did', jakem ja robi<sup>1</sup>t 'how did I do'  
           [m]: jak jam robi<sup>1</sup>t 'how did I do'  
       b. [eś]: sam robi<sup>1</sup>eś = sameś robi<sup>1</sup>t 'you did (it) yourself'  
           [ś]: tyś robi<sup>1</sup>t 'you did'

The vocalic forms *-em*, *-eś* appear after a consonant, and the consonantal allomorphs *-m* and *-ś* occur after vowels. It seems that we need a postlexical rule of *e*-insertion. This rule must be restricted to apply in the context of the clitics only. It cannot be regarded as a phonetically motivated rule, since Polish abounds in all kinds of clusters (see Dogil

(1984)). In sum, these facts pose a serious complication in postlexical phonology. Now recall that Polish has a rule that accounts for the *e*-zero alternation—namely, Lower (18). This rule could be used to derive the vocalic form of the clitics (see below). However, as pointed out in section 2.1, Lower is cyclic and lexical. In fact, it is probably the best-documented cyclic rule in Polish phonology (Rubach (1984, 184ff.)). The analysis using Lower cannot be maintained if clitic placement is effected by Movement. The point is that Movement applies in the syntax, whereas Lower applies in the lexicon.

In summary, the interaction between the clitics and the four phonological rules discussed in this section leads invariably to the conclusion that cliticization cannot be effected by Movement. The theory of Lexical Phonology imposes an analysis under which this type of cliticization must be carried out in the lexicon. Thus, cliticization must simply be a word formation rule. What happens, then, in the syntax?

We suggest that Polish should contain a syntactic filter that rules out structures such as (70a) but permits structures such as (70b) and (70c):

- (70) a. \*... X + clitic<sub>i</sub> ... Y + clitic<sub>i</sub> ...  
 b. ... X + clitic ... Y ...  
 c. ... X ... Y + clitic ...

Like other word formation processes, Cliticization is an optional rule. Thus, in the lexicon both *robił* 'did' and *robilem* are generated, both *ja* 'I' and *jam*, both *już* 'already' and *jużem*, and so forth. It is the task of the filter to guarantee that the appropriate forms are selected to produce correct sentences.

This theory, which we will call *Lexical Cliticization*, solves the phonological problems encountered by the Movement theory. To show this, we consider the same rules as before—Stress, Raising, and Lower—and the same examples.

The cyclic component of the lexicon generates both *robilem* 'I did' and *robił*.

Postcyclically, but still in the lexicon, stress is placed as required: *robilem*, *robił*.

Both *mog + ł + e + m* /mog + ł + e + m/ 'I could' and *móg + ł* /mog + ł/ are generated. Raising applies in the postcyclic lexical component and turns /o/ into /u/ in [mogł]. In *mog + ł + e + m* the environment of Raising is not met: *-em* blocks the rule.

Before we propose our analysis for Lower, let us look at some background facts. The preterite is formed in Polish by adding the past morpheme //ł/ to the verb stem (see Rubach (1984)). For 'do' the stem is *rob + i*, where *i* is the verbalization morpheme; compare *rob + ot + a* 'work'. The past tense //ł/ is followed by a gender marker and further by the now familiar clitic endings that denote person and number:

(71)		<i>Singular</i>		
		<i>Masculine</i>	<i>Feminine</i>	<i>Neuter</i>
	1	<i>rob + i + ł + e + m</i>	<i>rob + i + ł + a + m</i>	—
	2	<i>rob + i + ł + e + ś</i>	<i>rob + i + ł + a + ś</i>	—
	3 (no ending)	<i>rob + i + ł</i>	<i>rob + i + ł + a</i>	<i>rob + i + ł + o</i>

	<i>Plural</i>	
	<i>Masculine virile</i>	<i>Nonvirile</i>
1	rob+i+l+i+šmy	rob+i+l+y+šmy
2	rob+i+l+i+šcie	rob+i+l+y+šcie
3 (no ending)	rob+i+l+i	rob+i+l+y

As is evident from (71), the gender marker for the feminine is //a//, for the neuter //o//, for the masculine virile plural //i//, and for the nonvirile plural //ɨ//. It is the masculine singular gender marker that requires some explanation.

As argued in Gussmann (1980) and Rubach (1984), the underlying representation of the masculine singular gender morpheme is the yer //ĩ//. This representation is motivated from a number of sources: for example, the vowel-zero alternation in (71), and the fact that the yer in the verb stem surfaces as [e] via Lower in words such as *szed+l* //šĩd+l+i// 'he went' vs. *sz+l+a* //šĩd+l+a// 'she went'. The endings -m and -ś in 1sg. and 2sg. are //mĩ// and //śĩ//, since they trigger Lower, as shown in (72):

(72)	<i>szedłem</i> 'I went'	<i>szedłeś</i> 'you went'	<i>szedł</i> 'he went'	
Cycle 1	šĩd	šĩd no rule applies	šĩd	
Cycle 2	šĩd+l	šĩd+l no rule applies	šĩd+l	WFR: Preterite
Cycle 3	šĩd+l+i šed+l+i	šĩd+l+i šed+l+i	šĩd+l+i šed+l+i	WFR: Gender Lower
Cycle 4	šed+l+i+mĩ šed+l+e+mĩ	šed+l+i+śĩ šed+l+e+śĩ	— —	WFR: Cliticization Lower
Postcyclic	šedłem	šedłeś	šedł	Yer Deletion

This analysis accounts for the surfacing of /e/ in the clitic endings -(e)m and -(e)ś. We propose that the same analysis be assumed to account for the e-zero alternation when clitics are attached to nonverbal hosts.

First let us look at *sameś robił* 'you did (it) yourself', the cliticized form in (69b). We start by noting that the clitic is -ś and not -eś, as the comparison of *sameś robił* and *sam robiłeś* might misleadingly suggest. This is shown even more clearly by *jakeś, jak* ('how' plus 2sg. clitic). Compare the masculine and the feminine forms in (73):

(73) Masculine:	jak ty rob+i+l+e+ś = jakeś ty rob+i+l
	'how did you do (it)'
Feminine:	jak ty rob+i+l+a+ś = jakeś ty rob+i+l+a

The gender marker -a has not been detached from the verb; hence, the clitic is -ś and

not *-eś*. Consequently, the /e/ in *jakeś*, as well as in *sameś*, must come from some other source.

For *sameś* this source is quite obvious: *sam* is an adjective in the masc. nom.sg. case and hence has the inflectional ending //ĩ// (recall the discussion of *win + ien* 'guilty' in section 2.1). Clitics are attached to inflected forms of their hosts: compare *Stefan + a + ś* in (66e) and sentences such as *sam + ego* (gen.sg.) *szefa widziałeś* = *sam + ego + ś szefa widział* 'you saw the boss himself'. Thus, prior to Cliticization *sam* is represented as /sam + ĩ/. Cliticization attaches //śi//, the 2sg. ending (compare the derivation in (72)). Nothing further needs to be said. The rules apply as expected:

(74) Cycle 1	sam	
	no rule applies	
Cycle 2	sam + ĩ	WFR: Masc. nom.sg.
	—	Lower
Cycle 3	sam + ĩ + śi	WFR: Cliticization
	sam + e + śi	Lower
Postcyclic	sameś	Yer Deletion

In the feminine form, *sam + a rob + i + t + a + ś* = *sam + a + ś rob + i + t + a* 'you did (it) yourself', the inflectional ending of the nom.sg. is *-a* and hence Lower cannot apply: //sam + a + śi// becomes [samaś] by Yer Deletion. The same type of derivation holds for those hosts that end in a vowel: for instance, *ja + m* //ja + mi// 'I' in (66a), *co + m* //co + mi// 'what' in (66b), *ale + m* //ale + mi// 'but' in (66c).

There are four morphemes in Polish that end phonetically in a consonant but are not declinable and thus do not carry inflectional yers. Yet /e/ appears in the cliticized forms. The minimal assumption that we suggest is that these morphemes end in a yer in underlying representation: *jak* //jakĩ// 'how', *tak* //takĩ// 'so', *już* //jużĩ// 'already', and *tam* //tamĩ// 'there'.

We sum up our discussion by looking at the derivation of the cliticized forms *jakem* 'how', *jużem* 'already', and *alem* 'but':<sup>24</sup>

(75) Cycle 1	jakĩ	jużĩ	ale	
	—	—	—	Lower
Cycle 2	jakĩ + mi	jużĩ + mi	ale + mi	WFR: Cliticization
	jake + mi	juże + mi	—	Lower
Postcyclic	jakem	jużem	alem	Yer Deletion

We have shown that the Lexical Cliticization approach offers a solution to the phonological problems raised by clitics. Lexical Phonology requires that these clitics be

<sup>24</sup> Dogil's (1984) analysis of the *e-zero* alternation in the clitics is different. First, he believes that in Lexical Phonology this alternation cannot be accounted for by Lower since Lower is a cyclic rule, whereas the relevant contexts can arise only after the syntax. We have shown that this difficulty can be overcome. Second, he assumes that the gender marker for the preterite masculine singular is zero rather than //ĩ//. Consequently, he cannot account for the surfacing of the yer in forms such as *szed + t* 'he went'; compare the derivation in (72). Third, he interprets the clitic endings as //imĩ// and //isi// (presumably) rather than //mi// and //śi//. This complication in the underlying representation could probably be balanced by the fact that the four morphemes *jak*

derived in the lexicon. Although the supporting evidence from phonology is very strong, it is interesting to discover that the analysis imposed by Lexical Phonology finds confirmation in other areas of the grammar.

First, it happens in substandard Polish that clitics are doubled, which is "incorrect": *aleś powiedziałś* 'but you said' (the doubling of *ś*), *aleście zrobiliście* 'but you (pl.) did' (the doubling of *-ście*; see section 6.2.4), and so forth. These facts are often ridiculed in jokes and speech parody. The doubling of clitics cannot be accounted for in the Movement theory. In the Lexical Cliticization approach it is explained as a violation of the syntactic filter.

Second, as pointed out by Dogil (1984), clitics interact with Indefinite Pronoun Formation, a rule that adds the indefinite morpheme *-ś* to interrogative pronouns (examples are Dogil's):

- (76) *jako* 'how' - *jako + ś* 'somehow'  
*kiedy* 'when' - *kiedy + ś* 'sometime'  
*kto* 'who' - *kto + ś* 'someone'  
*co* 'what' - *co + ś* 'something'  
*gdzie* 'where' - *gdzie + ś* 'somewhere'

Dogil draws attention to the fact that the clitic is inserted before the indefinite pronoun *-ś* (examples again from Dogil (1984)):

- (77) *jako + ś mu po + mog + i + e + m* = *jako + m + ś mu po + móg + i*  
 'I helped him somehow'  
*kiedy + ś to kup + i + i + e + m* = *kiedy + m + ś to kup + i + i*  
 'I bought it sometime'

The facts mentioned by Dogil are a strong argument in favor of Lexical Phonology. The pronoun plus clitic forms in (77) show that Cliticization *must* be a lexical rule. This follows from the observation that Cliticization precedes Indefinite Pronoun Formation, which, like all other word formation rules, belongs to the lexicon:

- (78) Cycle 1      *jako*  
                   no rule applies  
       Cycle 2      *jako + mĩ*      WFR: Cliticization  
                   no rule applies  
       Cycle 3      *jako + mĩ + ś*      WFR: Indefinite Pronoun Formation  
                   no rule applies  
       Postcyclic    *jakomś*              Yer Deletion

'how', *tak* 'so', *już* 'already', and *tam* 'there' need not end in a yer in his theory. However, his representations for the clitics run into difficulty when clitics are attached to hosts ending in a vowel. Thus, for example, *co + m* 'what' plus the 1sg. clitic is //co + i mĩ// in Dogil's theory. How can this theory avoid generating the incorrect \*[co + em] via Lower and Yer Deletion? The only way out is to apply the rule of Vowel Deletion: V → Ø / \_\_\_\_ V. However, this analysis cannot be correct since (i) Vowel Deletion applies to verbs only (Rubach (1984)) and (ii) even when relaxed to apply to all kinds of words, it would delete the wrong vowel, allowing the derivation of \*[c + em] rather than [co + m].

6.2.3. *The Clitic -by.* In this section we look at the clitic *-by* 'would', whose behavior turns out to be quite different from that of the clitics *-m* and *-ś*. We will conclude that *-by* is a syntactic rather than a lexical clitic.

We begin by subjecting *-by* to the same diagnostic rules used for *-m* and *-ś*.

Since *-by* carries no yer, it does not interact with Lower. Unfortunately, therefore, Lower cannot be used as a diagnostic in this case.

Stress Assignment (penultimate stress rule) ignores *-by*. That is, it applies as if *-by* had not been added to the verb: *protest + ɔw + a + t + by* and not \**protest + ow + ɔ + t + by* 'he would protest'.

Raising is not sensitive to the presence of *-by* either. In other words, Raising applies as if *-by* had not been there:

- (79) *m[u]g + t + by* 'he would be able'  
*m[u]g + t* 'he could'  
 but  
*mog + t + e + m* 'I could'

These observations show that *-by* is not present when Stress Assignment and Raising apply. Both rules are (postcyclic) lexical. Consequently, structures of the form verb plus *-by* cannot be found in the lexicon. *-by* must therefore be a syntactic clitic. It is inserted in the syntax, and then Movement or Copying (followed by deletion, Dogil's (1984) House Keeping rule) places *-by* in various positions in the sentence:

- (80) *teraz to z + rob + i + t + by* 'he would do this now' (perfective)  
 = *teraz to by z + rob + i + t*  
 = *teraz by to z + rob + i + t*  
 = *by teraz to z + rob + i + t* (this structure is possible for some speakers only)

The last variant in (80) is a telling example. Observe that *-by* has no host in surface structure. There is no such possibility with the other clitics: *-m*, *-ś* or *-śmy*, *-ście* (to be discussed below). This shows that *-by* indeed has a different status.

Furthermore, *-by* combines with other clitics; that is, it acts as a host: *by + m*, *by + ś*, *by + śmy*, *by + ście*. The combined forms are islands from the syntactic point of view. When moved to a different position in a sentence, they are moved as units, for example:

- (81) *ja to z + rob + i + t + by + m* 'I would do this' (perfective)  
 = *ja to by + m z + rob + i + t*  
 = *ja by + m to z + rob + i + t*  
 = *by + m ja to z + rob + i + t*

This is not surprising. In fact, it is a predictable result. Our Lexical Cliticization rule derives *by + m*, etc., in the lexicon. In other words, it applies to *-by* in the same way it applies to other lexical items (recall the data in (66)).



6.2.4. *The Clitics -śmy and -ście.* The behavior of *-śmy* and *-ście* [śće] is similar to the behavior of *-m* and *-ś*. However, in one testing context *-śmy* and *-ście* seem to act like *-by*.

Subjecting *-śmy* and *-ście* to the same diagnostic rules as before, we find that unfortunately Raising is not applicable in this case. This is because *-śmy* and *-ście* are always separated from the stem by the plural gender markers *-i* and *-y*, as shown in the paradigms in (71). The gender suffixes block the potential application of Raising: for example, *ale mog + l + i + ście* 'but you (pl.) could' = *ale + ście mog + l + i*.

The remaining two diagnostic rules provide evidence that is in part conflicting.

With respect to Lower, we find that the clitics *-śmy* and *-ście* must be added in the lexicon in order to obtain forms such as *jake + śmy* 'how' (1pl.), *jake + ście* (2pl.), *take + śmy* 'so' (1pl.). The plural clitics contain yers in their underlying representations. In (82) we derive *juże + śmy* 'already' and *ale + śmy* 'but':

(82)	Cycle 1	jużi	ale	
			no rule applies	
	Cycle 2	jużi + śimi	ale + śimi	WFR: Cliticization
		juże + śimi	—	Lower
	Postcyclic	juże śmi	ale śmi	Yer Deletion

With respect to stress, words containing *-śmy* and *-ście* show variation: either the antepenult or the penult is stressed.

(83)	rob + i + l + i + śmy	~	rob + i + l + i + śmy
	'we did'		

This variation is conditioned both socially and stylistically. The cultivated form is the one stressed on the antepenult. However, more often than not one hears forms with the penultimate stress, since they are invariably used by speakers of modest education and occasionally even by some of the leading intellectuals of the nation when these speakers are tired, joyful, or sufficiently relaxed to forget the prescriptive norms.

Antepenultimate stressing brings *-śmy* and *-ście* into line with *-by* and may suggest that they should be regarded as syntactic clitics. However, the behavior of *-śmy* and *-ście* with respect to Lower, as well as doubling in uneducated speech (section 6.2.2), swing the balance toward the lexical solution. This means that *robiliśmy* 'we did' in (83) emerges from the lexicon with penultimate stress. The cultivated antepenultimate forms are generated at a cost: either the clitics are optionally extrametrical or there is a rule of stress adjustment.

6.2.5. *Lexicalization.* It is interesting to look at the historical origin of the clitics. Klemensiewicz, Lehr-Spławiński, and Urbańczyk (1955, 370) explain that the preterite clitics derive historically from the forms of the auxiliary 'to be':

(84)	<i>Singular</i>	<i>Plural</i>
1	-m ← jeśm	-śmy ← jesmy
2	-ś ← jeś	-ście ← jeście

For instance, some fourteenth- and fifteenth-century documents contain forms such as the following:

(85)	<i>Archaic form</i>	<i>Gloss</i>	<i>Current form</i>
	wyszedł jeśm	'I went out'	wyszedłem
	jeśm wywiódł	'I proved'	wywiódłem
	radowała jeśm się	'I enjoyed' (fem.)	radowałam się

This contrasts sharply with the current situation. As we have shown, the four preterite clitics must now be derived in the lexicon rather than in the syntax and thus present a case of lexicalization. Given the framework of Lexical Phonology, this is not a surprising phenomenon. It is precisely this framework that is admirably adequate to capture the phonological consequences of lexicalization.

## 7. Conclusion

In this article we have argued for Lexical Phonology as a linguistic model in general and for a three-component version of this model in particular. We have proposed that the standard model of Lexical Phonology should be revised to include a component of post-cyclic lexical rules in addition to the generally recognized components of cyclic lexical rules and postlexical rules.

The rules of each component form blocks with no interspersing of different types of rule (cyclic, postcyclic, and postlexical). This way of viewing the organization of rules increases the predictive power of Lexical Phonology. On the one hand, we can assign rules to components on the basis of the ordering relationships into which they enter. We thereby predict whether the rule should comply with the principle of Strict Cyclicity and what kind of domain it should have. On the other hand, we can predict many cases of ordering once the rules have been assigned to components.

Our proposal that the postcyclic component be recognized as an integral part of Lexical Phonology has been made with the intent of capturing the facts of word-level phonology. There are two types of word-level rules: (i) those that must apply in the lexicon to guarantee that they will not take effect in phrase phonology, and (ii) those that refer to the information "end of a phonological word" in their environments. The latter may apply either in the postcyclic or in the postlexical component.

Clitics seem to be an area where Lexical Phonology is likely to run into difficulties. On closer study, however, this is not so. Our examination of clitics in Dutch and Polish leads to the conclusion that cliticization is in fact a lexical process. More specifically, the clitics that interact with lexical rules are lexical. Others, such as *-by* 'would' in Polish, are indeed syntactic. Historical evidence shows that clitics may tend to move into the lexicon. Once they have been lexicalized, their behavior with respect to a number of rules is entirely predictable in the framework of Lexical Phonology.

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(Booij)

Department of Linguistics  
Vrije Universiteit  
P.O.B. 7161  
1007 MC Amsterdam  
The Netherlands

(Rubach)

Instytut Anglistyki  
University of Warsaw  
ul. Krakowskie Przedmieście 26/28  
Warsaw 64  
Poland