

INVESTIGATIONS INTO POLISH MORPHOLOGY AND PHONOLOGY

by

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Submitted to the Department of Linguistics and Philosophy
in Partial Fulfillment of the Requirements
for the Degree of

DOCTOR OF PHILOSOPHY

at the

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
September, 1988

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ABSTRACT

This study investigates the relationship between morphology and phonology. It addresses two interrelated but distinct questions: first, what are the morphological devices and processes required to generate the input to the phonology, and second, how do the rules of the phonology interact with the morphological structure? Answers to these questions are provided by a detailed examination of the morphology and phonology of Polish. It is argued that morphology is distinct and separate from phonology, and that phonology operates on objects which are created by the morphology. The phonology consists of two distinct components: word-level and phrase-level phonology. The word-level component involves processes that apply word-internally and is organized into two blocks, one of cyclic and the other of noncyclic rules. The phrase-level component involves processes not limited to the word.

The thesis is organized as a series of three studies of particular topics in Polish morphology and phonology. The first study is concerned with the morphological structure of Polish verbs. It is argued that the Polish verb has a four-part constituent structure, consisting of a Class-stem, a Verbalizing Suffix Stem, a Tense Marker Stem, and a Person/Number Stem. The Class-stem, which carries the lexical semantic content of a verb, is specified for membership in a particular inflectional class; inflectional and some derivational properties of a stem are predictable from class membership. It is proposed that word-formation rules which derive denominal or secondary Imperfective Class-stems are conversion rules which change a stem's class membership; these rules may involve concomitant affixation or phonological alternations. The discussion of verbs illustrates the fact that morphological structure is not necessarily isomorphic either with semantics or phonology. For example, Polish prefixes are argued to be phonological words, even though morphologically, they are included in the verb word.

The second study focusses on the cyclic phonological alternations commonly referred to as palatalizations. It is argued that most of the palatalization rules are morphologically, rather than phonologically, conditioned, but that they are nevertheless ordered in the cyclic component of the phonology. Several vowel alternations are shown to be lexically conditioned in that, although they apply in phonologically well-defined environments, they apply in only a subset of forms which meet their structural descriptions. Thus it is concluded that the phonology of Polish is governed by more idiosyncratic behaviour than previous research had assumed.

The third study deals with the processes associated with the orthographic nasal vowels of Polish. Taking into account recent work in hierarchical feature representations and underspecification theory, it is argued that the nasal vowels are underlying nasal diphthongs whose first member is a mid vowel and whose second member is a placeless nasal glide. The similar behaviour of nasal glides and nasal stops is accounted for by assuming that nasal stops can lose their place of articulation specifications. Both the underlying and the derived placeless nasals receive place features by rules of assimilation or by redundancy rules. The nasal processes provide evidence for the noncyclic word-level component and the phrase-level component of the phonology.

Thesis Supervisor: Morris Halle
Title: Institute Professor

This thesis is dedicated to my parents
Jaga Czaykowska and Bogdan Czaykowski

ACKNOWLEDGEMENTS

I wish to thank my thesis supervisor and teacher Morris Halle. Morris and I have argued about almost every idea or analysis in this thesis (as William Blake wrote, "opposition is true friendship"); it has been a privilege to work with him. I have also learned a great deal from the other members of my committee, Donca Steriade and Jim Harris, both about linguistics and about how to write a thesis. I am especially grateful to Morris, Donca, and Jim for their constant encouragement and for the way in which all three of them kept questioning my assumptions and analyses, forcing me to clarify my ideas.

Although they did not contribute directly to the writing of this thesis, I am grateful to several professors from the Universities of British Columbia and of Toronto for introducing me to the field of linguistics and for encouraging me over the years: Sarah Bell, M. Dale Kinkade, Patricia Shaw, and Keren Rice.

It has been exciting to be a phonologist at MIT over the last four years, since there have been so many of us working on similar ideas and asking similar questions. I am especially grateful to Andrea Calabrese, Jennifer Cole, and Loren Trigo for long and involved discussions about phonological theory (and, along the way, about many other things) and to Alicja Gorecka for discussions about Polish. I am also grateful to Harry Bochner from Harvard-down-the-road for several very useful discussions about words.

I would like to thank past and present members of my class for providing camaraderie and support over the last four years—Andrea Calabrese, David Feldman, Alicja Gorecka, Myung Yoon Kang, Betsy Klipple, Sandra Levinson, Kate McCreight Young, Janis Melvold, Betsy Ritter, Marc Ryser, and Loren Trigo—and the many other members of the MIT community, visitors, students and faculty, who were around while I was studying. Janis Melvold and Betsy Ritter have been very dear friends, especially in this last year, and I thank them for their friendship, for brunches, lunches, and teas, and for always being there to listen when I had to complain to someone.

My parents, Jaga and Bogdan Czaykowski, and my brother Piotr Czaykowski have, as always, been a source of strength. Their love and their faith in me (and my mother's frequent phonecalls) helped keep me sane and optimistic, even when things seemed bleak. I owe a special debt to my father for his help with proofreading the Polish, for his endless store of knowledge about Polish, and for his curiosity. Finally, I would like to thank my husband Iain Higgins for believing in my work, for setting a good example by not procrastinating in the writing of his own thesis, and for helping to make the last four years in Cambridge interesting and very happy. This thesis would have been much harder to write without him.

My studies at MIT over the last four years have been funded by a Social Sciences and Humanities Research Council of Canada Doctoral Fellowship; I am grateful to the Council for this essential support.

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LIST OF ABBREVIATIONS

a.	accusative
A / Adj.	adjective
Adv.	adverb
agt.	agentive
aug.	augmentative
C-stem	class-stem
d.	dative
dim.	diminutive
f.	feminine
g.	genitive
ger.	gerund
i.	instrumental
inf.	infinitive
I. / Impf.	imperfective
l.	locative
m.	masculine
m.pl.	masculine plural-personal (virile)
n.	nominative
ne.	neuter
nom.	nominalizer
N	noun
P. / Pf.	perfective
p.	past
ppp	past passive participle
part.	participle
pl.	plural
P/N	person/number
Pres.	present tense
refl.	reflexive
sg.	singular
Sec. Impf. / S.I.	secondary imperfective
sem.	semelfactive
TM	tense marker
V	verb
VS	verbalizing suffix

TRANSCRIPTION AND ORTHOGRAPHY

Transcription

Polish Orthography

č,dž	cz, dž or drz
š,ž	sz, ż or rz
ś,ź,ć,dź,ń	ś,ź,ć,dź,ń and si,zi,ci,dzi,ni
w,ł	ł
v	w
x	ch,h
ę,ø	ę,ø
y	y
u	ó

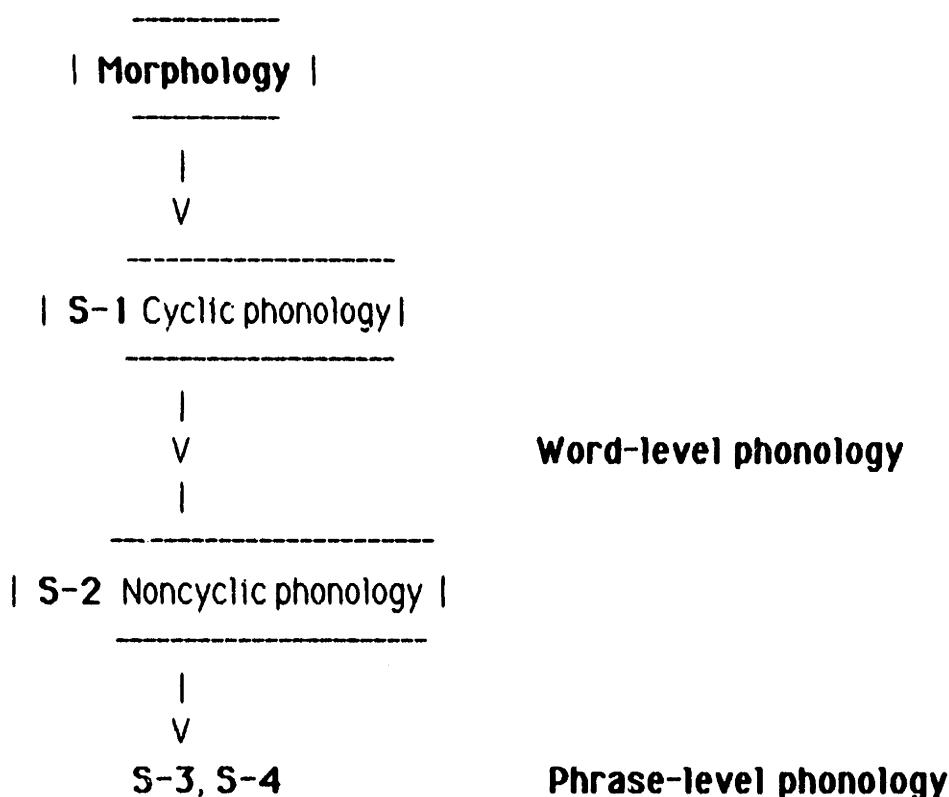
CHAPTER 1

INTRODUCTION

This study investigates the relationship between morphology and phonology. It addresses two interrelated but distinct questions: first, what are the morphological devices and processes required to generate the input to the phonology, and second, how do the rules of the phonology interact with the morphological structure? The answers to these questions are provided by a detailed examination of the morphology and phonology of Polish, a language with both a complex morphological structure and a complex system of morphophonological and phonological alternations. Following recent work by Halle and Vergnaud (1987a,b) and Halle (1987) and returning to assumptions made in the *The Sound Pattern of English* (Chomsky and Halle 1968), I argue that morphology is distinct and separate from phonology, and that phonology operates on objects which are created by the morphology. Again following Halle and Vergnaud, I propose first that the phonology consists of two distinct components—word-level and phrase-level phonology, where the first involves processes that apply word-internally and the latter involves processes not limited to the word—and second that the word-level component is organized into two blocks of cyclic and

noncyclic rules.¹ The model of the interaction of phonology and morphology argued for here is given in (1):

(1)



In (1) the input to the phonology is referred to as "morphology". I shall use this term to refer only to the output of word formation and the lexicon.

¹ In the theory of Lexical Phonology and Morphology (see below), the terms "lexical" and "postlexical" are used to refer to word-level and phrase-level rules, respectively. Although, like Lexical Phonology, I assume that there exists a distinction between rules which apply word-internally and those which apply across words, I shall not use the terms lexical and post-lexical to refer to this distinction; instead, I use the terms word-level and phrase-level, assuming, following Sproat (1985), Halle and Vergnaud (1987a,b), Halle (1987) and others, that the primary distinction between the two types of rules is their domain of application. Lexical Phonology considers that lexical and post-lexical rules are distinguished not only in their domains of application but also in differences between the structure-preserving or cyclic properties of phonological rules, etc. (see (10)).

Clearly the phrase-level phonology operates on structures which have been generated by the syntax but, since I deal almost exclusively with word-level rules here, I will have nothing to say about how the inputs to the phrase-level rules are generated. Phrase-level processes such as the English Nuclear Stress Rule which assigns stress cyclically to phrasal constituents such as *bláck boárd* (see, also Dresher 1983 on Hebrew) and processes such as the Polish nasal place assimilation (discussed in Chapter 4) which applies across the board at the phrase-level suggest that the phrase-level component may have both cyclic and noncyclic strata.

The thesis is organized as a series of three studies of particular topics in Polish morphology and phonology. The first study, presented in Chapter 2, is concerned with the morphological structure of Polish verbs. The second, presented in Chapter 3, focusses on the cyclic phonological alternations commonly referred to as palatalizations. The third study, presented in Chapter 4, deals with the noncyclic processes associated with the orthographic nasal vowels of Polish. The present chapter provides an introduction to the issues discussed in the later chapters and to the assumptions that underlie those discussions.

1. Morphology

Morphological theory has dealt with such issues as what items have lexical entries and how entries are related to each other, how morphological productivity is to be expressed within a theory of word formation, whether derivational and inflectional morphology should be accounted for by the same sorts of formal processes, and whether word formation is a result of

lexical insertion or is accomplished by word formation rules associated with individual affixes. In this section I present some of the assumptions about these issues which underlie my discussion of Polish verbal morphology in Chapter 2.

1.1 Morphological Theory

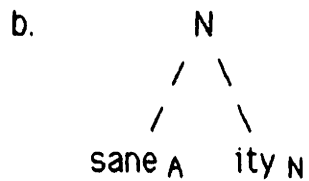
Within generative theory one can broadly distinguish two approaches to morphology: word-based and morpheme-based. The former approach, pursued most thoroughly in Jackendoff (1975), Aronoff (1976), and recently in Bochner (1988), assumes that words and not morphemes are listed in the lexicon and that therefore words are formed from other words.² The latter and more common approach, pursued, for example, in Lieber (1980), Kiparsky (1982a,b), and Selkirk (1983), assumes that morphemes as well as words have lexical entries and that therefore words are formed by putting morphemes together. Even though word-meaning is to some extent compositional, however, many words have idiosyncratic meanings which are not predictable from the sum of their parts. To account for this fact most proponents of the morpheme-based model have suggested that words as well as morphemes are listed in the lexicon. In this thesis I follow the morpheme-based approach, assuming that individual morphemes are listed in the lexicon. In addition, I assume that the lexicon lists not words but what I call class-stems.

² Bochner (1988) even goes so far as to suggest that all formal use of the notion of "morpheme" can be eliminated from the theory of word formation.

Class-stems (C-stems) are stems specified for membership in an inflectional class and thus for a particular lexical category (see Chapter 2). For a language such as English the distinction between class-stems and words is largely obscured by the limited inflectional morphology; since much work in generative morphology has focussed on English, researchers have claimed that words are listed in the lexicon. In a highly inflected language such as Polish in which case, agreement and tense are specified by particular desinential (i.e., word-final) or inflectional morphemes, the idiosyncratic units of the lexicon are not words but rather uninflected class-stems and it is these and not words which are listed.

Morphological information about the kinds of stems an affix is added to, whether it is a prefix or a suffix, and the kinds of properties it contributes to the form that results from its affixation are encoded in lexical entries by means of subcategorization frames and inherent categorial specifications. Given that all this information is in the lexical entries of affixes, Lieber (1980; and references therein) argues that word formation is accomplished by lexical insertion of affixes into binary-branching unlabelled trees subject, of course, to their subcategorization requirements. For example, the English suffix *-ity* has the lexical entry given in (2a) which specifies that it affixes to adjectives and forms nouns; after insertion into a lexical structure, its features percolate up to become features of the derived word:

(2) a. *-ity* [$\text{A}^{\text{---}}$]_N



In Lieber's framework all concatenative morphology is accomplished by lexical insertion (see also Kiparsky 1982b). In contrast, Aronoff (1976) and Kiparsky (1982a), among others, assume that affixation is accomplished by word formation rules, and that subcategorization and categorial information is encoded in the rules themselves:

(3) Insert *-ity* in env. [A—]N

I follow Lieber in assuming that most affixation is lexical insertion. I also argue, however, that some affixation in Polish is not a result of lexical insertion, but is instead accomplished by a specific type of word formation rule which takes class-stems of a particular inflectional class and assigns them to a different class. For example, in the verbal system a change in the aspectual grammatical category of a verb-stem from simple (Im)perfective to Secondary Imperfective is effected by changing the class membership of the verb-stem; Class 1-3 simple verbs become Class 1 stems in the secondary imperfective, whereas Class 4-5 simple verbs become Class 2 stems. In the former case, the change in class membership is accompanied by affixation of the suffix *-i*; in the latter case it may be accompanied by a phonological alternation in the quality of the underlying vowel (see the discussion of Secondary Imperfective formation in Chapter 2).³

³ In the Extended Word and Paradigm Theory (see Anderson 1982, Thomas-Flinders 1981, and Janda 1983), it is claimed that morphemes, rather than being "things" or entities, are rules which can involve substitution, deletion, addition, and permutation of phonological material. The

In a framework which assumes that all word formation, including affixation, is accomplished by rules, these rules may serve a dual function as redundancy rules which analyze already existing words and encode generalizations about the relations between words and morphemes and as generative rules which can be used to create new words (see Aronoff 1976, Selkirk 1983, Mohanan 1986). In a framework such as the one assumed here, in which most word formation takes place by lexical insertion, it is necessary to postulate distinct redundancy rules to represent relations between lexical entries. It is, however, beyond the scope of this thesis to discuss the properties of redundancy rules.

Most of the early work in generative morphology excludes inflectional morphology, assuming that grammatical distinctions such as case, person, number, gender, etc., should be represented in the syntax by syntactic features. Before the application of phonological rules, the syntactic features are converted into segmental material by so-called readjustment rules (see also Anderson 1982 for a related, although distinct, approach). Lieber (1980) argues, however, that there is no clear-cut distinction between inflectional and derivational morphology and that the formal devices needed to account for inflection are the same as those needed to account for derivation. In this thesis I assume, following Lieber, that inflectional morphemes as well as derivational morphemes have lexical entries and morphological subcategorization frames. Inflectional

class-changing rules that I propose in Chapter 2 for secondary imperfective formation could perhaps be viewed as examples of morphemes which are rules rather than "things," if one assumed that the grammatical category of secondary imperfective is actually assigned by the word formation process. If, however, one assumes that the grammatical category is assigned by independent aspectual rules, then it is not necessarily the case that the rule is a "morpheme." In this thesis I assume that morphemes are entities.

morphemes like derivational morphemes trigger rules of the word-level phonology. We must therefore assume that at the point at which the word-level phonological rules apply, the inflectional as well as the derivational morphemes are available to the phonology. I leave open the question of whether the inflectional morphemes are affixed in the morphology or the syntax. Let me emphasize, however, that the combinations of inflectional morphemes found in the different conjugation classes of Polish are governed by restrictions on morphological structure and not by principles of the syntax. For instance, the fact that *-m* '1st sg., pres.' affixes only to stems ending in the verbalizing suffix *-aj*, and that *-ę* is the '1st.sg., pres.' morpheme used with stems ending in all other verbalizing suffixes is dependent on morphological subcategorization requirements.

As we will see in Chapter 2, the verbs of Polish belong to different conjugation classes; membership in a particular verb class is signaled by the form of the verbalizing suffix that a verb-stem takes. Two possible hypotheses about how verb class membership is represented are first, to assume that there is a system of diacritics marking both roots and verbalizing suffixes, and that verbalizing suffixes are affixed only to roots whose diacritic markings are compatible with their own and, second, to assume that each stem is listed in the lexicon along with each related root, and that the relationship between them is represented by some kind of morpholexical rule which defines the verb class. This latter hypothesis is proposed in Lieber (1980). Lieber argues against the hypothesis that roots should be diacritically marked for class membership, claiming a) that the necessary diacritics could not help but be arbitrary, and b) that a model in which idiosyncratic stems are listed in the lexicon predicts that both types of stems should be available for derivational word-formation, a prediction

which the diacritic hypothesis does not make but which seems to be correct. In Chapter 2 I claim that even if one lists stems in the lexicon it is essential to use diacritics to distinguish the different verb classes. My claim is based on the observation that rules of secondary imperfective formation make crucial reference to verb class, reference which can be made only by means of diacritics.

Finally, in my discussion of the morphology of Polish verbs in Chapter 2, I illustrate a well-known fact about morphology, namely that morphological structure is not necessarily isomorphic either with semantics or with phonology. For example, I argue that Polish prefixes are phonological words, even though morphologically, they are subcategorized to affix to verb C-stems.

1.2 Polish Morphology

Most work on Polish morphology has been in the traditional and structuralist frameworks, and has focussed on establishing semantic-morphological classifications of different categories of lexical items (see, for instance, Grzegorzczkova 1972, Grzegorzczkova and Puzynina 1979, Grzegorzczkova et al. 1984, Satkiewicz 1969, Piernikarski 1969). Generative work on Polish morphology consists for the most part of articles and dissertations written in the 1980's. Szymanek (1985a; based on a 1981 dissertation), for instance, examining adjective formation in Polish (and English), argues that Aronoff's (1976) "one affix, one rule" hypothesis which postulates that every affix is associated with one word formation rule, cannot account adequately for processes of adjectivization. Following Laskowski (1981), he suggests that word formation should be separated into

derivation and affixation, where the former creates semantico-syntactic units that can be represented by several different suffixes.⁴ Several articles on Polish word formation are included in two volumes edited by Gussmann (1985, 1987). Górska (1985) discusses the suffix *-arni* 'locative' which triggers palatalization of a preceding stem-final consonant in some words but not in others, and proposes that in the environment of [+anterior] stems this suffix undergoes an extension-allomorphy rule that inserts a morpheme *-i-* before it (see also Szymanek 1985b for a discussion of inter-morphemic extensions). Malicka-Kleparska (1985, 1987) is concerned with the difference between the notions of Conditional and Permanent Lexicon (see Allen 1978), arguing that word formation rules overgenerate in that they derive forms which are well-formed semantically and morphologically and are thus included in the Conditional Lexicon; whether these forms enter the Permanent Lexicon depends on such lexical factors as the existence in the Conditional Lexicon of a different form with identical semantic and syntactic properties.⁵ Szymanek (1987) argues that some denominal adjectives in Polish have lexical entries, whereas others are derived by word formation rules. Three papers discuss the interaction between phonology and morphology. On the basis of an analysis of the imperative,

⁴ Polish deverbal "adjectives of possibility", for example, are formed by means of the suffixes *-alny*, *-tly*, *-liwy*, *-ny*, *-alny* and a few other very unproductive suffixes (only the final suffix is productive):

(i)	a.	czytać	'read'	czyt+alny	'readable'
	b.	pić	'drink'	pi+tly	'potable'
	c.	łupać	'fissure'	łup+liwy	'fissile'
	d.	kosić	'mow'	koś+ny	'mowable'
	e.	odwracać	'reverse'	odwrac+alny	'reversible'

⁵ Malicka-Kleparska (1985) examines Polish diminutives which potentially can be formed by means of two suffixes *-ek* and *-ik*. Some nouns can have diminutives in both suffixes; other nouns form diminutives only in *-ek* and still others only in *-ik*.

Rubach (1985b) claims that word formation and allomorphy rules must be ordered before any phonological rules apply; Nykiel-Herbert (1985) examines morphological factors which seem to affect the e~∅ alternation in prefixes; and Szpyra (1987b) argues that morphologically simple forms are subject to "linear application of phonological rules," whereas complex forms such as secondary imperfective verbs and deverbal nouns possess a morphological structure which may allow "multiple application" of phonological rules.

Szpyra and Laskowski are the only two authors known to me who discuss the complex morphology of verbs within a generative framework, both of them providing analyses of secondary imperfective formation (Laskowski 1975b, Szpyra 1987). However, their proposals about verbal structure and about secondary imperfective formation differ from those made below in Chapter 2. In that chapter, I propose that Polish verbs have the four part constituent structure given in (4),

(4) Constituent Structure of the Verb

[[**TM** [**VS** [**v** (Prefix) [C-stem] **v**] (VS) **VS**] (TM) **TM**] P/N]

C-stem=root or derived stem
 VS=verbalizing suffix
 TM=tense, infinitive, participle
 P/N=person, number, gender

and that verbal affixes are subcategorized to attach to particular constituents of the verb. The C-stem, whether it is an underived or a derived verbal root or stem, or a denominal or deadjectival derived stem, is the basic lexical/semantic unit of the verb and is marked as belonging to

the category of Verb. Polish verb-stems fall into a number of different derivational and conjugational classes. The class of a verb C-stem can be determined most clearly from the verbalizing suffix that appears in its infinitive or 3rd pl. pres. form (cf., *-a* in *pisać* 'write,' *-i* in *prosić* 'ask'). Since the form of the verbalizing suffix and thus the class of any one verb-stem is unpredictable, class membership must be marked in the verb's lexical entry. However, once the class of a verb-stem is determined the forms that that verb-stem can take when conjugated are predictable. For instance, knowing that a verb-stem such as *pis* 'write' takes the verbalizing suffix *-a* (and hence belongs to Class 1) determines that the present tense connecting morpheme *-e* is affixed to the verbalizing suffix stem thus creating a TM-stem ending in [e], whereas knowing that *pros* takes the verbalizing suffix *-i* determines that the present tense connecting morpheme is *-i*.

Laskowski (1975b, and Szpyra 1987b following Laskowski) assumes that class membership is specified by listing in each lexical entry the root and the verbalizing suffix associated with that root. For them, lexical entries of verbs thus consist of at least two morphemes: the root and the associated verbalizing suffix. It is this polymorphemic lexical entry which constitutes the verb and which serves as the input to further word formation. The resulting morphological structures and the morphological and phonological rules needed to derive the correct surface forms of the verbs are, I argue, excessively complex (see Chapter 2). Therefore, in contrast to Laskowski and Szpyra, I propose that the classes of verbs (and of nouns) are represented by diacritics and that class-marking verbalizing suffixes are not present in lexical entries but rather affix to appropriately marked verb-stems. While the morphological structures that result from

my assumptions are also complex, the rules and the ways in which they apply to derive the surface forms are considerably simplified.

2. Phonology

The traditional view that phonology takes as input fully formed morphological and syntactic structures was taken over in *SPE* (Chomsky and Halle 1968) and was assumed to be more or less correct throughout the 1970's. However, one of the more influential developments in generative morphology, namely, Siegel's (1974) proposal that blocks of affixation rules are ordered among the rules of the phonology, opened the way to the exploration of the lexicon as a module that contains both morphological *and* phonological rules and subsequently led to the development of the theory of Lexical Phonology (Pesetsky 1979, Kiparsky 1982a,b, 1986, Mohanan 1982, 1986, Pulleyblank 1986, Halle and Mohanan 1985, etc). Most recently, Halle and Vergnaud (1987a,b) and Halle (1987) have argued that the hypothesis that morphology and phonology are ordered in the same module of grammar cannot be correct, and have proposed the model given in (1) above in which morphology and phonology are distinct.

One of the observations made as early as *SPE* (Chomsky and Halle 1968) is that some phonological rules apply only once in a derivation, whereas others seem to follow morphological constituent structure and thus to apply step by step. Subsequent to *SPE*, there was considerable discussion about the properties of and distinctions between the two types of rules—referred to as noncyclic (or postcyclic) and cyclic, respectively (see below for definitions); the discussion involved such questions as what

kinds of rules are cyclic, how the two types of rules are ordered with respect to each other, whether cyclic rules are constrained by the Strict Cycle Condition, and if so whether all cyclic rules are so constrained (see, for example, Brame 1974, Kisseberth 1973, Kean 1974, Mascaro 1976, Halle 1978, Pesetsky 1979, Kiparsky 1982a, 1986). Within Lexical Phonology, for example, there has been discussion about whether all and only cyclic rules are lexical (word-level); and there is general agreement that cyclic and noncyclic rules are organized into blocks of rules, although there have been different claims made about the number and organization of these blocks. Again, most recently, Halle and Vergnaud (1987a,b) have claimed that the phonology is organized into blocks of word-level cyclic and noncyclic rules and phrase-level cyclic and noncyclic rules, and that at each level the cyclic-rule component is ordered before the noncyclic component.

2.1 Cyclicity

Cyclic phonological rules are rules that apply in cycles to the layers of constituents created by the morphology, starting with the innermost constituents and proceeding outward. Such rules are generally assumed to be constrained by the Strict Cycle Condition (Mascaro 1976, Halle 1978, Kiparsky 1982a, 1986) which, simply stated, means that cyclic rules apply on any given cycle only if their structural description has been derived on that cycle. In Polish, for instance, a cyclic rule that epenthesizes a vowel before a stray consonant applies in the derived environment before the *-k* of the diminutive morpheme in (5a) but does not apply before [k] in (5b); in (5b) the [k] is part of the root morpheme and therefore the environment in which epenthesis might apply is not derived.

- (5) a. las+k lasek 'small wood'
 b. blask blask 'glare'

In this thesis I shall assume the version of the Strict Cycle Condition given in Halle (1978) and assumed also in Rubach (1984):

(6) Strict Cycle Condition

"A cyclic rule R applies properly on cycle j only if either (a) or (b) is satisfied:

- (a) R makes specific use of information, part of which is available on a prior pass through the cyclic rules, and part of which becomes first available on cycle j. There are three separate cases subsumed under (a). R refers specifically to some A or B

In:

- (i) [_j XAY ... [_{j-1} ... B ...] Z];
 (ii) [_j Z [_{j-1} ... B] XAY];
 (iii) [_j X [_{j-1} ... A] Y [_{j-1} ... B ...] Z];

- (b) R makes specific use of information assigned on cycle j by a rule applying before R."

The Strict Cycle Condition ensures that a cyclic rule will apply on a particular cycle only in an environment which has been derived by prior application of a phonological rule on that cycle or by the accessing of new morphological material. It prevents cyclic rules from applying on the first cycle of a word and, in addition, from applying within the domain of individual affixes. In Polish, for instance, the cyclic rule of epenthesis is blocked from applying in the environment of [k] in the form in (7) because this environment is morpheme-internal and consequently does not fit any of the definitions of derived environment given in (6):

- (7) ćel+sk ćelsk 'body, aug., g.pl.'

Not all cyclic rules are necessarily considered to be subject to the Strict Cycle Condition. Kiparsky (1982a) suggests, for instance, that cyclic structure-building rules may apply in underived environments and are thus not prevented by Strict Cyclicity from applying in morpheme-internal environments. Rules such as syllabification and stress assignment in languages in which syllable structure and stress are not distinctive are structure-building rules. Application of syllabification or stress assignment rules in these languages provides (builds) structure, but does not change existing structure (at least not on the first cycle). In contrast to structure-building rules, according to Kiparsky, cyclic structure-changing rules are always prevented from applying morpheme-internally and on the first cycle, because such rules generate structures which are distinctive. The Polish epenthesis rule is structure-changing, since in underlying representations we find distinctions between forms such as /lik'er/ (*l'ik'er* ~ *l'ik'eru* 'liqueur') vs. /cukr/ (*cuk'er* ~ *cukru* 'sugar') or /p's/ (*p'es* ~ *psa* 'dog') vs. /b'es/ (*b'es* ~ *b'esa* 'devil'). Structure-changing cyclic rules may apply in a morphologically underived environment, if a structure-building rule has previously applied to create a phonologically derived environment.

Noncyclic rules are not subject to the Strict Cycle Condition and thus may apply in underived environments. At the point at which they apply, therefore, they may take as their domain of application morpheme-internal and derived environments. One of the noncyclic rules of Polish derives [y] from an underlying /i/ in the environment of a preceding non-front consonant such as /t/. As (8) illustrates we find sequences of [ty] both morpheme-internally (8a) and in morphologically derived environments (8b):

- (8) a. tydzień 'week'
 b. kot+i koty 'cat, n.pl.'⁶

2.2 Lexical Phonology and the Ordering Hypothesis

In *SPE*, Chomsky and Halle (1968) distinguish two types of affixes in English: those associated with a '+' morpheme-boundary which determine the stress of the derived word in which they appear (e.g., *-al*, *-ity*), and those associated with a '*' word-boundary which are stress neutral in that they do not change the stress of constituents to which they are affixed and themselves do not receive stress (e.g., *-hood*, *-ness*; cf. *párent*, *paréntal*, *párenthood*). It was the distinct phonological properties of these two types of affixes that led Siegel to propose that they be placed into distinct blocks or strata of affixation rules and that phonological rules such as the stress-rule of English be ordered between the two strata. Stress is thus assigned to the outputs of affixation processes ordered before the stress rules apply (namely, to the outputs of +-boundary affixation), whereas it is not assigned to outputs of affixation processes ordered after the stress rules (namely, to the outputs of *-boundary affixation).

The assumption that both word formation and phonological rules are ordered in the lexicon and function in tandem, with the former supplying the input to the latter, is common to all versions of Lexical Phonology. The phonological rules ordered within the lexicon are called lexical rules.

⁶ Although the n.pl. morpheme *-i* is a front high vowel in underlying form, no palatalization takes place in the environment of this morpheme (see Chapter 3 for justification of this claim). Consequently in the noncyclic component the rule retracting /i/ to [y] can apply.

Lexical rules always apply within the domains of words and not between words. Rules which apply across words (as well as within words) are called post-lexical. In addition to the distinction in domains of application, different researchers have postulated several other distinguishing properties for lexical and post-lexical rules. A summary, taken from Pulleyblank (1986), of proposed differences between the two sets of lexical and post-lexical rules, is given in (10):

(10)	LEXICAL	POST-LEXICAL
	a. may refer to word-internal structure	a. cannot refer to word-internal structure
	b. may not apply across words	b. may apply across words
	c. may be cyclic	c. cannot be cyclic
	d. if cyclic, then subject to strict cycle	d. noncyclic, hence across-the-board
	e. structure-preserving	e. need not be structure-preserving
	f. may have lexical exceptions	f. cannot have lexical exceptions
	g. must precede all post-lexical rule applications	g. must follow all lexical rule applications

All versions of Lexical Phonology assume that the lexicon is organized into several strata, although they differ in such matters as how many lexical strata of morphological and phonological processes they postulate (Kiparsky 1982a, for instance, postulates that English has three lexical strata, whereas Halle and Mohanan 1985 postulate four), and in whether they assume that lexical strata can be cyclic or noncyclic.

Kiparsky (1982a) and Mohanan (1982) postulate that all lexical strata and thus all lexical phonological rules are cyclic; cyclic rule application is automatic given the assumption that lexical phonological rules apply to the output of every morphological process. Halle and Mohanan (1982) and Mohanan (1986) argue, however, that some strata may in fact be noncyclic; on a noncyclic stratum the rules are postulated to apply only once after all the morphological processes have applied on that stratum.

While Lexical Phonology has been the predominant model of morphology and phonology in North American work in generative phonology throughout the 1980's, its assumptions and claims have been subjected to criticism for several years. The most serious criticism of Lexical Phonology is that it makes incorrect predictions both about the ordering of affixes within words and about the relationship between the structures required by the morphology and by the phonology. In the latter case—since in Lexical Phonology, phonological rules are postulated to be ordered among the word formation processes—it is predicted that the domains within which the phonological rules apply should be isomorphic with the domains created by the word formation rules.

As Siegel (1978) points out, one consequence of analyzing the affixes of English into blocks is the ordering hypothesis: namely, that the stress-neutral affixes should always be attached to constituents that are external to constituents containing stress-sensitive affixes. And indeed in many cases the stress-neutral suffixes do occur outside the stress-sensitive suffixes, whereas the reverse order is disallowed. Thus, for example, while the stress-neutral suffix *-ness* is added after both the stress-sensitive *-al* and the stress-neutral *-ed* in words such as those in (11), the stress-

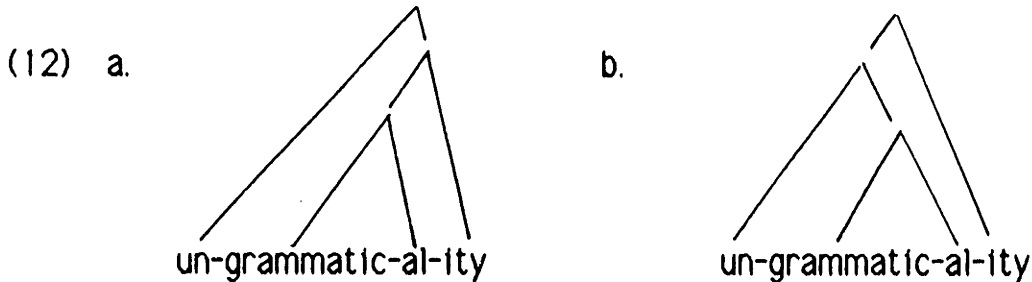
sensitive *-ity* in (11b) can occur only after the stress-sensitive *-al*, but not after the stress-neutral *-ed* (examples are taken from Halle 1987):

- | | | | |
|-----|----|-----------------|--------------|
| (9) | a. | gradualness | guardedness |
| | | grammaticalness | wretchedness |
| | b. | graduality | *guardedity |
| | | grammaticality | *wretchedity |

As early as 1976 (Aronoff 1976), however, it was pointed out that the ordering hypothesis is basically incorrect (see also Aronoff and Sridhar 1983). For example, although *-ity* is a stress-sensitive suffix, it can be affixed to stems ending in stress-neutral suffixes (e.g., *pátentability*; cf. *pátent*, *pátentable*). Furthermore, affixation of *-ity* is followed by the application of the rules of stress-assignment (as the assignment of stress to the final syllable of *-able* shows), even though, according to the organization of the strata initially proposed by Siegel to account for the lack of stress-assignment in the environment of stress-neutral affixes, stress-assignment should not apply after the affixation of stress-neutral affixes (e.g., *pátentable*).

Another counterexample to the ordering hypothesis is provided by words like the English *ungrammaticality*. In this word the phonological behaviour of the prefix *un-* has led researchers to postulate that it belongs together with stress-neutral affixes such as *-ness* or *-hood*, and thus should be ordered outside stress-sensitive affixes such as *-al* or *-i-y*; *un-* is opposed to *in-*, a prefix which from the point of view of phonology belongs with the stress-sensitive affixes (e.g., *in-* undergoes nasal assimilation as in *if[ŋ]complete*, whereas *un-* does not). The word *ungrammaticality* thus has the constituent structure given in (12a), as

required by the phonology. But morphological restrictions on the behaviour of this same prefix *un-* require that it be attached to an adjective *grammatical*, and thus require the constituent structure in (12b):



ungrammaticality is an example of what has been called a *bracketing paradox*: a case in which, contrary to the predictions of Lexical Phonology, morphological and phonological structure are not isomorphic.^{7, 8}

One proposal that has been made to account for counterexamples to the ordering hypothesis is that it is possible to "loop" back to an earlier stratum after application of the rules on a later stratum (Mohanan 1982). Halle (1987) argues, however, that adoption of this proposal either results in the derivation of incorrect surface forms, or leads to the conclusion that morphology and phonology must be separate.

Consider again the two types of English affixes. The rules of stress-assignment are cyclic rules in English. It has thus been assumed that the stress-sensitive suffixes in whose environments the stress rules apply are cyclic affixes, whereas the stress-neutral ones are not (see, for instance,

⁷ Fabb (1986) points out that the ordering hypothesis does not account on its own for the restrictions on affix sequences in English. He proposes other constraints which determine the cooccurrence possibilities of English affixes, and argues that once these other constraints are recognized, the ordering hypothesis becomes superfluous. Thus, even as a constraint on affix combinations the ordering hypothesis is inadequate.

⁸ See Pesetsky (1979, 1985), Sprout (1985), Halle and Vergnaud (1987a,b) for discussion of and postulated explanations for bracketing paradoxes.

Halle and Mohanan 1985, Halle and Vergnaud 1987a,b). In the framework of Lexical Phonology, it is hypothesized that the stratum on which the stress-sensitive suffixes are ordered is a cyclic stratum and that the rules on this stratum apply after each affixation rule, whereas the stress-neutral suffixes are ordered on a noncyclic stratum; on the noncyclic stratum the phonological rules apply in a block only after all the affixation processes have taken place. Given Siegel's ordering hypothesis, the cyclic stratum is Stratum 1, and is ordered before the noncyclic stratum, Stratum 2. In the case of a word like *patentability*, *-able* is a Stratum 2 affix, whereas *-ity* belongs to Stratum 1. Consequently, in deriving this word, one can assume that after the affixation and phonological rules of Stratum 2 have applied, it is possible to "loop" back to, or return to Stratum 1 to affix *-ity* and to apply the cyclic stress-rule. Assuming that looping occurs raises the following question, pointed out in Halle (1987): in looping back to a cyclic stratum from a noncyclic stratum how do we apply the phonological rules? Do we delay the application of the phonological rules of the noncyclic Stratum 2 until after the application of the cyclic rules of Stratum 1, or do we apply the noncyclic rules on Stratum 2 and then, in going back to Stratum 1, apply the cyclic rules? As Halle shows, if we adopt the latter alternative incorrect results are obtained. English has a noncyclic and therefore Stratum 2 rule of l-velarization which velarizes a syllable-final [l]. In a form like *patentable*, the final [l] is velarized since it is syllable-final. In *patentability*, however, [l] is not velarized since it is not syllable-final. But if we assumed the hypothesis that, before looping back to Stratum 1 from the noncyclic Stratum 2, the noncyclic rules apply, then [l] should surface as velarized as it is syllable-final in the Stratum 2 constituent *patentable*. Since no velarization applies, we can conclude that this hypothesis about

how the rules apply is incorrect. However, if we adopt the hypothesis that the noncyclic rules do not apply in Stratum 2, but are delayed till after the application of the cyclic rules of Stratum 1, then we are undermining the central hypothesis of Lexical Phonology that word formation and phonological rules apply in tandem, because on Stratum 2 phonological rules do not apply and therefore are in essence not associated with the noncyclic word formation processes. Halle concludes that since, to derive correct surface forms in cases such as *patentability*, we need to adopt the hypothesis that the noncyclic rules apply only after all the cyclic rules, we are led to adopt a pre-Lexical Phonology model of grammar in which morphology and phonology are distinct components.

Adopting the hypothesis that morphology and phonology are distinct components does not force us to abandon the hypothesis that some morphemes trigger cyclic rules while others do not. Halle and Vergnaud (1987a,b) and Halle (1987) suggest in fact that cyclicity is a diacritic property of individual affixes. For each affix it is necessary to learn whether or not it is cyclic; cyclic affixes trigger cyclic rules, noncyclic affixes do not. Instead, noncyclic rules apply in a block after all cyclic rules have applied. The hypothesis that each affix is specified for cyclicity predicts that cyclic and noncyclic affixes should be able to apply in any order within a word, and thus predicts that the constituent structure required by the morphology need not be isomorphic with that required by the phonology.

2.3 Polish Phonology

Polish has nine different types of palatalizations affecting labials, coronals and velars and five types of vowel alternations.⁹ Perhaps as a consequence of the complexity of the phonological alternations, there have been considerably more studies of the phonology of Polish within the generative framework than studies of morphology. Of these the most influential longer works have been Lightner (1963), Steele's Harvard dissertation (1973), Laskowski (1975a), Gussmann (1980), and Rubach (1981, 1984) (see References for other references). The discussion in this section will focus on the work of Gussmann and Rubach, since to a great extent this thesis has grown out of and in response to their work.

Gussmann (1980) argues that a number of phonological alternations in Polish can be explained if it is postulated that Polish has two abstract underlying lax high vowels (or yers, as they are often called). His most important claim is that the $e \sim \emptyset$ alternation seen in forms such as *cuk'er~cukru* is due to the presence of an underlying lax high vowel which surfaces if it is followed by another lax high vowel, and otherwise is deleted. In addition, he considers the presence of stem-final palatalized consonants preceding seemingly consonant-initial suffixes (e.g., in forms like *ręk+nik→ręćnik*) to be due to the underlying presence of a suffix-initial lax high vowel. Finally, he claims that various vowel alternations, such as that between the orthographic nasal vowels $ę \sim ǫ$, are triggered by lax high

⁹ The term palatalization is used as a cover term for several different types of consonant alternations: labials become fronted as a result of palatalization; dento-alveolar coronals either become prepalatal or alveopalatal; and velars become dento-alveolar affricates or alveopalatal segments. The underlying segments of Polish are given in S3 of this chapter; the palatalizations are described in S1 of Chapter 3.

vowels (in fact, he argues that nasal vowels are underlying lax high vowel +nasal consonant sequences). In Chapter 3 and 4 I present alternative analyses of these phonological processes which do not assume the presence of underlying lax high vowels: e~o alternations, for instance, are argued to be the result of epenthesis and the nasal vowels are claimed to be underlying vowel plus nasal glide diphthongs.

Rubach (1981, 1984)¹⁰ follows Gussmann in postulating that there are underlying abstract lax high vowels. His analysis of Polish differs from Gussmann's, however, in that Gussmann assumes that all the phonological rules of Polish apply noncyclically, whereas Rubach argues that Polish has both cyclic and noncyclic (his post-cyclic) rules, and that the cyclic rules are subject to the Strict Cycle Condition. Rubach (1981, 1984) is cited in works such as Kiparsky (1986) as evidence in favour of the validity of the notions of cyclic and Strict Cyclic rule application.

Szpyra (1985) and Gussmann (1985), in polemical reviews of Rubach (1981) and (1984) respectively, strongly disagree with Rubach's claims that Polish has cyclic rules. Both of them argue that since, in a cyclic model, morphology and phonology are so closely linked, the fact that Rubach does not explicitly formalize word formation rules undermines his claims about the cyclic nature of the phonological rules. Although there are several forms in which Rubach's assumptions about the morphological structure of particular words are in fact controversial, in most cases the division into morphemes provided by Rubach is accepted in traditional and generative analyses of Polish. To take one example, Gussmann questions Rubach's division of the infinitive of 'write' into three morphemes *p'is+ɔ+c'* Instead

¹⁰ Rubach (1981) is an earlier version of Rubach (1984).

of into two-*p'isa+c*. In view of the existence of such words as *p'ismo* 'handwriting' or *rekoop'is* 'manuscript' based on the root *p'is* 'write', Gussmann's questioning of Rubach's morpheme division in this case is rather surprising. Gussmann and Szypra also point out several forms in which putatively cyclic rules seem to apply noncyclically. For instance, in *każew~karwa* 'dwarf', palatalization of the liquid [r] occurs even though the form is monomorphemic and the rule is claimed by Rubach to be cyclic.¹¹ Again, while there are undoubtedly cases of this sort in Polish, in which cyclic rules seem to be applying morpheme-internally, the alternative hypothesis, that Polish has no cyclic rules leads to a great many more exceptional cases, since, as Szypra herself points out, there are many cases in Polish where palatalization could be expected to apply morpheme-internally, but does not (e.g., *sen* 'dream', *kelner* 'waiter', etc.; see chapter 3 for discussion of these cases). The lack of morpheme-internal palatalization in such cases is predicted if one assumes that the palatalization rules are cyclic, but if one assumes that the rules are noncyclic the forms become exceptional.

It is not my purpose here to provide a critique of Gussmann and Szypra's arguments against Rubach. My response to their claims is embodied in my analysis in Chapter 3 of many of the same rules as those discussed both in Gussmann (1980) and in Rubach (1984). On the basis of my analysis,

¹¹ This form can be considered to be an example of a cyclic rule applying morpheme-internally only in a framework which assumes that there are underlying lax high vowels. On the assumption that the e-ø alternation is due to epenthesis the alternating [r] must be considered to be underlyingly palatalized /r'/. The reason for this is as follows: in this particular form the epenthesized [e] is inserted noncyclically (epenthesis is both a cyclic and a noncyclic rule; see Chapter 3) and therefore the palatalization of /r/ cannot be triggered by epenthesis and cannot be the result of a cyclic rule. But since palatalization is not noncyclic, the palatalization of /r/ in this case is also not the result of a noncyclic rule. Consequently /r'/ must be underlying.

I conclude that Polish indeed has cyclic rules, but that most of them, and in particular, most of the palatalization rules, are morphologically rather than phonologically conditioned. The evidence for this claim comes from the observation that the palatalizing properties of suffixes are independent of their phonological form: some front-vowel initial suffixes trigger palatalization while others do not, and, similarly, some consonant-initial and back-vowel initial suffixes trigger palatalization while others do not. I argue that in spite of the morphological conditioning of these rules, several of them are ordered after rules which are clearly cyclic and subject to Strict Cyclicity, and therefore that the morphologically conditioned rules must themselves be cyclic. I also argue that a number of rules whose environments are clearly phonological are nevertheless lexically conditioned in that they only apply in a subset of forms which meet their structural descriptions. Chapter 3 explores, in addition, several alternative phonological analyses of the palatalization properties of Polish affixes. I consider the possibility that the morphemes in whose environments palatalizations occur have a floating feature; I also consider the possibility that the distinction between morphemes which trigger palatalization and those which do not is a distinction between cyclic and noncyclic affixes. In both cases, the extent and nature of the idiosyncrasies associated with the palatalizations leads me to conclude that under either of these alternatives it would still be necessary to list structural changes effected by the palatalization rules in particular morphological environments, and therefore that assuming either a floating feature or a cyclic/noncyclic distinction in the morphemes simply adds to the complexity of the grammar of Polish. While I do not claim that Polish lacks noncyclic affixes, I do suggest that since we know that many of its affixes

are cyclic, the null hypothesis in the case of Polish is to assume that all of the affixes are cyclic. At present I know of no evidence disproving this hypothesis. Finally, I consider the possibility that the palatalization rules are actually morphological and not phonological rules by examining the consequences of adopting an analysis of palatalization similar to one given in Spencer (1986, 1988). I conclude that such an analysis makes it difficult to state the generalizations concerning the morphological structure of verbs given in Chapter 2.

Rubach (1984) postulates that in addition to the cyclic rules, Polish also has postcyclic rules which apply across the board in underived environments. Rubach and Booij (1987) argue that the postcyclic rules are of two types: those that apply noncyclically within words and are thus word-level or, in the terms of Lexical Phonology, lexical rules, and those that apply post-lexically, or at the phrase-level. My work confirms that there are indeed cyclic and noncyclic word-level and phrase-level phonological rules in Polish. The evidence for a distinction between noncyclic word-level and phrase-level rules is presented in Chapter 4, where I argue that at the phrase-level processes of nasal assimilation cannot affect word-final nasal glides because these glides become fully specified in the noncyclic component of the phonology.

The evidence presented in this thesis that the phonological component is distinct from the morphological component comes from two sources. The first is the well-known and I think uncontroversial observation that the semantics and phonology of words is not isomorphic with the morphological structure. Since a model such as Lexical Phonology predicts that isomorphism should exist, the fact that this isomorphism so clearly does not exist is evidence against the Lexical Phonology model. In Polish the clearest lack of

isomorphy between phonology and morphology is found in verbs. Morphologically, prefixes are part of the verb-word, but phonologically they function as distinct words—only phrase-level rules apply between a prefix and the stem to which it is affixed. The second source of evidence is the fact that in at least some cases lexical entries must be assumed to be bimorphemic, but the cyclic rules nevertheless treat the environment created by the concatenation of the two morphemes as derived. In particular, the idiosyncratic semantic and grammatical properties of prefix+verbal root combinations require that such combinations be listed as entries in the lexicon, yet in those cases in which prefixes function as affixes, they trigger the application of cyclic rules.¹²

3. The Underlying Consonant and Vowel Inventories

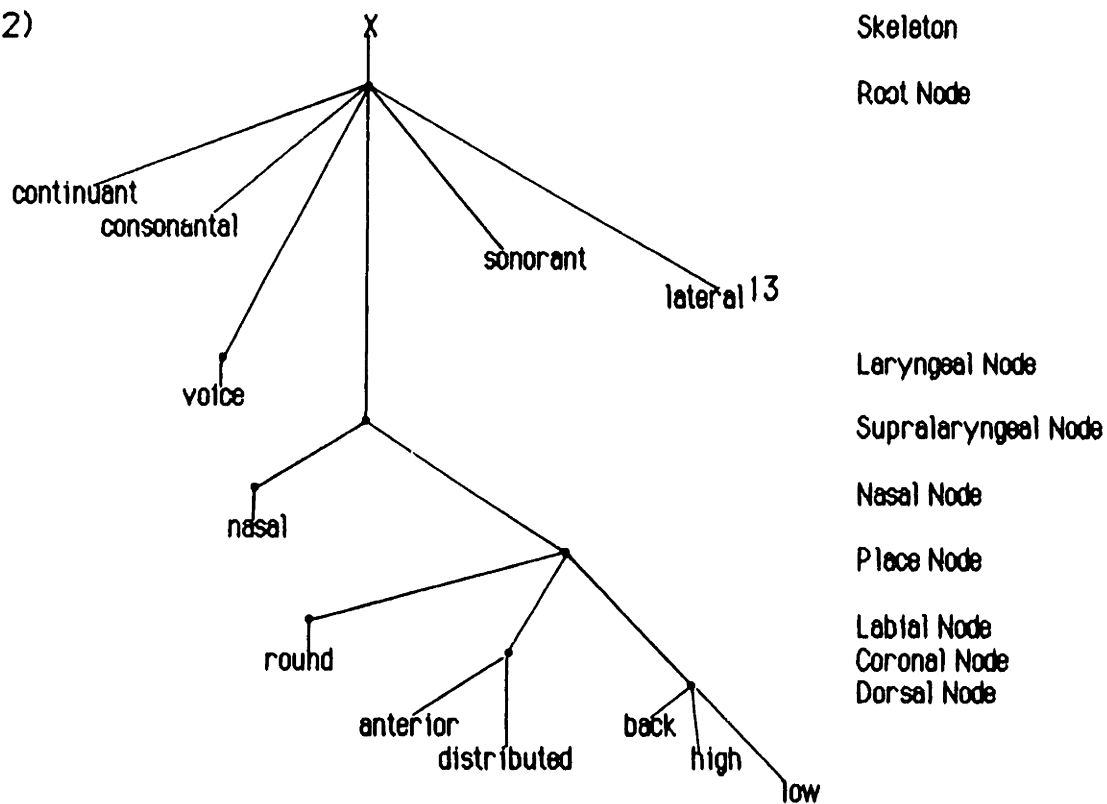
The underlying consonants of Polish are given in Table 1 along with the underlying feature representations associated with each consonant. In determining the feature representations, I assume both recent innovations in theories of feature representations and in underspecification theory. These assumptions are of relevance in Chapter 4 where I examine the processes of nasal assimilation and gliding.

Following Clements (1985), Sagey (1986), Archangeli and Pulleyblank (in prep.), and others, I assume that features are organized into sets constituting natural classes such as the laryngeal, supralaryngeal, and place

¹² In Chapter 2 I argue that while prefixes are phonological words, in some well-defined cases they are demoted to the status of phonological affixes.

features. Each of these sets can function independently from the others in the application of phonological rules such as assimilation. The sets of features are represented as nodes in a hierarchical tree (see (12)). I assume, following Sagey (1986), that the Place features are organized according to articulators each of which dominates terminal features. Nonterminal nodes in the hierarchy are either activated or unactivated and therefore are not represented as binary features. There has been some discussion in the literature about the position in the hierarchy of stricture or manner features such as [continuant] (see Clements 1985, Sagey 1986). I take no position on this issue and consequently in (12) I simply list all the manner features under the root node (although see Chapter 4 for some evidence that stricture features spread along with place features). (12) represents a synthesized and simplified version of the feature hierarchy presented in Sagey (1986) and Steriade (1987):

(12)



The theory of underspecification (Kiparsky 1982, Archangeli 1984, Steriade 1987, Archangeli and Pulleyblank in prep., Calabrese 1988) is an attempt to eliminate redundancy from underlying representations. For instance, in many languages of the world sonorants are always voiced. In a theory of underspecification, sonorants are consequently not marked in underlying representations as [+voice] but instead are supplied with this redundant value by means of redundancy rules. For purposes of this thesis, I follow Steriade (1987) and Calabrese (1988) in assuming that features

¹³ Sagay (1986) and Steriade (1987) represent lateral as a feature under the coronal node; since there are well-attested instances of dorsal laterals, I follow Halle (1988) in assuming that this is a stricture feature.

which are distinctive within a particular class of segments are specified underlyingly.¹⁴

The underlying consonant inventory of Polish is given in Table 1. '*' indicates activated articulators. '±' represent values of terminal features. All the consonants are [+consonantal], the glides are [-consonantal]:

TABLE 1: UNDERLYING CONSONANTS OF POLISH¹⁵

	LABIAL		LABIO-DORSAL					CORONAL							CORONO-DORSAL					DORSAL																	
			front					dento-alveolar				alveopalatal			prepalatal																						
	p	b	f	v	m	p'	b'	f'	v'	m'	w	t	d	s	z	c	ɟ	ʃ	r	n	š	ž	č	ǰ	t'	d'	s'	z'	n'	l	j	k	g	x			
Labial	•	•	•	•	•	•	•	•	•	•																											
round										+																											
Coronal												•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
anter											+	+	+	+	+	+																					
Dorsal						•	•	•	•	•																•	•	•	•	•	•	•	•	•	•	•	
back						-	-	-	-	-	+															-	-	-	-	-	-	-	-	-	-	-	
Nasal					•				•																												
nasal					+				+																												
Laryngeal																																					
Voice	-	+	-	+		-	+	-	+		-	+	-	+	-	+		-	+	-	+		-	+	-	+	-	+	-	+	-	+	-	+	-		
Cont			+	+					+	+				+	+	-/+				+	+	-/+				+	+									+	
Son	-	-	-	-	+					+	-	-	-	-	-	-	-	+	+	+	+					-	-	-	-	+	+	+	+				
Lateral																																					+

¹⁴ Archangeli (1984) and Archangeli and Pulleyblank (in prep.) assume that underlying representations are maximally underspecified and that they are determined on a language specific basis by the phonological rules of the language.

¹⁵ The following is a list of correspondences between the symbols that I use in this thesis and the standard IPA symbols:

prepalatals	alveopalatals		
š=ɕ	č=ɟ	š=ʃ	č=tʃ
ž=ʒ	ǰ=dʒ	ž=ʒ	ǰ=dʒ=ʃ

As Table 1 indicates, there are two types of coarticulated segments in Polish, front labials and prepalatals. In Chapter 3, I provide evidence that front or [-back] labials are in fact underlying in Polish; in Chapter 4, I argue that prepalatals are both coronal and dorsal in underlying representations since they may decompose into sequences of a [-back] glide followed by a coronal consonant.

There has been considerable discussion about the features needed to represent the three series of coronal consonants in Polish. In *SPE*, Chomsky and Halle (1968) postulate that the prepalatals are distinguished from the dento-alveolars and the alveopalatals by means of the feature [\pm distributed]: prepalatals have a long constriction and are thus [+distributed] whereas the dento-alveolars and alveopalatals are [-distributed]. Notice that in the feature system I am using, the fact that prepalatals are coarticulated is enough to distinguish them from the other two types of coronal consonant. Further, since the dento-alveolars are distinguished from the alveopalatals in terms of the feature [\pm anterior], there is no need to assume that [\pm distributed] is a distinctive feature in Polish. The surface inventory of Polish coronals requires a slightly different set of features. On the surface, the prepalatals are pronounced as [š,ž,ć,dź].¹⁶ In addition, as a result of a phrase-level rule, dento-alveolars may become [-back], [s'] [t'], etc. in the environment preceding a [-back, +high] vowel or glide and alveopalatals may also become [-back] [š',ž'] etc. These [-back] dento-alveolars and alveopalatals are coarticulated coronal-dorsals, like the prepalatals. The question that arises is how they are distinguished from the prepalatals.

¹⁶ Keating (1988) points out that the prepalatal sounds vary in anteriority from speaker to speaker. This suggests that anterior is not a distinctive feature in these sounds.

Keating (1988) has pointed out that prepalatals (her alveolo-palatals) have a cavity under the tongue blade. This cavity is also found in the alveopalatals and is responsible for the "hushing" quality of both these types of sounds. It is not found, however, in dento-alveolar consonants. Halle (1988) suggests therefore that an additional feature, which he calls [\pm Lower Incisors Cavity] is needed to account for coronal differences. Dento-alveolars are [-Lower Incisor Cavity] meaning that the tongue touches the lower teeth, and thus does not create a cavity, whereas alveopalatals and prepalatals are [+Lower Incisor Cavity]. The difference between [-back] dento-alveolars and prepalatals, then, is that the former are [-back] and [-LIC], and the latter are [-back] and [+LIC]. Alveopalatals are [-anterior, -LIC]; and [-back, -anterior, -LIC] when fronted. [\pm LIC] is not, however, needed at the underlying level to distinguish the underlying coronal consonants of Polish. Therefore, I suggest that the values for this feature are inserted by redundancy rules which apply at the noncyclic word-level (the rules cannot apply at the phrase-level because then they would derive prepalatals from the [-back] dento-alveolars derived at the phrase-level).¹⁷

There are two laterals in Polish, one of which alternates between [l] in palatalizing environments, [l'] in palatalizing environments before [i], and [w] elsewhere, the other of which alternates between [l'] before [i] and [l]

¹⁷ The X-ray drawings in Wierzchowska (1980), Styczek (1973) and Koneczna (1951) do not indicate clearly the cavity which Keating (1988) and Halle (1988) claim is present under the tongue in the pronunciation of alveopalatals and prepalatals. Nevertheless, acoustic evidence suggests that this cavity is indeed present (Halle, p.c.). Both types of [+LIC] segments, have strong formants between 1500-3000 Hz as a result of the cavity beneath the tongue (according to Wierzchowska 1980, the prepalatals have strong formants in the 2500 to 3000 Hz range, the alveopalatals in the 1500-1700 range), while the [-LIC] dento-alveolars have strong formants in the 5000-10000 Hz range. Whether or not [\pm LIC] is a distinguishing feature in coronal consonants is a matter for further investigation. Clearly, however, some additional feature is required to capture the difference between the [-back] dento-alveolars and the prepalatals of Polish.

elsewhere. The latter [ɨ] functions like a [-back] consonant in morpheme-internal environments, and I have therefore assumed that it is [-back] as well as coronal in underlying representations and in this way is distinguished from the plain coronal /t/. In all environments except preceding [-back] high vowels, the [-back] feature of the prepalatal /ɨ/ and the palatalized /tʃ/ is delinked by a noncyclic rule. In Chapter 4, I argue, in addition, that /tʃ/ becomes a glide [w] as a result of delinking of the coronal node and insertion by redundancy rules of [+back, +round]. These latter redundancy rules are independently needed to derive nasal glides.

Rubach and Booij (1987) argue that Polish has no need for underlying glides, since glides are predictable on the basis of syllable structure. As I suggest in Chapter 4, surface [v] in the Slavic vocabulary of Polish is derived from an underlying /w/ (the evidence for this claim comes from voicing rules). Consequently, in these words at least, /w/ must be underlying and I have therefore included /w/ in Table 1. It is less clear whether /j/ is an underlying segment, since there are many instances in which its form is predictable from the syllable structure. Nevertheless, until more work on its status is done, I have included it in the underlying inventory. The glides are distinguished from underlying high vowels in that they are coarticulated segments; /w/ is labio-dorsal, whereas /j/ is coronal-dorsal.

Gussmann (1980), Rubach (1984), and others following them, have postulated quite large vowel inventories for Polish. In particular, it has been assumed that Polish has two high unrounded vowels /i/ and /ɨ/(=[y]),¹⁸

¹⁸ Throughout the thesis I use [y] to represent [ɨ], the retracted and lowered variant of /i/.

two abstract underlying high lax vowels, a tense [-high] front vowel, and, in Rubach (1984), a mid unrounded back vowel:

(13) Previously Postulated Vowel Inventory

i	ɨ	u
	ɨ̃	ɨ̃
ε	ɣ	ɔ
æ	a	

In Chapter 3, I argue that [i] and [ɨ](=[y]) are in complementary distribution and that therefore only /i/ is underlying. I also claim that the underlying lax high vowels, [ɣ] and [æ], are unnecessary, since all the phonological alternations which they were postulated to underlie can be explained in other ways. In addition, I argue in Chapter 4 that Polish has two underlying mid nasal diphthongs whose first member is a mid front or back vowel and whose second member is a placeless nasal glide. These are represented throughout this thesis as /ɛ̃/ and /ɔ̃/. Polish thus turns out to have the straightforward 5-vowel system with two nasal diphthongs pictured in Table 2 (all vowels are [-consonantal]):

TABLE 2: UNDERLYING VOWELS OF POLISH

	i	u	ɛ=[ε]	ɔ=[ɔ]	a	ɛ̃	ɔ̃
Dorsal	•	•	•	•	•	•	•
Back	-	+	-	+	-	+	
High	+	+	-	-	-	-	-
Low			-	-	+	-	-
Nasal						•	•
nasal						+	+

The features [±round] and [±tense] are inserted by redundancy rules, since they are not distinctive for any of the vowels in Polish. In particular, the nonhigh vowels are all [-tense] whereas the high vowels are [+tense]; the front vowels are [-round], and the back vowels are [+round] if [-low] and [-round] in the case of [+low].

Polish data in this thesis are transcribed according to the phonetic symbols given in the tables above rather than in Polish orthography. Most forms are given in intermediate, rather than in underlying or surface phonetic representations. In particular, although both [i] and [y] are actually /i/ in underlying forms, I transcribe [y] in those cases where it appears morpheme-internally (e.g., *b'ɨc* 'to fight' vs. *byc* 'to be'); similarly, rather than transcribing underlying or derived prepalatals as [t',d', s', z'], I use the prepalatal symbols [ś,ź,ć,dź].

CHAPTER 2

THE MORPHOLOGICAL COMPONENT: VERB STRUCTURE

Polish words belonging to the lexical categories Noun, Adjective, Adverb and Verb, may include up to 6 distinct morphemes in the case of the first three categories, and up to 9 in the case of verbs:

- (1)
- | | | | |
|----|---|------------------|---|
| a. | xłop+ak+k+ov+at+i
boy N dim A A m.sg. | xwopačkovaty | 'boyish' |
| b. | p'ek+ar+ńik +stv +o
bake Nagt N Nbst ne.sg. | p'ekarńictfo | 'the baker's trade' |
| c. | žeč+ov+ńik+ov+o
thing A N A Adv | žečovńikovo | 'substantivally' |
| d. | do+po+do+syp+ov+iv +a+ł+a
Pr Pr Pr pour VS VS _{SI} VS P fem.sg. | dopodosypovyvawa | 'add dry matter
(e.g. grain, sugar) bit
by bit by pouring, f.sg.past' |

In all of the examples in (1) the cooccurrence of different morphemes in the same form is restricted both by semantic and formal factors. The morpheme *-stv*, for instance, affixes only to nominal stems to form abstract nouns; *-iv* affixes to stems of verbs of a particular class to form secondary imperfectives (see below); etc. The number and types of morphemes and the restrictions on morpheme-cooccurrence found in verbal forms are more limited than those found in nominal, adjectival, and adverbial forms. For this reason the present chapter on the morphological component of Polish takes as its focus the formation of verbs.

The first section of the chapter gives a brief description of the basic grammatical categories represented in the Polish verbal system. For detailed descriptions of the grammar of Polish verbs, the reader is referred to works such as Schenker (1954, 1973), Szober (1953), and Brooks (1975). Section 2 provides an analysis of the constituent structure of verbs, distinguishing four different types of stems—class-stems, VS-stems, TM-stems and P/N stems—and proposing rules to derive denominal and deadjectival verb-stems, and secondary imperfectives. Verbs are argued to belong to particular classes; class membership determines the inflectional and some derivational properties of each verb. Section 3 discusses aspectual and morphological properties of prefixes, suggesting that prefixes are in many cases included in the lexical entries of verbs but are nevertheless perceived as distinct morphemes. And, section 4 argues that although prefixes are morphologically constituents of the verb-stem, they are not phonological constituents of the verb-stem but are instead independent phonological words.

1. Polish Verbs

The morphology of the Polish verb reflects grammatical distinctions in aspect, tense, mood, voice, person, number, gender, finite and nonfinite forms. There are two basic grammatical aspectual categories, imperfective and perfective, as well as several minor aspectual categories such as frequentative (habitual or repeated action, usually found in motion verbs) or semelfactive (momentary, completed action; cf. *wykłzyć* 'shout out' and *wykłzyknąć* 'shout out once, semelfactive'). Imperfectives are generally

unprefixed and refer to uncompleted events; perfectives are generally prefixed and refer to completed events. In addition, it is possible to form so-called secondary imperfectives from perfective stems; these usually have a frequentative or iterative meaning.¹ Non-secondary imperfectives and perfectives are usually referred to as simple verb forms. There are also two basic distinctions in tense encoded by means of inflectional suffixes affixed to the verb stem: nonpast and past. In imperfectives the nonpast forms have a present tense meaning, in perfectives they have a future meaning.² (2) illustrates aspectual and tense distinctions with different forms of the verb *p'is* 'write':

(2)	<i>p'isać</i>	infinitive, impf.	
	<i>nap'isać</i>	infinitive, pf.	
	<i>zap'isywać</i>	infinitive, sec. impf.	'write down'
	<i>p'iśę</i>	1st sg., impf., nonpast	'I write'
	<i>nap'iśę</i>	1st sg., pf., nonpast	'I will write'
	<i>zap'isuję</i>	1st sg., sec. impf., nonpast	'I write down'

All the forms in (2) are in the indicative mood; in addition, Polish distinguishes the imperative mood (see Chapter 3 for an analysis of imperative forms), and the subjunctive. The formation of subjunctives is not considered in this thesis (see, for example, Booij and Rubach 1987 for a discussion of clitics such as the subjunctive *-by*).

¹ Secondary imperfectives are usually referred to in the English literature on Polish as "derived imperfectives." I follow Laskowski (1975b) in using the term "secondary imperfective."

² It is also possible to form compound tenses in Polish. Thus, for instance, while the form *nap'iśę* 'I will write' is a perfective form with future meaning, the future of the imperfective is a compound form *będzie p'isow* 'I will write'.

Passive voice is generally formed in Polish by means of an auxiliary followed by a form of the passive participle, where the first is inflected like a verb, and the second like an adjective (e.g., *zostawa napisana* 'was written, fem.sg.pf.'). As well as passive participles, Polish also has active participles generally derived from imperfective verbs. Both active and passive participles may be indeclinable or adverbial, and declinable or adjectival:

(3)	<i>p'isȳc</i>	'write' active participle, adverbial
	<i>p'isȳcy</i>	active participle, m.sg.
	<i>p'isȳca</i>	active participle, f.sg.
	<i>p'isȳce</i>	active participle, ne.sg.
	<i>p'isany</i>	passive participle, m.sg.
	<i>p'isana</i>	passive participle, f.sg.
	<i>p'isane</i>	passive participle, ne.sg.
	<i>p'isano</i>	passive participle, adverbial

Participles are discussed in Chapter 3.

Finite, nonpast forms are inflected for person and number; past tense forms are inflected for gender, number, and person. (4) lists only 3rd person past tense forms; 1st and 2nd person forms are derived by means of clitics affixed to the 3rd person forms given in (4). The clitics are *-m* '1st sg.', *-ś* '2nd sg.', *-śmy* '1st pl.', *-ście* '2nd pl.' Feminine past forms, for instance, are *p'isawam* '1st sg.', *p'isawaś* '2nd sg.', *p'isawa* '3rd sg.', *p'isawysmy* '1st pl.', *p'isawyscie* '2nd pl.', and *p'isawy* '3rd pl.' I do not discuss the properties of the clitics here.

(4)	Nonpast		Past	
	p'iš <u>ę</u>	1st sg	p'isaw	m.sg.
	p'iš <u>ę</u> ś	2nd sg	p'isawa	f.sg.
	p'iš <u>ę</u>	3rd sg	p'isawo	ne.sg.
	p'iš <u>ę</u> my	1st pl	p'isal'i	m.pl. ³
	p'iš <u>ę</u> će	2nd pl	p'isawy	f./ne./m. pl.
	p'iš <u>ę</u>	3rd pl		

The verb *p'is* represents one of the three basic conjugations, each of which is characterized by the form of the suffix preceding the final morpheme in nonpast forms (this suffix is underlined). (5) gives examples of verbs from the other two conjugations:

(5)	Nonpast		Past	
	pros 'ask'			
	pro <u>ś</u> ę	1st sg	pro <u>ś</u> iw	m.sg.
	pro <u>ś</u> iś	2nd sg	pro <u>ś</u> iwa	f.sg.
	pro <u>ś</u> i	3rd sg	pro <u>ś</u> iwo	ne.sg.
	pro <u>ś</u> i <u>my</u>	1st pl	pro <u>ś</u> i <u>l'i</u>	m.pl.
	pro <u>ś</u> i <u>će</u>	2nd pl	pro <u>ś</u> i <u>wy</u>	f./ne.m. pl.
	pro <u>ś</u> ę	3rd pl		
	čyt 'read'			
	čyt <u>a</u> m	1st sg	čytaw	m.sg.
	čyt <u>a</u> ś	2nd sg	čytawa	f.sg.
	čyt <u>a</u>	3rd sg	čytawo	ne.sg.
	čyt <u>a</u> my	1st pl	čytal'i	m.pl.
	čyt <u>a</u> će	2nd pl	čytawy	f./ne./m. pl.
	čyt <u>a</u> ją	3rd pl		

³ In the plural Polish distinguishes masculine plural personal or virile forms from all other masculine and feminine and neuter forms. The abbreviation 'm.pl.' is used here to refer to the personal masculine plural. The abbreviation 'f./ne./m.' refers to all other plural forms.

2. Constituent Structure of the Verbs

The hypothesis underlying the discussion in this section is that the morphological template of the Polish verb consists of four basic constituents: the C-stem, the VS-stem, the TM-stem and the P/N-stem.⁴

(6) Constituent Structure of the Verb

[[TM [VS [v (Prefix) [C-stem] v] (VS) vs] (TM) TM] P/N]

C-stem=root or derived stem

VS=verbalizing suffix

TM=tense, infinitive, participle

P/N=person, number, gender

The C-stem is that constituent of the verb which carries the bulk of the lexical content. Since verbs can be underived or derived from nominal, adjectival, and occasionally other forms, a C-stem can be either a root or a stem consisting of a root plus one or more non-inflectional affixes. It is thus the minimal constituent of the verb specified as belonging to a particular inflectional class. The class membership of a C-stem determines the form of its VS-stem. The VS-stem is the central constituent of the verb because it reflects verb class membership, and because, as I show below, it determines the form of the TM-stem, which in turn determines the form of the P/N constituent. I begin the discussion of verbal constituent

⁴ The parentheses around the different affix types indicate that not every form of the verb contains representatives of every type of affix. The brackets indicate the layers of dependencies within the verbal morphology.

structure by examining the relationships between the morphemes which occupy the TM and P/N positions.

2.1 Person/Number and Tense-Marker Morphemes

The Person/Number, Tense-Marker⁵ and Verbalizing Suffix morphemes of the Polish verb system are given in (7). In discussing the distribution of these morphemes, I follow the classic Jakobsonian analysis of Russian verb conjugation (see Jakobson 1948; and, for Polish, Schenker 1954). The verbalizing suffixes and examples in this subsection are listed in terms of the verb classes which are proposed and justified in §2.2 below. I refer to verb classes here to simplify the exposition of the data.

(7)	<u>TM Morphemes</u>		<u>P/N Markers</u>		
	-i/y- 'CM'		-ę/-m	'1st sg.'	-my '1st pl.'
	-e- 'CM'		-ś	'2nd sg.'	-će '2nd pl.'
	-w/i- 'past'		-∅	'3rd sg.'	-ą '3rd pl.'
	-ć 'infinitive' ⁶			<u>Past Tense-Gender/Number</u>	
			-a	'fem., sg'	-y/i 'fem. pl.' ⁷
			-∅	'masc. sg.' ⁸	-i/y 'masc. pl.'

⁵ Of the morphemes listed as Tense-Markers only *-w/i-*, as a past tense morpheme, actually marks tense. The connecting morpheme *-i/y/∅* is found in nonpast forms but does not mark nonpast tense (see below), and the infinitive marker occurs in non-finite and therefore specifically tenseless forms.

⁶ Although historically this morpheme was syllabic, consisting of /t/ followed by a front vowel, in Polish it is now simply a prepalatal affricate. In Class 5 verbs the final consonants of Class 5 verb bases undergo various alternations (see (8), for example); the infinitive morpheme itself occasionally surfaces as [c] following velar-final Class 5 bases (e.g., /mog+ć/ 'can' surfaces as [muc]). The alternations seen in Class 5 infinitives are limited to occurring in these forms; they may thus be mostly morphologically rather than phonologically conditioned.

⁷ Although both the feminine and the masculine plural forms are /i/ underlyingly, the feminine plural does not trigger palatalization while the masculine plural does.

⁸ The past tense gender/number marker surfaces as [e] when clitics which mark person are affixed to a past tense stem ending in a gender/number marker. For instance, *o'isaw* 'he

(8) Verbalizing Suffixes⁹

- a Class 1
- aj Class 2
- e Class 3
- i/y Class 4
- nɔ̃ Class 6¹⁰
- ej Class 7

(9) provides representative examples of inflectional patterns.¹¹ The underlined constituents in (9) are the C-stems of the verbs (see §2.2.2).

(9)	Nonpast			Past		Gloss
	infinitive	2nd sg.	3rd pl.	m. sg.	m. pl.	
1	<u>p'isac</u>	p'iseš	p'išɔ̃	p'isaw	p'isal'i	write
	<u>malovac</u>	maluješ ¹²	malujɔ̃	malovaw	maloval'i	paint
	<u>nocovac</u>	nocuješ	nocujɔ̃	nocovaw	nocoval'i	spend the night

wrote', when inflected for first or second person singular by affixation of the clitics *-m* or *-ś* respectively, becomes *p'isawem* 'I wrote, m.sg.' or *p'isawas* 'you wrote, m.sg.' (cf. *p'isawa* 'she wrote, *p'isawam* 'I wrote, f.sg.', *p'isawas* 'you wrote, f.sg.'). The [e] of the m.sg. is likely epenthetic (see Chapter 3 for discussion of epenthesis).

⁹ Class 5 is not represented here because it is characterized by lack of a verbalizing suffix. See examples in (9) and §2.2.

¹⁰ The suffix *-nɔ̃* has been postulated to have many different shapes. In Gussmann (1980) and Rubach (1984) it is assumed to have the form /nOn/, where /O/ is an underlying lax high vowel. Since, I argue in Chapter 4 that Polish nasal vowels are not sequences of vowels plus nasal stops, but rather are nasal diphthongs consisting of a vowel plus a nasal glide, I assume here that this morpheme has an underlying back nasal diphthong.

¹¹ The 2nd sg. morpheme represents the set which also includes 3rd sg., 1st pl. and 2nd pl. All the morphemes in this set have identical subcategorization requirements. The 3rd pl. morpheme has the same properties as the 1st sg.

¹² The morphemes *-ov* and *-iv* contain a final-glide in underlying representations. Their alternation with *-uj* is due to a rule of j-formation, which derives a [j] in the environment of a sequence of two vowels where the second vowel is [-high], followed by a rule that deletes [o] or [i] and vocalizes the underlying /w/ to [u]. See Chapter 3 for discussion.

	<u>p'isyvać</u>	p'isuješ	p'isujǫ	p'isyvaw	p'isyval'i	write (S.I.)
2	<u>čytać</u>	čytaš	čytajǫ	čytaw	čytal'i	read
	<u>zapašać</u>	zapašaš	zapašajǫ	zapašaw	zapašal'i	ask (S.I.)
	<u>pžesalać</u>	pžesalaš	pžesalajǫ	pžesalaw	pžesalal'i	salt (S.I.)
3	<u>kžyčec</u>	kžyčyš	kžyčǫ	kžyčaw	kžyčel'i ¹³	shout (I)
4	<u>prošić</u>	prošiš	prošǫ	prošiw	prošil'i	ask for (I)
	<u>černić</u>	černiš	černǫ	černiw	černil'i	blacken
	<u>sol'ić</u>	sol'iš	posolǫ	posol'iw	posol'il'i	salt (I)
5	<u>kwaść</u>	kwadžeš	kwadǫ	kwadw	kwadl'i	put down
6	<u>kžyknǫć</u>	kžykneš	kžyknǫ	kžyknǫw	kžyknel'i	shout (P)
7	<u>wyśec</u>	wyśeješ	wyśejǫ	wyśaw	wyśel'i	go tald

From (9) we can make the following observations about the distribution of the P/N and TM suffixes. First, the past tense gender/number markers are affixed to stems ending in the past tense morpheme *-w/l* (e.g., *p'isal'i* 'm.pl.'). This morpheme is never followed by nonpast P/N markers. (The alternation of [w] with [l^(v)] is phonologically-conditioned and noncyclic. Since in underlying representation this morpheme is a coronal lateral consonant, it becomes [-back] in the environment of a following [-back] segment, and a [+back] glide elsewhere. See Chapter 4.) Second, in all classes except Class 2, nonpast P/N markers such as 2nd sg. are affixed to stems ending in connecting morphemes (e.g., *p'iš**eš***, *kžyč**yš***, where the connecting morphemes are in bold); 3rd pl., by contrast, is affixed to stems ending in the verbalizing suffixes illustrated in (8). Evidence that 3rd pl. is indeed affixed to stems ending in verbalizing suffixes comes from two sources: in Classes 6 and 7 the verbalizing suffixes surface preceding the 3rd pl. morpheme *-ǫ* (e.g., *kžyknǫ*, *wyśejǫ*); in Classes 1,3, and 4, although

¹³ The vowel alternations seen in Classes 3,6, and 7 are discussed in Chapter 3. They are derived as a result of the application of lexically-conditioned phonological rules.

the verbalizing suffixes do not surface, the forms of the consonants directly preceding $\text{-}\varnothing$ indicate that the verbalizing suffixes are present in the underlying representations. In the form $\rho/\text{š}\varnothing$ 'write, 3 pl.', for instance, the root final /s/ surfaces as [š] as a result of the application of Iotation. Iotation is a rule that derives [c,dz,š,ž] from underlying /t,d,s,z/ in the environment of a following [j]. [j] is itself derived in the environment of a sequence of two vowels, provided that the second vowel is [-high] (see Chapter 3). The fact that the final consonant in the 3rd pl. of 'write' is Iotated indicates that in the underlying representation, the [-high] nasal diphthong $\text{-}\varnothing$ must be preceded by the verbalizing suffix $\text{-}\text{a}$. Third, the palatalization seen in Class 1, 3, and 4 2nd sg. forms and the surface presence of verbalizing suffixes in Class 6 and 7 2nd p.sg. forms provides evidence that, like 3rd pl. morphemes, the TM morphemes are also attached to stems ending in verbalizing suffixes. Fourth, in Class 5 there appears to be no verbalizing suffix; 3rd pl. and TM morphemes seem to be attached directly to the verb root. Fifth, in Class 2, 2nd sg. as well as 3rd pl. P/N suffixes and TM morphemes are attached directly to stems ending in the verbalizing suffix $\text{-}\text{aj}$ with no connecting morphemes between them.¹⁴ Class 2 also takes the morpheme $\text{-}\text{m}$ in the 1st sg., while in all other classes $\text{-}\varnothing$ is used (c. *čytam* 'read, 1st sg.; Class 2' and $\rho/\text{š}\varnothing$ 'write, 1st sg.; Class 1', *kžyčϕ* 'shout, 1st sg.; Class 3', etc.). And, finally, the 3rd sg. is characterized by lack of any visible P/N suffix. Instead, the final visible morpheme in the 3rd sg. form is a connecting morpheme:

¹⁴ The final glide of $\text{-}\text{aj}$ surfaces only in the 3rd p.pl. Following Rubach (1984) and others I assume that the final glide of $\text{-}\text{aj}$ (and of the Class 7 $\text{-}\text{aj}$) is deleted in the environment before a consonant. I differ from Rubach, however, in assuming that the rule responsible for deletion of [j] before a consonant is not the same as the rule that deletes [j] following coronals. See Chapter 3, §4 for discussion of j-deletion.

- (10) Class 1 p'iše
 2 čyta
 3 kžyčy
 4 proši
 5 kwadže
 6 kžykne
 7 wyšeje

Rather than postulating a zero-affix for the 3rd sg., I suggest that this form is simply characterized by absence of marking; in other words the unmarked TM-stem is interpreted by speakers as referring to the unmarked person/number form of the language.

The P/N and TM morphemes thus have the distribution summarized in (11): TM and 3 pl. morphemes attach to stems ending in verbalizing suffixes; 2nd sg. and past tense gender/number morphemes attach to stems ending in TM morphemes, with nonpast attaching to the connecting morphemes, and past attaching to the past tense marker; and stems ending in *-a/* serve as bases for affixation of past tense, infinitive and all P/N morphemes (except *-e*).

(11) Morphemes attaching to stems ending in:

<u>VS</u>		<u>TM</u>		<u>-a/</u>	
-i/y/e	'CM'	-š	'2nd sg.'	-m	'1st sg.'
-w/l	'Past'	-∅	'3rd sg.'	-w/l	'Past'
-ć	'Infinitive'	-my	'1st pl.'	-ć	'Infinitive'
-ę	'1st sg.'	-će	'2nd pl.'	-š	'2nd sg.'
-ø	'3rd pl.'	-a	'fem.sg.'	-∅	'3rd sg.'
		-i	'masc.pl.'	-će	'2nd pl.'
		-y	'fem.pl.'	-ø	'3rd pl.'
		-∅	'masc.sg.'		

Setting Class 2 forms aside for a moment, we can see that morphemes attaching to stems ending in VS's and those attaching to stems ending in TM's are in complementary distribution. We can account for their distribution by assuming that the two types of stems—VS-stems and TM-stems—are distinct constituents of the verb and that suffixes are specified for the type of stem or constituent to which they affix and for the type of constituent which they form. TM morphemes and 3rd pl. are thus specified as affixing to a VS-stem and, in the former case, as deriving TM-stems, and P/N morphemes are specified for TM-stems. The past P/N markers need to be specified, in addition, to follow only the past tense morpheme; the nonpast P/N markers must be specified so as to follow only connecting morphemes. The nonpast P/N morphemes, since they are always word-final, are also specified with the information that their affixation creates morphological words. None of the P/N markers needs to be specified not to follow the infinitive marker if one assumes that this morpheme also includes information that its affixation creates a morphological word.

Information about the type of stem a morpheme affixes to and the type of stem its affixation creates are easily represented by means of subcategorization frames associated with lexical entries for individual affixes (as suggested, for instance, in Lieber 1980). That this information is unpredictable and must be encoded in lexical entries for the affixes is clearly illustrated by the distributional properties of the 3rd pl. and 1st sg. suffixes $-\varnothing$ and $-\text{ɛ}$. These suffixes occur only in nonpast forms and yet, unlike the other nonpast P/N suffixes, they affix to VS- and not to TM-stems. Although the two suffixes happen to be the two nasal diphthongs of Polish, there is no phonological reason for their distribution. Since the

connecting morphemes are front vowels in underlying representations, one could imagine, for instance, that the nasal diphthongs are prohibited from occurring after front vowels. However, two of the verbalizing suffixes, *-e* and *-i* are also underlyingly front vowels, and yet *-ɔ* and *-ɛ* are found after them. Similarly, there is no syntactic or semantic reason for setting off 1st sg. and 3rd pl. as a class distinct from other persons and numbers. We can only conclude that the distribution of *-ɔ* and *-ɛ* is simply an arbitrary fact about the morphological structure of Polish verbs and must be stipulated in the lexical entries of the suffixes themselves.

The presence of connecting morphemes in nonpast forms is also an arbitrary structural property of verbs, and is not motivated by any phonological, syntactic or semantic factors. In fact, connecting morphemes have no identifiable meaning. Rubach (1984) refers to *-i/y* and *-e* as present tense markers. Although it is true that they appear in present tense forms, they also appears in future forms. As pointed out in §1, the perfective form of an Imperfective/perfective aspect pair whose members differ only in that a prefix appears in the perfective, always has a future sense, while its corresponding Imperfective has a present tense meaning. One could perhaps argue that the connecting morphemes are nonpast morphemes. But, as we have seen, they do not appear in all nonpast finite forms. Nevertheless, 1st sg. and 3rd pl. forms in which the connecting morphemes do not appear still have a nonpast meaning. In contrast to past tense, which is marked by the suffix *-w//*, nonpast seems not to be marked by any one morpheme. It appears that the nonpast tense of a verb is a property of the whole verb form rather than being a property supplied by one particular morpheme. This conclusion is not surprising given the well-known fact that the semantics and the structure of morphological forms are

not necessarily isomorphic. The presence of the connecting morphemes is clearly required by the morphology. They must therefore be given lexical entries with appropriate subcategorization frames, but containing no semantic information (it is for this reason, that I refer to them as connecting morphemes).

Note that the form of the connecting morphemes that appears in present tense forms is predictable from the form of the preceding verbalizing suffix: *-i/y* occurs following the Class 3 and 4 verbalizing suffixes (which surface as [-back] vowels), whereas *-e* occurs elsewhere. One can therefore assume that there is only one connecting morpheme with two allomorphs. The connecting morpheme triggers palatalization alternations in preceding consonants; its [y] form surfaces only after alveopalatal coronals which are the output of palatalization processes (see Chapter 3).

The fact that the Class 2 verbalizing suffix behaves differently from the other verbalizing suffixes and from TM morphemes is another arbitrary fact about Polish morphology. Recall that although *-aj*'s affixation creates VS-stems to which are affixed, as expected, the past tense, infinitive and 3rd pl. markers, it also forms stems to which are affixed the P/N markers that generally attach to TM-stems. *-aj* behaves as if its affixation created both a VS-stem and a TM-stem and it must thus be distinguished in the grammar from the other verbalizing suffixes. *-aj* must also be marked both so as to allow the morpheme *-m* '1st sg., Class 2' to affix to it, rather than the more general 1st sg. morpheme *-ę* which affixes to all other VS-stems, and so as to prevent affixation to it of the TM connecting morphemes.

The distribution of all the P/N and TM morphemes, including that associated with the Class 2 VS-stem, is presented in (12) in terms of

subcategorization frames. All the distributional properties can be captured if we assume that in addition to distinguishing VS- and TM-stems, the grammar of Polish contains two features, [$\pm a_j$] and [$\pm Past$]. [$\pm a_j$] divides morphemes that affix to VS-stems into two types: those specifically prohibited from affixing to stems ending in the verbalizing suffix *-a_j*, and those not so prohibited. Similarly, [$\pm Past$] divides morphemes that affix to TM-stems into two types: those which affix to past tense stems, and those which do not. In the subcategorization frames in (12), lack of diacritic marking on a bracket indicates that the attachment of the relevant affix creates a morphological word or P/N-stem, to which no further affixes may attach (although, clitics may affix to morphological words ending in the past P/N morphemes).

(12) Subcategorization Frames for P/N and TM morphemes

$\left. \begin{array}{l}] \text{VS} \text{ — }] \\ +a_j \\ -m \\ -\text{q} \\ -\acute{c} \end{array} \right\}$	$\left. \begin{array}{l}] \text{VS} \text{ — }] \text{TM} \\ +a_j \quad +P \\ -w/l \end{array} \right\}$	$\left. \begin{array}{l}] \text{VS} \text{ — }] \\ -a_j \\ -\text{ę} \end{array} \right\}$	$\left. \begin{array}{l}] \text{VS} \text{ — }] \text{TM} \\ -a_j \quad -P \\ -i/y, -e \end{array} \right\}$
$\left. \begin{array}{l}] \text{TM} \text{ — }] \\ +P \\ -a \\ -i \\ -y \end{array} \right\}$	$\left. \begin{array}{l}] \text{TM} \text{ — }] \\ -P \\ -\acute{s} \\ -my \\ -\acute{c}e \end{array} \right\}$		

Notice that, given the subcategorization frames in (12), the verbalizing suffix *-a_j* must be marked as both VS [$+a_j$] and TM [$-P$] in order to ensure that the correct TM and P/N morphemes affix to it.

Since the TM and some P/N morphemes affix to stems ending in verbalizing suffixes, it is often the case that the underlying representation of a verb form contains a sequence of two vowels. (13) gives examples of underlying representations that result from affixing TM and P/N morphemes to VS-stems. 'X' represents the stem to which a verbalizing suffix is affixed (see §2.2); the VS-stem is in bold.

(13)	Class	2nd p. sg.	3rd p. pl.
	1	X+a +e+š	X+a +ɔ
	2	X+a j+š	X+a j+ɔ
	3	X+e +i+š	X+e +ɔ
	4	X+i +i+š	X+i +ɔ
	6	X+nɔ +e+š	X+nɔ +ɔ
	7	X+e j+e+š	X+e j+ɔ

As pointed out above, if the second of the two vowels is [-high], as in Class 1 and Class 6 2nd sg. and Classes 1, 3, 4 and 6 3rd pl., j-formation occurs to change the first vowel in the sequence into a [j] (see Chapter 3, §4). This derived [j] subsequently triggers palatalization. If the second of the two vowels is [+high], the first is deleted.

2.2 VS-stems and C-stems

In the previous subsection we saw that the tense marker and some person/number morphemes of Polish verbs affix to stems ending in verbalizing suffixes. We also saw that in a number of cases the verbalizing suffix directly affects the choice of a particular TM or P/N morpheme. In this subsection I argue that the verbalizing suffix has a purely

classificatory morphological function in that it represents the class that a particular verb belongs to. I also argue that verbalizing suffixes are themselves affixed to class-stems which are specified for verb class membership by means of diacritics. The inflectional and derivational properties of a particular C-stem depend on the verb class it belongs to regardless of whether it is a simple, underived, verb root, a derived secondary imperfective stem, or a denominal or deadjectival verb stem.

2.2.1 VS-stems and Verb Classes

(14) lists 6 of the most common verbalizing suffixes of Polish ((14) is repeated from (8) above):

(14) Verbalizing Suffixes

- a Class 1
- aj Class 2
- e Class 3
- i/y Class 4
- nɔ Class 6
- ej Class 7

Verbalizing suffixes may appear in underived and derived verbs, as the following examples illustrate (the underlined morphemes are roots):

(15) Verbalizing Suffixes

a. Underived simple verbs

- | | | | | |
|-----|-----------------|------------|---------------|-----------|
| -a | <u>p'isac'</u> | 'to write' | | |
| | <u>kupovac'</u> | 'to buy' | | |
| -aj | <u>čytac'</u> | 'to read' | <u>čytajɔ</u> | '3rd pl.' |

-e	<u>křyčec</u>	'to shout'		
-i	<u>prořic</u>	'to ask for'		
	<u>kwařc</u>	'to put down'	<u>kwadř</u>	'3rd pl.'
-nř	<u>křyknřc</u>	'to shout out'		
-ej	<u>gřac</u>	'to heat'	<u>gřejř</u>	'3rd pl.'
b. Derived simple verbs				
-a	<u>nocovac</u>	'to spend the night'		(cf. <i>noc</i> 'night')
-i	<u>vykonřc</u> ¹⁵	'to finish'		(cf. <i>konřec</i> 'end')
-ej	<u>černec</u>	'to become black'	<u>černejř</u>	'3rd pl.'
				(cf. <i>čarny</i> 'black')

In the case of underived verbs, the verbalizing suffix which appears in the verb is something that must be learned for each verb, since the verbalizing suffix (or lack thereof, as in the case of kwařc; see below) associated with a particular root in underived verbs is unpredictable both from the point of view of semantics and of phonology. For instance, various roots ending in the segment /s/ are associated with the different verbalizing suffixes in (16):¹⁶

(16) a.	p'is+a+ć	p'isać	'write'
b.	kis+l+ć	kislic	'pickle'
c.	v'is+e+ć	v'iseć	'hang'
d.	pas+ć	pać	'graze'
e.	ćos+aj+ć	ćosać	'hew'

In the case of derived verbs it is necessary to learn rules of word-formation which result in the affixation of appropriate verbalizing suffixes. Derived verbs are discussed in §2.2.3. Let us consider now how the grammar

¹⁵ I argue below that prefixes are affixed to C-stems and that their affixation does not change the C-stem status of the form to which they are affixed.

¹⁶ The examples in (15) are taken from Szpyra (1987b).

represents the unpredictable relationship between a particular underived verb and the verbalizing suffix that that verb takes when inflected.

In earlier work on Polish it has been suggested that verbalizing suffixes are listed as part of the lexical entries of underived verb roots. Lexical entries of underived verbs are thus bi-formative, consisting of what I have termed above a VS-stem, namely, the structure Root+VS (see Laskowski 1975b; Szpyra 1986, 1987b—Szpyra adopts Laskowski's hypothesis). Szpyra argues that an advantage of the bi-formative hypothesis is that it obviates the need for postulating *ad hoc* verb classes that must be referred to in terms of diacritics. In fact, as I suggest below, not postulating that verbs belong to different classes makes it difficult to capture several generalizations about the language.

I assume here, then, that verbs are organized into classes and that class membership is specified in the lexical entries of both roots and verbalizing suffixes by means of diacritics. Verbalizing suffixes of a particular class thus affix only to roots of the same class. Since each of the verbalizing suffixes listed above affixes unpredictably to at least some roots, we may assume that there are as many classes as there are verbalizing suffixes. The verb classes associated with the verbalizing suffixes in (14) are given in (17). Each class is labelled with a number for ease of reference; the choice of numbers is arbitrary. In addition, the form of the VS-stem associated with each class is given, with the verbalizing suffix represented in bold:¹⁷

¹⁷ Some roots belong to more than one verb class; these are irregular verbs. One example is the root *kup* 'buy'. In the Imperfective, *kup* belongs to the *-oV* subset of Class 1 (i.e., *kupovać* 'to buy, I. '); in the perfective, *kup* belongs to a different class—Class 4 (i.e., *kupić* 'to buy, Pf.'). Irregular verbs of this kind most likely have two lexically listed alternants: thus *kup* has a Class 1 alternant marked as Imperfective, and a Class 4 alternant marked as Perfective.

(17)	<p>Class 1</p> <p>X+a</p> <p>p'is 'write'</p> <p>płak 'cry'</p> <p>kop 'kick'</p> <p>X+ov</p> <p>kup 'buy'</p> <p>mal 'paint'</p>	<p>Class 2</p> <p>X+a_j</p> <p>čyt 'read'</p> <p>kox 'love'</p> <p>xov 'hide'</p>
	<p>Class 3</p> <p>X+e</p> <p>v'ld 'see'</p> <p>kžyk 'shout'</p> <p>v'is 'hang'</p>	<p>Class 4</p> <p>X+i</p> <p>pros 'request'</p> <p>rux 'move'</p> <p>top 'drown'</p>
	<p>Class 5</p> <p>X</p> <p>kład 'put'</p> <p>mog 'can'</p> <p>gñet 'crush'</p> <p>myj 'wash'</p>	<p>Class 6</p> <p>X+n_q</p> <p>ros 'grow'</p> <p>ćog 'pull'</p>
	<p>Class 7</p> <p>X+e_j</p> <p>gž 'heat'</p> <p>tl 'smoulder'</p>	

The verbalizing suffixes serve a classificatory function in the sense that they are the surface encoders of membership in a particular verb class. A speaker determines the class of a particular verb, and thus the

inflectional and derivational properties of that verb, from the form of the verbalizing suffix appearing in its VS-stem.

Two points need to be made about the classes in (17). First, roots of Class 5 are not followed on the surface by verbalizing suffixes. This is illustrated more fully in (18) where both underlying and surface forms of infinitives of some Class 5 roots are listed. If these roots did take a verbalizing suffix, the suffix would surface between the root and the infinitive morpheme *-ć* (See Fn. 6 on the consonant alternations):

(18)	a. <i>kład+ć</i>	<i>kwaść</i>	'put'
	b. <i>mug+ć</i>	<i>muc</i>	'can'
	c. <i>gńet+ć</i>	<i>gńeść</i>	'crush'
	d. <i>myj+ć</i>	<i>myć</i>	'wash'

Laskowski (1975b) and Szypra (1987b) assume that roots such as those in (18) are in fact followed by a verbalizing suffix, but this suffix is postulated to be a zero-affix. However, it is possible to account for Class 5 roots without postulating zero-affixes, if one assumes that, unlike the VS-stems of underived verbs of the other classes, Class 5 VS-stems are simply characterized by having no verbalizing suffix. Thus in Class 5, the VS-stems are identical to the roots from which they are derived. The affix-less 'X' shown under Class 5 in (17) is meant to indicate this.

The second point involves a subclass of Class 1: roots followed by the suffix *-oV* which is, in turn, followed by the VS *-a*. The fact that roots such as *kup* 'buy' or *mal* 'paint' are followed by *-oV* is unpredictable, and must be specified in their lexical entries. However, verb stems ending in *-oV* are always conjugated according to the pattern followed by Class 1. Since affixes as well as roots and stems have lexical entries, we can assume that

the suffix *-ov* is diacritically specified as belonging to Class 1. Affixation of *-ov* to a root will automatically mark the stem derived by its affixation as belonging to Class 1, thus ensuring that it will always be followed by the Class 1 verbalizing suffix. Now, if one assumed, following the bi-formative hypothesis of Laskowski (1975b), that verbalizing suffixes were included in the lexical entries of verb roots, then both *-ov* and *-a* would have to be included in the lexical entries. If both were included, then the question would arise whether *-ov-a* should be considered to be one suffix, *-ova* or two. The latter possibility, that *-ov-a* is two suffixes, would not allow us to state the generalization that *-ov* is always followed by *-a*, since it would simply involve listing *-ov* and *-a* with every verb; the former possibility would not account for the fact that the conjugational and derivational properties of verbs in *-ova* are identical to those of verbs in *-a*. By not distinguishing verb classes, the Laskowski-Szpyra bi-formative hypothesis thus misses a generalization about the inflectional pattern followed by one set of verbs. In §2.2.4 on secondary Imperfectives I present another example of the need for distinguishing verb classes.

Assuming that roots are specified for the class they belong to, and that verbalizing suffixes have lexical entries distinct from those of verbs, but which also specify the class of verb in which these suffixes appear, has the effect of distinguishing two types of constituents: the VS-stem in which the verbalizing suffix appears, and a stem on which membership is marked, and to which the verbalizing suffix affixes. This latter type of stem is a class-stem.

2.2.2 C-stems

Laskowski (1975b) suggests that all roots in Polish are unspecified for lexical category but instead carry only lexical meaning; according to Laskowski, derivational or inflectional affixes such as the verbalizing suffixes provide the category-less roots with category features. My assumption that verbal roots are marked in the lexicon as members of particular classes of lexical items, all of which are inflected in the same way, has the effect of assigning roots to lexical categories without necessarily specifying that they are verbs, nouns, etc. In other words, specifying that a particular root belongs to a class of lexical items which serve as stems for affixation of verbalizing suffixes, and, subsequently, for affixation of TM and P/N suffixes, ensures that that root will be inflected as a verb and not as a noun or an adjective. To be inflected as a noun or as an adjective, a root would have to be specified as belonging to a class distinct from those classes which take verbal inflection. Thus the property of belonging to a particular class is not only a characteristic of verbal roots but of all nominal, adjectival and adverbial roots as well. Furthermore, given that roots may serve as bases for derivational suffixation, and given that the rightmost suffix in a stem determines the inflectional properties of that stem, we can assume that derivational suffixes are also marked for class membership. For instance, while the noun root *rɛk* 'hand' belongs to the class of feminine nouns, the noun stem *rɛcʰ+nɪk* 'towel', formed by suffixing *-nɪk* to the root, belongs to the class of masculine-gender nouns. Affixation of *-nɪk* adds lexical content to the root, and also involves a change in the inflectional class of the derived stem.

The central constituent of verbs, nouns, adjectives, and adverbs, then, is the C-stem. A C-stem is a constituent which is specified for belonging to a particular lexical class; class membership determines the inflectional and some derivational properties of a stem. In addition, the C-stem is that constituent which carries the lexical semantic content, as distinct from case, agreement, tense, and other grammatical content which is supplied by suffixes that appear outside the C-stem.

Given that specification of class membership determines the inflectional properties of a lexical item, specifying lexical category in addition to class membership would simply be redundant. I assume, therefore, that roots are not specifically marked as verbs, nouns, adjectives, or adverbs in their lexical entries, but that they are marked as belonging to particular classes.¹⁸ Lexical categories are assigned by the inflectional morphemes of the language. In the case of the verbs in Polish, it is TM- and P/N-suffixes which supply the category of Verb to the stems in which they appear.

2.2.3 Denominal and Deadjectival C-stems

I claimed above that membership in a verb class is unpredictable and must be learned separately for each underived C-stem. Consider now the verb classes associated with derived verbs. As illustrated in (14b) above, there are three main types of denominal and deadjectival derived verbs: those formed with *-oV*, which is followed by *-a*, those formed with *-ej* and

¹⁸ Since I do not treat nominal, adjectival or adverbial stems in this thesis, I refer to such stems by means of category labels rather than in terms of class membership. The nonverbal classes of Polish await detailed study in a generative framework.

those formed with *-i*. The most productive of these is the first type. The relationship between a denominal or deadjectival verb C-stem and the verbalizing suffix that appears in the VS-stem of that derived-verb C-stem is not idiosyncratic in the way that the relationship between a root and a particular verbalizing suffix is. The formation of *-oV* denominal verbs, for instance, is a productive process in contemporary Polish. According to Grzegorzczkova (1972), in most cases *-oV* is affixed to a nominal root or stem to form a verb which specifies an action connected in some way to the meaning of the root or stem:¹⁹

- | | | | | | |
|------|----|------------------|-------------------|---------------|-------------|
| (19) | a. | p'iwovať | 'to saw, file' | p'iwa | 'saw' |
| | b. | korkovať | 'to cork, block' | korek | 'cork' |
| | c. | butelkovať | 'to bottle' | butel+k+a | 'bottle' |
| | d. | nocovať | 'spend the night' | noc | 'night' |
| | e. | b'ibl'otekažovať | 'run a library' | b'ibl'otek+až | 'librarian' |

Clearly we would not want to assume that all nominal stems, like verb roots, are marked in the lexicon for the particular verbalizing suffix that they can take and hence for the verb class to which they belong, or to which they would belong if they ever happened to be used as bases for denominal verb formation. Affixation of *-oV* to a denominal stem is thus not a learned property of that stem.²⁰ The formation of denominal *-oV* verbs, however, as

¹⁹ Examples and facts about derived verbs are taken from Grzegorzczkova (1972), Satkiewicz (1969), and Grzegorzczkova et al. (1984). The facts presented here are fairly superficial as far as the semantics of the verbs is concerned and the reader is therefore referred to these works and to references cited there for detailed discussion.

²⁰ The use of *-i* and *-ej* to form denominal verb stems seems to be less productive today than the use of *-oV*. Thus, Grzegorzczkova (1972) states that in some cases *-oV* is replacing *-i* in denominal verbs (e.g., the former *kuaż+y+ć* and *matć+y+ć* are today *kuaż+oV+ć* - *kuażovať* 'to cook' and *matk+oV+ć* 'to mother'). If the classes of nominal and adjectival stems to which *-i* and *-ej* can be affixed are closed, then it may be the case that the derived c-

a regular process of Polish word formation, is represented in the grammar of Polish by a word formation rule. And it is this rule which is learned by speakers of Polish.

The word formation rule deriving denominal *-oV* verbs must include the information that *-oV* affixes to nominal roots or stems (of a particular semantic type) and that its affixation forms derived-verb C-stems which belong to Class I. X+oV Class I C-stems thus come from two sources: verb root C-stems (see (17)) and the denominal *-oV* word formation rule. And as the following comparison of the first and third singular forms of *nocować* 'spend the night' and *kupować* 'buy' shows (where the former is denominal and the latter is verbal) in (20) shows, both underived verb C-stems and denominal verb C-stems are conjugated in the same way:

(20)			1 sg.	3 sg.
	a. <i>nocować</i>	'spend the night'	<i>nocuje</i>	<i>nocuje</i>
	b. <i>kupować</i>	'to buy, I.'	<i>kupuje</i>	<i>kupuje</i>

Denominal and deadjectival verb C-stems associated with the verbalizing suffixes *-i* and *-e/* are also derived by means of word formation rules. (21) provides examples of transitive verbs containing *-i* which are derived from both nouns and adjectives.

(21)	a. <i>černić</i>	'blacken'	<u>čarny</u>	'black'
	b. <i>ućišyc</i>	'quieten'	<u>ćixy</u>	'quiet'
	c. <i>odgłowić</i>	'behead'	<u>gwova</u>	'head'

stems in which these affixes appear should be listed in the lexicon. This is a question that requires further investigation. For present purposes, I assume that verbs containing *-i* and *-e/* are derived by word formation rules.

d. odskużyć	'to skin'	<u>skura</u>	'skin'
e. uaktualnić	'bring to the fore'	<u>aktualny</u>	'current'
f. posolić	'to salt'	<u>sól</u>	'salt'

The verbs illustrated in (21) have the same derivational and inflectional properties as Class 4 verb roots, and like Class 4 roots form their VS-stems by affixation of the verbalizing suffix *-i*. The distinguishing characteristic of the rule of word formation by which Class 4 derived verb C-stems are formed is that, unlike in the case of *-oV* derived verbs in which the assignment of verb class membership to a non-verbal stem is accompanied by affixation of a suffix, derivation of a Class 4 verbal C-stem does not involve affixation. The word formation rule simply takes a particular nominal or adjectival stem, and assigns it to the Class 4 verb class (i.e., []_N → []_{Class 4}). It is as a result of this assignment to Class 4 that the derived verb C-stem forms its VS-stem by affixation of the verbalizing suffix *-i*.

-ej appears in "processual" intransitive verbs based on adjectives and nouns specifying some kind of quality.

(22) a. <i>čerńeć</i>	'become black'	<i>čarny</i>	'black'
b. <i>zmądzęć</i>	'become wise(r)'	<i>mądry</i>	'wise'
c. <i>korkovaćeć</i>	'become cork-like'	<i>kork+ov+at+y</i>	'cork-like, adj.'
d. <i>zdźiwaćeć</i>	'become strange'	<i>dźiw+ak</i>	'an eccentric'

As in the case of *-i* denominal verbs, formation of *-ej* verbs does not involve affixation, but rather involves assigning membership in Class 7 to a denominal or deadjectival stem. The Class 7 diacritic on the derived verbal

C-stem ensures that the Class 7 verbalizing suffix *-ej* appears in forms of the verb.

The three word formation rules for deriving denominal and deadjectival verb C-stems are given in (23):

(23) a. []_{N-class} → []_{OV}]_{Class 1}

b. []_{N-class} → []_{Class 4}
 A-class

c. []_{A-class} → []_{Class 7}
 N-class

Since (23b) and (23c) simply involve changing the nominal or adjectival class membership of a root or stem to membership in a verb class, these are effectively conversion rules, similar to rules involved in English pairs such as *récord_N~recórd_V* or *convért_V~cónvert_N*. (23a) is also a conversion rule, however, although it involves suffixation as well as change in class membership. The morpheme *-ov* is an all-purpose class-less morpheme in Polish which can take on several different functions. It appears in adjectives derived from nouns (e.g., *osob+ovy* 'personal', *osob+a* 'person'), in feminine forms of surnames (e.g., *Pańi Bušova* 'Mrs. Busza'), in non-Slavic verbs containing the formant *-iz* (*dem'il'itaryzovać* 'demilitarize'), in deverbal verbs such as *malovać* 'paint', and in denominal verbs such as *kalkulovać* 'calculate' or *cyrkulovać* 'circulate' derived from non-Slavic nouns such as *kalkul+acj+a* 'calculation' or *cyrkul+acj+a* 'circulation' which do not have corresponding *-ov* adjectives (**kalkulovy*, **cyrkulovy*). In all these different cases, *-ov* has the same phonological properties.

Rather than suggesting that there are several different *-ov* morphemes, I suggest that there is only one, but that this morpheme takes part in several different word formation rules which attach it as a suffix to stems, and which supply those stems to which it is suffixed with different class membership. For instance, (23a) affixes *-ov* and assigns the stem thus derived to membership in the verb class 1. Another rule affixes *-ov* to nouns while assigning membership in an adjectival class; and so on. Affixation of *-ov* is thus concomitant with, or part of, rules that change the class membership of the stems which they take as input. In this sense, then, (23a) is a conversion rule just as (23b) and (23c) are; it differs from the latter two only in that it also involves affixation.

The discussion of derived verbal C-stems has shown that nominal and adjectival stems become members of particular verb classes by means of rules of word formation. Derived C-stems differ from underived verb root C-stems in that in the latter case class membership is indicated in lexical entries rather than being assigned by rule. What is significant, however, is that regardless of how class membership is assigned, all verb C-stems of a particular class have the same inflectional and derivational properties. Class 1, for instance, includes verb root C-stems such as *p'is* 'write', deverbal *-ov* verbs such as *mal+ov* 'paint', denominal *-ov* verbs, such as *b'ibl'otek+až+ov* 'run a library', and secondary Imperfectives of Class 1, 2, and 3 verbs such as *p'is+yv* 'write, freq.' or *za+mal+ov+yv* 'paint over, S.I.'. Let us turn now to the formation of secondary Imperfective C-stems.

2.2.4 Secondary Imperfectives

Secondary imperfectives are imperfective forms usually derived from simple perfective stems and usually having a frequentative or iterative meaning.²¹ This subsection illustrates that secondary imperfective stems are themselves C-stems and that the formation of a secondary imperfective C-stem from a simple verb is predictable from verb class membership. My analysis of secondary imperfectives differs from earlier generative analyses (Laskowski 1975b, Gussmann 1980, Rubach 1984, Szpyra 1987b) in that I propose that there is no secondary imperfective morpheme *-aj*, but that instead, the presence of *-aj* in certain secondary imperfectives is a result of the shift in verb class membership. I suggest that the vowel alternations which occur in certain secondary imperfectives may be due to morphological, rather than to phonological processes.

2.2.4.1 Secondary Imperfectives and Verb Classes

(24) illustrates the forms of secondary imperfectives associated with the verb classes postulated in (17). The stems are presented without P/N or TM markers affixed to them, and are in near-surface forms. Class 6 from (17) is not represented in (24) for reasons discussed in later sections.

(24)	VS-stem	Secondary imperfective VS-stem	
Class 1	p'is+a	za+p'is+yv+a	'write up'
	kop+a	od+kop+yv+a	'dig up'

²¹ Simple perfectives generally contain prefixes. For purposes of this section I assume that prefixes are included in C-stem constituents. In §2.2.5 I provide arguments in favour of this assumption.

	pže+mal+ov+a	pže+mal+ov+yv+a	'paint'
	za+p'iw+ov+a	za+p'iw+ov+yv+a	'file'
Class 2	čyt+aj	vy+čyt+yv+a	'read'
	kox+aj	za+kox'+iv+a	'fall in love'
Class 3	kžyk+e	vy+kžyk'+iv+a	'shout out'
	v'id+e	pže+v'id+yv+a	'foresee'
Class 4	pros+i	za+praš+aj	'invite'
	skrut+l	skrac+aj	'shorten'
	rux+i	roz+ruš+aj	'move'
	pže+sol'+i	pže+sal+aj	'salt'
Class 5	gńet	roz+gńat+aj	'crush'
	kład	vy+kład+aj	'put'
Class 7	gž+ej	roz+gž+ev+aj	'heat'

As (24) shows there are two types of secondary imperfectives. One affects both underived and derived verbs belonging to Classes 1-3, and involves affixation of a suffix *-iv/yv*²² to a stem; the resulting stem is conjugated following the pattern of Class 1 simple verbs:²³

(25) a.	zap'isyvać	'inf.'
	zap'isuję	'3rd pl.'
	zap'isuješ	'2nd sg.'
	zap'isyvaw	'past, m.sg.'

²² The underlying form of this morpheme contains an initial /i/. [y] is derived by rule following labial and coronal consonants. See Chapter 3 for discussion.

²³ Although stems ending in *-iv* 'DI' are usually conjugated as Class 1 verbs, there are some verbs in which *-iv* may be followed by *-ej*, or by *-e*. Thus the following types of alternant forms are found: *dogadyvać* 'scold, DI' appears as *dogadyvam* or *dogadyje* in the first singular; similarly, *akutyvać* 'wrap up' appears as *akutyvam* or *akutyje*; and *dosrubovyvać* 'screw on' appears as *dosrubovyvam* or *dosrubovuje*; see Brooks (1975) p. 149 for a list of similar alternating forms. These examples suggest that speakers occasionally interpret *-iv* as belonging to Class 2 rather than to Class 1, thus conjugating forms containing *-iv* according to Class 2 patterns.

The other affects underived and derived verbs of Classes 4, 5 and 7. The secondary imperfectives of verbs from these classes are conjugated according to the pattern of Class 2 simple verbs:

(26)	rozrušać	'Inf.'
	rozrušaję	'3rd pl.'
	rozrušaś	'2nd sg.'
	rozrušaw	'past, m.sg.'

As (24) illustrates, the secondary imperfectives of Classes 4 and 5 often involve vowel alternations which do not occur in Classes 1-3. I will discuss these in §2.2.4.2. Classes 4 and 7 secondary imperfectives also involve alternations in the final consonants of the C-stems. Class 4 alternations are discussed shortly; see §2.2.4.3 for Class 7 consonant alternations.

It is clear from the examples in (24), that the forms of secondary imperfectives of all regular verbs are predictable on the basis of the class membership of simple (im)perfective C-stems. Setting aside for a moment the vowel and consonant alternations seen in secondary imperfectives, the formation of secondary imperfectives resembles the two types of denominal and deadjectival verb-stem formation postulated above (see (23)). Class 4, 5 and 7 secondary imperfective formation seems to involve assignment of membership in Class 2 without concomitant affixation (this is similar to the formation of *i-* and *e/-* stem derived verbs in which no affixation occurs), whereas Class 1-3 secondary imperfective formation seems to involve assignment of membership in Class 1, but with concomitant affixation of the suffix *-iv* (this is similar to the formation of *ov-* stem denominal verbs). We can assume that secondary imperfectives are derived

by rule and are not listed in the lexicon, not only because the forms of secondary Imperfectives are predictable, but also because their meanings are always regular, and predictable from the meanings of the corresponding simple verbs. The rules of secondary imperfective formation, then, derive Class 1 or Class 2 C-stems. Each rule, however, takes a different kind of verbal constituent as input.

The form of the secondary imperfective of the Class 7 verb in (24) indicates that it is the VS-stem of the verb (i.e., $\underline{X+e_j}$) which serves as input to secondary imperfective formation. The consonant alternations between /s/~[š] and /t/~[c] seen in Class 4 secondary imperfectives indicate that in this case too, it is the VS-stem of Class 4 verbs which is the input to the secondary imperfective rule assigning membership in Class 2. /s/~[š] and /t/~[c] only occur in the environment before a [j] (as a result of the application of the rule of lotation; see Ch 3).²⁴ The triggering [j] is not underlying, but instead is derived by means of a rule of j-formation which occurs in the environment of a sequence of two vowels of which the second is [-high]. In Class 4 secondary Imperfectives, j-formation and subsequently lotation take place as a result of the affixation of the Class 2 verbalizing suffix *-aj* to the VS-stem (i.e., $\underline{X+1}$) of Class 4 verbs. And, finally, in the case of Class 5 verbs, one can also assume that the input to secondary imperfective formation is the VS-stem, since Class 5 verbs are characterized by the lack of a verbalizing suffix in their VS-stems (recall that TM- and 3rd pl.-morphemes are adjacent to roots in Class 5 forms; e.g.,

²⁴ The alternation between /x/~[š] is found before [j] as well as before relevant morphemes.

gnieć 'crush' has the infinitive *gnieść*, the past tense (f.) *gniotwa*, and the 3 pl. *gniotą*).

In Classes 1-3, the suffix *-iv* is affixed directly onto a C-stem and not onto a VS-stem; the input to the secondary imperfective rule for these verb classes is thus a C-stem and not a VS-stem. This is clear from the secondary imperfectives of Class 2 in particular. If the secondary imperfective formation of Class 2 verbs took the Class 2 VS-stem as input, it would generate underlying forms in which *-aj* would be followed by *-iv*. On the surface, however, *-aj* does not appear. Thus we get *wyczytywać* 'read out, S.I.' and not **wycytajivac*. If one assumed that *-iv* affixed to the VS-stem of Class 2 verbs, then we would also need to postulate rules to delete the vowel and the glide of the verbalizing suffix *-aj*. Polish actually has independently motivated phonological rules of vowel- and [j]-deletion, but these rules would not delete both segments of the Class 2 suffix in the environment before *-iv*. The vowel-deletion rule applies in the environment before another vowel, but since it is ordered after j-deletion, it could not apply to delete the vowel of *-aj*. j-deletion applies after coronal consonants or in the environment preceding another consonant, but it does not apply to delete a [j] before another vowel; on the contrary, gliding occasionally occurs in the environment preceding a vowel (e.g., a form like *ide+a* can be pronounced [ideja]). Given that no phonological rules of Polish could apply to delete the segments of *-aj*, if we assumed that *-iv* affixed to the *-aj* VS-stem, we would also need to postulate a highly specific morphological rule to delete *-aj* preceding *-iv*. However, if we assume that the reason why [aj] does not surface in secondary imperfectives of Class 2 verbs is that *-iv* does not affix to the Class 2 VS-stem, but that, instead, Class 2 secondary imperfective formation takes a C-stem as input,

then no rule to delete *-a'* is needed. Since the same process of secondary imperfective formation seems to apply in Classes 1, 2, and 3, we can therefore assume that in all three cases, the input to the rule is the C-stem.

The two types of secondary imperfective formation are thus similar in that both effect a change in the verb class of the form which they affect. As we have seen, however, the two processes differ in several respects: one involves suffixation as well as assignment of class membership, whereas the other merely assigns class; one affects verbs of Classes 1-3, the other affects Classes 4-5,7; and, finally, one takes a verb C-stem as input, and the other takes a VS-stem.

Secondary imperfective formation provides evidence in favour of the use of diacritics to mark classes. The secondary imperfective rules crucially make reference to verbs of particular classes. The only way to distinguish classes is by means of diacritics. Although these diacritics are indeed arbitrary, as critics of such an approach point out (e.g., Lieber 1980), inflectional classes of lexical items are in themselves also arbitrary. Lieber (1980) proposes that instead of using diacritics to mark inflectional classes, unpredictable stems are listed in the lexicon along with the roots to which they are related. The relationships between the listed roots and stems are represented by means of morpholexical rules which define the inflectional or derivational classes. Applied to Polish verbs, Lieber's model would require listing all root and derived C-stems as well as their related VS-stems. Morpholexical rules of the form $X \sim X_2$ for Class 1, or $X \sim X_1$ for Class 4, etc. would also be included in the lexicon to define the verb classes. Even if both C-stems and VS-stems are listed, however, without diacritics of some kind there is no way to single out stems belonging to different classes to serve as inputs for rules such as those of secondary imperfective

formation. Within Lieber's model, the only way to account for secondary imperfectives is by means of morpholexical rules, since these represent relations between roots and stems of different stem-types. Thus for Class 1 secondary imperfectives one could propose a morpholexical rule of the form $Xa \sim Xyva$, whereas for Class 4 one could propose a rule of the form $Xl \sim Xla_j$. As defined by Lieber, morpholexical rules represent relations between listed items; only unpredictable forms are listed in the lexicon. Consequently, postulating morpholexical rules to represent secondary imperfective classes predicts that secondary imperfective stems are listed. However, as we have seen, the forms and meanings of secondary imperfectives are predictable; secondary imperfective stems are therefore not listed in the lexicon. Lieber's model is the most fully worked out generative model that tries to minimize the use of diacritics in morphology. Given that it makes the wrong predictions about secondary imperfectives in Polish, and given that using diacritics to distinguish verb classes allows us to account straightforwardly for inflectional and derivational properties of verbs, we can conclude that the use of diacritics is necessary. In addition, if we use diacritics, we do not need to assume that VS-stems are listed in the lexicon. Only C-stems must be listed.

The correlation between verb class and secondary imperfective forms discussed in this section is arbitrary in the sense that it does not follow from any independent properties. However, once we know the rules of secondary imperfective formation, we can predict the secondary imperfective form of any regular verb as soon as we know its verb class. Irregular verbs, of course, require special handling. In (27) I give two irregular verbs, a Class 4 verb which forms its secondary imperfective by affixation of *-iv* rather than by switching to Class 2, and a Class 3 verb

which forms its secondary imperfective by switching to Class 2 rather than by suffixation:

(27)	Simple Verb		Sec. Impf.
	a. ob+swuž+y ...	'serve, Pf.'	ob+swug+iv+a ...
	b. leć+e ...	'fly, Impf.'	lat+aj ...

In order to account for the irregular forms of the secondary imperfectives of these verbs it is necessary to assume that the roots are marked to undergo specific rules of secondary imperfective formation, thus blocking the application of the expected rules.

Let us turn now to the vowel alternations that occur in Class 4 and 5 secondary imperfective stems.

2.2.4.2 Secondary Imperfectives and Vowel Alternations

There are three types of vowel alternations in Class 4/5 secondary imperfectives, resulting from two different processes. The first, affecting only a limited number of roots, involves alternations between the presence of a vowel in the secondary imperfective form of the root and the absence of a vowel in the simple (im)perfective forms (with concomitant V~∅ alternations in prefixes). Roots are underlined in the following examples (just over 30 verb roots exhibit V~∅ alternations; all of these have surface vowels in secondary imperfective forms):

(28)	Simple Pf.	Sec. Impf.	
	inf.	1st sg.	inf.
a.	zery <u>ać</u>		zry <u>wać</u> 'tear off'
b.	vess <u>ać</u>		vsys <u>ać</u> 'suck in'
c.	roz <u>d</u> ć	roze <u>d</u> mę	roz <u>d</u> ymać 'expand'
d.	ob <u>ć</u> ć	ob <u>et</u> nę	ob <u>ć</u> lnać 'cut off'
e.	sk <u>ł</u> ć	z <u>ek</u> lnę	(p <u>że</u>) <u>kl</u> lnać 'swear'
f.	ode <u>px</u> nć		od <u>py</u> xać 'push'
g.	zet <u>ż</u> ć	z <u>et</u> rę	s <u>ć</u> erać 'wipe off'
h.	ze <u>b</u> rać		z <u>b</u> ierać 'gather'

The quality of the vowel which surfaces in the secondary Imperfectives is partly predictable: [e] surfaces before /r/, [i] before /n/, and [y] elsewhere. Since the roots illustrated in (28) exhibit alternations between V and \emptyset , and since, furthermore, they trigger the appearance of [e] in prefix-final position, it is assumed in the standard generative literature that they contain underlying lax high vowels (so-called yers) which surface as [i], [y] or [e] in secondary Imperfective forms as a result of the application of a rule of tensing: Derived Imperfective Tensing ([e] is considered to surface as a result of a rule that lowers the tensed vowel before [r]; see Gussmann 1980, Rubach 1984, Szpyra 1987b). The rule which causes the surfacing of [i], [y] and [e] in secondary Imperfectives affects only the small class of verb roots exemplified in (28), however. Denominal or deadjectival verbs derived from nominal or adjectival stems that also exhibit V~ \emptyset alternations are never affected by Derived Imperfective Tensing. In non-verbal forms the nominal and adjectival stems in (29) exhibit V~ \emptyset alternations in the positions marked by 'E'.

(29)	a. /vy+końEc+I +aj+ć/ pref+ <u>end</u> +VS+SI+Inf	[vykań <u>ć</u> ać]	'finish off' cf. koń <u>ć</u> ~koń <u>ca</u> 'end'
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b. /na+mydEł+i +aj+ć/ pref+ <u>soap</u> +VS+SI+Inf	[namydlać]	'soap'
		cf. mydło~mydeł 'soap'
c. /u+v'idok+En +i +aj+ć/ pref+ <u>view</u> +adj+VS +SI+Inf	[uv'idačńać]	'show' ²⁵

Gussmann (1980) and others have postulated that the V~∅ alternations in (29), like those in (28) are due to the presence of an underlying lax high vowel. We would expect therefore that when these nominal stems appear in verbal forms, and in secondary Imperfectives in particular, the lax high vowels would be tensed by DI-Tensing as they are in (28) and that the following incorrect surface forms would be derived: **vykańićać*, **namydlać*, and **uvidačńać*, respectively. However, no vowels surface in V~∅ positions of denominal/deadjectival secondary Imperfectives. This shows, then, that the process which yields surface vowels in secondary Imperfectives of V~∅ C-stems is restricted to applying only in a small class of roots. Even if the V~∅ alternations are not due to the presence of underlying yers (as I argue in Chapter 3), the conclusion that the V~∅ alternation seen in the roots of (28) applies only in a small class of forms still holds.

The second vowel alternation also affects only a small number of roots, like *gnēt* found in *gnieść* 'knead' ~ *gnote* '1sg.p.' which in addition exhibit an alternation between e~o. In such roots, an [a] appears in: secondary imperfectives:

²⁵ The adjective *v'ubčny* (underlying /v'idok+En+y/) never surfaces with [e] in the position marked by 'E'. However, in some short-form adjectives in which -En occurs, [e] does surface (e.g., /v'in+En/ [v'inen] 'guilty, short form'; cf. /v'in+En+y/ [v'inny] 'guilty, masc. sg.'). One can therefore conclude that the position marked 'E' is in fact a position in which a V~∅ alternation can occur.

(30)	Simple Impf.		Sec. Impf.
	inf.		inf.
	a. gnieść 'knead'		rozgnatać
	b. mieść 'drift'		nam'atać
	1st sg. Impf./Pf.		2nd sg. Impf.
	a'. gnotę		gniećeś
	b'. zmiotę		zmiećeś

And finally, underlying /o/ surfaces as [a] in forms of the secondary Imperfective:

(31)	Simple Impf./Pf.		Sec. Impf.
	inf.		inf.
	a. topić 'drown'		zatapać
	b. zasolić 'salt'		zasalać
	c. upokożyć 'humiliate'		upokazać
	d. gnoić 'decompose'		nagnajać
	e. uspokoić 'calm'		uspokajać~uspakajać
	f. wynarodović 'denationalize'		vynarodav'ać~vynaradav'ać

The shift of /o/ to [a] does not affect prefix vowels, but may affect one or both of the vowels of the remainder of the C-stem.

The e~a alternation occurs only in forms in which [e] also alternates with [o]. In fact, as I argue in Chapter 3, an /o/ underlies e~o alternations in Polish; consequently, the apparent shift of [e] to [a] is actually a shift of [o] to [a]. Thus both the e~a and the o~a alternation are due to the same process and I shall refer to it as the o~a alternation from now on.

Unlike the secondary Imperfective V~∅ alternation, the o~a alternation is not restricted to applying only in verbal roots. The examples in (29) of denominal and deadjectival secondary Imperfectives, for instance, show /o/ shifting to [a] in nominal and adjectival C-stems. We may conclude

therefore that the two types of vowel alternations are distinct processes, and must be expressed differently in the grammar.²⁶

In addition to the distinction in the occurrence of the secondary imperfective vowel alternations—namely, that $V \sim \emptyset$ applies only in a limited number of verb roots, whereas $o \sim a$ applies both to underived and derived verbal C-stems—there is another distinction in the application of these alternations which has not yet been pointed out. In their simple (im)perfective forms, the roots which exhibit $V \sim \emptyset$ alternations belong to various classes including Classes 1-3, whereas those exhibiting $o \sim a$ alternations belong only to Classes 4-5 (cf. (28), (29) and (30) above). The secondary Imperfectives of the $V \sim \emptyset$ set of roots are therefore irregular; given the classes to which the roots belong in their simple forms we would expect their secondary Imperfectives to be derived by affixation of $-i\kappa$. Furthermore, the Class 2 verbalizing suffix $-aj$ is affixed directly onto the $V \sim \emptyset$ C-stems and not onto their VS-stems. If, for example, $-aj$ were affixed to the VS-stem of a Class 3 $V \sim \emptyset$ root such as *čer* 'wipe', then we would expect the final consonant /r/ to surface as [ž] in the secondary imperfective form as a result of application of Iotation in the environment of the two suffixes $e+aj$ (i.e., we would expect **ščežajρ* instead of the correct *ščerajρ*). The fact that no Iotation occurs shows that $-aj$ is affixed to the C-stem and not to the VS-stem ending in $-e$. Thus although both the $V \sim \emptyset$ roots and the Class 4/5 C-stems form secondary Imperfectives by becoming Class 2 forms, the processes by which they form secondary imperfectives are clearly distinct. Secondary imperfective formation of

²⁶ Rubach (1984) also concludes that the two processes are distinct. Gussmann (1980) and Szpyra (1986) consider that they are both due to one rule of Derived Imperfective Tensing.

Class 4/5 C-stems specifies that it takes as input VS-stems, that it assigns Class 2 membership to these stems, and also that it shifts an underlying /o/ to [a]. Secondary imperfective formation of V~Ø roots takes as input verb C-stems, assigns Class 2 membership to these C-stems, and derives surface [i], [y] or [e].²⁷ This latter rule is thus more complicated than the former. Presumably the V~Ø roots are marked to undergo this rule. Although the two types of vowel alternations are distinct processes, they are both found only in secondary imperfectives. The following comments thus apply to both processes. Standard generative analyses, although they differ in detail, all specify that the vowel alternations are triggered by the verbalizing suffix *-aj* in secondary imperfective forms (see, for example, Laskowski 1975b, Gussmann 1980, Rubach 1984, Szpyra 1987b) and they assume that the rule effecting the alternations is ordered in the phonology.

The morpheme *-aj* itself does not actually trigger the vowel alternations. This is clear from the fact that in simple Class 2 verbs containing the *-aj* verbalizing suffix, no vowel shift occurs. The Class 2 root *kox* 'love', for instance, surfaces with the vowel [o] and not with the vowel [a] in the environment preceding the morpheme *-aj* (*koxajɔ* '3 pl.'; **kaxajɔ*). If one assumed that the alternations were triggered by *-aj*, then one would need to postulate the existence of two distinct morphemes with the same phonological shape, *-ajsɪ* and *-aj*, the first of which would trigger vowel shift, and the second of which would not. However, apart

²⁷ I argue in Chapter 3 that the Ø-alternants of V-Ø roots do not contain underlying lax high vowels, but rather are underlyingly syllabic. Consequently, the rule deriving the secondary imperfectives of these roots must insert vowels. Since there is, as I pointed out above, a certain regularity in the quality of the vowels which surface in these roots, and since furthermore the consonants appearing in the alternant forms of the roots remain the same, one would probably want to express the regularity in the relationships between the roots by means of some kind of rule(s), rather than by listing all their alternants.

from differences in triggering vowel-shift, the two postulated *-aj*'s would have identical phonological forms and morphological properties. For example, both would be followed by the first person singular morpheme *-m*, rather than by the morpheme *-ɸ* which occurs in all other verb classes. The only way to distinguish the morphemes would thus be by some completely arbitrary diacritic. But, even if such a diacritic were postulated, the distinction between the morphemes would still be very difficult to learn, given that they occur in identical positions and are in all other respects alike. This suggests, therefore, that there is only one morpheme *-aj* and, indeed, the hypothesis set forth above, that secondary imperfectives are formed by assigning Class 4, 5, and 7 VS-stems to Class 2, assumes that this conclusion is correct.

If vowel-shift is not triggered by *-aj*, then how do we account for the fact that the vowel shift occurs only in secondary imperfective forms? Two possible hypotheses suggest themselves. The first is that vowel shift is effected by a phonological rule which is restricted to applying in forms which are specified morphologically as secondary imperfectives. In other words, vowel shift is a rule of the form $X \rightarrow Y / \text{---}]_S$. Such a rule would need to be further restricted to apply only in secondary imperfectives of Class 2, however; recall that no vowel shift occurs in Class 1 *-i* secondary imperfectives. The second hypothesis is that vowel shift is effected by, or part of, the morphological rule that forms secondary imperfectives of Classes 4 and 5 by assigning Class 2 membership to VS-stems of Class 4 and 5 verbs. There is no evidence that would allow us to conclude firmly that one of the two hypotheses is obviously correct and that the other is incorrect. Possible evidence in favour of the first hypothesis comes from the observation that the *o~a* vowel shift never affects a prefix vowel. The

secondary imperfective of a form such as *po+sq+i+c* 'to salt' (the root is underlined), for instance, is *posalač* and not **pasalač*. I argue below that prefixes are phonological words and thus phonologically independent of the remainder of the morphological verb form but that they are morphologically part of the C-stem (see §2.5). Presumably, then, one would not expect a morphologically-restricted word-level phonological rule to affect prefixes, since the morphological environment required by the rule would only be found in the non-prefix part of the C-stem. If one assumes that vowel shift is a phonological rule and that prefixes are phonological words, then the fact that vowel shift does not affect the prefix vowels is explained. If one assumes, following the second hypothesis, that vowel shift is part of the word formation rule itself, then it is less clear why it does not affect a prefix vowel, since a prefix is morphologically part of the C-stem. The second hypothesis thus seems to require a stipulation to the effect that the vowel shift is restricted to applying in the non-prefix part of the derived C-stem. Possible evidence that the second hypothesis is correct comes from the interaction of vowel shift with a process of prefix restructuring. Although prefixes are phonological words, in the environment before the syllabic alternant of a verb from the small class of roots which exhibit V~Ø alternations, they are "demoted" or restructured to the status of phonological morphemes. We know that in this particular environment prefixes do not function as independent phonological words, because they undergo a word-level process of epenthesis (e.g., *roz+ryv+a/c* 'tear, SI' becomes *rozE+rv+a/c* 'SI', where 'E' represents the epenthetic vowel). Now, I suggest in Chapter 3 that this process of restructuring must be ordered in the morphological component, before any of the cyclic rules of the language can apply. Notice, however, that vowel shift must be ordered before

restructuring. The reason for this is that vowel shift provides the verb root with a vowel, making it syllabic and thereby blocking the process of restructuring. If vowel shift is ordered before restructuring, and if restructuring is in the morphological component, then vowel shift must also be ordered in the morphological component.

We seem, then, to have evidence both for and against both hypotheses. It is significant, however, that the evidence in favour of the phonological hypothesis comes from the $o \sim a$ vowel alternation, while that in favour of the morphological hypothesis comes from the $V \sim \emptyset$ alternation. I assume, on the basis of the evidence, that the latter alternation is indeed ordered in the morphology as part of one of the morphological processes of secondary imperfective formation. I leave open the question of whether the $o \sim a$ alternation is morphological or phonological. Given that it is highly restricted morphologically, and that no phonological material is referred to in the environment of the rule, it seems likely that the alternation is in fact a phonological change which takes place as part of the word formation rule deriving secondary imperfectives.

2.2.4.3 Glide-Final Roots

As the following examples show, certain Class 5 roots and Class 7 VS-stems exhibit an alternation between [j] and [v], with [j] occurring in the simple (im)perfective forms and [v] appearing in the secondary imperfective:

	(32) Simple (Im)perfective			Secondary Imperfective		Gloss
	Infinitive	1 sg	2 sg	Infinitive	1 sg	
a.	myć	myję	myješ	zmywać	zmyvam	'wash'
b.	šyć	šyję	šyješ	zašywać	zašyvam	'sew'
c.	čuć	čuję	čuješ	odčuwać	odčuvam	'feel'
d.	śać	śeję	śeješ	rozśewać	rozśevam	'sow'
e.	lać	leję	leješ	rozlewać	rozlevam	'spill'
f.	gźać	gź+e.j+ę	gźeješ	ogźewać	ogźevam	'heat'

Since the Slavic [v] is derived from a back glide [w]²⁸ the alternation seen in (32) can be considered to be between two glides: an underlying /j/ and a derived [w] → [v]. As in the case of the vowel alternations, the shift in the glides is restricted to the morphological environment of secondary imperfectives.²⁹ Again, it is difficult to decide whether the shift should be part of a secondary imperfective formation rule or whether it should be a morphologically-restricted phonological rule. I assume the former hypothesis.

2.2.4.4 The Rules

The two basic rules for forming secondary imperfectives are given in (33):

²⁸ See Chapter 4 for a brief justification of this claim.

²⁹ A similar alternation occurs in Russian. Coats (1974) argues for Russian that this alternation arises as a result of a rule which shifts underlying /j/ to /w/ in the context of the secondary imperfective morpheme -o/ (see also Flier 1974). A late rule then changes the /w/ to [v].

(33) a. SI Rule for verbs of Classes 1, 2, 3

$$\begin{array}{ccc} [\quad]_{\text{C-stem}} & \rightarrow & [\quad]_{\text{iv}}]_{\text{C-stem}} \\ \text{Class 1,2,3} & & \text{Class 1} \end{array}$$

b. SI Rule for verbs of Classes 4, 5, 7

$$\begin{array}{ccc} [\quad]_{\text{VS-stem}} & \rightarrow & [\quad]_{\text{C-stem}} \\ \text{Class 4,5,7} & & \text{Class 2} \end{array}$$

In addition to these two rules, there are several sub-rules of (33b) which include the vowel and consonant alternations illustrated above:

(34) a. SI Rule for asyllabic irregular verbs like *ryv~rv* 'tear'

$$\begin{array}{ccc} [(C)CC]_{\text{C-stem}} & \rightarrow & [(C)CVC]_{\text{C-stem}} \\ \text{Class 1,2,3} & & \text{Class 2} \end{array}$$

b. SI Rule for Class 4,5 verbs containing /o/

$$\begin{array}{ccc} [X+Y \dots o \dots Z]_{\text{VS-stem}} & \rightarrow & [X+Y \dots a \dots Z]_{\text{C-stem}} \\ \text{Class 4,5} & & \text{Class 2} \end{array}$$

c. SI Rule for Class 5, 7 verbs ending in /j/

$$\begin{array}{ccc} [X \dots j]_{\text{VS-stem}} & \rightarrow & [X \dots w]_{\text{C-stem}} \\ \text{Class 5, 7} & & \text{Class 2} \end{array}$$

2.2.5 C-Stems and Prefixes

So far we have discussed only the morphological properties of verbal suffixes. Prefixes also play a major role in contributing to lexical and grammatical (aspectual) meanings of verbs to which they attach. In the

examples in (35), all the prefixed forms are perfective, and, in most cases, also have a different lexical meaning from that of the corresponding unprefixed verbs (see §2.5 for discussion of prefixes and aspect).

(35)	a.	p'isać	'write, Impf.'
		nap'isać	'write, Pf.'
		zap'isać	'write down, Pf.'
		pžep'isać	'rewrite, Pf.'
	b.	šyć	'sew, Impf.'
		ušyć	'sew, Pf.'
		vyšyć	'embroider, Pf.'
	c.	sol'ić	'salt, Impf.'
		posol'ić	'salt, Pf.'
		pžesol'ić	'over-salt'
		dosol'ić	'salt sufficiently'

From (35) we can see that prefixes do not affect the verb class membership of the verbs to which they affix: the simple imperfective and prefixed perfective forms in (35) all belong to the same verb class. Class membership thus depends on the root or derived verb C-stem with which a prefix combines. The evidence suggests, in fact, that prefixes affix to C-stem constituents, and that their affixation derives constituents which are also C-stems; thus a prefixed stem has the form : [Prefix [C-stem]]_{C-stem}.

Szpyra (1986, 1987a,b) argues that prefixes can attach only to verbal constituents. And there is reason to believe that at least some prefixes tend not to attach to stems which are not verbal. Prefixes such as *po-*, *u-*, *od-*, and *roz-*, for instance, are very rarely found affixed to roots which are clearly nominal (or adjectival). They are found in words which function as

nouns, but in most cases the meanings of such nouns suggest that they are derived from corresponding prefixed verbs (roots are underlined):

(36)	a. <u>ś</u> ćek	'drain'	ś+ćekać	'flow down'
	b. nas <u>wu</u> x	'monitoring'	naswuxać się	'to hear'
	c. <u>u</u> targ	'takings'	utargować	'gain'
	d. <u>s</u> puśc	'trigger'	spuścić	'release'
	e. o <u>t</u> ok	'rim'	otożyć	'surround'
	f. po <u>ć</u> isk	'projectile'	poćiskać	'press (a button)'
	g. roz <u>d</u> ział	'distribution'	rozdzielać	'divide, break up'
	h. od <u>k</u> op	'return kick'	odkopać	'kick back'

Recall that Szpyra and Laskowski adopt the hypothesis that verbs are listed in lexical entries as bi-formative stems. Given this hypothesis, the minimal verbal constituent is the constituent which I refer to as VS-stem—that is, the verb form containing a verbalizing suffix. Therefore, if it is true that prefixes attach to verbal constituents, then under the bi-formative hypothesis, it is necessary to assume that prefixes attach to VS-stems.³⁰ And this is in fact what Szpyra assumes. In contrast, according to the analysis of verbal constituent structure proposed in this chapter, C-stems as well as larger constituents of the verb are verbal; therefore, we can assume that prefixes attach to C-stems and still account for the observation that prefixes attach to verbal constituents.

Under the hypothesis that prefixes are attached to VS-stems, the nouns in (36) can only be derived by means of a rule of backformation which truncates the verbalizing suffix present in the VS-stem (see Szpyra (1986, 1987a)). Under the hypothesis that prefixes are affixed to C-stems, the

³⁰ According to Szpyra, the constituents formed by prefixation are themselves VS-stems. Szpyra does not actually discuss this point.

deverbal nouns must be derived by conversion rules which convert the verb-class C-stems into C-stems belonging to nominal classes. While there is no *a priori* reason to assume that rules of truncation should be avoided, in this instance an analysis assuming conversion is simpler than one assuming truncation. The conversion analysis postulates that there is one operation involved in deverbal noun formation, namely, changing C-stem class membership. The truncation analysis involves truncation of a verbalizing suffix, but also must involve an operation which assigns the truncated stem to a nominal class. Thus this latter analysis requires two operations, and, *ceteris paribus*, is therefore more complex than the former.

Additional evidence that prefixes are affixed to C-stems comes from the observation that lexical meanings of prefixed secondary imperfective forms are identical to the lexical meanings of corresponding simple perfectives.

	Simple Pf.	Sec. Impf.	
(37) a.	zap'isać	zap'isywać	'write down'
	pżep'isać	pżep'isywać	'rewrite'
b.	zakochać się	zakoch'ivać się	'fall in love'
c.	dov'edzieć się	dov'adywać się	'find out'
d.	vyšyć	vyšywać	'embroider'
e.	pżesolić	pżesalać	'over-salt'

In (37a-c) the secondary imperfectives are derived by means of the rule that forms Class 1 C-stems and affixes *-iv-*; this rule takes as its input simple verb C-stems (see (33a)). In (37d,e) the secondary imperfectives are derived by assigning membership in Class 2 to VS-stems. I argued above that verb VS-stems are formed by affixing verbalizing suffixes to C-stems of the appropriate verb classes. If it is assumed that prefixes attach to VS-

stems, then prefixation will be ordered after simple verb VS-stem formation and also after secondary imperfective C-stem and, subsequently, VS-stem formation. In the case of (37d,e), since secondary imperfective formation takes as input VS-stems, then both unprefixated and prefixed forms will serve as inputs to secondary imperfective formation. In the case of (37a-c), however, secondary imperfective formation will have to take unprefixated C-stems as input; prefixation in these forms will be able to occur only after secondary imperfective formation and after affixation of the Class 1 verbalizing suffix to the secondary imperfective C-stem. Consequently, in these latter cases the completely consistent correspondence in meaning between the prefixed perfectives and the secondary imperfectives will be unexpected and unexplained. If it is assumed that prefixes affix to C-stems and if it is also assumed that prefixed constituents are themselves C-stems, then the correspondence in meaning between secondary imperfectives and prefixed perfectives such as those in (37a-c), as well as those in (37d,e), simply falls out. In other words, in both cases, the formation of the simple (prefixed) verb form and the secondary imperfective form will have identical morphological and lexical constituents as input. We can therefore conclude that prefixes are affixed to verb C-stems.

There exist in Polish verbs in which two or occasionally even three prefixes are found:

- | | | | |
|------|----|----------------|-------------------------------|
| (38) | a. | po+za+p'isywać | 'write down, take notes, Pf.' |
| | b. | ob+u+mżeć | 'waste away, atrophy, Impf.' |

c. do+po+do+sypovyvać³¹ 'add dry matter bit by bit by pouring,
Pf.'

Although such forms are rare, their formation is constrained to a great extent by semantic rather than by structural factors. The fact that they exist confirms that the constituents formed by affixation of prefixes are themselves verbal C-stems. If prefixes are specified to attach to C-stems and to form C-stems by their affixation, then the fact that prefixed C-stems may undergo further prefixation is predicted. If, however, prefixation were assumed to form constituents which are not C-stems, then such double- or triple-prefixed forms would either be falsely predicted not to exist, or it would be necessary to stipulate that prefixes affix to C-stems and also to some other type of Prefix+C-stem constituent.

2.3 Laskowski (1975b), Szpyra (1986, 1987b)

I have referred several times to Laskowski's (1975b) hypothesis that all roots are entered in the lexicon as bi-formative structures consisting of the root plus a verbalizing suffix. In this subsection I wish to contrast the bi-formative hypothesis with my analysis of verbs.

The bi-formative hypothesis entails that word formation processes entered into by verbs must take the bi-formative stems as inputs. Laskowski and Szpyra (1987b), who follows Laskowski, thus assume that the secondary Imperfective morphemes *-iv* and *-aj* are always affixed to VS-stems:

³¹ Example taken from Piernikarski (1969, 165). Piernikarski reports that it occurs in the dialect/jargon of Domaniewka.

- (39) a. vy+kžyk+e+iv+a ...
 b. pže+mal+ov+a+iv+a ...
 c. vy+čyt+aj+iv+a ...
 d. za+pros+i+aj ...
 e. roz+gñet+Ø+aj ...³²
 f. roz+gž+ej+aj ...

In order to account for the surface forms of Class 1-3 secondary imperfective stems, in which the verbalizing suffixes of the VS-stems do not appear, Laskowski and Szpyra postulate the existence of a morphological rule of Verb Suffix Truncation that deletes a verbalizing suffix in the environment of a derivational morpheme. The rule deleting the verbalizing suffixes must be morphological rather than phonological, since, as I pointed out above, no phonological rules of Polish could delete the suffix *-aj*. In addition, the rule is restricted to applying only in the environment of derivational suffixes since, as we know, the suffixes are not deleted before P/N and TM morphemes (which can be termed inflectional morphemes). In the case of Class 4 and Class 7 secondary imperfectives, such as *za+pros+i+aj* and *roz+gž+ej+aj*, Truncation does not apply, as the surface forms *zaprąšaj* and *rozgževaj* show.³³ The only way this can be accounted for within the framework used by Laskowski and Szpyra is by an *ad hoc* restriction on the rule of Truncation.

³² Recall that Laskowski (1975b) assumes that one of the verbalizing suffixes is a zero-affix, but I have suggested that such an assumption is unnecessary. I include the zero-affix here to illustrate the analysis proposed by Laskowski and Szpyra.

³³ The italicized form of the C-stem final consonant /s/ indicates that *-s-* is not deleted before *-ej*.

As far as I can tell, the fact that the verbalizing suffixes *-i* and *-ej* surface in secondary imperfectives of Class 4 and Class 7 verbs, respectively, is an arbitrary fact about Polish. It cannot be predicted from any properties of the verbal system or of the morphemes involved and must therefore be stipulated in the grammar. Within a model of verbal morphology such as the one being proposed here, which makes a distinction between two types of constituents—verbal C-stems and VS-stems—the form of Class 4 secondary imperfectives is accounted for by stipulating that the rule deriving these secondary imperfectives takes Class 4,5 and 7 VS-stems as its input. Such a stipulation is, however, not entirely *ad hoc*, because it takes advantage of a distinction which is made independently in the grammar. In this sense, then, the analysis I am proposing is superior to the Truncation analysis. In addition, my analysis does not require postulation of a rule of Verb Suffix Truncation. Postulating such a rule only adds complexity to the grammar and does not provide a more straightforward account of the facts. Szpyra (1986) claims that if one assumes that bi-formative stems are listed in the lexicon, then it is unnecessary to postulate *ad hoc* verb classes. But notice that if one follows Laskowski and Szpyra, and assumes that all secondary imperfective word formation processes take as their input bi-formative stems (i.e., VS-stems), it is still necessary to distinguish between the different classes of VS-stems and to stipulate that some classes undergo one type of secondary imperfective formation, whereas other classes undergo a different type, since the affixation of *-iv* must distinguish VS-stems ending in *-a*, for instance, from those ending in *-i*. Thus both analyses must use the same kinds of mechanisms for distinguishing between different verb classes and the same kinds of word formation processes, but my analysis requires no more than

this, whereas the Laskowski/Szpyra analysis requires in addition, a rule truncating suffixes and a stipulation preventing this truncation in two cases.

An additional truncation rule is also needed to account for deverbal nouns such as *utarg* 'takings' (from *utargovać* 'gain'), *odkop* 'return kick' (from *odkopać* 'kick back'), or *spust* 'trigger' (from *spuścić* 'release'; see (37) above). Under the bi-formative hypothesis such nouns can only be derived by means of a rule of backformation which truncates the verbalizing suffix. The truncation rule needed for deverbal nouns, however, is not the same rule as that needed for deriving secondary imperfectives, since the former rule applies to stems of all classes (notice that in the case of *spust*, for instance, *-i* is truncated) and does not require that the verbalizing suffix be followed by derivational morphemes (see Szpyra 1987b, 181). The fact that two rules are needed to effect essentially the same operation, and that one is restricted, while the other is not, seems rather complex and suggests that perhaps the analysis is not on the right track. The true complexity of the analysis, however, is revealed in an examination of double secondary imperfectives and forms derived from them.

Szpyra (1987b) points out the existence of a small number of forms which she refers to as Double Derived Imperfectives. These are forms in which the verb C-stem undergoes two processes of secondary imperfective formation:

(40)	Pf.	Sec. Impf.	Double Sec. Impf.	
a.	vy+m'ieś+ć	vy+m'at+aj+ć	vy+m'at+yv+a+ć	Class 5 'sweep'
b.	vz+leć+e+ć	vz+lat+aj+ć	vz+lat+yv+a+ć	Class 3 'fly up' (Irregular)
c.	vy+pleś+ć	vy+plat+aj+ć	vy+plat+yv+a+ć	Class 5 'weave'

The normal secondary imperfectives of the verbs in (40) are given in the middle column. (40b) is an irregular root in that although it is a Class 3 root in simple forms, its secondary imperfective is not the expected **vzlotyvác* (which would result from the application of the rule of Class 3 secondary imperfective formation), but is rather the form *vzlatać* which arises as the result of the application of Class 4/5/7 secondary imperfective formation. As Class 5 roots, (40a,c) also undergo the Class 4/5/7 rule. The double secondary imperfectives are forms in which a verb C-stem that has undergone the Class 4/5/7 secondary imperfective rule then undergoes Class 1-3 secondary imperfective formation. We know that the double secondary imperfectives have indeed undergone both word formation processes because the vowels in the roots exhibit the e~a (i.e., o~a; see §2.2.3.2 above) alternation which I have postulated to be part of the word formation rule of Class 4/5/7 secondary imperfective formation.

Szpyra (1987b) who employs Verb Suffix Truncation proposes the following underlying form for the double secondary imperfective of (40b):

(41) [[vz= [let+e]]_V +a]]_V +yv + a + ć]_V

To derive the correct surface form Szpyra has to assume that truncation applies twice; after its first application the rule shifting [e] to [a] applies (she considers this latter rule to be a phonological rule called Derived Imperfective Tensing), followed by the second application. VST, which is a morphological operation is thus mixed in with phonological rules. In addition, Szpyra assumes that the suffix *-iv* is bi-morphemic (i.e., *iv+a*) in order to avoid having to explain why the verbalizing suffix *-iv* is not

affected by Verb Suffix Truncation even though it is always followed by another verbalizing suffix.³⁴ Neither of the other two double secondary imperfectives given in (40) has to undergo two applications of truncation, but this is only because both the roots belong to Class 5 and therefore do not take a verbalizing suffix in their VS-stems. In a deverbal noun based on a double secondary Imperfective, *oblatyvač* 'test pilot', Verb Suffix Truncation has to apply three times. (42) illustrates the derivation of this form adapted from a derivation given in Szpyra (1987b; 'E' symbolizes an underlying lax high vowel; the rule of Lower is postulated to cause this vowel to lower to [e] in the environment of a following E, and to delete otherwise).

(42)	[[[[obE = [let + e]] _v + a]] _v + iv + a] _v + ač + E] _N
First Pass	[[obE = [let + e]] _v + a] _v
VST	∅
Der.Impf. Tensing	a
Lower	∅
output	{ob = lat + a } _v
Second Pass	[[ob = lat + a]] _v + iv + a] _v
VST	∅
output	[ob = lat + iv + a] _v
Third Pass	[[ob = lat + iv + a]] _v + ač + E] _N
VST	∅
Lower	∅
output	[oblatyvač]

³⁴ Szpyra's (1987b) reason for assuming that this verbalizing suffix is in fact bi-morphemic is that *-iv/v* is always followed by *-ə* and it is necessary to encode this correlation somehow. As I pointed out in Fn. 23, however, *-iv/v* is occasionally followed by *-əj*, something which Szpyra's analysis would not be able to explain. See also my comments in S2.2.1 on the relationship between *-ov* and *-ə*.

Notice that the rules postulated by Szpyra do not apply cyclically (in the standard sense) to the constituents created by affixation of every morpheme in the language. Szpyra in fact argues against what she calls a mechanistic cyclic approach, in which every affix brings about the application of phonological rules, and in favour of an approach in which only certain, complex lexical items possess "cyclic" structure. In the case of the double secondary imperfective forms, she claims that the presence of more than one set of brackets labelled for lexical categories such as Verb invokes cyclic rule application. The cycles are referred to as First Pass, Second Pass, etc. Szpyra's argument against the view that not every affix triggers cyclic rule application is based on her assumption that verbs have bi-formative lexical entries. If every affix did trigger cyclic rules, then in the case of a form such as that in (42), given the bi-formative hypothesis, the first non-prefix cycle would be created by the verbalizing suffix *-e*. *-e* normally triggers palatalization of the preceding root-final consonant (cf. *let+e+ć* 'fly, Impf.' which surfaces as *lećeć*), but as we can see there is no palatalization in (42). Szpyra claims that the reason there is no palatalization in this form is that the stem containing *-e* is not complex and therefore does not create a cycle on which the rules can apply. It is not until the suffix *-aj* is added that the item is complex and a cycle is created; at this point, however, VST applies first, before any palatalization rules, and therefore *-e* does not trigger palatalization. Szpyra's analysis of double secondary imperfectives thus requires the postulation of highly complex underlying forms, and the assumption that cyclic rule application is motivated by the morphological complexity of the base. The analysis of verbal morphology proposed in this chapter permits us to postulate simpler underlying forms for the double secondary imperfectives, forms which do

The derivation in (43) involves three distinct word formation rules, two of secondary imperfective formation, and one of deverbal noun-stem formation. The underlying form given in (43b) can be processed by the rules of the phonology, according to standard assumptions about cyclic rule application.

Notice that the derivation given in (43) assumes that the morphological processes take place before the phonological processes. While there is no evidence from secondary imperfective formation that such an ordering is crucial, there is also no evidence disproving this assumption.

2.4 Comments on the Semantics of Prefixation

In this subsection I discuss the role of prefixes in perfectivization, differences in the formation of perfectives and secondary imperfectives, and the need to assume that prefixes are included in the lexical entries of at least some verbs. The section is necessarily brief and speculative since it is beyond the scope of this thesis to discuss the complex problems associated with the aspectual properties of Polish prefixes. It is, however, necessary to have some understanding of the semantics of prefixation when discussing the morphology of the Polish verb.

(44) contains examples of prefixed and unprefixed forms based on three roots: *p'is* 'write', *šy/* 'sew', and *so/* 'salt' (this latter is a nominal root). Some of these examples were already presented in the section on prefixes and C-stems above.

(44)	a. p'isać 'write, Impf.'	
	Perf.	Sec. Impf.
	nap'isać 'write'	
	zap'isać 'write down'	zap'isywać
	pżep'isać 'rewrite'	pżep'isywać
	dop'isać 'add a few words'	dop'isywać
	odp'isać 'write back'	odp'isywać
	vyp'isać 'write out'	vyp'isywać
	pżyp'isać 'attribute to'	pżyp'isywać

	b. šyć 'sew, Impf.'	
	Perf.	Sec. Impf.
	ušyć 'sew'	
	zašyć 'sew up'	zašywać
	pżyšyć 'sew on'	pżyšywać
	vyšyć 'embroider'	vyšywać
	zšyć 'sew together'	zšywać

	c. sol'ić 'salt, Impf.'	
	Perf.	Sec. Impf.
	posol'ić 'salt'	
	nasol'ić 'season with salt'	nasalać
	pżesol'ić 'over-salt'	pżesalać
	dosol'ić 'salt sufficiently'	dosalać

All the perfective forms in (44) contain prefixes, reflecting the fact that in Polish prefixed simple verbs are usually perfective. In addition, in most cases prefixation seems to contribute to the lexical meaning of the verb form, although in certain forms such as *nap'isać* 'write, Pf.', the only difference between the prefixed form and the corresponding unprefixed form is a difference in aspect.

One of the questions discussed in work on Polish verbal morphology is whether the lexical or the grammatical function of prefixes is primary. Is

It the case that affixation of a prefix adds the grammatical category "perfective" to a C-stem, and that prefixes are therefore basically perfective markers? On the one hand existence of forms like *napisać*, *użyć* or *posiść*, in which the prefix seems to be semantically "empty", suggest that prefixes are actually perfective markers. On the other hand, there exist cases of prefixed verbs which are Imperfective:³⁵

- (45) a. *leżeć* 'recline, Impf.' b. *widzieć* 'see'
 na+leżeć 'belong, Impf.' *nie+na+widzieć* 'hate, Impf.'
 za+leżeć 'depend, Impf.'

There are also cases of unprefixed verbs which can serve as both Imperfective and perfective depending on syntactic context (in the sentence in (46a), the unprefixed verb is used perfectively):

- (46) a. *aprobować* 'approve, Impf./Pf.'
 cf. *Na pewno po powrocie aprobuje twoją decyzję* 'He will certainly approve your decision after his return.'
 b. *abdykować* 'abdicate, Impf./Pf.'
 c. *importować* 'import, Impf./Pf.'
 d. *impregnować* 'impregnate, Impf./Pf.'

And, finally, there exist unprefixed verbs which are perfective:

³⁵ Non-native prefixes such as *de-*, appearing for instance in *demilitaryzować* 'to demilitarize' do not participate in imperfective/perfective oppositions. The perfective of the verb 'to demilitarize' is *zdemilitaryzować*, using the native prefix *z-* (examples are taken from Grzegorzczkova, et al.).

- (47) a. kup'ić 'buy, Pf.'
b. žućić 'throw, Pf.'
c. śqść 'sit, Pf.'
d. žec 'declare, Pf.'
e. znaleźć 'find, Pf.'

Although the examples in (45), (46) and (47) are to some extent irregular, the fact that they exist at all indicates that prefixation and perfectivization are not in a one-to-one correspondence and that therefore it would be incorrect to postulate that prefixation is a direct marker of perfectivity. One is therefore led to postulate that the basic function of prefixes is the lexical or semantic one and that the grammatical category of perfective aspect is associated with the types of meanings provided by prefixation.

Prefixation, then, has the opposite function to secondary imperfective formation. Secondary imperfectives, such as those illustrated in (44), are for the most part derived from prefixed verb forms; as pointed out above, given that the meanings of secondary imperfectives are identical to the meanings of their corresponding simple verbs, secondary imperfective formation seems to contribute no lexical content to a stem, but only to contribute grammatical information.

In a paper on Russian aspect, Brecht (1984) makes a distinction between the grammatical aspectual categories of perfective and imperfective, and the semantic aspectual categories of telic and atelic.³⁶ He argues that the semantic function of prefixation is to transform a basic

³⁶ Brecht (1984) follows Vendler and Garey in dividing situations into those which inherently involve a goal or natural end-point (telic) and those which do not (atelic). He points out that the perfective aspect in Russian is the base form for telic verbs whereas the imperfective aspect is the primary form for atelic verbs.

atelic situation into a telic situation, and suggests that since telicity is generally more compatible with perfective aspect, the creation of a telic verb by addition of a prefix to an atelic unprefixated form automatically triggers a shift in aspect from imperfective to perfective. According to Brecht the grammatical imperfective and perfective categories are supplied by marking conventions. Brecht's approach to aspectual distinctions in Russian thus assumes that prefixes are not perfective markers as such and is compatible with the remarks made above with respect to Polish prefixation. As far as secondary imperfectives are concerned, Brecht proposes that secondary imperfective formation is a grammatical process of assigning imperfective aspect to a verb form which is telic; as a result of the imperfective assignment, atelicization of the telic verb form occurs. This, of course, is exactly the opposite to cases of prefixation in which it is the telicity and not the aspect that is provided by the word formation process of prefixation. Brecht's hypothesis thus attempts to explain why most secondary imperfectives are formed from prefixed verb C-stems: prefixed C-stems are generally telic and thus available for atelicization (secondary imperfective formation), whereas unprefixated C-stems are generally not telic. If Brecht's hypothesis is applicable to Polish, then it will be necessary to assume that the word formation processes of secondary imperfective formation postulated above include information specifying that they can only apply to telic verb forms.

Although perfective aspect is not usually associated with suffixation, there are some verbs whose perfective forms always contain the verbalizing suffix *-np*. These perfective verbs never serve as inputs to secondary imperfective formation.

Suffixation of the verbalizing suffix *-ŋɔ* is accompanied by addition of a semelfactive (i.e., momentary) meaning to the root; and semelfactivity is compatible with perfective rather than imperfective aspect. Consequently, semelfactive verbs are always perfective.³⁷

(48)	a.	vykžyknɔć	'shout out, Pf.'	cf.	kžyčec	'Impf.' 3
	b.	džv'ignɔć	'lift up, Pf.'		džv'igać	'Impf.' 2
	c.	kopnɔć	'kick, Pf.'		kopać	'Impf.' 1
	d.	coŋnɔć	'to remove, Pf.'		cofać	'Impf.' 2

Verbs to which *-ŋɔ*-semelfactives are related belong to several different verb classes (as I have indicated by the numbers in (48)). The fact that a particular root forms a semelfactive by affixation of *-ŋɔ* is partly idiosyncratic and partly dependent on the meaning of the root; clearly not all verbs have meanings which can be made semelfactive. Given that there is some unpredictability involved, I propose that roots must be marked to undergo a word-formation rule that affixes *-ŋɔ*. Recall that I postulated a distinct verb class, Class 6, for verbs taking *-ŋɔ* as a verbalizing suffix. Thus, in addition to marking a verb as semelfactive, affixation of *-ŋɔ* also ensures that the verbs to which it is affixed will be conjugated like other Class 6 verbs.

Some verbs with *ŋɔ*-semelfactives also have prefixed perfectives (e.g., *kžyč+e+ć* 'shout, Impf.' *vy+kžyč+e+ć* 'shout out, Pf.'). In fact, in some cases the prefixed C-stem can undergo the rule which affixes the semelfactive

³⁷ *-ŋɔ* also forms some processual verbs from adjective or verb roots (e.g., *ogwunŋɔć* 'to become deaf', *zblachŋɔć* 'to become pale', *urastŋɔć* 'to grow'). According to Grzegorzczykowa (1972) this type of affixation is no longer productive. In such cases *-ŋɔ* functions like *-ej*.

suffix (e.g., *vy+kžyk+nq+c* 'shout out, Semel.'). If one assumed that prefixes and the suffix *-nq* were inherently perfective, then a form such as *vy+kžyk+nq+c* would appear to be doubly marked as perfective. However, under the assumption that these morphemes supply meanings compatible with perfective aspect, it becomes clear that perfective is not actually marked by two different morphemes.

As examples of secondary Imperfectives have illustrated, verb C-stems from which secondary imperfectives are formed are generally prefixed. In the case of a verb such as *vy+kžyč+e+c/vy+kžyk+nq+c* both the simple perfective and the semelfactive forms are prefixed. The secondary imperfective of this verb is *vy+kžyk'+lv+a+c*. The semelfactive verb, however, cannot be an input to the secondary imperfective formation process because secondary imperfective formation only takes verb C-stems as input and the rule forming semelfactives, by affixing the verbalizing suffix *-nq* to a C-stem, creates a verb VS-stem.

Consider, again, the semantic properties of the prefixes. As (44) and (45) illustrate, the semantics of a prefix+root combination is, to a great extent, idiosyncratic. The same prefix can function as semantically empty or can contribute lexical content; compare, for instance, (44a) *nap'isac* 'write, Pf.', where the prefix is semantically empty, (44c) *nasol'ic* 'season with salt', where its affixation changes slightly the meaning of the root, and (45a) *naležec* 'belong', where the meaning of the prefix+root is completely opaque and unpredictable from the meanings of the parts. Clearly the semantic contribution of the prefix to the meaning of a C-stem depends on both the root and the prefix. Since, moreover, there is so much semantic idiosyncrasy in the prefix+root combinations, this suggests that such combinations are listed as lexical entries. Additional evidence for this

hypothesis comes from the properties of semantically empty prefixes. According to Grzegorzczkova (1972), although a root may combine with more than one prefix, for any one root only one prefix can serve as semantically empty. For instance, in the case of *p'is* the semantically empty prefix is *na-*; in the case of *šy/*, it is *u-*; and in the case of *so/* it is *po-*. Which prefix serves as semantically empty, however, depends on the whole set of prefix+root combinations associated with a particular root. In order to determine the semantic properties of prefixes in combination with particular roots, it is necessary to know the whole list of these combinations associated with each root. This means, then, that root+prefix combinations must be listed together in lexical entries and suggests that lexical entries can be bi-morphemic.

2.5 The Phonology of Prefixation

In preceding sections I have argued that prefixes are affixed to and included in the verbal C-stem constituent and that prefix+root C-stems must be listed in the lexicon. Thus from the point of view of morphology and of semantics, prefixes form constituents with verbal roots. Prefixes do not, however, form phonological units with other morphemes included in the remainder of the C-stem or the verb. In fact, as I show in this section, prefixes usually function phonologically as if they were independent phonological words and not as if they were morphemes.

2.5.1 Prefixes as Phonological Words

Not all of the regular phonological rules of Polish affect prefixes. It turns out that those rules which do not apply in the environment created by the concatenation of a prefix and a root are word-level phonological processes, whereas the rules which do apply in this environment are rules which apply at the phrase-level, and thus across word-boundaries (as well as within words).^{38, 39}

Coronal Palatalization, for instance, affects the coronals /t,d,s,z,r,ʃ,n/, changing them into prepalatal or 'palatalized' segments [ć,dź,ś,ź,r',l',ń] (see Chapter 3). The rule is limited to applying in derived environments, as in /mroz/ 'frost' → [mrozić] 'freeze', but it never affects the final consonant of a prefix (e.g., /roz+iskżyć/ 'to sparkle' → [roz'iskzyć], not *[roz'iskzyć]). Word-internally Polish prohibits sequences of non-prepalatal coronals followed by [i]; thus, *[ti, si, ci, či] etc. always surface as [ty, sy, cy, čy].⁴⁰ Given that prefixes are bound constituents, we would therefore expect to find the surface form *[rozyskzyć]. Instead what we find is the [z] surfacing as secondarily palatalized [z'], a segment which is derived only by means of the phrase-level rule of Surface Palatalization (e.g., /bez im'ienia/ 'without a name' → [bez' im'ienia]). In addition, the initial vowel of the root /skr- in the form *roziskzyć* surfaces as [i] and not as [y]

³⁸ For a detailed discussion of processes which do and do not apply in the environment of prefixes I refer the reader to Nykiel-Herbert (1985) and Szyra (1987a).

³⁹ I am using the term 'boundary' in this thesis in a pre-theoretic sense to mean the edge of a prosodic or morphological unit. My use of this term does not imply that I believe boundaries are phonological segments.

⁴⁰ This constraint on coronal-high V sequences applies word-internally in both native vocabulary and loanwords with a few exceptions in the borrowed technical or obviously foreign vocabulary (e.g., Chicago is pronounced [š'ikago]). See Chapter 4 for a discussion of these facts.

suggesting that [i] is perceived as being in word-initial position, since there are no words in Polish with initial [y].

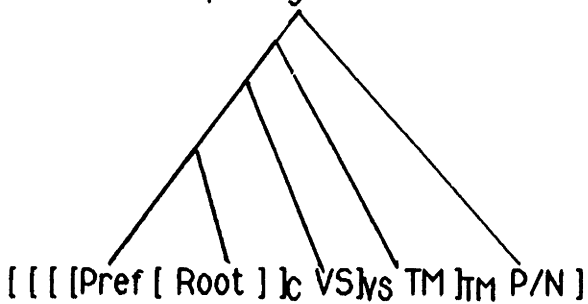
Similarly two processes of palatal assimilation which I shall refer to here as A and B, differ in whether they apply in the environment of prefixes. Palatal Assimilation A applies within words to coronal stridents, assimilating them to following coronal continuants and affricates and to sonorants (see 49a-d). Across word-boundaries, however, Palatal Assimilation B rather than Palatal Assimilation A applies. B also affects coronal stridents, but is limited to occurring only in the environment of following continuants or affricates (see 49e-g). As the examples in (50) show, only Palatal Assimilation B, the phrase-level process applies across the prefix boundary (all forms in the left column are intermediate rather than underlying representations):

- | | | | | | |
|------|----|-------------|---|-----------------------------|--------------------------------------|
| (49) | a. | sń+e | → | [śńe] | 'dream, l.sg.' cf. snu 'g.sg.' |
| | b. | m'esc+e | → | [m'eście] | 'town, l.sg.' cf. m'asto
'n.sg.' |
| | c. | gv'ezdź+e | → | [gv'eźdźe] | 'star, l.sg.' cf. gv'azda
'n.sg.' |
| | d. | masl+e | → | [maście] | 'butter, l.sg.' cf. maswo
'n.sg.' |
| | e. | gwoś sōstry | → | [gwoś sōstry] | 'sister's voice' |
| | f. | las ćemny | → | [laś ćemny] | 'dark forest' |
| | g. | gwoś nāńi | → | [gwoś nāńi]
*[gwoś nāńi] | 'nanny's voice' |
| (50) | a. | ros+ćpć | → | [rosćpć]/[rośćpć] | 'cut' |
| | b. | z+dźerać | → | [źdźerać]/[zdźerać] | 'tear off' |
| | c. | bes+čelny | → | [besčelny]/[beščelny] | 'insolent' |
| | d. | z+ńiščyc | → | [zńiščyc] *[źńiščyc] | 'to destroy' |
| | e. | z+l'ićyc | → | [zl'ićyc] *[źl'ićyc] | 'count' |

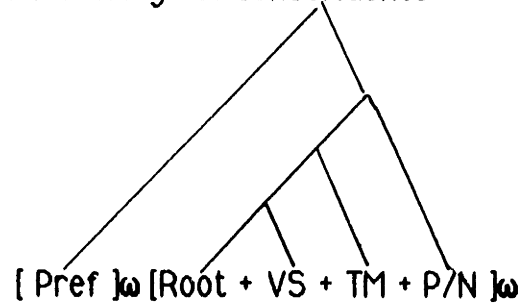
The restrictions on phonological rule application in the environment of prefixes fall out if one makes the assumption that prefixes are independent phonological words. In such a case the concatenation of a prefix and a C-stem would never trigger the application of word-internal phonological processes.⁴¹

Polish prefixes are thus examples of a mismatch or lack of isomorphism between phonological and morphological/semantic constituent structures. (51a) illustrates the morphological structure of Polish verbs containing prefixes; (51b) illustrates the phonological structure:

(51) a. Morphological Constituents



b. Phonological Constituents

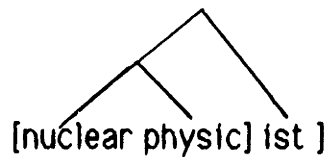


These kinds of mismatches between phonology and morphology have been referred to in the literature on the interaction between phonology and morphology as *bracketing paradoxes*. In English such paradoxes are exemplified by the form *nuclear physicist*. In this form, *nuclear* is a phonological word distinct from *physicist*; the suffix *-ist* phonologically belongs together with *physic*. From the point of view of the semantics and the morphology of the form, however, *nuclear* and *physic* one constituent to which *-ist* is affixed:

⁴¹ The proposal that prefixes are phonological but not morphological words has been made previously in Rubach (1984) and Szyra (1987a).

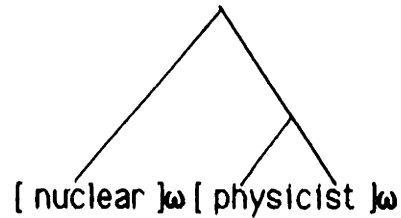
(52) Morphological Structure

a.



Phonological Structure

b.



Bracketing paradoxes have provoked a great deal of discussion largely because the theory of Lexical Phonology (which assumes that morphological and phonological operations function in tandem, with phonological operations following every morphological operation) predicts that the lack of isomorphism between phonological and morphological constituent structures found in the case of Polish and (some) English prefixes should not exist (see, e.g., Pesetsky 1979). In a model in which the morphological component is independent of the phonological component, the fact that there may be a lack of isomorphism between structures required by the two components is not unexpected. One would not, of course, expect the relationship between morphological and phonological structure to be completely random because the lack of isomorphism comes at a cost. And indeed, the fact that most frequently phonological and morphological constituent structure correspond shows that the relationship is not random. In addition, in both Polish and English lack of isomorphism between the phonological and morphological structures is limited to occurring only in the case of certain (classes of) morphemes. This latter fact suggests that individual morphemes are associated with specific phonological properties; in other words, it is a property of Polish prefixes that they are phonological

words, whereas other bound morphemes are not phonological words but instead function phonologically and morphologically as morphemes (see Inkelas 1987a,b for a model in which the independence of phonological and morphological properties of morphemes such as that illustrated by the behaviour of Polish prefixes is encoded by assuming that morphemes have phonological subcategorization frames—which encode phonological information—as well as morphological subcategorization frames). Distinguishing phonological from morphological properties of morphemes makes it possible to characterize mismatches between phonological and morphological constituent structure in a straightforward fashion. Polish prefixes thus are morphologically bound to C-stems, but are independent words phonologically.

In Russian, as in Polish, the phonological and morphological properties of prefixes are not isomorphic. Halle and Vergnaud have proposed to account for this lack of isomorphism by postulating that prefixes are noncyclic morphemes in Russian and that therefore in the environment created by the concatenation of prefixes and roots, noncyclic word-level rules can apply. Given the relationship between Russian and Polish, it is plausible to hypothesize that Polish prefixes are also noncyclic affixes rather than phonological words. Such a hypothesis is, however, untenable for Polish since noncyclic word-level as well as cyclic word-level rules are blocked from applying in the prefix environment. The rule retracting /i/ to [y] following coronal obstruents, for instance, is a noncyclic rule (see Chapters 3 and 4); recall that it does not apply in the environment of prefixes (thus /roz+iskr+.../ surfaces as [roz'iskr...] and not as *[rozyskr...]).

One way to account for the fact that noncyclic phonological rules do not apply in the environment of prefixes would be to assume that some

underlying segment blocks their application. Analyses of Polish which assume that Polish has abstract underlying lax high vowels or yers (that are lowered to [e] in the environment preceding another lax high vowel by means of a cyclic rule (see Rubach 1984) and are otherwise lowered by means of a noncyclic rule) postulate in fact that the reason a rule such as retraction does not apply in the prefix environment is that prefixes have final lax high vowels whose noncyclic deletion is ordered after the retraction rule. Postulating final lax high vowels for prefixes is argued to be independently motivated by the fact that in a number of cases prefixes exhibit e~∅ alternations (see Gussmann 1980, Rubach 1984, Nykiel-Herbert 1985, Szpyra 1987a, etc.). Although the lax high vowel-analysis does account for the blocking of retraction, assuming such vowels leads to other problems. For instance, postulating a blocking prefix-final lax high vowel could account for the fact that Palatal Assimilation A, a noncyclic rule (see above), does not apply in the environment of a prefix, if one assumed that Palatal Assimilation A was ordered before the noncyclic rule which deletes the yer. This latter assumption cannot be maintained, however, since in word-internal cases of PA-A the rule must be ordered after deletion of the vowel. (53a,b) show that the [e] in *bwazen* alternates with zero, and can thus be postulated to have an underlying lax high vowel. In (53b) we see that Palatal Assimilation, which causes [z] to assimilate to [ń] (derived by Coronal Palatalization in the environment of the *-e* 'loc sg'), must be ordered after lax high vowel-deletion, since the presence of the underlying lax high vowel would block Palatal Assimilation otherwise:⁴²

⁴² This point is made in both Nykiel-Herbert (1985) and Gorecka (1986).

- (53) a. *bwazen* + \emptyset 'clown, n.sg.'
 b. *bwaźń*+*e* 'clown, l.sg.'

Given this problem with ordering it is clear that postulating that noncyclic rules are blocked from applying in the environment created by the concatenation of a prefix and a C-stem because of the presence of an underlying segment such as a lax high vowel is problematic. No such problems arise on the assumption that prefixes are phonological words.

Many prefixes have identical corresponding forms which function as prepositions. The behaviour of prefixes and prepositions with respect to such phonological processes as Voicing Assimilation and Devoicing, or Stress-Assignment is identical (see Bethin 1984b; Rubach and Booij 1985). Thus, for instance, neither prefixes nor prepositions undergo the rule of Final Devoicing which applies word-finally to devoice obstruents (e.g., the [z] of *roz'iskżyć* does not devoice). Given my claim that prefixes are phonological words, one would expect them to undergo Final Devoicing. However, since prepositions also do not undergo this rule (e.g., [pod obrazem] 'under the picture', *[pot obrazem]), and since prepositions are morphologically as well as phonologically independent items, the fact that prefixes are like prepositions in not undergoing Final Devoicing is not a counterexample to the claim that prefixes are phonological words.

2.5.2 The e- \emptyset Alternation and Prosodic Restructuring

There exists in Polish a class of verbs in which the prefix behaves as if it were a phonological morpheme rather than a phonological word. Examples of such verbs are given in (54).

(54)	<u>Perf. Inf.</u>	<u>1st sg. Pres.</u>	<u>Sec. Impf. Inf.</u>	<u>Gloss</u>
a.	ze+rv+ać	zervę	zrywać	tear off
b.	ve+ss+ać	vesę	vsysać	suck in
c.	roz+dq+ć	roze+dmę	rozdymać	expand
d.	ob+ćq+ć	obe+tnę	obcinać	cut off
e.	s+klq+ć	ze+klnę	pżekl'inać	swear
f.	ode+px+nq+ć	odepxnę	odpyxać	push
g.	ze+tż+eć	zetrę	śc'erać	wipe off
h.	ze+br+ać	zb'orę	zb'erać	gather

The prefixes in (54) exhibit an alternation between [e] and [∅] which is the result of a word-level and not of a phrase-level process.⁴³ The alternation does occur between words in a small class of prepositional phrases (see (55)) but in all these cases the phrases are lexicalized. As a comparison with corresponding non-lexicalized phrases in (56) shows, the alternation does not in general occur between words.

(55)	a. ve krv'i	'in blood'	(cf. krev/krv'i 'blood')
	b. ve mgle	'in the fog'	(cf. mgew/mgwy 'fog')
	c. pżede dñem	'before sunrise'	(cf. dżeń/dña 'day')
	d. ze vśi	'from the country'	(cf. v'eś/vśi 'village')

(56)	a. v krv'i ludzk'ej	'in human blood'
	b. v mgl'isty dżeń	'on a foggy day'

⁴³ Prefixes ending in spirants (e.g., *z-* and *raz-*) surface with final [e]'s in the environment preceding roots with complex initial clusters whose first member is a coronal spirant (e.g., *ze+stroić* 'harmonize', *ze+ścupleć* 'grow thin', *ze+środkować* 'concentrate'). The appearance of [e] in these forms is the result of a phrase-level cluster simplification rule (of which Polish has several different types; see Rubach 1977) that applies also in the environment between prepositions and following nouns (e.g., *ze smutk'em* 'with sorrow'; cf. *z zębem* 'with the tooth'). For discussion of this rule see Rubach (1985). The appearance of [e] in prefixes being discussed in this section is not due to this rule of cluster simplification. I shall not discuss the latter rule here.

- c. před dnem včorajšym 'before yesterday'
 d. z vsí okolíčnyx 'from nearby villages'

Since the alternation occurs between words only in the lexicalized prepositional phrases and not in any other cases, we can conclude that it is not a phrase-level alternation.

The existence of forms such as those in (54) in which the $e \sim \emptyset$ alternation occurs in the environment of prefixes and in which we must therefore assume that the prefixes behave as phonological morphemes rather than as phonological words, does not invalidate the hypothesis that prefixes are phonological words. The $e \sim \emptyset$ alternation in prefixes is confined only to a small class of verb roots (about 30 roots), all of which behave exceptionally in other respects. For instance, many of these roots are conjugated irregularly (e.g., *odervac'* 'tear off' belongs to Class 1 and would therefore be expected to have a lotated form in the 1st sg./3rd pl., as it does in the other 4 persons—*oderv'e* '3rd sg.'; however, no palatalization of any kind occurs in 1st sg./3rd pl.—*odervε* '1st sg.'— suggesting that the verbalizing suffix *-a* is not present in the underlying form). In addition many of the roots belong to Classes 1–3 and would therefore be expected to undergo the secondary Imperfective rule affixing *-iv/yv*, but instead they become secondary Imperfectives by being assigned Class 2 membership. And finally, as (54) shows, the roots which trigger the $e \sim \emptyset$ alternation in prefixes themselves exhibit a $V \sim \emptyset$ alternation, with a full vowel appearing in secondary Imperfective forms as a result of the rule of secondary Imperfective formation and no vowel appearing in simple (Im)perfectives. The exceptional behaviour of these verb roots, then, suggests that the fact that prefixes behave irregularly in their environments is simply another

the fact that when a monosyllabic root is followed by an overt inflectional affix, restructuring does not apply (see 59c).

The effect of restructuring is to allow rules which could not otherwise have applied in a particular environment to apply. Returning now to the properties of prefixes, we can see that this is precisely what happens in the case of prefixes in which the e~∅ alternation occurs. In such cases the prosodic words function as morphemes phonologically. In a recent paper, Szpyra (1987a) therefore proposes that the reason word-level rules apply in the environment of prefixes before some roots is that the prefixes are demoted from the status of prosodic words to the status of morphemes.⁴⁵

Szpyra's analysis of the prefix behaviour is based on the assumption that Polish has the abstract lax high vowels or yers in its underlying vowel inventory. Since the roots that trigger prefix e~∅ alternations themselves exhibit V~∅ alternations, she assumes that these roots contain yers in their underlying representations and, furthermore, she assumes that prefix-final yers underlie the alternations in the prefixes. These assumptions lead her to propose the following mapping convention to account for the behaviour of prefixes:

⁴⁵ Although Rubach considers prefixes to be phonological words, he does not adopt an analysis in which prosodic restructuring takes place. Instead he assumes the existence of a rule that combines two (or more) phonological words into a compound phonological word forming an additional prosodic constituent (which he refers to as *mot prima*). He further assumes that the rules deriving [e] apply not only within phonological words, but also within the domain of *mots primes*. Rubach's analysis does not, however, account for the fact that [e] never surfaces in prefixes preceding nominal and adjectival stems, but instead predicts that it should surface. Since the problems with his analysis have been discussed extensively by Nykiel-Herbert (1985) and Szpyra (1987a), I do not discuss the analysis here.

h.	od+set+ek	'percentage'	set+k+a/st+o	'hundred'
i.	pod+šev+k+a	'lining'	šev/šv+u	'stitch'
j.	pod+p'eń+ek	'honey fungus'	p'eń/pń+a	'trunk'

(62)	a.	od+všyc	'de- <u>louse</u> '	veš/vš+y	'louse'
	b.	od+pxl'ic	'de- <u>flea</u> '	pxew/pxw+a	'flea, g.pl.'
	c.	roz+wzav'ic	'draw <u>tears</u> '	wesz/wz+a	'tear, g.pl.'
	d.	z+mg'l'ic	'become <u>foggy</u> '	mg'ew/mgw+a	'fog, g.pl.'
	e.	v+šń'ic šę	'dream into'	sen/šń+e	'sleep'
	f.	roz+krvav'ic	'cause to bleed'	krev/krv'+i	'blood'

According to Szpyra the denominal or deadjectival verbs in (62) do not trigger restructuring of the prefixes even though they are verbs which contain lax high vowels (as specified in (60a)) because they are not simple verbs, but rather are denominal and have the structure given below, which "departs from the one specified in the formulated mapping convention." Consequently, "prefixes will not be phonologically directly attached to such verbs" (Szpyra 1987a, 22).

(63) [[Pref [[C_i V C]_N +VS]_V]_V]_V
[+high
-tense]

Szpyra's explanation for the non-occurrence of demotion in the case of denominal verbs requires that prefixes be able to see inside verbs before undergoing restructuring to determine whether they are denominal or deverbal. Most generative theories of morphology have assumed that morphological operations are constrained to make reference only to immediately adjacent material. Allen (1978), for instance, proposes the Adjacency Condition given in (64):

(64) Adjacency Condition (Allen 1978)

No WFR can involve X and Y, unless Y is uniquely contained in the cycle adjacent to X.

As Allen points out, the Adjacency Condition limits the number of types of rules and conditions on rules allowed by the grammar. By using the powerful device of making reference to non-adjacent material in determining the application of a rule, Szpyra's explanation for the restrictions on prefix restructuring constitutes a weakening of a theory of morphology .

An alternative explanation for the facts, which preserves the Adjacency Condition, is simply to assume that demotion only occurs in the environment of certain roots or C-stems, and that those forms which trigger it are specially marked. Under such an assumption demotion does not need to make reference to the category or derivational history of the form to which the prefix is affixed, but instead is triggered by a diacritic. This analysis thus treats the occurrence of phonological restructuring as lexically-determined. The assumption that prefix-restructuring in Polish is lexically-determined is not an unreasonable one given that such cases exist in other languages. English, for instance, has a rule which changes the phonological status of the form *man* from that of phonological word to that of morpheme (see Halle and Vergnaud 1987a,b for discussion of such forms). The forms in (65a), for instance, are compound words (with compound stress) whose second member is *man*, whereas those in (65b) have regular word stress indicating that *man* is functioning like a suffix (the vowel of *man* in the examples in (65b) is reduced or deleted):

- | | | |
|------|----------------|------------|
| (65) | a. garbage man | b. postman |
| | front man | horseman |
| | garage man | salesman |
| | | fireman |

There are no criteria by which forms in (65b) can be distinguished from those in (65a); consequently the prosodic behaviour of *man* in nouns of the sort seen in (65) must be lexically-determined.

In Polish the forms which trigger prefix restructuring, although specially marked, are all characterized by a similarity in phonological form. In particular, all such forms have asyllabic alternants. Szpyra captures this characteristic by specifying that demoting roots contain underlying lax high vowels. There exist a few verbs which do not exhibit $V \sim \emptyset$ alternations and in which there is therefore no evidence for the presence of an underlying lax high vowel, but in which prefixes nevertheless surface with [e]. Examples are given in (66):

- | | | |
|------|----------------|------------|
| (66) | a. zexćeć | 'desire' |
| | b. zelżeć | 'ease' |
| | c. zetleć | 'smoulder' |
| | d. zemścić się | 'revenge' |

To preserve Szpyra's assumption that all roots which trigger demotion contain lax high vowels, we would need to assume that examples such as those in (66) also have such underlying vowels, although in such a case these vowels would be used in a purely diacritic capacity. Alternatively, we could assume that the roots in (66) are underlyingly asyllabic and that roots postulated to have lax high vowels are also underlyingly asyllabic. This

assumption would require the postulation of epenthesis rules to provide the roots with vowels in some cases. I will have more to say about these possibilities in the following chapter.

A small number of prefixed denominal verbs and prefixed nouns or adjectives also trigger restructuring (prefix is underlined):

(67)	a. <u>roze</u> dnieć	'be broad daylight'	dżeń/dña	'day'
	b. <u>z</u> epść	'go to the dogs'	p'es/psa	'dog'
	c. <u>o</u> demglać	'devaporate'	mgwa/mgew	'fog'
	d. <u>pode</u> śfa	'sole of shoe'	śef/śfu	'seam'
	e. <u>be</u> zecny	'infamous'	cny	'worthy'

All of them conform to the phonological requirement that the roots have asyllabic surface alternants. In order to account for these forms we must assume that the derived verb C-stems in (67a-c) and the noun and adjective roots in (67d-e) are also lexically specified to trigger prefix restructuring.

In §2.2.3 I argued that the formation of denominal or deadjectival verbs involves assigning membership in a verb class such as Class 4 to a noun or adjective. In the case of verbs such as *nocować* 'spend the night' which involve assignment of Class 2 membership to the noun *noc* 'night' with concomitant affixation of *-ov*, the resultant verb C-stem has the following structure:

(68) [[noc]_N ov]_{Class 2}

In the case of verbs such as *so/ʔc* 'to salt', I assumed above that assigning the nominal root *so/* 'salt' in this form involves a rule of conversion as in (69):

(69) [*so/*]_N → Class 4

If the denominal verb formation is indeed a result of conversion, then it provides evidence in favour of my proposal that prefix restructuring is lexically-determined rather than constrained not to apply in denominal verbs. Obviously if restructuring needs to make reference to the denominal status of a verb, it needs to be able to see the categorial marking on the nominal/adjectival root or stem from which the verb is derived. However, a rule of conversion removes the underlying categorial marking of the form to which it applies. Recall that prefixes are affixed to verb C-stems. If denominal verb formation involves conversion, then at the point at which the prefix is affixed to the C-stem, and at which restructuring can apply, the denominal verb C-stem will have exactly the same morphological structure as a deverbal verb C-stem. Consequently, the restructuring process will not be able to make reference to the denominal character of the C-stem.

3. Concluding Remarks

In this chapter we have seen that the semantics and morphology of verbs are not necessarily isomorphic. I argued, for instance, that nonpast tense is not supplied by any one morpheme of the language, but is determined from the structure of the whole verb form. We have seen too,

that the phonological behaviour of prefixes is independent of their morphological behaviour and that therefore the phonological constituent structure is not isomorphic with the morphological structure. Finally, we have seen that the morphological component has its own rules and restrictions on structure. The consistent lack of isomorphism between morphological structure and semantic and phonological structure is evidence against the assumption, made in the model of grammar set forth in the theory of Lexical Phonology, that the rules of morphology are mixed in with the rules of phonology and that morphology and phonology are ordered in the same lexical component, and is therefore evidence in favour of the hypothesis that morphology is a component distinct from the phonology. The analysis of secondary imperfective formation, and in particular of double secondary imperfectives, in as much as it is a successful analysis, suggests further that the rules of the morphological component apply in a block before the rules of the phonology.

I argued in §2.4 that prefix+C-stem combinations must be listed in the lexicon since the grammatical and semantic properties of such combinations are often idiosyncratic. If this is correct, then it is evidence that polymorphemic structures may be inputs to the phonological component. Significantly, such polymorphemic structures are treated as derived environments by the cyclic phonological rules of Polish, even though the actual affixation is not ordered directly before the phonological rules. In Chapter 3 I suggest that prefixes are demoted to the status of morphemes in the morphological component, and hence before any of the cyclic rules apply. Now, in those cases where prefix restructuring occurs, the cyclic rule of epenthesis applies to insert a vowel in the environment created by the concatenation of the prefix plus the C-stem. Since, however, prefixes are

listed as part of the lexical entries of verbs, and since, furthermore, the restructuring process takes place in the morphological component, this means that the cyclic epenthesis rule is not fed directly by a morphological rule; the fact that the epenthesis rule applies here indicates that the environment counts as derived. We can conclude, therefore, that the environment created by the juxtaposition of two adjacent morphemes may in fact count as derived, even when the input to the phonology is a fully derived morphological form.

CHAPTER 3

THE CYCLIC COMPONENT: PALATALIZATION RULES

The term palatalization in Polish refers to several different series of consonant alternations affecting underlying labials, coronals and velars. Most generative work on the palatalizations has assumed that they are triggered by [-back] vowels and/or the [-back] glide [j]. The most thorough recent work on the palatalizations, Rubach (1984), claims that all but one of these processes are effected by cyclic rules which are subject to the Strict Cycle Condition. In this chapter I argue that many of the palatalizations are not, in fact, phonologically-conditioned, since the morphologically-derived environments in which they apply do not constitute a phonologically-defined class. I suggest, therefore, that the rules are morphologically-conditioned, but that they are nevertheless ordered in the cyclic component of the grammar. In addition, several vowel alternations are phonologically-conditioned, but are restricted to applying only in a subset of words whose forms meet the structural descriptions of the rules which effect them. Thus it appears that a great deal more morphological and lexical information needs to be stipulated in the phonology of Polish than has previously been assumed.

I begin the chapter by presenting the different series of palatalizations. §2 presents evidence that the palatalization rules are not phonologically-triggered, and §3 argues in favour of the hypothesis that the rules are morphologically-conditioned rules of the phonology. Finally, in §4,

lexical conditioning of phonological rules is discussed through an examination of four different vowel alternations.

1. The Palatalizations¹

The underlying consonants of Polish given in Table 1 are repeated from Chapter 1 (see Chapter 1 for underlying feature representations):

TABLE 1: UNDERLYING CONSONANTS OF POLISH

LABIAL	LABIO-DORSAL		CORONAL		CORONO-DORSAL			DORSAL
	FRONT		DENTO-ALVEOLAR		ALVEOPALATAL	PREPALATAL		
p f	p' f'	w	t s c		č š	t' s' j	k x	
b v	p' v'		d z dʒ		dʒ ž	d' z'	g	
m	m'		n			n'		
			r ɹ			l		

This subsection describes the alternations affecting the underlying consonants, and is not concerned with the environments in which these alternations occur.

Of all the consonants in the underlying inventory, the labials have the least complicated palatalization properties. They undergo only one type of palatalization alternation, namely fronting or secondary palatalization.

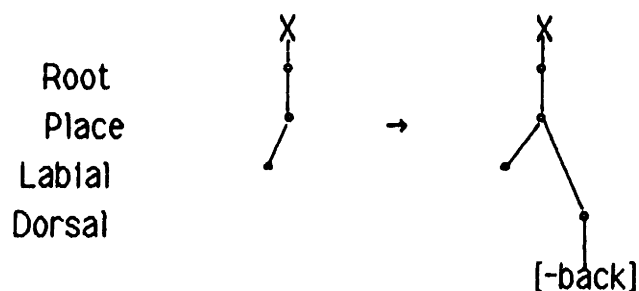
¹ Polish also has a set of consonant alternations that are governed by rates and registers of speech and involve for the most part simplification of consonant clusters by means of deletion and assimilation rules. Some of these processes are partially lexicalized, but on the whole they occur both within and between words and can therefore be considered to be ordered at the phrase-level. I do not deal with such alternations here (for discussion see Rubach 1977).

Thus the outputs of **Labial Palatalization** are identical to the underlying palatal labials. Preceding all vowels but the high front [i], both underlying and derived front labials are usually pronounced with an off-glide; preceding other consonants and in word-final position, both types of front labials are depalatalized² (in (1f), for example, even though, as (1e) indicates, the morpheme *-c* triggers palatalization, the palatalized [p'] surfaces as depalatalized):³

- | | | | | |
|-----|----|-----------|------------|----------------|
| (1) | a. | słup+e | swup'(j)e | 'pole, 1.sg.' |
| | b. | rob+i+ć | rob'ić | 'to make' |
| | c. | dżev+e | dżev'(j)e | 'tree, 1.sg.' |
| | d. | żem+ist+y | żem'isty | 'sallow' |
| | e. | skɔp+c | skɔp'(j)ec | 'miser' |
| | f. | skɔp+c+a | skɔpca | 'miser, g.sg.' |

The alternation undergone by labials as a result of palatalization is represented in (2):

(2) Labial Palatalization



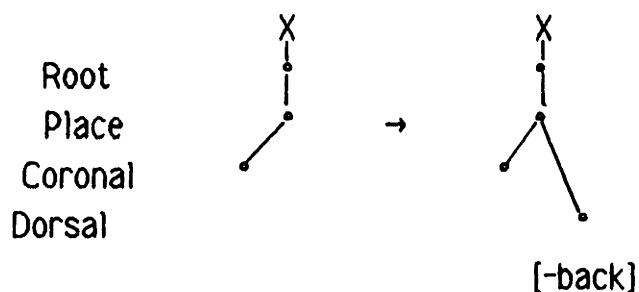
² This depalatalization occurs in derived and underived environments and is therefore due to a noncyclic process; I shall not discuss it further here.

³ All the examples in this subsection are given in intermediate forms, with the examples in the leftmost column being closer to underlying representations, and those in the rightmost column being closer to surface representations. In (1) the parentheses around [j] indicate that this segment is created in the course of the derivation and is not underlying.

Three different types of palatalizations are associated with the coronal obstruents: Coronal Palatalization, Iotation, and Affricate Palatalization.⁴ In all three of these palatalizations, the affected consonants remain as coronals, but undergo changes in exact place and/or manner of articulation.

Coronal Palatalization adds a dorsal [-back] articulation to the dento-alveolar segments /t,d,s,z,r,ʃ,n/, changing them into corresponding [-back] coronal-dorsals [t',d',s',z',r',l',n']:⁵

(3) Coronal Palatalization



As the examples in (4) and (5) indicate, however, the surface forms of palatalized coronals are not simply the coronals with a [-back] secondary palatalization derived by (3).

- (4) a. kob'et+e kob'(j)ěće 'woman, d./l. sg.'
 b. xod+i+ć xodźić 'to walk'

⁴ A fourth coronal palatalization, Strident Palatalization, changes /š/ or /x/ into [ś]. I do not discuss this rule here:

- | | | |
|------------------|-------------|-----------------------|
| a. myš+i | myši | 'mouse, adj.' |
| b. groš+iv+o | grošiwo | 'monetary unit, aug.' |
| c. kapeluš+isk+o | kapelušisko | 'hat, aug.' |
| d. mńix+i | mńiśi | 'monks, m.pl.' |

⁵ See Chapter 4 for evidence that the prepalatals are co-articulated coronal-dorsal segments.

	c. šos+e	šoše	'road, d./l. sg.'
	d. mroz+n+y	mroźny	'icy'
(5)	a. żon+e	żońe	'wife, d./l.sg.'
	b. obron+c+a	obrońca	'defender'
	c. zasłan+(j)l+a+j+ɔ	zasłaniajɔ	'they cover, Sec. Impf.'
	d. star+(e)c	stażec	'old man'
	e. star+c+a	starca	'old man, g.sg.'
	f. kar+(j)a+e	każe	'he punishes'
	g. szkoł+e	škole	'school, d./l.sg.'
	h. stoł+isk+o	stol'isko	'table, aug.'
	i. naśr'etł+(j)l+a+j+ɔ	naśr'etlajɔ	'they elucidate, Sec. Impf.'
	j. mebl+i	mebl'i	'furniture, g.pl.'

As I pointed out in Chapter 1, the coronal-obstruents surface as prepalatal segments, characterized by the presence of a cavity under the tongue (i.e., as [+Lower Incisor Cavity]). The presence of this cavity is a predictable property of [-back] coronal obstruents, and is therefore assigned by means of a redundancy rule which applies in the noncyclic component of the grammar. Another predictable property of the palatalized coronal obstruents is that the stops surface as affricates. This affrication or spirantization of stops is a feature of all the palatalization processes of Polish (compare, Iotation, and First and Second Velar Palatalization below). Again, since it is predictable, it can be represented by means of redundancy rules and does not need to be stated as part of the rules of palatalization.

The rule which supplies [+LIC] applies noncyclically at the word-level. We know that it applies noncyclically because it affects both morpheme-internal underlying coronal-obstruents, and coronal-obstruents appearing in derived environments which are derived by palatalization. We know that it applies at the word-level and not at the phrase-level because [-back] coronal

outputs of a rule of Surface Palatalization which is ordered at the phrase-level do not become [+LIC]. (6) gives examples of outputs of Surface Palatalization; these are secondarily palatalized coronal segments and not prepalatals:

- (6) a. bra[t' i] sóstra 'brother and sister' *[ć i]
 b. gwo[s' i]reny 'Irene's voice' *[ś i]

In the case of the palatalized sonorant coronals, the actual surface forms are different for each type of consonant. /n/ surfaces as a prepalatal [ń], both /t/ and /l/ surface as [t'] before [i] and as [t] elsewhere, and /r/ surfaces as alveopalatal [ž] (5d) unless it is followed by a consonant (5e). The alternation between (5d) and (5e) provides evidence in favour of the hypothesis that Coronal Palatalization supplies a [-back] feature to coronal consonants, and that later redundancy or spell-out rules derive correct surface forms. If we assumed that /r/ went directly to [ž], then we would also have to assume that the depalatalization which takes place pre-consonantly changes the derived [ž] back into [r]. However, assuming that /r/ first becomes [r'] makes it possible to state depalatalization as a simple delinking of [-back], a rule which also applies in the case of palatalized labials (see above) and palatalized laterals.

lotation affects only the coronal obstruents and is only triggered by the segment [j] (see §3.3). Following Rubach (1984), I assume that the inputs to lotation are coronal obstruents that have already undergone Coronal Palatalization. The outputs of lotation are less straightforward than those of Coronal Palatalization. /s',z'/ and the clusters /s't', z'd'/

always surface as alveopalatals [š,ž,č,dž]; /t',d'/, however, surface as the alveolar affricates [c,dz].⁶

(7)	a.	zapas+(j)l+a+j+q	zapašajq	'they invite, Sec. Impf.'
	b.	kaz+(j)a+e	kaže	'he orders'
	c.	pwat+(j)l+ę	pwacę	'I pay'
	d.	v'id+(j)l+q	v'idzq	'they see'
	e.	post+(j)l+q	poščq	'they fast'
	f.	gv'izd+(j)l+ę	gv'iždže	'I whistle'

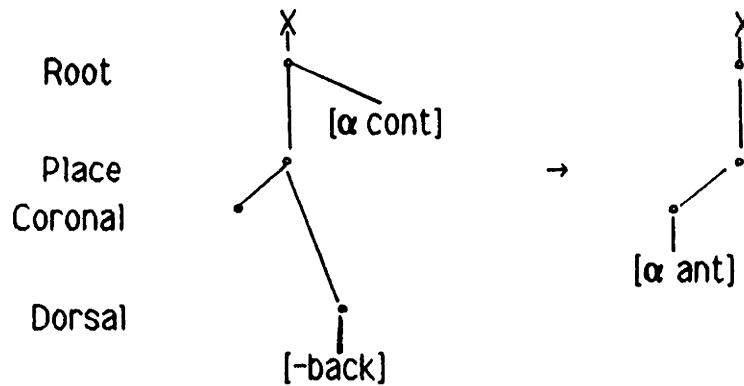
As in the case of Coronal Palatalization, the lotated forms of the coronal stops are affricates. The rule of lotation is given in (8). To make the statement of the rule as simple as possible, I assume that the clusters [s't',z'd'] are perceived by speakers of Polish as [+cont]:

⁶ In a small number of verbs, all of which belong to Class 1 and most of which denote sounds, /t/ may be lotated to [č]. There is considerable lexical idiosyncrasy in that in some verbs the alveopalatal lotated form is the only possible alternant, in others it is the primary alternant, but coexists with the alveolar lotated form, and in still others it is rare.

- | | | | |
|----|---------------|------------------|--------------|
| a. | turkot+(j)a+e | turkoč e-turkoce | 'it rumbles' |
| b. | rext+(j)a+e | rexče -rexce | 'it grunts' |

One of the characteristics of a large number of rural dialects of Polish is the *mazurzenie* or the regular replacement of the alveopalatals by the dento-alveolars (i.e., Standard Polish /š,ž,č,dž/ are pronounced [s,z,c,dz]). Gladney (1983) suggests that in forms such as those in (a,b) the regular output of lotation of /t/, namely [c], is for some reason felt to be a *mazurzenie* pronunciation; the alveopalatal pronunciation is thus according to Gladney a hypercorrection.

(8) Iotation



The redundancy rules for $[\pm\text{LIC}]$ specify the $[-\text{anterior}]$ output of (8) as $[\text{+LIC}]$ and the $[\text{+anterior}]$ output as $[-\text{LIC}]$.⁷

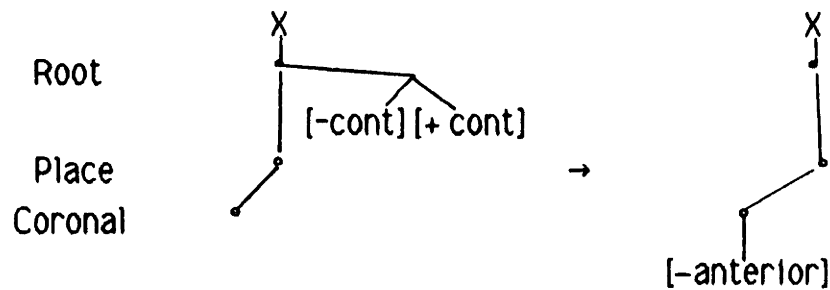
Affricate Palatalization⁸ affects only the alveolar affricates /c,dz/ changing them into alveopalatals [č,dž].

- | | | | |
|-----|------------------|-------------|--------------------|
| (9) | a. cuk'erńic+k+a | cuk'erńička | 'sugar bowl, dim.' |
| | b. zajǫc+isk+o | zajǫčysko | 'hare, aug.' |
| | c. kśǫdz+ik | kśę(d)żyk | 'priest, dim.' |
| | d. p'eńǫdz+n+y | p'eńę(d)żny | 'money, adj.' |

⁷ As the examples in (4) and (5) indicate, [j] also triggers Coronal Palatalization. Unlike the coronal obstruents, palatalized sonorants have the same surface forms before [j] as they do in other palatalizing environments.

⁸ Affricate Palatalization was first proposed as a rule of Polish in Rubach (1984). Earlier analyses of Polish (e.g., Lightner 1963, Steele 1973, Gussmann 1978, Laskowski 1975a) assume that the affricates which participate in Affricate Palatalization derive from underlying velars, and that "Affricate Palatalization" is thus actually application of First Velar Palatalization. The dental affricates [c,dz] are assumed to be derived by means of a rule of Progressive Velar Palatalization (or Baudouin de Courtenay Palatalization, named by Steele after the Slavic progressive palatalization from which this alternation descends). Rubach argues that the progressive palatalization is not a synchronic rule of Polish and that therefore the affricates /c,dz/ are underlying (see Rubach 1984 for details). Since the c,dz-č,dž alternation does not occur in exactly the same environments as First Velar Palatalization (see S2 and S3), I follow Rubach in assuming that there is a distinct rule of Affricate Palatalization.

(10) Affricate Palatalization



In (9c,d) derived [dʒ] becomes [ʒ] as a result of a rule of Spirantization. Spirantization affects the voiced outputs of both Affricate Palatalization and First Velar Palatalization (see below), in the environment of a preceding sonorant:

- (11) a. drob'azg+k drob'aždžek 'detail, dim.'
 b. rog+k rožek 'horn, dim.'
 c. skarg+l+ć skaržyc 'to complain'

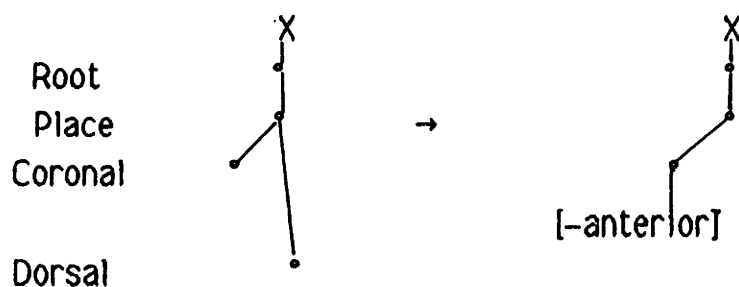
Velar consonants can undergo three different types of palatalizations. **First Velar Palatalization** which is the most common velar palatalization, changes /k,g,x/ to alveopalatals [č,dž,š] (recall that [dž] can surface as [ž]).

- (12) a. ręk+ńik ręćńik 'towel'
 b. kżyk+e+ć kżyćeć 'shout'
 c. płak+(j)a+e pwaće 'he cries'
 d. m'azg+l+ć m'aždżić 'crush'
 e. śńeg+isk+o śńeżisko 'snow, aug.'
 f. łg+(j)a+e wże 'he tells lies'
 g. mux+e muše 'fly, d./l.sg.'
 h. ux+ast+y ušasty 'ear, adj.'

i. brex+(j)a+e breše 'he fibs'

The rule of First Velar Palatalization is given in (13). As in the case of Coronal Palatalization, and Iotation, the fact that the stops become affricates as a result of palatalization is predictable and therefore not stated in the rule itself.

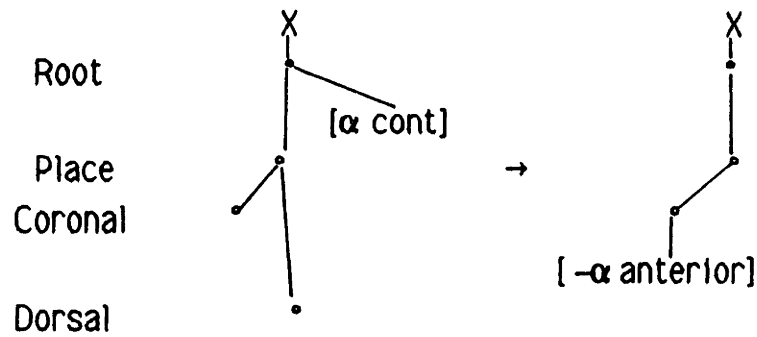
(13) First Velar Palatalization



Second Velar Palatalization changes the velar stops /k,g/ to [c,dz] in the environment of a small number of morphemes of the nominal inflectional system. In these same environments the velar fricative becomes an alveopalatal [š].

- (14) a. žek+e žece 'river, d./l.sg.'
 b. v'elk+i v'elcy 'great, n.pl. m. adj.'
 c. nog+e nodze 'leg, d./l.sg.'
 d. drog+i drodzy 'dear, n.pl. m. adj.'
 e. mux+e muše 'fly, d./l.sg.'

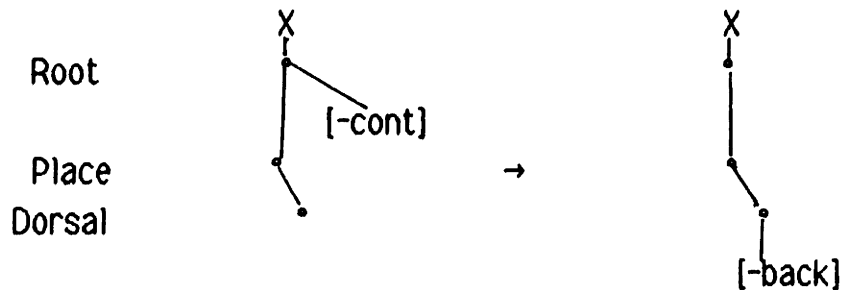
(15) Second Velar Palatalization



Velar Fronting affects only the velar stops, causing them to become fronted to [k',g']:

- (16) a. v'elk+ego v'elk'ego 'great, g.sg. m. adj.'
 b. drog+emu drog'emu 'dear, d.sg. m. adj.'

(17) Velar Fronting



Rubach (1984) argues, on the basis of examples such as those in (18), that all the palatalizations presented in this section apply only in derived environments at the word-level (except Surface Palatalization). In (18) we see words in which underlying labials, coronals, or velars precede morpheme-internal instances of the [-back] vowel [e]. Since, as we have seen above, many of the morphemes in whose environments the

palatalizations do apply begin with initial [e]'s, and since Rubach assumes that the palatalizations are triggered by front vowels, then the fact that the palatalizations do not apply morpheme-internally preceding [e] is taken by Rubach as evidence that the rules apply only in derived environments and are hence subject to the Strict Cycle Condition :

- (18) a. bez 'lilac'
 b. deptać 'trample'
 c. serce 'heart'
 d. rexotać 'croak'
 e. kelner 'waiter'
 f. xerlavy 'sickly'

2. Palatalization in Morphologically-Derived Environments

In (19) are listed examples of palatalized consonants before suffixes whose initial segment provides the expected [-back] environment for palatalization; (20) shows cases where exactly the same consonant alternations as those found in (19) occur, but the suffixes are consonant-initial on the surface:⁹

- (19) a. xwop+isk+o xwop'isko 'fellow, aug.'
 b. ryb+l+a ryb'ja 'fish-like'
 c. zwot+lst+y zwoćisty 'golden'
 d. stoł+isk+o stol'isko 'table, aug.'
 e. swug+l+ć swużyć 'to serve'

⁹ There are no examples of palatalized labials before consonant-initial suffixes, since, as pointed out above, all palatalized labials are actually depalatalized in coda position.

- | | | | |
|---------|------------|----------|------------------|
| f. | gmax+isk+o | gmašysko | 'building, aug.' |
| (20) a. | pan+stv+o | państwo | 'state' |
| b. | ańeł+sk+i | ańelski | 'angelic' |
| c. | ręk+ńik | ręčńik | 'towel' |
| d. | strax+n+y | strašny | 'terrible' |
| e. | nog+k+a | nužka | 'leg, dim.' |

Gussmann (1980), Rubach (1984) and many others have assumed that suffixes such as those in (20) have initial underlying abstract [-back] lax high vowels which trigger palatalization and which surface either as [e] or are deleted (see below for discussion). Evidence for the presence of a lax high vowel in consonant initial suffixes is claimed to come from the fact that two of the suffixes in (20), *-k* 'diminutive', and *-n* 'adjective', have alternants with surface [e]:

- | | | | |
|---------|----------|----------|----------------------------------|
| (21) a. | uog+k | nužek | 'leg, dim., g.pl.' |
| b. | cuk' r+k | cuk'erek | 'candy, n.sg.' |
| c. | v'in+n | v'ińen | 'guilty, short-form adj., n.sg.' |
| d. | god+n | godžen | 'worthy, short-form adj., n.sg.' |

If the consonant-initial suffixes were the only affixes in Polish without surface initial front vowels which trigger palatalization, then the hypothesis that they have abstract underlying initial front vowels would indeed explain their unexpected palatalizing properties. However, as I show in this section, the consonant-initial suffixes are not the only suffixes with unexpected palatalizing properties: not all front-vowel-initial suffixes trigger palatalization, and several back-vowel-initial suffixes do. Furthermore, following Gorecka (1986, 1988), I argue that the $e \sim \emptyset$

alternation seen in (21) is due to epenthesis, and not to the presence of an abstract underlying vowel. Postulating underlying initial front vowels for consonant-initial suffixes does not therefore explain the palatalizing properties of suffixes in general. We need an alternative hypothesis that accounts for the palatalizing properties of all Polish suffixes. Such a hypothesis is provided in §3. Let us turn now to an examination of the palatalizing properties of suffixes.¹⁰

2.1 The i~y Alternation

Polish has a number of morphemes which in initial position exhibit an alternation between [i] and [y]. As the examples in (22) show, some of these morphemes trigger palatalization (22a-f), whereas others do not (22g-n) (for the moment I specify all alternating i~y's as 'I' in underlying representation):

(22)	a. gmax+Isk+o	gmašysko	'building, aug.'
	b. kot+Isk+o	koćisko	'cat, aug.'
	c. osob+Ist+I	osob'isty	'personal'
	d. perł+Ist+I	perł'isty	'pearl, adj.'
	e. student+I	studentci	'students, n.pl. m.'
	f. kozak+I	kozacy	'Cossack, n.pl. m.'
	g. čarn+Ix	čarnyx	'black, g./l.pl.'
	h. dobr+Ix	dobryx	'good, g./l.pl.'
	i. rIb+I	ryby	'fish, n.pl. f.'
	j. mas+I	masy	'mass, n.pl. f.'

¹⁰ Gussmann (1987) has independently arrived at several of the conclusions given here regarding the palatalizing properties of suffixes, and presents much of the same data. Since I had access to his paper before the final version of this chapter was written I have been able to refer to his work.

k. cex+I	cexy	'feature, n.pl. f.'
l. curk+I	curk'i	'daughter, n.pl. f.'
m. tań+ImI	tańim'i	'cheap, i.pl.'
n. mIł+ImI	m'iwym'i	'nice, i.pl.'

In works such as Gussmann (1980) or Rubach (1984), it has been assumed that the distinction between the two types of morphemes is due to a distinction in the underlying initial vowel: namely, those morphemes which trigger palatalization have an underlying /i/ and those which do not trigger palatalization have an underlying high unrounded back /y/. In this subsection I show that the distinction between the two types of morphemes cannot be a distinction in the underlying representation of the initial vowel.

The most important argument against assuming an underlying distinction in /i/ and /y/ is that the two segments are in complementary distribution: [i] occurs in onsetless syllables, following [-back] segments, and following the velar stops, and [y] appears elsewhere.

(23) [i]	[y]
/front labial ___	/labial___
/prepalatal ___	/dento-alveolar___
/ * ___	/alveopalatal___
/V ___	/x ___
/k,g ___	
/j___	

The distribution of [i] and [y] is the same regardless of whether the preceding consonants are underlying or derived. In (22a), for instance, the underlying velar fricative is palatalized to the alveopalatal [š]; consequently, [y] rather than [i] surfaces in the initial position of the palatalizing morpheme. Conversely, in (22g,h,i,n) [y] surfaces following

underlying unpalatalized coronals; following the velar stop /k/, however, in (22), an nonpalatalizing *l~y* surfaces as [i]. There are no native or borrowed words in Polish that begin with [y]; in the environment following vowels, [i] rather than [y] surfaces, even in the case of one of the nonpalatalizing *l~y* morphemes (e.g. *Genua* 'Genoa', *Genui* 'g.sg'; cf. *ryba* 'fish', *ryby* 'g.sg').

The fact that both [i] and [y] surface after labials in word-internal positions has been taken as additional evidence that the two must be distinct underlyingly (cf., e.g., *być* 'to be' and *b'ić* 'to beat'). Differences such as those between *być* and *b'ić* were thus attributed to a distinction in the vowels, and not in the underlying labials (see Gussmann 1987 for discussion). However, the existence of words such as those in (24), in which the morpheme-internal occurrences of [-back] labials are unpredictable, provides evidence that it is necessary for independent reasons to assume that labials are underlyingly distinguished as [-back]:¹¹

- (24) a. v'adr+o 'pall'
 b. m'ud 'honey'
 c. b'odr+o 'hip'

We can therefore assume that differences such as those between the two verbs are not due to a difference in the vowels, but rather to a difference in the onsets to those vowels. Rubach (1984) suggests that the underlying [-back] labials are really underlying labial+[j] sequences; with this hypothesis it is possible to assume both that there is no set of

¹¹ Historically, forms such as those in (24) derive from roots which contained an e-o or e-a alternation. The palatalization of the labials was thus originally triggered by the front vowel; over time the forms were reanalyzed with the back vowel alternant taken as the underlying vowel, but the palatalization of the labials remained (see S4; and Fn. 43).

underlying [-back] labials (thus the consonant inventory is kept smaller) and that labials can be distinguished as either [-back] or [+back]. In borrowed forms containing [b]+[j] sequences, these sequences are always interpreted as [b'i]. French *bibliothèque* 'library', for instance, has been borrowed into Polish as *b'ibl'oteka*. Although one could suppose that the initial labial in such forms is interpreted as a [bj] sequence, to which a rule removing the [j] then applies, it is more likely that in fact the sequence is interpreted as containing a [-back] labial [b']. More important, there is a small set of words which has an underlying [-back] labial in stem-final position. In the nominative. sg., for example, the adjective root *gwup* 'foolish' has the form [gwup'i]; if the root ended in a nonpalatal labial then one would expect the form [gwupy] (cf. *gruby* 'fat'). The root 'foolish' can thus be postulated to have one of two possible underlying forms: /gʷupj/, after Rubach (1984), or /gʷup'/. In §2.4.2 I provide evidence that Polish codas are governed by constraints which prohibit sequences of stop+glides, and that epenthesis applies to break-up III-formed codas. Given the coda-constraints, we would expect that a sequence of stop+glide would undergo epenthesis if followed by a consonant-initial suffix (e.g., /lesbj+sk+i/ surfaces as *lesbijski* 'lesbian' with an epenthetic [i] derived from [e] in the environment of /j/). /gwup+stv+o/, however, surfaces as *gwupstvo* and not as **gwupijstvo*. The lack of epenthesis in this form can be accounted for if one assumes that there is no underlying final [pj] sequence, but rather that the final segment is an underlying [-back] labial.

The velar fricative /x/, in native words is always followed by [y] both in underived and derived environments.¹² Comparing (22k) and (22l), for example, indicates that in the same environment in which we get the sequence [k'i] with the velar stop, the velar fricative+[i] sequence surfaces as [xy]. In borrowings, however, both [x'i] and [xy] are found (examples are from Gussmann 1987; the [h] in these forms is interpreted as a velar fricative):

- (25) a. hycel 'dog-catcher'
 b. hymn 'hymn'
 c. x'iny 'China'
 d. h'ipnoza 'hypnosis'
 e. h'ig'ena 'hygiene'

Gussmann suggests that the surfacing of [i] following [x] in a small subset of cases is due to a [-back] diacritic lexically marked on the roots. This is equivalent to saying that a [-back] /x/ is a marginal segment in the underlying inventory of Polish.

Given that [i] and [y] are in complementary distribution and that their distribution following labials can be attributed to a distinction in the underlying labials and not to an underlying distinction in [i] and [y], we can conclude that [i] and [y] are surface variants derived from one underlying representation. We need now to consider how the surface variants are derived.

¹² Preceding the secondary imperfective morpheme *-iv/yv*, the velar fricative /x/ is fronted; see below for discussion. It is also fronted before two or three nonnative suffixes (e.g., *ist-a*, *-ik*).

Gussmann (1987) proposes the following analysis for the distribution of *i~y*.¹³ He argues that /i/ is underlyingly unspecified for [back]; in fact, he postulates that all the vowels of Polish are underspecified for [back] and are distinguished only by [high], [round], and [low]. Prepalatal consonants and [-back] labials are specified as [-back] in underlying representations whereas other consonants receive the value [+back] by means of a rule of Consonant Backness which states that a consonant unspecified for [back] is [-back]. A rule of Surface Velar Palatalization assigns the feature [-back] to the configuration: velar stop + [-round, -low] vowel. Finally, the value for [back] is supplied to the underspecified vowel /i/ by one of two rules, Backness Linking, which causes the vowel to assimilate the [back] value from the preceding consonant, or Vowel Backness, a default rule that supplies [-back] to [-round] vowels and [+back] to [+round] vowels.

The [-back] consonants of Polish are the [-back] labials and the prepalatals. In both cases we can justify specifying these consonants as [-back]: in the case of the labials this is the primary feature which distinguishes the [-back] labials from the nonpalatal labials; in the case of the prepalatals, a process of decomposition (discussed in Chapter 4) decomposes these segments into [j] plus consonant (e.g., /słońce/ [swojnce] 'sun'), indicating that they are coarticulated coronal-dorsal segments.

¹³ On the assumption that the palatalizing morphemes have underlying /i/ and the nonpalatalizing morphemes have underlying /y/, it is necessary to postulate two rules, one to back /i/ to [y] following dento-alveolar and alveopalatal coronals (Rubach 1984 refers to this rule as Retraction), and another to front /y/ to [i] following the velar stops (Rubach calls this Fronting). Rubach postulates that the rule of Fronting must apply cyclically; but in fact although the morphemes mentioned in Fn. 12 do trigger fronting of /x/ cyclically, the fronting of /k, g/ is not due to a cyclic process. Almost without exception /ki, gi/ sequences surface as [k'i, g'i] both morpheme-internally and in derived environments. There are only two or three words in the language in which [y] follows a velar stop (e.g., *kynologia* 'cynology'). Retraction does indeed apply morpheme-internally both in native and borrowed words.

Specifying the nonpalatal labials as [+back], however, is more difficult to justify. There is no evidence of coarticulation in these cases. In fact, in Gussmann's analysis the [+back] feature is used as a diacritic to make a symmetrical rule of [±back] assimilation. Gussmann's analysis of the i~y alternation also relies crucially on the assumption that Polish vowels are unspecified for [±back] at the underlying level. Recent work in underspecification theory by Steriade (1987) and Calabrese (1988) suggests that segments should be specified at the underlying level for those of their features which are distinctive. For a typical 5 vowel system, such as that of Polish, it is generally assumed that it is [±back] which is the distinctive feature in the non-low vowels and not [±round]. And in fact, given that in Polish the feature [-back] is distinctive for the consonant system it would be very surprising if it played no underlying role in the vowel system.

The distribution of the high vowel variants suggests that Polish has an underlying phonotactic constraint against the appearance of [i] in a syllable in which the onset is not [-back]. If this is the case, then we must assume that different classes of segments which violate this constraint resolve the violation differently. In the case of the velar stops, the ungrammatical sequences *[ki] and *[gi] are fixed up by fronting the velars (probably by delinking the dorsal node from the velar and spreading the dorsal node of the vowel creating a structure linked through the dorsal node; this may be an Obligatory Contour Principle effect (see, for example, McCarthy 1986)); thus from /ki, gi/ we get [k'i, g'i]. In the case of the nonpalatal labials, the non-prepalatal coronals and [x], the sequences *Ci are fixed up by delinking the [-back] value of the vowel. Later (default) rules specify the high unrounded vowel as both lower and retracted in relation to [i]. In those cases where [i] surfaces word-initially or following a vowel the constraint does not apply

since there is no onset and consequently no delinking of the [-back] value of the vowel is required. Making the appearance of [i] dependent on a [-back] consonant exclusively avoids postulating [+back] specifications where there is no phonetic evidence for them. It also makes it unnecessary to assume the underspecification proposed by Gussmann for the vowels. The processes which effect the retraction of /i/ must be noncyclic as they affect both word-internal instances of /i/ and /i/ which occurs in environments derived by affixation. Since they are noncyclic, the fact that they apply after all other palatalization rules have applied is accounted for without additional stipulation.

Whatever the correct analysis of the i~y alternation, it is clear that the two segments are in complementary distribution and that therefore the occurrence or lack of palatalization in the environment of morphemes exhibiting this alternation in initial position cannot be accounted for by postulating an underlying distinction in /i/ and /y/. Additional evidence that this is the case comes from morphemes which exhibit the i~y alternation but have variable palatalizing properties. Before the morpheme *-/i-/ /-y-/*, for instance, Labial Palatalization and Affricate Palatalization but not Coronal Palatalization occur. Notice also that we find [x'i] and not the expected [xy] in (26d).

- (26) a. graf'íni 'wife of a graf'
 b. gospodyní 'landlady'
 c. čwonk'íni 'member, f.'
 d. monarx'íni 'monarch, f.'
 e. doradčyńi 'adviser, f.' (cf. doradca 'adviser')

Rubach (1984) postulates that this morpheme has an underlying initial /y/ and that therefore it does not trigger Coronal Palatalization. He assumes, however, that it does trigger a rule, that he calls Fronting, which causes /y/ to become [i] following velars (In this case including the velar fricative). While this analysis certainly accounts for (26b, c, d), it cannot explain why the labial is palatalized in (26a) and why the affricate /c/ is palatalized to [č] in (26e) since, under this analysis, the morpheme provides no environment which could trigger any palatalization rules. Another morpheme which exhibits behaviour similar to that of *-iŋ-* is the Latinate *-iŋt-a* (not to be confused with the Polish *-iŋt-y* before which palatalization always occurs):

- | | | |
|------|----------------------------------|------------------------------------|
| (27) | a. <i>sylob'ista</i> | 'author of syllabic verse' |
| | b. <i>balladysta~balladźista</i> | 'writer of ballads' |
| | c. <i>m'il'itarysta</i> | 'militarist' |
| | d. <i>frank'ista</i> | 'member of an 18th C. mystic sect' |
| | e. <i>anarx'ista</i> | 'anarchist' |

This morpheme has the following properties: palatalization of the labials always occurs before it, palatalization of coronals occurs in some cases but not in others (witness the alternative form in 27b), and fronting of the velars, but not First Velar Palatalization takes place. Again it is necessary to assume that the underlying representation of this morpheme has an initial /i/, even though palatalization does not occur before it in all cases. If we assumed that it had an underlying /y/ we would not be able to account for the different palatalization effects.

-iŋ-, *-iŋt-a*, and the morphemes in (22) must thus be postulated to have initial underlying /i/. Their palatalizing properties are therefore

independent of their underlying representation. This independence of phonological form and palatalizing properties is seen in other types of morphemes as well.

2.2 e-Initial Suffixes

Consider another set of morphemes beginning with a front vowel: e-initial morphemes. There are three types of e-initial morphemes (excluding both the verbal '1st sg.' and the nominal 'acc.' $-ę$ which never trigger palatalization of any kind): before one we find Labial Palatalization, Coronal Palatalization of both sonorants and obstruents, and Second Velar Palatalization (28a-c); before another, Labial Palatalization, Coronal Palatalization and First Velar Palatalization (28d-f); before a third, only Velar Fronting (28g-l):

(28)	a. zęb+e	zęb'e	'tooth, 1.sg.'
	b. kot+e	koće	'cat, 1.sg.'
	c. ręk+e	ręce	'hand, d./l. sg.'
	d. śiv+ej+ɔ	śiv'ejɔ	'they become grey'
	e. wys+ej+ɔ	wyśejɔ	'they become bald'
	f. v'ilk+e+ć	v'ilčec	'to become wolf-like'
	g. zęb+em	zębem	'tooth, 1.sg.'
	h. kot+em	kotem	'cat, 1.sg.'
	i. krok+em	krok'em	'step, 1.sg.'

Rubach (1984) has postulated that Second Velar Palatalization is marked to occur in the environment of only a few morphemes with initial front vowels, including the e-initial morphemes in (28a-c); First Velar

Palatalization applies in all the other palatalizing environments. He has accounted for the third set of morphemes by postulating that they have an initial underlying mid back unrounded vowel /ɣ/ which is fronted to [e] in the environment of the velars and then later, at the phrase-level (see Rubach and Booij 1987) triggers the fronting of the velars.

There are only a few morphemes of the language for which underlying /ɣ/ would need to be postulated. Rubach does argue that the postulation of an underlying /ɣ/ is independently motivated by certain facts about nasal vowels. Nasal vowels can alternate between surface [ɔ] and [ɛ] in verbs and in nouns (e.g., sklɛwam – sklɔw 'I swore – he swore; zɔb – zɛby 'tooth: nom.sg.– nom.pl. '; see §4). To account for the alternations in the verbs, Rubach proposes that underlying low high vowel+nasal becomes ɣ+nasal, and that this [ɣ] is later spelled out by a noncyclic rule of Vowel-spellout ([ɣ] → [ɔ] / __CC*, [ɣ] → [ɛ] elsewhere). In the case of the nouns, Rubach initially postulates that some nouns contain /ɣN/ in underlying forms, and that this /ɣ/ is spelled out post-cyclically (only 16 nouns actually require /ɣ/ underlyingly). Later in the book, however, he argues that if syllable-structure is taken into consideration, then no /ɣ/ is required to account for the nouns exhibiting nasal vowel alternations, but that, instead, nouns too can be analyzed as containing underlying high low vowel+nasal sequences. Rubach thus argues in favour of postulating an underlying /ɣ/ in morphemes such as those in (28g-i) on the basis that such a vowel is needed to account for nasals, in any case; however, he undermines his own argument by arguing later that /ɣ/ is not needed to explain nasal vowel behaviour. More important, in Chapter 4 I argue that nasal vowels are not vowel+nasal sequences. Rubach's analysis is therefore inadequate in accounting for nasal

vowels and cannot be considered independent evidence for the postulation of a mid unrounded vowel.

Rubach claims that the underlying form of both morphemes which are spelled $-e$ '1 p sg. pres.' and 'acc.sg.f.' is $/-ym/$ (p. 146). Although he does not return to these morphemes later in the book, when he argues that y +nasal sequences are really high lax vowel+nasal sequences, his statement of the Vowel-shift and Vowel-Spellout rules would not be able to derive the surface forms of these two morphemes if they contained underlying high lax vowels. I therefore conclude that he intended to have both these morphemes represented as $/-ym/$ in underlying form; if this is true then they have the same underlying forms as that postulated for $-em$ 'i.sg.' in (28). However, Rubach's rules do not derive the correct surface forms in those cases where the $-e$ morphemes are affixed to velar-final stems. Thus, *drog+e* 'road, acc sg' has the following derivation:

(29)	$/drog+ym/$	
Fronting	e	
Lab/Vel j-ins	j	
<hr style="width: 20%; margin-left: 0;"/>		
Surf. Pal.	g'	
other rules	\emptyset	
	$*[drog'e(\tilde{w})]$	cf. $[droge(\tilde{w})]$

The correct form has no fronting of the velar. Rubach cannot derive or explain the difference between the alternation occurring in the environment of $-e$ and the alternations occurring in the environment of $-em$ and morphemes like it. Similar problems would face any analysis that tried to account for the difference in the palatalizing properties of the e -initial morphemes in terms of different underlying representations.

The e-initial morphemes thus present a similar puzzle to that posed by the i-initial morphemes, namely although they all seem to have the same initial segment, they have different palatalizing properties. In fact, as it turns out the same conclusion can be drawn for back-vowel initial suffixes.

2.3 Back-Vowel Suffixes

As far as back-vowel suffixes are concerned, while palatalization does not occur in the environment of all such suffixes (e.g., *-ov* or *-av* never trigger palatalization), it does occur in the environment of suffixes beginning with all three back vowels, [u], [o] or [a].

(30)	a.	torb+ast+y	torb'iasty	'baggy'
	b.	kf'at+ast+y	kf'ačasty	'flowery'
	c.	kžak+ast+y	kžačasty	'bushy'
	d.	palc+ast+y	palčasty	'digital'
	e.	farb+až	farb'až	'colourer'
	f.	grab+až	grabaž	'grave-digger'
	g.	veŋn+až	vewñaž	'wool maker'
	h.	p'is+až	p'isaž	'writer'
	i.	dax+až	daxaž	'rooter'
	j.	fajk+až	fajčaž~fajkaž	'pipe-smoker'
	k.	xleb+ak	xlebak	'haversack'
	l.	słom+ak	swom'ak	'straw bee-hive'
	m.	ps+ak	pśak	'pup'
	n.	ŋys+ak	wysak	'bald man'
	o.	mlek+ak	mlečak	'suckling'
	p.	twust+ox	twuścox	'fatty, squab'
	q.	upart+ux	uparc'ux	'stubborn one, dim.'

With the exception of the adjective suffix *-ast-y* in whose environment labials, coronals, velars and affricates always palatalize, the palatalizing back-vowel suffixes have variable palatalizing properties. For instance, labials and coronals are more likely to be palatalized in the environment of *-aʒ* 'nom.', than are velars (see Górska 1985); by contrast, before *-ak* 'nom.' velars are always palatalized, whereas coronals are palatalized less often, and labials less often still. Coupled with the fact that palatalization does not occur in the environment of all front-vowel suffixes, the fact that palatalization may occur in the environment of back-vowel suffixes suggests strongly that the palatalizing properties of suffixes are independent of their underlying phonological form. In earlier work on Polish, various hypotheses have been proposed to account for the palatalizing properties of back-vowel suffixes. Rubach (1984), for instance, assumes that the lexical representations of these morphemes contain initial back-vowels and that [i] is inserted into morpheme-initial position by an allomorphy rule in lexically governed contexts. Górska (1985) also suggests that [i] is inserted, but she considers that the insertion is partly phonologically determined and that the inserted [i] is an "inter-morph" inserted between the stem and the back-vowel suffix. If all other environments in which palatalization takes place contained front vowels, then we would be justified in considering solutions such as those of Rubach and Górska. As we will see next, however, palatalization also takes place before consonant-initial suffixes.

2.4 Consonant-Initial Suffixes: The e-Ø Alternations

There is at least one consonant-initial suffix which is nonpalatalizing: *-/ʲv-y* 'adj.' In the environment of this morpheme we find unpalatalized labials, coronals and velars. Only the two coronal fricatives /s/ and /z/ surface as prepalatals before *-/ʲv-y*. This palatalization of the fricatives is clearly due to the noncyclic rule of Palatal Assimilation discussed in Chapter 2 by which /s/ and /z/ become [s̺] and [z̺] in the environment of fronted coronal sonorants and obstruents (see Ch. 2, §2.5.1):¹⁴

- | | | | | |
|------|----|-------------|-----------|----------------------|
| (31) | a. | osob+ʲiv+y | osobʲivy | 'peculiar, singular' |
| | b. | škod+ʲiv+y | škodʲivy | 'harmful' |
| | c. | jęk+ʲiv+y | jękʲivy | 'whining' |
| | d. | kox+ʲiv+y | koxʲivy | 'amorous' |
| | e. | zaraz+ʲiv+y | zaraźʲivy | 'infectious' |

We have already seen consonant-initial suffixes in whose environments palatalizations take place. Before all of them except the diminutive *-k*, Labial Palatalization, Coronal Palatalization, and First Velar Palatalization occur. Before the diminutive morpheme neither labials nor coronals are palatalized.¹⁵ In the environment of *-k*, First Velar Palatalization and Affricate Palatalization do occur.

¹⁴ *-/ʲv-y* also causes depalatalization; e.g. xęć+ʲiv+y xętlʲivy 'lustful'

¹⁵ In fact, before the diminutive, final prepalatal coronals in so-called soft-stem nouns are actually depalatalized:

- | | | | |
|----|------------|------------|---------------------|
| a. | kość+k+a | kostka | 'small bone, ankle' |
| b. | p'ersćen+k | p'ersćonek | 'small ring' |

Recall that in underlying forms the prepalatals are simply coarticulated coronal and [-back] dorsal segments; depalatalization therefore involves delinking of the dorsal node of these segments. The depalatalization of the coronal obstruents is similar to that found in the case of the

- | | | | | |
|------|----|----------|---------|--------------------|
| (32) | a. | snop+ek | snopek | 'small sheaf' |
| | b. | kot+k+a | kotka | 'small cat, g.sg.' |
| | c. | ux+k+o | uško | 'small ear' |
| | d. | drog+k+a | družka | 'small road' |
| | e. | zajȓc+k | zajȓček | 'small hare' |

The existence of suffixes which trigger palatalization, but which on the surface have initial consonants has been explained by assuming that Polish has underlying lax high vowels, front /ɨ/ and back /ɤ/ (see Gussmann 1980, Rubach 1984; also for an earlier analysis along these lines see Laskowski 1975a). This hypothesis requires rules that lower the high vowels to [e] in environments preceding another lax high vowel, and that delete the vowel elsewhere. Such abstract vowels have also been postulated to account for e~∅ alternations such as those in (33):^{16,17}

palatalized liquid /r/ before a consonant (cf. *starȓc* 'old man', *starca* 'g.sg.'). Depalatalization of coronal prepalatals is, to some extent, morphologically restricted since, although it takes place in the environment of most consonant-initial suffixes, it does not take place in the environment of -c as does depalatalization of [r'] (cf. *kośćȓc* 'skeleton', *kości* 'g.sg.'). Depalatalization is ordered after the palatalization rules since it affects the outputs of these rules.

¹⁶ V-∅ alternations are characteristic of all Slavic languages; but in different languages the "fleeting" vowel may have different surface forms. The alternation has its roots in the fall of the Common Slavic short vowels known as yers—ɨ, the back yer, and ɤ, the front yer—by which a yer in a metrically weak position was deleted and a yer in a metrically strong position followed by another yer remained. In Polish the strong yers developed into [e]. After the historic fall of the yers (which occurred around the 11th century; see Kuraszkiewicz 1972), the alternation of a vowel with zero took on a life of its own in the sense that many borrowings into Polish were reanalyzed in such a way as to contain the alternation. English 'sweater', for instance, has the forms *svetar* 'n.sg.', *svetra* 'g.sg.'.

¹⁷ Recently several alternatives to the lax high vowel hypothesis have been proposed. Spencer (1986), for example, has suggested that these vowels are actually underlying empty V-slots which are either assigned the features of a default vowel [e], or are deleted (a similar position is adopted in Gussmann's latest work (1987)). Such a hypothesis involves the further assumption that the palatalizations are not triggered by these vowels. Kenstowicz and Rubach (1987, for Slovak) and Rubach and Booij (1987, for Polish) argue that the yers are floating vowels, specified on the melodic tier with no underlying position on the skeletal tier.

(33)	a.	mg'ew	'fog, g.pl.'	mgw+a	'n.sg.'
	b.	pweć	'sex'	pwć+i	'g.sg.'
	c.	v'ertew	'borer, g.pl.'	v'ertw+o	'n.sg.'
	d.	marxev	'carrot'	marxv+i	'g.sg.'

It has been claimed that the position of the e~∅ alternation in a word is unpredictable and must therefore be specified underlyingly. In this section I examine evidence provided in Gorecka (1986, 1988) that the position of the e~∅ alternation is in fact governed to a great extent by constraints on syllable structure. I conclude that Gorecka is correct in assuming that the e~∅ alternation is in fact the result of epenthesis. Given that the lax high vowels are not needed to account for e~∅ alternations, the argument that seemingly consonant-initial suffixes before which palatalization takes place have initial lax high vowels is considerably weakened.¹⁸

Rozwadowska (1987) does not specify what the form of the vowel(s) underlying the alternation is, but she proposes that rather than being triggered by the presence of a following vowel, the surfacing of [e] is dependent on syllable-structure and in particular on whether or not it appears in a closed syllable.

¹⁸ Other properties of Polish which are accounted for by making crucial reference to the presence of underlying lax high vowels include the nasal vowels and nasal-vowel front~back alternations, the distribution of allomorphs of the imperative morpheme, and the blocking of certain processes across affix boundaries (see Gussmann 1980, Rubach 1984, Nykiel-Herbert 1985, Szpyra 1986, and Rubach and Booij 1987). I discuss alternative analyses of these properties elsewhere in the thesis. In Chapter 4, I show that the nasal vowels are underlying nasal diphthongs and not lax high vowel-nasal sequences. Bethin (1987) has argued that the distribution of the imperative is syllable-dependent and not dependent on lax high vowels (see below). And, in Chapter 2, I argued that prefixes are phonological words and that it is for this reason that various processes do not apply in their environments.

2.4.1 Constraints on Codas

Gorecka (1986, 1988) shows that the position and occurrence of the $e \sim \emptyset$ alternations (in the nominal system in particular) is correlated with constraints on the forms that syllable codas can have in Polish (see §2.4.2 for some discussion of syllabification rules). Specifically, $e \sim \emptyset$ alternations occur stem-finally between consonants which, if they cooccurred in the same coda, would violate either the Sonority Sequencing Parameter¹⁹ or a constraint on the cooccurrence in a coda of two sonorant segments— $*[[+son][+son]]_{\text{coda}}$. Conversely, $e \sim \emptyset$ alternations are rarely found between consonants whose cooccurrence in a coda violates no constraints. Compare the forms in (34) and (35):

- | | | | | | |
|------|----|---------|-------------|---------|---------|
| (34) | a. | śv'atwo | 'light' | śv'atew | 'g.pl.' |
| | b. | gumno | 'barn' | gum'en | 'g.pl.' |
| | c. | sosna | 'pine tree' | sosen | 'g.pl.' |
| (35) | a. | blask | 'glare' | | |
| | b. | skrypt | 'script' | | |
| | c. | żart | 'joke' | | |

In (34a,c), the stem-final consonant is more sonorous than the consonant preceding it; if the two consonants were in the same coda, then the Sonority Sequencing Parameter would be violated. In (34b) the two stem-final consonants are sonorants; their inclusion in the same coda would

¹⁹ Several versions of the Sonority Sequencing Parameter have been proposed. One of these, proposed in Steriade (1982) is as follows: Sonority peaks within a syllable must be adjacent (a sonority peak is defined as a segment of higher sonority than a neighbouring segment). This constraint captures the fact that in onsets consonant clusters tend to increase in sonority, whereas in codas clusters tend to decrease in sonority.

violate the *[[+son][+son]]_{coda} constraint. In (35) in all three examples the final consonant is either less sonorant, or of equal sonority to the consonant preceding it and therefore the two consonants can occur in the same coda. The correlation between coda-constraints and the occurrence of e~∅ alternations is seen most clearly in polysyllabic nominal roots as illustrated in Table 2.

TABLE 2: OCCURRENCE OF [E] BETWEEN 2 FINAL CONSONANTS OF POLYSYLLABIC STEMS²⁰

2nd C 1st C	Stop	Fricative	Nasal	Liquid	Glide
Stop	no	yes	yes	yes	yes
Fricative	no	no	yes	yes	yes
Nasal	no	no	yes	yes	yes
Liquid	no	no	yes	yes	yes
Glide	no	no	yes	no	data

Exceptions to the pattern exhibited in Table 2 do occur. Thus we find [e] alternations between two consonants which violate neither coda-constraint (e.g., *valk+a* 'fight' ~ *valk* 'g.pl.', but *valeč+n+y*), and ∅ occurs in positions in which [e] is predicted (e.g., *kolumn* 'column, g.pl.', *bubr* 'beaver'). More exceptions of the latter type occur than of the former type. In addition, the exceptions of the latter type are to a great extent systematic. Thus, for example, roots or stems ending in [k,s,v,r] and the nasals may exhibit exceptional behaviour. [m]-final stems, for instance, never contain [e] between the last two consonants in word-final position (e.g., *taśm*, *rękop'ism*, *plazm*). In other cases, whether a stem behaves

²⁰ Table 1 is a simplified version of the facts presented in Gorecka (1986) and Laskowski (1975a).

exceptionally is more arbitrary (as in the case of [r]-final stems), and is partly dependent on the grammatical or lexical category of the stem. Final stop+[v] sequences, for example, are not split by [e] (even though they violate the SSP) in masculine and neuter nouns, but in feminine nouns [e]'s occurrence is either optional or obligatory. As Gorecka points out, an important fact about the exceptions to the coda-constraints is that they are largely confined to word-final position. In a position preceding a suffix, words whose final consonant cluster violates a constraint almost invariably surface with [e] even if this [e] is not present in underived forms. The underived forms of the left column in (36), for example, violate the constraints, whereas corresponding derived words do not. (36f,g) illustrate examples of words in which [e] shows up in both word-final and word-internal position:

(36)	a.	form	'form'	foremny	'adj.'
	b.	kolumn	'column'	kolum'enka	'dim.'
	c.	sarn/saren	'deer, g.sg.'	sarenka	'dim.'
	d.	lity	'lithuanian, g.pl.'	lityvka	'dim.' ²¹
	e.	srebr	'silver, g.pl.'	sreberko	'dim.'

The fact that [e] does not always surface in word-final positions but does surface when followed by derivational affixes leads Gorecka to suggest that some word-final consonants may be extrasyllabic and thus not visible at the time when the coda-constraint violations are fixed up.

The hypothesis that the e~∅ alternations are represented underlyingly by segments or V-slots and may be deleted cannot account for the

²¹ The segment underlying the final [v] in this stem is /w/; see Chapter 4.

distributional regularities exhibited in Table 1. Under such a deletion-hypothesis, the fact that no $e \sim \emptyset$ alternations ever occur in a consonant cluster in which the final consonant is a stop, for instance, is simply an unexplained oddity. In contrast, if it is assumed that the alternation is due to a rule of epenthesis, this fact is both explained and expected.

The $e \sim \emptyset$ alternation is not the only process of Polish which is governed by constraints on coda-formation. The forms of the imperative and comparative morphemes are governed by the coda-constraints as well (Bethin 1987, and Rubach and Booij 1987, who follow Bethin). Both morphemes have two surface forms, \emptyset or $-ij/\gamma j$ in the case of the imperative, and $-ś$ or $-e/ś$ in the case of the comparative. In both cases the syllabic form is chosen if the final consonant cluster of the preceding stem would violate one of the coda-constraints, otherwise the asyllabic alternant is chosen. Examples are given in (37)-(40) (see § 3.3.2 for an analysis of the imperative):

- | | | | |
|------|------------------------|-------------|------------------|
| (37) | infinitive | imperative | |
| | a. <u>ušt</u> ynić | uštyn'ij | 'stiffen' |
| | b. <u>rozdrob</u> nić | rozdrob'ij | 'crumble' |
| | c. <u>ujażm</u> ić | ujażm'ij | 'subjugate' |
| | d. <u>nagl</u> ić | nagl'ij | 'urge' |
| | e. <u>upraktyčn</u> ić | upraktyčńij | 'make practical' |
| (38) | a. <u>uv'elb</u> ić | uv'elb | 'adore' |
| | b. <u>vot</u> nić | votp | 'doubt' |
| | c. <u>zv'ilž</u> yc | zv'ilž | 'moisten' |
| (39) | adjective | comparative | |
| | a. <u>ćemn</u> +y | ćemń+ejš+y | 'dark(er)' |
| | b. <u>mōdr</u> +y | mōdź+ejš+y | 'wis(er)' |

- | | | | | |
|------|----|---------|-----------|-------------|
| (40) | a. | tvard+y | tvard+š+y | 'hard(er)' |
| | b. | prost+y | prost+š+y | 'simpl(er)' |

The fact that the coda-constraints play a role in several different areas of Polish provides additional justification for the argument that they determine the position of the e~∅ alternation and that this position is therefore predictable. I conclude that the e~∅ alternation arises as a result of epenthesis.

2.4.2 Epenthesis

The fact that the e~∅ alternations occur consistently in monomorphemic roots between consonants whose inclusion in the same coda would violate one of the two constraints on codas discussed in §2.4.1 is not the only predictable property of the distribution of the alternations. As Gorecka also points out, the alternation always appears before (or after) the edge-most consonant in a sequence of consonants. In the following examples, for instance, e~∅ appears in the environment CC_C, but not in the environment C_CC. In prefixes, furthermore, it always appears following the leftmost consonant.

- | | | | | | |
|------|----|--------------|----------------|-----------|----------------|
| (41) | a. | pweć | 'sex' | pwć+1 | 'g.sg.' |
| | b. | krev | 'blood' | krv'+1 | 'g.sg.' |
| | c. | pań+stev+k+o | 'nation, dim.' | pań+stv+o | 'nation' |
| | d. | ze+rv+a+ć | 'tear off' | z+ryv+a+ć | 'tear off, SI' |

In addition, as we saw in Chapter 2, the e~∅ alternation occurs in prefixes only before verb roots which have asyllabic alternants. In this

subsection I briefly present Gorecka's account of epenthesis (1986, 1988) and discuss a consequence of this analysis for the prefix restructuring postulated in Chapter 2.

Following Steriade (1982), Gorecka assumes that Universal Grammar provides three basic syllabification processes: the CV Rule which puts one consonant together with a following vowel, the Onset Rule, which adjoins unsyllabified consonants to the left of the CV sequence, and the Coda Rule which incorporates consonants to the right of the CV sequence into the Rhyme. She also assumes that Polish has a Resyllabification rule that may override previously-assigned syllable structure. Following Kiparsky (1985), she assumes that the CV, Onset and Coda rules are not constrained by Strict Cyclicity, since they are structure-building, but that Resyllabification and Epenthesis are constrained by Strict Cyclicity, since they are structure-changing (see Chapter 1 for a brief discussion of the difference between structure-building and structure-changing rules).²²

²² Rubach (1984), who assumes that Polish has underlying lax high vowels, also argues that the rule deriving [e] from these underlying vowels (i.e., Lower) is a cyclic rule. The first argument adduced by Rubach to show that Lower is cyclic involves a rule that he refers to as Labio/Velar Palatalization. Rubach argues that Lower must precede Lab/Vel and that the latter rule is cyclic; therefore Lower is also cyclic. I show below that the palatalization of velars purportedly triggered by this rule is in fact a noncyclic process. Rubach's second argument involves the e-∅ alternations found in prefixes. Recall from Chapter 2 that these alternations occur only in the environment preceding roots which themselves exhibit V-∅ alternations and are therefore also postulated to contain underlying yers. More specifically, the prefix lax high vowels lower only if the root lax high vowels do not. Rubach explains this latter fact by adopting several assumptions: that prefixes are cyclic and processed on the last cycle; that Lower and Lax High Vowel-Deletion are distinct and, finally, that only the former is a cyclic rule. In Chapter 2 I argued that prefixes are phonological words and that it is only in the environment of a limited number of (mostly verbal) roots that they are demoted to phonological status and are subject to word-level phonological processes. In the relevant roots, the prefix lax high vowel lowers only in simple (im)perfective forms; in secondary imperfectives, where, according to the analysis adopted by Rubach, a rule of Derived Imperfective Tensing has tensed the underlying lax high vowel and caused it to surface, the prefix lax high vowel is prevented from lowering (cf. *adb+rv+a+ć'*tear, Pf.; *ad+rɣv+a+ć'*tear, Sec. Impf.). As long as the process that derives [y] in the secondary imperfective form is ordered before the lax high vowel-lowering rule (as is assumed by Rubach in any case), the correct surface forms in verbs such as *adb+rv+a+ć'*

Consider the examples in (42) and (43).

(42)	a.	las+ek	'small wood'	las+k+u	'g.sg.'
	b.	vor+ek	'small sack'	vor+k+a	'g.sg.'
	c.	goń+ec	'errand-boy'	goń+c+a	'g.sg.'
(43)	a.	blask	'glare'	blask+u	'g.sg.'
	b.	kark	'nape'	kark+u	'g.sg.'
	c.	swońc	'sun,g.pl.'	swońc+e	'n.sg.'

In (42) we have epenthesis applying between two consonants which, as the examples in (43) testify, could form a well-formed coda. The difference between the two sets of forms is a difference in derived and underived environment, respectively: In the first set the final consonant is a monoconsonantal suffix and thus provides a derived environment, while in the second set, the final consonant is included in the monomorphemic root

od+ryv+a+c' can be derived just as well on the assumption that lax high vowel-lowering applies noncyclically as on the assumption that it applies cyclically. There are two verb forms, however, which show that Lower may indeed be cyclic, if one accepts Rubach's assumption about the last-cyclic status of prefixes (which, as Pesetsky (1979) and others have pointed out is a morphologically unjustified structure): these are forms like $/[vE[\check{E}d+\uparrow+a]]/$ *vaš'a* 'she came in' vs. $/[vE+[\check{E}d+\uparrow+E]]/$ *vš'a* 'he came in' (the same facts are found in the case of the root *sEx* 'dry'; 'E' denotes a lax high vowel). According to Rubach, in the case of the masculine singular, if the rules apply cyclically, on the innermost brackets first, then the correct form is derived. A third argument suggests that Lower is subject to Strict Cyclicity. In the morpheme *-EstEv* found in *paristvo - paristevko* 'nation, dim.' the first lax high vowel never surfaces although its presence is assumed because the morpheme triggers palatalization of preceding consonants. If the rules applied noncyclically, then one would expect the first lax high vowel to surface. However, if one assumes that Lower is subject to Strict Cyclicity then the first lax high vowel should not surface because it never appears in an environment that is derived. I show below that although this morpheme does trigger palatalization the fact that it does so is not due to the presence of an initial lax high vowel. Thus, the argument that Lower is subject to Strict Cyclicity becomes less compelling. The other three arguments presented by Rubach are not as significant as the three just discussed.

and hence the environment is underived. Given that Epenthesis is a structure-changing rule and is therefore subject to Strict Cyclicity, the fact that it does not apply in an underived environment is not surprising. What needs to be explained, however, is why Epenthesis applies before *-k* and *-c*. If one assumes that the syllabification rules are ordered before Epenthesis, then on the second cycle monoconsonantal obstruent suffixes like *-k* and *-c* could get syllabified into the same coda as preceding stem-final consonants. Gorecka accounts for the fact that such suffixes do not get syllabified with preceding consonants by assuming that cyclic Epenthesis is ordered before the Coda rule. At the point at which Epenthesis applies, then, a monoconsonantal suffix is unsyllabified, and therefore stray, and can trigger Epenthesis. Polyconsonantal suffixes such as *-sk* 'aug.' in *čel+sk+o* 'carcass' ~ *čel/sk* 'g.pl.' do not trigger Epenthesis. Given that Epenthesis always applies in the environment of an edgemost consonant, it does not insert a V-slot preceding a bi- or tri-consonantal suffix (see 41b). Moreover, a V-slot cannot be inserted cyclically before the final consonant of such a suffix, since it is prevented by Strict Cyclicity, from applying morpheme-internally.

From the examples in (42) we can see also that whether or not [e] surfaces depends on the phonological material supplied on a later adjacent cycle. Specifically, [e] does not surface in those forms in which the consonant before which Epenthesis could apply is syllabified into the onset of a syllable created on a later cycle. Other examples are given in (44):

- (44) a. *mg'ew* 'fog, g.pl.' *mgw+a* 'n.sg.'
 b. *sen* 'sleep' *snu* 'g.sg.' Cf. *sen+n+y* 'adj.'
 c. *śf'atew* 'light, g.pl.' *śf'atw+o* 'n.sg.'

To account for the fact that the surfacing of [e] is dependent on the following cycle, Gorecka proposes that epenthesis takes place in two steps: first, insertion of a prosodic element, a vowel slot, and second, insertion of a melody. Feature-Filling, by which the melody is inserted, is assumed to apply at the phrase-level and to be dependent on the syllabic status of the following consonant: if the consonant following the inserted V-slot is syllabified as part of the following syllable, Feature-Filling does not apply. Resyllabification must thus apply to the consonant following an inserted prosodic slot to resyllabify it from a coda to an onset. Since the [e] derived by Epenthesis and Feature-filling triggers the noncyclic rule of Velar Fronting (see §4.3.3), I suggest that it is ordered in the noncyclic component and not, as Gorecka suggests, at the phrase-level.

(45)	lasek	lasku
	'small forest'	'g.sg.'
	las+k	las+k+u
ROOT		
CV,On	las	las
Co	∇	∇
Cycle A		
CV, On	--	--
EP	las vk	las vk
Co	∇ ∇	∇ ∇
Cycle B		
CV,On,Resyllab.		las vk u
Ep		∇ ∇
Co		
Noncyclic		
F.F.	lasek	--
	lasek	lasku

In order to account for forms such as those in (44) and (46) below, in which Epenthesis applies morpheme-internally, Gorecka proposes that the epenthesis rule also applies noncyclically

- (46)
- | | | | | |
|----|--------|---------------|---------|---------|
| a. | sen | 'sleep' | sn+u | 'g.sg.' |
| b. | v'ader | 'pail, g.pl.' | v'adr+o | 'n.sg.' |
| c. | p'es | 'dog' | ps+a | 'g.sg.' |

Gorecka's rule of Epenthesis, given in (47), states that a nucleus position is inserted before the (rightmost) stray or unsyllabified consonant within a constituent (the asterisk specifies that the consonant is stray, the % that the rule is a mirror image rule, and that therefore leftmost and rightmost consonants also be stray):

(47) Epenthesis (Cyclic and Noncyclic)

$$\begin{array}{c} \text{N} \\ | \\ \emptyset \rightarrow \text{X} / \text{C} _ \text{*C}\% \end{array}$$

(48) illustrates two derivations, one of Epenthesis applying in an underived environment, and the other of a derived form in which two V-slots are inserted, but only one [e] surfaces:

(48)	cuk'er 'sugar' cukr	senny 'sleepy, adj.' sn+n+y
ROOT		
CV, On	cuk *r	—
Co		
Cycle A		
CV, On		—
EP		sn Vn
Co		
Cycle B		
CV, On, Resyllab.		sn V n y
EP		—
Co		—
Noncyclic		
EP	cuk Vr	sVn V ny
F.F.	cuker	sen V ny
other rules	cuk'er	senny

Recall from §2.4.1 that there exist forms in Polish in which epenthesis does not apply as predicted by the coda-constraints in a word-final cluster, but does apply when this same consonant cluster is followed by another morpheme:²³

(49)	a. forem+n+y	'form, adj.'	form	'form'
	b. kolum'en+k+a	'column, dim.'	kolumn	'column'
	c. saren+k+a	'deer, dim.'	sarn/saren	'deer, g.sg.'

²³ In addition to word-final exceptions to epenthesis which can be accounted for by positing a rule of extrametricality, there is a small number of other exceptions in which epenthesis applies although one would expect it not to. These are cases like *wałk+a* 'fight', *wałk'* 'g.pl.', but *wałc'+n+y* 'adj.'. In the analysis presented by Gorecka (1986, 1988), since V-slot insertion precedes and is distinct from the rule which inserts the features of [e], it is possible to account for these forms by assuming that they are exceptional in that they have an underlying V-slot.

Gorecka accounts for such cases by assuming that the final consonant is made extrametrical by a rule which applies after Epenthesis, but before the Feature Filling Rule. At the point at which the Feature Filling Rule applies, then, an extrametrical word-final consonant is not visible to the rule, and therefore the environment in which the rule can apply is not met.²⁴

The epenthesis analysis of $e \sim \emptyset$ alternations carries over to prefixes.²⁵ Recall that I argued in Chapter 2 that prefixes are phonological words but that in a small set of forms they are demoted from the status of phonological words to that of morphemes. As phonological words, they do not undergo Epenthesis since they never provide a suitable environment for it to apply. Therefore no $e \sim \emptyset$ alternations are normally seen in prefixes:

- (50) a. bez+sen+n+y 'sleepless'
 b. nad+brv'+ov+y 'over the brow'
 c. bez+pwć+ov+y 'sexless'
 d. bez+deń 'abyss'
 e. v+śńić śę 'dream into'
 f. roz+krvav'ić 'cause to bleed'

In the small class of cases in which prefixes are demoted, however, $e \sim \emptyset$ alternations do occur preceding roots with an asyllabic alternant. The examples in (51) are repeated from Chapter 2:

²⁴ Evidence that Extrametricality influences the application of the Feature Filling Rule, but not of the V-slot insertion, comes from examples such as (a) *vruč'+b* 'foreboding' vs. (b) *vruč'+ob+n+y* 'adj.'. We know that Extrametricality affects the nominalizing suffix *-b* in (a) because the surface form is not the predicted **vruč'ob*. Gorecka (1986, 1988) argues that since Epenthesis is not sensitive to what follows *-b*, it must apply on the *-b* cycle. Consequently, it must be the case that Extrametricality affects the Feature Filling Rule.

²⁵ Gorecka (1986, 1988) does not assume that prefixes are phonological words. The presentation here thus departs from her analysis.

(51)	<u>Perf. Inf.</u>	<u>1st sg. Pres.</u>	<u>Sec. Impf. Inf.</u>	<u>Gloss</u>
a.	ze+rv+ać	zervę	zrywać	tear off
b.	ve+ss+ać	vesę	vsysać	suck in
c.	roz+dq+ć	rozedmę	rozdytać	expand
d.	ob+ćq+ć	obetnę	obcinać	cut off
e.	s+klq+ć	zeknę	pżeklinać	swear
f.	ode+px+nq+ć	odepxnę	odpytać	push
g.	ze+tż+eć	zetrę	ścierać	tear off
h.	ze+br+ać	zb'orę	zb'erać	gather

Examples such as the 1st sg. Pres. of (51c) provide evidence that demoted prefixes are processed by the phonology on the first non-root cycle. In other words, the constituent structure followed by the phonology after prefix restructuring is identical to that provided by the morphology. The morphological structure of a verb stem containing a prefix is given in (52a); as I argued in Chapter 2, prefixes affix to C-stems.²⁶ In (52a) on the prefix cycle the root is unsyllabified, as is the final [z] of the prefix. We therefore have three unsyllabified consonants in a row. At this point, a V-slot is inserted between [z] and [d], allowing an epenthetic vowel to surface as required by the form. (Recall that according to Gorecka's Epenthesis rule, the V-slot is always inserted at the edgemost segment, which in prefixes is after the leftmost consonant in a cluster).

²⁶ Gorecka (1988) discusses two forms in which the prefix seems to be affixed to the Secondary Imperfective C-stem rather than to the Simple C-stem as assumed in Chapter 2. These are the words *roz+gr+iv+o+d'* 'to play out', and *ob+sr+iv+o+d'* 'to defame'. The simple forms of these verbs are *razegrać* and *obesrać*, respectively, indicating that the roots *gr* 'play' and *sr* 'shit' are asyllabic and trigger demotion of the prefixes. If the prefix were processed before the secondary imperfective morpheme *-iv*, then we would derive the incorrect forms **razegrzywać* and **obesrywać*. To derive the correct surface forms, the whole SI C-stem must be processed before the prefix.

(52) a. [[roz [dm]_{C-stem}] ɛ] b. [roz [[dm] ɛ]]

The demotion of the prefix cannot occur late in the cyclic or in the noncyclic phonology, since if it did, then the prefix would be processed on the last cycle or in the noncyclic component and incorrect surface forms would be derived. (52b) illustrates the phonological structure that would be followed by the cyclic rules, if the prefix were processed on the last cycle or in the noncyclic component. In (52b), although the root is asyllabic and does not therefore undergo syllabification on the root cycle, on the second cycle both [d] and [m] are syllabified as part of the onset to the desinential vowel. Consequently on the prefix cycle there is no environment in which epenthesis could apply to derive the correct surface forms and thus the incorrect **rozdmɛ* would be generated.

The fact that prefixes must be processed on the first cycle in order to derive the correct surface forms shows that the rule which demotes prefixes from phonological-word status is ordered before cyclic rules such as those of syllabification and epenthesis. Given the extent to which demotion is lexically-governed I suggest that it be ordered in the morphological component rather than as an early cyclic rule.

It is possible to account for e~∅ alternations in all but two forms in which prefixes are demoted. The relevant forms are given in (53); the 'X' indicates that the underlying form of these roots is in question:

(53) a.	všedw	/v+šXd+ɪ/	'he came in'
b.	vešwa	/v+šXd+ɪ+a/	'she came in'
c.	rozsexw	/roz+sXx+ɪ/	'he dried up'
d.	rozesxwa	/rox+sXx+ɪa/	'she dried up'

Since the prefixes and roots in these forms exhibit e~∅ alternations, we can assume that the roots 'come' and 'dry' belong to that class of roots which triggers demotion of the prefixes and that therefore these roots have asyllabic alternants. Roots with asyllabic alternants have corresponding syllabic alternants only in secondary imperfectives; these are derived by means of the rule of secondary Imperfective formation. If we assume therefore, that the underlying forms of these roots are asyllabic then the feminine forms in (53b,d) can be derived by our rules. The masculine forms, however, cannot; we would predict the forms **vešw* or **vesxw*. The question then is how do we derive the [e] that surfaces in the masculine forms. If we assume that the roots are underlyingly /šed/ and /sex/ respectively, then we cannot derive the correct feminine forms. As Laskowski (1975a) points out, these roots are irregular in other forms as well (compare, for instance, *šedwem* 'I walked' with *sxwem* 'I dried', where the two roots behave differently in the same morphological form). One way to account for the forms in (53), then, is to assume that these two verbs have two alternants /šed~šd/ and /sex~sx/, respectively, which are used idiosyncratically in different grammatical forms.

In Fn. 22, I pointed out that the masculine forms in (53) constitute evidence that the rule of Lowering which derives [e] from lax high vowels is a cyclic rule in Rubach's (1984) framework, on the assumption that prefixes are processed on the last cycle and that the desinential morpheme of the masculine singular (in (53a,c)) is an underlying lax high vowel. If Lowering applied noncyclically, then, given that these forms have three yers in a row (in the prefix, the root, and the desinence: /VE+sEx+†+E/), the surface form would be **vesexw*. If Lower is cyclic and prefixes are processed on the

last cycle, then the root lax high vowel will be lowered to [e] before the prefix cycle and therefore the prefix lax high vowel will not lower. Halle and Vergnaud (1987a,b) account for similar forms in Russian by assuming that prefixes are noncyclic and that Lowering is both a cyclic and a noncyclic rule. I have shown, however, that, if demoted, Polish prefixes are cyclic in all but the two cases in (53). I suggest that these forms do not constitute a counterexample to my claims but should rather simply be treated as exceptional.²⁷

2.4.3 Word-Internal Palatalization and e-∅ Alternations

Some word-internal instances of the e-∅ alternation are preceded by palatalized consonants whereas others are not.

(54)	a. sen	'sleep'	snu	'g.sg.'
	b. v'ężeń	'prisoner'	v'ęźńa	'g.sg.'
	c. p'ies	'dog'	psa	'g.sg.'
	d. bez	'lilac'	bzu	'g.sg.'
	e. mg'ew	'fog, g.pl.'	mgwa	'n.sg.'
	f. isk'er	'spark, g.pl.'	iskra	'n.sg.'
	g. pxew	'flea, g.pl.'	pxwa	'n.sg.'

²⁷ Szpyra (1987a) points out a few other cases of deverbal nouns in which the e-∅ alternations behave exceptionally. In the examples in (i) and (ii), for instance, although both words are derived from the same root *zv* 'call' (cf. *zv* 'call, Sec. Impf. '), one of them has [e] in both the form with no overt desinence and that with a vocalic desinence, whereas the other exhibits the expected e-∅ alternation:

(i)	po+zew	'summons'	po+zv+u	'g.sg.'
(ii)	od+zew	'response'	od+zew+u	'g.sg.'

(cf. also *odzwie* 'proclamation')

Clearly these deverbal nouns derive historically from the prefixed asyllabic alternants of the verb 'call'. As nouns they used to undergo the regular rules of epenthesis; however, over time the [e] has become underlying in (ii), but not in (i). In the form *odzwie* the root seems to have idiosyncratically triggered demotion of the prefix in the nominal form, on the pattern expected for verbs derived from this root. *odzew* and *odzwie* cannot be derived synchronically by the regular rules of the grammar and must simply be listed in the lexicon in their correct surface forms.

The differences in the forms of consonants preceding the vowel alternation have been attributed to the front or back quality of the lax high vowel postulated to underlie the vowel alternation (see Gussmann (1980)). Thus (54d) is given the underlying form /bɤz-/, whereas (54c) is given the form /pɤs-/. An analysis which assumes that there are no underlying lax high vowels in Polish must obviously account for these palatalization facts.

Assuming that underlying vowels account for the presence or absence of palatalization in the environment of the e~∅ alternation in word-internal positions implies that whether or not palatalization occurs preceding e~∅ is idiosyncratic and must be learned for each form. In fact, however, palatalization in the environment of this alternation is predictable in the case of coronals and velars, and in the case of labials can be argued to depend on the quality of the labial and not on the vowel.

Setting aside the labials for the moment, one can make the following generalizations about the behaviour of coronals and velars before the e~∅ alternation. Velar stops are always fronted (as in (54e,f); see §1), the velar fricative never is (54g), and coronals are alveolar or alveopalatal and not [-back], unless, as in the case of (54b), the stem-final coronal consonant is underlyingly prepalatal. Rubach (1984) has argued that palatalization of coronals before /e/ is accomplished by a cyclic rule. Evidence for this claim comes from the observation that in underived environments unpalatalized as well as palatalized coronals are found before /e/.

- (55) a. deptać 'to tread'
 b. dźecko 'child'
 c. te 'these'
 d. ćeb'e 'you, g.sg.'

e.	serce	'heart'
f.	śeć	'net'
g.	zešyt	'exercise book'
h.	žem'a	'earth'

Unless one were to postulate an underlying difference between the [e] in those words in which palatalization occurs and the [e] in those forms in which no palatalization occurs, a difference for which there is no independent evidence in the language, the forms in (55) illustrate that Coronal Palatalization of coronals before /e/ does not take place in underived environments. By contrast, such palatalization does take place between morphemes (e.g., /sens+e/ *sensę* 'sense, 1.sg.'). Palatalization of coronals is thus a cyclic process. The fact that it does not occur before the e~∅ alternation is readily accounted for by Gorecka's analysis of Epenthesis. Epenthesis is a cyclic process in Gorecka's analysis, but it only inserts a V-slot. The features of [e], which could be assumed to trigger the Coronal Palatalization rule, are not filled in until the noncyclic component. Consequently, at the point at which Coronal Palatalization applies, in the cyclic component, the V-slot has no features with which to trigger palatalization. Those few forms in which a coronal is palatalized before a derived [e] as in the case of (55d) *vježen* 'prisoner' can be accounted for by assuming that they have underlying prepalatals. In (56), the fact that the underlying prepalatals surface as unpalatalized in the genitive singular form is due to the rule of depalatalization discussed in Fn. 15.

(56)	a.	dzeń	'day'	dña	'g.sg.'
	b.	kr'ećen	'april'	kr'etña	'g.sg.'

The fronting of the velar stops before derived [e] is due to a noncyclic rule, which must be ordered after the Feature-Filling rule. Evidence that the fronting of the velar stops to [k', g'] before /e/ is noncyclic comes from native words or early borrowings in which the velar stops are always fronted before /e/; /x/, however, is never fronted. In the environment of a small set of [e]-initial morphemes /k,g/ also become fronted without exception:²⁸

- | | | | | |
|------|----|-----------|-----------|--------------------|
| (57) | a. | k'epski | | 'poor' |
| | b. | k'ešer | | 'pocket' |
| | c. | g'etki | | 'elastic' |
| | d. | g'ewda | | 'stock exchange' |
| | e. | xewbotac | | 'splash' |
| | f. | xewpic | | 'boast' |
| (58) | a. | krok+em | krok'em | 'step, instr.sg.' |
| | b. | v'elk+emu | v'elk'emu | 'great, dat.sg.m.' |
| | c. | dwug+ej | dwug'ej | 'long, gen.sg.f.' |

In the case of the labials, the two forms in (54c,d) illustrate that both [-back] and non-dorsal labials occur preceding the e~∅ alternation. Since, as I argued in §2.1, the [-back] quality of morpheme-internal labials must be specified in some underlying representations, then clearly it could also be specified in the case of forms such as (54c) *p'es* in which the [e] following the labial is derived by epenthesis and feature-filling. The suggestion that the fronting of labials before e~∅ alternations follows from the quality of an abstract underlying vowel is thus unnecessary.

²⁸ In later borrowings, we find that for the most part the voiced velar stop is not fronted, whereas the voiceless velar stop may or may not be fronted: *pak'et* 'packet', *park'et* 'parquet', *k'armaš* 'fair'; *kelner* 'waiter', *kemping* 'camping'.

I began this section by discussing consonant-initial suffixes in whose environments palatalization applies and by pointing out that the palatalizing properties of these suffixes have been explained by postulating that they have an initial underlying front lax high vowel. In this section I have argued, however, that there is no independent motivation for the presence of lax high vowels in the underlying inventory of Polish. The palatalization of consonants before word-internal derived [e] can be explained without postulating an abstract underlying vowel and therefore the argument that palatalization before e~∅ in word-internal environments requires us to postulate underlying high lax vowels in Polish is at best weak. Furthermore, as we saw in the preceding subsection, the position in which e~∅ alternations occur is predictable, and therefore [e] is derived as a result of epenthesis, and is not due to the presence of an underlying high lax vowel. Given that there is no independent evidence to suggest that Polish has high lax vowels, the hypothesis that consonant-initial suffixes in whose environments palatalization occurs have an initial underlying front high lax vowel, which never surfaces, is untenable. Just as in the case of front-vowel suffixes and back-vowel suffixes, the palatalizing properties of consonant-initial suffixes are independent of their underlying phonological form.

The palatalizing properties of the suffixes discussed in this chapter are summarized in Table 3. The Table illustrates which consonant alternations occur in the environments of which morphemes. Under Type 1 are listed several adjective forming and nominalizing morphemes beginning with back vowels in whose environment palatalization never occurs. In

some instances, in the case of the desinential morphemes, one or two morphemes representative of a whole class are given:

TABLE 3²⁹

Type	Labials	Coronals	Velars	Morphemes
I	P	T	K	-ĕ, -av, -ov, -ač, -at, -liv-y
II	P	T	K'	-i/y, -ix/yx etc. -egc, -emu, -ej, -e, -em -iv/yvys
III	P'	T (ć)	K'	-iń-i/yń-i, -ik/yk, -ist-a/yst-a
IV	P/P'	T/ć	K/č	-ak, -až, -arń, -an, -k, -in-a/yn-a, -izm/yzm
V	P'	ć	č	-ast, -c, -ik/yk, -izn/yzn, -lc/yc, -ist/yst-y, isk/ysk-o, -sk-i, -stv-o, -nik, -n-y, -ivs, -evs, -ejvs
VI	P'	ć	c	-i/y, -e

²⁹The alternations are specified in terms of the outputs of the underlying voiceless stops which are held to be representative of the whole group to which they belong. ()'s indicate that while this alternation occurs, it is not the primary alternation. The dash (/) indicates that both illustrated alternations occur consistently, or that both surface forms of a morpheme are predictable. 'VS' indicates that the morpheme is a verbalizing suffix.

3. Morphologically-Conditioned Phonological Rules

In §2 we saw that there is a considerable degree of idiosyncrasy in the occurrence of palatalizations both in the sense that the morphemes in whose environments palatalizations apply are not phonologically distinguished from nonpalatalizing morphemes, and in the sense that even in the environment of palatalizing morphemes different palatalizations may or may not apply. At the same time, the palatalizations are completely regular in the sense that in the environment of a palatalizing morpheme the palatalizations associated with that morpheme always apply. These facts suggest that the palatalizations are effected by rules and that the rules are morphologically governed. We need now to consider whether this implies that the rules are ordered in the morphological component of the grammar, or whether they are phonological rules which are morphologically conditioned. I shall argue below in favour of the latter hypothesis. First I wish to consider briefly two hypotheses which must be rejected.

3.1 Cyclic and Noncyclic Affixes: A Rejected Hypothesis

Recently Halle and Vergnaud (1987a,b), Halle (1987), Cole (1987) have argued that affixes as well as rules may be specified as cyclic or noncyclic (they also assume, following standard assumptions about cyclicity, that only cyclic affixes trigger the application of cyclic rules, whereas noncyclic rules apply in a block after all the cyclic rules; see Chapter 1 for discussion of this hypothesis). The cyclic or noncyclic status of a morpheme is independent of that morpheme's morphological properties and

thus of its position within the constituent of the word in which it occurs; cyclicity is instead a stipulated phonological property of a morpheme.

The behaviour of the *i~y* alternating morphemes lends itself well to explanation in terms of the cyclic/noncyclic morpheme hypothesis. Recall that not all morphemes with an initial /i/ trigger palatalization. Given that Rubach has postulated that the palatalization processes are cyclic (see this chapter, §1), one could postulate that those *i~y* morphemes in whose environments palatalizations apply are cyclic while those in whose environments no palatalizations apply are noncyclic. Since only cyclic morphemes trigger cyclic rules, it is only in the environments of the cyclic *i~y* morphemes that the palatalization processes will apply.

Like the *i~y* morphemes, the *e*-initial morphemes fall into two classes: those before which palatalization rules apply, and those before which labials, coronals, and the velar fricative [x] remain unpalatalized whereas the velar stops undergo Velar Fronting. One could postulate that the distinction between the two classes of morphemes is parallel to that suggested for the *i~y* morphemes and that the first class of *e*-initial suffixes is cyclic and thus triggers the cyclic palatalization rules, whereas the second class before which only Velar Fronting occurs is noncyclic. It is also necessary, however, to stipulate that two of the *e*-initial morphemes trigger Second Velar (/k/ → [c]), rather than First Velar Palatalization (/k/ → [č]).

In the case of suffixes which do not have initial front vowels, assuming a cyclic/noncyclic distinction explains nothing on its own. One could assume that Type 1 suffixes from Table 3 are noncyclic and that would certainly explain why they do not cause palatalization to apply. All the other suffixes which do cause palatalization would thus be cyclic. But it

would still be necessary to postulate for all these cyclic affixes some kind of phonological representation which would trigger palatalization.

Furthermore, as we have seen, the palatalizing properties of several of these suffixes are variable. For a suffix such as the diminutive *-k*, to take a straightforward example, one would need to assume either that it is both cyclic and noncyclic and that it behaves cyclically only following stems ending in alveolar affricates and velars; or that it has two allomorphs one containing a palatal trigger and cooccurring only with the affricate and velar stems, and the other containing no palatal trigger and appearing elsewhere; or, finally, that *-k* is simply marked to trigger only First Velar and Affricate Palatalization. Other variably palatalizing affixes would require similar types of devices.

The distinction between cyclic and noncyclic affixes would also not be able to account for the behaviour of a suffix such as the secondary imperfective *-iv/yv*. Before this suffix the labials and the coronals remain unpalatalized, suggesting that this is a noncyclic suffix. The velar stops are fronted to [k', g'], as the result of the noncyclic resolution of a constraint prohibiting velar stop plus [i] sequences (see §2.1), again suggesting that the suffix is noncyclic. However, the velar fricative [x] is also fronted to [x'] in the environment of this morpheme:

- (59) a. *ułamywać* 'break off, Sec.Impf.'
 b. *zap'isywać* 'write down, Sec.Impf.'
 c. *podskak'ivać* 'jump up and down, Sec.Impf.'
 d. *obsług'ivać* 'serve, Sec.Impf.'
 e. *nasłuch'ivać* 'listen intently, Sec.Impf.' (cf. *mux+y* 'fly, n.pl.')

The fronting of the velar fricative cannot be the result of a noncyclic process, since, as we have seen, in the vast majority of cases /x/ is

followed by [y] morpheme-internally as well as in morphologically derived environments. Thus the fronting of /x/ before *-iv/yv* must be accomplished by a cyclic rule, suggesting that this morpheme is cyclic. But this contradicts its otherwise noncyclic behaviour. To account for the fronting of /x/, we must assume that *-iv/yv* is a cyclic, but basically nonpalatalizing morpheme, which triggers only one cyclic "palatalization rule", a rule fronting [x].

The distinction between cyclic and noncyclic affixes is thus not sufficient to account for the palatalization facts of Polish. One cannot assume that all palatalizing morphemes are cyclic, whereas nonpalatalizing morphemes are noncyclic since, as it turns out, nonpalatalizing morphemes may also be cyclic. In the verbal system the '1st sg. pres.' morpheme *-ę*, does not trigger palatalization (in Class 5, for instance, if added to a VS-stem such as *gnót* 'crush', it yields the form *gnotę* and not the palatalized **gnóćę*). It does, however, trigger j-formation and Vowel Deletion, both of which are, as I show in a following section, cyclic rules. Thus, clearly, not only is the property of being a palatalizing suffix not sufficient to determine the cyclic or noncyclic status of a morpheme, but neither is the property of being nonpalatalizing. Given, then, that the cyclic/noncyclic distinction does not explain the palatalizing properties of Polish morphemes in general, we can assume the null hypothesis that all Polish morphemes have the same (cyclic or noncyclic) status. In §2.4.2 we saw that the rules of syllabification apply cyclically; since, for purposes of syllabification, each affix constitutes a cyclic domain in Polish, we can assume that for other rules of the phonology affixes also constitute cyclic domains. Therefore all affixes in Polish can be considered to be cyclic. This conclusion does not imply that there are no noncyclic rules in the word-

level component of the phonology. On the contrary, as we will see in Chapter 4, and as I have already suggested in §1 of this chapter, Polish does have noncyclic word-level rules in addition to cyclic rules.

In Czaykowska-Higgins (1987), I suggested that the affixes of Polish are organized into two cyclic levels, one including derivational affixes, and the other including inflectional affixes, and that different phonological rules are associated with each block of affixes. This hypothesis was based on the assumption that the palatalizations take place in [-back] palatalizing environments and also on the assumption that both morphological and phonological rules are ordered in the lexicon. Since in Chapter 2 I argued that morphology is a component distinct from phonology, the hypothesis that the affixes are organized into levels which reflect their palatalizing properties is ruled out in principle. Furthermore, given that the palatalizing properties of affixes are independent of their phonological forms, a level-ordered hypothesis explains little. Notice, also, that in any case palatalizing and nonpalatalizing affixes do not constitute coherent morphological classes. For instance, palatalizing and nonpalatalizing *i*-initial affixes are both derivational and inflectional morphemes (e.g., *-i* 'n.pl.' does not trigger palatalization, while *-i* 'm.pl.' does trigger palatalization, including Second Velar Palatalization, and *-i* 'Class 4-VS' also triggers palatalization, but it triggers First Velar and not Second Velar).

3.2 Floating Features: A Rejected Hypothesis

Gussmann (1987) claims that palatalization across morpheme boundaries must be regarded as a phonological process " . . . if only because

it applies with the regularity and generality of low phonetic rules" (p. 46). He suggests therefore that the palatalizing properties of the morphemes are due to the presence in the underlying representations of these morphemes of a floating [-back] autosegment. The floating autosegment is anchored or associated with the final consonant(s) of the preceding (lefthand) morpheme (p.48). This hypothesis cannot be correct, however. Floating or free autosegments, because they are not bound to a particular position do not exhibit the kinds of local effects seen in the case of Polish palatalization but rather are free to associate wherever universal conventions will allow them to do so (see, for example, Goldsmith 1976 on Igbo tonal morphemes). Ito and Mester (1986) reject the hypothesis that [+voice] is a floating autosegment in Japanese Rendaku for the same reason that I reject such a hypothesis for Polish [-back], namely in Japanese [+voice] associates to undergoing consonants only in particular positions and in this sense behaves as if it were bound to a particular position. To account for this behaviour of [+voice] they propose the existence of a [+voice] autosegment which is bound to its skeletal anchor, thus marking a position in the phonological string, and which is inserted in a certain morphological context.

Even the hypothesis that palatalization is triggered by a [-back] autosegment which is not floating but is rather bound to a skeletal anchor is not entirely appropriate for Polish, however, although it does get around the problem posed by postulation of a floating [-back] autosegment. In Japanese, the effect of inserting a [+voice] autosegment is to trigger voicing of those consonants which can undergo a rule that spreads voicing. Spreading of the inserted feature may be blocked by the presence of another [+voice] segment in the string. Thus, once the [+voice] bound autosegment is inserted its behaviour is phonologically regular. In the case of Polish,

however, the outputs of palatalization rules are idiosyncratic. Consider, for instance, Labial Palatalization, Coronal Palatalization and First Velar Palatalization. In the case of the labials, palatalization can be accounted for simply by assuming that a hypothetical [-back] segment is associated to the Place node of a labial yielding a labial-dorsal coarticulated segment. In the case of the coronal obstruents, a similar assumption is possible; the actual surface outputs of the palatalization of [r] for instance (recall that palatalized [r] surfaces as [ʒ]) can be accounted for by assuming that there are noncyclic "spell-out rules" (see Rubach 1984). In the case of the velars, however, the change to alveopalatal consonants must take place in the cyclic component; in other words, the output of First Velar Palatalization is not simply a fronted velar that later becomes an alveopalatal. Evidence for this point comes from the fact that a cyclic rule such as Spirantization may apply to the alveopalatal outputs of First Velar Palatalization (see §1 for discussion of Spirantization).

In addition, as we saw above, in the environment of some morphemes Second Velar Palatalization and not First Velar Palatalization applies. These kinds of differences in the palatalization outputs suggest that the structural changes effected by the palatalization rules are not simply phonologically automatic results of spreading a [-back] feature, but rather are partially lexicalized and must therefore be stipulated by the grammar. Furthermore, postulation of a [-back] bound autosegment would not be sufficient to account for the palatalizing properties of such morphemes as the diminutive *-k* which trigger only some palatalizations. Just as in the case of a cyclic/noncyclic distinction, then, a distinction between morphemes with which a [-back] bound autosegment is associated and those

not associated with such an autosegment is not sufficient to explain the facts of Polish.

3.3 Palatalizations are Morphologically-Conditioned

The data presented in §2 and the discussion in §3.1 and §3.2 make clear that both the occurrence of stem-final palatalization and the type of palatalization depend on the suffix adjacent to the stem. This suggests that the application of a particular palatalization rule is conditioned by the adjacent suffix. Since each palatalization rule occurs in the environment of more than one suffix, we can assume that palatalization rules include in their structural descriptions a list of the suffixes which condition them.

Recall that nominalizing suffixes such as *-aʒ* or *-ak* are variably palatalizing, with the former triggering Labial and Coronal Palatalization more frequently than First Velar Palatalization, and the latter triggering especially First Velar. Both these affixes also occur with nonpalatalized labial, coronal and, in the case of *-aʒ*, velar stems. From Table 3 and the description of palatalizing properties of different suffixes it is clear that the property of conditioning palatalization is inherent to a particular suffix. But forms containing variably palatalizing suffixes reveal that whether the stem to which a palatalizing suffix is added actually surfaces as palatalized also depends on the properties of that stem. In other words, although suffixes such as *-aʒ* and *-ak* are palatalizing in some cases the stems to which they are affixed block application of palatalization. This suggests that particular roots are lexically marked as to whether or not they will undergo palatalization rules.

(60) contains the palatalization rules specified according to the suffixes which condition them (the suffixes are those from Table 3).

(60) Labial Palatalization

-iń-i	-ast
-ik[+v]	-izn
-ist-a	-ic
-ak	-ist
-až	-isk
-an	-ivs
-in-a	-eys
-izm	-ejys
	-i
	-e

Coronal Palatalization

	-ast	-sk
-ik	-izn	-stv
-ist-a	-ic	-nik
-ak	-ist	-n
-až	-isk	-c
-an	-ivs	
-in-a	-eys	
-izm	-ejys	
	-i	
	-e	

First Velar Palatalization

-ast		-e
-ik	-izn	-i
-ist-a	-ic	-nik
-ak	-ist	-n
-až	-isk	-c
-an	-ivs	-k
-in-a	-eys	-sk
-izm	-ejys	-stv

Affricate Palatalization

-ń-ł

-k

Second Velar Palatalization

-ł

-e

3.4 Palatalizations are Phonological Rules

Although the palatalization processes mentioned in (60) are morphologically conditioned, they are nevertheless ordered in the phonological and not in the morphological component of the grammar. Evidence for this claim comes from the observation that in one case several of the palatalizations, including łotation, must be ordered after a cyclic phonological rule of j-formation. łotation thus turns out to be one of only two palatalization rules which are exclusively phonologically triggered (the other being Velar Fronting, which is a noncyclic rule).³⁰ The other palatalization rules which apply in the same environment as łotation, namely Labial Palatalization, Sonorant Palatalization, and First Velar Palatalization, are, as (60) indicates, largely morphologically conditioned.

³⁰ A very small class of adjectives, and a few nouns show reflexes of łotation. (1) gives examples of such forms:

(1)	a.	kob'eta	'woman'	kob'ecy	'adj.'
	b.	jagne-jagniot	'lamb'	jagnicy	'adj.'
	c.	cale-ćelot	'calf'	ćelcy	'adj.'
	d.	twusty	'fatty'	twušč	'fat'
	e.	puety	'empty'	pušča	'wilderness'

In such forms, the reflexes of łotation must be lexically specified since they are irregular and are not triggered by underlying [j] (most adjectives show reflexes of Coronal Palatalization not łotation); I will not deal with these forms here.

The [j] environment is the only phonologically motivated environment in which they occur.

3.4.1 j-Formation

The process of j-formation is itself not an entirely automatic phonological alternation, but it does apply in a specific phonological environment. In most cases the [j] which results from j-formation does not surface; its effects are seen in the application of Iotation and other palatalization rules. There is one set of cases, however, in which [j] does surface: this is in present tense forms of Class 1 verbs containing the suffix *-ov* and in Secondary Imperfective Class 1 verbs containing the suffix *-iv/yv*.

(61)	Infinitive		3rd sg. pres.	
	a. kup+ov+a+ć	'buy'	/kup+ov+a+e/	kupuje
	b. mal+ov+a+ć	'paint'	/mal+ov+a+e/	maluje
	c. p'is+iv+a+ć	'write,SI'	/p'is+iv+a+e/	pisuje

As the examples in (61) show, in the present tense the morphemes *-ov* and *-iv* surface as *-uj*. The final [j] of *-uj* is derived by means of j-formation (I discuss the derivation of *-uj* shortly). In other Class 1 verbs in the present tense we find stem-final Labial Palatalization, Iotation, Coronal (sonorant) Palatalization, and First Velar Palatalization:

(62)	a. kop+a+e	kop'je	'he digs'
	b. kaz+a+e	kaže	'he orders'
	c. kar+a+e	kaž:	'he punishes'
	d. plak+a+e	pwače	'he cries'

d. łg+a+e	wže	'he tells lies'
f. brex+a+e	breše	'he fibs'

The other environments in which j-formation occurs are marked in (63) with an asterisk and by indicating in bold the outputs of lotation. The fact that lotation takes place in these forms is evidence that j-formation has also taken place:

(63)	Present		PPP	Ger	Sec. Impf. inf.	
Class	3rd pl	2nd sg				
1	*p'is+a+ɔ [p'išɔ]	*p'is+a+e+š [p'išeš]	p'is+a+n+y [p'isany]	*p'is+a+ɔc [p'išɔc]	p'is+yv+a+ć [p'isyvać]	'write'
3	*v'id+e+ɔ [v'ɪdzɔ]	v'id+e+i+š [v'ɪdžiš]	*v'id+e+eń+i [v'ɪdzeńi] v'id+e+n+a [v'ɪdžana]	*v'id+e+ɔc [v'ɪdzɔc]	v'id+yv+a+ć [v'ɪdyvać]	'see'
4	*pros+i+ɔ [prošɔ]	pros+i+i+š [prošiš]	*pros+i+eń+i [prošeńi]	*pros+i+ɔc [prošɔc]	*zapras+i+a+ć [zapašać]	'ask'
5	g'not+ɔ [g'notɔ]	g'not+e+š [g'nećeš]	*g'not+eń+i [g'neceńi] g'not+en+i [g'nećony]	g'not+ɔc [g'notɔc]	vyg'nat+a+ć [vyg'natać]	'crush'

From (61)-(63) we can see that when in the underlying form of a verb we have a sequence of two vowels, if the second of the two vowels is [-high], j-formation occurs. In those cases where there is no vowel sequence or where the second vowel is high, no j-formation takes place. The only exception to this generalization occurs in the masculine plural (but not in other forms) of Class 5 Past Passive Participles of a few verbs ending in the dento-alveolar stops (e.g., g'neceńi); in these cases lotation occurs even though there is no vowel sequence which would trigger j-

formation. Significantly, however, Class 5 verbs which end in dento-alveolar fricatives do not show lotation reflexes but rather undergo the expected Coronal Palatalization (e.g., /griz+eń+i/ [gryżeńi] 'bite, PPP.'). We can thus assume that the occurrence of lotation in Class 5 verbs is not derived by regular rules of Polish but must be treated as exceptional. Notice also that in Class 3 verbs, the masculine plural of the Past Passive Participle undergoes lotation (i.e. *v'Idzeńi*), whereas the feminine singular (and all other forms) undergo Coronal Palatalization (i.e., *v'Idżana*). In (63) I postulated different underlying forms for the participle suffix in masculine plural, thus ensuring that in those forms where lotation does occur the environment for j-formation is met. I will have more to say about this in §3.4.3.

There have been several different formulations of the rule of j-formation; most recently Rubach (1984) and Rubach and Booij (1987) have suggested that the rule involves insertion of [+high, -back] features. In Rubach (1984) it is assumed that it is a glide which is inserted in the environment preceding the two vowels, whereas in Rubach and Booij's work, it is assumed that there are no underlying glides in Polish and that consequently the [i] is inserted and then syllabified as an onset to a following vowel, thus surfacing as the front glide [j]. As the examples in (63) indicate, the first of the two vowels in a sequence is deleted whether or not that sequence triggers j-formation. This is accounted for in Rubach and in Rubach and Booij by assuming that after j-insertion, a rule of vowel deletion applies. Formulation of the rule of vowel deletion as delinking of the vowel melody from the skeleton allows us to assume that j-formation does not involve insertion of the [-back, +high] features in the environment preceding a two vowel sequence but that instead it involves supplying the

skeletal position left behind after vowel delinking with [-back, +high]. The rules of Vowel Delinking and [-back, +high] insertion are given in (64) and (65). I have called the insertion rule i-Insertion; recall that no glide is actually present until after the rules of syllabification have applied (the process of j-formation is thus accomplished in two steps, insertion and syllabification; see §2.4.2):

(64) Vowel Delinking

$$\begin{array}{ccc} \text{V} & \text{V} & \\ \neq & | & \rightarrow \\ [\alpha \text{ F}] & [\beta \text{ G}] & \\ & & \text{V} \quad \text{V} \\ & & | \\ & & [\beta \text{ G}] \end{array}$$

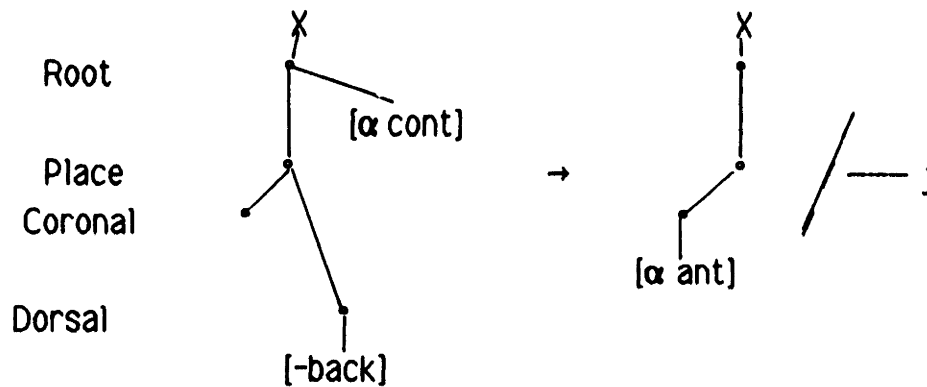
(65) i-Insertion

$$\begin{array}{ccc} \text{V} & \text{V} & \\ & | & \rightarrow \\ & [-\text{high}] & \\ & & \text{V} \quad \text{V} \\ & & | \quad | \\ & & [+high] \quad [-high] \\ & & [-back] \end{array}$$

In all cases of lotation except those in Class 1 verbs, the input to lotation is a coronal obstruent that has already been palatalized. Consider, for example, a form like /pros+i+ę/ *prošę* 'ask, 1st p.sg.'. Since, as I show below, the rules apply cyclically, on the second cycle the verbalizing suffix -/ triggers Coronal Palatalization, yielding a [-back] coronal segment. On the third cycle, when j-formation and lotation apply, the input to lotation is a [-back] coronal obstruent. In the case of Class 1 verbs, however, the verbalizing suffix -a triggers no palatalization rules, and therefore after j-formation the coronal obstruents are not palatalized. Rubach (1984) accounts for these facts by postulating that Coronal Palatalization is ordered after j-formation and is triggered by j-formation, and that,

furthermore, lotation applies to [-back] coronal obstruents. Since the coronal sonorants undergo palatalization in the environment of lotation, I follow Rubach in assuming that lotation applies to the [-back] coronal obstruents and is ordered after Coronal Palatalization. The rule of lotation is given below:

(66) lotation



Condition: applies only in verbs

lotation is constrained to apply before [j] only in verbs (and in a few nouns and adjectives, see Fn. 30). In denominal adjectives formed by affixation of the suffix -/, for instance, on the final (desinential) cycle, the adjectivizing suffix [i] is turned into a glide by the rules of syllabification. lotation, however, does not apply:

- | | | | | |
|------|--------------|--------|----------------|-------------|
| (67) | a. ryb+i+a | ryb'ja | 'fish, adj.f.' | |
| | b. kot+i+a | koća | 'cat, adj.,f.' | (cf. *koca) |
| | c. lis+i+e | liše | 'fox, adj.,n.' | (cf. liše) |
| | d. v'ilk+i+i | v'ilčy | 'wolf, adj.m.' | |

The [j] that triggers Iotation and the other palatalization rules exemplified in the forms in (62) does not surface following the outputs of Iotation, Coronal Palatalization and First Velar Palatalization, although it does surface following the palatalized labials. It is thus necessary to assume that Polish has a rule deleting [j]. Following Rubach (1984) I assume that j-Deletion takes place in the environment following coronal consonants. This rule only applies in derived environments, as is clear from the fact that forms such as *d'jabew* 'devil', or *t'jara* 'tiara', in which [j] appears following morpheme-internal coronals, occur. Rubach also postulates that j-deletion applies word-finally and preceding a consonant. The word-final application is meant to account for cases such as the 3rd sg. of Class 2 verbs where forms such as underlying /kox+aj/ surface as *koxa* 's/he loves'. In the case of imperatives of Class 2 and Class 7 verbs (e.g., *koxaj* 'love!', *wyśej* 'go bald!') j-deletion is claimed to be blocked by the abstract vowel underlying the imperative morpheme. The application of j-deletion preceding a consonant is meant to account for forms such as the following in which the final [j] of the stem is deleted before the consonant of the adjacent suffix:

- | | | | |
|------|--------------|--------|---|
| (68) | a. myj+t+y | myty | 'wash, p.part.(cf. myje 'wash, 3rd sg') |
| | b. czyt+aj+ć | czytać | 'to read' |
| | c. łys+ej+ł | wyśaw | 'bald, past, m.' |
| | d. czyt+aj+m | czytam | 'read, 1st sg.,pres.' |

It is not always the case, however, that [j] is deleted before a consonant even in a derived environment:

- (69) a. jaj+k+o jajko 'egg'
 b. olej+n+y olejny 'oil, adj.'
 c. złodziej+sk+i zwoźżejski 'thief, adj.'

Rubach accounts for cases such as those in (69) by assuming that the presence of an abstract underlying vowel in the initial position of the suffixes in (69) blocks j-deletion. This explanation is impossible given the hypothesis that Polish has no such abstract underlying vowels. There are two possible explanations for the nonoccurrence of [j] word-finally and before consonants in examples such as those in (68). First, notice that all the forms in (68) are verbs. One could postulate that the deletion of [j] is limited to occurring only in verbs. But this does not explain why [j] is deleted in the 3rd sg. pres. in word-final position, but is not deleted word-finally in the imperative morpheme *-ij* (the occurrence of [j] in the imperatives of Class 2 and Class 7 forms could be explained by assuming that j-deletion is ordered before Imperative Deletion). The second possible explanation is that most front glide-final verbal morphemes, whether roots or suffixes, have two allomorphs one of which has a final glide, the other of which does not, and that the glide-final allomorph is selected only when the following suffix is vowel-initial. The selection of the correct form of the morpheme would take place in the morphological component. Whichever is the correct explanation, I suggest that the deletion of [j] following coronals is distinct from and more general than the process by which [j] is prevented from occurring in glide-final verbal roots and suffixes.

To conclude this section let me return to the derivation of the present tense forms of Class 1 *-oV* and *-iV* verbs. I repeat examples of such verbs in (70):

(70)	infinitive		3rd sg. pres.	
a.	kup+ov+a+ć	'buy'	/kup+ow+a+e/	kupuje
b.	mal+ov+a+ć	'paint'	/ma'+ow+a+e/	maluje
c.	p'is+iv+a+ć	'write,SI'	/p'is+iw+a+e/	pisuje

As mentioned above, the [j] that surfaces in the present tense forms is derived by means of j-formation. The [u] is derived by means of rules that are specific to these two morphemes. The underlying forms of the suffixes *-ov* and *-iv* contain a final back glide [w] which becomes [v] by means of a late noncyclic rule (see Chapter 4 for justification of this hypothesis). After j-formation has applied one vowel and two glides are adjacent to each other. In this configuration, the vowel is deleted and the back glide [w] gets vocalized. It is necessary to assume that this process takes place only in the environment of these morphemes to prevent its application in forms such as /ʃow+i+ę/ *wow'jɛ* 'fish, 1st sg.pres.'. In this form, j-formation applies on the third cycle yielding the configuration: vowel followed by [w] and [j]. If the vowel deletion and [w] vocalization rules applied here then we would get the incorrect form **wu'jɛ*.

3.4.2 Cyclic Vowel-DeLinking and Imperative Formation

Evidence that i-Insertion, and hence the whole process of j-Formation, is cyclic comes from the fact that i-Insertion follows Vowel DeLinking, a rule which must apply cyclically.³¹

³¹ Rubach (1984) points out that Vowel DeLinking (his Vowel Deletion) is restricted to applying only in verbs. Native Polish nouns and adjectives never have adjacent vowels morpheme-internally or in morphologically derived environments. Vowel-vowel sequences are

Although Rubach (1984) claims that the palatalization rules and the rules of j-insertion and Vowel Deletion (equivalent to (64) and (65) above) apply cyclically, the derivation of verbal forms which he examines do not actually force us to assume that the rules apply cyclically. Consider the derivations in (71) based on the rules given in Rubach (1984):³²

found only in borrowed words where they occur both in derived and underived environments (e.g., *ide+a* 'idea', *ide+p* 'occ.', *teatr* 'theatre', etc.)

32 Rubach's (1984) Rules

a. j-insertion (= 114)

$\emptyset \rightarrow / - V \quad V[-\text{tense}]$

b. Vowel Deletion (=147)

$V \rightarrow \emptyset / - V$

c. First Velar Palatalization (=160)

$k, g, x \rightarrow \check{c}, \check{d}\check{z}, \check{s} / - [-\text{cons}]$
 $[-\text{back}]$

d. Coronal Palatalization (=103)

$t, d, s, z, n, r, \text{ř} \rightarrow \acute{c}, \acute{d}\acute{z}, \acute{s}, \acute{z}, \acute{n}, \acute{r}' / - [-\text{cons}]$
 $[-\text{back}]$

e. Iotation (=111)

$\acute{c}, \acute{d}\acute{z}, \acute{s}, \acute{z}, \acute{s}\acute{c}, \acute{z}\acute{t}\acute{z} \rightarrow c, dz, \check{s}, \check{z}, \check{s}\check{c}, \check{z}\check{d}\check{z} / - j$

f. j-Deletion (=143)

$j \rightarrow \emptyset / \left\{ \begin{array}{l} [+ \text{coronal}] - \\ - C \\ * \end{array} \right\}$

(71)	a. p'íšeš 'you write'	b. lećiš 'you fly'	c. ježdžø 'they drive'	d. kročøc 'stepping'	e. kop'ję 'I kick'
UR	p'is+a+e+š	let+e+l+š	jezd+l+ø	krok+l+øc	kop+a+ę
Cycle 2	s+a	t+e	zd+l	k+l	p+a
j-inser	-	-	-	-	-
V-del	-	-	-	-	-
FVP	-	-	-	č+l	-
CP	-	ć+e	ždž+l	-	-
lot.	-	-	-	-	-
j-del	-	-	-	-	-
Cycle 3	s+a+e	ć+e+l	ždž+l+ø	č+l+øc	p+a+ę
j-inser	s+j+a+e	-	ždž+l+l+ø	č+l+l+øc	p+j+a+ę
V-del	s+j+e	ć+l	ždž+l+j+ø	č+l+j+øc	p'+j+ę
FVP	-	-	-	-	-
CP	ś+j+e	-	-	-	-
lot.	š+j+e	-	ždž+l+j+ø	-	-
j-del	š+e	-	ždž+l+ø	č+øc	-
Cycle 4	š+e+š	ć+l+š	-	-	-
	p'íšeš	lećiš	ježdžø	kročøc	kop'ję

Almost all the rules in these derivations actually apply only on the third cycle; no rules ever apply on cycle 4, and only Coronal Palatalization and First Velar Palatalization apply on cycle 2. Obviously the reason for this is that it is only on the third cycle that affixation of the connecting morpheme creates the environment for j-insertion. Given that j-insertion is ordered first, and that in Rubach's system [j] triggers both Coronal Palatalization and First Velar Palatalization, it is not actually necessary to have cycle 2. And, as the derivations in (72) show, if it is assumed that all the verbal morphemes are affixed before any phonological rules apply and that the rules apply noncyclically in the order given below, the correct

surface forms are in fact derived. In addition, the entirely vacuous insertion and deletion of [j] seen in (71d) is avoided.

(72)	a. p'íšeš	b. lećiš	c. ježdžo	d. kročoc	e. kopję
UR	p'is+a+e+š	let+e+i+š	jezd+i+o	krok+i+oc	kop+a+ę
j-inser	s+j+a+e+š	-	zd+j+i+o	k+j+i+oc	p+j+a+ę
V-del	s+j+e+š	t+i+š	zd+j+o	k+j+oc	p+j+ę
FVP	-	-	-	č+j+oc	-
CP	ś+j+e+š	ć+i+š	ždź+j+o	-	-
lot.	š+j+e+š	-	ždź+j+o	-	-
j-del	š+e+š	-	ždź+o	č+oc	-
	p'íšeš	lećiš	ježdžo	kročoc	kopję

Most of these verb forms, then, can be derived by means of one noncyclic application of the rules. There is thus no direct evidence from these forms for cyclic rule application.

Such evidence can be found, however, in the derivation of imperative forms. (73) exemplifies imperative forms of verbs belonging to the different verb classes:

(73)	Class	3rd sg.pres.	imperative	
	1	p'íše	p'iš	'write'
	2	čyta	čytaj	'read'
	3	v'idźi	v'idź	'see'
	4	xodźi	xodź	'come'
	5	kwadže	kwadź	'put down'
	6	kżykńe	kżykńij	'shout, sem.'
	7	wyśeje	wyśej	'go bald'

In most cases the form of the Imperative is basically the form of the nonpast verb stem. Thus in Class 1 and 6, the imperative form ends in a

consonant that has undergone lotation; in all the other cases no lotation takes place although the other palatalization of coronals, Coronal Palatalization does. In addition, in Class 6, and in other forms in which the stem ends in a complex consonant cluster that would violate one of the two coda constraints if syllabified as part of the same coda, the Imperative surfaces with a final *-j/* (see §2). In the examples in (74) (taken from Bethin 1987) the two final consonants violate either the Sonority Sequencing Parameter (74a,e,f) or the constraint which prohibits two sonorants from occurring in the same coda (74g,h). As Bethin points out, sonority violations are less tolerated than violations of the constraint on cooccurring sonorants, hence alternating forms such as those in (74g) exist.³³

(74)	3rd sg.pres.	Imperative	
a.	vytře	vytříj	'cut out'
b.	dm'e	dm'ij	'blow'
c.	vyrv'e	vyrvij	'tear out'
d.	śńi	śńij	'dream'
e.	zapevní	zapevníj	'make certain'
f.	nagl'i	nagl'ij	'urge'
g.	oznajm'i	oznajm'ij/oznajm	'announce'
h.	śćemńi	śćemńij	'darken'

³³ Earlier generative accounts of the Imperative (Rubach 1984, 1985, Gussmann 1980a) argued that the *-j/* form of the Imperative is selected if the preceding stem contains an underlying lax high vowel. As Bethin points out, even in a framework which assumes that Polish does indeed have such underlying lax high vowels, this analysis is inadequate since many stems which do not contain yers (e.g., 74f) also surface with *-j/*. The hypothesis that the complexity of the final consonant cluster determines the form of the Imperative is the traditional view (see, for instance, Szober 1963, and more recently Gladney 1983), although as far as I know, Bethin (1987) is the first to suggest that the complex clusters require a following *-j/* only if they violate syllable constraints. Bethin does not formulate the syllable constraints as constraints on codas although she does discuss sonority violations and constraints against the occurrence of two adjacent sonorants in the same syllable.

The forms in (74) must be contrasted with forms whose stems end in complex codas in which no coda constraint violations occur. In such cases the imperative *-ij* does not surface:

(75)	3rd sg.pres.	imperative	
	a. vɔtp'i	vɔtp	'doubt'
	b. xewp'i	xewp	'boast'
	c. up'ɛkšy	up'ɛkš	'beautify'
	d. uiści	uiśc	'pay'

In providing an analysis of the imperative there are therefore two sets of facts which need to be accounted for. First, it is necessary to account for the occurrence or nonoccurrence of *-ij* in the imperative. And second, we must explain how the stems undergo palatalization.

Gussmann (1980a), Rubach (1984, 1985) and Rubach and Booij (1987) propose that the underlying form of the imperative morpheme is basically an abstract front vowel which is affixed to the VS-stem of a verb form (e.g., /p'is+a+E/, /čyt+a+j+E/, /kžyk+e+E/ etc., where E represents the abstract vowel). In the work of Gussmann and Rubach this abstract vowel is a high lax vowel, whereas in Rubach and Booij it is a mid front [e] which lacks a skeletal position. This abstract vowel serves two purposes: it provides an environment for j-insertion and thus for application of lotation and the other palatalizations in Class 1 verbs, and it triggers palatalizations (but not lotation) in verbs of the other classes.³⁴ However, as pointed out in

³⁴ Rubach (1984, 1985) assumes that j-insertion applies in the environment of two vowels if the second vowel is lax; in Rubach and Booij (1987), however, since the abstract vowels are distinguished from other vowels by not being linked to a skeletal position it is

Rubach (1984, 1985), while the postulated imperative morpheme correctly provides an environment for j-insertion in Class 1 verbs, it also incorrectly provides such an environment in Class 3 and Class 4 verbs since the sequences of the verbalizing suffixes *-e* or *-i* followed by the abstract vowel should trigger j-insertion. That j-insertion has not applied is clear from the fact that Coronal Palatalization and not Iotation is the palatalization affecting stem-final coronal obstruents of Class 3 and 4 imperatives. Rubach proposes to account for the lack of Iotation in Class 3 and 4 forms by means of a rule of Front Vowel Truncation which deletes *-e* and *-i* preceding the imperative morpheme. To account for the appearance of *-ij* he proposes a rule of Imperative Allomorphy which inserts *-ij* preceding the *-E* of the imperative morpheme in the environment of certain types of stems (see Fn. 33); in Rubach and Booij (1987) this insertion is made sensitive to the syllable structure of the language.

I have argued throughout this thesis that postulation of an abstract underlying vowel does not account for facts of Polish such as the *e~o* alternations; consequently we can assume that such a vowel is also not the underlying form of the imperative morpheme. Following Bethin (1987) I assume that the underlying form of the imperative is *-ij*.³⁵ Bethin suggests

unnecessary to assume that the abstract vowels are lax and high. j-insertion thus takes place preceding two vowels if the second vowel is [-high], just as in (66) above.

³⁵ Gladney (1983) suggests that the underlying representation is /i/, following the historical form of the morpheme (which is preserved in other Slavic languages such as Russian). This representation requires postulation of a rule specific to the imperative to derive the final glide. In Class 3 and 4 3rd sg. nonpast tense verbs and in several cases in the nominal system, desinential *-i* morphemes do not surface with final glides. Since, as in the case of j-formation, front glides in Polish are usually derived as a result of syllabification requirements, it is probably the case that the imperative morpheme is underlyingly a sequence of two high front vowels /ii/, the second of which becomes a glide. I shall refer to this morpheme as *-ij* below.

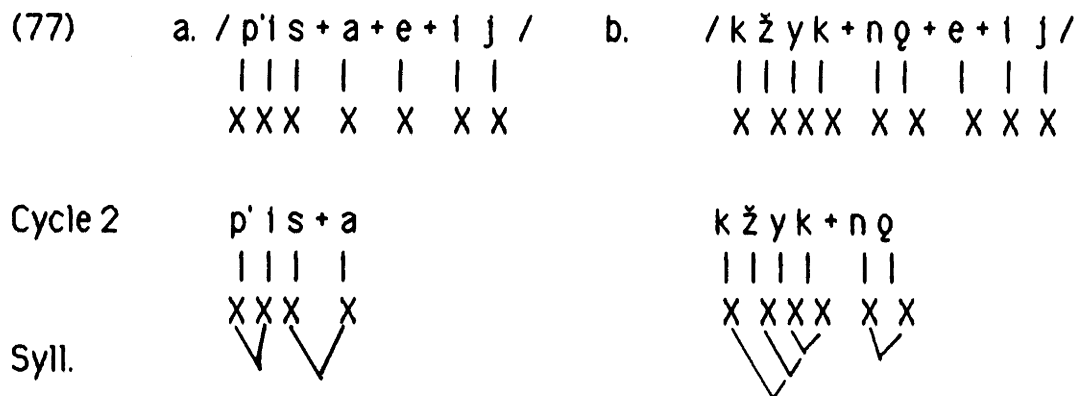
that while the morpheme is present in underlying form, it is syllabified only if the nature of the preceding consonant cluster requires it; otherwise the /ij/ remains unassociated and therefore unpronounced (but see below). She does not, however, account for the different stem-final palatalizations that occur in the imperative forms.

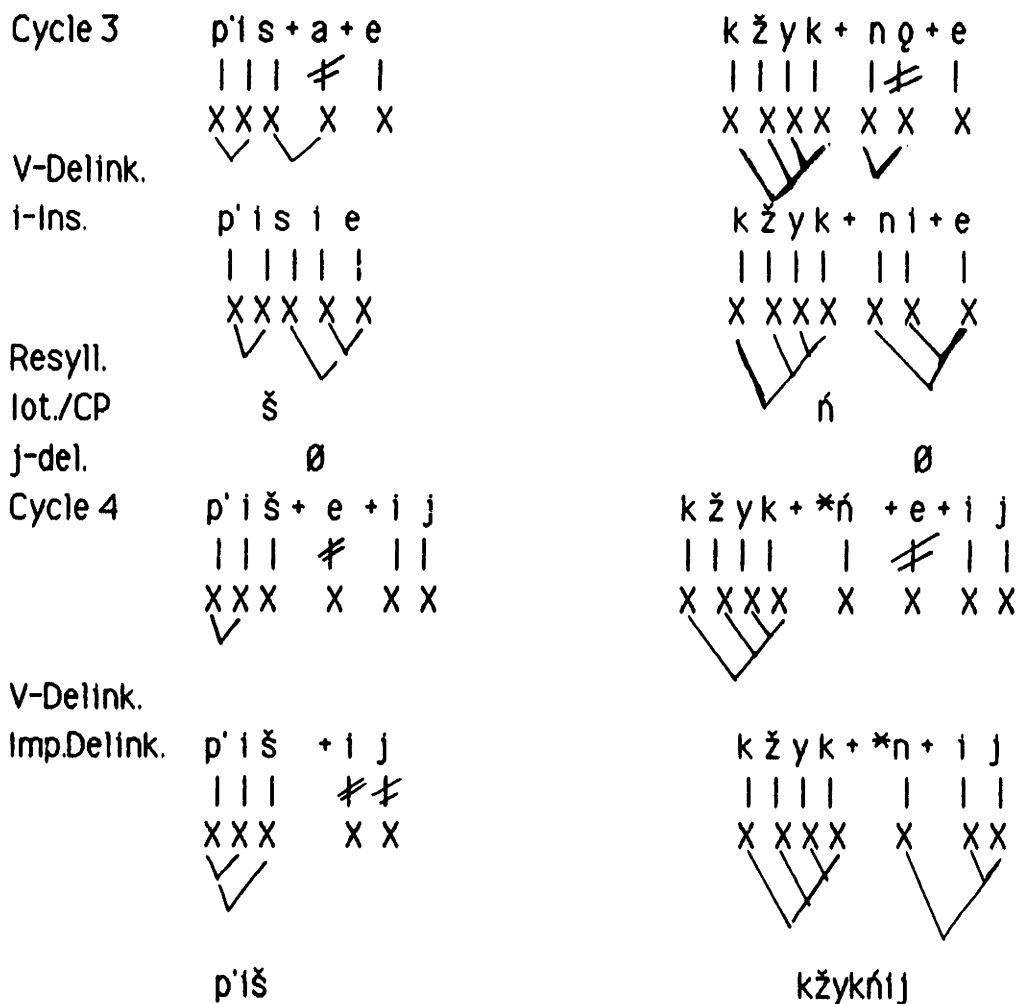
The important point about the phonological alternations seen in the forms of the imperative is, as I mentioned above, that the form of the imperative is actually the form of the nonpast tense stem. Analyses such as those of Rubach, etc. fail to capture this fact because they assume that the imperative morpheme is affixed to the VS-stem of a verb. Given the constituent structure of verb forms proposed in Chapter 2, it is possible to assume instead that the imperative morpheme is affixed not to the VS-stem, but to the nonpast TM-stem of a verb. This assumption allows us to account for the palatalization effects seen in the imperative. In particular, the nonpast TM-stem of Class 1 and 6 verbs will trigger j-formation and subsequently lotation and the other associated palatalizations, whereas the TM-stems of verbs in other classes will not trigger j-formation. In (76) the underlying nonpast TM-stems of the imperatives of each Class are given:

(76)	Class 1	p'is+a+e+ij
	2	čyt+a+j+ij
	3	v'id+e+i+i+j
	4	xod+i+i+i+j
	5	kwad+e+i+j
	6	kžyk+nq+e+i+j
	7	wys+e+j+e+i+j

Only the Class 1 and Class 6 stems provide the environment in which j-formation can occur. It is for this reason, then, that lotation shows up only in such verbs.

(77) gives partial derivations of imperative forms. Notice that to derive the correct surface forms, Vowel Delinking must apply cyclically. In (77a) if both the [a] and [e] were delinked at the same point in the derivation (even if Delinking applied iteratively from left to right), then there would be no environment for i-insertion since after Vowel Delinking the empty vowel slots would precede the [i] of the imperative, a high vowel (i-insertion applies only before nonhigh vowels). Notice also that it is not until after Vowel Delinking has applied on the cycle of the Imperative morpheme that it is possible to determine whether or not to syllabify *-ij*, since it is only at this point that *-ij* is adjacent to the stem (the asterisk specifies a syllabically stray segment).





Bethin (1987) assumes that the imperative morpheme is not actually deleted in forms like (77a), but rather remains unsyllabified and consequently unpronounced. The problem with this hypothesis is that if the morpheme is unsyllabified in the cyclic component but is not deleted, then in principle it should be available to the rules of syllabification that apply at the phrase-level and could therefore be syllabified at that level, yielding incorrect forms such as **p' i š / j*. In the case of the morpheme *-e / š* 'comparative', it is also necessary to assume that deletion has to apply. As pointed out in §2, the comparative morpheme has two forms, *-e / š* and *-š*. The restrictions on the appearance of the two morphemes are similar to

those governing the form of the imperative; namely, *-e/š* surfaces if the final consonant cluster of the stem to which it is affixed cannot be analyzed as a well-formed coda. (78) repeats examples from §2:

- (78) a. *ćemń+ejš+y* 'darker' (cf. *ćemń+y* 'dark')
 b. *mōdž+ejš+y* 'wiser' (cf. *mōdr+y* 'wise')
 c. *tvard+š+y* 'harder' (cf. *tvard+y* 'hard')
 d. *prost+š+y* 'simpler' (cf. *prost+y* 'simple')

As in the case of the imperative, we can assume that [ej] is syllabified only if it is needed, and that otherwise it is deleted. If it were not deleted on the cycle of the comparative morpheme, then again the noncyclic or phrase-level syllabification rules would be able to syllabify it.

Close examination of the derivations in (77) reveals an interesting aspect to the conditions under which *-i/* is deleted. On the imperative cycle, after Vowel Delinking has taken place, both the final consonant of the stem *ρ'iš* and the final *-n* of *kžykn* are unsyllabified. At this point, then, in both cases the final consonants of the stem are stray and available to syllabify as onsets to the imperative morpheme. However, in the former case, the final consonant can be syllabified as part of the coda of the preceding syllable and therefore it allows *-i/* to delete, while in the latter case the final consonant cannot be syllabified with the preceding syllable. Since this consonant would remain stray if *-i/* were deleted, deletion is blocked. The rule deleting *-i/* is thus restricted by a condition imposed on its output. It cannot apply if it would leave a stray segment behind.^{36,37}

³⁶ McCarthy (1986) proposes that in some languages processes are blocked from applying if the outputs of these processes would create structures that would violate the Obligatory Contour Principle, a prohibition against adjacent identical segments or features on the same tier. These

We have seen, then, that Vowel Delinking must apply cyclically. Given that application of i-Insertion is dependent on the previous application of Vowel Delinking, i-insertion and thus j-formation in general must also be cyclic. Finally, given that Labial Palatalization, Coronal Palatalization, Iotation, and First Velar Palatalization all take place in the environment of the derived [j], we can conclude that all these palatalization rules are cyclic phonological rules, even though to a great extent the environments in which they occur are morphologically conditioned.

3.5 Comments on a Morphological Analysis of Palatalization

Since, in the preceding section, I focused on Iotation to argue that palatalizations such as Labial, Coronal and First Velar apply in the cyclic component of the phonology, in this section I shall also focus on Iotation to

"antigemination" effects thus involve the same kind of condition on outputs as that governing the Imperative Delinking in Polish.

³⁷ An alternative hypothesis is provided by Rubach and Booij (1987). In attempting to deal with this condition on the form of the imperative, Rubach and Booij suggest that after deletion of the final stem vowel, the syllabification rules reapply, in the middle of the cycle, to syllabify the final consonant of a verb like *pis'* as part of the coda of the preceding syllable. The insertion of *-j* is ordered after this resyllabification has taken place (in the case of the analysis suggested here, the deletion of *-j* would have to be ordered after the resyllabification of the final consonant into a coda). They use the facts of the imperative as evidence that syllabification applies constantly throughout a cycle after every operation on that cycle. Since Vowel Delinking is ordered before Imperative Deletion, the input to the Imperative Deletion rule is a stem with a well-formed final syllable. Given a structure such as /pros+ i+ i/, Rubach and Booij's analysis requires that on the third cycle, after deletion of the leftmost [i], the final [s] of the stem is first resyllabified as part of the coda of the stem syllable. Clearly, however, the word surfaces as fully syllabified with the stem-final [s] serving as the onset to the final vowel. Therefore, immediately after [s] is resyllabified as part of the coda of the stem, it must be resyllabified again as the onset of the final vowel. In this thesis I have assumed, following Gorecka (1986, 1988), that syllabification rules apply only once on a given cycle, and that they are ordered with respect to phonological rules. Rubach and Booij's analysis of the imperative is thus incompatible with my assumptions.

discuss an alternative analysis in which palatalization rules are not considered to be morphologically conditioned phonological rules.

Although, as we saw above, the insertion of [i] is not an automatic phonological alternation, it does take place in a clearly defined phonological environment. Any analysis which assumes that the palatalization rules triggered by j-formation are not part of the phonology, but rather are either entirely morphological in nature or apply in a component of the grammar which is pre-phonological, would miss this generalization. Nevertheless, if it were possible to show that assuming that lotation and other palatalizations are non- or pre-phonological processes allows us to capture other significant generalizations about Polish which are not captured in the phonological analysis of palatalizations, then the fact that the environments in which lotation, etc. occur are phonologically regular would become less significant.

Recently Spencer (1986) has argued that the palatalization rules of Polish are not phonological rules at all but are rather morpholexical rules, where by the term "morpholexical rule" Spencer means a context-free rule applying before the cyclic rules of the phonology (at what he calls Level 0) to derive from underlying representations of roots and suffixes the variants or allomorphs of these morphemes that "figure in morphologically complex contexts" (p.270). He accounts for the fact that particular palatalizations occur in the environment of particular affixes by assuming that affixes select appropriately palatalized stem allomorphs; thus, for instance, the affixes in whose environments Second Velar Palatalization occurs select Second Velar allomorphs of stems ending in velars.

In Spencer's framework, then, at the point at which affixation takes place, the palatalization rules have already applied to derive palatalized

stems such as those of the Classes 1,3,4, and 5 verbs listed in (79). Notice that velar (and also labial and coronal sonorant) stems have only one palatalized variant, whereas stems ending in coronal obstruents have two palatalized variants, one exhibiting lotation, the other exhibiting Coronal Palatalization. Only Class 5 verbs ending in coronal stops have lotated stems; Class 5 lotated stems are thus very limited in occurrence (see §3.4 above).

(79)			Pal[lot.]	Pal[cp.]
	Class 1	p'is	p'iš	
		płak	płač	
	3	v'id	v'idz	v'idž
		kžyk	kžyč	
	4	pros	proš	proś
		krok	kroč	
	5	gńot	(gńec)	gńeć

(80) illustrates the morphological forms in which lotated stems occur.

(80)	Present	PPP	Ger	Sec. Impf.	
Class	3rd pl	2nd sg		Inf.	
1	p'is+a+q [p'išq]	p'is+a+e+š [p'išeš]	p'is+a+qc [p'išqc]		'write'
3	v'id+e+q [v'idzq]	v'id+e+eń+i [v'idzeńi]	v'id+e+qc [v'idzqc]		'see'
4	pros+i+q [prošq]	pros+i+eń+i [prošeńi]	pros+i+qc [prošqc]	zapas+i+a+c [zapašać]	'ask'
5		gńot+eń+i [gńećeńi]			'crush'

For Spencer's assumption that morphemes select the stems to which they affix to work, the morphological constituent structure of verbs

proposed in Chapter 2 cannot be entirely correct. Specifically, it cannot be the case that morphemes such as the Connecting Morpheme, the 1st sg. and 3rd pl., and the Gerund attach to stems ending in the verbalizing suffix (i.e., to VS-stems). If these morphemes did attach to VS-stems, then the fact that the forms in which they occur are always palatalized could not be attributed to selectional restrictions on the morphemes, since they would never be adjacent to the palatalized stems. One would need to assume instead, for instance, that the distinction between C-stem and VS-stem is not that the latter contains a verbalizing suffix whereas the former does not, but rather that the latter is "palatalized" whereas the former is not. It would then be necessary to assume in addition that there is another constituent corresponding to the VS-stem that contains a verbalizing suffix to which are affixed the past tense and infinitive markers.

Consider now the selectional restrictions on affixes such as the Connecting Morpheme, 1st sg. and 3rd pl. and the Gerund. In Class 1 the Connecting Morpheme affixes to a palatalized, lotated stem. In Classes 3, 4 and 5, it affixes to a coronal palatalized stem:

(81)	Class 1	p'íš+e	'3rd sg.'
	3	v'iqž+i	
	4	proś+i	
	5	gńeć+e	

Recall that I pointed out in Chapter 2 that there is one Connecting Morpheme which affixes to the constituent VS-stem, whose form depends on the form of the verbalizing suffix of the VS-stem (-/ appears if the verbalizing suffix is [-back], -e appears elsewhere). In Spencer's framework it is necessary to assume that there are three different Connecting

Morphemes: *-e* which affixes to lotated Class 1 stems, *-ʹ* which affixes to Class 3 and 4 Coronal Palatalized stems, and *-e* which affixes to Class 5 Coronal Palatalized stems.

In the case of the 1st sg. and the 3rd pl., I postulated that these suffixes are affixed to the VS-stem constituent. Spencer needs to postulate that in Class 1, 3, and 4, they affix to lotated stems, but in Class 5 they affix to unpalatalized stems:

(83)	Class 1	p'iš+ɛ	'1st sg.'
	3	v'ɪdz+ɛ	
	4	proš+ɛ	
	5	gʰot+ɛ	

And, similarly, in the case of the Gerund, in Classes 1,3, and 4 the Gerund affixes to lotated stems, but not in Class 5:

(84)	Class 1	p'iš+ɔc	'gerund.'
	3	v'ɪdz+ɔc	
	4	proš+ɔc	
	5	gʰot+ɔc	

Spencer's framework thus results in a loss of generalization about the selectional restrictions on the affixes. It also makes it more difficult to account straightforwardly for the Secondary Imperfective formation of Class 4 and Class 5 verbs. Verbs of these classes become secondary imperfectives by being assigned membership in Class 2. In the case of Class 4 verbs, the secondary imperfectives have a lotated stem; Class 5 verbs, however, have no palatalization in the secondary imperfective:

- (83) Class 4 *zapař+aj+ǫ* 'invite, Sl., 3rd pl.'
 Class 5 *rozǧat+aj+ǫ* 'crush, Sl., 3rd pl.'

The fact that in both cases secondary imperfective formation results in assignment to Class 2 and also causes alternations in the vowels, suggests that the same process is at work in both Class 4 and Class 5 (the same process also occurs in Class 7 verbs). In Chapter 2 I argued that since Class 5 C-stems are identical to Class 5 VS-stems, if we assume that secondary imperfective formation takes Class 4 and 5 VS-stems as input and assigns the VS-stem to Class 2 membership, then we can account for the similar secondary imperfective forms in the two classes. The lotation effects in Class 4 are a result of the juxtaposition of two verbalizing suffixes, the *-j* of Class 4 and the *-aj* of Class 2. In Class 5, since there is no verbalizing suffix, *-aj* is simply affixed to the VS-stem, and no palatalization occurs. In Spencer's framework the similarities in the assignment of class membership and in the vowel alternations in the secondary imperfectives of both classes become simply accidental: it is necessary to assume that in Class 4 *-aj* selects a lotated stem, while in Class 5 it does not. Since in Class 2 forms *-aj* actually never selects a palatalized stem (e.g. *čyt+aj+*) the simple generalization that Class 4 and 5 verbs are conjugated like Class 2 verbs in the Secondary Imperfective becomes much more difficult to state.

In addition to making it difficult to state generalizations about morphological structure, Spencer's framework does not provide a more straightforward account of irregular lotation effects than does the framework in which palatalizations are assumed to be phonological rules. In §3.4.1 I pointed out that in Class 3 Past Passive Participles lotation

occurs unexpectedly in the masculine plural; all other person/number forms exhibit Coronal Palatalization (the parentheses around [j] indicate that this consonant does not surface):

(85)	Past Passive Participle ³⁸			
	m.sg.	m.pl.	f.sg.	f.pl.
Class 1	p'isany	p'isańi	p'isana	p'isane
2	čytany	čytańi	čytana	čytane
3	v'idžany	v'idžeńi	v'idžana	v'idžane
4	prošony	prošeńi	prošona	prošone
5	gryžony	gryžeńi	gryžona	gryžone

In terms of the morphological constituent structure developed in Chapter 2, the forms of the past passive participle can be accounted for as follows. In Class 1 and Class 2 the suffix *-n-* is added to the VS-stem; in Classes 4 and 5 the suffix *-en/-on* is added also to the VS-stem as we can see from the fact that in Class 4 lotation has taken place (the vowel alternation in this latter suffix is due to a lexically governed process which has no bearing on the discussion here; see § 4). In Class 3 we appear to have a hybrid past passive participle. The Class 3 verbalizing suffix *-e* alternates with [a] (e.g., in the past tense we get *v'idžaw* 'he saw' but *v'idžeŋi* 'they saw, m.'). This suggests that in the non-masculine plural forms, the suffix *-n-* is added to the VS-stem X+e to form the participle. In these cases, as expected, the verbalizing suffix triggers Coronal Palatalization. In the masculine plural, we can account for the lotation effects if we assume that the Class 4 and 5 participial suffix *-en/on* is

³⁸ Verbs whose stems end in nasal diphthongs take *-ŋ* in the past passive participle form: e.g., *zap'ęty* (*zap'ęć* 'fasten').

added to the VS-stem. The sequence of two vowels triggers j-formation because the second vowel is [-high]; consequently lotation is also triggered.

In Spencer's framework exactly the same hypothesis, namely that Class 3 past participles are formed according to the pattern for Class 1/2 verbs and also in the plural masculine according to the pattern for Class 4/5 verbs, is needed to account for the facts. He cannot assume that Class 3 participles are formed from affixation of one suffix, such as, for instance, an *-en/an* alternating suffix because then he would not be able to explain why this suffix selects both Coronal Palatalized and lotated stems. So Spencer's assumptions about palatalization rules and selectional restrictions on morphemes make it difficult to capture generalizations about verbal morphology and make it no easier to account for idiosyncratic facts.³⁹

³⁹ Recently, Bochner (1988) has proposed a word-based theory of Lexical Relatedness Morphology in which morphological simplicity is characterized as conformity with patterns of the grammar, rather than as brevity. According to Bochner the morphological component of grammar contains a list of words (the Lexicon) and a set of rules that "express systematic patterns of similarity among entries listed in the Lexicon." (p. 57). The rules that express patterns of similarity may also be used to provide patterns according to which new words are formed. In this theory morphological operations involve substitutions and concatenations and also include changes in the phonological shapes of words. He considers that // morphophonological alternations are integrated into the morphological rule system. Thus, for Bochner all the palatalizations of Polish are part of the morphological operations of affixation with which they are associated, and not phonological rules triggered by morphemes. One of the consequences of Bochner's assumptions is that the fact that many morphophonological alternations apply only in derived environments is automatically predicted. Clearly, if morphophonological operations include associated phonological changes then these phonological changes can occur only if the associated morphological operations occur. In underived environments, since no morphological operations are at work, no morphophonological changes can take place. Since Bochner (1988) is concerned for the most part with the nonphonological forms of morphological operations and with the development of an evaluation metric, he has not fully developed a theory of how morphophonological operations are to be represented in the grammar and integrated into the morphological operations. I shall not therefore attempt to respond to his work here although it is an alternative worth examining. Given that there exist phonological rules in the grammar of Polish which are not morphologized (e.g., the processes affecting nasals; see Chapter 4), it is natural to explore, as I have done in this thesis, how much of the morphophonology can be accounted for in the phonology rather than in the morphology.

4. Lexically-Conditioned Phonological Alternations

In previous sections of this chapter I have focused on morphologically conditioned phonological alternations and in particular on the consonant alternations or palatalizations. In addition to these alternations Polish has four sets of vowel alternations which apply in specific phonological environments, but which are lexically conditioned in the sense that they apply only in a subset of the words which meet the phonological environments of the rules. These alternations are: $e \sim o$, $e \sim a$, $o \sim u$, and $\epsilon \sim \varnothing$. In this subsection I describe and provide rules for the alternations to illustrate the types of lexical conditioning that seem to be at play in Polish. This discussion, however, is not intended as a definitive account of the alternations (for more extensive discussion see Gussmann 1980).

The most straightforward of these alternations are the first two, $e \sim o$ and $e \sim a$. Both are found in nouns and verbs. In nouns [e] surfaces in the environment of a preceding [-back] consonant and a following palatalized coronal; if the following coronal is unpalatalized, [o] or [a] surfaces. There also exist forms which meet the environment for the rule but in which the alternations do not occur:⁴⁰

(86)			1.sg.
a.	ćast+o	'cake'	ćeść+e
b.	las	'wood'	leś+e
c.	ob'ad	'dinner'	ob'edź+e
d.	ańow	'angel'	ańel+e

⁴⁰ Most of the examples in this section are taken from Gussmann (1980).

	e. pšod+y	'front, n.pl.'	pšedž+e
	f. ňeb'osa	'heaven, n.pl.'	ňeb'ešex (pl.)
cf.	g. m'od	'honey'	m'odže
	h. b'odro	'hip'	b'odže
	j. v'adro	'pail'	v'adže

The examples in (86) are of underived nouns in the sense that the nominal root is followed only by an inflectional/desinential affix. There are also noun (and some adjective) roots which have [a] or [o] in underived forms throughout the paradigm even if the desinential affix triggers palatalization of the stem-final coronal consonant, but which surface with [e] when followed by a derivational affix that triggers palatalization; as (87) indicates, denominal and deadjectival verbs often contain [e]:

(87)	a. podžaw	'division'	podžal+e	'l.sg.'	podžel'íc	'verb'
	b. stšaw	'shot'	stšal+e	'l.sg.'	stšel'íc	'verb'
	c. šan+o	'straw'	šaň+e	'l.sg.'	šenny	'adj.'
	d. ślad	'trace'	śladž+e	'l.sg.'	śledž'íc	'verb'
	e. b'aw+y	'white'	b'al'+i	'm.pl.'	b'e'l'eć	'verb'
	f. m'otw+a	'broom'	m'otl+e	'l.sg.'	m'etl'isko	'aug.' ⁴¹
	g. aňow	'angel'	aňel+e	'l.sg.'	aňelski	'adj.'
	h. jazda	'drive'	ježdž+e	'l.sg.'	ježdžec	'driver'

Before consonant-initial palatalizing suffixes, [e] surfaces (although see Fn. 41). Before the consonant-initial diminutive suffix, however, the situation is different: alternating roots always surface with [o] or [a]. This

⁴¹ This word has an alternative form *m'otl'isko* (cf. also *m'otlasty* 'adj' - *m'etlasty*). Some nominal roots with e-a or e-o alternations behave like *m'otwa* 'broom' in the sense that not all the forms in which they are followed by palatalizing derivational suffixes actually contain [e]. *k'fal* 'flower' is another example— this root occurs in the following derived words: *k'felnik* 'flower bed', *k'falcisty* 'flowery', *k'feciisty* 'flowery', *k'falcaria* 'florist' - *k'falcaria*.

is true even of roots which have underlying final [-back] coronal consonants (recall that *-k* triggers depalatalization of such stems; see Fn. 15):

(88)	a.	ańow	'angel'	ańele	'1.sg.'	ańowek	'dim.'
	b.	ńano	'hay'	ńenny	'adj.'	ńanko	'dim.'
	c.	kam'eń	'stone'	kam'enny	'adj.'	kam'onek	'dim.'
	d.	p'ersćeń	'ring'	p'ersćenny	'adj.'	p'ersćonek	'dim.'
	e.	ńedźv'edź	'bear'			ńedźv'adek	'dim.'
	f.	gv'azda	'star'	gv'ezdny	'adj.'	gv'azdka	'dim.'

There is a small number of verb roots which have *e~o* alternations. In all but one case (89d) the final consonant of the root is coronal. As in nouns, [e] surfaces if the final consonant is palatalized, otherwise [o] surfaces. One verb, (89f), has an *e~a* alternation.

(89)	infinitive		1st.sg.pres.	2nd.sg.pres.	past.f.	past.m.
	a.	gńeść	'crush'	gńotę	gńećeś	gńotwa gńeti'1
	b.	v'eść	'lead'	v'odę	v'edźeś	v'odwa v'edi'1
	c.	ńeść	'carry'	ńosę	ńeśeś	ńoswa ńeśi'1
	d.	vlec	'drag'	vlokę	vlećeś	vlokwa vleki'1
	e.	brać	'bring'	b'orę	b'eżes	braw brai'1 ⁴²
	f.	jexać	'go'	jadę	jedźeś	jexaw jexai'1

Finally, *e~o* and *e~a* are found in several suffixes of the verbal system. The Class 3 and the Class 7 verbalizing suffixes *-e* and *-ej* alternate with [a], and the Class 4 and 5 past passive participial suffix alternates between *-on* and *-eń*:

⁴² *brać* 'bring' and *prać* 'launder' have irregular root alternants and appear both in syllabic and asyllabic forms as (89) shows.

(90)	infinitive		1st.sg.pres.	past.f.	past.m.	p.p.p.sg.	nominal
a.	wyśeć	'go bald'	wyśeję	wyśawa	wyśel'i		
b.	kżyćeć	'shout'	kżyczę	kżyčawa	kżyčel'i	kżyčany	okżyčeńe
c.	ńeść	'carry'	ńosę	ńoswa	ńeśl'i	ńeśony	ńeśeńe

Gussmann (1980) suggests first, that there must be two distinct front vowels underlying these alternations. The vowels must be front according to Gussmann because the consonants preceding the alternations are always [-back]. Since there are two distinct alternations, there must be two vowels underlying them. Gussmann thus postulates that Polish has an underlying tense /*ɛ̃*/ that alternates with [a] and that lax /*ɛ̄*/ alternates with [o]. To derive [a] and [o] there is a rule of Backing that applies in the environment of an unpalatalized coronal. Notice, however, that it is actually unnecessary to postulate that the vowels underlying these alternations are front vowels. As we have seen, it is necessary to assume that Polish has underlying [-back] labial and coronal consonants; given that rules which derive [-back] consonants are all morphologically conditioned rules, root-internal instances of such consonants must be considered to be underlying. Thus in all the root-internal cases of *e~a*, *e~o* alternations, the preceding consonants must be underlyingly palatalized. We are therefore not forced to postulate that the alternations are front vowels underlyingly. In those cases where suffixes exhibit the alternations (in the verbal system; see (89)), since suffixes do not necessarily have to have front vowels to condition palatalization there is also no need to assume that in these cases there are underlying front vowels. I conclude then, that the vowel underlying the *e~o* alternation is /*o*/, and that underlying the *e~a* alternation is [a]. Fronting of these vowels occurs when the following (almost invariably coronal) consonant becomes [-back] as a result of

application of a palatalization rule. This fronting, or Vowel Palatalization, is lexically-conditioned in two senses: first, not all forms which meet the environment for the application of the rule undergo it, and, second, in most cases it takes place only in the environment of non-desinential or derivational morphemes—only a few roots undergo the rule if it is triggered by nominal inflectional/desinential suffixes.

Interestingly, [o] and [a] rather than [e] surface before the diminutive suffix *-k*. Recall that this suffix triggers only palatalization of velars and the alveolar affricates, and does not palatalize labials or coronals; in addition, it causes depalatalization of underlyingly palatalized stem-final coronal consonants. In this sense it differs from other palatalizing consonant-initial suffixes like *-n* 'adj', *-ń/k* 'nom.' or *-st/v* 'nom' which trigger Labial, Coronal and First Velar Palatalizations. Since *-k* does not condition Coronal Palatalization, it follows that alternating vowels in coronal-final roots preceding this suffix will not be palatalized to [e].

The rule of Vowel Palatalization is given in (91):

(91) Vowel Palatalization

V		V		C		C
X	→	X	/	X	--	X
[+back]		[-back]		[-back]		[-back]
[-high]						

(91) derives a [+low, -back] [æ] from underlying /a/; since this is not a permissible segment in Polish, later clean-up rules ensure that [æ] surfaces as [e] (see Calabrese 1988 for the notion of clean-up rule). Notice that if

this hypothesis about the representations underlying the e~o and e~a alternations is correct, it leads us to postulate that the verbalizing suffixes *-e* and *-ej* are actually *-a* and *-aj* underlyingly, but are distinguished from the Class 1 and Class 2 *-a* and *-aj* by diacritics which indicate that they undergo Vowel Palatalization.⁴³

The second vowel alternation, o~u, occurs in a closed word-final syllable just in case the following consonant is voiced and can be characterized as Raising of underlying /o/ to [u].⁴⁴ It appears in both nouns and verbs. Not all words which could undergo Raising do (92m,n), and some words which do not meet the environment since they have final voiceless consonants nevertheless undergo the alternation (92g,h,o).

(92) Nouns

	a.	moda	'fashion'	mud	'g.pl.'
	b.	boby	'beans,n.pl.'	bub	'n.sg.'
	c.	droga	'road'	drug	'g.pl.'
	d.	może	'sea'	muż	'g.pl.'
cf.	e.	grota	'cave'	grot	'g.pl.'

⁴³ Historically the vowels underlying these alternations were indeed front vowels. That this is the case is evident from the fact that words which historically contained [e] no longer do. For instance, the word for 'honey', *m'od-m'odze* is related to English *mead*. *b'adro-b'adze* 'hip' came from *b'adro*; etc.' At the time when these alternations were more productive than they are now there were indeed two nonhigh front vowels, as Gussmann suggests. Synchronically, however, the only reason to postulate a second [-high] front vowel is to account for these alternations, which, as we have seen, are lexically-conditioned in any case. For this reason I have proposed that the alternations have been reanalyzed and in contemporary Polish are represented by underlying back vowels.

⁴⁴ Nasal-final stems never have o~u alternations; some liquid-final stems do and some do not; and glide-final stems do exhibit the alternation. It is unclear to me whether these facts suggest that nasals are not supplied with the default feature [+voice] until after the rule raising [o] has applied, whereas liquids receive the [+voice] feature earlier, or whether it is simply the case that nasals are excluded from the rule for no natural phonological reason. It is beyond the scope of this work to deal with redundancy rules in any detail. I shall therefore discuss only obstruent-final stems here since [+voice] obstruents are most likely specified as such in underlying representations.

	f.	šopa	'shed'	šop	'g.pl.'
cf.	g.	robota	'work'	robut	'g.pl.'
	h.	stopa	'foot'	stup	'g.pl.'
	Imperatives				
	i.	rob'ić	'work'	rub	'Imp.'
	j.	pomagać	'help'	pomuž	'Imp.'
	k.	otfożyć	'open'	otfuž	'Imp.'
	l.	godzić	'agree'	guđź	'Imp.'
cf.	m.	skrobać	'scrape'	skrob	'Imp.'
	n.	xodźić	'go'	xodź	'Imp.'
	Past Tense			3rdsg.masc.	1stsg.masc.
	o.	ńeść	'carry'	ńusw	ńoswem
	p.	buść	'gore'	budw	bodwem
	q.	muc	'can'	mugw	mogwem

Preceding consonant-initial suffixes, Raising does not apply, although again, there are exceptions (93e):

(93)	a.	sposub	'way'	sposobu	'g.sg'	sposobny	'adj'
	b.	xwud	'cold'	xwodu		xwodny	'adj.'
						xwodńik	'cold soup'
	c.	dźub	'beak'	dźobu		dźobńica	'stem'
	d.	m'ud	'honey'	m'odu		m'odńik	'nectary'
	e.	bug	'god'	boga		boski	'adj.'
						cf. bustvo	'deity'
	f.	rug	'horn.'	rogu	'g.sg'	nosorožec	'rhino'
						cf. nosorožca	'g.sg.'

The examples in (93) indicate that Raising takes place in a word-final closed syllable. The situation is complicated, however, by the case of the diminutives. While diminutives of masculine nouns that have the o~u

alternation in nondiminutive forms very rarely contain Raising, diminutives of feminines and neuters do contain Raising.

(94)	a.	grub	'grave,m.'	grobu	'g.sg.	nagrobek	'tombstone'
						nagrobka	'g.pl.'
	b.	dźub	'beak,m.'	dźobu		dźobek	'dim.'
	c.	gwud	'hunger,m.'	gwodu		gwodek	'dim.'
	d.	osub	'person,g.pl.'	osoba	'n.f.'	osubka	'dim.'
						osubek	'g.pl.'
	e.	bżuz	'birch,g.pl.'	bżoza	'n.f.'	bżuzka	'dim.'
	f.	pul	'field,g.pl.'	pole	'n.ne.'	pulko	'dim.'

The fact that Raising does not occur in masculine diminutive nouns is expected, given that it seems to occur only in word-final position. In feminine and neuter nouns, the diminutive suffix behaves as if it, and the desinential suffix following it were not present, as if it were outside the word at the point at which Raising applies. Clearly this behaviour of the feminine and neuter diminutives is specific to the Raising rule since in the case of other alternations diminutives of all genders are undistinguished. The Raising rule is given in (95). It must be ordered before rules of Voicing Assimilation and Final Devoicing which may change the voiced nature of a stem-final consonant and thus bleed Raising.

(95)	Raising				
	V	V		Rhyme	
				/ \	
	X →	X /		-- Coda] ω
					-*
	[+back]	[+high]		C ₁	
	[-high]			[+voice]	
	[-low]				

The final vowel alternation, $\text{ɛ} \sim \text{ɔ}$, also involves idiosyncratic behaviour on the part of the diminutive.⁴⁵ The basic generalization is that in those cases where alternations occur, $[\text{ɛ}]$ is found in open syllables, whereas $[\text{ɔ}]$ occurs in closed syllables. (96) gives examples from the verbal system; notice that the verbalizing suffix $-\text{no}$ undergoes the alternation:

(96)	infinitive	past,m.	past,f.	p.p.p.,m.	
	a. zap'ɔć	zap'ɔw	zap'ɛwa	zap'ɛty	'button up'
	b. nadɔć	nadɔw	nadɛwa	nadɛty	'inflate'
	c. kżyknɔć	kżyknɔw	kżyknɛwa	kżyknɛty	'shout,sem.'

In nouns we find many cases with nasal diphthongs in which no alternations occur. In those words which do have alternating forms, $[\text{ɔ}]$ surfaces in closed syllables, whereas $[\text{ɛ}]$ surfaces in open syllables. Given that there exist so many words with either $/\text{ɔ}/$ or $/\text{ɛ}/$ in which no alternations occur we must assume that lexical items are marked to undergo the rule. Once a form is marked to undergo the rule, it applies only if its phonological environment is met:

(97)	a. mɔż	'husband'	mɛża	'g.sg.'
	b. mɔk	'torture,g.pl.'	mɛka	'n.sg.'
	cf. mɔka	'flour,n.sg.'	mɔk	'g.pl.'
	c. bwɔd	'error'	bwɛdże	'l.sg.'
	d. śv'ɔt	'holiday,g.pl.'	śv'ɛta	'n.pl.'
	e. jag'ɔt	'lamb,g.pl.'	jag'ɛ	'n.sg.'
	f. jastšɔb	'hawk'	jastšɛb'a	'g.sg.'

⁴⁵ Gussmann (1980) accounts for the nasal diphthong alternations by postulating that the nasal diphthongs are underlying lax high vowel + nasal consonant sequences. See Chapter 4 for a completely different analysis. He does not refer to syllable structure in his account.

In both the verbs and the nouns above, the vowel underlying the alternations is the front alternant; backing occurs in a closed syllable. Before derivational suffixes we find that in the environment of the diminutive, backing always occurs, but before other consonant-initial suffixes no backing occurs. The lack of backing in these latter cases is not explainable on the basis of syllable structure since in the majority of cases the syllable containing the nasal diphthong is closed:

(98)	a.	zɔb	'tooth'	zɛba	'g.sg.'	zɔbka/zɔbek	'dim.'
						zɛbny	'adj'
						zɛbnica	'cogwheel rail'
						zɛb'ec/zɛbca	'aug.'
	b.	kʂɔg	'book,g.pl.'	kʂɛga	'n.sg.'	kʂɔʒka	'dim.'
						čarnokʂɛstvo	'blackmagic'
	c.	rɔk	'hand,g.pl.'	rɛka	'n.sg.'	rɔčka	'dim.'
						rɛčny	'adj.'
	d.	mɔʒ	'husband'	mɛʒa	'g.sg.'	mɛʒny	'adj.'
						mɛski	'manly'
	e.	jastʂɔb	'hawk'	jastʂɛb'a	'g.sg.'	jastʂɛb'ec/jastʂɛbca	'hawkweed'

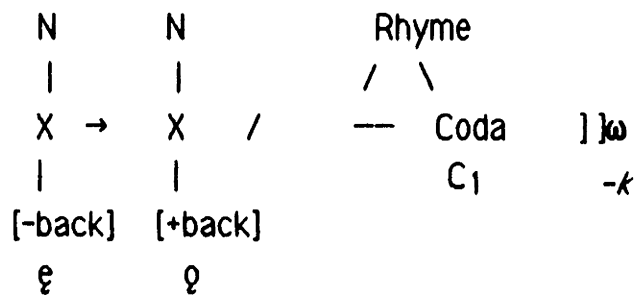
Since no Backing occurs before the suffix *-c* 'nom' which has the same epenthesis properties as does the diminutive *-ka*, we cannot assume that the reason Nasal Backing occurs in diminutives is that it is ordered before epenthesis inserts [e] in its environment and that therefore in diminutives at the point at which the rule applies the nasal diphthong is in a closed syllable. Again we have a case where the diminutive suffix behaves differently from the other suffixes. If it is assumed that the closed syllables in which Nasal Backing applies must be word-final, then the

behaviour of the diminutive with respect to this rule is similar to its behaviour in the case of the o~u alternation. For purposes of the application of the rule the diminutive behaves as if it were not there. It must also, however, be specified to trigger Nasal Backing since there is a number of words in which the vowels are basically nonalternating but which surface with [ɔ] before the diminutive:

- (99) a. p'ečęć 'seal' p'ečɔtka 'dim.'
 b. kęs 'bite' kɔska 'dim.g.sg.'
 c. pam'ięć 'memory' pam'ɔtka 'souvenir'

The rule of Nasal Backing is given in (100):

(100) Nasal Backing



Although the alternation effected by Nasal Backing is very different from that effected by Raising of /o/, it is interesting to note that the environments in which they occur are identical. Both Steele (1973) and Laskowski (1977) suggest that this is the case. The rules differ, however, in their relative ordering with respect to the application of epenthesis in clitics. The masculine 1st sg. of the past tense is signalled by affixing the clitic *-m* to a TM-stem ending in the past tense morpheme. In this environment we find an epenthetic [e] (cf. *kwadw* '3rd sg.m.past', *kwadwam*

'1st sg.f.past' and *kwadwem* '1st sg.m.past'). Raising must be ordered after cliticization and epenthesis (e.g., *noswem* 'carry, 1st sg.m.past', *nosw* '3rd sg.m.past', *noswam* '1st sg.f.past') whereas Nasal Backing is ordered before cliticization (e.g., *dpwem* 'breathe, 1st sg.m.past' *dpw* '3rd sg.m.past', *dɛwam* '1st sg.f.past').

5. Conclusion

(101) lists most of the rules discussed in this chapter (with the number, or section in which they occur). The rules are listed in the general order in which they apply (this ordering has not been justified in all cases):

(101)

Cyclic Rules

Vowel Delinking (64)
 i-Insertion (65)
 Imperative Delinking (§3.4.1)
 Syllabification: CV, Onset, Resyllabification
 Epenthesis (47)
 Coda (§2.4.2)
 Coronal Palatalization (3)
 Labial Palatalization (2)
 First Velar Palatalization (13)
 Second Velar Palatalization (15)
 Affricate Palatalization (10)
 Strident Palatalization (Fn. 4)
 Spirantization (§1; see 11)
 Iotation (8, 66)
 j-Deletion (§3.4.1)
 Vowel Palatalization (91)
 Nasal Backing (100)

Clitic Epenthesis (§4)⁴⁶
Raising (95)

Noncyclic Rules

Syllabification
Epenthesis (47)
Extrametricity (§2.4.2)
Feature-Filling (of [e]) (§2.4.2)
Velar Fronting (17, §2.4.3)
Depalatalization (Fn. 15, §1)
Redundancy Rules: [±LIC] insertion (§1)
Affrication (§1)

In this chapter I have argued that most of the rules listed as cyclic are morphologically or lexically conditioned. An automatic consequence of the fact that a rule is morphologically conditioned is that that rule cannot apply in underived environments. If all the rules were simply morphologically conditioned, then there would be no need to postulate a condition such as the Strict Cycle Condition to account for the fact that these rules seem to apply only in morphologically derived environments. However, cyclic Epenthesis, V-Delinking, and Iotation which are not morphologically conditioned but are cyclic rules, also apply only in derived environments. The Strict Cycle Condition is thus needed in the grammar. In accounting for the consonant and vowel alternations, I have claimed that the morphologically conditioned rules are ordered in the phonology; I have also claimed that all Polish suffixes are cyclic. Even if these claims turn out subsequently to be false, the general claims that I have made seem to be indisputable: namely, that a

⁴⁶ Raising and Clitic Epenthesis are listed as cyclic here; whether rules that apply in the environment of clitics can in fact be word-level cyclic rules, or whether they must instead be ordered at the phrase-level is a question that requires further study.

great deal more idiosyncratic information is associated with the phonological rules of Polish than previous generative analyses of Polish had assumed.

While this chapter has focussed on cyclic rules, I have assumed throughout that there is a noncyclic phonological component. In the next chapter we turn to an examination of the noncyclic (word-level) and phrase-level nasal processes of Polish.

CHAPTER 4

THE NONCYCLIC COMPONENT: NASAL PROCESSES AND NASAL DIPHTHONGS*

Nasal assimilation and nasal gliding are common word-level noncyclic and phrase-level processes in Polish. Since nasal segments and their properties have been the subject of much discussion as well as of much confusion in the literature on Polish, I illustrate the existence of a noncyclic phonological component in the Polish grammar by proposing an explanatory analysis of these segments.¹

1. Introduction

The orthography of Polish distinguishes 2 nasal vowels, 'ę' and 'ą'=[ɔ], in addition to 6 oral vowels 'i,y,u,o,e,a'. Phonetic studies have shown, however, that the orthographic nasal vowels are not nasal. Unlike French nasal vowels, to take one example, where the nasal vowels have distinctly different formant structures from corresponding oral vowels, Polish nasal vowels are actually sequences of an oral vowel, which is optionally slightly

* This chapter has benefitted greatly from discussions with Loren Trigo.

¹ See, for example, Bethin (1984a), Benni (1959), Biedrzycki (1963), Dukiewicz (1967), Feldstein (1983), Gładney (1968), Gussmann (1974, 1980), Rubach (1977b, 1984), Wierzchowska (1966), Brooks (1968) and references therein.

nasalized, plus a nasal stop or plus a nasal glide (see e.g., Dukiewicz 1967, Brooks 1968 and references therein). The nasal stop variant of an orthographic nasal vowel is always homorganic to a following noncontinuant (1a,b); the nasal glide surfaces as labiovelar (1c), or, occasionally, as palatalized (1d), in the environment of a following fricative:

- | | | | | |
|-----|----|-----------|--------------|-----------------|
| (1) | a. | vstęg+a | [fstɛŋga] | 'ribbon, n.sg.' |
| | b. | vstęg+e | [fstɛndzɛ] | 'l.sg.' |
| | c. | vstęż+k+a | [fstɔwʃka] | 'dim.' |
| | d. | gęś | [gɛwʃ ~ gɛʃ] | 'goose' |

Polish orthography also distinguishes three nasal stops 'm', 'n', and 'ń'. As (2) shows, these may surface as nasal glides (in fast speech), or as stops homorganic to a following noncontinuant:

- | | | | | |
|-----|----|--------------|-----------------|---------------|
| (2) | a. | informacja | [iŋformacja] | 'information' |
| | b. | tramvaj | [traŋvaj] | 'tram' |
| | c. | czynś | [čyŋś] | 'rent' |
| | d. | kunśt | [kuŋśt] | 'artistry' |
| | e. | bomba | [bomba] | 'bomb' |
| | f. | inteligentny | [intel'igentny] | 'intelligent' |
| | g. | cynk | [cyŋk] | 'zinc' |

Polish thus has two types of nasal segments phonetically: nasal stops and labiovelar or palatal nasal glides. The distinction between them is neutralized in the environment of a following consonant: before noncontinuant (stops, affricates and nasals) homorganic nasal stops are

found; before continuants nasal glides occur.² In word-final position, however, contrasts between three nasal stops and the labiodental nasal glide are observed:³

- | | | | | | |
|-----|--------|------------------|-----|----------|--------------|
| (3) | a. ton | 'tone' | (4) | a. sen | 'dream' |
| | b. toń | 'depth' | | b. šeń | 'vestibule' |
| | c. tom | 'volume' | | c. ps+em | 'dog, i.sg.' |
| | d. toŵ | 'this, i.sg.' | | d. šeŵ | 'refl.' |
| | e. to | 'this, n.sg.ne.' | | | |

Given the sequential properties of orthographic "nasal vowels" and the similarities in phonetic forms of these vowels and orthographic oral vowel plus nasal stop sequences, generative analyses of Polish nasals have disregarded orthography and have argued that all vowel plus nasal sequences are in fact simply vowel plus nasal-stop sequences underlyingly. A problem facing such analyses is that they cannot account straightforwardly for the word-final contrasts between nasal glides and nasal stops (see (3),(4) above). A hypothesis such as that reflected in the orthography, that Polish has two mid nasal vowels, can account for these distributional facts, but this hypothesis in turn makes it difficult to account for the sequential properties of "nasal vowels" and for their similarities to nasal stops. Some nongenerative analyses tried to get around this problem by postulating that Polish has an additional segment, a phonemic nasal glide (Schenker 1954,

² This statement is qualified in the presentation of data in S2. In particular, /m/ and /ń/ behave differently from /n/ with respect to neutralization; and word-internal neutralization is different from neutralization across word-boundaries.

³ In fast speech in word-final position the nasal glide may lose its nasalization or be deleted. Thus *sz* 'reflexive' may be pronounced [šeŵ], [še] (rarely) or [še]. [oŵ] may be pronounced as [ow], rarely as [o].

Feldstein 1983), or a nasal diphthong (Biedrzycki 1963) but such hypotheses do not explain why the occurrence of such nasal segments is limited to pre-continuant or word-final position.

The difficulties faced by all previous analyses of Polish nasal segments arise because all of these analyses can account successfully for only some of the facts at any one time. Hence the great number of studies devoted to the problems of nasal segments.

The difficulties faced by earlier analyses are due in part to the limitations of linear frameworks. In this chapter I show that combining recent developments in the theories of hierarchical feature representations (see Clements 1985; Sagey 1986; Archangeli and Pulleyblank, in prep.) and of underspecification (Archangeli 1984, Steriade 1987, etc.) not only allows us to explain the various distributional and phonetic facts associated with nasal segments, but also leads us to expect those facts. Thus in addition to explaining Polish nasal processes, the analysis presented here also provides evidence in favour of both hierarchical feature-representations and underspecification.

The analysis is essentially as follows. I argue that Polish has two nasal diphthongs which contain an oral mid vowel followed by a nasal segment that lacks place of articulation. The placeless nasal segment receives place specifications either by Spreading of a place node from a following noncontinuant segment (as in (1a,b)), or by Insertion of dorsal and labial features ((1c,d) and (3d,4d)). I further argue that nasal consonants, under the right conditions may lose their underlying place nodes and thus also either assimilate place of articulation from following consonants or become specified later as labiovelar nasal glides. The word-internal

neutralization of nasal diphthongs and nasal consonants is thus attributed to the fact that both types of nasal segments are, or become, placeless.

The analysis presented below suggests that, unlike terminal features such as [high], [back], [round], [anterior], which, it is claimed, need not be specified underlyingly but may be supplied by default rules (see, e.g., Archangeli 1984; Archangeli and Pulleyblank, in prep.; Pulleyblank 1988; Mascaró 1987; Steriade 1987; etc.), all nonterminal Place nodes, including the unmarked node for Polish [coronal], must be specified in underlying representations.

The chapter is organized into eight sections. Section 2 presents the data. In sections 3-7 I give arguments in favour of postulating an underlying nasal diphthong, and discuss underlying representations of the nasals /m/, /n/ and /ń/, the rules and their modes of application. §8 is the conclusion. In order to minimize confusion in terminology I will assume the correctness of my analysis before providing arguments for it, and will refer to mid-vowel-nasal-segment sequences represented as orthographic nasal vowels as nasal diphthongs. I will continue to use the symbols 'ę' and 'ǫ' in non-phonetic representations to distinguish nasal diphthongs from regular oral vowel plus nasal segment sequences.

2. The Data

The three nasal stops represented in Polish orthography are in fact underlying nasals in Polish. In this section I describe the conditions under which these stops assimilate place of articulation from following

noncontinuants, or become nasal glides. I also describe more fully than above the properties of nasal diphthongs.

2.1 Nasal Assimilation

The nasal part of nasal diphthongs always surfaces as a nasal stop homorganic with a following noncontinuant:

- | | | | | |
|-----|----|--------|-----------|---------------|
| (5) | a. | rɔb+ać | [rombać] | 'hew' |
| | b. | ʒɔd+y | [ʒɔndy] | 'governments' |
| | c. | tɛč+a | [teŋča] | 'rainbow' |
| | d. | p'ɛć | [p'eńć] | 'five' |
| | e. | rɛk+l | [reŋ'k'l] | 'hand, g.sg.' |
| | f. | vɛgl+a | [veŋgla] | 'coal, g.sg.' |

Of the three underlying nasal stops, however, only the coronal stop /n/ always assimilates to a following noncontinuant.⁴ /n/ undergoes place assimilation both word-internally and across word-boundaries.

Assimilation to a velar (6a,c), or across word-boundaries is optional and occurs most frequently in faster speech; assimilation to a labial or to a coronal is obligatory word-internally in all types of speech:

- | | | | | |
|-----|----|---------|-----------|-----------|
| (6) | a. | kemping | [kempyŋg] | 'camping' |
| | b. | blond | [blɔnd] | 'blond' |
| | c. | bank | [baŋk] | 'bank' |

⁴ /n/ does not assimilate to a following stop in one word-internal context: before the diminutive suffix *-k*. Rubach and Booij (1987) attribute this lack of assimilation to the presence of an underlying vowel which has a melody but no timing slot (this vowel is postulated to underlie the e-∅ alternations). Given the analysis of Epenthesis suggested in the previous chapter, one can perhaps assume that the lack of assimilation preceding *-k* is due to the presence of an inserted V-slot.

d. pan bug	[pam buk]	'Lord God'
e. on čeka	[oŋ čeka]	'he waits'
f. on k'eruje	[oŋ' k'eruje]	'he drives'
g. huragan kolosalny	[huragaŋ kolosalny]	'colossal hurricane'

The assimilation in place features to a following noncontinuant undergone by coronal nasals is similar to that undergone by nasal diphthongs. What distinguishes coronal nasals from the nasal segment found in nasal diphthongs is that while the former may assimilate to a following consonant across a word-boundary (as in (6)), the nasal diphthong never assimilates across a word-boundary:

(7) a. tō taksuvkō	[toŋ taksuvkoŋ . . .]	'by this taxi'
	*[ton taksuvkoŋ . . .]	
b. on sę ceŋi	[oŋ sɛ(ŋ) ceŋi]	'he values himself'
	*[oŋ sɛn ceŋi]	

Underlying /m/ never assimilates to a following non-labial stop or affricate, although it is found before labial stops. Examples are given in (8):⁵

(8) a. komtur	'commander of Teutonic Knights'
b. mdlić	'feel nauseous'
c. klamka	'doorknob'
d. tamten	'that one'
e. kwamca	'liar'
f. ćemno	'dark'

⁵ There are no examples in the literature which show phrase-level assimilation of a labial nasal to a following non-labial stop. I therefore assume that lack of such examples means that labials do not assimilate to stops between words, just as they do not assimilate within words. This assumption seems to be borne out by speakers of Polish that I have checked with.

2.2 Nasal Gliding

As pointed out above, nasal diphthongs surface as nasal labiovelar or palatal glides in the environment of following continuants and word-finally. If the following consonant is [-back], the nasalized glide may also be [-back]:⁷

- | | | | | |
|------|----|----------|---------------|-----------------|
| (10) | a. | vɔsk+i | [voʷski] | 'narrow, m.sg.' |
| | b. | kʂɔʒ+k+a | [kʂoʷʂka] | 'book' |
| | c. | vɛx | [veʷx] | 'smell' |
| | d. | gɛs+i | [geʷsi~geʷsi] | 'goose' |

The nasal stops become nasal glides both word-internally and across word-boundaries when followed by continuants, subject to the following conditions: 1) /m/ becomes a glide only before a labial continuant (11a,b,h,l); 2) an underlying or derived prepalatal /ń/ always surfaces as a palatal glide [ɲ] (11e,g,l); 3) a glide derived from /m/ or /n/ may become [-back] if the following continuant is [-back] (11f,m), again depending on the palatal quality of the preceding consonant(s) and vowel; and 4) in very fast speech a word-final glide may become [-back] (11m). The examples in (11) are organized in terms of the place of articulation of the underlying nasal stops; word-internal assimilation is illustrated in (11a-g), phrase-level assimilation is illustrated in (11i-m):

⁷ Gladney (1968) claims that the appearance of [ɲ] is more likely if the preceding vowel is [e] (as in (10d)), or if the onset as well as the coda of the syllable containing the nasal diphthong is [-back] (e.g., *vzjɔt* ~ [vzoʷt] or [vzoʷt] 'to take').

(11)	a. triumf	[tryuɯ̃f]	'triumph'
	b. xamski	[xamski]	'boorish'
	c. šansa	[šaɯ̃sa]	'chance'
	d. konflikt	[koɯ̃flikt]	'conflict'
	e. koński	[kõski]	'horse's'
	f. sense	[seɯ̃se~sẽse]	'sense, 1.sg.'
	g. tańsy	[tãsy]	'cheaper'
	h. tam walq	[taɯ̃ valoɯ̃]	'they are banging there'
	i. zvariantem šereg'em	[zvariantem šereg'em] ³	'in close order'
	j. on vyšedł	[oɯ̃ vyšed]	'he went out'
	k. zabudowań fabryčnyx	[zabudowã fab..]	'factory buildings'
	l. on się	[oɯ̃ še~õ še]	'he refl.'
	m. cócóq się ...	[cócó̃ še. . .]	'aunt, 1.sg. refl.'

3. Nasal Diphthongs

In this section I present arguments in favour of the hypothesis that nasal diphthongs really are, as I suggested in §1, underlying diphthongs whose second member is a placeless nasal segment. I begin in the following subsection by taking up the hypothesis presented in previous generative analyses of nasal diphthongs that the diphthongs are derived from underlying oral vowel plus nasal stop sequences.

³ Benni (1959) claims that /m/ becomes a glide in this phrase even though the following continuant is not labial. Rubach (1977b), however, disagrees. My own intuitions, and those of an informant agree with Rubach. According to Rubach (1977b) final /m/ may in some cases become a glide before non-labial continuants, but this happens only in very fast speech (a slur-type rule), and is limited to the 1st m.sg. ending of the past tense (i.e., X+w+em) if the glide of the past tense morpheme has previously been deleted.

3.1 Nasal Diphthongs are not Vowel/Stop Sequences

The argument that nasal diphthongs are not derived from vowel plus nasal stop sequences is a simple one: any analysis which makes such a hypothesis cannot derive the word-final contrasts between nasal diphthongs and nasal stops in an explanatory or nonarbitrary way.

Recall that in word-final position the nasal glide contrasts with nasal stops. I repeat the relevant examples from (3) and (4) here as (12) and (13):

- | | | | | | |
|------|--------|------------------|------|----------|--------------|
| (12) | a. ton | 'tone' | (13) | a. sen | 'dream' |
| | b. toń | 'depth' | | b. šeń | 'vestibule' |
| | c. tom | 'volume' | | c. ps+em | 'dog, 1.sg.' |
| | d. toŵ | 'this, 1.sg.' | | d. šeŵ | 'refl.' |
| | e. to | 'this, n.sg.ne.' | | | |

An analysis that tries to derive the nasal glide from an underlying nasal stop such as the coronal nasal, to take one possibility (proposed, for example, in Rubach 1977a), makes the prediction that word-finally there should be no contrast between the nasal glide and the coronal nasal in surface forms. In other words, such an analysis predicts that one should either find [n] or [ŵ] word-finally, but not both. The fact that both exist obviously indicates that this prediction is false.

Gussmann (1980) and Rubach (1984), make crucial use of word-final underlying lax high vowels to distinguish nasal stops which do not become nasal glides (gliding is blocked by the presence of a following lax high

vowel) from those which do (no lax high vowel follows these).⁹ Although there are many cases where a postulated final lax high vowel is claimed to function as an inflectional (masculine nominative singular, or genitive plural) suffix, there are also cases where such vowels are used simply as diacritics to prevent gliding (as in, for example, the postulated underlying form for the instrumental suffix *-em*: /emO/). Furthermore, proposing that lax high vowels block word-final gliding leads to an ordering paradox. In order for lax high vowels to block gliding, the gliding rule must be ordered before Lower, the rule which lowers or deletes these vowels.¹⁰ In forms such as /pan+Esk+i/~[pański]~[paʃski] 'lordly', however, the rule which causes the palatalized nasal (whose palatalization is supposedly triggered by the presence of a lax high vowel) to become a glide must be ordered after Lower otherwise the lax high vowel would block the gliding rule since the nasal would not be before a [+continuant] consonant.¹¹ Thus even if one assumes the existence of lax high vowels, such an analysis is not without its problems. I have argued in chapter 3, however, that Polish does not have underlying lax high vowels. If this is correct, then using such vowels to prevent gliding is not a possible option. Moreover, postulating any other

⁹ Gladney (1968) provides no solution to this problem, although he recognizes it as a problem. Rubach (1977) suggests that the gliding of nasal stops word-finally is limited to certain morphological environments.

¹⁰ Gussmann's rule of Lower both lowers and deletes lax high vowels:

$$\left. \begin{array}{l} [+syll] \\ [+hi] \\ [-\text{'anse}] \\ [-nasal] \end{array} \right\} \rightarrow \left\{ \begin{array}{l} [-hi] \quad [+syll] \\ [-back] / \text{---} \quad [+hi] \\ \emptyset \quad \quad \quad [-tense] \end{array} \right\}$$

Rubach (1984) considers Lower to be a cyclic rule, whereas Lax High Vowel-deletion is postcyclic. My argument holds for either view of this rule.

¹¹ It might be possible to resolve the paradox if one assumed, for example, that word-final gliding occurs at the word-level and is ordered before Lax High Vowel-deletion, whereas gliding before a continuant is ordered at the phrase-level and thus after deletion. As I show below, however, word-final and pre-continuant gliding result from the same process.

type of segment to block nasal gliding would be even more *ad hoc* than using lax high vowels since at least, within a framework where such vowels are assumed to exist underlyingly, the hypothesis that they occur word-finally as inflectional suffixes in many forms is motivated on independent grounds.¹²

One argument used by Gussmann (1980) as evidence in favour of the hypothesis that nasal stops underlie all nasal processes, comes from data such as the following:

¹² Bethin (1984a) attempts a nonlinear, syllable-based analysis of the nasal facts. She postulates 1) that nasal consonants which become glides word-finally are in syllable rhymes, whereas other nasal stops are in appendices, and 2) that nasals in rhymes are unspecified with respect to features such as coronal, anterior, etc., and that these features are acquired from following obstruents. In the absence of a following obstruent the unspecified nasal becomes a nasal glide (how this happens is not made clear). The suggestion that Polish has a placeless nasal is, as I have already indicated, one which I will argue below to be correct. In spite of this, however, Bethin's analysis as a whole is untenable because the distinction that she postulates between nasals in rhymes and nasals in appendices is unlearnable. Bethin does not discuss the syllabification algorithm for Polish, and therefore she does not make clear how non-nasal consonants following vowels are to be syllabified if Polish has a rhyme/appendix distinction for consonants following a nucleus. In the case of forms like *bwpd*-[bwɔd] 'mistake' the stop following the nasal in the rhyme is presumably in the appendix of the syllable. But in the case of a simple CVC syllable such as *vud* 'water, g.pl.' the final [d] could be either in the rhyme or in the appendix. If [d] is syllabified as part of the rhyme, then it has a different structure from a seemingly simple CVC syllable which ends in a nasal (e.g., *ton*). It is difficult to see how a speaker could deduce the difference in structure of two such similar syllables. Conversely, if the [d] of *vud* is syllabified as an appendix, then this suggests that core syllables of Polish can only have nasal codas (where the nasal is unspecified for place) and that all other consonants following a nucleus, including fully specified nasals, are not part of the core syllable. In the absence of other evidence in favour of such a claim, the structures proposed by Bethin to distinguish *tp* from *ton* or *tam* are merely *ad hoc*. Furthermore, the constraints on codas (discussed in Chapter 3) which play a role in the *e-∅* alternations and in the determination of imperative and comparative allomorphy (see Bethin 1987 for discussion of the allomorphy) suggest that non-nasal as well as nasal consonants are incorporated into syllables by rules of core-syllable formation such as the Coda Rule, and are thus not appendices.

	infinitive pf.	1st sg. pf	p.pf.part.	
(14) a.	vyžóć [vyžońć]	vyžnę	vyžęty	'reap'
b.	vyćóć [vyćońć]	vytnę	vyćęty	'cut off'
c.	vyžóć [vyžońć]	vyžmę	vyžęty	'squeeze'
d.	nadóć [nadońć]	nadmę	nadęty	'inflate'

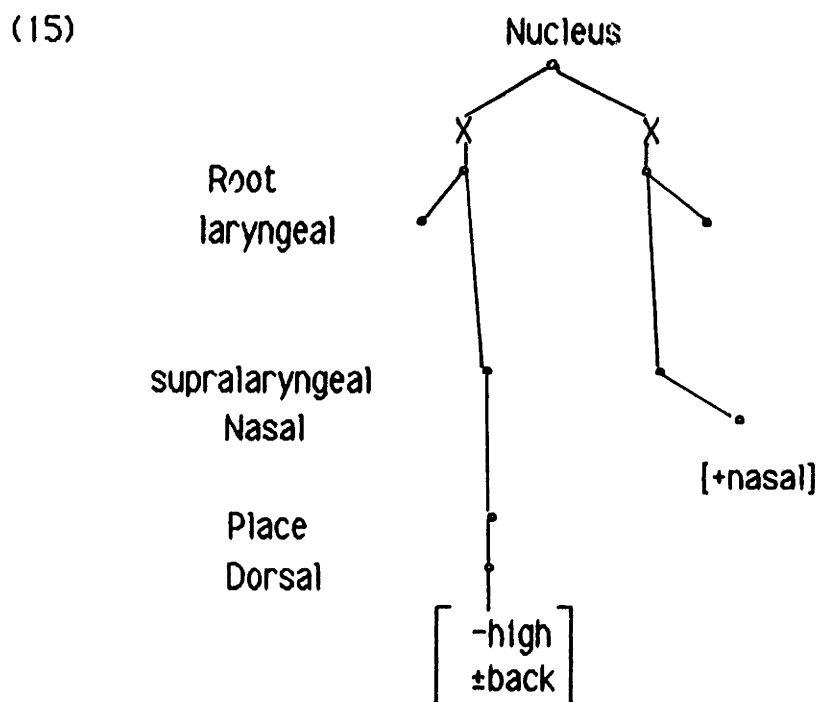
In these forms, nasal consonants alternate with nasal diphthongs. Notice in particular, that in two of these verbs, the nasal consonant is labial. Gussmann argues on the basis of these forms that, since the quality of the nasal stop is unpredictable it must be underlying. If Gussmann's analysis of the facts represented in the examples was correct, then it would be strong evidence in favour of the underlying-nasal-stop analysis. However, there are only two roots with labial consonants, *žm* 'squeeze' and *dm* 'breathe', which participate in the illustrated alternations. Furthermore, these roots belong to a small class of verb roots (discussed in Chapters 2 & 3) which trigger the e~∅ alternation in prefixes and which for this reason are unusual. Finally, even if there were a rule to derive the nasal diphthongs from underlying vowel plus labial-nasal sequences, an additional rule would be needed to cause the /m/ to assimilate in place of articulation to a following stop (see 14c,d above). But, as we saw in §2, labial nasal stops never assimilate in place to following stops. Thus any rule that could be posited to derive the correct surface forms would go counter to the other rules of Polish. Given these considerations, Gussmann's argument in favour of underlying nasal stops is considerably weakened.

Nasal diphthongs are thus not derivable from vowel plus nasal stop sequences. Therefore the similarities in the behaviour of nasal diphthongs and [coronal] consonants with respect to assimilation and gliding must be

explained in some other way. In the next section I show that nasal diphthongs are placeless in underlying representations and that they are diphthongs rather than simply placeless nasal segments. In §4 I provide evidence that coronal consonants are also placeless when assimilation occurs, thus explaining the parallels between nasal diphthongs and coronal nasals.

3.2 Nasal Diphthongs are Unspecified for Place

The structure that I propose for nasal diphthongs is given in (15):



The structure in (15) represents the fact that nasal diphthongs always occur in the environment following mid vowels and that they take up more than one timing slot (measurements taken by Brooks (1968) suggest that, at least in word-final position, the mid vowel-placeless nasal sequences

(especially ϱ) are longer than oral vowels, and shorter than vowel plus nasal stop sequences). Postulating that the nasal part of a nasal diphthong is a placeless segment, specified only for nasality, represents the fact that the place of articulation of this nasal is predictable.

3.2.1 Predictability of Place of Articulation

As we have seen, the nasal member of the diphthongs surfaces in two forms: as a nasal stop homorganic to a following noncontinuant segment (e.g., *bwɔd* [bwɔnd] 'error', *bwɔdźić* [bwɔndźić] 'to err'), and as a labiovelar nasal glide [ɰ̃] (the glide may become palatal by means of a late rule spreading [-back]; I discuss this below). Since the labiovelar nasal glide surfaces both before continuants and word-finally, it can be considered to appear in the "elsewhere" environment. It is clear that the homorganic nasal stop alternant of the diphthong is derived by a rule which spreads Place of Articulation from the following noncontinuant and in this sense is predictable (see §5.3 for a statement of the rule by which Place of Articulation spreads). It is less clear that the labiovelar glide alternant must be derived by rule. Two sets of facts, however, indicate that this is indeed the case. First, Polish has no rule which deletes labiovelar place specifications, suggesting that these specifications are not present in underlying forms and, second, rules inserting labiovelar features are needed for deriving lateral sonorants as well as for deriving labiovelar nasal glides. I argue for the first point next.

If the labiovelar specification of the nasal diphthong were not derived by rule, then it would be necessary to assume that this specification was present underlyingly and that the second member of the diphthong was

specified [+back].¹³ Before noncontinuants the labiovelar specifications would need to be deleted in order to assimilate place of articulation features from the adjacent segment.¹⁴

Recall from §2 that although the coronal and prepalatal nasals can assimilate in place of articulation to following noncontinuants across word-boundaries, word-final nasal diphthongs never assimilate to following consonants in this environment (the examples in (16) are repeated from §2):

- | | | | |
|------|------------------|------------------------|-------------------|
| (16) | a. pan bug | [pam buk] | 'Lord God' |
| | b. on čeka | [oŋ čeka] | 'he waits' |
| | c. on k'eruje | [oŋ' k'eruje] | 'he drives' |
| | d. zagoń do domu | [zagojŋ do domu] | 'chase (it) home' |
| | e. tō taksuvkō | [toŵ taksuvkoŵ . . .] | 'by this taxi' |
| | | *[ton taksuvkoŵ . . .] | |

The lack of assimilation of the nasal diphthong to a following [t] in (16e) suggests that at the point at which phrase-level spreading of place applies, the word-final segments are fully specified for place of articulation features. This implies therefore that coronal place specifications can be deleted (as in (16a-d)) and hence trigger spreading of place from following noncontinuants, whereas dorsal specifications cannot

¹³ We know from independent evidence that labial specifications are not deleted before spreading applies, since in forms such as *kamtur* 'commander of Teutonic knights' (see (8) in §2) a labial nasal stop does not assimilate to a following noncontinuant. We also know that the diphthongs cannot have only labial specifications underlyingly since then they would be indistinguishable from labial nasal stops. I assume therefore that if they were underlyingly specified for place they would at the least have to be specified as [+back] and thus as dorsal (although they could also be [+round]). The evidence presented here suggests, then, that Polish has no rule of dorsal deletion, as well as no rule of labial deletion.

¹⁴ Alternatively one could assume that spreading of place of articulation from the noncontinuant to the nasal causes deletion of the place node dominating the labiovelar specification of the diphthong. I argue below that in Polish deletion of place precedes spreading of place. The point I am making here, however, applies to both possible versions of assimilation.

be deleted. Other arguments that deletion of [coronal] is indeed a rule of Polish are given in §5.

Assuming, then, that there is no rule that deletes dorsal specifications, and given that spreading of place to a nasal diphthong in word-internal position is obligatory, one can conclude that nasal diphthongs cannot be specified as dorsal (or dorsal-labial) in underlying forms. Notice also that they cannot be specified as coronal, because then they would not be distinguishable from coronal nasal stops in word-final position. One could assume that nasal diphthongs are distinguished from coronal nasals in underlying representation by means of the features [-consonantal] or [-continuant]. In the former case, the nasal diphthong would be specified as [-consonantal], while the coronal nasal would be either [+consonantal] or unspecified for [consonantal]. In the latter case, the nasal diphthong would be unspecified for continuancy, while the coronal nasal would be [-continuant]. In the case of both these segments, the values for [consonantal] and [continuant] which these segments take on are predictable from the context in which they appear. A nasal diphthong is [-consonantal] if it surfaces as a glide, and [+consonantal] if it takes on the place features of an adjacent nasal stop. A coronal nasal is [-continuant] except before a continuant segment, when it surfaces as a [+continuant] nasal glide. Assuming that either [-consonantal] or [-continuant] are underlyingly specified would therefore require us to postulate that rules delink these features in the appropriate environments (i.e., before nasal stops in the one case, before continuants in the other case) so as to allow the rule-governed values of these features to be derived. But such delinking rules are unnecessary on the assumption that nasal diphthongs are distinguished from coronal nasals in that the former are placeless, whereas the latter have a

coronal place specification. One can conclude, therefore, that the nasal part of nasal diphthongs are not specified for place in underlying forms, and that consequently they are placeless.

If this latter conclusion is correct, then the labiovelar specifications must be filled in by rule(s). In fact these rules seem to be default rules for placeless sonorants in general, since they are also needed to account for laterals. And this brings me to the second argument in favour of the hypothesis that the place specifications of the nasal part of a nasal diphthong are predictable.

One of the consonant alternations found in standard Polish involves the lateral represented orthographically as 'ł'. In the environment of following [-back] segments 'ł' is pronounced as a [-back] lateral [l'] or [l]; in all other environments it surfaces as the labiovelar glide [w] (e.g., [škowa] 'school', n.sg., [škole] d./l.sg. [škuw] 'g.pl.'; [b'awy] 'white, m.n.sg.', [b'al'i] 'm.n.pl.'). This lateral contrasts with another lateral-orthographic 'l'=[l]- which alternates only with [l'] (e.g., [fala] 'wave, n.sg.', [fal'i] 'd./l.sg.'). We know that 'ł' in underlying representations is not a labiovelar glide which is later specified as a lateral since, in Polish, underlying /w/ surfaces as a labial fricative, [f] or [v]. Evidence for this latter assertion comes from the behaviour of the labial fricative with respect to voicing assimilation.

Voicing assimilation in Polish is regressive for the most part as the examples in (17a-c) illustrate. In some cases, however, devoicing seems to spread progressively (17d-f):

- | | | | | | | |
|------|----|---------|------------|-----------------|-----------|-----------------|
| (17) | a. | ryb+a | 'fish' | ryb+k+a | [rypka] | 'dim.' |
| | b. | lic+y+ć | 'to count' | lic+b+a | [li'dźba] | 'number' |
| | c. | sklep | 'store' | skle[b] vażyvny | | 'greengrocer's' |

- d. l'istv+a 'board' l'istevek [l'istevek] 'dim.'
 [l'istfa]
- e. b'itv+a 'battle' b'itevny [b'itevny] 'adj.'
 [b'itfa]
- f. p'otž+e¹⁵ 'Peter,voc.' P'otr [p'otr] 'Peter'
 [p'otše]

Booij and Rubach (1987) claim that Polish has two rules of voicing assimilation, one which is regressive and accounts for the first three examples in (17), and another of progressive devoicing (which they formulate as applying in feature-changing fashion to fricatives). Mascaró (1987) shows that if one assumes a) that voicing assimilation applies before the default value of [+voice] is assigned to sonorants, and b) that [f/v] in (17d,e) are underlyingly /w/ and hence sonorants (an assumption that is justified on historical grounds within Slavic), then the rule of progressive devoicing becomes a feature-filling rule which spreads [-voice] from an adjacent obstruent. Since /r/ is also a sonorant it undergoes the same kind of progressive devoicing as does /w/. Notice that in (17c) [v] spreads the feature [+voice] to the preceding obstruent. This follows on the assumption, argued for above, that when phrase level rules apply, all segments are fully specified.

If 'ʃ' is not labiovelar underlyingly, then this suggests that it receives its labiovelar specifications by rule. The question then is what is the underlying representation for this segment. 'ʃ' functions like a coronal in its palatalizing properties. For instance, an 'ʃ' which has been palatalized by rule triggers Palatal Assimilation of a preceding coronal fricative (e.g., *v'ista* 'Vistula, n.sg.', *v'is'e* 'd./l.sg. '; see Chapter 2, §2.5.1 for examples of

¹⁵ The output of the application of a palatalization rule to /r/ is /ž/.

Palatal Assimilation). Since all the other cases in which Palatal Assimilation takes place involve only clusters of (palatalized) coronal segments, we can assume that 'ʃ' is coronal. As I argue below the coronal place of articulation is more easily delinked than are other places of articulation. As a coronal lateral, then, 'ʃ' loses its place of articulation and its lateral specification in all environments except palatalizing environments.¹⁶ As a placeless sonorant segment 'l' receives its place features by insertion of labiovelar specifications. 'l' functions together with the prepalatal coronal consonants in that it always requires a [-back] high vowel to follow it (e.g., cf. *košul'+l* 'shirt, g.sg. ~ *košul'+a* 'n.sg. '; *smoť+y* 'coal tar, g.sg' ~ *smoť+a*). This indicates that 'l' is a coronal-dorsal segment. The two laterals are thus distinguished from one another in that one is a simple coronal, while the other is a coarticulated [-back] dorsal and coronal segment.

Rules that insert labiovelar specifications thus seem to be needed to account for both laterals and for nasals. We can thus safely conclude that the nasal member of the nasal diphthong is unspecified for place at the underlying level and that it receives place features either by spreading of Place of Articulation triggered by a following noncontinuant, or by rules

¹⁶ The fact that [lateral] is deleted along with [coronal] suggests that Steriade (1986) and Sagey (1985) are correct in postulating that [lateral] is dominated by the coronal node. However, evidence from other Polish dialects suggests the opposite. In some Polish dialects, the coronal lateral is pronounced as a dark-*l* rather than as a labiovelar glide in nonpalatalized environments. Dark-*l* is dorsal [+back]. Now, if one assumed that [lateral] is not under the coronal node, then one could account for the dark-*l* pronunciation by postulating that in this case, as in the case of the labiovelar-*l* dialects, a coronal place node is deleted and a dorsal [+back] feature is inserted, but that the lateral feature is not deleted. The difference between the two dialects, then would be in the deletion of [lateral]. As indicated in Chapter 1, I assume here that lateral is a stricture feature and is not situated under the coronal node. This question requires further investigation. What is clear from the behaviour of the lateral, however, is that placeless sonorants predictably become labiovelar glides.

which apply to placeless sonorants. Notice that this kind of analysis is possible only within a framework which assumes both that distinctive features are organized into ordered sets which constitute natural groupings of the features and that predictable feature specifications need not be present at the underlying level.

3.2.2 Nasal Diphthongs as Vowels

Nasal diphthongs undergo two types of phonological processes which affect vowels.

As we saw in Chapter 3, Polish has the alternation between e~o seen in (18). It occurs in the environment of a preceding palatalized consonant and a following coronal consonant; when the coronal is palatal(ized) [e] occurs, when it is not, [o] occurs:

(18)	a.	ańow	'angel'	ańel+e	'l.sg.'
	b.	čow+o	'forehead'	čel+e	'l.sg.'
	c.	ńeb'os+a	'heavens'	ńeb'eś+ex	'l.pl.'
	d.	żow+o	'herb'	żel+ńik	'herb book'
	e.	kam'on+k+a	'stoneware'	kam'eń	'stone'

In a small set of cases, an underlying nasal diphthong followed by a coronal segment undergoes the e~o alternation:

(19)	a.	pami'ot+k+a	'souvenir'	pami'ęc	'memory'
	b.	ćel'ot+k+o	'calf, dim.'	ćelę	'calf'

This suggests that because the nasal diphthongs are nuclei in which the mid vowels are heads, they function like vowels. This hypothesis is supported by the fact that the diphthongs undergo an alternation, exemplified in (20), which is similar to other vowel alternations in that it is a phonologically triggered ([ɔ] in this alternation is found only in closed syllables, [ɛ] occurs in open syllables), but lexically-conditioned alternation:

(20)	a.	bwɔd	'mistake'	bwɛd+u	'g.sg.'
	b.	zɔb	'tooth'	zɛb+a	'g.sg.'
	c.	śv'ɔt	'holiday,g.pl.'	śv'ɛt+o	'n.sg.'
	d.	kśɔg	'book, g.pl.'	kśɛg+a	'n.sg.'

Furthermore, in the verb system, the nasal diphthong that occurs in the Class 6 verbalizing suffix *-nɔ*, undergoes the rule of Vowel Delinking (e.g., *kżyk+nɔ+e+ś* 'shout, 2nd sg.' → *kżykńeś*), and triggers j-formation.

In this section we have seen evidence that the nasal diphthong contains a placeless nasal segment in underlying representation and that it functions like a vowel. I turn now to a discussion of the underlying representations of nasal stops, beginning with prepalatal nasals.

4. Prepalatal Nasals

As we saw in the examples in (9) in §2, when the prepalatal nasal undergoes decomposition into two segments, the second of which is a nasal segment, the kind of assimilation which the nasal segment can undergo is identical to that undergone by a coronal nasal (e.g., *barńka* 'can' [bajŋka],

etc.). This suggests that the prepalatal is actually a complex segment with a double coronal-dorsal articulation, and that it is the coronal articulator which takes part in the assimilation rule, while the dorsal [-back] articulation remains unassimilated. Evidence that all prepalatals are coarticulated segments comes also from other cases of decomposition; as the examples in (21) show, one of a pair of adjacent (almost) identical stridents is subject to a deletion rule which is obligatory word-internally and optional post-lexically:

- (21) a. /v'eš+sk+i/ [v'ejski] 'rural'
 b. /šešć+set/ [šešset, šejset, šejset] 'six hundred'
 c. /ńegdyś šedł/ [ńegdyjšed] 'once, he walked...'

Sagey (1986) argues that complex segments have unordered or simultaneous articulations. Since the [-back] dorsal specification of the prepalatals has both leftward and rightward effects—in /tań+i/ 'cheap', for example, the prepalatal nasal ensures that the vowel [i] to its right remains [-back] and is not retracted to [y] (i.e., [tańi]), while in decomposition the dorsal features attach to the left—this is further evidence that they are complex, coarticulated segments. Interestingly enough, it appears that both of the articulators are primary, or major (Sagey 1986).¹⁷ Historically, prepalatal segments derive from palatalized dentals; hence, one would expect that synchronically the coronal articulator is the major articulator. The fact that in normal or *lento* speech (before Decomposition has applied since it is a rule of casual or faster speech) the

¹⁷ Sagey (1986) defines a "major" articulator in a segment as "an articulator to which the phonological degree of closure features of the segment apply" (p. 203).

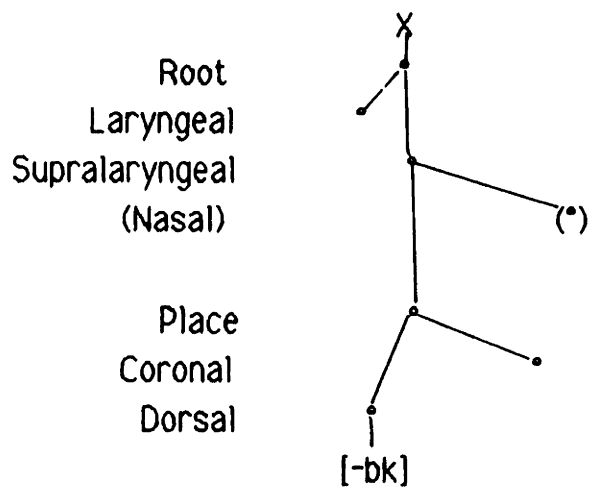
prepalatal nasal, unlike the coronal nasal, does not obligatorily assimilate to a following noncontinuant suggests that coronal is not the (only) major articulator. If it were, then one would expect the prepalatals to behave like all other coronals and thus to obligatorily undergo delinking of the coronal node.

Given that prepalatals are [-back] dorsal-coronal coarticulated segments (and regardless of which articulator is major), both the dorsal and the coronal articulator must be specified in underlying representations. The [-back] dorsal feature, and hence the dorsal node, is unpredictable and marked and must therefore be specified. Coronal must also be specified because without its specification there would be no way to indicate that the segment is coarticulated.¹⁸ The underlying representation for a prepalatal segment is thus as in (22), where the parentheses around Nasal indicate that prepalatals need not be nasal segments:¹⁹

¹⁸ Sagey (1986) indicates major articulators by means of pointers which represent the relations between the degree of closure features and the major articulator(s). Assuming both articulators in a prepalatal segment are major, one could imagine that the segment in underlying representation has two pointers but that only the dorsal value of the segment is specified. Since, however, a pointer represents a relation between degree of closure and an articulator, and since a relation presumably can hold only between at least two elements, it is difficult to see what a pointer pointing to nothing could mean. It therefore seems that both articulators do indeed have to be specified underlyingly.

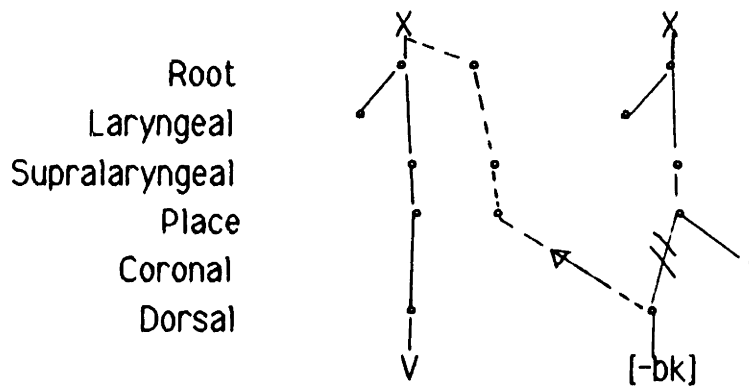
¹⁹ Catalan has a palatal nasal which undergoes the same kind of decomposition found in Polish. Bonet (1987) suggests, as I do here, that the Catalan process of decomposition indicates that palatal nasals in Catalan are coarticulated coronal-dorsal segments. See also Mascaró (1986) for a discussion of Catalan palatals.

(22)



I suggested above that in *lento* speech, when Decomposition has not applied, the prepalatal is not treated as a coronal segment and does not undergo assimilation to a following stop. If this is correct, then clearly the rule of assimilation affects only coronal nasals (we have already seen that labials do not assimilate); since assimilation does occur after Decomposition, then Decomposition must remove the dorsal articulator from the coarticulated prepalatal, leaving the coronal articulator behind. At this point, the coronal derived from a prepalatal and the underlying coronal are identical (this is justified in more detail in §5). Therefore they behave in the same way. The rule of Decomposition is given in (23) (see Mascaró 1986 for an analysis of palatal decomposition in Catalan):

(23) Decomposition



Notice that this rule, rather than simply delinking the dorsal specification of the prepalatal, both delinks the dorsal node and spreads it leftwards, creating a palatal diphthong. Since, by definition, the vowel already has a dorsal node of its own (see Sagey 1986), the only way that the dorsal node from the prepalatal can dock onto the preceding vowel is by generating its own place node which in turn generates a supralaryngeal node and a root node (node generation is discussed in Archangeli and Pulleyblank, in prep.). The diphthong created by Decomposition is a contour segment involving sequences of articulations, and thus contrasts with the complex coarticulated prepalatal segments. Decomposition must be ordered before rules which cause coronal consonants to assimilate to following consonants. The ease with which coronals are affected by assimilation rules is discussed in §5.

5. Coronal Nasals

The fact that coronals and not labials or prepalatals lose their place specifications and assimilate to following noncontinuants is not a

phenomenon peculiar to Polish. Word-internally in English, for instance, we always find labial and velar nasals unassimilated to following stops (e.g., *Camden, Tomkins, [æŋma], Langdon*), but we rarely find cases of unassimilated coronals.²⁰

In Central Catalan the coronal (dental and alveolar) stops and nasals, but not the labial or velar ones, assimilate in place to a following consonant (examples are from Mascaró 1987):

- (24) a. se[t] se[b b]eus se[d d]ones se[ʎ ʎ]adres se[k k]osins
 'seven' 'voices' 'women' 'thieves' 'cousins'
 b. re[p] re[b b]eus re[b d]ones re[b ʎ]adres re[p k]osins
 's/he receives'
 c. di[k] di[g b]eus di[g d]ones di[g ʎ]adres di[k k]osins
 'I say'
 d. só[n] só[m b]eus só[n d]ones só[n ʎ]adres só[n k]osins
 'they are'
 e. só[m] só[m b]eus só[m d]ones só[m ʎ]adres só[m k]osins
 'we are'
 f. ci[ŋ] ci[ŋ b]eus ci[ŋ d]ones ci[ŋ ʎ]adres ci[ŋ k]osins

Mascaró (1987) claims that assimilation affects the coronals because their place of articulation is unmarked, and that this follows from the general observation that consonants of any class can assimilate most properties except those they are marked for (or that are incompatible with them). Thus he argues that since nasals are marked for nasality they do not lose this property, but can assimilate in place, laterals can become palatal, dental or nasal, and so on.

²⁰ I am indebted to Morris Halle for these examples.

In some dialects of Spanish nasals in codas regularly lose their place features. If they are followed by an obstruent, the placeless nasals become homorganic to the obstruents (25a); if, however, no obstruent follows, then coronal is inserted (25b):

- (25) a. impio 'impious' b. desden 'disdain' (cf. desdej-a
 indigno 'undignified' 'disdairi-vb')

I propose that the susceptibility of the coronal nasal of Polish to assimilation and gliding, and the comparative inertness of the labial and prepalatal nasals can be attributed, as in Spanish, Catalan and English, to the unmarked, and therefore default, status of the coronal place of articulation.

5.1 Coronal as Unmarked

Recent work in underspecification theory has suggested that default values of features, or terminal nodes in feature hierarchies (see Clements 1985, Sagey 1986, Archangeli and Pulleyblank, in preparation) are unspecified in underlying representations, and that their values are filled in by universal or language-specific redundancy rules. Mascaró (1987) has argued, for example, that such differences in voicing assimilation as that in some languages voicing is triggered by sonorants (e.g., Cracow Polish), whereas in other languages it is not (e.g., Warsaw Polish), can be explained by ordering voicing assimilation after default assignment of [+voice] to sonorants in the former case, and before the default voice assignment in the latter case. Similarly, Pulleyblank (1988) shows that the asymmetric

behaviour of the default vowel [i] in Yoruba with respect to rules such as regressive spreading of vowel features is a result of the fact that [i] is unspecified for the relevant features when the rules apply.

Given the evidence that default underlying feature values are unspecified, one could assume that default place specifications (or non-terminal nodes) are also unspecified. In the case of Polish such an assumption would mean that the coronal nasal would have no place specifications.

In this section I provide two arguments showing that [coronal] must be specified in underlying representations in spite of the fact that it is the unmarked place of articulation in Polish. The first argument comes from the processes of phrase-level spreading of place to coronals, and from the underlying representation of prepalatal segments.

If the coronal nasal stop were in fact placeless in underlying representations, then there would be no need to postulate a rule to delete coronal specifications (such a rule could either precede Spreading and thus trigger Spreading, or it could be triggered by Spreading to a coronal). However, as it turns out, such a rule is needed independently in Polish to account for the nasal assimilation which takes place after prepalatal Decomposition, and for the assimilation of coronals to following obstruents across word-boundaries. In the first case, as I argued in §4, the prepalatal nasal is specified as both dorsal and coronal underlyingly. Therefore after decomposition, at a point before or at which Spreading of place of articulation occurs, the nasal segment which is to be the target of the assimilation rule has a [coronal] node which must be deleted. As far as phrase-level place assimilation is concerned, recall that the reason why nasal diphthongs in word-final position do not undergo assimilation to

following noncontinuants is because at the phrasal level they are fully specified as labiovelar glides. If glides are fully specified at this level, then presumably all nasal stops are also. Thus in order for coronal nasal stops to undergo assimilation at the phrase level, the [coronal] specification must be deleted.

Given this independent motivation for coronal-deletion, postulating that coronals have a tendency to assimilate because they lack place specifications in underlying representations is not necessarily a better explanation of the Polish facts than postulating that coronals are specified underlyingly and lose their place features.

The second argument that [coronal] is present underlyingly comes from the application of redundancy rules. If [coronal] were not present underlyingly, then it would have to be inserted by means of a redundancy rule, after all phonological rules providing place of articulation features to placeless nasals had applied. In §3.2.1 I concluded that Polish has another redundancy rule which applies to placeless sonorants: namely, a rule inserting labiovelar specifications. This rule derives both labiovelar nasal glides from placeless nasals and labiovelar oral glides from placeless laterals. Postulating that both rules (i.e., insertion of coronal and insertion of dorsal/labial features) are active in Polish leads to a problem, however. The structures to which a coronal redundancy rule would apply are identical to those to which the labiovelar rule applies. Consequently, depending on which rule would be ordered first, that rule would assign features to all placeless sonorants, and therefore would yield either all coronal segments or all labiovelar segments, obviously an incorrect result. One could hypothesize that coronal place insertion was limited to nasal segments, thus perhaps preventing its application to placeless laterals, but even in

this case whichever redundancy rule applied first would apply both to the placeless nasal segment of the nasal diphthong and to the placeless nasal segment purportedly underlying the coronal nasal stop. It might be possible to play around with the underlying representation of the coronal nasal stop to distinguish it from the nasal diphthong's placeless nasal (e.g., one could assume that the nasal stop, though placeless, was specified as [-continuant]; this might present a problem as well, though, given that stricture features seem to be dependent on place features (see Fn.18); if [-continuant] were specified underlyingly on a placeless segment, then there would be no place node that the [cont] pointer could point to). Since a rule of coronal deletion is needed in any case for Polish, it is much simpler to assume that the [coronal] is specified underlyingly for all nasal stops and in this way to avoid the problem of conflicting redundancy rules. Notice in addition that nonnasal obstruents must be underlyingly specified as coronal, since if they were not, then when Spreading applies (before the redundancy rules) they would have no features to spread. As coronal does spread, along with labial and dorsal features (see §2), it clearly is present in obstruents, and thus it must be present in nasals as well.

5.2 Coronal Deletion

The question that must now be answered is whether the rule which deletes [coronal] is independent of, and ordered before, the Spreading rule, or whether delinking of [coronal] is a result of Spreading. If the latter were correct, then Spreading of place features would have to be sensitive to the coronal specification of the nasal preceding it and would thus be a feature-changing rule. Since it applies to the placeless nasal segment which is part

of the nasal diphthong, however, we already know that it can apply as a feature-filling rule. I suggest therefore that, rather than having Spreading apply in both feature-changing and feature-filling fashion, we assume that it is only feature-filling. This implies that coronal deletion is independent of Spreading. The rule of Coronal Deletion is given in (26):

(26) Coronal Deletion

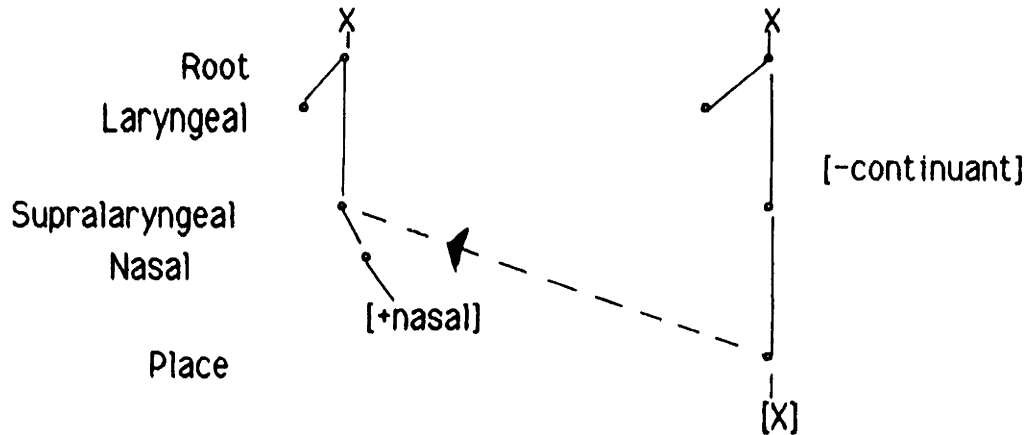


(26) states that [coronal] is deleted if it occurs in a syllable Rhyme.

5.3 Spreading

After the application of Coronal Deletion, the placeless, formerly coronal, nasal and the placeless nasal segment of the diphthong are targets for the rule which spreads place of articulation. This rule is given in (27):

(27) Spreading-Place

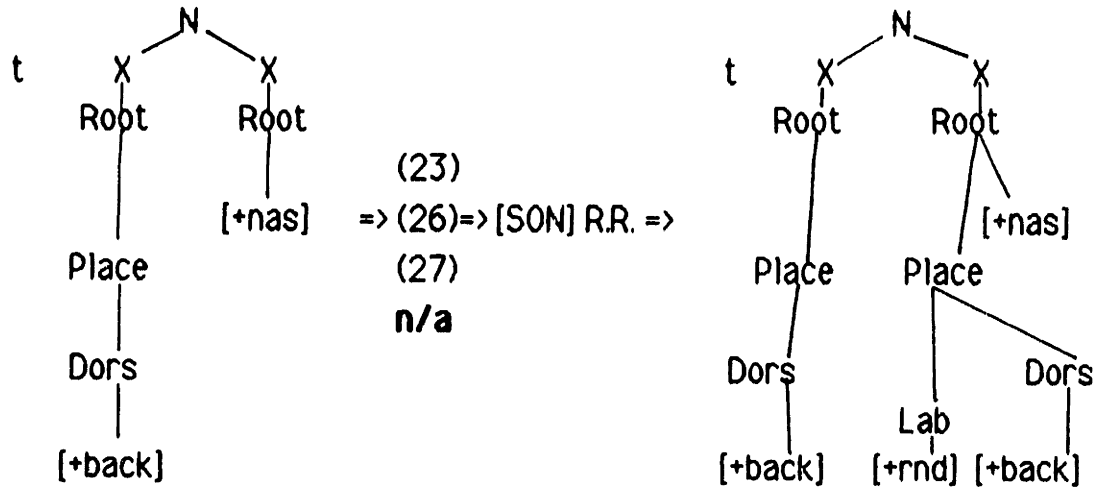


(26) states that a [-continuant] segment spreads its place of articulation features by spreading its Place node leftwards onto a placeless nasal segment. This rule must refer to the noncontinuant status of the triggering obstruent, since it does not apply when the obstruent following the placeless nasal is continuant.

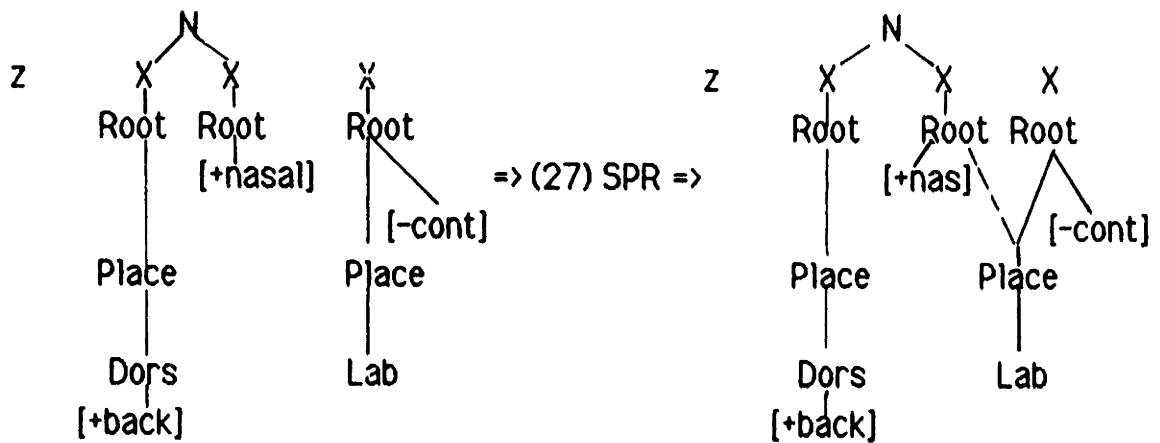
So far I have proposed four different rules to account for nasal processes in Polish: (23) Decomposition, (26) Coronal Deletion, (27) Spreading-Place, and the sonorant redundancy rule which provides placeless sonorants with labiovelar specifications (discussed in §3.2.1). The order in which the rules apply is reflected in the order in which they are listed. These rules account for the decomposition and subsequent assimilation to a following noncontinuant of the prepalatal nasal, assimilation to a noncontinuant of a coronal nasal, and the word-final surfacing of the nasal diphthong as a labiovelar nasal glide. It remains still to account for word-internal labiovelar and palatal nasal glides, and for the behaviour of the labial nasal. Before discussing these processes, I provide sample derivations illustrating the application of the rules (only nodes relevant to

the derivations are represented in (28); recall that [nasal] is actually under the supralaryngeal node):

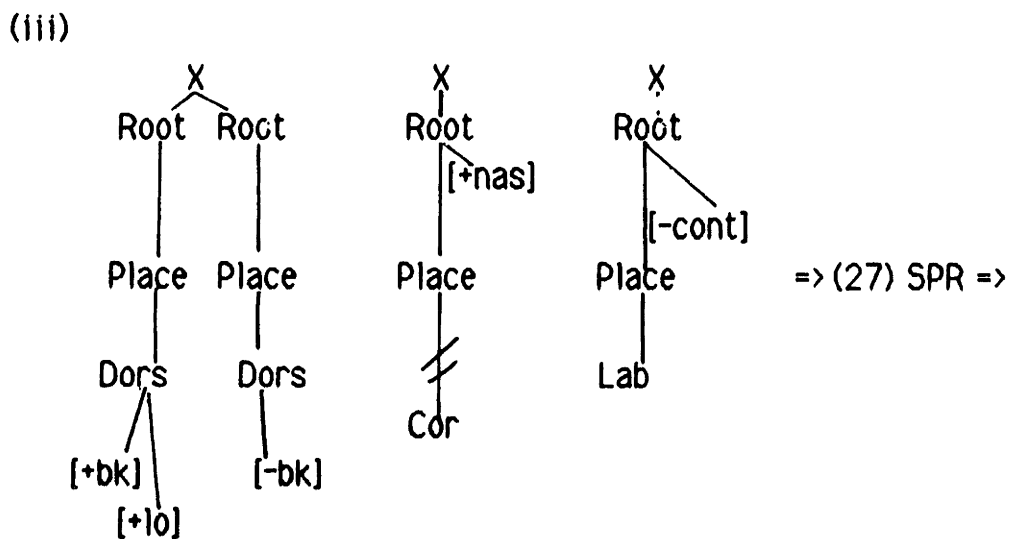
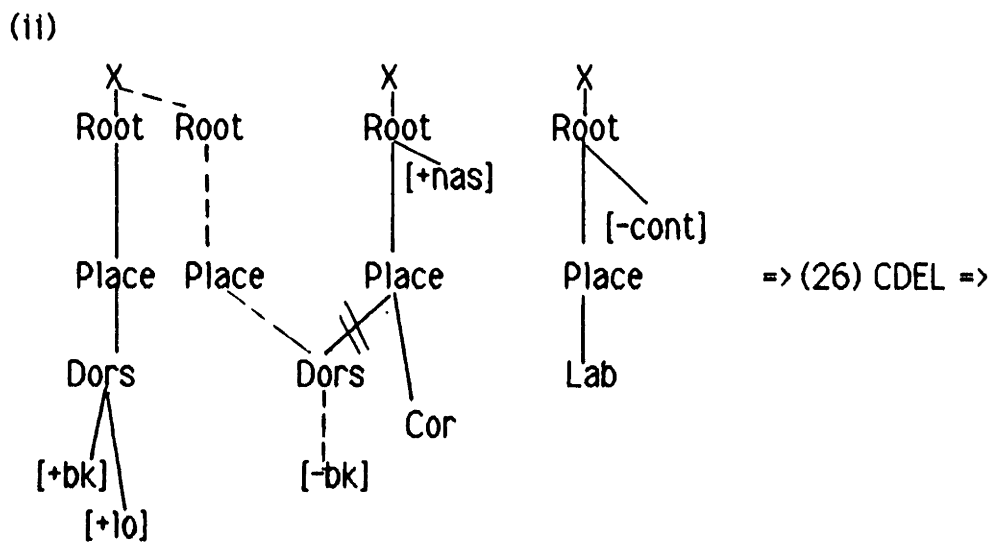
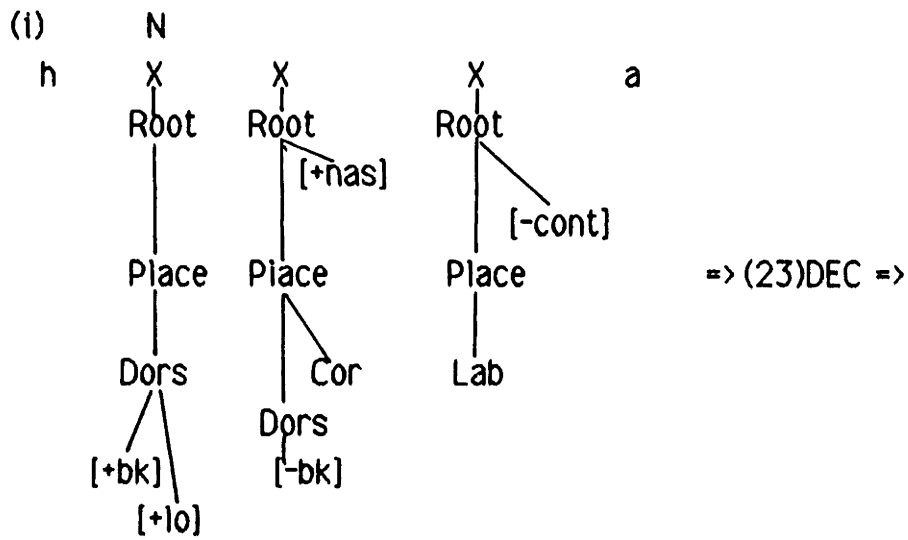
(28) a. /tq/=[tõ]



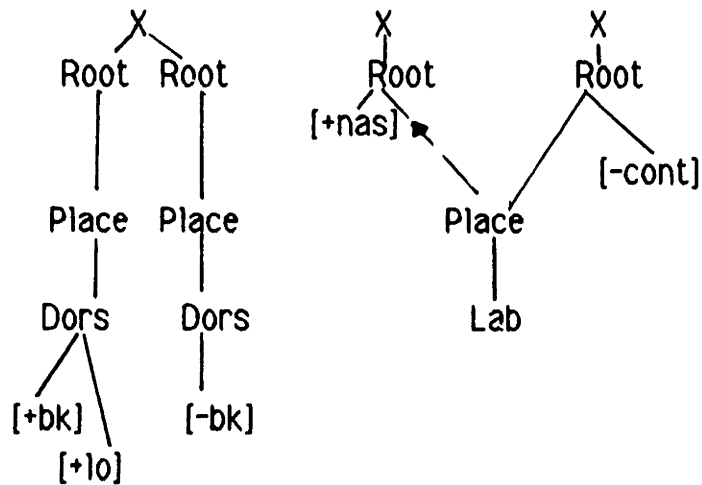
b. /zqb/=[zomb]



c. /haŋba/=[hajmba]



(iv)



6. Labial Nasals

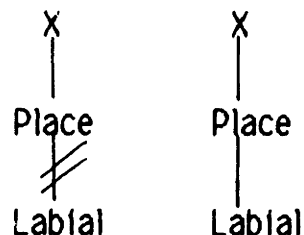
In §2 we saw that labial nasals never assimilate in place of articulation to following noncontinuants (e.g., *komtur* 'commander of Teutonic knights'), but they do become nasal glides in fast speech if followed by a homorganic labial fricative (cf. *tramvaj* [traʋaj] 'tram', but *xamski* [xamski] 'boorish'). In contrast, coronal and prepalatal nasals become glides in fast speech regardless of the place of articulation of the following continuant (cf. *šansa* [šaʋsa] 'chance'; *konvuž* [koʋvuž] 'convoy'; *on xce* [oʋxce] 'he wants'; *koŋiski* [koŋiski] 'horse-like'). In both cases, in fast speech the gliding of the stops is obligatory. In the case of nasal glides derived from underlying nasal diphthongs, glides are obligatory word-internally before continuants and word-finally.

The lack of assimilation of a labial nasal to a following noncontinuant was attributed above (§5.1) to the fact that [labial] has a relatively marked status as a place of articulation. Since labials do not assimilate to coronal

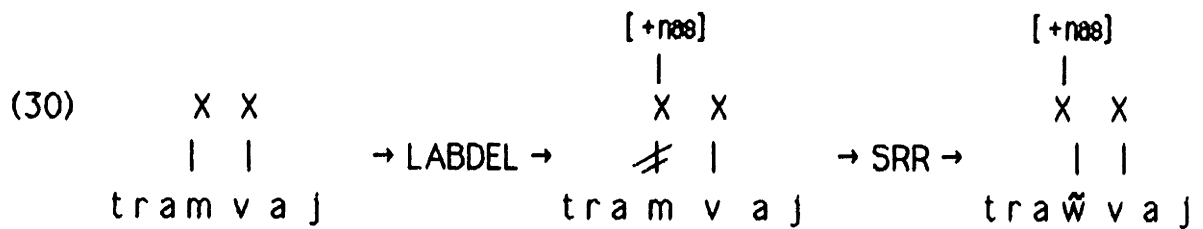
or prepalatal noncontinuants as coronals do, one can conclude that there is no rule of [labial] place-deletion in Polish which would function similarly to Coronal Deletion and would delete the [labial] node of a segment situated in a syllable Rhyme. The fact that labial nasal do become nasal glides before labial noncontinuants, however, indicates that there must be a rule that deletes [labial]. Given that labials lose their place nodes only in the environment of following labials, I suggest that the [labial] deletion rule is triggered by the Obligatory Contour Principle: when two labial nodes are adjacent to each other, the Obligatory Contour Principle causes the first or leftmost labial place specifications to be deleted.²¹ The placeless segment that results from the [labial] place node delinking, either gets labial features from the following noncontinuant labial by the rule of Spreading, creating a linked labial segment, or if the following labial is a continuant, the usual sonorant redundancy rules supply the placeless segment with labiovelar features.

The Labial Deletion rule is stated in (29); the derivation of *tramvaj* [traʋaj] 'tram' is given in (30) in a simplified form:

(29) Labial Deletion



²¹ McCarthy (1986) states the Obligatory Contour Principle (OCP) as follows: "At the melodic level, adjacent identical elements are prohibited." See also Leben (1973), Yip (1988) and references therein.



7. Palatal Nasal Glides

One final autosegmental process is needed to account for Polish; this is a rule fusing two glides.

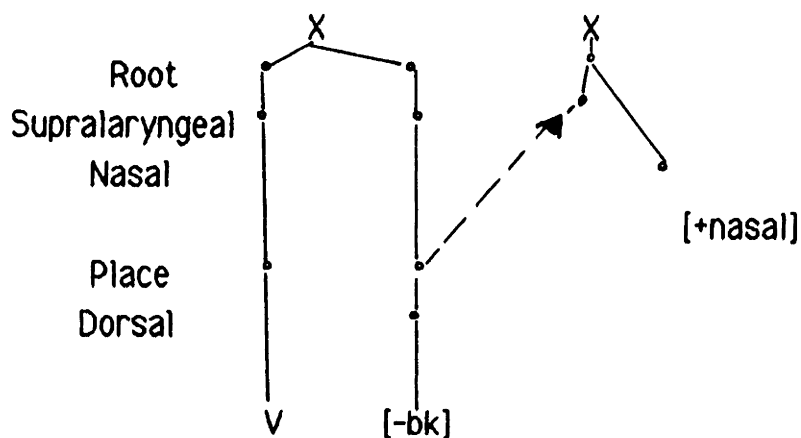
Prepalatal nasals, as you will remember, surface as palatal nasal glides, whether they are underlying as in (31a,c) or derived (31b):

- (31)
- | | | | | |
|----|-----------|---------|--------------------|------------------|
| a. | koń+sk+i | | [kɔ̃]ski] | 'horse-adj.' |
| b. | pan+stv+o | państwo | [pã]stvo] | 'state' |
| c. | koń xce | | [kɔ̃] xce] | 'horse wants' |
| d. | sens+e | sensé | [se ʍ̃́se~sẽ]́se] | 'sense, loc.sg.' |

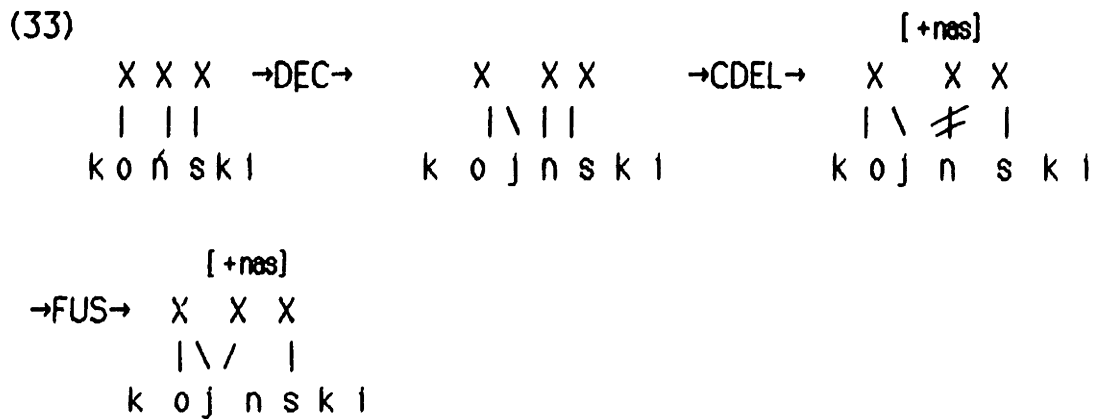
The [-back] quality of the nasal glides is not a result of spreading of [-back] from a following segment. In (31a,b) the affixes *-sk-*, *-stv-o* are palatalizing but, as we saw in Chapter 3, this property is independent of their phonological form. In (31c), the word *xce* 'wants' cannot be considered to spread [-back] and yet a palatal nasal glide appears. (31d) shows that when [-back] does in fact come from a following segment (in this case it comes from [ś] derived from /s/) the palatalization of the glide is optional. When [-back] derives from a prepalatal nasal, as in (31a-c), the glide is obligatorily palatal. Thus the palatal nasal glide derives its [-back] specification from its own dorsal node. I have argued above, however, that

in order for the prepalatal to become a nasal glide, it must first undergo Decomposition and Coronal Deletion. This suggests, then, that the [-back] quality of a palatal nasal glide derived from a prepalatal nasal arises as a result of the fusion of two glides, the [-back] dorsal glide linked by Decomposition to the preceding vowel, and the placeless nasal glide created by Coronal Deletion:

(32) Fusion



This rule takes the place specifications of the palatal glide and combines them with the [+nasal] specification of the placeless nasal. I have schematized it in (32) as a spreading of the place node of the palatal glide to the placeless nasal. The derivation of a form such as (31a) thus involves several steps: first, the underlying prepalatal nasal undergoes Decomposition; second, the coronal nasal is deleted by Coronal Deletion; third, the [-back] dorsal specification on the diphthong derived by Decomposition spreads onto the placeless nasal as a result of Fusion:



8. The Noncyclic Component

This completes my discussion of the autosegmental rules needed to account for the nasal vowels and nasal processes of Polish. The order of the rules is given in (34):²²

- (34) (23) Decomposition
 (26) Coronal Deletion
 (29) Labial Deletion
 (27) Spreading-Place
 (32) Fusion
 Sonorant Redundancy Rules

²² In addition to the rules in (34) there are three fast-speech rules which apply only in word-final position. It is only in quite deliberate speech that word-final occurrences of the nasal diphthong are pronounced as [oŋ] or [eŋ]. More frequently, in fast speech [oŋ] is heard as [ow], whereas [eŋ] may be either [ew] or [e]. Polish thus has rules which delete the nasal feature, and/or the glide portion of the nasal diphthong. In addition, in some cases [oŋ] and [eŋ] are actually pronounced as [om] or [em] (Rubach (1984; p. 162 Fn. 13) points out that this pronunciation is not accepted in prescriptive descriptions of Polish, and is found more often in the speech of less-educated Poles). A phrase-level rule inserting [-continuant] could account for this pronunciation.

The examples in this chapter have illustrated that all the rules in (34) apply within words and between words. Within a model of phonology such as that adopted in this thesis, there are two possible explanations for the fact that the rules apply both within and between words: either the rules are all ordered in the phrase-level component of the grammar, or they are ordered both in the word-level component and the phrase-level component. The word-final behaviour of the nasal diphthong indicates that the latter hypothesis is correct. Recall from §3.2.1 that although coronal and prepalatal nasals can assimilate in place of articulation to following noncontinuants across word-boundaries, word-final nasal diphthongs never assimilate to following consonants in this environment (cf. *pan bug* [pam buk] 'Lord God'; *tə taksuvkə* [tõ taksuvkõ] 'with this taxi', *[ton taksuvkõ]). These facts indicate that at the point at which the phrase-level Deletion and Spreading rules apply, the nasal diphthong is already fully specified as a labiovelar glide. Therefore, the Sonorant Redundancy Rules must have already applied by the time the phrase-level nasal processes are activated. Furthermore, the Sonorant Redundancy Rules must be ordered after all the word-level applications of nasal deletion processes, since they apply to the outputs of these processes, and after word-level Spreading, since Spreading bleeds them (i.e., since Spreading supplies place features, segments affected by Spreading cannot be inputs to the Sonorant Redundancy Rules). So the Redundancy Rules are sandwiched between the word-level nasal processes and the phrase-level processes and could, in principle be ordered either at the end of the word-level component or at the beginning of the phrase-level component. Since Redundancy Rules also apply to the outputs of phrase-level Coronal and Labial Deletion (before continuants the outputs of Deletion rules become nasal glides; e.g., *tam valə* [tã val̃] 'they

are banging there), they must be ordered after the nasal processes at the phrase-level. This suggests, then, that they are also ordered after the nasal processes at the word-level and that we have two parallel sets of rules, applying in two different components: at the word-level and at the phrase-level. At the word-level, all the nasal processes apply noncyclically. This is clear from the observation that they consistently apply both morpheme-internally and in morphologically derived environments (cf. *swońc+a* 'sun, g.sg' → [swɔŋ̃nca] and *gońc+a* 'runner, g.sg.' → [goŋ̃nca]).

The nasal processes are not the only processes in Polish that reveal a distinction between word-level and phrase-level application of rules. In Chapter 3, §2.1 (and also in Chapter 2, §2.5) I discussed the rule of Surface Palatalization which applies at the phrase-level in the environment of the [+high,-back] vowel or glide. This rule is bled by a rule which applies in the noncyclic component, namely, the rule which retracts /ɪ/ to [y]. Examples of Surface Palatalization are given in (35) (examples are taken from Rubach 1984), examples of forms in which Retraction has occurred are given in (36). Retraction is not a phrase-level rule, since it does not apply between words:

- | | | | |
|------|----|-----------------|-------------------------|
| (35) | a. | xwop' idże | 'the farmer is walking' |
| | b. | pas' jest | 'the belt is' |
| | c. | brat' i siostra | 'brother and sister' |
| | d. | s'inus | 'sinus' |
| | e. | zobač' je | 'see them' |
| | f. | dż'insy | 'jeans' |
| (36) | a. | być | 'to be' |
| | b. | optyrn'ista | 'optimist' |
| | d. | šynka | 'ham' |

Since Retraction is a noncyclic rule, it applies to most word-internal instances of /i/ following consonants which are not [-back], both in nonnative (36b,c) and native (36a) words. Retraction does not affect word-initial underlying /i/. Consequently in most cases the environments in which Surface Palatalization can apply are created by juxtaposition of two words, the second of which has an initial unretracted /i/. In some nonnative words, however, Retraction is blocked from applying (e.g., 35d,f). In these cases, Surface Palatalization applies within words.

In addition to the nasal processes and Retraction, the noncyclic component contains redundancy rules such as those which supply [±Lower Incisor Cavity] to coronal segments (see Chapter 1, §3, Chapter 3, §1). The phrase-level component also contains various cluster simplification rules (see Rubach 1977a) such as those in the following example: /šeś set/ → [šeś set] → [še]s set] → [še]set].

I mentioned above that the rule of Labial Deletion occurs only in fast speech. An examination of nasal processes in Polish reveals (at least) three different speech rates, each with its own rules: 1) slow speech permits no Decomposition of prepalatal nasals, does allow coronal deletion and spreading of place, and does allow the redundancy rules (in other words, in slow speech only underlying nasal diphthongs and underlying coronal nasals can undergo assimilation in place of articulation);²³ 2) casual speech

²³ In slow speech, coronal nasals do not become nasal glides in the environment of following continuants. However, if coronal deletion were obligatory in slow speech as I suggest here, then one would predict that coronal nasals would always surface as nasal glides before continuants. Conversely, in all but very slow speech coronals do assimilate to following stops (e.g., /cynk/ is almost always pronounced with a velar nasal, and there are no examples of *nb* clusters). This discrepancy in the behaviour of coronals is just one example of the way rules apply differently at different tempos of speech. Another example also involves assimilation before continuants: in casual speech, rather than finding the expected nasal glides in the environment of continuants, we can find nasal stops homorganic to the following continuant (Rubach 1977a). This suggests that in

allows Decomposition in addition to the other rules found in slow speech (prepalatals can thus also assimilate); and 3) fast speech allows all the rules allowed in the two slower rates as well as Labial Deletion (labials as well as coronals, prepalatals and nasal diphthongs can become nasal glides).

It is interesting to note that regardless of the rate of speech at which they apply, all the processes which affect nasals in Polish apply both within words, and across word-boundaries. This suggests that the organization of rules into cyclic, noncyclic, word-level and phrase-level, is independent of speech rate.

casual speech continuants may spread their place features, but not their continuancy features, to preceding placeless nasals. The three different speech rates postulated here thus represent a simplification of the facts. More work remains to be done on the relationship between rule application and tempo and style of speech.

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