

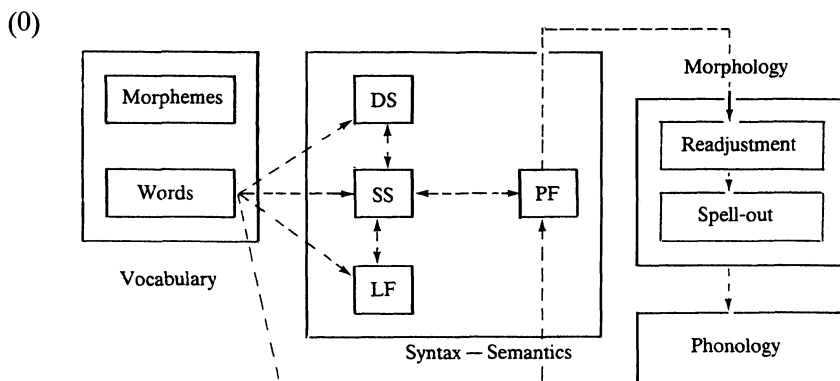
The Latvian declension*

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1. INTRODUCTION

In this paper I examine in some detail the declension of Latvian nouns and adjectives in the light of a descriptive framework for morphology that I have developed in a number of recent papers (Halle 1990a, 1990b). The data examined provide clear evidence for the need to distinguish gender from inflection class, a distinction that is also supported by the facts from other languages reviewed in this volume in the papers by Harris, Hoberman, and Aronoff. In addition — and perhaps more importantly — the Latvian facts illuminate the central role played in the morphology by — what I have called — *abstract morphemes* and shed interesting new light on the ordering of rules, in particular, on the issue of disjunctive rule order and default rules.

The flow chart in (0) represents the major components of the framework and their interrelations.



The morphology portion of the framework represented by the two blocks on the right of (0) is in the main a formalization of the traditional view that words are composed of one or more morphemes and that pluri-morphemic words have the familiar nested constituent structure. The framework treats each morpheme as a complex symbol consisting of an identifying index paired with a set of markers representing the grammatical and semantic properties of the word. Although at first sight this may appear as an innovation, it is but a modernized version of Saussure's widely discussed conception of the word as a *sign* composed of a *signifier* and a *signified*, which itself has ancient roots in Stoic philosophy (see Jakobson 1966).¹

The identifying index of most morphemes consists of a sequence of

phonemes (or distinctive feature complexes). I refer to morphemes with such identifying indices as *concrete morphemes* and distinguish them from *abstract morphemes*, which have an identifying index — represented here by the capital letter Q — whose phonetic reflexes are spelled out by a special block of rules. The majority of abstract morphemes are inflectional morphemes, such as Plural, Past, Possessive, but there also exist inflectional morphemes that are concrete, as well as noninflectional morphemes that are abstract. An example of a concrete inflectional morpheme is the English progressive aspect marker *-ing*, which has a unique phonological shape, whereas an example of an abstract noninflectional morpheme is the verb *be*, which both in English and in many other languages has surface reflexes of great variety that cannot be correlated by means of plausible phonological rules.

In (1a) I illustrate the complex symbol of a noun recently added to the English Vocabulary and in (1b) the complex symbol of the English Plural morpheme.

(1)	identifying index:	a. /glasnost/	b. Q
	Lexical categorization	—]N]N —]N
	Meaning	'candour, openness'	Plural
	Morphological properties	stem	suffix
			etc.

The essential difference between concrete and abstract morphemes is that the former have phonetically related surface forms, whereas abstract morphemes have surface realizations that are phonetically quite unrelated. In (2a) I have illustrated some of the phonetic realizations of the English Plural morpheme.

(2) a. i.	ox-en, child-r-en	b. Q → /n/ in env. X' + ____, P1 where X' = ox, child . . .
ii.	fish, deer, moose	Q → ∅ in env. X" + ____, P1 where X" = fish, deer . . .
iii.	bush-es, cough-s, pie-s	Q → /z/ in env. ____, P1

I have given in (2b) the Spell-out rules of the Plural morpheme for the three classes of nouns illustrated in (2a). The first two Spell-out rules apply only to listed items, whereas the third rule is quite unrestricted.

A Spell-out rule rewrites the abstract symbol Q as a sequence of one or more phonemes or deletes the symbol Q. Since Spell-out rules are ordered, the application of a Spell-out rule bleeds all Spell-out rules ordered below it. For example, the application of the first rule in (2b), which rewrites Q as /n/, bleeds the third Spell-out rule in (2b), which rewrites Q as /z/. This bleeding property of the rules accounts for the fact that in English doubly marked plural forms such as *childrens*, *oxens* are ungrammatical. In languages such as Yiddish (Perlmutter 1988) and Breton (Stump 1989), where doubly marked plurals are grammatical, this is achieved with the help of a readjust-

ment rule that reduplicates the abstract Plural morpheme. For some discussion, see Bromberger and Halle (1989) and Halle (1989).

The Latvian data provide evidence that Spell-out rules are ordered by the principle — traditionally attributed to Pāṇini — that a more complex rule takes precedence over one that is less complex. For the Latvian Spell-out rules given in (8) and (11) below, rule complexity is determined simply by counting the number of morphological features mentioned in each rule.

I conjecture that the bleeding property of ordered rules can account for all instances where rules apply disjunctively and that there is no need or role for a special principle of disjunctive rule order of the kind proposed in Chomsky and Halle (1968) (SPE), Kiparsky (1973) and Anderson (1986). It is of course understood that this is a merely a conjecture lacking at this time the necessary supporting documentation.

It is not unusual for affixation to be accompanied by modifications in the stem. I have illustrated in (3) two simple instances of such stem modification in the English Plural.

- (3) a. hous-es shelv-es wiv-es bath-s mouth-s
 [+cont] → [+voice] in env. [X' __] + Q, Plural
 where [X' [+cont]] = house, shelf, mouth etc.
- b. men mice lice geese
 [-cons] → [-back, -low] in env. [Y __ Z] + Q, Plural
 where [Y [-cons] Z] = mouse, goose, man, etc.

The examples in (3a) illustrate stem final continuant voicing in the Plural whereas the examples in (3b) illustrate ablaut of the stem vowel.

Voicing by rule (3a) takes place only in a small number of English stems. For instance, *house* is the only noun ending in /s/ that is subject to stem-final voicing (e.g., there is no voicing in *blous-es*, *spous-es*, *plac-es*, *buss-es*, etc.), and noun-final [f, θ] voice in the plural of only a handful of nouns but remain voiceless in the plural of most nouns; e.g., *coughs*, *cuffs*, *fourths*, *myths*. Similarly, only a subset of the nouns with zero plural undergo vowel ablaut by (3b); e.g., the nouns *moose*, *quail*, etc. take zero plural but do not undergo ablaut.

The changes in the stem illustrated in (3) are implemented by a special block of rules, which I have called the *Readjustment rules*. Like the Spell-out rules Readjustment rules may be restricted to apply to particular lists of morphemes. Moreover, the Readjustment rules affect not only phonological properties of stems; they may also affect the grammatical information in the complex symbol. In fact, the well-known phenomenon of morphological syncretism is in many instances best expressed by Readjustment rules that affect the grammatical markers in the complex symbol.

A number of further properties of the proposed organization of the rules may be noted at this point. In the model the actual surface forms of mor-

phemes — and this is especially obvious in the case of abstract morphemes — are the result of the application of rules in separate modules of the grammar. This fact imposes a partial ordering on the application of the rules. The rules of the morphology always precede those of the phonology, and inside the morphology, the Readjustment rules are ordered before the Spell-out rules. This ordering may however not be manifest in every derivation. Because all morphological rules apply cyclically to each constituent of the word, in a given derivation the Spell-out rules may apply before all Readjustment rules.

Second, a given word is subject not only to rules of the morphology and the phonology: it may also be subject to the principles and parameters of the syntax. In particular, the linear order of morphemes is determined by special principles of the syntax that relate Surface Structure (SS) to Phonological Form (PF). As a side product of this linearization process, the constituent structure of the morphemes composing a word may be modified in a number of limited ways (see Baker (1985), Marantz 1988).

To the extent to which the organization of the grammar in (0) correctly reflects the state of affairs it provides evidence for the traditional view that morphology is a distinct component of the grammar on a par with the syntax, the vocabulary and the phonology and argues against various attempts to make morphology either part of the phonology (see, e.g., Kiparsky 1982) or part of the syntax.

2. THE LATVIAN NOUN DECLENSION

The Latvian nominal declension is illustrated in (4).²

(4)	Declension Class A ('masculine')			
	I	IIa	IIb	III
	'horse'	'swan'	'stone'	'market'
nom. sg.	zīrg-s	gulb-i-s	akmen-s	tīrg-u-s
gen.	zīrg-a	gulb-j-a	akmen-s	tīrg-u-s
dat.	zīrg-a-m	gulb-i-m	akmen-i-m	tīrg-u-m
instr.	zīrg-u	gulb-i	akmen-i	tīrg-u
acc.	zīrg-u	gulb-i	akmen-i	tīrg-u
loc.	zīrg-a:	gulb-i:	akmen-i:	tīrg-u:
nom. pl.	zīrg-i	gulb-j-i	akmen-j-i	tīrg-i
gen.	zīrg-u	gulb-j-u	akmen-j-u	tīrg-u
dat.	zīrg-ie-m	gulb-j-ie-m	akmen-j-ie-m	tīrg-ie-m
instr.	zīrg-ie-m	gulb-j-ie-m	akmen-j-ie-m	tīrg-ie-m
acc.	zīrg-u-s	gulb-j-u-s	akmen-j-u-s	tīrg-u-s
loc.	zīrg-uo-s	gulbj-uo-s	akmen-j-uo-s	tīrg-uo-s

(4)	Declension Class B ('feminine')			
	I	II	III	IV
	'sister'	'cow'	'handmill'	'earth'
nom. sg.	ma:s-a	gov-s		zem-e
gen.	ma:s-a-s	gov-s		zem-e-s
dat.	ma:s-a-j	gov-i-j		zem-e-j
instr.	ma:s-u	gov-i		zem-i
acc.	ma:s-u	gov-i		zem-i
loc.	ma:s-a:	gov-i:		zem-e:
nom. pl.	ma:s-a-s	gov-i-s	dzirn-u-s	zem-e-s
gen.	ma:s-u	gov-j-u	dzirn-u	zem-j-u
dat.	ma:s-a:-m	gov-i:-m	dzirn-u:-m	zem-e:-m
instr.	ma:s-a:-m	gov-i:-m	dzirn-u:-m	zem-e:-m
acc.	ma:s-a-s	gov-i-s	dzirn-u-s	zem-e-s
loc.	ma:s-a:-s	gov-i:-s	dzirn-u:-s	zem-e:-s

The first fact to be noted about the paradigms in (4) is that they are distinguished by declension class rather than by gender. As this deviates from the traditional view a brief explanation is in order. I assume with Aronoff (this volume) that gender determines syntactic concord, whereas declension class governs purely morphological, nonsyntactic phenomena, such as the choice of the number-case desinence. Like in most other IE languages, gender in Latvian is highly correlated with declension class, but the correlation is not total.³ Thus, while the majority of Latvian nouns of masculine gender belong to declension class A, the nouns *puika* 'boy' *bende* 'hangman' and family names of males such as *Liepa* 'linden tree' *Roze* 'rose' are masculine in gender, yet belong to declension class B. Because of this fact, gender in Latvian must be distinguished from declension class.

To take formal account of the correlation between gender and declension class we postulate the rules in (5) which assign feminine nouns to declension class B and non feminine nouns to class A.

(5) a. [+Fem] → Class B

b. [-Fem] → Class A

If we assume that (5) are redundancy rules that supply to the complex symbol of a Latvian noun information about declension class this information need not figure in the Vocabulary and hence need not be memorized for

most nouns. Nouns like *puika* 'boy', *bende* 'hangman' will, of course, be exceptional in that for them both gender and declension class will be supplied in their Vocabulary representation and will therefore have to be memorized.⁴

I assume — for motivation, see Halle (1990 a, b) — that redundancy rules like (5) are what Kiparsky (1982) has termed 'feature-filling'. 'Feature-filling' rules can add grammatical markers or other features to a complex symbol, but they cannot replace a given marker or feature by another. This 'feature-filling' property of rule (5a) accounts for the fact that it does not affect exceptional nouns such as *puika*, *bende* whose declension class is supplied in the Vocabulary.

The Latvian noun has the constituent structure (6).

- (6) [[Noun + Q, Theme Vowel] + Q, Number-Case]

The Theme Vowel is viewed here as a nominalizing morpheme analogous to the verbalizing suffixes that figure in the conjugation in the Slavic languages (for some discussion of the Russian facts, see Halle 1973) as well as in Latvian, Latin and other Indo-European languages. Since Theme Vowel and Number-Case are separate morphemes in the string, they are spelled out by different rules; i.e. (8) vs. (11).

The constituent assembly in (6) is seen most clearly in the Sg. Dat. forms of both classes. As shown by the Sg. Dat. forms of class B each of the four vowels of Latvian — [a e u i] — can function as Theme Vowel. Class A lacks e-stems and has two kinds of i-stems that take rather different number-case endings, or *desinences*. In Class A i-stems the choice of desinence is therefore determined not by the Theme Vowel, but rather by the noun stem, and the stems will have to be entered with appropriate diacritic features. These same diacritic features will then determine the choice of Theme Vowel. The diacritic features of Latvian noun stems are given in (7).

- | | | | | | | |
|-----|----------|---|----------------|----------------|---|----------|
| (7) | Class B: | u | i | e | a | |
| | Class A: | u | i _b | i _a | a | |
| | | + | + | - | - | Marginal |
| | | + | - | + | - | Marked |

The feature [marginal] reflects formally the marked asymmetry existing between a small set of [+marginal] nouns and the rest.⁵ Moreover, in both declension classes the marginal nouns take [+high] Theme Vowels; i.e. [u i]. The converse — that all nouns with high Theme Vowel are [+marginal] — however, does not hold: in Class A only some i-stems are [+marginal], the majority of i-stems are [-marginal].

The Spell-out rules for the Theme Vowels are given in (8).⁶

$$(8) \quad Q \rightarrow \left\{ \begin{array}{l} \text{a. /e/ in env. } \left[\begin{array}{l} \text{Noun} \\ - \text{Marginal} \\ + \text{Marked} \\ \text{Class B} \end{array} \right] \\ \\ \text{b. /i/ in env. } \left\{ \begin{array}{l} \left[\begin{array}{l} \text{Noun} \\ - \text{Marginal} \\ + \text{Marked} \end{array} \right] \\ \left[\begin{array}{l} \text{Noun} \\ + \text{Marginal} \\ - \text{Marked} \end{array} \right] \end{array} \right\} \\ \\ \text{c. /u/ in env. } \left[\begin{array}{l} \text{Noun} \\ + \text{Marginal} \end{array} \right] \\ \\ \text{d. /a/ in env. } \left[\text{Noun} \right] \end{array} \right\} + \text{ ______ , Theme Vowel}$$

In stating the Spell-out rules I have assumed that they apply in the order shown in (8). The ordering of the rules is determined by the Pānini-an principle mentioned above that more restricted rules take precedence over less restricted rules. As can readily be seen in (8), degree of restrictedness is measured by the number of morphological features mentioned in the rule. Because of the fact that the rules literally spell out the element Q, the application of a given rule bleeds — i.e., blocks the application — of any rule affecting Q ordered below it in (8).

I mentioned above my conjecture that all instances of disjunctive rule application are the result of the bleeding property of ordered rules and that there may therefore be no role for the special principle of disjunctive rule order of the sort proposed in SPE, Kiparsky (1973) or Anderson (1986). The main reason for this revisionist conjecture is that the most telling examples of disjunctive ordering have lost much of their persuasiveness as a result of recent developments in phonological theory. Thus, in SPE and in Kiparsky (1973) the best examples of disjunctive order were the stress rules. The introduction of metrical phonology has eliminated these examples because the disjunctive effect of stress rules is accounted for without appeal to disjunctive ordering. A similar fate has befallen four of the six non-stress examples adduced by Kiparsky in support of his 'Elsewhere' condition on rule disjunctivity. The disjunctivity of the rules in these four examples (from Karok, Finnish, Diola-Fogny, and Sanskrit) would now be attributed to the 'inalterability' effects of feature spreading rules (Hayes 1986 and Schein and Steriade 1986), rather than to disjunctive properties of the rules themselves. Since the central examples of disjunctive rule application are thus accounted for without recourse to any special principle of disjunctive rule ordering, this

may be true also of the rest, although I am unable at this time to provide conclusive evidence in favor of this conjecture.⁷

Rule (8) will not generate the correct Theme Vowel for all number-case forms. To obtain the correct outputs the two sets of readjustment rules (9) and (10) are needed.⁸

- (9) a. $[-\text{cons}] \left\{ \begin{array}{l} \rightarrow [+high] \text{ in env. } ___ + Q, \text{ Sg. Acc.} \\ \vdots \\ X \end{array} \right.$
- b. $\left\{ \begin{array}{l} \rightarrow \text{ in env. } [\text{Class B}] + \left\{ \begin{array}{l} ___ + Q, \text{ Pl. Loc. \setminus Dat.} \\ ___ + Q, \text{ Sg. Loc.} \end{array} \right. \\ \begin{array}{c} \diagup \quad \diagdown \\ X \quad X \end{array} \end{array} \right.$
- (10) a. $\left\{ \begin{array}{l} \rightarrow ie \quad \text{in env. } [\text{Class A}] + ___ Q, \text{ Pl. Dat.} \\ \text{b. } \emptyset \left\{ \begin{array}{l} \rightarrow u \quad \text{in env. } [\text{Class A}] + ___ Q, \text{ Pl. Acc.} \\ \rightarrow (u)o \quad \text{in env. } [\text{Class A}] + ___ Q, \text{ Pl. Loc.} \end{array} \right. \end{array} \right.$

The two rules in (9) modify the Theme Vowel in several number-case forms, whereas the rules in (10) insert a vowel in position after the Theme Vowel in some plural forms of class A nouns.⁹ I shall say here no more about the functioning of rules (9) and (10) except note that these two Readjustment rules apply on the cycle subsequent to the one where the Theme Vowel is spelled out. This follows from the constituent structure (6) because only on that latter cycle will the Number-Case morpheme be accessible to the rules of the morphology, and the rules (9, 10) all require reference to Number-Case.

Like most (all?) Indo-European languages with extensive noun inflections Latvian consistently fuses number and case, so that a single suffix represents these two morphologically distinct categories. This fact is reflected in the Spell-out rules for the number-case suffixes given in (11).

- (11) a. $Q \rightarrow a \text{ in env. } [\text{Class A}] + ___ \text{ Sg. Gen.}$
 $Q \rightarrow i \text{ in env. } [\text{Class A}] + ___ \text{ Pl. Nom.}$
 $Q \rightarrow j \text{ in env. } [+Fem] + ___ \text{ Sg. Dat.}$
 $Q \rightarrow \emptyset \text{ in env. } [\text{Class B}] + ___ \text{ Sg. Nom.}$
- b. $Q \rightarrow \emptyset \text{ in env. } ___ \text{ Sg. Acc./Loc.}$
 $Q \rightarrow u \text{ in env. } ___ \text{ Pl. Gen.}$
- c. $Q \rightarrow m \text{ in env. } ___ \text{ Dat.}$
- d. $Q \rightarrow s$

Like the ordering of the Spell-out rules (8), the ordering of the rules in (11) is determined by the Pāṇini-an principle of decreasing complexity. The rules in (11a) are ordered before those in (11b) because the former refer to both number and case as well as to either declension class or gender, whereas rule (11b) refers neither to declension class nor to gender, but only to number and case. Since rule (11c) refers only to a single factor, it is ordered next,

followed by (11d), the unrestricted default rule. If the rules in (11) are assumed to be unordered each will require additional stipulations. Moreover, interesting generalizations will not be directly expressed; e.g., the fact that the suffixes /s/, /m/ and zero each stands for a multiplicity of cases.¹⁰

I have assumed that the rules are ordered (extrinsically) within the blocks (11a) and (11b), but this ordering has no consequences for the forms generated in the output, since the rules in these two blocks are mutually exclusive.

We still need to deal with a number of instances of case syncretism. The most striking example of this is the Instrumental case, which as every Latvian grammar notes, is identical with the Accusative in the Singular and with the Dative in the Plural. We express this fact by the Readjustment rules (12a).

$$(12) \text{ a. } \text{Instr} \rightarrow \left\{ \begin{array}{ll} \text{Acc in the env. Q, Sg.} \text{ ____} & \text{i.} \\ \text{Dat in the env. Q, Pl.} \text{ ____} & \text{ii.} \end{array} \right.$$

The special property of the Readjustment rules (12) is that they affect morphological, rather than phonological features of the formatives. See Halle (1990a) for additional examples of this type of Readjustment rules, which have much the same effect as the 'referral rules' in Zwicky (1988).

A second instance of case syncretism occurs in the Singular Nominative and Genitive forms of some sub-paradigms, namely those that are [+Marginal]. We express this by the Readjustment rules (12b) which like (12a) are ordered before the Theme Vowel Readjustment rules (9) and (10) and like (10) apply on the same cycle as the Number-Case Spell-out rules (11).¹¹

$$(12) \text{ b. } \left. \begin{array}{l} \text{i. } \text{Nom} \rightarrow \text{Gen in env. [Class B,} \\ \text{ii. } \text{Gen} \rightarrow \text{Nom in env. [Class A,} \end{array} \right\} \text{+Marginal] + Q, Sg. ____}$$

In spite of their similarity the two rules of (12b) cannot be merged since there is a different syncretism in the two declensional classes. As an examination of the relevant portions of (4) will show, in class A the Genitive is merged with the Nominative, whereas in class B it is the Nominative form that merges with the Genitive.¹²

Rule (12a) is stated in terms of the diacritic feature [+Marginal] of the noun stem rather than in terms of the phonetic properties of the stem vowel because only some Class A i-stems undergo rule (12). As noted above, this is one of the reasons for assigning the diacritic features in (7) to the stems. This decision receives additional support from the second peculiarity of the Singular Nominative and Genitive forms; i.e., the absence of the Theme Vowel in some of these forms. We capture this fact by means of a Readjustment rule (13).

$$(13) \quad [-\text{cons}] \rightarrow \emptyset \text{ in env. } \left\{ \begin{array}{l} \text{[Class B, +Marginal] + ____ + Q, Sg. Gen.} \\ \text{[Class A, -Marked] + ____ + Q, Sg. Nom.} \end{array} \right.$$

As in (12), to maintain the relative simplicity of (13) the rule must be stated

in terms of the diacritic features of the stem rather than in terms of the phonetic features of the Theme Vowel.

The rules developed above will generate vowel sequences in some case forms, but as can readily be seen in (4) no such vowel sequences appear in the output. Vowel sequences are generated, on the one hand, by the readjustment rules in (10), and on the other hand, by the Spell-out rules (8) and (11) in the Sg. Gen. and Pl. Nom. of Class A nouns and in the Pl. Gen. of all nouns. Since none of these vowel sequences surfaces additional rules will be required.

As an example, consider the output strings generated by the rules developed to this point for the Pl. Gen. forms given in (14).

- (14) Class A: zirg-a-u > zirg-u
 gulb-i-u > gulb-j-u
 akmen-i-u > akmen-j-u
 tirg-u-u > tirg-u
- Class B: ma:s-a-u > ma:s-u
 gov-i-u > gov-j-u
 zem-e-u > zem-j-u
 dzirn-u-u > dzirn-u

A comparison of the input strings on the left with their surface realizations on the right shows that when the stem vowel is [-back] — [i e] — it surfaces as the glide [j], elsewhere it is deleted. We capture this with the rules in (15). These rules are part of the phonology of Latvian, rather than of the morphology proper.

- (15)
$$\left. \begin{array}{l} [-\text{back}] \rightarrow /j/ \\ [-\text{cons}] \\ [-\text{cons}] \rightarrow \emptyset \end{array} \right\} \text{ in the env. } ___ + [-\text{cons}]$$

This completes the generation of the desinences of the Latvian noun declension. We give in (16) a summary of the rules developed to this point.

- (16) Gender-Declension Class Redundancy (5)
 Readjustment (9, 10, 12, 13)
 Theme Vowel Spell-out (8)
 Number-Case Spell-out (11)
 Vowel Sequence Phonology (15)

3. THE ADJECTIVE DECLENSION

Adjectives, which share with nouns the syntactic property of not assigning case to NP's, differ from nouns universally (?) in that they lack inherent gender. Adjectives obtain gender by the application of concord rules which assign to them the gender as well as the number and case of the noun that the adjective modifies. Like nouns the adjectives are subject to the redundancy rule (5), and they differ from nouns in that no Latvian adjective is marked for

its declensional class. Since in Latvian all adjectives take the Theme Vowel [a], we must stipulate that all adjectives are redundantly supplied with the diacritic features [−Marginal, −Marked]. This implies that adjectives are inflected exactly like a-stem nouns. That this implication is correct is readily seen by comparing the forms in (17) with those of the first column of the noun paradigms in (4).

(17)		Class A (masc)	Class B (fem)
	nom. sg.	lab-s 'good'	lab-a
	gen.	lab-a	lab-a-s
	dat.	lab-a-m	lab-a-j
	acc./inst.	lab-u	lab-u
	loc.	lab-a:	lab-a:
	nom. pl.	lab-i	lab-a-s
	gen.	lab-u	lab-u
	dat./inst.	lab-ie-m	lab-a:-m
	acc.	lab-u-s	lab-a-s
	loc.	lab-uo-s	lab-a:-s

Latvian does not have the counterparts of the English articles *the*, *a*. It expresses the contrast between definite and indefinite NPs by using definite vs. indefinite form of the adjective. The declension pattern of definite adjectives is given in (18).

(18)		Class A (masc)	Class B (fem)
	nom. sg.	lab-aj-s 'good'	lab-a:
	gen.	lab-a:	lab-a:-s
	dat.	lab-aj-a-m	lab-aj-a-j
	acc./inst.	lab-uo	lab-uo
	loc.	lab—aj-a:	lab-aj-a:
	nom. pl.	lab-ie	lab-a:-s
	gen.	lab-uo	lab-uo
	dat./inst.	lab-aj-ie-m	lab-aj-a:-m
	acc.	lab-uo-s	lab-a:-s
	loc.	lab-aj-uo-s	lab-aj-a:-s

It is immediately obvious from a comparison of the dative and locative forms in (17) and (18) that the definite adjective is marked by the suffixation of the string /aj/ to the adjective stem and that the extended stems then undergo the normal rules of the Latvian nominal declension.¹³ We shall therefore assume that these adjective forms have the underlying structure (19a).

(19) a. [[[Stem + (/aj/, Definite)] + Q, Theme Vowel] + Q, Number Case]

Not all case forms of the definite adjective have the glide /j/ in the definite suffix. Forms without the glide have the underlying representation (19b), which except for the definite suffix is identical with (19a).

(19) b. [[[Stem + (/a/, Definite)] + Q, Theme Vowel] + Q, Number Case]

The two representations raise the question as to which is to be taken as the more basic one. I decided to take (19b) as the more basic one because the environment of Readjustment rule (20) inserting /j/ is somewhat simpler than that of a rule that would delete /j/ in the complement of the environment of rule (20).

$$(20) \quad \emptyset \rightarrow /j/ \text{ in env. } \left\{ \begin{array}{l} \left[\begin{array}{l} \text{Adj} \\ \text{Class A} \end{array} \right] + a \text{ ____ } + Q, \text{ Sg. Nom.} \quad \text{i.} \\ \text{____} + Q, \left\{ \begin{array}{l} \text{Dat.} \\ \text{Loc.} \end{array} \right. \quad \begin{array}{l} \text{ii.} \\ \text{iii.} \end{array} \end{array} \right.$$

The Definite suffix is treated as a concrete, rather than as an abstract morpheme. The reason for this is that the two variants of the suffix — /a/ and /aj/ — are related by the rule of glide epenthesis (20), which utilizes only devices available to rules in the phonology. It is only in cases where the different allomorphs cannot be related by such rules that an abstract morpheme with an identifying index Q is postulated.

The rules (20) will generate as input to the phonology strings such as those in (21), where the first /a/ is the definite marker and the second /a/ is the Theme Vowel.¹⁴

- (21) a. [[lab-a]-a] (Sg. Nom. Class B)
 b. [[[[lab-a]-a]-s] (Sg. Gen. Class A)

These strings would produce the correct output provided we had a means for blocking the application of rule (15). We can readily achieve this if we assume that rule (15) is a cyclic rule, which is prevented from applying to the second constituent in (21) because the Theme Vowel is a noncyclic suffix.¹⁵

By contrast with those in (21) the vowel sequences generated in the indefinite adjectives in (22) will be subject to rule (15) because the second vowel is a Number-Case suffix and these are cyclic.

- (22) a. [[lab-a]-a] (Sg. Gen. Class A)
 b. [[lab-a]-us] (Pl. Acc. Class A)

Additional forms of the definite adjective are given in (23) in the representation that is input to the rules of the phonology.

- (23) [[lab+a]+u] Sg. Acc. A/B [[[[lab+a]+a]+i] Pl. Nom. A
 [[lab+a]+a]+u] Pl. Gen. A/B [[[[lab+a]+u]+s] Pl. Acc. A
 [[[[lab+a]+a]+a] Sg. Gen A

In all the examples in (23) the cyclic rules (15) will apply first and delete the second vowel in prevocalic position. Since the second vowel suffix is noncyclic it will not trigger rule (15) and will not delete the first vowel.

After the application of the cyclic rules the forms in (23) will emerge as shown to left of the > mark in (24).

- (24) lab+a+u > lab-uo lab+a+i > lab-ie
 lab+a+u > lab-uo lab+a+u+s > lab-uo-s
 lab+a+a > lab-a:

These forms will evidently have to undergo additional rules to generate the surface forms shown on the right of the > mark in (24). In particular, the correct surface form of all but the last example in (23) will be generated by postulating that Latvian is subject to the rule of metathesis (25), which applies to a sequence consisting of a nonhigh vowel followed by a high vowel.

- (25) [-high] [+high]
 1 2 → 2 1

The metathesis rule applies elsewhere as well. For example, in verb stems ending in [ei] metathesis applies before consonantal endings, but not before endings beginning with a vowel; e.g., *lej-u* 'I pour' vs. *lie-t* 'to pour', *dew-u* 'I gave' vs. *duo-t* 'to give'

If rule (25) is ordered after the vowel deletion rule (15) the correct outputs are obtained. In fact, this order is independently motivated, for unlike vowel deletion (15) rule (25) is in the noncyclic block, as shown by the fact that it applies to the two Sg. Acc. in (23) as well as morpheme internally in verbs. If rule (25) is among the noncyclic rules, it will, of course, be applied after all cyclic rules.

To generate the surface forms given to the right of the > mark in (24) we must assume in addition phonological rules that account for the fact that vowel sequences are tautosyllabic and that nonhigh vowels assimilate rounding and backness from a directly preceding vowel. These two rules are not stated here since they do not interact with any of the other rules.

NOTES

* I am grateful to M. Kenstowicz, A. Marantz and R. Noyer for helpful comments on an earlier draft of this paper. The present study supersedes the proposals I made in Halle (1987). I am attempting to extend to the Latin declension the approach developed in this paper. When completed this study will also supersede the account of the Latin declension in Halle (1990a), which no longer seems satisfactory to me.

¹ I have found a similar view of morphemes as complex symbols in the recent book by Levelt (1989); see also Chomsky (1965).

² The sequences of coronal consonants + /j/ that appear in the forms of subclass A II, are realized as palatals, [-anterior, +distributed]. As this is effected by a rule of the phonology which does not interact with facts under discussion here no formal account of this phenomenon is taken below.

³ In Latin the majority of class 1 nouns are feminine, and those of class 2 are non-feminine, but there are exceptions. Thus, *mensa* 'table' and *hortus* 'garden' are feminine class 1 and masculine class 2, respectively, but *maalus* 'apple tree' and *agricola* 'farmer' are respectively feminine class 2 and masculine class 1.

⁴ I have argued in Halle (1990a, b) that rules essentially identical with (5) apply in Russian and Latin.

⁵ The Latvian Academy Grammar (1959) lists 15 Class A u-stems and 5 i_b stems; it lists three Class B u-stems, all of which are *pluralia tantum*, and remarks about class B i-stems that "the number of such nouns is not large at present" (p. 420).

- ⁶ There is some correlation between the diacritic features of a noun stem and the phonetic features of its Theme Vowel. E.g. all [+marginal] stems take [+high] Theme Vowels. I have not expressed this correlation in the rule set (8).
- ⁷ The main counter-examples to this radical conjecture known to me are the vowel quantity rules of English, which in SPE were named Trisyllabic Laxing, Prevocalic Tensing, and CiV Tensing. It was argued by Myers (1986) that CiV Tensing must be disjunctive with respect to Trisyllabic Laxing, and I have not succeeded in finding a way around these counterexamples.
- ⁸ Rule (9b) lengthens Class B stem vowels in the contexts stipulated on the right.
- ⁹ That we are dealing here with vowel insertion rather than with Theme Vowel readjustment is shown by the fact that in the forms under discussion (Class A Plural Dative, Accusative, and Locative) the Theme Vowel [i] surfaces as [j] which is its normal reflex in prevocalic position. The other Theme Vowels in the forms under discussion do not surface because they are deleted. Both the change from [i] to [j] and the deletion of the other Theme Vowels are implemented by rule (15) below.
- ¹⁰ In work in progress I have found interesting parallels to properties of the Latvian rule sets (8) and (11) in Russian and in Latin. This is not unexpected in view of the fact that both languages belong to the Indo-European family.
- ¹¹ As stated, rule (12b) will apply to class B u-stems. As all of these are pluralia tantum and have no singular forms, this implication of the rule cannot be tested.
- ¹² The Class A i-stem *sun+s* 'dog' is an exception to (12bii). As a consequence the Sg. Gen. will be spelled out as *sun+j+a* rather than as *sun+s*.
- ¹³ The suffix /aj/ surfaces also in the Singular Nominative of the masculine definite adjective.
- ¹⁴ There is no third suffix in (21a) because Class B Sg. Nom. is spelled out as zero (cf. (11)). On the special conventions governing the application of cyclic and noncyclic rules in the phonology, see Halle and Vergnaud (1987, Ch. 3).
- ¹⁵ Alternatively it is possible to assume that (20) is not a Readjustment rule, but is rather a part of the phonology of the language. By ordering (20) after rule (15) the correct outputs will be generated. I prefer to place (20) among the Readjustment rules rather than in the phonology because of the heavy morphological restrictions that must be imposed on its application. The matter however cannot be definitively resolved until we have a much clearer conception about the formal differences between morphological and phonological rules, as well as about the phonology and morphology of Latvian.

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