31. Representations and the Organization of Rules in Slavic Phonology

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Subject	Theoretical Linguistics » Pholonogy
Place	Europe » Eastern Europe Southeastern Europe » Balkans
DOI:	10.1111/b.9780631201267.1996.00033.x

0 Introduction

The rich and complex phonologies of the Slavic languages are of particular interest for studies that deal with the structure of phonological representations and the organization of phonological rules. In this chapter, we shall pursue both of these issues, showing that representations must be nonlinear and that distinctions must be drawn between segmental melodies, skeletal slots, and syllabic structures all of which function independently of each other. With regard to the organization of rules, it is necessary to distinguish between cyclic, post-cyclic, and post-lexical rules, in a fashion predicted by the theory of lexical phonology.

In the first part of this chapter we look at several rules of Slovak and discuss the problem of how phonological structure should be represented. Marginally, we look at an example of a cyclic rule that applies in derived environments. The second part of this chapter is a study of consonant palatalization and vowel retraction rules in Polish and Russian. These two languages have virtually the same rules, yet their surface effects are different. This problem, as well as certain language-internal ordering conflicts, can be resolved in an illuminating way by drawing a distinction between post-cyclic and post-lexical rules.

1 Representations

In this section we look at some length alternations in Slovak, a language that contrasts long and short syllable nuclei both at the underlying and at the phonetic level:[1]

(1)

(a)	krik	“shout”	kríik	“bush”
(b)	kur+a	“chicken”	kúr+a	“cure”
(c)	rad	“row”	grád	“rdegree”

Where the accent indicates a long vowel.

Length is affected by several lengthening and shortening rules. It should be noted that Slovak rising diphthongs [ie ia uo] behave in exactly the same way as long vowels. This reflects the fact that, historically, Slovak diphthongs come from long vowels. If we now show that the parallel behavior of long vowels and diphthongs can be captured only by appealing to the skeletal and the syllabic tiers

and ignoring the distinctions made at the melodic tier, then we have an argument that representations must be multitiered rather than linear as traditionally construed in the classic generative phonology of *The Sound Pattern of English* (Chomsky and Halle 1968, hereafter *SPE*) type. We begin our presentation by introducing two lengthening rules.

Consider the following alternations of short and long vowels in the class of neuter nouns:

(2)

Nom.sg.	Gen.pl.	Glass
piv+o	pív	"bee"
put+o	pút	"chain"
lan+o	lán	cable

Vowels lengthen in the genitive plural.[2] Schematically:

(3) Vowel Lengthening $\acute{V} \rightarrow [+\text{long}] \; / \; -\, C]_{\text{gen. pl.}}$

A similar lengthening is found in several other contexts, for example, before the diminutive suffix *-ik*:

(4)

znak "sign" znáč + ik "sign" (dim)
puk "bud" púč + ik "bud" (dim)

The mid vowels /e o/ and the front low vowel /ä/ (phonetically[æ]), diphthongize in the lengthening contexts. Note: ô is the orthographic represenation of the diphthong [uo].

(5)

(a)	čel+o	"forehead"	čiel (gen. pl.)
	kol+o	"wheel"	kôl (gen. pl.)
	mäs+o	"meat"	mias (gen. pl.)
(b)	človek	"man"	človieč+ik (dim.)
	krok	"step"	krôč+ik (dim.)

The occurrence of the diphthongs is commonly explained by assuming that vowels first lengthen by general rules and subsequently diphthongize by a rule that is schematically stated as follows (Kenstowicz 1972; Kenstowicz and Kisseberth 1979):

(6)

Diphthongization é ó ǟ → ie uo ia

The most important sources of motivation for Diphthongization come, on the one hand, from the fact that several independent lengthening rules (but not all) yield diphthongs from the lengthened /e o ä/ and, on the other hand, from the fact that lengthening may sometimes be undone by subsequent shortening rules (see Rubach 1993). The latter is simple if the shortening rule applies at the stage

prior to Diphthongization. On a more general level, Diphthongization helps establish the parallel between long vowels and diphthongs. That such a parallel is essential is shown, for example, by the operation of the Rhythmic Law.

Standard Slovak exhibits a widespread regularity with regard to the distribution of short and long vowels. In (7) we adduce some examples from both inflectional and derivational morphology:

(7)

(a) Neuter nouns

Nom. sg.	Nom. pl.	Dat. pl.	Loc. pl.	Gloss
lan+o	lan+á	lan+ám	lan+ách	"cable"
stád+o	stá+da	stád+am	stád+ach	"herd"
čísl+o	čísl+a	čísl+am	čísl+ach	"number"

(b) Masculine adjectives

Nom. sg.	Gen. sg.	Dat. sg.	Gloss
mal+ý	mal+ého	mal+ému	"small"
múdr+y	múdr+eho	múdr+emu	"wise"
čír+y	čír+eho	čír+emu	"clear"

(c) Agentive *-nik*:

hut+a	hut+ník	"steel works"
montáž	montáž+nik	"assembling"
čalún	čalún+nik	"wallpaper"

Thus, vowels shorten after long vowels:

(8)

$$\text{Rhythmic Law} \quad \acute{V} \rightarrow [-\text{long}] / \left[\begin{matrix} V \\ +\text{long} \end{matrix}\right] C_0 \_\_$$

The situation becomes more complex when we realize that not only long vowels but also diphthongs trigger the Rhythmic Law. The examples in (9) parallel those in (7):

(9)

(a)	miest+o	miest+a	miest+am	miest+ach	"place"
	hniezd+o	hniezd+a	hniezd+am	hniezd+ach	"nest"
(b)	čiern+y	čiern+eho	čiern+emu		"black"
	priam+y	priam+eho	priam+emu		"direct"
(c)	papier	papier+nik			"paper"
	požiar	požiar+nik			"fire"

Furthermore, diphthongs, exactly like long vowels, can undergo the Rhythmic Law whereby they change into short vowels. Thus, the present tense morpheme *ie* of, for instance, *strež+ie+m* "I guard" becomes *e* in *môž+e+m* [muož+e+m] "I can". Given these facts, the statement of the Rhythmic Law seems to call for very complex disjunctions, because both the input and the environment would have to be specified to include either a long vowel or a diphthong. Worse, such complex disjunctions would

have to be repeated in every shortening rule, and these abound in Slovak. For example, in addition to the Rhythmic Law there is a rule that shortens vowels and diphthongs before the suffix *-ák*:

(10)

(a)	múdr+y	"wise"	mudr+ák	"sage"
(b)	biel+y	"white"	bel+ák	"white hare"

Classic generative phonology solves the problem of how to express the parallel between diphthongs and long vowels by assuming that diphthongs do not exist at the underlying level (cf. Kenstowicz and Kisseberth 1979). Rather, they are represented by respective long vowels /é ó á/. Diphthongization (6), which exists in the grammar of Slovak anyway, derives surface diphthongs in all instances wherever /é ó / have not been shortened by one of the shortening rules. In view of this, then, the parallel behavior of long vowels and diphthongs is understandable. The derivation of our earlier examples *stád+a* "herds", *miest+a* "places" as well as *strež+ie+m* "I guard" and *môž+e+m* "I can" is now as follows. Recall that the nominative plural ending is a long *-á*:

(11)

stád+á	mést+á	strež+é+m	móž+é+m	
stád+a	mést+a		móž+e+m	Rhythmic Law
	miest+a	strež+ie+m	muož+e+m	Diphthongization

This analysis recapitulates synchronically what has taken place historically. Diphthongization is a late rule that applies in an unrestricted manner irrespective of the source of the long vowel, whether it is derived by a lengthening rule such as (3) or whether it is underlying as in (11).

Serious problems with this *SPE* interpretation begin to appear when we look at the etymologically foreign vocabulary of Slovak. It contains literally hundreds of items with morpheme-internal long mid vowels that systematically fail to diphthongize:

(12)

režisér	"director"	šofér	"driver"	krém	"cream"	afér+a	"affair"
mód+a	"fashion"	póz+a	"pose"	vagón	"carriage"	gól	"goal"

In the days of classic generative phonology, etymologically foreign words were left out of the analysis since it was believed that they would form a system of their own. While this assumption might be true of a certain subset of foreign vocabulary in a language, it clearly need not generalize to all etymologically foreign words. The Slovak data are a good illustration of this thesis.

On the one hand, the words in (12) are composed entirely of segments that appear in the native part of the Slovak vocabulary, and their canonical structure does not diverge from that of the native roots. Even the fact that a mid vowel remains undiphthongized does not automatically assign the words in (12) to a class of "borrowings," since some etymologically native words also surface with a long mid vowel, for example, *dcér+a* "daughter", and *-ého*, the genitive singular ending of masculine adjectives. In the *SPE* theory these would be treated as exceptions to Diphthongization. On the other hand, all other tests, both morphological and phonological, indicate that words such as those in (12) have been fully integrated into the grammatical system of Slovak.

Morphological integration is seen in the fact that these words are indistinguishable from the etymologically native words in terms of both inflectional and derivational morphology. Compare the etymologically foreign *režisér* "director" with the native *pisár* "writer":

(13)

Nom. sg.	Gen. sg.	Dat. sg.	Adj. form	Abstr. nom.	Fem. formation
režisér	režisér+a	režisér+ovi	režisér+sk+y	režisér+stv+o	režisér+k+a
pisár	pisár+a	pisár+ovi	pisár+sk+y	pisár+stv+o	pisár+k+a

Similarly, phonological tests indicate that the behavior of etymologically foreign words is identical to that of etymologically native words. For example, they trigger the Rhythmic Law. In (14a) we compare the foreign *mód+a* "fashion" with the native *lúk+a* "meadow" for their triggering effects. We adduce also the native *skaz+a* "flaw" with a short root vowel in order to show that the endings have underlying long vowels. In (15b) the native *dvor+sk+ý* "courtly" shows the underlying representation of the endings. The native *stál+y* "constant" and the foreign *šofér+sk+y* "driver" (adj.) both induce the Rhythmic Law.

(14)

(a)	Dat. pl.	Loc. pl.	
	skaz+ám	skaz-ách	
	lúk+am	lúk+ach	
	mód+am	mód+ach	
(b)	Nom. sg.	Gen. sg.	Dat. sg.
	dvor+sk+ý	dvor+sk+ého	dvor+sk+ému
	stál+y	stál+eho	stál+emu
	šofér+sk+y	šofér+sk+eho	šofér+sk+emu

Etymologically foreign words also undergo shortening rules. Thus, for instance, there is a rule which shortens the stem vowel when an agentive suffix *-ár* is appended, as in the native *slovník* "dictionary" - *slovnik+ár*. The same rule affects the foreign *scén+a* "scene" → *scen+ár* and *betón* "concrete" → *beton+ár*.

In sum, etymologically foreign words both trigger and undergo the shortening rules. Even more striking is the fact that they undergo lengthening rules as well and if the vowel is mid, then it is also diphthongized:

(15)

	Nom. sg.	Gen. pl.	gloss
(a)	fabrik+a	fabrík	"factory"
	pyžam+a	pyžám	"pyjamas"
(b)	oper+a	opier	"opera"
	bomb+a	bômb [buomp]	"bomb"

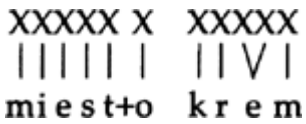
We conclude that on all counts etymologically foreign words are fully integrated into the system of Slovak, and hence constitute legitimate evidence on which to evaluate competing phonological solutions. But this creates a problem. How are we going to account for the parallel behavior of long vowels and diphthongs? Notice that the *SPE* solution – that in all instances diphthongs derive from

underlying long vowels – is not open to us any more.

If morpheme-internal diphthongs in words such as *miest+o* "place" and *biel+y* "white" were to be derived from underlying /mést+o/ and /bél+í/, then they would be indistinguishable from words such as *režisér* "director" and *afér+a* "affair". That is, we would not be able to predict where Diphthongization should and where it should not apply. Consequently, we must assume that diphthongs are actually underlying in today's Slovak. Thus, *miest+o* is /miest+o/[3] while *režisér* is /režisér/ as indeed found in the surface representations. In other words, we must admit that in historical terms a restructuring of underlying representations has taken place: morpheme-internal diphthongs are now part of the underlying structure. However, given this conclusion, the parallel between long vowels and diphthongs achieved by the *SPE* analysis disappears. A new solution is available, but only in a nonlinear theory of phonological representations.

It has been recognized for some years now that phonological representations should be construed as three-dimensional (cf. chapters 1, 5, 6, 7 this volume). In addition to the melodic tier, two other tiers have been introduced: the skeletal tier and the syllabic tier. These tiers are independent of each other in the sense that there is no requirement of a one-to-one correspondence between them. Thus, for instance, a long vowel is a single melody unit but it occupies two slots in the skeleton. The opposite is also true. The so-called contour and complex segments occupy one skeletal slot but correspond to two articulatory gestures at the melodic tier (cf. chapter 7 this volume). Skeletal slots reflect the facts of phonological length and segmentation. In this theory long vowels and diphthongs have a common property: the presence of two skeletal slots. Thus, *miest+o* "place" and *krém* "cream" are represented as follows:[4]

(16)



Within the view that long vowels and diphthongs can be related at the skeleton, we would expect that differences found at the melodic tier should be irrelevant. That this is a correct expectation is shown convincingly by the behavior of long liquids.

In addition to short and long vowels as well as diphthongs, Slovak has also short and long syllabic liquids:

(17)

prst	"finger"
vŕb+a	"willow"
vlk	"wolf"
tĺk	"pestle"

Relevant at this point is the observation that long liquids parallel long vowels and diphthongs in that they trigger the shortening rules. Thus, the long vowel of the dative plural ending exemplified in (14a) shortens in *vŕb+am* "willow". With this observation it is clear that reducing diphthongs to underlying long vowels cannot solve all the problems anyway since long liquids would not be included in such a statement. What then is the relevant property for triggering the shortening rules? A partial answer to this query has already been given: the presence of two slots at the skeletal tier. This includes long liquids because they have a representation that parallels long vowels: a single melodic segment linked to two X-slots. However, our analysis is not yet complete. Words such as *ú+mr+t+n+ý* "dead" with a syllabic *r* show that the Rhythmic Law counts syllable nuclei. In this instance the final +ý is not shortened because it is preceded by a short syllable nucleus – that of the *r*. Consequently, the

presence of the long *ú+* in the prefix has no effect on the ending +ý.

To summarize, shortening rules apply if two conditions are fulfilled: there are two skeletal slots and the segments are syllabic. Unfortunately, even these restrictions are not sufficient. The evidence comes, on the one hand, from vowel sequences and, on the other hand, from combinations of glides and vowels.[5]

Slovak contrasts diphthongs and vowel sequences, both phonetically and phonologically. In the following examples, the former are perceived as one and the latter as two syllables (we separate them by a dot).

(18)

Diphthong	Vowel sequence
rias+a "cassock"	mili.ard+a "milliard"
riek+a "river"	paci.ent "patient"

The phonetic distinction between diphthongs and vowel sequences is corroborated by phonological behavior. The former do, while the latter do not, trigger the Rhythmic Law:

(19)

Dat. pl.	Loc. pl.
rias+am	rias+ach
mili.ard+ám	mili.ard+ách

We conclude that shortening rules require that both of the skeletal slots be contained in one syllable. Under such a formulation, vowel sequences are correctly excluded. However, even this restrictive environment turns out to be too permissive, as shown by the different effects of the Rhythmic Law in (20):

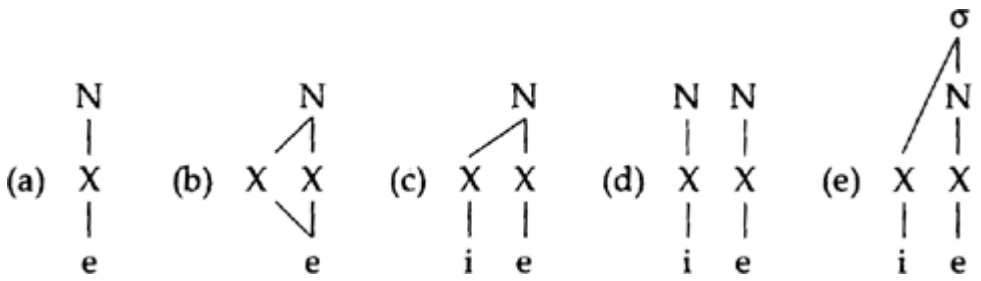
(20)

Nom. sg.	Dat. pl.	Loc. pl.	Gloss
m*ie*st+o	m*ie*st+am	m*ie*st+ach	"place"
*je*dl+o	*je*dl+am	*je*dl+ach	"meal"

In both instances the relevant segmental structure is the same: a gliding element followed by *e*. In both instances the two segments belong to a single syllable; yet, it is only in the case of *miest+o* that the Rhythmic Law applies. How is therefore *miest+o* different from *jedl+o*? In *miest+o* the onglide is a constituent of the syllable nucleus while in *jedl+o* it is a syllable onset.[6] (At the melodic tier they are identical.) This shows conclusively that shortening rules are sensitive to the structure of the nucleus.

To summarize briefly, it is essential to distinguish between the melody and the skeleton, since only then do we have a level of representation which is common to long vowels, diphthongs, and long liquids. Furthermore, the syllabic tier must also be recognized in order to identify correctly the type of nucleus that triggers shortening rules. We thus have an argument that represenations must be three-dimensional. With these representations we can correctly distinguish between a short vowel in (21a), a long vowel in (21b), a diphthong in (21c), a vowel sequence in (21d) and a glide-vowel combination in (21e):

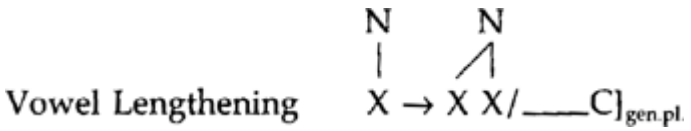
(21)



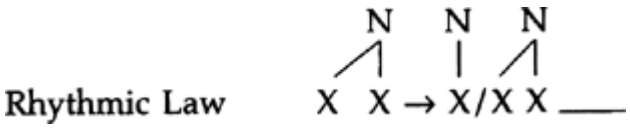
We assume that Slovak nuclei are right-headed, which is motivated by the fact that Slovak has rising rather than falling diphthongs.

Against this background we can now return to the statement of the lengthening and shortening rules. The former add while the latter delete a nuclear slot:

(22)



(23)

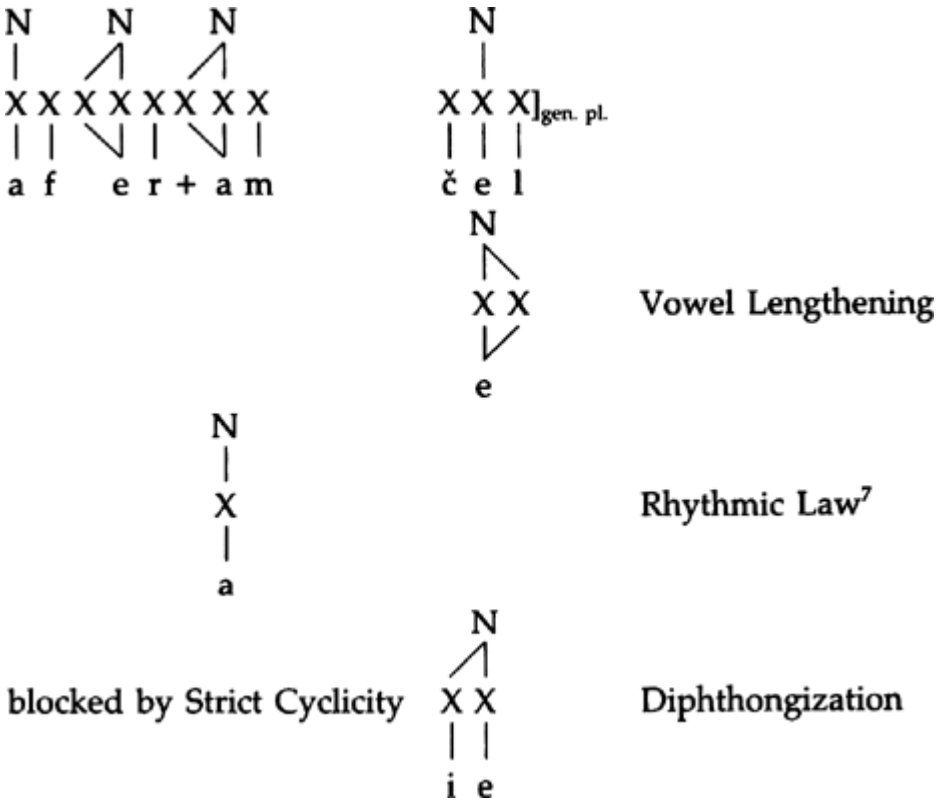


Thus, quantitative operations are manipulations at the skeletal tier. Melodic representations play no role there, precisely as desired.

We now return to Diphthongization in order to determine its status in the grammar of Slovak. We demonstrated earlier that the difference between long vowels and diphthongs is contrastive and thus it is not possible to assume that all diphthongs derive from long vowels, as they did historically. However, it is still true that, as shown by the examples in (5) and (15b), most lengthening rules lead to the rise of diphthongs from lengthened /e o ä/. Thus, Diphthongization exists as a rule, but its application has been restricted to derived environments. Such rules are not at all uncommon. In the framework of lexical phonology they are regarded as cyclic and the Strict Cyclicity Constraint limits their application to derived environments. Since we know that Diphthongization used to apply to underlying long vowels, that is, in nonderived environments, the historical development lies in the fact that the rule has changed its status from noncyclic to cyclic.

We conclude this section by looking at two sample derivations. Our examples are the dative plural *afér+am* "affair" and the genitive plural *čiel* "forehead". The latter comes from *čel+o*, that is, it has a short vowel in the underlying representation.

(24)



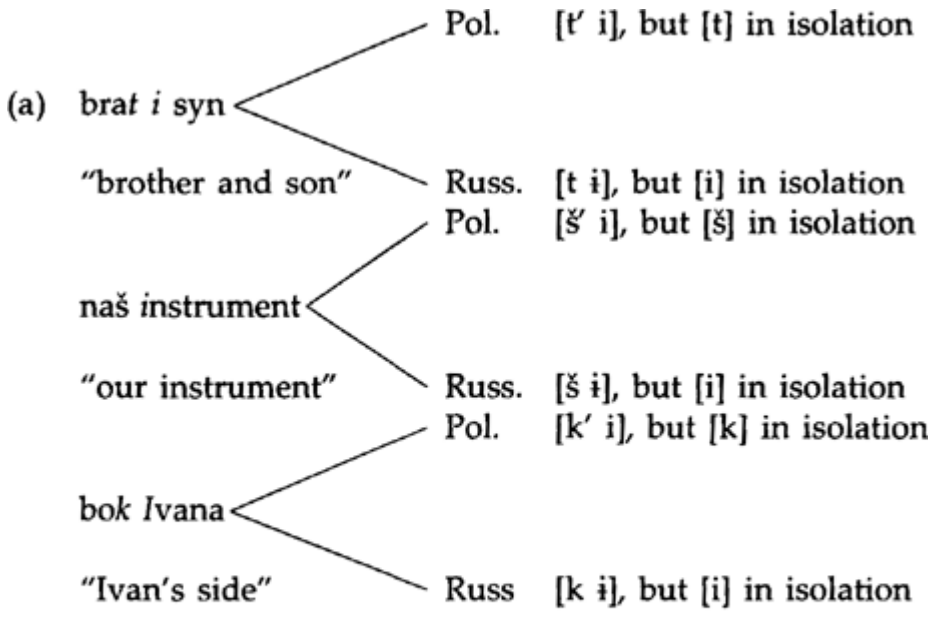
The reason that Diphthongization applies to *čiel* but not to *afér+a* is that only in the former has a feeding change with regard to Diphthongization been made in the course of the derivation: a second X slot was added by Vowel Lengthening.

2 Post-cyclic and Post-lexical Rules

In the preceding section, we considered the case of a cyclic rule. In this section, we show that it is essential to recognize a class of post-cyclic lexical rules as well (Booij and Rubach 1987). These rules are distinct from both cyclic lexical rules and post-lexical rules. They differ from cyclic lexical rules in that, first, they do not apply cyclically and, second, they are not subject to the Strict Cyclicity Constraint. The effect of these properties is that post-cyclic rules apply across the board in both derived and underived environments. A common characteristic of cyclic and post-cyclic rules is their confinement to the lexicon. Since words but not sentences are available in the lexicon, it is natural that these rules take the word as their maximal domain. In contrast, post-lexical rules exist outside the lexicon and apply to all strings, including those derived by the syntax. That is, they apply in an unconstrained fashion both inside words and across word boundaries. A further property shared by cyclic and post-cyclic lexical rules (though not by post-lexical rules) is their ability to refer to lexical information such as exceptionality features (cf. Mohanan 1982, 1986). That is, post-lexical rules cannot have exceptions.[8]

Against this background we turn now to an analysis of two rules of Polish and Russian. We show how the distinction between post-cyclic and post-lexical rules helps solve ordering conflicts in the grammer of each of these languages as well as illuminate a way in which related languages may differ. We begin with two sets of rather puzzling examples which have been selected from the class of words that are virtually identical in Polish and Russian.[9]

(25)



(b)

Polish	Russian	Gloss
instytut [t ɨ]	institut [t'i]	"institute"
dyrektor [d ɨ]	direktor [d'i]	"director"
eksperyment [r ɨ]	eksperiment [r'i]	"experiment"

The data in (25a) show that Polish has a palatalization while Russian a vowel retraction rule. Schematically:

(26)

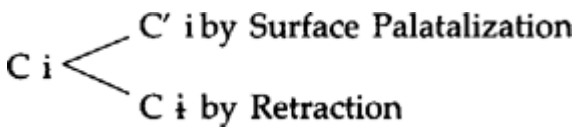
(a) Surface Palatalization C → C' / ____ i
(b) Retraction i → ɨ / nonpalatalized C ____

However, (25b) indicates that the reverse is true as well: Polish also has Retraction while Russian also has Surface Palatalization. The words in (25b) are latinate borrowings in both languages. Regardless of whether they came directly from Latin or, which is more likely, via some Western European language, one fact is clear: the source language did not have palatalized consonants or a back vowel [

ɨ

] since such segments simply do not exist in any of the likely source languages. Thus, palatalization and retraction are Slavic innovations. This claim is supported by the fact that a sequence of a nonpalatalized consonant followed by an [i] is phonetically impossible in both Polish and Russian. That is, either the C is palatalized or the /i/ is retracted to [i]:

(27)



Since both of these options are exploited in both languages, a question arises as to which option is selected under which circumstances. Notice that Surface Palatalization and Retraction are mutually bleeding: if one applies the other one cannot apply. Before we attempt to solve this dilemma, we need to look at the details regarding the statement and the application of these rules in each language.

Polish Surface Palatalization is exceptionless and it applies before *i* and *j*, both inside words and across word boundaries:

(28)

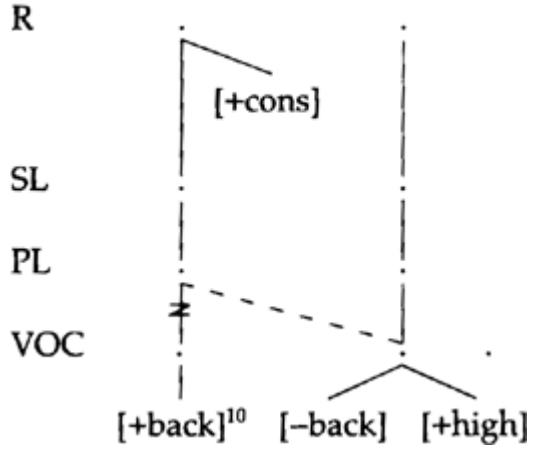
(a) [š′] Chicago, dasz im "you will give them", dasz jej "you will give her"
[t′] Tirana, brat idzie "my brother is going", brat je "my brother is eating"
[r′] Riwiera "Riviere", dar inwencji "gift of invention", dar Janka "Janek's gift"

(b) [p′] pisk "scream", kup inny "buy another', kup jogurt "buy yogurt"
[m′] miska "bowl", prom indianski "Indian ferry", prom jedzie "the ferry is coming"
[k′] kino "cinema", brak informacji "lack of information", brak jasności "lack of clarity"
[x′] Chiny "China", zamach iracki "Iraqi coup", zamach jordanski "Jordanian coup" etc.

The rule is a straightforward spreading assimilation: the vowel node VOC is spread onto the place node of the preceding consonant:

(29)

Surface Palatalization (Polish)



Note: R stands for root, SL for the supralaryngeal node, PL for place, and VOC for the vocalic node. In the representation of the feature hierarchy I follow Clements (1985a, 1991a).

Unlike Surface Palatalization, Retraction is restricted to coronal consonants, that is, it never applies after labials and velars. Retraction accounts for the [i]–[

ɨ

] alternations that occur throughout the whole phonological system of Polish. Below we look at the verbalizing suffix */*

ɨ

. (Note: [

ɨ

] is spelled *y*, [ć], a prepalatal affricate, is the infinitive suffix).

(30)

(a)	dym		"smoke"
	dym+i+ć		"to smoke"
	garb		"hunch"
	garb+i+ć		"to be hunch-backed"
(b)	towarzysz		"companion"
	towarzysz+y+ć	[tovažiš+ɨ+ć]	"accompany"
	tłumacz		"interpreter"
	tłumacz+y+ć	[twumač+ɨ+ć]	"interpret"
(c)	grzech		"sin"
	grzesz+y+ć	[gžeš+ɨ+ć]	"to sin"
	tłok		"crowd"
	tłocz+y+ć	[twoč+ɨ+ć]	"to crowd"

While the data in (30a–b) might seem ambiguous, as it is not immediately clear whether the [i] or the [

ɨ

] should be underlying, the data in (30c) leave little doubt that the underlying segment is /i/. This follows from the fact that the verbs show reflexes of the so-called First Velar Palatalization, a rule that is found in all Slavic languages.[11] Schematically:

(31)

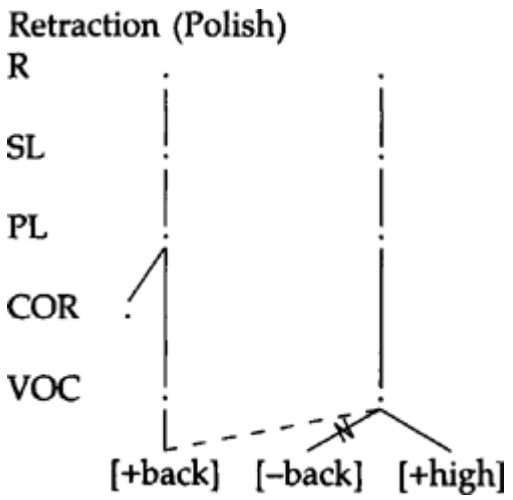
First Velar Palatalization k g x → č ǰ š / ____ front vowels

This rule changes velars into postalveolars, and these stops become affricates (see Rubach 1984). In fact, First Velar Palatalization spreads *coronal* rather than [−back] and hence its outputs are hard (that is, nonpalatalized) consonants. This brings up a more general problem of the phonetic contrast between hard and soft consonants.

In Polish and Russian (as well as in Byelorussian, Ukrainian, and Lusatian) there are no consonants neutral with respect to the feature [back]. Phonetically, a consonant is always either [+back] (hard), or [−back] (soft). Since some consonants need to be specified as [−back] underlyingly, it is [+back] that is assigned by default. In effect, at the stage at which Retraction applies, all consonants that are not palatalized underlyingly or have not been palatalized by an earlier rule[12] are marked as [+back]. Now Retraction can be stated as a straightforward spreading rule which applies in the environment of hard

coronals:

(32)



A striking fact about Russian is that the statement of the rules is, in all essential matters, the same as in Polish. There are two minor differences. First, Surface Palatalization applies not only before *i* (and *j*) but also before *e*.[13] Second, Retraction is more general as it applies not only after coronals but after all consonants including labials and velars. (Most of the examples below are from Lightner 1972.)

(33)

(a) Surface Palatalization (Russian)

[b′]	bomb+a	"bomb"	bomb′+e	(dat. sg.)	bomb′+i+t′	"to bomb"
[n′]	žen+a	"wife"	žen′+e	(dat. sg.)	žen′+in	"wife's"
[r′]	sestr+a	"sister"	sestr′+e	(dat. sg.)	sestr′+in	"sister's"
[g′]	nog+a	"leg"	nog′+e	(dat. sg.)	nog′+i	(nom. pl.)
[x′]	mux+a	"fly"	mux′+e	(dat. sg.)	mux′+i	(nom. pl.)

(b) Retraction

(i)	šum	"noise"	šum+i+t′		"make noise"
	grex	"sin"	greš+*i*+t′	[š+i]	"to sin"
	drug	"friend"	druž+*i*+t′	[ž+i]	"to be friends with"
(ii)	xle*b i*z peci [pɨ]		"bread from the oven"		
	dar *i*skustva [rɨ]		"a gift of art"		
	les *i* voda [sɨ]		"forest and water"		

The data in (33bi) parallel those given for Polish in (30): the verbalizing suffix /i/ is realized as [ɨ] after hard consonants.[14] That the consonant must be hard and not underlyingly palatalized is shown by examples in (33bii). If the consonant is underlyingly palatalized as in *gost*′ "guest", then the following *i* does not undergo Retraction: *gost*′ *iz Polši* [is] "guest from Poland". Needless to say, *iz* is pronounced [is] in isolation, hence all the instances of [ɨ]

s] must be due to Retraction.

One further comment is in order. In Russian, unlike in Polish, Surface Palatalization has exceptions. For example, borrowed words such as *teza* "thesis" *šse* "freeway", and *kafe* "cafe" do not show any trace of Surface Palatalization, but many others appear with palatalized consonants, for example, *t'ekst* "text", *t'echn'ika* "technology", etc. (Avanesov 1968). Needless to say, some words show variation. This class includes even names such as *Voltaire*: [t]□[t'] (Halle 1959, p. 73). That is, exceptions to Surface Palatalization tend to be suppressed. With regard to Retraction the situation is different; the Russian rule is entirely exceptionless while the Polish one is not (see below).

We are now in a position to consider some theoretical implications of Surface Palatalization and Retraction and to determine how Polish differs from Russian. Recall that the two rules mutually bleed each other. In the early version of lexical phonology which distinguished only between lexical and post-lexical rules, where lexical meant cyclic, this would create a serious difficulty. One thing is clear, neither of the rules in any of the languages can be cyclic. We have conclusive evidence from the assimilation of borrowings that both rules may apply morpheme-internally, thus in nonderived environments. In the early version of lexical phonology (Kiparsky 1982c), the rules would therefore have to be post-lexical. But this leads to a paradox: whichever order we assume, the output is incorrect. In (34) we investigate both logically possible orderings. We look at the Polish examples given earlier in (30b) and (28a): *towarzysz+i+ć* [tovaž

i

š+

i

+ć] from underlying /tovaž

i

š+i+ć/[15] "accompany" and *dasz im* [daš' im] "you will give them":

(34)

(a)	tovažiš+i+ć	daš im	
	i	i	Retraction
	—	—	Surface Palatalization
		*daš im	
(b)	tovažiš+i+ć	daš im	
	š'	š'	Surface Palatalization
	—	—	Retraction
	*tovažiš+i+ć		

Exactly the same problem arises in Russian if we try to analyze the examples given in (25). In sum, Surface Palatalization and Retraction cannot be ordered.

Our dilemma is solved easily if we recognize post-cyclic lexical rules as a legitimate class. If Polish Retraction is post-cyclic and Polish Surface Palatalization is post-lexical, then things fall into place. Retraction applies in the lexicon, hence in the domain of words. Consequently, it affects *towarzyszyć* "accompany" but not *dasz im* "you will give them". The latter is a pharase produced by the syntax, hence outside the lexicon. It thus escapes Retraction and falls within the scope of Surface Palatalization which is post-lexical.[16] Note that given the post-cyclic / post-lexical distinction, Retraction and Surface Palatalization need not be ordered with respect to each other. The former is in the post-cyclic component in the lexicon, whereas the latter is in the post-lexical component and by

definition, the lexical components (cyclic and post-cyclic) precede the post-lexical component. Derivation (34) is now corrected as follows:

(35)

tovažiš+i+ć			*Post-cyclic*
i			Retraction
tovažiš+i+ć	daš	im	*Post-lexical*
—	š′		Surface Palatalization

Now we return briefly to the data in (28). We look at the examples which end in coronal consonants because in principle they could be inputs to both Retraction and Surface Palatalization. (Recall that Polish Retraction applies after coronals.) As we notice, Retraction fails to apply to foreign names and they thus become inputs to Surface Palatalization, for example, *Chicago* [š'i].[17] How should such words be treated? They are best viewed as exceptions to Retraction, particularly since they are unstable as a class. They tend to lose their status as exceptions and yield to Retraction. Needless to say, whether a given newly borrowed word or a foreign name is already pronounced with [

i̵

] or still with [i] is a matter of considerable variation. Thus, more educated and conservative speakers tend to retain the variant with [i] for a longer time, especially in careful and monitored speech. The accomodation of borrowings with regard to Retraction proceeds on a word-by-word basis. For example, *bridge* (card game) borrowed into Polish earlier in this century is now fully assimilated: *brydż* [br

i̵

č], where [č] is the effect of Final Devoicing. The word *reżim* "regime" is pronounced more often with [

i̵

] than with [i] while *rizotto* "risotto" just the opposite, more often with [i] than with [

i̵

], and so forth (see Rubach 1984 for details).

We conclude that Polish Retraction may have exceptions, but this is not surprising since the rule is post-cyclic and hence lexical. To carry on with the same reasoning, Russian Surface Palatalization has exceptions and consequently it must be post-cyclic. On the other hand, Russian Retraction is exceptionless and hence it can be post-lexical. We now solve an ordering conflict that would arise in the grammar of Russian, exactly as it did in the grammar of Polish (see (34)). Our examples from (25), *institute* "institute" and *brat i* "brother and", are now derived as follows:

(36)

institut			Post-cyclic
t′			Surface Palatalization
inst′itut	brat	i	Post-lexical
—		i	Retraction

If post-cyclic rules did not exist as a class (and consequently, Surface Palatalization would have to be post-lexical) there would be no way in which the rules in (36) could be ordered: either the *i* would be incorrectly retracted to [

ɨ

] in *institut* "institute" or the *t* would be incorrectly palatalized to [t'] in *brat i* "brother and". That Russian Surface Palatalization cannot be post-lexical is demonstrated independently by the way it applies in the environment of *e*. Note that *i* but not *e* is affected by Retraction, and hence the *e* contexts could be available to Surface Palatalization if it were post-lexical. On the other hand, if Surface Palatalization is post-cyclic, then it is predicted that the *e* that occurs across a word boundary cannot induce palatalization. This prediction is borne out. For example, the *t* of *brat* "brother" remains hard in *brat etovo čeloveka* "this man's brother".

Finally, if Surface Palatalization applies in the domain of words and precedes Retraction, it is legitimate to ask how Retraction could ever apply inside words. Would it not be preempted by Surface Palatalization in all instances? We asked the same question about Polish, but there the relation was reversed, it was Retraction that could preempt Surface Palatalization in word-internal position. In the case of Polish we simply said that we were dealing with a class of lexical exceptions. In the case of Russian this would be inappropriate. The [

ɨ

] in *greš*+*i*+t'] "to sin" and *druž*+*i*+*t'* [druž+

ɨ

+t´] "to be friends with" given earlier in (33bi) is perfectly stable and it is never pronounced as [i]. The problem is that with Surface Palatalization preceding Retraction, we derive [š' ž] rather than [

ɨ

]. We propose to solve this problem by postulating a hardening rule (Lightner 1972). Schematically:

(37)

Hardening š' ž' → [+back]

This rule applies after Surface Palatalization and provides an environment for Retraction. While at first glance Hardening may seem quite arbitrary as a rule, it is well motivated in the grammar of Russian. The point is that not only the derived [š' ž] in words such as *greš*+*i*+*t´* "to sin" (from /x/, see (33b)) but also the underlying /š' ž'/ need to be hardened in the course of the derivation. (Needless to say, underlying /š' ž'/ also induce Retraction.) That /š ž/ need to be treated as underlyingly soft is demonstrated by their behavior with respect to a number of morphological and phonological rules of Russian. That is, they function together with underlying palatalized consonants /t' s' r' .../.[18] Thus, Hardening is motivated independently of the problems that arise in the derivation of our examples in (33b).

3 Conclusion

To summarize, an inspection of palatalization and vowel retraction processes in Polish and Russian has unveiled a striking fact. Both languages have essentially the same rules. In both languages the rules are mutually bleeding and hence potentially cause derivational problems. These problems are solved without difficulty in a version of lexical phonology that recognizes a distinction between post-cyclic lexical and post-lexical rules. In this theory the conflicting rules are interpreted as belonging to

different components: one is post-cyclic and the other post-lexical. Now not only the ordering conflict but also the very need for ordering the rules disappears altogether. The properties of post-cyclic and post-lexical rules in Polish and Russian accord well with the assumptions of lexical phonology; post-cyclic but not post-lexical rules have exceptions. A remarkable fact is that even though Polish and Russian have virtually the same rules, their status in each of these languages is different. Russian is, as it were, a mirror image of Polish. In Polish, Surface Palatalization is post-lexical, whereas in Russian it is post-cyclic. On the other hand, Polish Retraction is post-cyclic whereas Russian Retraction is post-lexical. The mysterious facts adduced at the beginning of this section in (25) now fall out from the theory in a natural fashion. In phrase phonology, assimilations are handled in Polish by Surface Palatalization and in Russian by Retraction. In word phonology, on the other hand, the same assimilations work differently: in Polish they are handled by Retraction while in Russian by Surface Palatalization. To conclude, not only does lexical phonology solve internal rule conflicts within each language separately but it also illuminates the fact that, typologically, languages may differ solely by assigning a different status to what are patently the same rules.

This article was written while I was a visiting professor at the Ohio State University and the University of Iowa. I would like to thank both of these institutions for their sponsorship.

1 The data for this analysis are drawn from standard descriptive sources such as Dvonč (1966), D'urovič (1975), Letz (1950), Pauliny (1979), and Sabol (1989), as well as from Slovak dictionaries. Note the following transcription symbols used in Slovak, Polish, and Russian: [c] alveolar voiceless affricate [č ǰ] postalveolor affricate [ć] prepalatal voiceless affricate [š, ž] Postalveless fricative [x] velar voiceless fricative

2 This is a simplification. I have argued elsewhere that the lengthening is triggered by one of the fleeting vowels known as “yers” which functions here as the gen.pl. ending. These vowels surface phonetically only in restricted contexts (cf. Kenstowicz and Rubach 1987; Rubach 1986).

3 In fact, it is not necessary to fully specify both elements of the diphthong since the quality of the onglide can be determined from the vowel in the head position by spreading, see Rubach (1993).

4 Whether the skeleton is composed of skeletal X-slots or moras is an open question; see chapter 5, this volume, for extended discussion. In Rubach (forthcoming) I claim that only the X-slots and not the moras are appropriate for Slovak.

5 The analysis of the Slovak syllable nuclei in the remainder of this section is based on Kenstowicz and Rubach (1987).

6 Distinctions of this type have been suggested earlier for French by Kaye and Lowenstamm (1984). The authors point out that, for example, the [w] in *watt* (borrowed from English) and the [w] in *oie* [wa] “goose” behave differently with regard to liaison which applies in the latter but not in the former case. This difference is understandable if one assumes that the [w] of *watt* is part of the onset while the [w] of *oie* is in the nucleus and hence forms a diphthong with the following vowel.

7 The relevant adjacency for the application of the Rhythmic Law is established at the level of Ns.

8 I mean the phonetically-oriented postlexical rules, the class of rules designated as P-2 in terms of kaisse (1985).

9 The Russian words are transliterated. In (25a) Polish [š] is spelled š rather than *sz* to facilitate a comparison with Russian. [ɨ] is a high back unrounded vowel. It is an underlying segment in both Polish and Russian.

10 As we explain below, Surface Palatalization applies after Retraction, hence at the stage at which all nonpalatalized consonants have been specified as [+back]. Surface Palatalization is therefore a “spreading cum delinking” rule.

11 There are also good descriptive reasons for why the assumption of underlying /i/ would be impossible: labials admit both [i] and [

], thus next to *dym+i+č* "to smoke" we have *dom+y* "houses".

12 Polish – but not Russian – has such a rule. It is Coronal Palatalization, discussed in Rubach (1984).

13 This means that the Russian Surface Palatalization is a rule spreading the feature [−back], but not [+high] because /e/ is not [+high]. The missing [+high] is added later by a redundancy rule.

14 The consonants are derived by First Velar Palatalization (31) with /g/ first changing into an affricate and then spirantizing into a fricative, as is the case in most Slavic languages.

15 Whether the [

] in the root morpheme is underlying or not is irrelevant at this point. Either assumption would produce the correct result.

16 In classic generative phonology, the desirable effect would be achieved by a clever encoding of boundaries in the structural descriptions of the rules. However, for many good reasons, boundaries have been rejected as a permissible instrument in phonological analysis (see, for example, Kiparsky 1982 and Mohanan 1986).

17 Many Poles say [č'ikago], with an affricate, but this does not affect our argument.

18 For example, Ikan'se, a rule that reduces unstressed nonhigh vowels to [i] if they are preceded by a soft consonant, applies not only to [č'is+

], from underlying /č'as+

/ "clock", but also to [ž'il'+e+t´], from underlying /žal'+e+t´/ "to regret". In the latter Hardening provides an environment for Retraction and we derive the final output [ž

l'+e+t´]. The nonreduced vowels appear in the nominative singular of the nouns *čas* "time" and *žal'* "regret".

Cite this article

RUBACH, JERZY. "Representations and the Organization of Rules in Slavic Phonology." *The Handbook of Phonological Theory*. Glodsmith, John A. Blackwell Publishing, 1996. Blackwell Reference Online. 31 December 2007 <http://www.blackwellreference.com/subscriber/tocnode?id=g9780631201267_chunk_g978063120126733>

Bibliographic Details

The Handbook of Phonological Theory

Edited by: John A. Glodsmith
eISBN: 9780631201267
Print publication date: 1996