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### Russian Phonology: The Core

An important discovery made by phonologists in the 1920's (Jakobson, Trubetzkoy, Sapir, Bloomfield), but not altogether correctly appreciated at the time, was that in addition to the surface representation (the so-called narrow phonetic transcription) utterances also have (more) abstract underlying representations, which differ in various systematic ways from the surface representations.

It was widely assumed then - and this assumption is also made here - that both underlying and surface representations are sequences of discrete segments (phonemes), and moreover - this is special contribution of Jakobson - that the segments are not the ultimate constituents of language. Rather, it is assumed here that each segment is itself composed of (largely) binary features, such as [+/-back], [+/-round], etc. Both underlying and surface representations are therefore sequences of such feature complexes. In the discussions below segments are usually represented by single letters of some alphabet; however, this is done only for typographical perspicuity, and each letter is always understood as an abbreviation for a specific complex of features.

We begin the discussion with cases where the two representations differ in the segments of which they are composed. In (1) we give the Past tense forms of two Russian verbs. (The bold face letters represent stressed vowels.)

- (1) a. n, is-**l**-a      n, is-**l**-o      n, is-**l**,-i      'carried'  
      b. staya-**l**-a      staya-**l**-a      staya-**l**,-i      'stood'

The first two forms are those of the Singular Feminine and Neuter, respectively, and the third form is that of the Plural (where gender distinctions are systematically neutralized in Russian). We leave aside at this point the Sg Masc, because it involves some complexities that are discussed below.

Each form in (1a) is composed of three pieces in a definite order: a stem, a Past tense morpheme /l/, and an Agr morpheme: /a/ SgFem, /o/ SgNeut, and /i/ Pl. The important thing to be

noted at this point is the complete syntactic transparency of the forms.

Two further things need to be discussed here. First, the Past tense morpheme /l/ appears as palatalized /l, / in the Pl. We assume that this is due to a special rule of Palatalization, which has been stated informally in (2), where C, stands for a consonant with the feature [-back]

(2) C >>> C, in env. \_\_\_\_ V[-back]

Alternations such as that between /l/ and /l, / need to be dealt with somehow in every phonological account of Russian. Here this is done by means of a rule such as that in (2), which changes the feature composition of the phoneme sequence. In this respect the present account differs from various accounts formulated in terms of violable constraints. One of the purposes of the present account is to argue for the superiority of rules over constraints. I propose to do this not in one fell swoop, but gradually, by examining a variety of phenomena for which rule accounts are obviously superior to the alternatives.

The second fact to be noted about (1) is that the SgNeut appears as /o/ in (1a) where it is stressed, but as /a/ in (1b) where it is unstressed. Russian stress is discussed in a subsequent lecture. At this point, we note that in the literary dialect of Russian the vowels are subject to a variety of neutralizations, called akan'e/ikan'e in the Russian linguistic literature; their effects are stated informally in (3).

(3) a. akan'e. Unstressed /o/ >>> /a/

b. ikan'e. Unstressed [-high] vowels >>> /i/  
in env. C[-back] \_\_\_\_

In (4) I have shown the singular Present forms of the two verbs

(4)	1Sg	n, is- <b>u</b>	stay- <b>u</b>
	2Sg	n, is, - <b>o</b> -s*	stay- <b>i</b> -s*
	3Sg	n, is, - <b>o</b> -t	stay- <b>i</b> -t

where /s\*/ is the [-ant] Coronal fricative [š]

The 2Sg and 3Sg forms of the verb on the left are relatively transparent: /o/ is the Present tense marker and /s/ and /t/ are the 2Sg and 3Sg exponents respectively. This hypothesis is confirmed by the forms of the verb on the right. However, here the Present tense marker is /o/ but /i/. This is due to the fact

that in Russian verbs belong to what traditional grammars call two conjugation. Verbs of the II Conjugation (like /stoy-a/) take /i/ as their Present tense marker, verbs of the I Conjugation take /o/, which, as we shall see in a moment, is underlyingly not /o/, but /e/. The choice of Present tense exponent is entirely predictable from the form of the verb system as I will show below.

Comparison of the Present forms of the verb /stoya/ with those of the Past tense in (1) reveals that verb final /a/ is missing, and this needs, of course, to be explained. The explanation, which was discovered by Jakobson in 1948, is that Russian is subject to rule (5), which deletes a vowel in position before a vowel.

(5) V >>>> Ø in env. \_\_\_\_\_V

The importance of Jakobson deletion rule cannot be exaggerated, it is the key to the understanding of the morphology of Russian (and of all Slavic languages).

Vowel deletion explains the absence of the vowel /a/ not only in /stoy-i-s\*/ and /stoy-i-t/, but it also explains the absence of the Present exponent /o/ in 1Sg /n, is-u/. Moreover, it also accounts for the 1Sg form /stoy-u/ from the underlying

/staya-i-u/

with double application of Jakobson's rule.

We are still not done with the forms in (4). We still need to explain the fact that the root /n, is/ has a palatalized /s,/ in the 2/3Sg, but an unpalatalized /s/ elsewhere. Since the tense marker /o/ is deleted in 1Sg, where there is no palatalization, we must attribute the palatalization to it. We have a rule - rule (2) - that palatalizes consonants; however, rule (2) applies only before [-back] vowels, and /o/ is [+back]. We could add another rule that applies before /o/ in the Present tense only. But this is obviously a desperate and ugly move. A better move is to posit that the Present tense marker of I Conjugation verbs is /e/ and that Russian is subject to rule (6) which turns /e/ into /o/ when it bears the word stress.

(6) /e/ >>>> [+back, +round] when stressed

Rule (6) must meet some additional conditions, which we set aside at this point. For more details see Lightner 1972, chapter 1, whose account, by and large, is being followed here and below.

Given the rules developed to this point we derive the forms in (4) from the underlying representations in (7).

(7)	1Sg	n, is-e-u	staya-i-u
	2Sg	n, is-e-s*	staya-i-s*
	3Sg	n, is-e-t	staya-i-t

These forms will be subject to rules (2) and (6) as shown in (8).

(8)	n, is-e-s*	->	n, is, -e-s*	->	n, is, -o-s*
		2		6	
	n, is-e-t	->	n, is, -e-t	->	n, is, -o-t
		2		6	

It is important to note that this result is predicated on the assumption that rules are ordered: if (6) had applied before (2), the condition for application of (2) were no longer in place, and (2) could not have applied. It may be objected at this point that there is another way of dealing with this situation, namely, by denying reality to intermediate representation and applying all rules to the underlying representation.

The 1Sg form, however, shows that this is incorrect. The rules that apply to the underlying representation /n, is-e-u/ are (2), (3), (5), and (6), and if all four rules applied we would get as output /n, is, -u/, instead of the correct /n, is-u/. As shown in (9), if we order (5) before (2), this produces /n, is-u/, to which (2) cannot apply (neither can (3) or (6)).

(9)	/n, is-e-u/	->	n, is-u
		5	

In (10) I have recapitulated the rules discussed to this point and listed them in the order in which they apply. An argument for ordering (3) is presented below (cf. XXX). Next to the rule numbers in (10) I have inserted an informal mnemonic by which this rule will be referred to below.

(10)	(5) VDel	V >>>	∅ in env.	___ V
	(2) Pal	C >>>	C, in env.	___ V[-back]
	(6) e>o	/e/ >>>>	[+back, +round]	when stressed
	(3) akan'e	a.	Unstressed /o/ >>>	/a/

ikan'e b. Unstressed [-high] vowels >>> /i/  
in env. C[-back] \_\_\_\_\_

It is of interest to note that the official orthography of Russian represents forms without showing the effects of rules (2), (3) and (6) have not applied. In the case of the two verbs that have served as our examples above the official spellings are nes and stoya, and, as these are also the correct underlying representations they are employed everywhere below. These underlying representation are required in order to account for the Past SgMasc form [n,os] and for the SgImperative form [stoy]. In the former case the underlying /e/ palatalizes the preceding /n/ and is then turned into [o] by rule (6). To obtain the Imperative [stoy], it is necessary to assume that /o/ is in the underlying representation. When unstressed, /o/ is turned in /a/ by the akan'e rule (3a).

We now turn to the Plural forms in (11).

(11)	1Pl	n, is, -o-m	stay-i-m
	2Pl	n, is, -o-t, i	stay-i-t, i
	3Pl	n, is-u-t	stay-a-t

Nothing needs to be said about the 1Pl and 2Pl: their underlying representations are given in (12) and the rules given to this point produce the correct outputs.

(12)	1Pl	nes-e-m	stoya-i-m
	2Pl	nes-e-t, i	stoya-i-t, i
	3Pl	nes-e-t	stoya-i-t

This is obviously not the case for the 3Pl. We have assumed here that the underlying representation of 3Pl is identical with that of 3Sg, and this is obviously incorrect since the surface forms differ in both conjugations. Following the proposal in Lightner 1972 we assume that the 3Pl exponent is not /t/, but /nt/. By itself this change in underlying representation will not produce the correct surface form; we need also the Nasal rule (13).

(13) Tautosyllabic VN is replaced a. by /a/ if V = [-back]  
b. by /u/ if V = [+back]

It is assumed here that syllabification is one of the first rules of the phonology. The precise character of this rule and its effects are not totally clear to me at this point, and I assume below that it allows to divide a string as shown below, where a dot represents the beginning of each consecutive syllable



(16)	s=nim-e-u	s=nim-e-t	s=nim-l-a	s=nim-l-i
Syllab	.s=nim.-e-.u	.s=ni.m-e-t	.s=nim-.l-a	.s=nim-.l-i
VDel (5)	.s=n.im-u	dna	dna	dna
Pal (2)	.s=n,i.m-u	.s=n,i.m,-e-t	.s=n,im-.l-a	.s=n,im-.l,-i
Nas (13a)	dna	dna	.s=n,a-.l-a	.s=n,a-.l,-i
e>o (6)	dna	dna	dna	dna
ikan'e (3)	dna	.s=n,i.m,-i-t	.s=n,i-.l-a	dna

The derivations in (16) show that the stem alternations are perfectly regular phenomena of the phonology of Russian. In fact, additional machinery would be required if these alternations did not exist. According to Garde 1980, para 544, Russian has six verb stems ending with a nasal, and every verb formed with these six stems exhibits the alternations in (16).

We return to the role of the Nasal rule in Russian phonology below. At this point we need to return to the conjugation of the verb *nesti* and account for the 3Pl Present tense form. This form has the underlying representation

nes-e-nt

The rules developed to this point would generate the output

.n,i.s,-a-t

which is grossly incorrect. To obtain the correct output we assume that in the 3Pl a Readjustment rule applies to the Present tense exponent /e/ and turns it into /o/. Such Readjustment rule are widely attested in English where, as shown in (17) they affect the verb stem vowel.

(17)	sing-sang-sung	strike-struck-strick-en	break-broke-broke-n
	give-gave-give-n	buy-bough-t	sell-sol-d

Russian also has stem alternations of the English kind, but in addition in Russian the Pres tense exponent /e/ - i.e., a nonstem - is also subject to vowel alternation. Formally, we capture this by the Readjustment rule (18).

(18) /e/ >> [+back, +round] in env. \_\_\_\_ Pres + 3Pl

Like all Readjustment rules, (18) is ordered before any of the rules of the phonology, and this produces the correct output as shown in (19).

(19) nes-e-nt >>> .ne.s-e-nt >>> .ne.s-o-nt >>> .n,e.s-o-nt >>>  
Syl (19) (2) (13b)  
  
>>> .n,i.s-u-t  
(3b)

The addition of rule (13), however, produces an incorrect output for the 1Pl form as shown in (20).

(20)  
nes-e-m >> .ne.s-e-m >> .n,e.s,-e-m >> .n,e.s,-a >> .n,i.s,-a\*\*  
Syl (2) (13a) (3b)

It is obvious that in order to get the correct output [.n,i.s,om], rule (13) must be prevented from applying here. In order to see why (13) is blocked here we need to explore one of the most original aspects of the phonology of Russian (and of all Slavic languages, as well), and that is the existence of Yers, a topic to which we turn next.

Consider to this end the SgG and SgN forms of the nouns in (21).

(21) a. park-a park 'park' b. turk-a turak 'Turk'

In (21b) differs from (21a) in that a vowel appears in prefinal position in (21b) and not in (21a). Following again the lead of Lightner 1972 I propose that the two nouns differ in underlying representation, specifically that the /rk/ cluster includes a Yer in (21b), but not in (21a), where Yer is a special vowel that surfaces in some positions, but deletes elsewhere. The rules that govern the distribution of underlying yers, of which there are two: [-/+back], are those in (22). (For additional discussion of the treatment of Yers, see Halle and Vergnaud 1987.)

(22) a. +high >> -high in env. \_\_\_\_ C<sub>0</sub> +high  
-ATR -ATR  
  
b. +high >> 0

It is assumed here that yers are [+high] vowels that differ from [i u ɨ] as being [-ATR], while the latter are [+ATR]. Since yers do not surface as such, this decision is based on the fact that

when yers do surface they are (mostly) [-ATR], as shown in (23).

- (23) son << sUn-U                      sna <<< sUn-a 'dream' N/GSg  
 l,ef <<< lIif-U                      l,v-a <<< lIv-a 'lion' N/GSg  
 xr,ib,et <<< xrebIt-U              xr,ibt-a <<< xrebIt-a 'crest' N/GSg  
 agon,-U <<< ogUn,-U              agn,-a <<< ogUn,-a 'fire' N/GSg

We shall have more to say below about Yers in the phonology of Russian. At this point, we return to the problem in (20) which was the cause of this digression. We note that we can now account for 1Pl forms by positing that the Agr suffix is not /m/ but /mU/, and since /U/ is a vowel like any other, it will result in the syllabification shown in (24)

- (24) nes-e-mU >>> .ne.s-e-.mU

The Nasal rule (13) does not apply here, because for this rule to apply the nasal must be in the same syllable as the vowel, whereas here the nasal syllabifies as the onset of the following yer.

Notice that if we assume that the 3Pl ends with a Yer, this will still result in Nasalization applying in 3Pl, as shown in (25), where the syllable Onset are marked with a dot, which I assume is inserted by a rule of Syllabification that is ordered before all other rules in the phonology.

- (25) nes-e-ntU >>> .ne.s-e-n.tU      stoya-i-ntU >>> .sto.y-i-n.tU

The case forms of the noun vremja 'time' in (26) provide additional support for this proposal. (Garde 1980, para 280 reports that there are 10 nouns of this type.)

- |                 |                |               |            |
|-----------------|----------------|---------------|------------|
| (26)            | vremen-i       | vremen-U      | vremen-Ø   |
| Syll            | .vre.me.n-i    | .vre.me.n-U   | .vre.men   |
| VDel (5)        | dna            | dna           | dna        |
| Pal (2)         | .vr,e,m,e,n,-i | .vr,e,m,e,n-U | .vr,e,m,en |
| Nas (13)        | dna            | dna           | .vr,e,m,a  |
| Yer Lower (22a) | dna            | dna           | dna        |

Stress Retract	dna	.vr,e.m,e.n-U	.vr,e.m,a
Yer Del (22b)	dna	.vr,e.m,on	dna
e/o (6)	dna	.vr,e.m,o.n-U	dna
akan'e (3a)	dna	dna	dna
ikan'e (3b)	.vr,e.m,i.n,-i	.vr,i.m,on	dna

The derivations in (26) should be self-explanatory, except for the rule of Stress Retraction, which will be discussed in a subsequent lecture devoted to the treatment of stress. As explained there, stress retracts off a yer onto the preceding syllable.

Before taking up additional facts it is useful to consider the effects of the preceding on the 1Sg suffix [u]. In view of the Nasal rule (13b), we now have two sources for this morpheme: in addition to representing it as underlying /u/ we can also represent it as a [+back] Vowel + Nasal, as shown in (27), where /N/ stands for a nasal consonant with an unspecified Designated Articulator.

(27) nes-e-oN >>> .ne.s-e.-oN >>> .ne.s-oN >>> n,e.s-oN  
                   Syl                                   VDel (5)                                   Pal (2)

>>>           .n,e.s-u >>> .n,i.s-u  
 Nas (13b)                                   ikan,e (3b)

stoya-i-oN >>> .sto.ya-.i.-oN >>> sto.y-oN >>>> .sto.y-u  
                   Syl                                   Vdel (5)                                   Nas  
 >>>           .sta.y-u  
 akan'e (3a)

The obvious question that is raised by the existence of alternative underlying representations is whether there is an argument for choosing the more abstract representation /oN/ over the concrete /u/.

The answer is 'yes', but in order to make it plausible, it is necessary to have a clearer picture about a number of further issues in Russian phonology, in particular, about the vowels that are part of the Russian phoneme alphabet. The alphabet is composed of the 9 vowels in (28).

(28)	i	ɨ	u	æ	a	I	U	e	o
high	+	+	+	-	-	+	+	-	-
ATR	+	+	+	+	+	-	-	-	-
back	-	+	+	-	+	-	+	-	+
low	-	-	-	+	+	-	-	-	-
round	-	-	+	-	-	-	-	-	+

As already explained [+high,-ATR] vowels never surface as such: they become [-high] if followed by a (+high,-ATR) vowel in the next syllable, but elsewhere they delete. (See rule (22) and discussion there.) In fact, the surface distribution of the feature [ATR] in [-high] vowels is subject to a complex rules, which will be discussed here only to a limited extent. The distinction between [+/-ATR] vowels both in underlying and intermediate representations is of the greatest importance as is shown directly below.

A fundamental distinction in Russian phonology is that between thematic and athematic verbs. In thematic verbs the root is followed by a vowel or longer phoneme sequence. The list of themes is given in (28)

(28)	a	pis-a 'write'
	nu	merz-nu 'freeze'
	ay	čit-ay 'read'
	ey	bel-ey 'become white'
	ow-a	ris-ow-a 'draw' (a picture)
	athematic	živ 'live' nes 'carry'
	i	govor-i 'speak'
	æ	šum-æ 'make noise'

Each verb of the language belongs takes one of these eight thematic suffixes, and these determine also the choice of present tense exponents. The thematic suffix determines the choice of Present tense exponent.

(29) Verbs with the theme /i/ or /æ/ plus the verbs /sUp-a/ 'sleep' and /gUn-a/ 'chase' take /i/ as their present tense exponent (II Conjugation). All other verbs take /e/

(I Conj).<sup>1</sup>

A fair number of verbs lose the theme in either the present or the past tense. This type of deletion is not part of the phonology proper, but is rather effected by Readjustment rules. A few examples are given below; for further details, see Halle and Matushansky in prep.

(30) m,orz-l-a 'froze' but inf. m,orz-nu-t'

sos,-o-t 'sucks' but Past sos-a-la

žd,-ot 'waits' but Past žd-a-l-a

It will be recalled from the discussion above that the verb /stoy-a/ 'stand' belongs to the II Conjugation and has /i/ as its Present tense exponent. This is not a counter-example to rule (29). Rather, the phonology of Russian is subject to the rule (31), which turns /æ/ into /a/ after a palatal - i.e., [daCoronal,-ant] consonant, including after the glide /y/.<sup>2</sup>

(31) /æ/ >>> [+back] in env. [daCor, -ant] \_\_\_\_\_

An important type of consonantal alternation in the conjugation is what is known in Russian grammars as 'transitive softening' (perexodnoe smjagčenie) (PS hereinafter). In 1Sg of II Conjugation and in all persons of I Conj verbs with the theme /a/, [+ant] Coronals are replaced by their [-ant] cognates, while labials are replaced in this environment by [Cl,], as shown in (32).

(32) t      d      s   z   n   l   r      k   g   x      p   b   f   v   m  
č/šč   ž/žd   š   ž   n, l, r,      č   ž   š      pl, bl, fl, vl, ml,

Examples of these alternations are given in (33).

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<sup>1</sup> There are also a number irregular verbs; e.g., /u-šib-i/ 'injure', /beg-a/ 'run', /xot-a/ 'want', etc. with unpredictable distribution of the Present tense exponent. These are dealt with by special Readjustment rules.

<sup>2</sup>The verb kišet' 'swarm (like bees)' is the sole exception to rule (30).

(33) (to be extended; see Garde 559, 566)

rez-a-l-a	rež-u	rež-i-t	rež-u-t	'cut'
klevet-a-l-a	klevešč-u	klevešč-i-t	klevešč-u-t	'defame'
koleb-a-la	kolebl,-u	kolebl,-i-t	kolebl,-u-t	'shake, rock'
kap-a-l-a	kapl,-u	kapl,-i-t	kapl,-u-t	'drip'
gl,ad,-e-l-a	gl,až-u	gl,ad,-i-t	gl,ad,-a-t	'stare'
vaz,-i-la	važ-u	voz,-i-t	voz,-a-t	'convey'
l,ub,-i-l-a	l,ubl,-u	l,ub,-i-t	l,ub,-a-t	'love'

In (33) the first three verbs are Iconj, the last four IIConj. The left-most form is that of the SgFem Past tense, the other three forms are Present tense: 1Sg, 3Sg, and #Pl, respectively.

The facts in (32)/(33) raise two questions. 1. What is the nature of the phonetic process to which the consonants are subject? 2. What is the environment in which the process takes place? I discuss here only the second question. I assume here that the consonant alternations in (32) are instituted in one fell swoop by the TP rule. Though this assumption is not correct, affects none of the issues discussed in this paper. For a correct account of the operation of TP, see Halle and Matushansky in prep and Halle 2004.

As shown in the examples in (33), transitive softening takes place only in the Present tense, but not in the Past tense forms of the verb. The two conjugations differ with regard to the Person forms that are subject to it: in I Conjugation verbs all Person forms undergo transitive softening, in the II Conjugation only 1Sg is subject to it, but none of the other Persons.

In (34) I have given the underlying sequence of morphemes of relevant Person forms of the I Conj verb kapat 'drip' and of the II Conjugation verb ljubit 'love'.

(34)

	Past FemSg	Pres3Sg	Pres3Pl	Pres1Sg
a.	kap-a-l-a	kap-a-e-tU	kap-a-e-ntU	kap-a-e-om
b.	l,ub-i-l-a	l,ub-i-i-tU	l,ub-i-i-ntU	l,ub-i-i-om

It can readily be seen that PS must be ordered before VDel (5) because Vdel deletes the Theme vowel /a/ and if VDel applied there would be no difference between the forms of verbs of the athematic class such as nesti 'carry' discussed at the beginning of the lecture, and verbs such as kapat' 'drip'.

I shall assume here that TP is ordered even before Syllabification. <This may not be correct, because Syllabification may be a persistent rule, in which case it will apply after every rule that changes the syllable structure of the string.> This decision means that the underlying representations such as those in (34) will determine whether or not TP applies. In fact it must be the vowel sequences that determine whether or not TP. In the IConj we have the sequence /a-e/ and that triggers TP, whereas in the IIconj we have the sequence /i-i/ (or /æ-i/ as shown by IIconj verbs such as xrapet' 'snore' kipet' 'boil' which are inflected like ljubit' 'love').

Following a suggestion that originally was made by Ewa Czaykowska-Higgins (1988) I assume here that it is the features of the vowels in the sequence that trigger TP, specifically TP is triggered before a vowel sequence of [+ATR][-ATR], but not elsewhere. Referring to the feature composition of Russian vowels in (28) it is obvious that such a sequence is found in

kap-a-e-tU      kap-a-e-ntU

but not in

l,ub-i-i-tU      l,ub-i-i-ntU

The 1Sg forms of the two verbs are not as transparent

kap-a-e-om      l,ub-i-i-om

because there are three vowels in the sequence. We note first that words have internal constituent structure. In particular, finite forms of verbs have the right-branching structure

[[[kap-a]-e]-om]      [[[l,ub-i]-i]-om]

We assume further that the rules of the phonology are assigned to two blocks (for some discussion see Halle and Mohanan 1985) a cyclic block, where each rule applies to each constituent in turn, and a non-cyclic block, ordered after the cyclic block, where every rule applies to the entire word. We posit further that in Russian the cyclic block contains the rules in (35a) and

the noncyclic block, those in (35b).<sup>3</sup>

(35)a. Cyclic block:

Transitive Palatalization  
V Del (5)  
Palatalization (2)  
æ >>> a (31)  
Nasal (13)  
Yer Lower (22a)

b. Noncyclic block

Stress Retraction  
Yer Lower (22a)  
Yer Deletion (22b)  
e >>> o (6)  
Akan'e (3a)  
Ikan'e (3b)

Given the rule ordering in (35), the 1Sg forms are derived as shown in (36)

(36) First cycle: [[[kap-a]-e]-om] >>> dna

[[[l,ub-i]-i]-om] >>> [[l,ub,-i]-i]-om]  
Pal (2)

Second cycle: [[kapa-e]-om] >>> [kapl,-e]-om  
TP

[[l,ub,-i-i]-om] >>> [[l,ub,-i]-om]  
Vdel (5)

Third cycle [kapl-e-om] >>> [kapl,-om] >>> [kapl,-u]  
Vdel (5) Nas (13b)

[l,ub,-i-om] >>> [l,ub,l,-om] >>> [l,ub,l,-u]  
TP Nas (13b)

The important difference between the two forms is that in [kapl,u] TP applies on the second cycle, whereas in [l,ubl,u] TP applies on the third cycle. It is, of course, immediately

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<sup>3</sup>As argued in Halle and Vergnaud 1988 the Yer Lower rule (22a) must be ordered both in the cyclic block and in the noncyclic block.

obvious that this account relies crucially on the fact that the 1Sg exponent begins with a [-ATR] /o/, which is turned into /u/ by Nasal rule (13b). The derivation would not produce the correct output, if the suffix had been [+ATR] /u/ in the underlying representation. None of the rules of the noncyclic block applies to the forms above.

This seems to be a good point at which to stop so as not to exceed the capacity of an audience to absorb details about a single topic, the Russian conjugation. Those interested in additional details are referred to the study of the phonology of Russian now in preparation by Ora Matushansky and me.

I conclude with the following observation: The analyses of the different verb forms above reflect rather closely their historical development from proto-IE. Thus, the nasal in the 3Pl exponent, the Nasalization rule and the Yers are well-known components of the phonological development of the Slavic languages. The audience will recall that one of the most striking results of Chomsky and Halle 1968 was the need to include into the phonology of modern English the rule of Vowel Shift, which is known to have come into the language in the fifteenth century. The phonology of both English and Russian reflects the fact that languages change quite slowly in their underlying structure - i.e., in the underlying representation and the rules that determine how these are pronounced. Both accounts also shows that the addition of one or two simple rules to the phonology of a language may have dramatic effects on the form of the output.

#### References

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- Garde 1980
- Halle 2004
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