Jer Vowels in Russian*

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1. Introduction

The vowel-zero alternations that we see in the Russian forms given below in (1), are representative of one of the better-known problems of Slavic phonology. Instances of this alternation may be found in all of the Slavic languages (with some differences of detail), and occur in all types of vocabulary, functional as well as lexical, in affixes as well as roots, and among derived forms sharing a single root:

(1) a. kusok 'piece' (nom. sg.) den' 'day' (nom. sg.)
kusk - a " (gen. sg.) dn' - a " (gen. sg.)

b. polon 'full' (short form adj) beden 'poor' (short form adj)
poln - ɨj " (long form adj) bedn - ɨj " (long form adj)

c. žog 'burned' (m, pst tns) pod - žog 'set on fire' (m, pst tns)
žg - la " (f, pst tns) podo - žg -la " (f, pst tns)

d. mest' 'vengeance' (noun) voš 'louse' (noun)
mst - it' 'avenge' (verb) vš -ivɨj 'lice-ridden' (adj)

In Russian this alternation involves *e* and *o*, though some have argued that instances of other vowels alternating with zero in the above manner can also be found.[1] Not all instantiations of *e* and *o* undergo this kind of alternation, however, as may be illustrated by forms of the following type:

(2) a. mest - o 'place' (nom. sg.) rabot - a 'work' (nom. sg.)
mest " (gen. sg.) rabot " (gen. sg.)

b. poxož - ɨj 'resembling' (long form) bel - ɨj 'white' (long form)
poxož " (short form) bel " (short form)

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1 Rubach (1986), for instance, postulates four jers for Polish.

(2) c. gore - l 'burned' (m, pst tns) pe - l 'sang' (m, pst tns)
gore - la " (f, pst tns) pe - la " (f, pst tns)

If the pattern illustrated in (1) held for all occurrences of *e* and *o*, we would incorrectly predict forms along the lines of: (2a) **msto* and **rabta*; (2b) **poxžij* and **blij*; (2c) **gorla* and**pla*. The precise nature of this pattern, however, is one of the core problems behind the alternation and will be discussed in detail as the paper proceeds.

By way of accounting for the differences between the pattern illustrated in (1) and that illustrated in (2), it has traditionally been assumed that those vowels which undergo the alternation with zero have a fundamentally different status (the precise nature of which has been much debated) from those which do not. This assumption has historical as well as synchronic motivation, for reasons to be addressed below in §2. Finessing all detail for the moment, this approach can be summarized in the following way. First, the non-alternating pattern in (2) is the result of forms containing only ordinary *e*'s and *o*'s. In constrast, the alternating pattern in (1) is the result of the presence of the so-called "jer vowels", which differ in some crucial respect (either featural or prosodic) from ordinary vowels. When realized, however, the jer vowels are identical to the outputs of ordinary underlying *e* and *o*.[2]

1.1 Purpose and Goals of the Present Paper

The central goal of this paper is to demonstrate that the patterns of jer realization/non-realization observed in Russian can be made to fall out from the interaction of quite a diverse group of independent prosodic and morphological considerations, none of which make specific reference to or targets of jers as such. Jer realization patterns are shown to be simply by-products of general phonological interactions rather than being due to any rules or constraints that single them out specifically. This approach stands in contrast with the very influential analysis of Lightner (1972) (a summary of Lightner's analysis is presented in §2.1).

To start off, I show that a great deal of evidence points towards an analysis of Russian jers as moraless vowels, supporting the position taken by Rubach (1986) and Kenstowicz & Rubach (1987) for other Slavic languages. I then show that this representational analysis entails a particular conception of what it means for a jer to be realized or not, and that these representational considerations interact significantly with constraints on syllable structure, alignment (both prosodic and morphological), and selectional properties of particular morphemes. I follow Szpyra (1992), Laskowski (1975) and Gorecka (1988), among others, in assigning syllable structure an important role in the factors affecting jer realization, but diverge from them in contending that syllable structure alone is not enough and that other considerations must also play a role in producing the observed surface patterns. Examples of such additional considerations include: the options for particular kinds of adjoined structure word-initially, the nature of the boundary between stems and prefixes, and the cyclic behavior of certain kinds of suffixes. I argue that constraints responsible for factors such as these work in conjunction with constraints on syllable structure in

[2] In subsequent examples, jer vowels will be distinguished from non-jers by the use of capital letters, as in: *kusOk* vs. *rabota*

an Optimality Theoretic constraint hierarchy to produce the patterns of jer realization that are observable at the level of surface output.[3]

1.2 Organization

The remainder of the paper is organized as follows. §2 presents both the historical background to the modern jer alternations and a survey of significant analyses that have attempted to treat the jer problem in its synchronic manifestations. §3 lays the groundwork for the present analysis by formally defining the core factors responsible for jer realization and non-realization. §4 extends the analysis to incorporate interactions of the constraints introduced in §3 with constraints on syllable structure, particularly those dealing with restrictions affecting the right syllable margin. §5 goes on to address the question of structural options at the left edge of the Prosodic Word and the effect that such options have upon jer realization. §6 treats the question of medial jer occurrences and the realization patterns of multiple adjacent jers. In this section it is proposed that while syllable structure plays a role, neither it nor any variety of alignment (either alone or in combination) can correctly generate the proper outputs for all the data we find. It is claimed that the observed patterns are instead due to the cyclic nature of several specific derivational affixes which idiosyncratically take fully structured output forms as stems to which to affix. In §7 the question of jer realization patterns in prefixed forms is considered. A proposal about the gross shape of prefixed forms is made here and is extended into a generalization about the specific stem shapes before which prefixal jers surface. The realization patterns of jers internal to stems are shown to fall out with no additions or modifications to the analysis as presented through §6 and the patterns of prefixal jer realization are shown to be due to the interaction of several constraints on alignment.

2.0 Historical Jers and Havlik's Law[4]

The unusual behavior of the modern Slavic jer vowels has at its root a historical process which wrought great changes in the phonology of all the languages of the Slavic family (with the exception of Polabian (V. Kiparsky 1979)). Up to at least the latter half of the ninth century, the vowels known as jers functioned just like ordinary full vowels and showed no alternation with zero. Just as in modern Russian, there were two of them, one front and one back (reflexes of Indo-European *i and *u), though their precise quality is not known. In addition to being of a completely pedestrian, non-alternating character, the jer vowels at this period had a considerably wider distribution than they do in any modern Slavic language. They were such a presence during this time (which can be isolated as the late Common Slavic period) — preceding the fundamental division into East, West, and South Slavic sub-groups — and shortly thereafter) that virtually all syllables were open, a radical difference from the modern Slavic languages. The so-called Law of the Open Syllable which Slavic observed in the Common Slavic period (largely by virtue of the jers' ubiquity) came to an end,

[3] The analysis will take as its theoretical starting point the framework of Optimality Theory developed by Prince & Smolensky (1993).

[4] The facts in this section come from the following sources: Matthews (1960), V. Kiparsky (1979), Vlasto (1986), Lunt (1968), and Schmalsteig (1976). For more detail on the historical role of the jers (or other aspects of the historical phonology of Slavic), any of the sources listed would provide ample additional information.

however, between the 10th and 14th centuries, as jer vowels began systematically dropping out of words throughout the territory in which Slavic was spoken. This progressive loss, sometimes referred to as "the fall of jers", was not a random process and did not result in the complete elimination of the jer vowels. Instead, the jers that dropped out did so in what was for the most part a highly regular pattern. This pattern, known as Havlik's Law, can be summarized as follows: Jers "vocalize" (i.e., are preserved) in an alternating pattern such that, "counting from the end of the word or from the last full (non-jer) vowel, every odd jer falls and every even jer is vocalized. If a full vowel falls between the reduced vowels, the count begins again" (V. Kiparsky 1979).[5] This is illustrated by the forms in (3), where "+'s" mark the so-called "strong" jers which were preserved, and "-'s" mark the "weak" jers that were lost:

(3) a. lEstEcE → l'stec 'flatterer'
- + -

b. sOžEčE → sžeč 'burn down'
- + -

One of the consequences of the fall of jers is that many of the historically attested jers seem to have been simply lost altogether. They never surface overtly and arguably have completely vanished from the modern Slavic languages. The relevance of this to a synchronic analysis of the jer phenomenon is not to be underestimated. Lightner (1972) provides one of the most influential and widely adopted analyses of the synchronic jer alternation, but his account relies quite heavily on the assumption that many of the historical jers that were almost certainly lost in the manner described, are still abstractly present in the modern Slavic languages. A case in point is that of the surface null suffix that we see in forms such as *kusok* (see (1a)), *l'stec*, and *žeč* (see (3)). These forms appear to consist just of bare roots with a null inflection, if any. Lightner's analysis, which will be presented in more detail below in §2.1, asserts that these inflections are not null, however, and that in fact Russian has no null suffixes. Instead, he claims that all apparently null suffixes in Russian consist of unrealized jers. In contrast, I will be taking the position that all the surface zero inflections traditionally claimed to consist of abstract underlying jers are synchronically zero, both in input and output. I will furthermore assume that any purported jer that does not overtly surface in an at least relatively regular alternation simply does not exist, since no language learner would bother to even posit such an entity without solid evidence to its necessity.

2.1 The Standard Analysis

The account which I will refer to as "the Standard Analysis" can be attributed to Lightner (1972), though it has been followed by many others since. Under the standard account, jers are proposed to differ from ordinary vowels featurally, being underlyingly high and lax. These high, lax vowels must then lower to be realized. The central generalization regarding the realization/non-realization patterns of the jers under this analysis is that jers vocalize when followed by a jer in the next syllable and delete in all other environments. In (4), below, we have Pesetsky's (1979) formulation of the "Lower" rule responsible for jer vocalization and deletion under a Lightner (1972)-type system:

[5] For discussion with a particularly high sensitivity to the prosodic issues inherent in the fall of jers, see Vlasto (1986).

(4) $\begin{bmatrix}-\text{cons}\\+\text{syl}\\+\text{hi}\\-\text{tns}\end{bmatrix} \rightarrow \begin{cases}[\text{-hi}] \,/\, \_\_\, \text{C} \begin{bmatrix}-\text{cons}\\+\text{syl}\\+\text{hi}\\-\text{tns}\end{bmatrix}\\ \emptyset\end{cases}$

It is worth noting that the generalization that this rule is designed to capture (i.e., that jers are realized when followed by another jer) is quite different from the historical generalization known as Havlik's Law (above, §2.0), wherein jers are realized in an alternating pattern. Under the historical alternating pattern, an input of the type [C_1 jer C_2 jer C_3 jer] would yield an output of [C_1C_2 V C_3], with only the middle jer being realized. Under the pattern proposed by the Standard Analysis, the input [C_1 jer C_2 jer C_3 jer] would yield an output of [C_1 V C_2 V C_3]. They thus make substantially different predictions about outputs derived from a single input.

2.2 Criticisms and Alternatives

As mentioned in §2.0, any rule derived from Lightner's generalization about jer realization patterns is going to have to rely heavily on the assumption that many if not all of the jers that were present historically are present synchronically as well, even if they are in positions where they are never realized and thus must be entirely abstract. For instance, under an account of this sort, the alternation we see in the forms *kusok*/*kuska*, 'piece' (nom. sg. and gen. sg., respectively), would be due to the presence of an underlying jer inflection in the form *kusok* that would force the jer in the root to vocalize. In *kuska*, however, the desinence consists of a non-jer vowel, *a*, and hence the jer in the root is unable to vocalize and deletes. This is illustrated in (5):

(5) kusOk - O ⇒ kusok kusOk - a ⇒ kuska

In addition to the relatively high level of abstraction required by this analysis, there are other criticisms that one can raise against it. First, the proposal that jers differ from other vowels in the Russian (or more generally, Slavic) inventory by a combination of laxness and height is entirely arbitrary. There is no evidence of any sort to suggest that this might be the case. A second more serious criticism to be raised is that the central generalization which the Lower rule is designed to capture is itself very arbitrary in character. I have been unable to find any work on this subject that has even attempted to attribute to it any kind of principled foundation whatsoever. While the alternating pattern of the historical fall of jers has a decidedly metrical flavor to it, the modern generalization espoused by the standard analysis seems to follow from absolutely nothing. Given these shortcomings, it seems that a search for alternative approaches has more than sufficient motivation.

In recent years, a number of alternative accounts to the problems which are presented by the jers have been pursued.[6] Much of the debate has centered on what, precisely, the jers' status ought to be and how they should be represented. The approaches which will be considered here fall into three classes: i) those

[6] The specific jer-related problems differ somewhat from language to language. See, for instance, Laskowski (1975), Gorecka (1988), Czaykowska-Higgins (1988), Piotrowski (1988), Spencer (1985), and Szpyra (1992) for discussion of jers in Polish, and Kenstowicz & Rubach (1987) for a discussion of jers in Slovak.

which propose that the jers are simply epenthetic, ii) those which propose that jers consist just of empty moras at the level of underlying representation, and iii) those which propose that jers are underlyingly moraless vowels. For reasons which should become clear, the third analysis will be adopted here since it is the only one capable of handling the Russian facts.[7]

2.3 Epenthesis

In a complete break from the historical roots of the jer phenomenon, numerous analysts have proposed that the synchronic jer alternations are the product of epenthesis. The various epenthetic analyses of jers (for instance, those of Laskowski 1975, Gorecka 1988, Czaykowska-Higgins 1988, and Piotrowski 1988 — all for Polish) have been driven by the observation that where jers appear in output forms seems to have a very high sensitivity to syllable structure. This is an important point and one to which we shall return later. The epenthetic approach, however, is completely impracticable for Russian for two reasons. First, in Russian it is altogether unpredictable whether it is *e* or *o* that will turn up in the output. This difficulty does not arise in Polish since all Polish jers arguably surface as *e* (including those which in the corresponding Russian forms surface as *o*). Second, it is simply not possible in Russian to predict the sites of "epenthesis" based purely on grounds of syllable structure (this appears to be the case even for Polish —see Szpyra 1992 for discussion). This is made perhaps most clear by the existence of minimal pairs like the following (taken from Townsend 1968):

(6)	a.	laska	'weasel' (nom. sg.)	laska	'caress' (nom. sg.)
		lasok	" (gen. pl.)	lask	" (gen. pl.)
	b.	kostra	'bonfire' (gen. sg.)	kostra	'boon' (nom. sg.)
		kost'or	" (nom. sg.)	kostr	" (gen. pl.)
	c.	bobra	'beaver fur' (nom. sg.)	bobra	'beaver' (gen. sg.)
		bob'or	" (gen. pl.)	bobr	" (nom. sg.)

Under an epenthetic analysis, the variation seen between the left and right columns in (6) is predicted to be impossible. Either an environment conditions epenthesis or it does not; we certainly would not expect it to condition epenthesis in some lexical items but not in others. Thus, while syllable structure may indeed play a role in deciding where it is that jers are realized, constraints on syllable well-formedness alone are insufficient to account for the surface patterns.

2.4 Jers as Empty Moras

A second important proposal (versions of which have been pursued by Spencer 1985 and Szpyra 1992 — both for Polish) has suggested that jers are contained in underlying representations as empty moras whose featural content gets filled in by default rules.[8] This analysis manages to avoid the second problem

[7] At least, it is the only purely phonological account capable of handling the Russian facts. There have also been approaches suggested which relied on allomorphy, discussion of which may be found in Gussman (1980).

[8] Szpyra's account actually proposes that the jer-moras dominate empty root nodes rather than nothing at all. Nevertheless, the same problems will arise for her analysis as for Spencer's with respect to the Russian data. Of course, there is more to these analyses than I am indicating here and not all the proposed underlying moras end up as surface vowels.

noted above for the epenthetic analysis by having the jers' presence in particular positions be underlyingly encoded, but as applied to Russian still runs into the insurmountable difficulty that it is never predictable from the context exactly *which* vowel will show up in any given form. This would preclude the featural specification through default rules which is proposed for Polish.

2.5 Jers as Underlyingly Moraless Vowels

A third proposal, which may be found in Rubach (1986) and Kenstowicz & Rubach (1987) (for Slovak), suggests that jers underlyingly consist of fully specified vocalic feature complexes and differ from other vowels solely in not being associated to any unit of weight/length. This analysis seems by far the most promising for the case at hand for two reasons: (i) it allows the realization of jers to be the result of a sensitivity to syllable structure without the location being a product of syllable wellformedness conditions, and (ii) since the vowels which undergo the alternation with zero may have fully specified featural content, the *e/o* distinction may be captured and other vowels may be assimilated to the alternating pattern as well (accounting for the fact that sometimes vowels other than *e* and *o* may perhaps show jer-like behavior — see fn. 1).[9] It is important to note that this account is crucially dependent on the assumption that ordinary vowels all come preassociated to moras in their input forms (as is proposed in Hayes 1989 and adopted in McCarthy & Prince 1993 to account for the inherent syllabicity of vowels and underlying distinctions in vowel length).

This analysis raises some questions of its own, of course. For instance, why should it be the case that some vowels should be moraless underlyingly, and why should any particular kind of vowel or vowels (such as the Russian mid-vowels) get singled out for this distinction? While I will not attempt to address these issues here, it is worth noting that these questions are part of a larger more fundamental one, specifically: why should moras *ever* be present underlyingly? This is a question beyond the scope of this paper. In the following, however, I will try to demonstrate that adopting a representational analysis of jers as moraless vowels helps provide a very natural account for the close relation between patterns of jer realization and principles of prosodic well-formedness.

3. An Optimality Theoretic Proposal: Part I

Our starting point will consist of two assumptions: a) jers are underlyingly moraless vowels and b) output syllable nuclei must always be moraic.[10] Given these assumptions, together with the fact that some jers do in fact surface as syllable nuclei, the task before us becomes one of accounting for why some jers have moras bestowed upon them and become realizable segments, while others do

[9] This second point is made by Kenstowicz & Rubach (1987) themselves and they note that there are instances in Slovak where the vowel *a* seems to fit the same alternating pattern as do the jer versions of *e* and *o*.

[10] Assumption (b) will presumably follow from a universal requirement for every prosodic constituent of level C^n to dominate at least one of level C^{n-1} (Selkirk 1980ab, 1993; Itô & Mester 1992, 1993). This property would constrain the possible parses set forth by GEN for consideration in the candidate sets submitted to the EVAL component of the grammar.

not. The two constraints I will take to be at the heart of this matter are MSEG[μ] and PARSE-V.[11]

MSEG[μ] requires that every mora in a candidate undergoing evaluation be an exponent of the morpheme within which it occurs, which is to say, it must correspond exactly to a mora in the input and not have been an element that was simply posited by GEN. All moras which are inconsistent with input moraic structure will incur a violation of MSEG[μ]. Since realization of a jer will always require GEN's positing a non-input mora in order to allow the jer to serve as a syllable nucleus, every output jer will then be the result of an MSEG[μ] violation. Realized jers are thus always the result of a non-faithful parse.

Given that realization of a jer as a vowel will always entail an MSEG[μ] violation, it would seem that non-realization of jers, or at least non-vocalic realization of jers would have to be inherently less costly. While I will argue below that non-realization *is* in fact less costly than realization, this will not be because realization incurs a constraint violation while non-realization violates nothing. On the contrary, unrealized jers are not going to come for free either. The reason for this is that the high sonority and featural makeup of these segments makes them quite unsuitable for any role except that of syllable nucleus. Lacking a mora, however, they are incapable of serving as nuclei and thus find themselves essentially unparseable. Because of the fact that there is no way to incorporate them into any representation with even a chance at well-formedness, they necessarily incur a violation of PARSE-V.[12] Unrealized jers then are also always the product of an unfaithful parse.

Under the analysis as presented so far, we are left with the rather interesting observation that a completely faithful parse of a form containing a jer will never be optimal. Actual surface forms will always be due to one of two varieties of unfaithful parsing. The prediction that there can be no faithful parse for forms containing segments of this type has a desirable side effect in that it gives an explanation for why such segments are actually quite rare. Certainly any segment incapable of being faithfully parsed is a costly item to have in one's inventory and it is to be expected that they would in general be avoided.

As to the relative ranking of these two core constraints, it is clear that MSEG[μ] must dominate PARSE-V, as is illustrated in the following tableau for *turka*, 'Turk' (gen. pl.), from which it is also clear that MSEG[μ] must dominate NOCODA. The angled brackets in (a) indicate an unparsed vowel, i.e., one which is not incorporated into the prosodic structure:

[11] MSEG is a family of constraints replacing the FILL of Prince & Smolensky (1993) and McCarthy & Prince (1993). MSEG requires that every phonological element be the exponent of a morpheme (from class handouts: John McCarthy's Optimality proseminar 9/8/93).

[12] For a moraless high vowel, however, we might well expect the story to be different, with incorporation as a syllable margin being a viable alternative to incorporation as a nucleus. Jers always occur between consonants, however, making a "consonantal" parse of a jer (regardless of height) inviable for reasons of sonority.

(7) MSEG[μ] » PARSE-V, NOCODA

/turOk - a/	MSEG[μ]	PARSE-V	NOCODA
a. ☞ tur.<O> .ka		*	*
b. tu. rO. ka	*!		

The specific prosodic representations being assumed for the forms in (7) are the following:

(8) input: μ μ — t u r O k a

candidates: (a) σ σ — t u r <O> k a (b) σ σ σ — t u r O k a

In (8b), the sub-optimal form, there is an extra mora (indicated by the box: [μ]) and, as a consequence, this form has an extra syllable as compared to the optimal candidate, (8a). The moraless vowel in form (8a) is left altogether unprosodified, but is still abstractly present as is required by the principle of Containment.[13]

With respect to the treatment of codas in (8),I will assume throughout that coda consonants are not moraic in Russian, given that there is no real evidence to suggest that this is not the case and given the fact that adopting this asumption will make several aspects of the analysis to be presented here simpler. While certain components of the analysis will be formulated in terms of this assumption, it is neither central nor crucial to the account. [14]

4. Part II, Jers and Syllable Structure

Given that MSEG[μ] » PARSE-V, we would expect no input jer to ever surface unless some higher ranked constraint compelled it, since the non-input mora necessary to jer realization would always incur a more severe violation than simple non-parsing of the feature complex of which the jer inherently consists. Since some jers do in fact surface in optimal forms, it is clear that there must be some constraint or set of constraints that is able to compel violation of MSEG[μ].The heart of my proposal will be that it is the interaction of MSEG[μ] and PARSE-V with constraints on syllable structure and alignment that generates the output patterns we find. This will be demonstrated in detail below.

[13] Regarding Containment, see McCarthy & Prince (1993a) after Prince & Smolensky (1993).

[14] If this assumption were to prove to be wrong, however, there would be a real question about how assignment of moras to codas differs from the assignment of moras to jers. As has been pointed out by Armin Mester (comments in John McCarthy's Fall 1993 Optimality proseminar), the moraic coda is the unmarked case in the world's languages and thus it would seem odd to penalize moras assigned to codas. In any case, if Russian codas were to turn out to be moraic, they would clearly need to not incur violations of the MSEG[μ] constraint proposed here.

4.1 Jers in Word-Final Syllables

Perhaps the most typical instances of the alternation with zero exhibited by jer vowels are those which we find occurring in the inflected forms of the nominal system and in the so-called "short-form" adjectival declensions. The forms in (9) provide an assortment of examples showing alternation in the nominal declension:

(9)

kuxn' - a	'kitchen'	(nom. sg.)	okn - o	'window'	(nom. sg.)
kuxon'	"	(gen. pl.)	okon	"	(gen. pl.)
otc - a	'father'	(gen. sg.)	jolk - a	'fir tree'	(nom. sg.)
otec	"	(nom. sg.)	jolok	"	(gen. pl.)
den'g - i	'money'	(nom. pl.)	balalajk - a	'balalaika'	(nom. sg.)
deneg	"	(gen. pl.)	balalajek	"	(gen. pl.)
rt - a	'mouth'	(gen. sg.)	amerikan - ec	'American'	(nom. sg.)
rot	"	(nom. sg.)	amerikan - c - a	"	(gen. sg.)
sud'b - a	'fate'	(nom. sg.)	lb - a	'forehead'	(gen. sg.)
sudeb	"	(gen. pl.)	lob	"	(nom. sg.)
sn - a	'dream'	(gen. sg.)	kovr - a	'rug'	(gen. sg.)
son	"	(nom. sg.)	kov'or	"	(nom. sg.)

Further examples of this type include forms such as *kusok/kuska*, 'piece' (nom. sg. and gen. sg., respectively), *den'/dn'a*, 'day' (nom. sg. and gen. sg.), and *turok/turka*, 'Turk' (nom. sg. and gen. sg.) which were presented in the introduction. Similar patterns may be found in the adjectival system, as the forms in (10) illustrate:[15]

(10)

korotk - a	'short'	(fem.)	bol'n - a	'sick'	(fem.)
korotok	"	(masc.)	bolen	"	(masc.)
spokojn - a	'calm'	(fem.)	umn - a	'intelligent'	(fem.)
spokojen	"	(masc.)	um'on	"	(masc.)
poln - a	'full'	(fem.)	dolžn - a	'ought'	(fem.)
polon	"	(masc.)	dolžen	"	(masc.)
uzk - a	'narrow'	(fem.)	l'oxk - ij	'easy'	(masc.)
uzok	"	(masc.)	l'ogok	"	(masc.)
nizk - a	'low'	(fem.)	zl - a	'evil'	(fem.)
nizok	"	(masc.)	zol	"	(masc.)
xitr - a	'cunning'	(fem.)	kisl - a	'sour'	(fem.)
xit'or	"	(masc.)	kisel	"	(masc.)

15 All of the examples given in (10) are "short forms", which show agreement only for gender and number, except for the form *l'oxkij*, which is a long form in the nominative singular.

The fact that we get *korotka* and *turka* rather than **korotoka* and **turoka* is derivable from the ranking among MSEG[μ], PARSE-V, and NOCODA alone, as was shown in §3. Forms such as *turok*, *korotok*, and *kusok*, however, require a different treatment since without a higher ranking constraint forcing violation of MSEG[μ], we would incorrectly predict **turk*, **korotk* and **kusk*. The relevant constraint in this case would seem to be one that bars complex codas, *COMPLEX[CODA], since coda simplification is precisely what realization of the input jer achieves.[16]

Before moving on, it is worth noting at least two things about the forms under consideration here. First, the clusters in forms such as **kusk* and **turk* are not bad clusters; indeed, they are about as good as coda clusters can possibly get. Furthermore, since such clusters are certainly acceptable in jerless contexts, as forms like those in (11) show, the realization of jers to prevent coda complexity is a case of emergence of the unmarked:[17]

(11)

vsplesk	'splash' (nom. sg.)	poverx	'over'	
lask	'caress' (gen. pl.)	tv'ord	'hard' (short form adj)	
xvost	'tail' (nom. sg.)	počerk	'handwriting'	

A second thing worth noting is that these clusters are occurring in word final position, which one might expect to mitigate the level of unacceptability associated with them. *COMPLEX[CODA], however, pays attention neither to the relative acceptability of the cluster nor to the location of the cluster in the word. It simply places an absolute restriction on possible coda size.[18] It is also important to emphasize that *COMPLEX[CODA] is a constraint distinct from NOCODA and which will necessarily be ranked differently from it. In order for *COMPLEX[CODA] to be able to force realization of the jer, it must be ranked above MSEG[μ], as is illustrated in the following tableau:[19]

(12) *COMPLEX[CODA] » MSEG[μ] » PARSE-V, NOCODA

/kusOk/	*COMPLEX[COD]	MSEG[μ]	PARSE-V	NOCODA
a. ☞ ku. sOk.		*		
b. kus<O>k.	*!		*	*

16 See Zoll (1993) for a similar analysis of Polish.

17 The fact that such clusters are tolerated indicates that PARSE-C must be ranked higher than *COMPLEX[CODA]. Otherwise, we might well expect "deletion" (underparsing) to be the preferred resolution to coda complexity. Regarding the alternative resolution presented by the option for full-segment epenthesis (another strategy not made use of by Russian) see fn. 19 on FILL.

18 It will, however, be necessary to assume a high ranking constraint along the lines of ALIGN[Pwd, R, σ, R] to prevent the adjunction of a word final segment or segments directly to the Prosodic Word. This responsibility can not be handed on to a constraint of the CLOSESTMOTHER variety since, as will be presented in §5, such adjunctions are in fact allowed word-initially, resulting in an asymmetry with respect to jer realization patterns in word-initial vs. word-final position.

19 It should be noted that the MSEG which takes the place of the FILL constraint of Prince & Smolensky (1993) and prohibits epenthesis of an entire segment (rather than just a mora), like PARSE-C will crucially need to be ranked above *COMPLEX[CODA]. Otherwise (depending on the ranking between PARSE-C and MSEG) we might well expect epenthesis in forms such as those given in (11).

The optimal form in this instance is the one where an extra mora is posited by GEN, allowing the jer's features to be prosodified and thus realized in the output. This contrasts with the situation illustrated in (7) where *non*-realization of the jer is optimal. In (7), non-realization of the jer results in just a simple NoCoda violation (in addition to the inevitable Parse-V violation) which, due to its lowly status in the hierarchy is not sufficient to force violation of MSeg[μ]. In (12), however, non-realization of the jer produces the significantly less desirable state of affairs in which multiple consonants would need to occupy the right syllable margin.

It is worth noting with respect to the tableau in (12) that the jer realization we see cannot simply be attributed to multiple violations of NoCoda (that is, it is not possible to simply eliminate *Complex[coda] as an independent constraint despite the fact that there seems to be some conceptual redundancy between it and NoCoda) since even a coda 4000 segments long would be insufficient to force jer realization by virtue of gradient NoCoda violations given NoCoda's crucial ranking below MSeg[μ]. However, the nature of the relation between *Complex[coda] and NoCoda might at first seem a rather troubling one. One might argue, for instance, that positing the existence of *Complex[coda] as a distinct and independently rankable constraint does nothing more than provide a mechanism by which the strictness of strict constraint domination may be evaded. The crucial question to ask with respect to this concern is, can these constraints be perceived as a manifestation of the scenario given in (13)?

(13)

> Given two constraints, A and B, in a strict domination relation such that A » B, no number of B violations should ever be able to outweigh a single violation of A... unless perhaps B can be reconceived of as two constraints, B and B', where B' is defined specifically as militating against multiple violations of B. If this were possible, one could then have the ranking B' » A » B, such that a single violation of A is worse than a single violation of B, but multiple violations of B, since they will entail violations of B', are more severe than any number of violations of A.

In the discussion to follow, I will argue first that *Complex[coda] and NoCoda are formally distinct enough that they cannot be regarded as manifestations of the abstract constraints B and B' outlined above, and second, that there are ways of achieving precisely the same effect as *Complex[coda] which have far less conceptual redundancy with NoCoda than does the rather heavy-handed formulation presented so far, and for which the concern raised above therefore does not even arise.

Regarding the first point, NoCoda and *Complex[coda] really target rather different configurations, and it is entirely possible for a form to incur multiple violations of NoCoda while sustaining no violations whatsoever of *Complex[coda], as in the following example: [[$_{\sigma}$CVC] [$_{\sigma}$CVC] [$_{\sigma}$CVC]]. Such a form would incur three NoCoda violations, one for each syllable, but as the codas are all simplex, *Complex[coda] would be perfectly satisfied.

As for the second point, it seems highly likely that the rather arbitrary, brute-force formulation of *Complex[coda] given above is not quite right anyway, and that the desired restriction on coda size, which up till now has just been stipulated, should probably be derivable from something else. For instance, it might very well be the case that there is no overt requirement on how many elements may occupy the post-nuclear syllable margin (not even the "one" or "more than one" distinction made up to this point), with the requirement instead being one which militates that a particular sonority distance must hold of any such elements. It might furthermore be the case that the sonority distance demanded in fact exceeds the sonority distance between the least and most sonorous elements of the Russian inventory, thus blocking the cooccurrence of any two (or more) segments in this post-nuclear position.[20] A constraint of this type would have precisely the same effect as *Complex[coda], could be ranked identically to it, and any conceptual links between it and NoCoda would be purely coincidental.

5.0 Jers in Word-Initial Syllables

As was mentioned briefly in footnote 18, there is an asymmetry between jer realization patterns word-initially and word-finally. Whereas jers are systematically realized to break up word-final clusters, they are just as systematically *not* realized when they appear in positions which would allow them to head up the first syllable of a (potentially multisyllabic) word.[21] In the word-final contexts we have just examined, the relative sonority of the segments involved in a coda-cluster plays no role in whether or not the jer gets realized. Any jer in such a context always surfaces. Similarly, the relative sonority of the segments involved in initial contexts also seems to play no role in whether or not the jer gets realized. In initial contexts, the jer never surfaces.[22] Examples of this include the following:

(14)

l'stit'	'flatter'	vs	lest'	'flattery'
mstit'	'avenge'	vs	mest'	'revenge'
všivьj	'lice-ridden'	vs	voš	'louse'
žgla	'burned' (fem)	vs	žog	'burned' (masc)
sna	'dream' (gen sg)	vs.	son	'dream' (nom sg)
lba	'forehead' (gen sg)	vs.	lob	'forehead' (nom sg)
vnešnij	'outward'	vs.	von	'out'
l'v'onok	'baby lion'	vs.	lev	'lion'
l'n'anoj	'linen'	vs.	l'on	'flax'
dnevnoj	'daily'	vs.	den'	'day'
pnistьj	'adj of 'stump''	vs.	pen'	'stump'

This seemingly perverse behavior by the word-initial jers actually falls out quite nicely from independently necessary assumptions about word-inital clusters. One very robust descriptive generalization about Russian is that its initial clusters

[20] See Steriade (1982) and Selkirk (1984) for discussion of sonority distance issues.

[21] The discussion in this section is entirely centered on non-prefixal jers. Prefixes, and the jers which appear in them, require a somewhat more elaborate treatment which will be presented in §7.

[22] This is disregarding forms in which the jer is the only vocalic element, as is the case with those forms in the righthand column in (14). While it is important not to simply disregard forms such as these, they will not enter into the present discussion because, as monosyllables, they simultaneously consist of both initial and final contexts all wrapped up in one little package. To include them at this point would obscure some important issues about the status of the initial position. For some discussion centered on jer realization in monosyllables, see fn. 33. In addition, there is a particular class of forms which seem to consistently violate the generalization being presented here. These forms will be discussed separately in §6.

can be quite impressive both in terms of the number of segments involved and their sometimes radical violations of sonority sequencing, as is illustrated by the forms in (14), above, and (15), below. It is significant, however, that neither of these observations is applicable to word-internal tautosyllabic clusters which are, by almost any standards, really quite well behaved. Violations of sonority sequencing within a syllable are simply not tolerated word-internally (with the exception of *s*-clusters, which are as ill-behaved in Russian as they are in English).

Not only may word-internal, tautosyllabic sonority sequencing not be violated, a certain amount of sonority distance seems to be necessary as well.[23] For instance, one may find many examples of word internal onset clusters consisting of stop + nasal (as in *po. smer. tno*, 'posthumously'), or stop + liquid (*kon. kre. tno*, 'specifically'; *u. po. tre. bl'at'*, 'to use'), but never does one find cases of stop + stop or even stop + fricative.[24] With fricatives, one finds cases involving fricative + nasal (*ka. tor. žnik*, 'convict') and cases of fricative + liquid (*zat. xlost'*, 'mustiness'), but never of fricative + stop or fricative + fricative. As for liquids and nasals, it looks as if these can never initiate an onset cluster, though in the case of the nasals this may well be just an arbitrary gap in the data (but see fn. 37 for discussion of the rather unusual status of the glide /j/, which could have bearing on why this gap might exist).

Even word-initial clusters are in reality quite tightly constrained since there is never more than one consonant that is not incorporable as an element of the onset of the first syllable under the quite ordinary sonority-based patterning discussed above. Such unincorporable consonants, when present, always occur at the left periphery of the cluster and appear to be entirely untroubled by matters of relative sonority. Some jer-containing examples of this phenomenon were given above in (14), and further examples can be found in forms such as:

(15)

rtut'	'mercury'		mgla	'haze'
kto	'who'		vzgl'ad	'look'
tknut'	'poke'		kstati	'apropos'
vtoroj	'second'		gde	'where'
ptica	'bird'		čtenije	'reading'

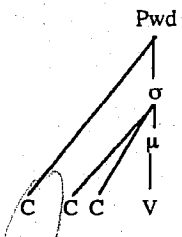
The lack of concern for sonority sequencing on the part of these peripheral elements strongly suggests that they are in fact external to the syllable formed by immediately subsequent segmental material. Given that despite being syllable-external they are obviously still parsed (since they are audible components of the optimal forms), it seems plausible that they are parsed directly by the Prosodic Word.[25] This would yield structures of the following type:

[23] The generalizations about syllable structure here are drawn from my own investigations of large numbers of forms (mainly through the reading of dictionaries).

[24] It may actually be that tautosyllabic stop+fricative clusters are in fact tolerated. The crucial examples would be forms such as *kl'aksa*, 'inkblot'. Whether the *ks* cluster is syllabified as an onset to the final syllable or is split between syllables is not obvious. Regardless of what the answer to this particular question is, however, it remains clear that at least *some* degree of sonority distance is required for all licit tautosyllabic clusters

[25] See also Rubach & Booij (1990) for discussion of appendices in Polish.

(16)

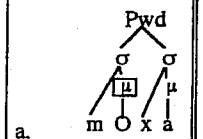
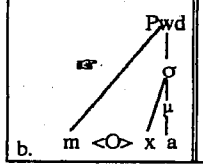


(*mgla*, 'haze', from (15))

While structures like (16) allow the prosodification of otherwise illicit consonants (illicit due to violations of sonority), they unquestionably incur violations related to the unorthodox parsing. For instance, they certainly result in misalignment of the Prosodic Word at the left edge.[26] This brings us back to the issue of the asymmetry in parsing options between the right and left edges of the Prosodic Word. It was noted in fn. 18 that there would need to be a very high ranking constraint of the type ALIGN[Pwd, R, σ, R] — hereafter ALIGN-R. This constraint would serve to effectively bar word-final appendices, ensuring instead that all parsed segments in a word-final cluster are incorporated as members of the coda of the final syllable. Because of the presence, ranking, and effect of this constraint, jers in word final contexts must always surface since doing so will help avoid incurring a *COMPLEX[CODA] violation. The situation in word-initial contexts is of course entirely the opposite, with jers not surfacing even when an appendix is necessary to prosodize an element of the cluster within which the jer occurs. The relative freedom with which initial appendices are tolerated would seem to indicate that Prosodic Word misalignment at the left edge incurs considerably less deadly violations than does misalignment at the right edge. Specifically, these facts suggest that ALIGN[Pwd, L, σ, L] — hereafter ALIGN-L — is ranked significantly lower than ALIGN-R and is crucially ranked below MSEG[μ], as the spectre of misalignment at the left edge is clearly unable to force jer realization. This is illustrated in (17), below, for the form *mxa*, 'moss' (gen. sg.) whose input is /mOx - a/:

[26] Such structures would also necessarily violate the constraint CLOSESTMOTHER (proposed by Itô & Mester 1992) or its counterpart EXHAUSTIVITY (Selkirk 1993), both of which require elements to be parsed by the prosodic level most directly above them (segments by syllables, syllables by feet, and so on). To rely on constraints of this type alone, however, would not properly capture the asymmetry between word-initial and word-final positions which was discussed in fn. 18, and which is quite naturally accounted for by differential ranking of the two proposed alignment constraints.

(17)

/mOx + a/	*COM[COD]	MSEG[μ]	PARSE-V	NOCODA	ALIGN-L
a. 		* !			
b. 			*		* *

The fact that *mxa* is chosen over **moxa* shows us clearly that ALIGN-L must be ranked below MSEG[μ] (MSEG[μ] » ALIGN-L) since candidate (b), which is optimal, is misaligned by two root nodes while the failed candidate (a), is perfectly aligned. If the ranking of these two constraints were reversed we would predict **moxa* as the output. Note that the placement of ALIGN-L below PARSE-V and NOCODA in the hierarchy is entirely arbitrary since (17) provides no evidence for rankings between ALIGN-L and either PARSE-V or NOCODA. It seems likely that there in fact is no crucial ranking between ALIGN-L and either of these constraints since, (a), it is difficult to see how ALIGN-L and NOCODA could possibly interact in the first place, and, (b), the crucial ranking of both PARSE-V and ALIGN-L below MSEG[μ] will hopelessly obscure any ranking which might exist between the two of them.

6. Medial Jers and Multiple Occurrences

The easiest place to find jers occurring medially within words is in morphologically complex forms such as those given below in (18):

(18) a. *single medial jer → realized*

mi*slenij 'mental'	otvetstvenij 'responsible'
(mi*sl + En + ij)	(otvet + stv + En + ij)[27]
gosudarstvenij 'national'	pravitel'stvenij 'governmental'
(gosudar + stv + En + ij)	(pravitel' + stv + En + ij)

[27] The morpheme which I am representing as *-stv-* (a derivational suffix which creates abstract nouns), historically had the shape *-Estv-*, with a jer as part of its underlying constituency. A not insignificant number of modern analysts have persisted in maintaining that this is also its synchronic form. It is the case, however, that the purported underlying vowel of this suffix surfaces only in a very, very limited number of cases (for instance, *mužestvo*, 'courage', and *kupečestvo*, 'merchant class'). The patterns of vowel realization/non-realization associated with this suffix follow from no jer account with which I am familiar and the instances where a vowel is realized are so very few that I feel justified in labelling them historical relics and in proposing for Russian, as Szpyra (1992) did for Polish, that the historical suffix *-Estv-* is synchronically just *-stv*.

(18) b. *single medial jer → not realized*

kogtistij 'sharp-clawed'	orlica 'she-eagle'
(kogOt + ist + ij)	(or'Ol + ic + a)
bezumolčnij 'unceasing'	udarnij 'percussive'
(bez + u + molč + En + ij)	(udar + En + ij)

c) *two medial jers, realization pattern: ...realized...not realized*

sudebnij 'judicial'	bašenka 'turret'
(sud + Eb + En + ij)	(bašEn + Ok + a)
banočka 'jar (dimin.)'	viločnij[28] 'fork (adj)'
(ban + Ok + Ek + a)[29]	(vilOk + En + ij)
volšebnij 'magical'	buločka 'roll, bun'
(volš + Eb + En + ij)	(bul + Ok + Ek + a)
kukolka 'doll (dimin.)'	vodočnij 'vodka (adj.)'
(kukOl + Ok + a)	(vodOk + En + ij)

d) *Realization of multiple adjacent jers, jers in word-initial syllables*

igoločka 'needle (double dimin.)	kotelok 'pot, kettle'
(igOl + Ok + Ek + a)	(kotEl + Ok)
den'ok 'day (dimin.)'	pen'oček 'stump (double dimin.)'
(dEn' + Ok)	(pEn' + Ok + Ek)
lestnij 'flattering'	bugoroček 'knob (dimin.)'
(lEst + En +ij)	(bugOr + Ok + Ek)

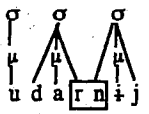
Forms such as those in (18a, b), which involve only a single medial jer, present no new problems and do not require any mechanisms beyond those that have already been introduced. This has been illustrated in (19 - 22), below, for the representative examples: *mislenij* (misl + En + ij), *otvetstvenij* (otvet + stv + En + ij), *udarnij* (udar + En + ij), *kogtistij* (kogOt' + ist + ij), and *bezumolčnij* (bez + u + molč + En + ij) — all from (18). In both (19) and (21), the candidates with realized jers have been given in column (a) and the clusters to be prosodified if the jer is not realized have been boxed in column (b). It should be noted that in all

[28] The input *k* in the root of this form palatalizes as a result of the following front vowel. In a standard processual framework with ordered rules, this palatalization would have to be the product of a rule ordered before deletion of the vowel (which would need to have been underlyingly present in order to effect the change upon the *k*). Within Optimality Theory, no ordering is necessary since by the principle of Containment no input element is ever literally removed from a candidate parse. Thus, regardless of whether the vowel is parsed into prosodic structure or not, it is still present in the representation and may influence surrounding elements by its presence. This same alternation of *k* with *č* is to be found in many of the forms in (18).

[29] I will regard *-Ok* and *-Ek* as allomorphic variants of a single diminutive morpheme. Historically, the two were underlyingly the same entity with a phonological rule deriving the *O* variant from the *E* variant. Whether this rule is synchronically operative or not I do not know and will not pursue the matter here. In any case, in all instances in the text where reference is made to the suffix *-Ok*, the reference should be taken to include *-Ek* as well.

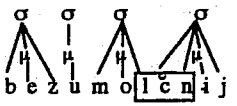
those instances where a good, sonority respecting syllable with no coda cluster can be formed without realization of the jer (as in 19b (i-ii)), the jer is left unparsed. This follows completely from the analysis as given so far and is illustrated by the forms below:

(19) a. i. *udarEnɨj



b. i.

ii. *bezumolčEnɨj



ii.

The formal motivation for non-parsing of the jer in forms of this type has been illustrated in the tableau given below in (20) using the form *udarnɨj*:

(20)

/udar + En + ɨj/	*COMPLEX[CODA]	MSEG[μ]	PARSE-V	NOCODA
a. u. da. rE. nɨj		*!		
b.☞ u. dar. <E>. nɨj			*	*

In contrast to cases like those illustrated above in (19), the jer always surfaces in circumstances where the price of not doing so is tolerance of a complex coda or of a sonority violating onset cluster. This is illustrated below in (21). We can take the constraints responsible for sonority sequencing to be undominated by any of the constraints presently under consideration, and the rest again falls out from the constraints and ranking already presented.

(21) a. i.

b. i. *mɨsɨnɨj

ii.

30

ii. *otvetstvnɨj

The formal motivation for parsing of the jer in forms of this type has been illustrated below in (22) using the form *mislenɨj*:

30 [v] is phonologically a sonorant in Russian and clusters such as *tv* and *stv* are very common, having a distribution paralleling that of (s +) stop + liquid clusters.

(22)

/mɨsl+ En + ɨj/	SONORITY	*COMPLEX	MSEG[μ]	PARSE-V	NOCODA
a. ☞ mis. lE. nɨj			*		**
b. misl.<E>. nɨj		* !		*	**
c. mis. l<E>nɨj	* !				

6.1 Multiple Jers

The analysis as laid out so far is insufficient to handle cases with multiple jers occurring in what would correspond to adjacent syllables (if all the relevant jers were to surface). Among the things that are not yet accounted for are the following: why should it be that a single-jered form like /bez + u + moč + En + ɨ)j/ surfaces as *bezumolčnɨj*, but the double-jered input /vilOk + En + ɨj/ surfaces as *viločnɨj*? Given a purely syllable-structure based account of the type presented up to this point we would expect /vilOk + En +ɨj/ to surface as **vil čnɨj* since that is the candidate that would incur no violations of MSEG[μ] at all, but still could support a completely acceptable syllabification.

A second question left open at this point is: why should it be that an input such as /kukOl + Ok + a/ surfaces as *kukolka* and not, for instance, as **kukloka*? Realization of either of the two jers would resolve the problem of the intractable *klk* cluster, so it needs to be determined what motivates the choice of one over the other. Along this same line, we need to ask why should it be that an input like /bugOr + Ok + Ek/ surfaces as *bugoroček* and not as **bugroček* or **bugorček*? Either of these two would seem preferable to the actual output in that they both minimize violation of MSEG[μ], (incurring only two marks instead of three), and would nevertheless be syllabically quite well-formed, having no complex codas or illicit onset clusters.

Finally, why should it be that inputs like /den' + Ok/ and /lEst + En + ɨj/ surface as *den'ok* and *lestnɨj* rather than as **dn'ok* and **l'stnɨj*?Interestingly, forms with an initial jer followed immediately by either the diminutive *-Ok* suffix or the derived adjectival *-En* suffix never lose that initial jer despite the fact that jers in initial position are systematically dropped (see §5). All of these questions will be taken up in the following sections.

6.2 The Core Problem and a Cyclic Solution

The central peculiarity about the *-Ok* [31] and *-En* suffixes is that jers which immediately precede them are never lost, regardless of the surrounding environment (though the jers that they themselves contain may be lost in accord with the principles laid out so far). We can see this, for example, in *viločnɨj* (/vilOk + En +ɨj/), where the first jer surfaces despite the fact that *neither* of the jers needs to surface for the word to be syllabifiable. We find a similar situation in *bugoroček* (/bugOr + Ok + Ek/) where all of the jers are preserved, though syllable structure constraints would demand the output presence of only two. Last and perhaps most importantly, despite the fact that word-initial jers are systematically not realized due to the low ranking of ALIGN-L (as discussed in §5), such jers are retained when appearing in positions which immediately precede either of these suffixes. It is facts like these that have made the Standard Analysis so popular since they follow quite straightforwardly from the rule of

31 Regarding the relation between *-Ok* and *-Ek*, see fn. 28.

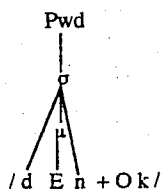
Lower (see §2.1). It is worth noting, however, that there *are* jer-containing suffixes which do not have this same effect. For instance, the suffix *-Ec*, which makes agentive nouns, does not seem to cause the retention of preceding jers, as forms like *l'stec* (lEst + Ec), 'flatterer', *igrec* (igOr + Ec) 'jester' demonstrate. The Standard Analysis would not predict this difference in suffixal behavior.

6.2.1 Cyclicity

In this section, I will try to argue that the troublesome facts laid out above are actually due to a kind of cyclic behavior on the part of the suffixes *-Ok* and *-En*.[32] I will argue that it is an idiosyncratic property of these suffixes that they must be affixed to stems which are in essence full-fledged words and have been fully prosodified, evaluated, and chosen as optimal in a completed pass through the phonological system.[33] I will claim that it is this property , which is restricted to a very particular set of affixes, that accounts for the peculiar patterns of jer realization noted above. Under this approach, the fact that the affixes which are characterized by this property contain jers themselves will be regarded as entirely accidental. The realization of jers preceding *-Ok* and *-En* will be due entirely to these suffixes' cyclic behavior, with no causal relation linking realization of jers to the presence of a following jer. We can demonstrate the fundamentals of this approach by showing how it allows the form *den'ok* to be chosen as the optimal candidate from input /dEn' + Ok/.

The central idea behind this proposal will require that the root /dEn'/ first be parsed and evaluated as a unit unto itself, just as is the case for the null-suffixed nominative singular non-diminutive form (which surfaces, unsurprisingly, as *den'*). Given that non-parsing of the jer in this root produces a syllable with a terribly defective head — [$_{\sigma}$ dn] — the form with the parsed jer is taken as the optimal candidate.[34] This fully parsed output form may then be regarded as a stem by these "cyclic" suffixes. The resulting collocation, which must be resubmitted to GEN and the evaluative hierarchy of constraints, is given in (23):

(23)



32 Thanks to John McCarthy (p.c.) for suggesting this.

33 Regarding this conception of the cycle, consult Borowsky (1990), Szpyra (1989).

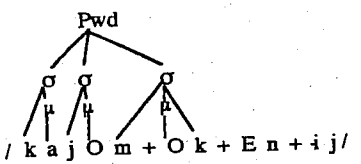
34 Formally speaking, [$_{\sigma}$ dn] would be ruled out by ranking MSEG[μ] lower than the constraints barring nasal consonants from serving as syllable nuclei. This ranking, in combination with the requirements that words must contain syllables and syllables must contain nuclei (see also fn. 10), will serve to ensure that the jer is realized given an input like /dEn'/. It is also worth noting at this point that MSEG[μ] will need to be ranked lower than the constraints barring liquids from nucleushood as well, as forms such as *xit'or*, (cf. *xitra*), 'cunning' and *kisel*, (cf. *kisla*), 'sour', from (10), show.

The crucial difference between the input representation in (23) and the completely unprosodified, non-recursive input representations assumed up to this point, is that the input in (23) really contains only *one* jer. Jers, after all, differ from ordinary midvowels solely by their moralessness at the level of input. The vowel in the root morpheme of (23) is, I will claim, almost indistinguishable from a non-jer (for clarification of this "almost", see below). When the candidate parses of /dEn'/ alone are evaluated, any candidates in which a mora dominates the *E* will unquestionably incur an MSEG[μ] violation. This follows from the fact that the MSEG family of constraints (along with the PARSE family) is designed to enforce faithfulness to an input. In the secondary collocation consisting of the fully parsed output stem and the unparsed derivational suffix, however, the mora over the parsed stem is undeniably *a part of the input* . Assuming that the mora dominating the stem jer is in fact a part of the input at this second level and assuming as well that the principle of Containment constrains GEN universally in its formation of candidate sets, (regardless of what the input might look like or what it might have been through already), then the mora dominating the stem jer will have to be considered completely on a par with the moras associated with ordinary non-jer vowels. Granted, one might well argue that the mora over the root jer still incurs an MSEG[μ] violation due to the fact that while it may be a part of the input at this level, it is still not an exponent of the root morpheme. In this respect, the mora over the root jer is *not* identical to that of an ordinary vowel. Nevertheless, if Containment holds of candidates derived from the input in (23) and PARSE[μ] » MSEG[μ] — both of which I shall presume to be the case — then the once-upon-a-time-epenthetic mora will still necessarily have to be parsed since not doing so would result in a lethal violation. Putting the ex-jer of the root on a par with ordinary vowels means that at this second level of evaluation it, like ordinary vowels, essentially *must* be parsed. The only true parsing question then arises with respect to the jer of the suffix, but the fact that the suffixal jer is parsed in the optimal form falls out naturally from the fact that to not do so would result in a coda cluster.

An important thing to note about the behavior of these suffixes is that further morphemes, both derivational and inflectional, may follow them. That is to say, while each instance of an *-Ok* or *-En* suffix must itself affix directly to a fully prosodified stem, they may be followed within a word by morphemes which do not have this cyclic property, as in *bditel'nost'*, (bdi + tel' + En + ost'), 'vigilance', where *-ost'* is a nominalizing derivational suffix. (Note that if *-ost'* were of the cyclic type we would expect to find **bditel'enost'*, with realization of the jer in the *-En* suffix).

Forms containing multiple occurrences of the *-Ok* or *-En* suffixes, however, will always require multiple separate evaluative efforts. For instance, for the form *kajomočnij* (kajOm + Ok + En + ij) — with the root *kajOm*, meaning 'border' (cf. nom. sg. *kajma*) — the *-Ok* would first be suffixed to the fully prosodified *kajom* and this bipartite unit, / [$_{wd}$ *kajom*] + *Ok*/ would be resubmitted to GEN and the constraint hierarchy. Assuming that ONSET is ranked higher than whatever constraint requires that the *m* of [*kajom*] be faithfully parsed as a coda to the second syllable of the root, the *m* will be reassigned at this level to serve as an onset to the syllable headed by the suffixal jer. The suffixal jer itself must surface to avoid the complex coda violation that would otherwise be sustained. At this point, *-En* and the inflectional morpheme *-ij* would be suffixed to the fully prosodified complex stem *kajomok* and the resultant structure would be resubmitted to GEN and the constraint hierarchy yet again. The resulting tertiary input would be something like that given in (24):

(24)



Under this account then, a form like *kajomačnɨj* would be the product of three separate evaluative efforts.[35]

6.2.2 Accounting for the Facts

Under this proposal, answers to all the questions asked in §6.1 fall out quite straightforwardly. The case of how *den'ok* gets selected as the optimal parse of /dEn + Ok/ has already been addressed in some detail, so we can proceed on to the other questions. As for why /vilOk + En + ɨj/ surfaces as *viločnɨj* rather than **vilčnɨj*, this is due to the fact that /vilOk/ must be evaluated as a single unit prior to concatenation with the morphemes *-En +ɨj*. In order to avoid a complex coda, the *O* is assigned a mora and parsed. It thus assumes the status of an ordinary full vowel in the secondary input where it is combined with *-En* and the inflection, *-ɨj*. In this environment, there is no high ranking constraint violation to be avoided by parsing the *E*, so it is left unprosodified. We can see this illustrated in the tableau in (25):[36]

(25)

/[wd vilOk] + En + ɨj/	*COMPLEX[CODA]	MSEG[μ]	PARSE-V	NOCODA
a. Pwd: v i l O c <E> n i j			*	*
b. Pwd: v i l O c E n i j		* !		*

35 While one might speculate that "directional" syllabification via alignment (Mester & Padgett 1993, McCarthy & Prince 1993)) could achieve the same effect as the derivational approach suggested here, this is not in fact the case. Introduction of a constraint along the lines of ALIGN(σ, L, Pwd, L), regardless of where it might be ranked in the hierarchy, consistently mispredicts the realization patterns in forms containing more than two adjacent jers.

36 With regard to the k → č shift, see fn. 27. Also, in candidate (a) it is possible that the second syllable's (input) coda remains a coda in the candidate parse, but I am assuming that NOCODA is higher ranked than whatever enforces faithfulness of the input coda association.

As for why an input like /kukOl + Ok + a/ comes out *kukolka* and not **kukloka* , this again will follow from the fact that the root undergoes evaluation prior to evaluation of the morphologically complex input as a whole. The *O* in /kukOl/ surfaces to avoid the word-final cluster *kl*. Given that the root jer has already been morified in the diminutive complex /[kukOl] + Ok + a/, there is no cluster for the suffixal jer to break up and hence it, like the jer of the *-En* suffix in *viločnɨj*, is left unparsed.

The fact that all three jers in forms like *bugorček* (/bugOr + Ok + Ek/) surface comes again from the recursive nature of the evaluation. The root /bugOr/ is evaluated independently and its jer must surface to avoid the word-final cluster. This output is then taken as a stem by the diminutive suffix *-Ok*: /[bugOr] + Ok/. The suffixal jer must also surface to avoid a word-final cluster. This output is in turn taken as a stem by the second occurrence of the diminutive suffix, yielding /[[bugOr] Ok] Ek/. This final jer must also surface to prevent a word-final cluster.

To sum up this section, under the present proposal it is the interplay of syllable structure requirements with the "subcategorizational" proclivities of the *-Ok* and *-En* suffixes which generate the otherwise unexpected patterns found in many multi-jered forms. It is worth noting that this proposal still requires only one phonological level, within which the constraints and constraint rankings remain constant regardless of the nature of the input. It should also be noted that the suffixes proposed to behave in this "cyclic" fashion are not coextensive with the set of jer-containing suffixes since there are some suffixes containing jers which behave precisely as would be predicted under a non-cyclic analysis. Nevertheless, it admittedly seems somewhat problematic that all the suffixes which behave in this cyclic fashion do themselves contain jers. It would certainly be desirable to find a well-motivated explanation for why this might be so.

7. Prefixal Jers

In addition to the root and suffixal alternations we have observed up to this point, there are many Russian prefixes which also contain jers. Prefixal jers surface in two distinct environments, specifically:

(i) When the following stem begins with a cluster that is not completely syllabifiable due to violations of sonority sequencing or language particular constraints on possible clusters.[37]

and (ii) When the following stem begins with a cluster which contains an unparsed jer *internal to it* (for instance,[[podO][b<O>rat']], where*b<O>rat'* is a single syllable in which the two components of the onset are actually separated by an unparsed jer).

37 Itô (1982) asserts that [j], for instance, may never occur preceded by another consonant within a syllable. I know of no principled reason why this should be so, but adopting this restriction as a high ranking requirement on onset clusters will allow forms such as *volju* (vO + li + u) and *podobju* (podO + bi + u) from (26b) — and the many others like them — to be given a unified accounting with the rest of the observed prefixal alternations. The reasons for this will become apparent below.

In the discussion to follow, it will be demonstrated that these two seemingly unrelated contexts within which prefixal jers surface are actually identical in a single crucial respect.

Some examples of forms illustrating the alternations we find in prefixed forms are given below in (26):

(26) a. *Unrealized Prefixal Jers*

smikat'	(sO + mik + at')	'close'	(inf, impf aspect)
podtkat'	(podO + tk + at')	'add to the weaving'	(inf, impf aspect)
podbit'	(podO + bi + t')	'line (with s.t.)'	(inf, perf asp)
vlit'	(vO + li + t')	'pour in'	(inf, perf asp)
podrival	(podO + riv + al)	'undermine'	(m sg, pst tns, impf asp)
sčitat'	(sO + čit + at')	'count'	(inf, impf asp)
podžigat'	(podO + žig + at')	'set on fire'	(inf, impf asp)
podžog	(podO + žEg)	"	(m sg, pst tns, pf asp)
podbirat'	(podO + bir + at')	'pick up'	(inf, impf asp)
podgl'adet'	(podO + gl'ad + et')	'peep, spy'	(inf, pf asp)
podzivat'	(podO + ziv + at')	'call, beckon'	(inf, impf asp)
podplit'	(podO + pli + t')	'swim under'	(inf, pf asp)

b. *Prefixal Jers Realized Before Unsyllabifiable Stem-Initial Clusters*

podotkat'	(podO + tk + at')	'add to the weaving'	(inf, pf asp)
podotknut'	(podO + tk + nut')	'tuck up'	(inf, pf asp)
solgat'	(sO + lg + at')	'to tell a lie'	(inf, pf asp)
podobju	(podO + bi + u)	'line (with s.t.)'	(1st prs sg, pf asp)
volju	(vO + li + u)	'pour in'	(1st prs sg, pf asp)
sovmestit'	(sO + vmest + it')	'combine'	(inf, pf asp)

(26) c. *Prefixal Jers Realized Before Jer-Containing Stem*

podol'stit'	(podO + lEst + it')	'worm one's self into s.o.'s good favor'	(inf, pf asp)
podorvat'	(podO + rOv + at')	'undermine'	(inf, pf asp)
podorvu	(podO + rOv + u)	"	(1st prs sg, pf asp)
podorval	(podO + rOv + al)	"	(m sg, pst tns, pf asp)
sočtu	(sO + čEt + u)	'consider'	(1st prs sg, pf asp)
sočla	(sO + čE + la)	"	(f sg, pst tns, pf asp)
otomstit'	(otO + mEst + it')	'take one's revenge'	(inf, pf asp)
podožgla	(podO + žEg + la)	'set on fire'	(f sg, pst tns)
podobrat'	(podO + bOr + at')	'pick up'	(inf, pf asp)
podozvat'	(podO + zOv + at')	'call, beckon'	(inf, pf asp)
somknut'	(sO + mOk + nut')	'close'	(inf, pf asp)
somknu	(sO + mOk + nu)	"	(1st prs sg, pf asp)

Jer realization patterns in prefixed forms have proven to be the most problematic cases for all the analyses with which I am familiar and will present a substantial challenge to the present account as well. Before proceeding with the current proposal, we can first survey some of the accounts that have gone before and see what problems they encountered and how they managed (or did not manage) to deal with the prefixal data.

7.1 Survey of What has Gone Before

7.1.1 The Standard Analysis

All accounts which rely on versions of the "Lower" rule originally proposed by Lightner in the Standard Analysis (see §2.1) encounter a serious problem in handling prefixed forms. The difficulty for the traditional account stems from patterns like the following:

(27) a.	podO + žEg[38]	→	pod - žog	'set on fire'	(masc, pst tense)
b.	podO - žEg -la	→	podo - žg -la	"	(fem, pst tense)

In cases of this sort, where there is a prefixal jer followed by a jer in the root, the traditional analysis predicts that the prefixal jer should always be realized. This produces no difficulties in the feminine form, but the masculine form would be expected to surface as **podžog*, rather than *podžog* (the jer in the root would be realized due to the presence of an abstract jer suffix under this account). The mechanisms invoked to resolve this dilemma have included: switching the direction of iteration of jer lowering rules from left-to-right to right-to-left in the relevant contexts; stipulating negative environments for rule application (Lightner 1972); and manipulating the morphological bracketing to make the prefix exterior to both the root and any suffixal material attached to that root so that jer lowering did not apply to prefixes until the final cycle of rule application, after all root and suffixal jers that were going to lower had already done so (Pesetsky 1979).

7.1.2 Syllable Structure Based Analyses (Epenthesis and Szpyra 1992)

The problems are perhaps even more severe for syllable structure based accounts due to the fact that prefixal jer realization patterns simply do not seem to be predictable from syllable structure alone, regardless of whether one views jers as underlying or epenthetic. While there certainly are forms that can be made to fall out quite nicely from such accounts due to the clusters involved (for instance, note (26b): *podotknut'*, (podO + tk + nut'), 'tuck up'), there are a sizeable number which simply will not, at least not without some unglamorous fiddling. A case in point is (26j): *podobrat'*, (podO + bOr + at'),'pick up'. There simply do not seem to be any serious grounds for ruling out plain **pod.brat'* on the basis of syllable ill-formedness.[39] Szpyra (1992) raises essentially this same criticism as a part of her argument against the epenthetic analysis of jers, but does not attempt to treat prefixed forms herself for good reason: the alternate analysis she proposes is insufficient, at least as given, to correctly predict the realization patterns either. Her analysis runs into precisely the same problems as does the "Lower"-based Standard Analysis.

It should be noted at this point that the difficulties we are going to encounter in the present effort are essentially the same as those of the syllable structure based analyses discussed above. The central task in attempting to resolve

[38] There was a historical process by which certain instantiations of underlying /e/ (full vowel or jer) went to [o] under stress. Whether this rule is synchronically active or not, I do not know and it is possible that the jers in the forms in (27) are now all underlyingly /O/. In any case, the changes from input /E/ to output [o] in the text are intended to reflect this process if indeed it is still active.

[39] Even under the present framework where constraints on syllable structure are not absolute but relative, a form like *pod.brat'* can not yet be ruled out given the high tolerance for coda consonants and the relative costliness of jer realization.

these problems will be to locate the crucial similarity or similarities that unite forms with complex root clusters such as *podo-tknut'* and those which do not, such as *podo-brat'* and in this way account for their uniform behavior with respect to prefixal jer realization. In order to do this, however, some fundamental assumptions about the structure of prefixed forms need to be laid out.

7.2 Prefixal Structure

Zubritskaya (1993) has argued that Russian prefixes (and phonologically proclitic prepositions) cannot be prosodized into the same Prosodic Word as the stem to which they are affixed.[40] The evidence that she brings to bear in support of this position includes (among other things) the lack of palatal assimilation and the lack of vowel hiatus resolution across prefix-stem boundaries.[41] Regarding the lack of palatal assimilation, for instance, we find the following contrast:

(28) a. vod + e → vo . d'e 'water' (prepositional case)
b. pod + et'im → pod . e . t'im 'under this'
(Zubritskaya (1993))

In (28a) we find an illustration of the general case, in which consonants become palatalized when preceding a front vowel. In (28b), however, we find that the front vowel of the stem does not cause the final consonant of the proclitic preposition *pod* to palatalize.[42]

Regarding the lack of vowel hiatus resolution, the crucial examples are forms such as we find in (29):

(29) po + obedat' → po. o . b'e. dat' 'to have dinner'

Forms such as this maintain the junctural vowel hiatus, despite the fact that there is a sytematic process of hiatus resolution within the language that causes the first vowel in a VV sequence to be underparsed. All of these things would seem to require a very high ranked alignment constraint ensuring the integrity of the prefix-stem boundary.

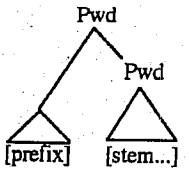
In light of Zubritskaya's findings, prefixed forms will henceforth be assumed to have the recursive Pwd structure given in (30), where the stem constitutes an independent Prosodic Word to which the prefix is adjoined:

40 See Booij & Rubach (1984) and Rubach & Booij (1990) for discussion of similar considerations in Polish.

41 Other phenomena that are relevant to distinguishing prefixal from suffixal behavior include the lack of degemination and the lack of fusion of /t s/ and /d z/ clusters across a prefix-stem boundary (Zubritskaya 1993).

42 Note also the fact that in (28b) the final consonant of the proclitic is proposed not to be syllabified as an onset to the first syllable of the stem. The question of syllabification across the prefix-stem boundary will be addressed in more detail in §7.3.

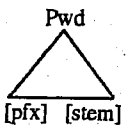
(30)



This proposal differs somewhat from Zubritskaya's own, but is, I believe, not incompatible with it. The Prosodic Word recursion in these contexts will be assumed to follow from the interaction of a set of constraints of the following type: ALIGN([Afx], R, Pwd, L),[43] NON-RECURSIVITY,[44] and PARSE-PCAT[45]. Both ALIGN-AFX and PARSE-PCAT would need to be crucially ranked above NON-RECURSIVITY in order for the structure in (30) — which violates NON-RECURSIVITY but satisifies both ALIGN-AFX andPARSE-PCAT — to be chosen over (31a) and (31b), given below:

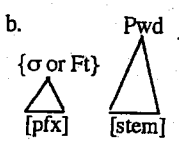
(31)

a.



ALIGN-AFX: *
NON-RECURS: ✓

b.



PARSE-PCAT: *
NON-RECURS: ✓

For purposes of the present discussion, we can take both PARSE-PCAT and ALIGN-AFX to be undominated and not crucially ranked with one another.

With the groundwork regarding the gross structure of prefixed forms now in place, we can return to our central concern of accounting for the patterns of jer realization that we find in such forms. The recursive Pwd structure which has

43 The designation "Afx" here is intended as a kind of variable over individual affixes (specifically those affixes which are members of the set of prefixes). The constraint as given is to be a kind of shorthand for a whole group of constraints, i.e., ALIGN([bez-], R, Pwd, L), ALIGN([sO-], R, Pwd, L), and so on. While it is tempting to replace "Afx" here with "Pfx", this would be incoherent if we adopt the assumption, following Prince & Smolensky (1993) and McCarthy & Prince (1993b), that the notion "prefix" is not a primitive but rather the product of a particular kind of morphological alignment: ALIGN([Afx], R, Stem, L). To have both ALIGN([Afx], R, Pwd, L) and ALIGN([Afx], R, Stem, L) functioning as meta-constraints over the set of prefixes seems clumsy and highly redundant, I'll admit, and it would be desirable to outline the relationship between the two and between them and the affixes to which they apply. This, however, is a project beyond the scope of the present paper.

44 NON-RECURSIVITY is a constraint proposed in Selkirk (1993) and Itô & Mester (1993) that bans recursion of any prosodic level. For discussion of the role of NON-RECURSIVITY in the prosodic treatment of proclitics by three dialects of Serbo-Croatian, see Selkirk (1993).

45 "PCAT" here is a variable over prosodic categories: μ, σ, Foot, etc. Thus, PARSE-PCAT is an abstraction over a whole group of constraints which together have the effect of requiring that every prosodic category be dominated by another prosodic category (to the extent possible within Universal Grammar). The role played by this constraint could also be handled by a constraint of the type LEX ≈ PWD (Prince & Smolensky 1993).

been shown to be strongly motivated by Zubritskaya's evidence regarding non jer-related phonological phenomena will prove exceptionally useful in helping to pinpoint the generalization which crucially links the realized prefixal jer in forms like *podo-brat'* to that in forms like *podo-tknut'*.

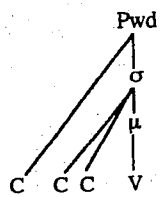
7.3 The Two Subcases

7.3.1 The First Subcase: Forms with Complex Stem-Initial Clusters

Assuming that the ALIGN-AFX constraint presented above in §7.2 is undominated, it should be the case that syllabification across a prefix-stem boundary is barred.[46] If this is the case, then a form like *podotknut'* cannot possibly be syllabified as *po. dot. knut'* despite the fact that tolerance of this syllabification would provide a reasonable explanation for why the prefixal jer surfaces in forms of this kind, i.e., realization of the jer provides a readily accessible way to resolve the otherwise intractable cluster found at the morpheme juncture. Since the prefix and stem must be self-contained syllabification domains in order to comply with the alignment requirement, however, it cannot be the case that the prefixal jer surfaces in order to break up the junctural cluster. Whether the prefixal jer surfaces or not, an unsyllabifiable cluster will remain in the domain of the stem as we can see in (i) and (ii): (i) [pod<O>]. [***tkn***ut'] vs. (ii) [po. dO]. [***tkn***ut']. Since realization of the jer in the prefix does not affect the syllabification status of the stem intial cluster in any way, the question arises as to how the stem-initial cluster gets prosodized. After all, *tkn* is not syllabifiable as an onset due to its violation of required sonority distance (see §5).

The answer to this question falls out quite straightforwardly from a combination of two factors already presented. First, in §5, it was was argued that word-initial clusters may have the form given in (16), repeated below as (32):

(32)

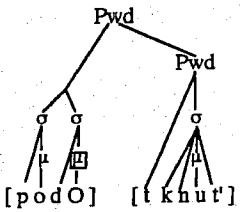


The low ranking of ALIGN-L made the configuration in (32) one that was freely available in Pwd-initial position. The option for Pwd-initial structure of the type shown in (32), in combination with the required Prosodic Word recursivity in prefixed forms (as given in (30)), leads us to the conclusion that *podotknut'* must

[46] There appears to be some dissent among sources I've consulted as to whether or not this prediction actually holds true. Zubritskaya (1993) and Vlasto (1986) claim that syllabification across a prefix-stem boundary does not occur in modern Russian, such that a form like *preduprediť*, 'prevent' (/pred + u + predit') —where *pred* and *y* are prefixes— is syllabified as *pred. u. pre. dit'* and not as **pre. du. pre. dit'*. There are, however, other sources that disagree, with Boyanus (1955) being an example. However, the fact that there is any question at all about the syllabification status of elements at the prefix-stem boundary (as in the case of the first *d* in *preduprediť*, above) suggests that there is something highly unusual about this environment that needs to be accounted for. For more extensive discussion of a similar case of dissent regarding prefix-stem syllabification patterns see Rubach & Booij (1990) about Polish.

be prosodized as in (33), below, with the stem-initial *t* adjoined directly to the interior Prosodic Word:

(33)

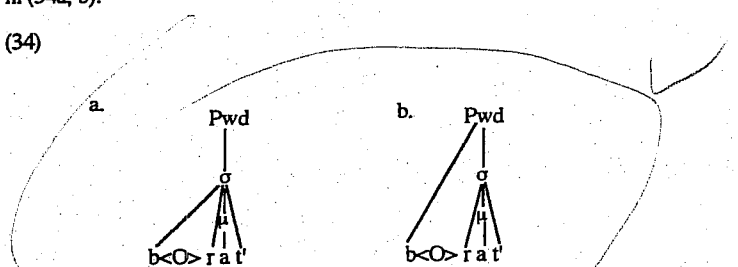


The remaining questions are two. First, what does such a structure have in common with syllabically unexceptional seeming forms such as *podobrat'*, and second, what effect does such a structure have on jer realization patterns? We shall deal with these questions in order, since the answer to the first leads into the answer to the second.

7.3.2 The Second Subcase: Forms with Stem Initial Jers

The situation with forms such as *podobrat'* (/podO + bOr + at'/) would seem to bear little resemblance to that discussed above for *podotknut'*. After all, *brat'* is a perfectly well-formed syllable, and we would not expect any extraordinary measures to be necessary to allow the stem-initial cluster to be prosodified (which is precisely the reason why purely syllable-structure based accounts are unable to predict the surfacing of the prefixal jer in forms of this type). Nevertheless, I would like to suggest that the interaction of a number of low-ranking constraints has the effect of producing what looks at first like a relatively counterintuitive parse of the stem; one wherein the stem-initial consonant, just like that in *podotknut'*, is adjoined to the internal Prosodic Word rather than being a component of the onset to the first (and in this case, only) syllable of the stem. In order to demonstrate this, we need only look at the two most salient parses of the stem (given non-parsing of the jer). These are presented in (34a, b):

(34)



The choice of (34b) over (34a) is, I propose, due to the interaction of ALIGN-L with a new constraint which I will call *GAP. *GAP is a constraint which militates against leaving unparsed material internal to a prosodic category. More specifically, I will assume that *GAP is actually a family of constraints where *GAP-α refers to a prohibition against any unparsed material of level C^{-1} within α, where α itself is of level C. The member of this family of constraints

which is relevant to our present concerns will be *GAP-σ, though I will persist in just referring to it as *GAP. Of the two candidate parses in (34), then (a) would violate *GAP, while (b) would not. As a further example of this constraint in action, we can look at the two jer-containing examples in (35), involving the input /kusOk + a/ which surfaces as *kuska*, 'piece' (gen. sg.). Of the two candidates here, (b) violates *GAP and (a) does not:

(35) a. [$_{\sigma}$kus] <O> [$_{\sigma}$ka] b. [$_{\sigma}$ku] [$_{\sigma}$s<O>ka]

In (35a) the unparsed jer occurs between syllables, invoking no violation of *GAP, but in (35b), the unparsed jer occurs internal to the second syllable and thus does incur a *GAP violation. Assuming that of the two alternates above (b) is chosen over (a), it is clear that NOCODA must outrank *GAP. This must be th case since the form containing a coda but no gap loses to that which contains a gap but no coda.[47] In order for the facts regarding structures such as those given in (34) to come out as I claim they should, however, it will be necessary for *GAP to outrank ALIGN-L. This is so because of the forms in (34), that with the gap but no Pwd-adjunction loses out to that with Pwd adjunction but no gap. We thus have the following ranking at the bottom of the constraint hierarchy: NOCODA » *GAP » ALIGN-L. To recap the total active ranking of constraints involved in transitive domination relations (i.e., excluding those which have been argued to be undominated) we now have the following hierarchy: *COMPLEX[CODA] » MSEG[μ] » PARSE-V, NOCODA » *GAP » ALIGN-L.

What the following discussion leaves us with is a close structural connection between the two types of forms in which we find prefixal jer realization. This structural parallel is one which distinguishes them from all other stem types and provides a foundation on which to build a unified analysis of the jer realization patterns in prefixed forms.

7.4 The Analysis

7.4.1 Parsing and Non-Parsing of the Stem-Initial Jer

One of the trickier points about jer realization patterns in prefixed forms is that stem jers sometimes surface (as in *podžog*, /podO + žEg/) and sometimes do not (as in *podobrat'*, /podO + bOr + at'/). These facts fall out cleanly from the system proposed so far. In the case of an input like /podO + žEg/, non-realization of the stem jer will result in a complex coda, producing either **podožg* or **pod žg*. Given the very high ranking of *COMPLEX[CODA] in the system and its crucial domination of MSEG[μ], no candidate from such an input whose stem jer remains unparsed could ever win out over a competing candidate with a parsed stem jer.

In the case of an input such as /podO + bOr + at'/, on the other hand, non-realization of the stem jer raises no specter of coda complexity. The fact that the cluster resultant from non-parsing of the jer may be prosodized quite easily while violating only low-ranking constraints seals the stem jer's fate. If the stem is parsed as *b<O>rat'*, the highest constraint violated will be PARSE-V, regardless of whether the *br* cluster is treated as a complex onset, or as a simplex onset plus Pwd-adjoined appendix. If the stem is parsed as **bOrat'*, however, a violation of

[47] While I have no independent Russian-specific evidence that the syllabification is in fact as I indicate here, the choice of (b) over (a) seems the most likely possibility in terms of cross-linguistic patterns. The choice is not, however, a crucial one.

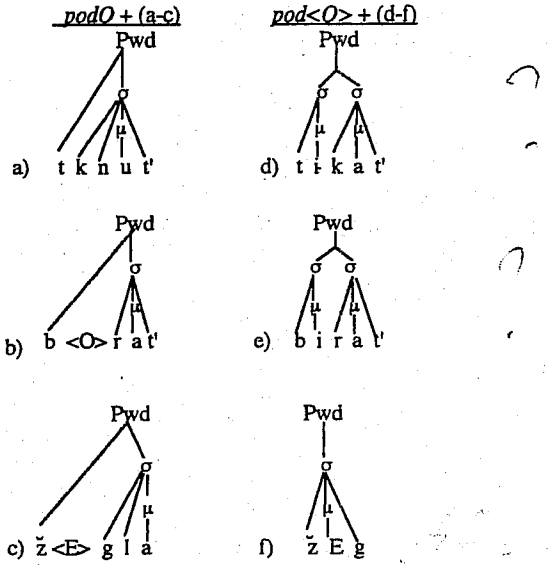
MSEG[μ] is sustained and a single such violation is more severe than any combination of violations of PARSE-V, *GAP, and ALIGN-L could ever be.

The behavior of stem jers in prefixed forms thus seems to come for free under the analysis as given so far. The main residual problem at this point is how to account for the realization patterns of the prefixal jers themselves. Answering this question will require a bit more work.

7.4.2 Parsing and Non-Parsing of the Prefixal Jer

As presented above in §7.3, it appears to be the case that the presence of a stem-initial Pwd-adjoined consonant correlates with realization of prefixal jers. To see this a bit more clearly, let us look at an assortment of stem structures which would be predicted optimal under the present analysis.[48] A suitable sample may be drawn from the following group: *podo-tknut'*, /podO + tk + nut'/, 'tuck up' (pf asp); *pod-tikat'*, /podO + tik + at'/, 'tuck up' (impf asp); *podo-brat'*, /podO + bOr + at'/, 'pick up' (pf asp); *pod-birat'*, /podO + bir + at'/, 'pick up' (impf asp); *podo-žgla*, /podO + žEg + la/, 'set on fire' (fem. pst tns); *pod-žog*, /podO + žEg/, 'set on fire' (masc, pst tns). The optimal stem for each of these forms is given below in (36):

(36) prefixal form: *podO + (a-c)* *pod<O> + (d-f)*



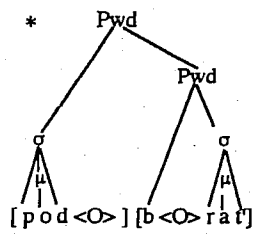
When the stems in (36a-c) occur in forms where they are preceded by a jer-containing prefix, the prefixal jer always surfaces. When the stems in (36d-f) occur in such forms, the prefixal jer goes unparsed. Since it has been shown to be the case that jers do not surface unless compelled to do so, it must be the case that

[48] Examining stem structures in isolation should be entirely valid given the strength of the prefix-stem boundary. Since ALIGN-AFX (see §7.2) is so very high-ranking (perhaps entirely undominated) the prefix and stem domains are quite independent of one another.

to not parse a prefixal jer before stems such as (36a-c) would violate some constraint ranked higher than MSEG[μ]. This constraint would have the effect of forcing jer realization before appendix-initial stems. The question then is, what is it about structures such as (37a), below, that crucially differentiates it from both (37b) and (37c), each of which yields a grammatical output:

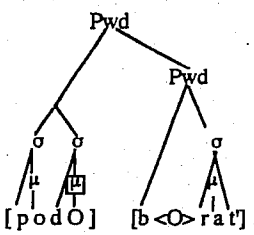
(37)

a. * Pwd



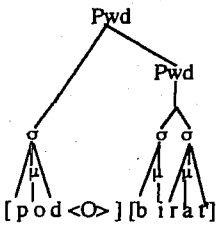
input: /podO + bOrat'/

b. Pwd



input: /podO + bOrat'/

c. Pwd



input: /podO + birat'/

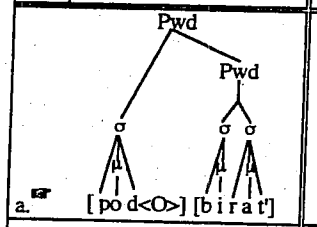
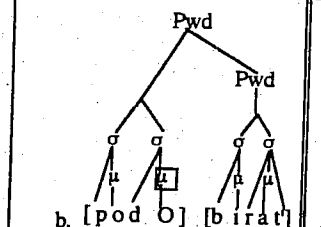
As already noted, the operative condition does not seem to be one of syllable structure since the syllables in (37a) are entirely as well-formed as those in (37c). Nor can it be some constraint militating against (semi-) medial adjunctions, because just such an adjunction appears to be perfectly acceptable in (37b).[49] Instead, I would like to suggest that the relevant constraint is one which requires the right edge of every prefix to be aligned with an edge of a syllable. Specifically, I propose that the relevant constraint is ALIGN([Afx], R, σ, E) where "E" is a variable over edges, (L and R), and [Afx] is again a stand-in for the elements of the set of prefixes (see fn. 43). This constraint diverges a bit from the

[49] One might try to dispute this point by arguing that the consonant which is represented as Pwd-adjoined in (37b) is actually taken as a coda by the second syllable of the prefix. Such a reanalysis is highly problematic for a number of reasons, however. For instance, as was discussed in fn. 46, there are those who argue that not even an *onset* may syllabify across the prefix-stem boundary, despite the fact that it is unquestionably the case that ONSET is a very high ranking constraint in Russian (though ranked below MSEG/FILL). If onsets may not be supplied across a prefix-stem boundary, however, then ALIGN-AFX (see §7.2) must be higher ranking yet. This fact, taken in combination with the fact that ALIGN-L is so low-ranking and the fact that codas are even less favored than appendices (note: NOCODA » *GAP » ALIGN-L, thus NOCODA » ALIGN-L (see §7.3.2), suggests quite strongly that the correct representation involves a structure along the lines of that which is given above.

pattern set out in the Generalized Alignment schema of McCarthy & Prince (1993b) in its use of a variable over edges, but the inclusion of this variable buys us precisely the distinction we need for sorting out the realization patterns of prefixal jers. We can see this in the forms illustrated in (37). In (37b), which yields the grammatical *podobrat'*, we have perfect alignment of the right edge of the prefix [podO] with the right edge of a syllable, the relevant syllable being [σ dO], of the prefix itself. In (37c), which yields the grammatical *podbirat'*, we have perfect alignment of the right edge of the prefix with the *left* edge of a syllable, specifically with the left edge of the first syllable of the root, [σbi]. In (37a), however, which would yield the ungrammatical **podbrat'*, the right edge of the prefix is not properly aligned with any syllable at all due to the combination of underparsing of the prefixal jer and the presence of a stem-initial appendix.

As noted above, it is imperative that this constraint, which will henceforth be dubbed ALIGN-E, be ranked above MSEG[μ] if it is ever to be able to force jer realization. In forms like *podbirat'* , however, the fact that ALIGN-E may be satisfied without jer realization causes the prefixal jer to be left unparsed. This is shown below in the tableau in (38):

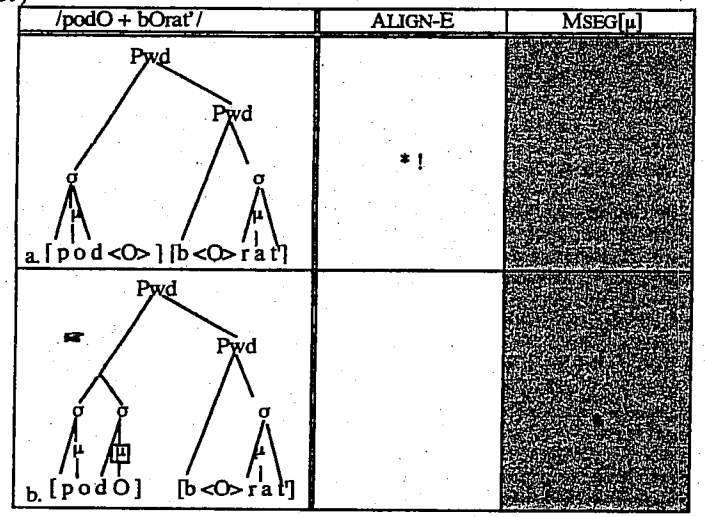
(38)

/podO + birat'/	ALIGN-E	MSEG[μ]
a. ☞ 		
b. 		* !

Since the jer is not necessary to achieve alignment here (this already being satisfied by the first syllable of the stem) and since realizing the jer does no other good aside from allowing a single NOCODA violation to be avoided, the optimal form is that in which the prefixal jer goes unparsed.

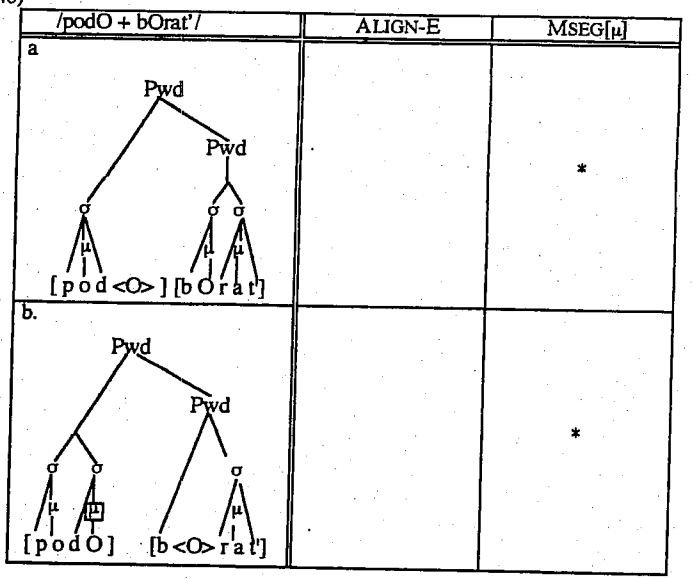
The situation is of course different for candidate forms where the stem involves an initial appendix. This is shown in (39):

(39)



In this case, the fact that realization of the prefixal jer is able to avert a violation of the higher ranked alignment constraint causes the jer to surface. The simple two candidate array in (39), however, oversimplifies the situation by neglecting one very important consideration, specifically: why must it be the prefixal jer that surfaces here and not the root jer? That is to say, *podOb<O>rat'* is not the only potential candidate that would satisfy ALIGN-E. A candidate such as **pod<O>bOrat'*, (in which the stem jer rather than the prefixal jer is realized), would be equally well aligned. Therefore, while ALIGN-E makes a significant contribution in ensuring that a jer is realized in the environments discussed, it alone is unable to choose between the ill-formed **pod<O>bOrat'* and the grammatical *podOb<O>rat'*. This is illustrated in the tableau in (40):

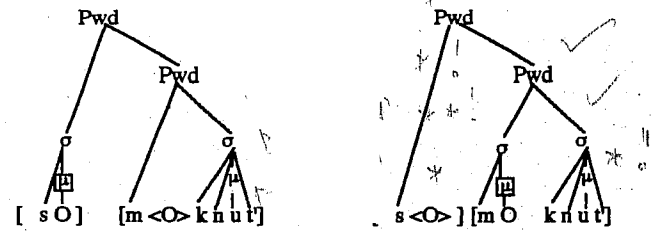
(40)



While the two candidates are completely tied on the higher ranking constraints, we could attribute the choice of *podobrat'* over **podborat'* in this particular case to the fact that *podborat'* will incur two violations of NOCODA while *podobrat'* incurs only one. Since NOCODA is ranked higher than ALIGN-L, the appendix in *podobrat'* is taken to be preferable to the extra coda in **podborat'*. The matter thus gets decided by constraints on the lower end of the hierarchy. This "coda vs. appendix" story will not suffice to account for the patterns in forms whose prefixes are of the shape consonant-jer, however, since non-realization of the prefixal jer in these cases does not result in an extra coda, but instead in an appendix (adjoined to the external Prosodic Word).[50] We can see this in forms such as those given in (41a, b) below, where the grammatical (41a), *somknut'* , follows precisely the same jer realization pattern as does the optimal candidate in the tableau in (40), with realization of the prefixal jer and underparsing of the stem jer. This results in an appendix at the left edge of the internal Prosodic Word which exactly parallels that found in (40). In the ungrammatical (41b), **smoknut'*, we have instead realization of the stem jer and underparsing of the prefixal one. Unlike in (40), however, non-realization of the prefixal jer in this case does not result in an extra coda, but simply in another kind of appendix, i.e., one that is adjoined to the external Prosodic Word. We can see these points illustrated below :

50 Examples of such prefixes include *sO-* and *vO-*.

(41) a.



While it might be the case that there is some particular factor which makes the externally adjoined appendix in (41b) fundamentally more ill-formed than the internally adjoined one in (41a), we do not as yet have any mechanism for predicting that (41a) will be chosen over (41b). The two are equally well aligned with respect to ALIGN-E, they are equivalent in their violation of MSEG[μ], and equivalent in the exent of their violations of PARSE-V, NOCODA, *GAP, and ALIGN-L. What is necessary then is a constraint that can serve as a tie-breaker. Towards this end I would like to make appeal to the Optimality Theoretic equivalent of directional syllabification developed in Mester & Padgett (1993) (based on the theory of Generalized Alignment developed in McCarthy & Prince 1993b). The relevant constraint, (taken directly from Mester & Padgett 1993), will be ALIGN(σ, L, Pwd, L). This constraint will require that the left edge of every syllable be aligned with the left edge of some Prosodic Word. Following Mester & Padgett, I will assume that violations of this constraint are gradient and measured in moras.[51] Exactly *how* violations are calculated is illustrated below in (42) . For purposes of exposition, take the hypothetical candidate set illustrated by (42) to be from a language in which codas are moraic.

(42)

ALIGN-σ-L	σ_1	σ_2	σ_3
a. $[cvc]_1.[cv]_2.[cv]_3$		μμ!	
b. ☛ $[cv]_1.[cvc]_2.[cv]_3$		μ	

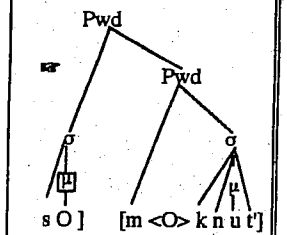
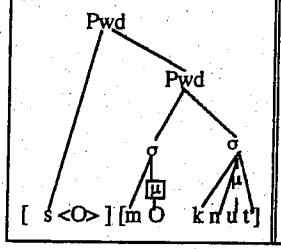
Given the universal quantification over syllables inherent in the definition of the constraint, the extent of misalignment must be reckoned for each syllable. The total extent of violation for any given candidate form is then a result of grouping together all the violations incurred by each syllable in that candidate. Thus, the extent of violation for (42a) would be "*****" (each mora's worth of misalignment constituting a single star), while the total extent of violation for (42b) would be "****". By the Cancellation/Domination Lemma of Prince &

[51] The gradient measure of violations is not crucial to the cases under consideration here, and in fact it is conceivable that the violations of alignment are all categorical and "ranked" by prosodic level. That is to say, misalignment by a single mora would be more severe than misalignment by any number of moraless root nodes, but if no moras intervene, the presence of intervening, misaligning root nodes would become relevant to winnowing the candidate set. (This observation regarding the potential for categorical alignment violations is based on handouts from John McCarthy's Fall 1993 Optimality proseminar.) For present purposes gradient measurement in terms of moras alone will be sufficient, but either conception would produce the desired result.

Smolensky (1993), (42b) would thus be the more harmonic candidate with respect to this constraint.

Measurement of violations of syllable alignment in terms of moras is not only intuitively appealing, (due to the fact that moras are the next level down from syllables in the prosodic hierarchy), it actually proves to be crucial to getting the facts right in the particular case presently under consideration, as will be illustrated below in (43). Since ALIGN-σ serves just as a tie-breaker, it can be ranked anywhere in the hierarchy and still resolve the stalemate between forms such as (41a) and (41b). The way in which the tie would be broken is illustrated below in (43):

(43)

/sO + mOknut'/	ALIGN-E	MSEG[μ]	ALIGN-σ
a. ☛ 		*	
b. 		*	* ! misalignment of σ_2 by μ

In the first candidate, the left edge of the prefixal syllable is perfectly aligned with the left edge of the external Prosodic Word. The stem syllable in the first candidate has two root nodes intervening between it and the left edge of the internal Prosodic Word, but no moras separate the syllable and Pwd edges so they count as perfectly aligned under the formal definition laid out above. In the second candidate, the first stem syllable is perfectly aligned with the left edge of the internal Prosodic Word, but the second stem syllable is separated from the nearest left Prosodic Word edge by a mora and this produces the fatal violation that removes the candidate from consideration. Regardless of where this constraint is ranked, it will serve to choose between the two tied candidates.

8. Conclusion

In this paper I have demonstrated that patterns of jer realization can be attributed to the interaction of a highly diverse group of phonological and morphological constraints. I have tried to show that the patterns of realization

observed at the level of output can be seen to follow directly as a consequence of the jers' input representation as moraless vowels, with the jers' underlying lack of morae accounting for the very close relation observed between jer realization and principles of prosodic well-formedness. I have also tried to show that the relevant principles of prosodic well-formedness cannot be restricted simply to matters of syllable structure since prosodic alignment of several types, and structural representations above the level of the syllable seem to play a significant role as well.

In addition, I have argued that morphological requirements enter strongly into the picture in a number of ways. From alignment of morphological categories with prosodic ones to subcategorizational requirements on particular morphemes, many morphological factors make themselves felt in the jer realization puzzle.

This paper certainly will not be the last word on jers, but it is hoped that the approach laid out here will help provide a fruitful new direction in the investigation of this and related phenomena.

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