1. Lexical patterns are part of the knowledge of Russian speakers

Gouskova and Becker (2016) (following Gouskova and Becker 2013) show that generalizations which can be made over the lexicon regarding vowels that alternate with zero in Russian (so-called yers) are part of grammatical knowledge: speakers reproduce them productively when rating the grammaticality of nonce words (in a wug test). For example, vowels that precede a root-final consonant cluster are never yers (i.e. never alternate with zero). Clusters are common word-finally (-st#: pomóst "stage Nsg") and three-membered clusters may be created by the deletion of a yer (stoC# - stC-V: kost'ór - kostr-á "fire Nsg, Gsg"). But in no Russian word is the vowel in a -CoCC# root deleted (*pomóst - pomst-á). This lexical distribution which the authors call complex coda blocking (there are no yers before root-final clusters) is mirrored by the fact that in nonce words, speakers accept deleted vowels significantly more often when they precede root-final singleton consonants (nonce pišoch - pišch-á) than when they are followed by a root-final cluster (nonce pišochl - pišchl-á). In order to make these judgements, Gouskova & Becker (2016) argue, speakers necessarily call on their grammatical knowledge.

Gouskova & Becker (2016) also show that the absence of yers before root-final clusters is a statement about the source (input) that cannot be captured by any product-based (output-based) generalization: -CCC-V strings are fine if they come from a -CCoC# input, but they are not in case they relate to a -CoCC# source. The authors further demonstrate that (unlike other source-oriented generalizations), this pattern cannot be expressed in terms of faithfulness. Rather, it needs to be encoded by a mechanism akin to SPE's Morpheme Structure Constraints which defines the properties of lexical items by running candidates for lexicalization through a specific set of constraints (which the authors call the gatekeeper grammar) that make sure that no lexical entries with certain properties occur (in our case -CyrrCC#). That is, speakers have two grammars, a gatekeeping grammar (GK) and a grammar proper (GP), the latter mapping inputs onto outputs.

Since the constraint against roots with final clusters is specific to those roots that have a yer (final clusters happily occur in non-yer roots), Gouskova & Becker (2016: 407) devise two separate sublexicons, one containing all and only those morphemes that exhibit a yer, the other containing morphemes where no yers occur. Speakers thus have two gatekeeping grammars, GKyer and GKnon-yer. The constraint ranking of the former rules out roots with final clusters, while the grammar of the latter does not.

Another piece of the knowledge of speakers that Gouskova & Becker's (2016) nonce word test reveals is that yer deletion is preferred if the resulting cluster is (C)TR, as compared to (C)RT, (C)TT, (C)RR (where T represents obstruents and R sonorants). Hence speakers prefer the vowel to be deleted in (nonce) sóm (yielding sm-á) when compared to (nonce) món (producing ms-á). Gouskova & Becker (2016: 394) report that this generalization is not mirrored in the lexicon. It is also different in kind with respect to the dispreference for yers followed by root-final clusters since it
has a clear output-driven (product-oriented in the terms of the authors) rationale based on sonority.

Here again the authors build on the split of the Russian lexicon into a sublexicon that contains yer-bearing morphemes and another sublexicon that hosts morphemes without yers. Since the generalization is product-oriented and hence falls into the competence of grammar proper, there are two lexically specific versions, \( GP_{yer}\) and \( GP_{non-\text{yer}}\).

A Russian speaker thus operates with two sublexicons and four grammars in total (for masculine nouns): \( GK_{yer}, GK_{non-\text{yer}}, GP_{yer}\) and \( GP_{non-\text{yer}}\). As a result, Gouskova & Becker attribute the absence of roots that end in yerCC\# and the preference for yer deletion-created clusters of rising sonority to entirely different mechanisms. While both generalizations are part of the grammatical knowledge of speakers, the locus of this knowledge lies in \( GK\) in the former, but in \( GP\) in the latter case. Finally, note that the two sublexicons are also motivated by the fact that in Russian (as much as in other Slavic languages), the occurrence of yers in lexical items is unpredictable: \( e \) and \( o \) may (rót - rt-á "mouth Nsg, Gsg") or may not (pót - pót-a "sweat Nsg, Gsg") alternate with zero. Following Gouskova (2012), Gouskova & Becker (2016) encode this contrast by lexically marking classes of morphemes (yer morphemes vs. non-yer morphemes), rather than individual segments (regular vowels vs. yers).

2. Three issues
In this reply I would like to make the three points below.

**The basic generalization regarding Slavic yers is missed.**

Gouskova's (2012) and Gouskova & Becker's (2016) way of approaching Slavic vowel-zero alternations in general and their Russian incarnation in particular misses a simple and well-established generalization that covers all cases of the intricate pattern at stake: yers appear on the surface iff they are followed by another yer. This is what a massive body of literature (on which more in section 4 below) has established as the so-called Lower rule since Lightner (1965). Instead of holding the avoidance of certain clusters responsible for the appearance of vowels on the surface (according to Gouskova & Becker, vowels are rather interpreted as non-yers in RoT-V, ToT-V and RoR-V in order to avoid the clusters that would result from deletion), Lower builds on a lateral relation with the following nucleus. Clusters play no role and there is no need for sublexicons or specific grammars that enforce lexical patterns.

**Misattribution of phenomena that concern the lexical distribution of yers in morphemes to the computational system (i.e. the mechanism that decides which yers appear on the surface).**

This is relevant on a number of occasions in Gouskova's (2012) and Gouskova & Becker's (2013, 2016) material (to be discussed in section 5 below), especially since the authors make arguments against Lower and in favour of the cluster-based analysis that are based on what they mistakenly take to be computational.

For example, the fact that TR clusters are preferred over other clusters when resulting from yer deletion is a fact about how ambiguous vowels (that could either be
a yer or a regular stable vowel) are lexicalized (in new loans, acronyms, nonce words etc.). It has nothing to do with the computational mechanism (Lower in the established literature), which decides about the surfacing of yers once they are recorded in the lexicon. The workings of this computation are 100% regular no matter what the sonority of the cluster created. It is this computational mechanism that is specific to Russian (or other Slavic languages) and needs to be encoded in its grammar – crucially without any reference to the sonority of resulting clusters. In other words, GP (grammar proper) where input-output mapping is operated must not make reference to the sonority of resulting clusters since it is irrelevant for its behaviour.

**Generalizations about the sonority profile of yer deletion-created clusters are irrelevant for actual human learners (children or adults, as opposed to machine learners that are used in Gouskova & Becker 2016).**

When faced with a new word that is unknown and whose last vowel is e or o, learners of Russian need to make a decision about how the surface e,o is stored in the lexicon: either as stable e,o or as alternating e,o (i.e. a yer). Likewise, when root-final clusters are encountered in new words that learners have only come across in a suffixed form […CC-V], they need to be interpreted as either bearing a yer (/…CyerC/) or not (/…CC/) upon lexicalization. These decisions need to be made by children in (first) language acquisition, and by adults when confronted with loans, acronyms etc. Children and adults may get it wrong: Łukaszewicz (2006: 15f) reports the following child data from Polish (where the workings of yers are the same as in Russian).

(1) Polish acquisition (A., 3;11)

a. TR#: yer insertion

<table>
<thead>
<tr>
<th>Adult Target</th>
<th>Child Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nsg</td>
<td>Gsg</td>
</tr>
<tr>
<td>wiat</td>
<td>wiatr-</td>
</tr>
<tr>
<td>motocykl</td>
<td>motocykl-a</td>
</tr>
<tr>
<td>bóbr</td>
<td>bobr-a</td>
</tr>
</tbody>
</table>

b. TR#: deletion of the final consonant

<table>
<thead>
<tr>
<th>Adult Target</th>
<th>Child Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nsg</td>
<td>Gsg</td>
</tr>
<tr>
<td>pomysl</td>
<td>pomysl-</td>
</tr>
<tr>
<td>zgadł (masc.)</td>
<td>zgadł-a (fem)</td>
</tr>
<tr>
<td>Piotr</td>
<td>Piotr-a</td>
</tr>
</tbody>
</table>

All examples involve final TR# clusters (which in Gouskova & Becker's findings have the highest likelihood to induce the lexicalization of a yer in their midst), which the child obviously cannot produce: as may be seen under (1), they are either broken up by a yer (1)a or simplified (1)b. That is, the child either lexicalizes a yer (/wiatr/) or a cluster (/Piotr/), whose second consonant is lost when occurring in word-final position. Łukaszewicz reports that the choice of the two strategies is unpredictable due to the fact, she argues, that the child knows that final (TR-) clusters may (sweter - -swetr-a "jumper Nsg, Gsg") or may not (filtr - -filr-a "filter Nsg, Gsg")
host a yer: there is nothing in the available data that a decision could be based on, and what ends up being lexicalized is a matter of chance.

Sooner or later, however, the child (or the adult) will be exposed to relevant evidence that disambiguates the situation. When hearing Russian bobr-á "beaver fur Gsg" and dolg-á "long fem.", the child has no way to know whether or not there is a yer hidden in the root-final cluster. They may make a guess based on the knowledge that Gouskova & Becker have shown natives possess: they will then be more likely to suppose that the root meaning "beaver fur" has a yer (since the cluster created by yer deletion is of the preferred TR type) and hence its Nsg is bobóír. By contrast, the root-final RT cluster in dolg-á rather drives the child into choosing an underlying form without yer, which will produce the masculine form dólg. The child will have been right in the former, but wrong in the latter case: the masc. form of dolg-á is dólog. When the child comes across this masculine form, though, it understands that having lexicalized /dolg-á/ was a mistake and corrects the lexical entry to /dolb-á/. The same goes for the adult.

In this entire process, whether or not a preference for yer deletion-created TR clusters is part of the knowledge of speakers is entirely irrelevant: it does not help learners in any way nor does it alter the learning path. If anything, the bias for yer deletion in /l(C)TyerR/ (as compared to /l(C)RyerT/, /l(C)TyerT/, /l(C)RyerR/) that Gouskova & Becker have identified in their experiment will induce children (and adults) more often into error than if they went by chance when they make guesses whether the root of a surface -TR-V# sequences ends in -TR/ or in -TyerR/. This is because, as Gouskova & Becker (2016: 394) report, the preference observed in the experiment is not mirrored in the actual lexicon of Russian: vowel deletion is not particularly probable in (C)To/eR# items. Hence putting the experimentally established knowledge in favour of a /l(C)TyerR-V/ - [(C)TR-V] mapping to use is dysfunctional: learners will tend to interpret [(C)TR-V] items as yer-bearing when this mapping is rather infrequent in the actual lexicon.

It would be interesting to see whether the TR-favouring bias that Gouskova & Becker have found when asking adults to judge unknown words is also present in the actual behaviour of children and adults when they lexicalize new words in the wild.

In sum, the bias in favour of yer deletion-created TR clusters is alien to the workings of Russian: it plays no role in either the computational system or the lexicon and is irrelevant in the acquisition of new words (by human learners, both children and adults). If anything, it is functionally counter-productive in the latter area.

What is the origin and locus of the sonority-based bias in Russian speakers, then? Showing that sonority sequencing is ubiquitous in productive phonological processes, that it is supported by typological data and constrains the behaviour of speakers in psycho-linguistic experiments, Berent (2013: 165ff) argues that sonority sequencing is a grammatical universal since it cannot be derived from extra-grammatical factors (such as phonetics). Berent also shows that sonority sequencing does not merely extend to lexical items that speakers have never come across: it is also active in structures that are unattested in the speaker's language (e.g. branching onset preferences produced by Korean speakers, whose language lacks branching onsets, Berent et al. 2008). On this backdrop, the behaviour of Russian speakers in Gouskova & Becker's (2016) experimental data may be a kind of emergence of the
unmarked: the preference for TR clusters is irrelevant in Russian (grammar, lexicon and learning), but still part of the universal knowledge of Russian speakers.

Optimality Theory aims to encode all knowledge that speakers have of their language in one single locus, the constraint hierarchy (Prince & Smolensky 2004 [1993]: 205ff, chapter 9). This constraint hierarchy is then responsible for actual phonological computation (input-output mapping) as much as for static properties such as inventory definition, systemic properties of inventories, parameter settings or even the regularities that are found in the lexicon (Richness of the Base: grammatical inputs are universal). It also encodes non-phonological processes (i.e. that do not relate a phonological input to a phonological output) such as analogy (OO faithfulness, paradigm uniformity) or the workings of the interface(s). In alternative approaches, active phonological computation (i.e. where phonological inputs are mapped onto phonological outputs) are not scrambled with the other types of knowledge. In the theory of contrast promoted by Dresher (2009) and Hall (2011) for example, systemic properties are acquired and then stored as stable information in form of a contrastive hierarchy to which phonological computation makes reference – but which is not a piece of phonological computation itself. The same goes for parameters and inventory definition, which may be hard-wired knowledge that is stored independently of phonological computation. This is to say that the computational mechanism that maps inputs onto outputs may not be all there is regarding grammar, and it may not be the only locus where the knowledge that speakers have about their language is encoded.

This is how the above conclusion is to be understood: the mechanism that carries out input-output computation in Russian must not include any bias in favour of yer deletion-created TR clusters. This is evidence for the distribution of tasks over different loci in grammar (rather than their exclusive concentration in input-output computation), just as Gouskova & Becker's (2016) central distinction between source-oriented and product-oriented generalizations (and hence between a gatekeeper grammar and a grammar proper) is.

The first two points made above are further contextualized below.

3. Cluster-based analyses
3.1. Cluster-based insertion analyses were abandoned


One of the reasons why the insertion-based perspective was abandoned is the fact that there is no context for insertion. Insertion-based analyses distinguish alternating and stable vowels by anchoring the latter in the lexicon (Po /bies/ yielding bies - bies-a "devil Nsg, Gsg"), from which the former are absent (Po /p’ls/ producing
pies - ps-a "dog Nsg, Gsg"). The motor for insertion is then held to be the avoidance of certain illegal, difficult, unsyllabifiable, unpronounceable or costly clusters which would arise if no vowel were inserted. In the following examples from Polish, in this perspective -tr# in /futr/ "fur Gpl", -p# in /stop\'n/ "step Nsg" or -mn# in /trum\'n/ "coffin Gpl" are broken up and the words appear as futer, stop\'en and trum\'en, respectively. The trouble is that the same word-final clusters do happily exist in Polish without being broken up: wiatr "wind Nsg", wap\'n "calcium Nsg", hymn "hymn Nsg".

The same pattern occurs in other Slavic languages: a sample of relevant cases where identical clusters are broken up in some words but not in others appears under (2) below. The minimal pairs lá\'ska and bobr\'á found in Russian are especially eloquent.

(2) identical clusters are broken up in some words but not in others

<table>
<thead>
<tr>
<th></th>
<th>cluster broken up</th>
<th>cluster is stable</th>
<th>gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CvC#</td>
<td>CC-V</td>
<td>CC#</td>
</tr>
<tr>
<td>Polish</td>
<td>futer</td>
<td>futr-o</td>
<td>wiatr</td>
</tr>
<tr>
<td>Czech</td>
<td>karet</td>
<td>kart-a</td>
<td>kwart</td>
</tr>
<tr>
<td>Russian</td>
<td>lá'sok</td>
<td>lásk-y</td>
<td>poct</td>
</tr>
<tr>
<td></td>
<td>bobr'é</td>
<td>bobr-á</td>
<td>bóbr</td>
</tr>
</tbody>
</table>

In conclusion, thus, there is no way to predict which clusters will be subject to epenthesis and which ones will not.

3.2. Cluster-based analyses revived through lexical marking

Starting with Szpyra (1992), there is a line of thinking that records yers in lexical representations (and hence abandons insertion), but like in the insertion perspective holds that the vocalization of yers (i.e. their promotion to surface existence) is due to the avoidance of certain clusters. Yearley (1995) is an incarnation of this idea, but the author does not explain how the yer vocalization mechanism actually distinguishes between identical clusters that are broken up in some words but not in others. It is only Gouskova (2012) who makes the cluster-based analysis technically workable by devising morpheme-specific constraints (e.g. Pater 2009) that apply to two separate classes of morphemes (or sublexicons), one containing words that bear yers, the other words that do not have any yer. Thus the Russian root meaning weasel, /l\'as\'k\'yer/ belongs to the yer lexicon, while the root meaning caress, /l\'as\'k\'non-yer/, does not. Constraints that only apply to the yer lexicon then rule out word-final -sk# clusters, to the effect that the yer in /l\'as\'k/ "weasel Gpl" must appear on the surface: lá\'sok. Final -sk# clusters in the non-yer lexicon are not impacted since the constraints against them do not control this set of morphemes.

This is where the idea of a split of the Russian lexicon into a yer- and non-yer-sublexicon comes from. Note that what is lexically marked in Gouskova's analysis is not the fact that a given vowel is or is not a yer (which is what regular analyses do), but the fact that a given morpheme does or does not bear a yer. Hence the title of Gouskova (2012), Unexceptional segments, referring to the fact that all [ɛ]'s and all [ɔ]'s that appear on the surface in Russian have the same lexical identity regardless of
whether or not they alternate with zero. For example, the aforementioned *rót - rt-á "mouth Nsg, Gsg" will be /rot_yl/ while *pót - pót-a "sweat Nsg, Gsg" identifies as /pot_non-yl/ (instead of /rôt/ vs. /pot/ on the segment-based analysis).  

3.3. An amorphous set of reasons why yers vocalize

Following insertion-based approaches, Yearley (1995) and Gouskova (2012: 83) hold that yers appear on the surface when they are the only vowel in the word (/sъn/ → són "dream Nsg" instead of *sn) since there are no words without vowels in the language. Yers are also vocalized when occurring in word-final clusters which may (/lasъk/ → lások "weasel Gpl") or may not be attested in the language. Gouskova (2012: 83) calls the latter "unpronounceable": the yers in /chlopъk/ and /korotъk/ surface in chlópok "cotton Nsg" (compare with chlóp-a "id., Gsg") and kórotok "short, masc." (compare with korot-a "id., fem.") because their absence would create -pk# and -tk#, clusters that are unattested in Russian.

Yearley (1995: 545, echoed by Gouskova 2012: 87f) further wonders why the two word edges seem to produce opposite behaviour of yers in Russian. Yers systematically surface to break up word-final clusters (/lasъk/ → lások "weasel Gpl"), but on the contrary are never realized when word-initial clusters could be avoided (/l'ьst-it'/ → l'st-í "to flatter", compare with lést' "flattery"). On Yearley's (and Gouskova's) analysis, this contrast stems from the possibility of initial clusters to have their edge-most consonant adjoined to the prosodic word (i.e. bypassing the onset and the syllable node), while this option is denied to word-final clusters.

Finally, there is another reason why yers vocalize: Triconsonantal Cluster Blocking (Gouskova 2012: 89ff) prevents yers from deleting (which on Yearley's / Gouskova's basic analysis they should) when their absence would create three consonants in a row. Both word-initial and word-medial three-membered clusters are subject to this restriction since, Gouskova argues, they are unsyllabifiable (note the difference with "unpronounceable" clusters mentioned earlier). For example, the last vowel of kot'ól "boiler Nsg" is a yer because it is absent in Gsg kotl-á. The diminutive of this word is kotel-ók in Nsg and kotel-k-á in Gsg. The reason why the last root vowel in the latter form does not delete, Gouskova contends, is the fact that deletion would produce the illegal three-membered cluster -ttk-. This analysis applies to all sequences of two or more yers, which are frequent and characteristic for double diminutives (e.g. igól-k-a - igól-ok "needle dim. Nsg, Gpl", igól-oč-k-a - igól-oč-ek "id. double dim. Nsg, Gpl").

4. Lower
4.1. A unified analysis

Yers in word-initial and word-final clusters only show contrastive behaviour under the assumption that yer vocalization is cluster-driven. The issue disappears under the established analysis of yers that originates in Lightner (1965) and had a massive offspring in linear and autosegmental incarnations. This analysis is known as Lower, and its basic insight is that yers vocalize iff they are followed by another yer in the underlying representation (Gussmann 1980, Rubach 1984, 1986, Kenstowicz and Rubach 1987, Farina 1991 and many others, see the survey in Scheer 2011).
Lower offers a unified perspective where all yers are vocalized for the same reason and are governed by the same mechanism. When looking at the patterns through this lens, there is no such thing as an opposite behaviour of yers at the two word edges, and no specific edge-based mechanism (the ability for edge-most consonants to adjoin to the prosodic word) needs to be devised. Yers after word-initial consonants are followed by a stable vowel and thus remain unvocalized (/lmъx-/a/ → mx-á "moss Gsg"), while yers before word-final consonants are followed by another yer and therefore appear on the surface (/lásъk/ → lások "weasel Gpl"). The same goes for yer chains: the leftmost yer is followed by another yer and therefore vocalizes, while the rightmost yer deletes in case it is followed by a stable vowel (/kotъl-ъk-а/ → kotel-k-á "boiler dim (= kettle) Gsg"). Clusters (or syllabification) play no role in this analysis.

Hence the amorphous set of reasons that is held responsible for yer vocalization under the cluster-based analysis reduces to a single unified reason and a single mechanism when Lower is assumed. A sample of relevant contexts comparing the cluster-based analysis and Lower is shown under (3).

(3) vowel-zero alternations:

<table>
<thead>
<tr>
<th>amorphous set of reasons (cluster-based) vs. one single reason (Lower)</th>
</tr>
</thead>
<tbody>
<tr>
<td>vocalized</td>
</tr>
<tr>
<td>a. /sъn-/ъ/ → són</td>
</tr>
<tr>
<td>b. /lásъk-/ъ/ → láskok</td>
</tr>
<tr>
<td>c. /chlopъk-/ъ/ → chlópkok</td>
</tr>
<tr>
<td>d. /mъx/ → móx</td>
</tr>
<tr>
<td>e. /kotъl-ъk-a/ → kotel-k-á</td>
</tr>
</tbody>
</table>

Abandoning Lower for the reasons discussed by Yearley (1995: 536f) and Gouskova (2012: 109f) thus comes at the cost of missing an overarching generalization: we are facing a single phenomenon, yers and their vocalization, rather than a series of unrelated processes. Also recall that the division of the lexicon into morphemes that do vs. do not contain yers is as unnecessary under the workings of Lower as the assumption of sublexicon-specific computational instructions. Finally, it is interesting to note that Gouskova (2012: 110) points out that it is impossible to implement Lower in OT since Richness of the Base does not allow for a situation where all lexical items of a language end either in a full vowel or a yer.

The major objection that is levelled against Lower, i.e. the existence of word-final yers that never appear on the surface, is addressed in the remainder of section 4.

4.2. Word-final yers that never appear on the surface

The unification-based argument in favour of Lower hinges on the presence of yers that follow word-final consonants: in /sъn-/ъ/ → són for example, vocalization occurs because the root /sъn/ is followed by a yer. In the classical literature, yers that occur after
word-final consonants and never appear on the surface (because they are not followed by another yer) are interpreted as case markers.

One motivation of insertion-based analyses was to get rid of these "abstract" word-final vowels (e.g. Szpyra 1992: 302f), which are also taken as the central argument by Yearley (1995: 536f) and Gouskova (2012: 108, note 25) to abandon Lower. This objection disappears in the environment of Government Phonology where vowels that alternate with zero are lexically distinct from the items that occur after word-final consonants: the former are floating pieces of melody, while the latter are (final) empty nuclei that come for free since word-final consonants are onsets of empty nuclei in all languages. In order to see this, the following section shows that Lower in fact describes a lateral relation known as government in Government Phonology.

4.3. Lower describes a lateral relation (government)

The fundamental insight of Lower is that vowel-zero alternations in Slavic are the result of a regressive (right-to-left) intervocalic relation: the target is the leftmost vowel, whose phonetic value is determined by the neighbour to its right: the former appears on the surface if the latter is a yer; otherwise it remains unexpressed. This is depicted under (4) below.

(4) Lower describes a regressive lateral relation among vowels

```
    pьbь
    \ \ \ \ 
    e
   ---
   pes Czech "dog Nsg"

vocalization
```

The ingredients of Lower match what is known as government in Government Phonology (Kaye et al. 1990, Kaye 1990, Lowenstamm 1996, Scheer 2004). Government describes a head-final lateral relation among two nuclei whereby the target nucleus is phonetically absent when governed (i.e. when the lateral relation is established), but appears on the surface in case it escapes government.

For example, French *la semaine* "the week" may be pronounced [la səmɛn] or [la smɛn] (the vowel-zero alternation is optional). The latter pronunciation is depicted under (5): the stable vowel e governs the preceding nucleus, whose vowel is therefore unable to associate.

(5) Government

```
    OwO
    |   |
    |   |
    s m e n French *la semaine* [la smɛn]
```
Government Phonology set up this system without any reference to the Slavic evidence, just as the classical generative analysis of Slavic vowel-zero alternations owes nothing to Government Phonology, which did not exist when Lightner (1965) wrote. It may thus be argued that the independence of both analyses lends support to their basic tenets (Scheer 2005).

4.4. Yers as nuclei with a floating piece of melody

The first autosegmental representation of yers is due to Hyman (1985: 58ff) and Rubach (1986). On their analysis, yers are floating pieces of melody (segments) that are devoid of syllabic support in the lexicon (while stable vowels are lexically associated to an x-slot or a mora). In the government-based approach where the vocalization of yers is due to a lateral relationship among two nuclei, Scheer (2004: §81f, 2005) and Gussmann (2007) follow the idea that alternating vowels (yers) are floating, while stable vowels are lexically associated. Unlike on Hyman's and Rubach's take, this nucleus is thus present.9

The original and government-based representations of yers and stable vowels are contrasted under (6) below, using Russian són - sn-á "dream Nsg, Gsg" for alternating and dóm - dóm-a "house Nsg, Gsg" for non-alternating vowels. On the autosegmental account specific yer vowels (ь, ъ) that are part of the phonemic inventory of the language do not need to be assumed. As shown under (6)a,b, yers are segmentally indistinguishable from stable vowels: alternating [ə] (back yer) in són - sn-á is segmentally /o/ just as much as non-alternating [ə] in dóm - dóm-a. The difference lies in the autosegmental relationship yers and non-yers entertain with syllabic positions (Bethin 1998: 206ff provides an overview): on the classical take (6)a yers are floating segments that do not possess any syllabic position (x-slot), while stable vowels are lexically associated to a syllabic position. The government-based analysis under (6)b follows the same logic, except that floating yers do possess a nucleus in the lexicon: the only thing that differentiates them from stable vowels is the absence of association to their nucleus.

Finally, recall from section 4.2 that on the original take word-final consonants are followed by yers, which represent case markers (hence the floating o after word-final consonants under (6)a). In the government-based alternative, these final yers do not exist: instead there is a final empty nucleus, which is crucially distinct from a yer since it does not possess any floating segment. This is the central point to be illustrated here since, recall, final yers are the major reason why cluster-based approaches reject Lower.

(6) underlying representation of yers and stable vowels

\[
\begin{array}{cccccccc}
\text{Nsg són} & \text{Nsg dén'} & \text{Nsg dóm} & \text{Nsg són} & \text{Nsg dén'} & \text{Nsg dóm} \\
\hline
x & x & x & x x & x x & O & N & O & N & O & N & O & N \\
\mid & \mid & \mid & \mid & \mid & \mid & \mid & \mid & \mid & \mid & \mid & \mid \\
\text{s o n o d e n' o d o m o} & \text{s o n d e n' d o m} \\
\end{array}
\]
The way yer vocalization works based on these lexical representations is shown under (7). In the Nsg són under (7)a, Lower finds that the floating root-internal vowel (a yer) is followed by another floating segment (another yer). Therefore the leftmost yer is vocalized. This is done by the epenthesis of an x-slot (a mora in Hyman's 1985 version) and the association of the floating vowel. Epenthesis and association do not occur in Gsg sn-á since the root-internal floating vowel is not followed by another floating vowel: the following vowel is the genitive marker -a, which does not float. Hence the floating root-internal vowel remains unassociated and is not pronounced. By contrast in Gsg dóm-a the root-internal vowel is pronounced since it was already associated in the lexicon and therefore does not need any epenthesis in order to appear on the surface.

(7) yer vocalization

<table>
<thead>
<tr>
<th></th>
<th>Nsg són</th>
<th>Gsg sn-á</th>
<th>Gsg dóm-a</th>
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</thead>
<tbody>
<tr>
<td>Gvt</td>
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Under (7)b, the lateral relation that Lower describes is made explicit: government embodies a head-final relationship between a filled and an empty nucleus. It can only be established when the head nucleus is contentful. This is the case in Gsg sn-á where the case marker -a fills the final nucleus: the lateral relation goes into effect, and government acts as an association inhibitor that prevents the floating melody of the target nucleus to associate. By contrast in Nsg són, the final nucleus is empty and hence no government can be established. Therefore the root-internal nucleus escapes government and its floating melody can associate. The general rule, then, is that floating melodies can only attach to ungoverned nuclei. Finally, stable vowels as in Gsg dóm-a are not concerned by the government-based calculus regarding association since there are no floating vowels: the case marker -a is attached and nothing more happens.

Let us now come back to the issue discussed in section 4.2, i.e. the fact that on the classical analysis it needs to be assumed that word-final consonants are followed by yers that never appear on the surface. That is, some yers (those that are word-internal) are alternation sites that host a vowel-zero alternation, while others (word-final yers) never appear on the surface.

On the analysis under (7)b, the two types of yers that are assumed on the classical take are distinct phonological objects: vowels that alternate with zero are nuclei with a floating piece of melody, while word-final consonants are followed by an empty nucleus (without floating piece of melody). The Lower computation is not affected by this difference since government is a general device of phonological theory that is active in all languages and therefore describes a relationship between two nuclei – not between two yers.10
The issue regarding word-final yers that never appear on the surface thus disappears when it is understood that they are not yers but final empty nuclei. These are not any specific to yers or Slavic, but rather universal in Government Phonology: word-final consonants are onsets of empty nuclei in all languages (arguments have been rehearsed e.g. in Kaye 1990 and Gussmann and Harris 2002). Note that the existence of empty nuclei following word-final consonants is also assumed outside of Government Phonology, e.g. by Dell (1995), Burzio (1994), Kiparsky (1991) and van Oostendorp (2005).

Finally, recall from note 2 that internal and final yers also show different behaviour elsewhere: there is variation regarding the vocalization of word-final clusters in Russian Gpl (which on the classical take are followed by a final yer) where some roots are non-vocalizing (igr-á - ígr "game Nsg, Gpl") while others vocalize (kúkl-a - kákol "doll Nsg, Gpl") and still others offer both options (igl-á - ígl / ígól "needle Nsg, Gpl"). When followed by an internal yer belonging to a yer-initial suffix such as the diminutive /-sk/, though, this variation is completely neutralized: all words obligatorily vocalize (igór-k-a, kákol-k-a, igól-k-a). This pattern suggests that there is an item following word-final consonants, but that this item is different from word-internal yers.

5. What is lexical and what is computational

5.1. Patterns misattributed to computation

The computational system of a language and the lexicon that contains the items that it manipulates are distinct ontologically, logically, in the mind as well as in the brain. This distinction is fundamental in linguistics and constitutes a central piece of the generative approach to language: it lies at the heart of the inverted T model where (in production) the morpho-syntactic concatenation (today Merge) of pieces (syntactic features) are retrieved from storage and precedes phonological (PF) as well as semantic (LF) interpretation (Chomsky 1965: 15ff). Lexical items are stored in long term memory, while computation is carried out in working (or short term) memory.11

The distinction at hand is also foundational in Cognitive Science and computational theory (Pylyshyn 1989: 55, Newell 1980: 156ff) where computational instructions and storage of to-be-computed items are distinct: a process transforms a pre-existing object following independently stored instructions.

It was mentioned that Gouskova & Becker (2016) propose a hard-wired implementation of this distinction: separate grammars control the well-formedness of lexical items (Gatekeeper Grammar, GK) and input-output computation (Grammar Proper, GP). On a number of occasions, they (as well as Gouskova 2012) confuse both areas, though, attributing to one what in fact belongs to the other. In the context of Slavic yers, the lexical-computational distinction means that the distribution of yers in lexical items and the workings of the computational mechanism that decides whether lexically present yers appear on the surface are two separate things.

Both Lower and the cluster-based alternative implemented by Yyearley (1995) and Gouskova (2012) describe the computational mechanism at hand. This mechanism is not responsible for and has nothing to say about the distribution of yers in the lexical shape of morphemes. It was mentioned that it is undisputed that this distribution cannot be predicted and hence is lexical accident. But of course the
 lexical distribution of yers must obey well-formedness requirements applying to lexical items. For instance, in case there is a synchronically active constraint against unattested -pk#, -tk# in Russian, there are a number of ways to make sure they cannot occur on the surface. There could be a computational repair deleting either consonant or epenthesizing a vowel in the midst or after the cluster (GP). Or the sequences could be repaired upon lexicalization (GK) by the same operations. In case the cluster is broken up by a vowel, this vowel could be stable or a yer. Russian appears to choose the latter option, i.e. turning /-pk#/,-tk#/ into /-p-ayer-k#/,-t-ayer-k#/. This has nothing to do with phonological computation (GP).  

Building on the case of unattested -pk#, -tk#, Gouskova (2012: 83) says that the fact that "yer alternations [...] are governed by discernible syllable structure constraints" is a well-established generalization. This is a piece of her argumentation in favour of the cluster-based approach to yer alternations where the vocalization of yers occurs in order to avoid certain clusters (rather than because of a following yer, as Lower has it). Her statement is incorrect and wrongly suggests that unattested -pk#, -tk# clusters play a role in yer vocalization: they do not. The lexical shape of morphemes, not the alternations, are governed by constraints on clusters. In Gouskova & Becker's (2016) approach, they will be active in the gatekeeper grammar GK (of both the yer and the non-ayer lexicon), not in grammar proper (GP) where input-output mapping is done. Hence unattested clusters that are broken up by yers cannot be used as an argument for either Lower or the cluster-based approach: they are entirely independent of and irrelevant to the computational mechanism that decides about yer vocalization.

Another instance where the labour of the Gatekeeper Grammar and Grammar Proper is confused is when Gouskova & Becker (2016) suggest that a generalization regarding the lexicon concerns phonological computation (deletion):

"The lexically specific, or unpredictable, nature of yer deletion in individual nouns has long been recognized. (Lightner 1965, [...]). Much of this literature debates mechanisms of encoding this lexically specific behavior, or the interactions between yer deletion and other rules. Nevertheless, more recent work recognizes that there are generalizations about yer deletion that make some predictions possible". Gouskova & Becker (2016: 392)

Again this is meant to be an argument in favour of the cluster-based approach, and against Lower. Gouskova & Becker suggest that the classical literature was not aware of some critical facts regarding the influence of clusters on yer deletion and therefore did not develop the right computational mechanism. This is not a valid argument, though, since the "generalizations about yer deletion" that Gouskova & Becker call on are in fact again generalizations about the lexicon. Gouskova & Becker (2016: 392) report that when yer deletion creates a CCC sequence in Russian, the middle consonant is almost always an obstruent (as in kost'ór - kostr-á "fire Nsg, Gsg"). Cases with a middle sonorant such as ágnec - ágnc-a "lamb Nsg, Gsg" (where the sonorant is trapped, like in the Polish case mentioned in note 12) exist but are very rare. Gouskova & Becker then show experimentally (through the judgement of nonce words) that this lexical proportion is part of the knowledge of speakers since they avoid TRT sequences created by yer deletion.

Their argument is well taken, but it does not tell us anything about the computational system or yer deletion. Once there is a yer in a TRyerT-V sequence,
computation will delete it just like in any other sequence, irrespectively of whether the resulting cluster TRT is rare, dispreferred or otherwise costly: it is not ill-formed. Maybe a feedback process of what speakers know about lexical statistics, i.e. lexicon optimization (e.g. Prince and Smolensky 2004 [1993]: 225ff, Inkelas 1995), will at some point eliminate all /TRyerT/ sequences, but this will then still be a process concerning the lexicon (and hence encoded in the gatekeeper grammar). Note that its completion does not necessarily mean that the computational system is also affected and becomes unable to produce TRT through yer deletion if such a lexical item were up for computation.

Along the same lines is what Gouskova & Becker (2016: 393f) call complex coda blocking (which was already discussed in section 1). In this case, the authors correctly ascribe the phenomenon observed to the lexicon (a source-oriented generalization in their terms), but they mistakenly suggest that the sequences at hand are ruled out by the Gatekeeper Grammar (“an offending structure in the base”, p.394): their own experimental evidence shows that they are dispreferred, but not impossible or ungrammatical.

Gouskova & Becker (2016: 393f) observe that there is not a single word in Russian where a vowel alternates with zero when it is followed by two consonants: in a VCC- sequence, V will never alternate with zero. Their experimental data then support this blocking effect of following clusters: speakers accept deleted vowels significantly more often when they precede root-final singleton consonants (nonce pišoch - pišch-a) than when they are followed by a root-final cluster (nonce pišochl - pišchl-a). What this behaviour of speakers judging nonce words shows, though, is precisely that yerCC- roots are possible in Russian, and that the computation of their yer is perfectly regular: speakers do not refuse the association of the Gsg pišchl-a to the Nsg pišochl, they merely operate this association less often than in case a single consonant separates the yer and the following vowel. In other words, they are able i) to lexicalize yerCC- items and ii) to have them undergo regular computation, which systematically produces the expected result.

We are thus facing a generalization about the distribution of yers in the lexicon (there are no morphemes of the shape yerCC-) which is mirrored in the behaviour of speakers – but this behaviour precisely shows that the non-occurrence of yerCC-items is an accidental gap. Speakers like yerCC- less well than yerC-, but they do happily lexicalize and compute items of this shape. Therefore in case they come across a neologism or acronym like Asótr which somebody inflects as Astr-á, speakers will happily lexicalize /asɔt/ and subject this item to regular phonological computation. This will then fill in a gap that linguists have detected (absence of yerCC-items in the lexicon), but which is accidental, rather than systematic.

5.2. Effects of preceding clusters on computation (yer vocalization)

Unlike in the cases discussed in the previous section that have nothing to do with input-output computation, there are instances where clusters really affect yer vocalization: this is when they precede yers. In order to show this, yer-initial suffixes need to be examined: they can be placed after single consonants, or after clusters. In Russian, Gouskova (2012: 89f) and Gouskova & Becker (2016: 392) use CC-final roots such as mudr- "wise" suffixed by the agentive -ec of which we independently
know that its vowel alternates with zero (see (8)a2). As shown under (8)a1, the yer fails to be deleted in /mudr-ec-a/ because of the preceding dr.

This is not a fact about the lexicon (we know that the vowel in question is a yer), but really about computation: although it should be absent, the yer fails to be deleted because there is a preceding cluster.\(^{14}\)

(8) failure of yer deletion after CC clusters

a. 1. mudr-éc  mudr-ec-á  wise person Nsg, Gsg  Russian
    2. bor-éć  bor-c-á  fighter Nsg, Gsg

b. Davíd-ek  David-k-ová  proper name masc., fem.  Czech
    Davídl-ek  Davidl-ek-ová  proper name masc., fem.
    Davídp-ek  Davidp-ek-ová  proper name masc., fem.
    Pát-ek  Pát-k-ová  proper name masc., fem.
    Pátr-ek  Pátr-ek-ová  proper name masc., fem.

c. běž-ec  běž-c-e  runner Nsg, Gsg  Czech
    tkadl-ec  tkadl-ec-e, tkad-c-e  weaver Nsg, Gsg
    Kadlec  Kadl-ec-e, Kad-c-e  proper name Nsg, Gsg

The same pattern occurs in Czech under (8)b,c where the vowel of the suffixes -ek (diminutive) and -ec (agentive) alternate with zero when the preceding root ends in a single consonant, but resists vowel deletion in case a consonant cluster occurs to its left (Scheer 2004: §127). Note that the avoidance of CCøC-V (where ø represents a deleted yer) under (8)c produces two patterns: either the yer refuses to alternate (tkadl-ec-e) or the root-final consonant is lost (tkad-c-e).\(^{15}\)

Finally, note that the presence of preceding (and following) clusters impacts the ability of vowels to alternate with zero in many languages, not just in Slavic. One case in point is French where schwas remain optionally unpronounced (la s’maine / la s’maine "the week"), but (in relevant varieties) must be realized in fortressesse "fortress" and autrement "otherwise" (see Dell 1976, Scheer 1999).

5.3. A non-question

Finally, let us address a question raised by Gouskova (2012: 86ff, 100ff): why is it that only the last vowel of morphemes can alternate with zero in Russian? Gouskova (2012: 86) says that this is "still a mystery". That is, why is V in CVC items and V\(_2\), but not V\(_1\) in CV\(_1\)CV\(_2\)C items able to alternate with zero? In response to this question, Gouskova develops a mechanism in order to derive what she calls an asymmetry and which she argues must be accounted for by the synchronic computational system of the language.

The question has a trivial answer that follows from general principles of how yers work, though. Devising an extra computational mechanism in order to address it is superfluous and again confuses static lexical properties with computation.

The only way to identify a vowel as a yer is to see that it alternates with zero. In order for a vowel to alternate with zero, its right context must be able to be manipulated: we can see that the vowel of the Russian word for dream alternates with zero because we are able to place it both in a context where the following consonant is word-final (result: són) and in a position where a vowel follows (result: sín-á). Were
there no V-initial suffixes that could be attached, the root would always be vocalized; and were there no way for /sъn/ to occur word-finally or before a consonant, the yer would always be unpronounced. In both cases, there would be no grounds for assuming that the vowel is a yer in the first place, neither for the linguist nor for the child in first language acquisition. In the former case the word would be lexicalized with a stable vowel (/son/: it never appears in any other shape), while in the latter case its underlying form would be set as /sn/ (the only form in which it occurs).

The yer in a hypothetical /CyерCVC/ root is an instance of the latter situation: we would never be able to see it on the surface since we are unable to remove the V – hence the root would always come out as CCVC. As a result, both the analyst and the child would conclude on a lexical entry /CCVC/.

The situation of a bisyllabic root where both vowels are yers /CyерCyерC/ is more interesting. There are two patterns in Slavic languages regarding the treatment of yer chains: either all yers in a row are vocalized (save the right-most), or every other is, counting from the right edge. The former pattern is the one described by Lower: Pol. /pъсъ-тъкъ/ is realized as pies-ek "dog dim. Nsg" (we know independently that both vowels alternate with zero: ps-a "dog Gsg", pies-k-a "dog dim. Gsg"). The latter pattern is the one that Antonín Havlík (1889) discovered in Old Czech and which governs many vowel-zero alternations outside of Slavic (e.g. Moroccan Arabic, German and French, see Scheer 2004: §468). It is also active in Old Polish, where /pъсъ-тъкъ/ appears as ps-ek "dog dim. Nsg", i.e. without the first yer (other forms are the same as in the modern language).

In a Lower language, a /C1 yerC2 yerC3/ root will appear on the surface as either C1VC2C3 (when the suffix is V-initial: /C1 yerC2 yerC3-V/) or C1VC2VC3 (elsewhere). That is, the left-most yer will always appear on the surface: there is no occurrence of the root where it is absent. Therefore both the analyst and the child will conclude that it is a stable vowel (rather than a yer): the item lexicalized will be /CVCyерC/. The only evidence that could be brought to bear in order to establish a yer identity of the first vowel is diachronic in kind. Gouskova (2012: 92) mentions two relevant cases, which do not represent bisyllabic roots but rather CyерC-ът-ъ (where -nt derives abstract nouns), though: rópot - rópot-a "murmur of discontent Nsg, Gsg" < CS ътъръ-тъ and totópot - totópot-a "tramp of feet Nsg, Gsg" < CS ътъръ-тъ. Whatever the root structure, the leftmost vowel, etymologically a yer, always appears on the surface as expected (Russian is a Lower language), and there are no grounds for either the analyst or the child to consider it a yer synchronically: the current lexical items are /ropot/ and /topot/.

By contrast in a Havlík language, the left-most yer of a /C1 yerC2 yerC3/ root could alternate with zero: the root by itself would appear as C1C2VC3, (like Old Polish /pъсъ-тъкъ/ → ps-ek). Followed by a V-initial suffix, however, it would produce C1VC2C3-V. Modern Slavic languages follow Lower, while Havlík governs earlier diachronic stages. Old Czech, a Havlík language, allows us to ascertain that the pattern the absence of which in Russian puzzles Gouskova (both V1 and V2 of a /CV1CV2C3/ root alternate with zero) does exist: CS ътъръ-тъ "insects" produces Old Czech hmez - hmez-a "Nsg, Gsg" and CS ътъръ-тъ "bucket" appears as čber - čebra "Nsg, Gsg".

Hence Gouskova’s observation that first vowels of bisyllabic morphemes never alternate with zero does not extend to all Slavic languages. In (Modern) Russian, a
Lower language, it is a non-question: the analyst and the child necessarily conclude that the first vowel of bisyllabic morphemes is a stable vowel, not a yer. This is a fact about the lexicon and has nothing to do with the computational system of the language. Devising a computational mechanism to exclude yers from the position of first vowels in bisyllabic morphemes is confusing lexical distribution and computation.

6. Conclusion

As indicated by the title, the main purpose of this reply was to clarify where exactly the red line runs between the computational mechanism that vocalizes yers and their lexical distribution in morphemes. On a number of occasions these are confused by Gouskova (2012) and Gouskova & Becker (2016), for example when Gouskova (2012) devises an extra computational mechanism to account for the lexical distribution of yers in polysyllabic roots that speakers get for free given what they know about their language (section 5.3). In the same way, when talking about unattested -pk#, -tk# in Russian it is incorrect to say that "yer alternations […] are governed by discernible syllable structure constraints" (Gouskova 2012: 83). This is also the case for the generalization that the middle consonant of yer deletion-created CCC sequences is almost always an obstruent, about which Gouskova & Becker (2016: 392) say that "more recent work recognizes that there are generalizations about yer deletion that make some predictions possible" (section 5.1).

These generalizations about the distribution of yers in lexical items are quite distinct from true effects that preceding clusters have on yer vocalization (section 5.2): what is at stake in these cases is the non-vocalization of a lexically established yer due to the consonantal environment. This behaviour needs to be built into the computational mechanism that governs yer vocalization (input-output), while the previous phenomena must not.

Another aspect regarding the lexical shape of morphemes is the distinction between systematic and accidental gaps. Given that yers do not occur before morpheme-final clusters in Russian, Gouskova & Becker's nonce-word based experiments show that speakers also prefer items that are distinct from yerCC- . They argue that *yerCC- is thus part of the knowledge of speakers, and this is certainly correct – but their evidence precisely shows that the absence of yerCC- items in Russian is an accidental gap: speakers like yerCC- less well than yerC-, but they do happily lexicalize and compute items of this shape. Hence we are talking about a tendency that is active upon the lexicalization of items, not about a systematic prohibition.

Finally, Gouskova & Becker (2016) have found a preference for yer deletion-created (C)TR clusters when speakers process nonce words. It was shown in section 2 that sonority patterns in clusters that result from yer deletion are irrelevant (or in fact dysfunctional) for Russian grammar (lexicon, input-output computation, acquisition). The sonority-sensitivity of Gouskova & Becker's experimental data may stem from a universal bias in favour of TR clusters (Berent 2013) that has nothing to do with Russian.

Given these results, what have we learned regarding the question whether yer vocalization is cluster-based (Gouskova 2012, Gouskova & Becker 2016) or cluster-
independent (Lower)? On a number of occasions Gouskova & Becker (2016) argue that Lower was established in times when relevant cluster-based generalizations were not discovered yet, and hence misses out on relevant empirical material that invalidates its central idea, i.e. that clusters are irrelevant for yer vocalization. As a matter of fact, though, this argument is ill-informed since Gouskova & Becker mistakenly believe that the phenomena it is based on are computational (input-output) in kind. Their belonging to the lexicon confirms the irrelevance of clusters for yer vocalization, and hence supports Lower (section 5.1). On the other hand, it was pointed out that cluster-based yer vocalization assumes that vowel-zero alternations are in fact five different processes with different causalities and hence misses the fact that the process follows a single and unified rationale. Lower on the other hand proposes a unified analysis based on just one single cause (section 4.1). Finally, it was shown that the major objection raised against Lower (final yers that never appear on the surface) disappears under the government-based implementation of Lower (section 4.4).

At this point and whatever the correct solution for yer vocalization, how does the preceding speak to the question whether, using Gouskova's terms, morphemes or segments (yers) are exceptional? Let us first look at the computational-lexical distinction. Once distributional patterns in the lexicon and input-output computation are properly distinguished, one could take either view on what yer vocalization makes reference to (at least in Russian where morphemes contain one yer at most): morphemes marked as yer-containing or segments marked as yers. Also, following Gouskova & Becker (2016), it seems reasonable that there is a mechanism enforcing (or inducing a preference for) certain shapes of morphemes upon lexicalization (SPE's Morpheme Structure Constraints, Gouskova & Becker's Gatekeeping Grammar).\(^\text{17}\)

There is a logical dependency between cluster-based vocalization and the morpheme-based view, though. As was shown in section 3.2, the cluster-based analysis of yer vocalization cannot tell CC# clusters that are from CC# clusters that are not broken up and therefore needs to assign those that do to a yer sublexicon and those that do not to a non-yer sublexicon. That is, the cluster-based analysis is only viable with morpheme-based yer-vocalization. Segment-based vocalization could not make reference to clusters: there would be no reason to vocalize */Cyerc#/ sequences if the non-vocalization produces a legal surface CC# cluster (like in */lasъk/ → lásk "weasel Gpl" in the presence of */lask/ → lásk "caress Gpl").

On the other hand, the morpheme-based identification of yers can work with cluster-based vocalization, but is also compatible with the classical implementation of Lower. This is because in this implementation two consecutive yers never belong to the same morpheme (at least in Russian where morphemes host one yer at most): recall from section 4.2 that yers which occur after word-final consonants are interpreted as case markers (-ъ in */sъnъ/ → són marks Nsg). Lower could therefore be stated as "vocalize a yer iff the following morpheme contains a yer" (instead of "…iff the following vowel is a yer"). The question is why this should be done: there is no import with respect to the regular formulation, and it seems odd for a phonological process to make reference to morphology when reference to phonology alone can do the job and avoid the setup of different sublexicons.

Things are different on the alternative implementation of Lower which was discussed in section 4.4, though. In contrast with the classical implementation, the yer
of són does not appear on the surface because it is followed by another yer that represents Nsg, but rather because it is followed by an empty nucleus (/sənø/ → són). Hence on this analysis yer vocalization cannot be described as occurring “iff the following morpheme contains a yer”: vocalization occurs iff the following nucleus is not associated to any melody, and the triggering empty nucleus in /sənø/ belongs to the same morpheme as the vocalized yer.

In sum, then, the situation is as follows. If it can be shown that cluster-based vocalization is incorrect, the necessity for morpheme-based yer identification disappears (the cluster-based option requires morpheme-based yer identification). This is precisely what is aimed at in section 4.1 which shows that the cluster-based analysis misses the basic insight into Slavic vowel-zero alternations and fails to provide a unified account for a unified phenomenon. We are thus left with a logical possibility for morpheme-based identification of yers when vocalization is driven by Lower in its classical implementation – an option that is unnecessary and costly without import, though. However, if yer vocalization is triggered by empty nuclei, morpheme-based yer identification is incompatible with Lower.

References


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In this article Russian words are rendered in transliteration that does not indicate vowel reduction (which is oblivious to the issues discussed). The secondary palatal articulation of consonants is marked by an apostrophe when palatality is not predictable from the following vowel (ʹs [sʼ]), including before spelt ç (= jo) as in ocëâ "donkey" (transcribed as osʼól). Stress is indicated by an acute accent on the vowel, and ş,ž,c represent [ʃ], [ʒ], [tʃ], respectively.

A reviewer points out that there is documented evidence from Korean showing that learners can override or ignore data in their native environment and develop coexisting morphophonemic variants (Ito 2010, Do et al. 2014). As far as I can see from the literature and my own experience, this is not the case in Slavic regarding yer vocalization. That is, nobody will say or accept Pol *swetr "jumper Nsg" or *filtr "filter Nsg" (only sweter and filtr occur and are judged well-formed). This notwithstanding, there is a locus of variation: the Gpl of …CC# roots that appear as …CC-V in Nsg. The more common lexical items of this class produce only one Gpl, either way: hence Pol ikr-ə - ikr "fish eggs Nsg, Gpl" vs. žebř-ō - žeber "rib Nsg, Gpl". But for a small group of words speakers accept both vocalized and unvocalized forms, or are unsure, or can be talked into either. Also, membership in this group may vary from speaker to speaker. Examples are sarn-ə - sarn / saren "roe deer Nsg, Gpl", biodr-ə - biodr / bioder "hip Nsg, Gpl". Most of these words are rare, or their Gpl is (as in the case of "hip"). Some of them are not, like torb-ə - torb / toreb "bag Nsg, Gpl" (a near-to complete list of the three classes is discussed in Scheer 2012a,b).

The same pattern occurs in Russian (Worth 1968): non-vocalizing igr-á - igr "game Nsg, Gpl" contrasts with vocalizing kákl-a - kákol "doll Nsg, Gpl", while igl-á - igl / igól "needle Nsg, Gpl" offers both forms. Czech has the same pattern, also related to the frequency of words or their Gpl forms: root-final
clusters usually vocalize in Gpl, but may not in rare words (harfa - harf / haref "harp Nsg, Gpl).
This situation points to competing lexical forms, which either already occur in the adult target (Pol. torba - torb / toreb), or arise because a speaker has not marked a particular lexical item as either belonging to the vocalizing (żebro) or non-vocalizing (ikra) class (mostly because s/he has never come across the Gpl). When facing the production of a Gpl of such an item, speakers may go either way. In absence of a consistent behaviour across other speakers, these items may remain unclassified and hence a (lexical) locus of variation.

But there is more: the presence of variation is conditioned (in surface terms) by the location in the word in which the cluster occurs. That is, variation is observed in CC#, but never in CC-CV, where all categories (vocalizing, non-vocalizing, ambiguous) are neutralized to obligatory vocalization. Hence the diminutive of Pol. ikr-a (non-vocalizing in Gpl) is iker-k-a, just as much as the diminutive of Pol. żebro-o (vocalizing in Gpl) is żeber-k-o, and the diminutive of Pol. biodr-o (ambiguous in Gpl) is bioder-k-o. The same goes for Russian: non-vocalizing igrá - ígr, vocalizing kúkl-a - kúkol and ambiguous igl-á - igl / igól all obligatorily vocalize in presence of a C-initial suffix: igór-k-a, kúkol-k-a, igól-k-a. Since all C-initial suffixes are in fact yer-initial (the Gpl of Pol. żeber-k-o and Ru igór-k-a are żeber-ek, igór-ok, respectively), the contrast appears to be "variation before word-final yers" (the Gpl morpheme is supposed to be a yer on the classical take, see section 4.2), but "obligatory vocalization before word-internal yers". In terms of the government-based analysis discussed in section 4.4, this distinction is in-built since final yers are in fact final empty nuclei (without any floating content), while internal yers are true yers (a nucleus with a floating segment). That is, variation occurs before final empty nuclei, but not before yers. The detail of the government-based analysis is exposed in Scheer (2012a,b).

3 Here and below I use the traditional symbols ъ and ъ to refer to yers in lexical representations in modern languages, as well as to regular Common Slavic vowels in Common Slavic words.
4 See Rubach (2013) for a critique of the analysis based on the lexical marking of yer morphemes, showing that this approach runs into insuperable problems when applied to Polish.
5 A reviewer points out that the split into a yer- and a non-yer lexicon may (or ought to) have consequences elsewhere in the phonology of Russian (regarding stress for example), since it is plausible that such an overarching lexical distinction will be exploited by computation.
6 For the sake of exposition I continue using yers in underlying forms even when discussing Gouskova (2012), who has no yers.
7 On Gouskova's analysis there are also syllabifiable medial triconsonantal clusters, which can be happily created by yer deletion. Examples are the aforementioned kost'ór - kosćr-a "fire Nsg, Gsg" or dólž-en - dólž-n-a "must pred. adj., masc., fem.
". It is not clear what the rationale is that tells syllabifiable from unsyllabifiable clusters: Gouskova does not discuss this issue.
8 Note that on the cluster-based perspective all instances of yer vocalization under
cannot be unified even if it were assumed that the yer in /sn/ vocalizes because
*sn would be a word-final cluster (rather than because there are no vowel-less
words, as Gouskova argues). Yer chains produce illegal clusters if both yers were
deleted, but the clusters at hand are not final in any sense. Hence Trisyllabic
Cluster Blocking is needed independently of a constraint against final clusters.
Also note that the basic generalization expressed by Lower may be altered by
cyclic effects produced by prefixes: the application of Lower to Russian
/pod'-žsg-'/ yields *podo'-žóg. Instead the item surfaces as (on) pod-žog "he set
on fire", indicating that the prefix is computed independently of the root. Prefixes
are known for their ability / tendency to have stand-alone phonology: this is
orthogonal to the scope of Lower and also challenges alternative yer-vocalizing
Gouskova (2012: 109) shows that as expected the diminutive suffix
-ok in Russian (whose vowel does not alternate with zero and hence is not a yer) triggers the
absence of a preceding yer when following a root that is made of at least two
syllables (os'-l - ósl-ik "donkey Nsg, dim. Nsg"). However, it fails to silence the
yer in monosyllabic roots (lób - lb'-á - lób-ik "forehead Nsg, Gsg, dim. Nsg"). The
size restriction related to this specific suffix (which the diminutive -ok for example
does not have) needs to be implemented by specific devices under all analyses and
can certainly not be used as a specific argument against Lower, which is the point
that Gouskova intends to make.
Another option that was entertained in the literature is that yers are underlyingly
empty nuclei (Spencer 1986, Szpyra 1992, Gussmann and Kaye 1993). This
analysis specifies the locus of vowel-zero alternations, but fails in languages like
Russian where more than one vowel alternates with zero (e and o): it cannot be
predicted which vowel appears in which morpheme (Ru děn' - dn'-á "day Nsg,
Gsg" vs., són - sn-á "dream Nsg, Gsg").
The invariable pattern of vowel-zero alternations across languages and the
government-based analysis thereof are described in Scheer (2004: §§15, 411, 426,
Of course the independence of the lexicon and computation does not preclude their
interaction, as in lexicon optimization (on which more below) or the impact of
token- and type frequency on the usage of lexical items (e.g. Bybee 2001).
Note that yers may also become stable vowels in diachronic evolution due to the
ill-formedness of the output cluster that would obtain if they were absent from the
surface. The word for garlic is *čes-ën-nk-ə in Common Slavic and does produce a
vowel-zero alternation that creates -snk- in Polish: czosnek - czosnk-u "garlic Nsg,
Gsg". By contrast, in Czech the etymological yer today is a stable vowel: česnek -
česnek-u "garlic Nsg, Gsg". This is obviously related to the fact that Polish happily
implements trapped n (i.e. n flanked by two obstruents), while in Czech nasals
cannot be syllabic or trapped. That is, -snk- is well-formed in the former, but ill-
formed in the latter language. See Scheer (2008, 2009) on the notion of trapped (as
opposed to syllabic) consonants. There are only two lexical items in Czech where a
high register pronunciation can produce syllabic nasals: seděn "seven" and osm
"eight". Outside of this high register, only sedum and osum occur.
In fact this generalization is not completely correct: there are two roots whose
vowel is followed by an s+C cluster and present in nominal incarnations, but absent in verbal and adjectival forms. They are discussed by Gouskova (2012: 90f), but left unmentioned in Gouskova & Becker (2016). That is, лёст' "flattery Nsg" alternates with l’ст-і' , l’ст-і’ , l’ст-ів-і' to flatter inf., imperative 2sg, fawning adj." and мест' "revenge Nsg" appears as mст-і’ "to revenge". Within nominal inflection the root vowel is stable, though: лёст-і, мёст-і "flattery Gsg, revenge Gsg" (note that the unvocalized imperative l’ст-і’ and the vocalized Gsg лёст-і ought to represent the same underlying form /lst-i/). The fact that within inflectional paradigms the vowels at hand are stable feeds the idea that verbal and nominal forms are not synchronically derived from a common underlier, i.e. have independently stored roots (or allomorphs).

A reviewer points out that etymological yers which occurred before a cluster in CS / Old Russian have systematically become stable vowels in Modern Russian: CS кръстъ > крёст - krest-á "cross Nsg, Gsg", CS doždъ > dožd’ - dožd’-á "rain Nsg, Gsg", CS žžklъ > žézl - žézl-á "mace Nsg, Gsg", čьrv-ъ > čérv’ - čérv’-á "worm Nsg, Gsg". This lends support to the view that Modern Russian vowels before a cluster are always stable, and hence that the alternations found in noun-verb pairs are based on two distinct lexical recordings (verbal/adjectival /lst/ , nominal /lest/ , which may either be different roots or different allomorphs).

In case they are not, a reviewer points out, the management of these words requires both lexical marking of the underlying form (as having a yer or belonging to the yer lexicon) and an input-output computation that blocks yer vocalization in nouns. Hence the behaviour of the two words at hand cannot be captured by a generalization on the source alone.

In sum, the Russian evidence is unlikely to be conclusive regarding the question whether the synchronic yer vocalizing mechanism can command vowel-zero alternations before clusters at all. Czech provides better evidence: lest - lst-i "ruse Nsg, Gsg", mzd-a - mezd "wage Nsg, Gpl" and mst-a - mest "revenge Nsg, Gpl" (a fourth case, čest - ct-i "honour Nsg, Gsg", is peculiar in that the vowel alternates but when the zero appears the s is lost and the č surfaces as a c, which is unheard of elsewhere in the language). Here the alternating forms occur within nominal inflection.

In all cases mentioned, the cluster at stake is st or zd. This is of course not accidental: s+C sequences display peculiar phonological properties in general – among other things they are known to behave as if they were a single consonant (Goad 2011). As far as I can see, no Slavic language (at any diachronic stage) has vowel-zero alternations before clusters other than s+C. Items such as the aforementioned CS čьrv-ъ "worm" have developed stable vowels in all modern languages.

An allomorphic analysis (/-ec/ after CC-final roots, /-bc/ otherwise) is possible, but not quite plausible: the regular phonological analysis has a good phonological rationale.

The judgements regarding feminine forms of CC-final roots under (8)b that I have collected are not 100% uniform: all speakers prefer instances with a stable vowel, but a few do not exclude the syncopated alternative. Note that the proper names in -CC-ék# are in fact nonce words: nobody is called like that (but somebody could
On the difference between the Lower and the Havlík pattern see Bethin (1998: 209ff), Scheer and Ziková (2010). On all accounts, the contrast lies in the cyclic (Lower) vs. non-cyclic (Havlík) application of the yer vocalizing mechanism.

In an OT environment, the compatibility of such a device with Richness of the Base begs the question, though.