ON THE DIFFERENCE BETWEEN THE LEXICON AND COMPUTATION (REGARDING SLAVIC YERS)

1. Introduction: phonology of segments or morphemes?

(1) in Polish, [ɛ] behaves in two different ways
   a. palatalizing e
      lot - lo[ɛ]-e
      [dʐɛ̞ni]- a
      Lsg    root
      "flight Nsg, Lsg"
   b. non-palatalizing e
      lot - lot-em
      sen - sn-u
      Isg    root
      "sleep Nsg, Gsg"
      prost-y - prost-e
      Npl non-masc. "straight Nsg, Npl"

(2) analytic option #1
   lexical distinctions are encoded in segments
   [ɛ] represents two distinct phonological items:
   a. /ɛ/ vs. /ɜ/
      1. Lsg = /ɛ/ lot - lo[ɛ]-e palatalizing because front
      2. Isg = /ɜ/ lot - lot-em non-palatalizing because non-front
   Rule-ordering: palatalization occurs before /ɛ/ is turned into [ɛ].
   Rubach (1984)
   b. /ɛ/-A vs. /ɜ/-A
      1. Lsg = /ɛ/-A lot - lo[ɛ]-e palatalizing because I is head (underscored)
      2. Isg = /ɜ/-A lot - lot-em non-palatalizing because I is not head
   Phonetic interpretation (i.e. conversion of the output of phonological computation into phonetic items): both /ɛ/-A and /ɜ/-A are pronounced [ɛ].
   Gussmann (2007: 56ff)

(3) analytic option #2
   lexical distinctions are encoded in morphemes: morpheme-specific phonology
   a. [ɛ] represents only one single phonological item, /ɛ/
   b. the lexicon is split into two sub-lexica
      1. palatalizing lexicon
         contains all morphemes that bear a palatalizing [ɛ]
      2. non-palatalizing lexicon
         contains all morphemes that bear a non-palatalizing [ɛ]

2. Vowel-zero alternations in Slavic and elsewhere
   [Scheer 2011]

2.1. Empirical generalizations

(5) property #1, shared by all Slavic languages
   whether a vowel alternates with zero or not cannot be predicted from its phonetic, contrastive or morphological properties.

<table>
<thead>
<tr>
<th>Alternating</th>
<th>Non-alternating</th>
</tr>
</thead>
<tbody>
<tr>
<td>CvC</td>
<td>CvC</td>
</tr>
<tr>
<td>CaC-V</td>
<td>CvC</td>
</tr>
<tr>
<td>non-alternating</td>
<td>CvC</td>
</tr>
<tr>
<td>gloss</td>
<td>Russian kusók kusók-a rabót rabóta piece Nsg, Gsg; work Gpl, Nsg</td>
</tr>
<tr>
<td></td>
<td>Polish pies psów-a pies bies-a dog Nsg, Gsg; devil Nsg, Gsg</td>
</tr>
<tr>
<td></td>
<td>Czech lev lev-a les lev-a lion Nsg, Gsg; forest Nsg, Gsg</td>
</tr>
<tr>
<td></td>
<td>BCS tajac tajac-a pająk pająk-a silence Nsg, Gsg; clown Nsg, Gsg</td>
</tr>
</tbody>
</table>

(6) consequence: alternating vowels must be lexically distinct
   a. analyses must be able to somehow distinguish "true" (i.e. stable) from "false" (i.e. alternating) vowels of the same quality.
   b. this is true for all morphemes: alternating vowels freely occur across prefixes, roots and suffixes.

(7) insertion or deletion?
   are alternating vowels undergoingly absent and inserted, or present and deleted?
   a. insertion-based analyses:
      epenthesis occurs in order to break up "difficult" or ill-formed consonant clusters.
c. because no context for insertion can be stated (alternating vowels are unpredictable...). identical clusters are broken up in some words but not in others

<table>
<thead>
<tr>
<th>cluster broken up</th>
<th>cluster is stable</th>
<th>gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVC#</td>
<td>CC-V</td>
<td>C# CC-V</td>
</tr>
<tr>
<td>Polish futer</td>
<td>futur-o</td>
<td>wiattr</td>
</tr>
<tr>
<td>Czech karet</td>
<td>karet-a</td>
<td>kvart</td>
</tr>
<tr>
<td>Russian lások</td>
<td>lások-a</td>
<td>lásk</td>
</tr>
<tr>
<td>Russian bobor</td>
<td>bobor-á</td>
<td>bôbr</td>
</tr>
</tbody>
</table>

more Polish examples: Rubach (2013: 1141)
1. st oszot | ost-u | thistle Nsg, Gsg |
2. rk korek | kork-a | cork Nsg, Gsg |
3. tr swezet | swezter | sweater Nsg, Gsg |

also in languages where more than one vowel alternates with zero (Eastern Slavic), speakers would not know which vowel to insert.

Russian e | d'én' | d'n-á | day Nsg, Gsg |
o | són | sn-á | dream Nsg, Gsg |

(8) Russian yer quality is not predictable from the consonantal environment (palatal vs. non-palatal)

C__ són | sn-á | vengérk-a | véngr | sleep Nsg, Gsg; Hungarian woman, Hungarian
C'C' fón | f'n-á | ĺe | véngr | sleep Nsg, Gsg; Hungarian woman, Hungarian
C__ fód | fód-á | chrebét | chrebét-á | ice Nsg, Gsg; spine Nsg, Gsg |
C'C' ogón | ogón-á | seméj | seméj-á | fire Nsg, Gsg; family Gpl, Nsg |

(9) property #2 distribution of vocalized and unvocalized alternation sites
a. first approximation:
V in closed, zero in open syllables

<table>
<thead>
<tr>
<th>open syllable</th>
<th>closed syllable</th>
<th>gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>C_C-V</td>
<td>C_C-Ø</td>
<td>C_C-CV</td>
</tr>
<tr>
<td>Russian vojón-á</td>
<td>vojen</td>
<td>vojen-nj</td>
</tr>
<tr>
<td>Czech loket-e</td>
<td>loket</td>
<td>loket-ní</td>
</tr>
<tr>
<td>Polish wojen-a</td>
<td>wojen</td>
<td>wojen-ny</td>
</tr>
</tbody>
</table>

b. BUT: vowels also occur in open syllables (grey-shaded column)

Empirical generalization

<table>
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<tr>
<th>open syllable</th>
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<th>gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>C_C-V</td>
<td>C_C-Ø</td>
<td>C_C-CV</td>
</tr>
<tr>
<td>Russian den-á</td>
<td>den-ěk</td>
<td>den-ěk</td>
</tr>
<tr>
<td>Czech dom-ěk-u</td>
<td>dom-ek</td>
<td>dom-ek</td>
</tr>
<tr>
<td>Slovak krid-él-o</td>
<td>krid-él</td>
<td>krid-él</td>
</tr>
<tr>
<td>Polish bul-øk-a</td>
<td>bul-ek</td>
<td>bul-ek</td>
</tr>
</tbody>
</table>

(10) Empirical generalization
Alternation sites are vocalized in open syllables iff the following vowel alternates with zero.

(11) the yer context

<table>
<thead>
<tr>
<th>in closed syllables</th>
<th>before yrs</th>
<th>after yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>C_C-V</td>
<td>C_C-Ø</td>
<td>C_C-CV</td>
</tr>
<tr>
<td>V / _</td>
<td>C_C-V</td>
<td>C_C-Ø</td>
</tr>
<tr>
<td>BCS</td>
<td>lakot-a</td>
<td>lakat</td>
</tr>
</tbody>
</table>

(12) challenge
disjunction
what do closed syllables and alternating vowels have in common?

2.2. Lower

(13) reducing the disjunction
a. is not possible by making reference to closed and open syllables
b. is possible by generalizing the other side of the disjunction: alternation sites are vocalized iff they are followed by an alternating vowel
c. == this is the insight of Lower
Lightner's (1965)
d. Lower

where the two input symbols are two distinct vowels, called yers, which never appear on the surface as such (they are absolutely neutralized)

(14) consequence: abstract vowels

a. all consonant-final words are assumed to end in a yer.
These final yers are interpreted as case markers.
b. all consonant-initial suffixes are assumed to begin with
a yer
c. distribution of abstract vowels:
1. after word-final consonants
2. in places where vowels alternate with zero
(15) cyclic application
   a. Lower must apply following the morphological structure, i.e. inside-out
      [[[[bul] b] k] j]
   b. /bul-Bk-ǐ/ → į
      1. computation of bul nothing happens
      2. computation of bul-Bk nothing happens
      3. computation of bul-Bk-ǐ Lower applies → bul-Ek-Bk
      4. computation of bul-Bk-ǐ Lower applies → bul-Ek-Ek-ǐ
      5. final yers are deleted
   d. non-cyclic version of Lower
      "the string is first scanned for the [alternating] segments; once these are identified, the change is implemented simultaneously" (Gussmann 1980: 30)

2.3. Autosegmental version of Lower

(16) underlying identity
   a. recall that alternating vowels must be lexically distinct from non-alternating vowels of the same quality.
   b. linear solution: two vowels added to the inventory
      ǔ
      properties: high vowels [-tense] in order to distinguish them from other high vowels
      [+banana] would have had the same motivation.
      Except the reminiscence to Common Slavic yers, which were high vowels.

(17) autosegmental solution
      a. the distinction is structural, rather than melodic
      b. alternating vowels are floating pieces of melody
         Czech "elbow"
         a. lokot-e Gsg b. loket Nsg c. loket-ní adjective
         ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ ≠ =

(18) autosegmentalised Lower
      an x-slot is associated to a floating vowel if that vowel is followed by another floating vowel.

      x
      V → V / C_o V

(19) advantages
   a. no need for extra vowels
   b. that are absolutely neutralized
   c. no need for invented properties such as [-tense]
   d. no need for a yer deletion rule: non-associated pieces of melody remain unpronounced
   e. no limitation of the number of alternating vowels
      Lightner’s yers could produce only two distinct vowels that alternate with zero.
      But there are languages with three or more alternating vowels, e.g. Slovak (Rubach 1993: 139ff).

2.4. Lower, empty nuclei and government

(20) Lower describes a lateral relation
   a. the only information which is needed in order to compute the phonetic value of alternation sites concerns the following vowel,
      1. which is either a yer (i.e. a floating piece of melody)  ==> vocalization
      2. or a non-yer (an associated piece of melody).  ==> non-vocalization
   b. basic insight of Lower:
      vowel-zero alternations are the result of a regressive (right-to-left) intervocalic relationship: the patient is the leftmost vowel, whose phonetic value is determined by its neighbor to the right.

(21) Lower describes a lateral and regressive relationship between vowels

      p l s i Czech pes ‘dog’ Nsg
      \  \ vocalization
      ε

(22) empty nuclei
   b. Spencer (1986) on Polish vowel-zero alternations
   c. Government Phonology
      Kaye et al. (1990), Kaye (1990)
      1. empty nuclei were not invented by GP, but they are a trademark of that theory because it gave them a theoretical status with stable cross-linguistic properties.
      2. distribution of empty nuclei:
         - after the last consonant of consonant-final words
         - in places where vowels alternate with zero
      3. e.g. French la semaine “the week” may be pronounced [la səmən] or [la səmən]

      m n e n French la semaine [la səmən]
d. Government
   schwa is deleted under the influence of government, a lateral force which originates in the following vowel and is always regressive (right-to-left).
   e. the distribution of empty nuclei in GP is exactly the one of abstract vowels (yers), cf. (14)c.
   f. multigenesis
   GP didn't know about Slavic, and Lighter, Rubach etc. wrote before GP was born.

(23) alternating vowels are empty nuclei: Gussmann & Kaye (1993)
   Czech "elbow"
a. lōk-t-e Gsg    b. lōket Ng    c. lōket-ní adjective
          N       N       N       N       N
   O  N  N  O  N  O  N  O
   lōk  t  e  lōk  t  lōk  t  ní
(24) Gussmann & Kaye (1993):
   insertion and deletion at the same time
   a. deletion
      empty nuclei are present lexically, but may be silenced (by government)
   b. insertion
      empty nuclei acquire melody through enepenthesis (in case they escape government)
   c. insertion of melody is impossible in languages where two distinct vowels alternate with zero (East Slavic): one would not know which vowel to insert.

(25) nuclei cum melody
   a. lexical identity of alternating vowels
      both nuclei and melody are present, but they are not associated.
      stable vowel alternating vowel different alternating vowels
      | N          | N       | O  N  N  O  N  O  N  O  N  O
      e  e       d  e  n    s  o  n
   b. government acts as an association-inhibitor: floating melodies associate by default except when their nucleus is governed.
      x  x  O  N  N  O  N  O  N  O
      |  |  |  |  |  |  |  |  |  |
      p  e  s  e  p  s  e  s

2.5. Yers and Lower are not specifically Slavic
(26) classical view
   a. yers are Common Slavic vowels and hence exist only exist in Slavic.
   b. therefore vowel-zero alternations in Slavic have nothing to do with vowel-zero alternations in other languages.
   c. in linear approaches, alternating vowels were represented as idiosyncratic melodic items in the underlying vocalic inventory - a specific fact about Slavic.
(27) analysis has made yers unspectacular and common
   a. only Slavic languages have [-tense] yers, but all languages can have floating pieces of melody.
   b. Government-based analyses have gone one step further: the lateral relation embodied by Lower identifies as government, and word-final consonants are followed by an empty nucleus, rather than by a yer with morphological value.
   c. vowels that alternate with zero in modern Slavic languages are perfectly independent from the Common Slavic vowels that are known as yers (see section 1).
   d. the phenomena at hand are not specifically Slavic, but phonological in nature.

(28) the yer context
   "in closed syllables and before a vowel that alternates with zero"
   a. controls phenomena in Slavic beyond vowel-zero alternations.
   b. controls alternations beyond Slavic.
(29) Western Slavic
   Scheer (2004: §428)

<table>
<thead>
<tr>
<th>open syllable</th>
<th>closed syllable</th>
</tr>
</thead>
<tbody>
<tr>
<td>C_C-CV</td>
<td>C_C-CV</td>
</tr>
<tr>
<td>C_C-yer</td>
<td>C_C#</td>
</tr>
</tbody>
</table>

 a. Czech VV-V
   zab-a  zab-ek  zab
   jmén-o  jmén-ý

 b. Czech o-ü
   nož-e  nož-ek  nůž
   nůž-šk-y

 c. Polish o-ó
   kroń-a  kroń-ek  kroń
   kroń-ok-a

 d. Polish e-a
   żab-a  żab-ek  żab
   żab-šk-a

(30) French
   ATR alternations of mid vowels
   Scheer (2004: §437)

<table>
<thead>
<tr>
<th>closed syllable</th>
<th>open syllable</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>C#</em> _C_CV</td>
<td>_C_C_Cv</td>
</tr>
</tbody>
</table>

 a. e  fét  aletje  sabari  feé
e  metjik  métrie

 b. metjik  metjik

 c. sereine, sereinément

 d. sereine, sereinément

 e. kód  roczké  pode  kód
 roczké  kód

 f. code, porter, moquerie, coder

 g. sobre, sobrenement

 h. heur, heu, heureusement, aperité

 i. œuvre, surfer, buvérie, œuvr

 j. jeune, veulerie, jeunesse
3. Lower vs. cluster-based analyses

3.1. Revival of the cluster-based analysis

(33) insertion or deletion?

a. recall from (7)

insertion-based analyses are refuted.

b. reason #1:

the environment of insertion is not predictable
identical clusters are broken up in some words but not in others

```
<table>
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</thead>
<tbody>
<tr>
<td>CvC#</td>
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</tr>
<tr>
<td>CC-V</td>
<td></td>
</tr>
<tr>
<td>gloss</td>
<td></td>
</tr>
</tbody>
</table>
```

Polish futer fut-r wiatr wiatr-u
Czech karet kar-t kvart kvart-a ucard Gpl, Nsg; quart Gpl, Nsg
ocet oct-y poct poct-y vinegar Nsg, Npl; honour Gpl, Npl
Russian lások lás-k lásk lás-k-a weasel Gpl, Nsg; caress Gpl, Nsg
bóbr bóbr-á böbr böbr-á beaver fur Nsg, Gsg; beaver Nsg, Gsg

(34) reviving cluster-based analyses


a. no insertion

yers are recorded in lexical representations

b. vocalization

is not governed by Lower but (like in the old insertion-based analyses) by the avoidance of certain clusters.

(35) hence

a. lexicon

yers are recorded in the lexicon

c. computation

their vocalization (i.e. their promotion to surface existence) is disputed:

1. Lower
2. cluster avoidance

(36) cluster avoidance

yers are vocalized
(examples from Russian)

a. when they are the only vowel in the word

/sàn/ ː són “dream Nsg”, instead of “sn”

⇒ there are no words without vowels in the language

---

(31) French

schwa - [e] alternation

Scheer (2004: §439)

closed syllable

<table>
<thead>
<tr>
<th>eC</th>
<th>eC</th>
<th>eCV</th>
<th>spelling</th>
</tr>
</thead>
<tbody>
<tr>
<td>moxyel</td>
<td>moxyel</td>
<td>moxyel</td>
<td>je morcelle, morcelons, morceler</td>
</tr>
<tr>
<td>aple</td>
<td>aple</td>
<td>aple</td>
<td>j'appele, appeller, appellation</td>
</tr>
<tr>
<td>ayskel</td>
<td>ayskel</td>
<td>ayskel</td>
<td>j'ensorcele, ensorcellement, ensorceler</td>
</tr>
<tr>
<td>ajv</td>
<td>ajv</td>
<td>ajve</td>
<td>j'achève, achèvement, achever</td>
</tr>
<tr>
<td>seo</td>
<td>seo</td>
<td>seo</td>
<td>je sèvre, sèvera, sevrer, sevrage</td>
</tr>
</tbody>
</table>

(32) German

distribution of [ŋ] and [ŋ] in monomorphemic environments

Scheer (2004: §482)

See also Dutch (Kager & Zonneveld 1986)

a. occurrence of [ŋ]

<table>
<thead>
<tr>
<th>#</th>
<th>C</th>
<th>spelling</th>
<th></th>
<th>C</th>
<th>spelling</th>
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<tr>
<td>laŋ</td>
<td>lang</td>
<td>?aŋst</td>
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<td>?ŋsta</td>
<td>Inge</td>
</tr>
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<td>draŋ</td>
<td>Drang</td>
<td>pinŋŋ</td>
<td>Pingpong</td>
<td>?aŋpl</td>
<td>Angel</td>
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<td>Hengst</td>
<td>fŋr</td>
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<td>Hunger</td>
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</table>
| b. occurrence of [ŋ]

<table>
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<th>spelling</th>
</tr>
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<tbody>
<tr>
<td>?ŋŋg</td>
<td>Ingo</td>
</tr>
<tr>
<td>tangg</td>
<td>Tango</td>
</tr>
<tr>
<td>?aŋtna</td>
<td>Angina</td>
</tr>
<tr>
<td>zŋgulaa</td>
<td>Singular</td>
</tr>
<tr>
<td>?aŋn</td>
<td>Ungarn</td>
</tr>
<tr>
<td>?efatŋeitt</td>
<td>evangelisch</td>
</tr>
<tr>
<td>?angeelika</td>
<td>Angelika</td>
</tr>
</tbody>
</table>
b. when occurring in word-final clusters which are
   1. either attested in the language
      /ləsk/ → ləsok “weasel Nsg”
      -sk# exists: /fləsk/ → ləsok “caress Nsg”
   2. or not attested in the language
      (Gouskova 2012: 83 calls these “unpronounceable”)
      /chłopak/ → chłopok “cotton Nsg”, compare with chłópk-a “id., Gsg.”
      /korotk/ → korotok “short, mass.” compare with korotok-a “id., fem.”
   the absence of yers from the surface would create unattested -pk# and -tk#
c. why do the two word edges produce opposite behaviour of yers in Russian?
   1. Yers systematically surface to break up word-final clusters
      /ləsk/ → ləsok “weasel Nsg”
   2. on the contrary they are never realized when word-initial clusters could be avoided
      /łust-it’/ → łst-it’ “to flatter” compare with łést’”flattery”
   3. 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.
   == this merely restates the facts
(37) the cluster-based option only works with multiple sub-lexica
a. strange
   Yearley (1995) does not explain how the yer vocalization mechanism distinguishes between identical clusters that are broken up in some words but not in others.
   b. only Gouskova (2012) makes the cluster-based analysis technically workable by devising morpheme-specific constraints 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.
   c. thus
      /ləsk# “weasel” yer lexicon
      /ləsk#n “caress” non-ayer lexicon
d. computation
   1. the mini-phonology (constraint set) that applies only to the yer lexicon
      rule out word-final -sk# clusters, to the effect that the yer in /ləsk/ “weasel Nsg” must appear on the surface: ləsok.
   2. final -sk# clusters in the non-yer lexicon are not impacted since the constraints against them do not control this set of morphemes.
(38) this what comes down to
In Russian (and elsewhere in Slavic) [r] and [ɾ] sometimes alternate with zero but at other times do not. This difference is recorded in the lexicon
a. as two different vowels
   /ɛl/ vs. /ɛl/ (yer)
   (autosegmental: lexically associated vs. floating)
   == computation required: Lower
b. as belonging to two distinct sub-lexica that morphemes are marked for by a diacritic
   /kusɔk#pl/ → kusok yer lexicon
   /kusɔk#pl/ → kusak non-ayer lexicon
   /rabɔt#n vs. /rabɔt# pl/ → rabət non-ayer lexicon
   == computation required: vocalization because of cluster avoidance
   c. hence
      for a vowel, the fact of alternating with zero or not is
      1. a lexical property of the vowel
      2. a lexical property of the morpheme
3.2. The basic generalization regarding Slavic yers is missed
(39) vowel-zero alternations
   a single phenomenon or a series of unrelated processes?
(40) Lower
   a. basic insight:
      yers vocalize iff they are followed by another yer in the underlying representation
   b. clusters play no role and there is no need for sublexicons or morpheme-specific mini-phonologies
(41) Lower
   a unified analysis
   a. all yer vocalizations are governed by the same mechanism
   b. there is no such thing as an opposite behaviour of yers at the two word edges.
   Yers after word-initial consonants are followed by a stable vowel and thus remain unvocalized (/łust-it’/ → łst-it’ “to flatter”), while yers before word-final consonants are followed by another yer and therefore appear on the surface (/ləsk# “weasel Nsg”).
(42) the amorphous list of contexts that is held responsible for yer vocalization under the cluster-based analysis is accounted for by Lower with a simple mechanism.

<table>
<thead>
<tr>
<th>yers</th>
<th>reason for yer (non-)vocalization</th>
</tr>
</thead>
<tbody>
<tr>
<td>vocalized</td>
<td>non-vocalized</td>
</tr>
<tr>
<td>cluster-based</td>
<td>Lower</td>
</tr>
<tr>
<td>a. /sən-’/ → són</td>
<td>/sən-al- → sən’</td>
</tr>
<tr>
<td>b. /ləsk# → ləsok</td>
<td>/ləsk#→ləsok-</td>
</tr>
<tr>
<td>c. /chłopak-a → chłopak-a</td>
<td>/chłopak-al-</td>
</tr>
<tr>
<td>d. /łst-it’ → łst’</td>
<td>/łst-it’t-</td>
</tr>
<tr>
<td>word</td>
<td></td>
</tr>
</tbody>
</table>
(43) what is wrong with Lower?
   a. impossible in OT
      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.
   b. the existence of word-final yers that never appear on the surface.
      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) against Lower.
3.3. Yers that never appear on the surface

(44) recall (14) above
abstract vowels
a. all consonant-final words are assumed to end in a yer. /plś-∀ → pes
These final yers are interpreted as case markers.
b. all consonant-initial suffixes are assumed to begin with /lokıt-ınl/ → loket-ńi
a yer
c. distribution of yers:
1. after word-final consonants never appear on the surface
2. in places where vowels alternate with zero do appear on the surface

(45) government-based analysis
a. the two type of yers are distinct phonological objects:
1. vowels that alternate with zero: floating piece of melody
2. after word-final consonants: empty nucleus without floating piece of melody

| O N O N |
|        |
| s o n  |
| son "sleep"

b. word-final empty nuclei (FEN) come for free
since in Government Phonology word-final consonants are onsets of empty nuclei in all languages.
c. FEN
Kaye (1990), Guussmann & 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).
d. hence
there is no such thing as "abstract vowels" that never appear on the surface.
There are floating vowels and FEN - both predicted by the basic workings of autosegmental representations.

4. Confusion between lexical distribution and computation

4.1. Subregularities concern the lexicon, not the computational system

(46) the lexicon and the computational system of a language are distinct
a. Slavic yers
1. distribution of yers in lexical items
2. computational mechanism that decides whether lexically present yers appear on the surface. This is input-output computation in OT vocabulary.
b. hence
the computational mechanism (Lower or cluster-based) is incompetent for and has nothing to say about the distribution of yers in the lexical shape of morphemes.
c. recall that
it is undisputed that this distribution cannot be predicted and hence is lexical accident.

(47) limited subregularities
a. the presence of a yer in a particular location of lexical items is enforced since its absence would produce illegal clusters.
b. In case there is a synchronically active constraint against unattested -pk#, -tk# in Russian for instance, these clusters are lexically broken up by yers (note that the same effect could be achieved by the epenthesis of a stable non-alternating vowel, though).
c. This has nothing to do with phonological computation.
Saying that "yer alternations [...] are governed by discernible syllable structure constraints" (Gouskova 2012: 83) is thus incorrect and misleading: the lexical shape of morphemes, not the alternations, are governed by these constraints.
d. In Gouskova & Becker's (2016) approach, they will be active in the gatekeeper grammar GK (of both the yer and the non-yr lexicon), not in grammar proper (GP) where input-output mapping is done.
e. GK vs. GP
1. GK - Gatekeeping Grammar
constraint set that defines what a well-formed lexical item is. It prevents ill-formed items from entering the lexicon.
2. GP - Grammar Proper
constraint set that defines what a well-formed surface form is. Takes lexical items as an input and returns the surface form. 

(48) what is to be done if an ill-formed lexical item knocks on the door?

a. -pk# and -tk# in Russian
(if there is anything wrong with these at all: their absence does not mean that there is an active constraint against them: they could be accidental gaps stemming from a formerly active ban against them that is not in power anymore. To test, speakers could be asked to rate / manipulate nonce words in -pk# and -tk#)
b. epenthesis of a yer -pk# → /pk#/ labour done by the Gatekeeping Grammar
c. epenthesis of a stable vowel -pk# → /pk#/ labour done by the Gatekeeping Grammar
d. epenthesis of a final vowel -pk# → /pk#/ labour done by the Gatekeeping Grammar
e. deletion of a consonant -pk# → /pk/ labour done by the Gatekeeping Grammar
f. Gouskova & Becker only consider epenthesis of a yer

(49) documented case: yer > stable vowel because of cluster ill-formedness
a. CS čes-tn-tk-á "garlic"
b. Polish -snk- created czosnek - czosnk-u "garlic Nsg, Gsg".
c. Czech: the etymological yer today is a stable vowel česnek - česnk-u "garlic Nsg, Gsg".
d. 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.
4.2. Yer deletion-created CCC: the middle C is an obstruent

(50) cluster-based generalization #1
by Gouskova & Becker (2016)

a. when yer deletion creates a CCC sequence in Russian, the middle consonant is almost always an obstruent.
b. kost'or - kostr-ä "fire Nsg, Gsg"
c. cases with a middle sonorant exist but are very rare
   āgnec - āgnca- "lamb Nsg, Gsg"
d. Gouskova & Becker 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.
e. this is a generalization about the lexicon (G&B’s Gatekeeper), not about the computational system.
f. the yer vocalization computation is entirely unimpressed by this kind of lexical tendency:
   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.
g. but Gouskova & Becker (2016: 392) suggest that their generalization regarding the lexicon concerns phonological computation (deletion):
   "more recent work recognizes that there are generalizations about yer deletion that make some predictions possible". This is misleading.
h. in their mind, this is an argument against Lower, where clusters play no role: G&B try to make the point that if clusters play a role in yer vocalization, Lower cannot be correct.
   The fact is that they do not play any role, hence supporting Lower.

4.2. *yerCC

(51) cluster-based generalization #2
complex coda blocking (G&B’s term)
a. 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.
b. G&B's experimental data then support this blocking effect of following clusters:
   in nonce words, speakers accept deleted vowels significantly more often when they precede root-final singleton consonants than when they are followed by a root-final cluster.
   pišoch what do you like better: pišch-a or pišoch-a ?
   pišochl what do you like better: pišchl-a or pišochl-a ?
c. in order to make these judgements, Gouskova & Becker (2016) argue, speakers necessarily call on their grammatical knowledge.
d. but again, this is about the occurrence of yers in the lexicon. It does not tell us anything about the computational system. The grammatical knowledge of speakers tested is about the Gatekeeper.
   pišochl what do you like better: pišchl-a or pišochl-a ?

5. Generalizations about the sonority profile of yer deletion-created clusters are irrelevant for actual human learners

(52) preference for yer deletion-created (C)TR
a. based on a nonce word test, G&B find 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)
b. hence
   sóm yielding sm-á preferred
   mós yielding ms-á dispreferred
c. this generalization is not mirrored in the real lexicon of Russian
   (Gouskova & Becker 2016: 394)
d. this time we are not talking about the lexical distribution of yers, but about a surface pattern that is produced by input-output computation (Grammar Proper GP)
d. hence G&B appeal to the two sub-lexica:
   yer lexicon (GP): TR preferred
   non-yer lexicon (GP): no preference

(53) when faced with a new word, learners need to guess
a. …CoC#
   …CeC#
   => to lexicalize e,o either as stable vowels or as yers
b. ...CC-V
   => to lexicalize the root as either
   ...CyerC or
   ...CC

c. these decisions need to be made
   1. by children in (first) language acquisition, and
   2. by adults when confronted with loans, acronyms etc.

(54) Children and adults may get it wrong:
Luńskasewicz (2006: 15f) reports the following child data from Polish (where the work-
ings of yers are the same as in Russian).

Polish acquisition (A., 3;11)

<table>
<thead>
<tr>
<th>TR#: yer insertion</th>
<th>adult target</th>
<th>child production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nsg</td>
<td>Gsg</td>
<td>Nsg</td>
</tr>
<tr>
<td>wiatr</td>
<td>wiatr-u</td>
<td>wiater</td>
</tr>
<tr>
<td>motocykl</td>
<td>motocykl-a</td>
<td>motocykel</td>
</tr>
<tr>
<td>bobr</td>
<td>bobr-a</td>
<td>bober</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TR#: deletion of the final consonant</th>
<th>adult target</th>
<th>child production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nsg</td>
<td>Gsg</td>
<td>Nsg</td>
</tr>
<tr>
<td>pomyśl</td>
<td>pomyśl-u</td>
<td>pomyś</td>
</tr>
<tr>
<td>zgad (masc.)</td>
<td>zgadl-a (fem)</td>
<td>zgad</td>
</tr>
<tr>
<td>Piotr</td>
<td>Piotr-a</td>
<td>Piot</td>
</tr>
</tbody>
</table>

(55) analysis

a. the child obviously cannot produce TR#: they are never produced
b. the child knows
   that final (TR-) clusters may
   sweter - swet-a  "jumper Nsg, Gsg" or may not
   filtr - filtr-a  "filter Nsg, Gsg"
   host a yer: there is nothing in the available data that a decision could be based on.

c. Luńskasewicz reports that the choice of the two strategies is unpredictable: what ends up being lexicalized is a matter of chance.

(56) disambiguation due to positive evidence

a. sooner or later, however, the child (or the adult) will be exposed to relevant evidence
   that disambiguates the situation.

b. hearing Russian
   bobr-á  "beaver fur Gsg"
   dolg-á  "long fem."
   children have no way to know whether or not there is a yer hidden in the root-final
   cluster.

c. they may make a guess based on the knowledge that Gouskova & Becker have shown natives possess:

1. 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
   Nsg bobór

2. by contrast, the root-final RT cluster in dolg-á rather drives the child into choosing
   an underlying form without yer, hence
   masc. dolg

d. the child will have been right in the former, but wrong in the latter case:
   the masc. form of dolg-á is dológ.
e. 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 /dológ-á/.
   The same goes for the adult.

(57) all this is irrelevant

a. 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:

b. learners will always have to make guesses, and a preference for TR clusters does not
   help them in any way nor does it alter the learning path.

c. there will be bad guesses, and they will be corrected by modifying the lexical repre-
sentation as soon as relevant evidence is available.

d. note that it is not the case that the preference for yer deletion-created TR clusters
   helps the learner to be less often wrong.

e. rather the reverse is true: a bias for deletion in such clusters will induce children (and
   adults) more often into error than if they went by chance.

f. 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.

(58) the bias in favour of yer deletion-created TR clusters

a. is alien to the workings of Russian:
   1. it plays no role in the computational system and
   2. is irrelevant in the acquisition of new words (by human learners, both children
      and adults).

b. if anything, it is functionally counter-productive in the latter area.

(59) so what is the origin and locus of the sonority-based bias in Russian speakers?

a. maybe a remnant of a universal property of phonology.

b. Berent (2013: 165ff) argues that sonority sequencing is a grammatical universal since
   it cannot be derived from extra-grammatical factors (such as phonetics).

c. evidence:
   sonority sequencing is ubiquitous in productive phonological processes, it is support-
   ed by typological data and constrains the behaviour of speakers in psycho-linguistic
   experiments.

d. Berent also shows that sonority sequencing extends not only to lexical items that
   speakers have never come across, but also to structures that are unattested in the
   speaker's language such as branching onset preferences produced by Korean speakers
   whose language lacks branching onsets (Berent et al. 2008).
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 and learning), but still part of the universal knowledge of Russian speakers.

References

Anderson, Stephen 1982. The analysis of French shwa: or, how to get something for nothing. Language 58: 534-573. WEB.
Gouskova, Maria & Michael Becker 2013. Nonce words show that Russian yer alternations are governed by the grammar. Natural Language and Linguistic Theory 31: 735-765.