

Evidence for Stratal Phonology

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23rd October 2018

0.1 *Outline*

- Stem-level cyclicity in Stratal Phonology
- Stem-level cyclicity and parts of speech: Welsh svarabhakti
- Stem-level cyclicity and phonemic structure: Irish vowel separation
- Converging evidence for stem-level cyclicity: Russian [e] ~ [ʲo] revisited

1 *Stratal Phonology and the stem level*

1.1 *Basic assumptions of Stratal Phonology*

- As defined by Bermúdez-Otero,¹ Stratal Phonology
 - respects cyclicity
 - respects stratification
 - builds on parallelist constraint-based theories²

¹ Ricardo Bermúdez-Otero. 2018. Stratal phonology. In S. J. Hannahs & Anna R. K. Bosch (eds.), *The Routledge handbook of phonological theory*. London, New York: Routledge.

² Optimality Theory or Harmonic Grammar are in; OT-CC or Harmonic Serialism are out

1.2 *Roots, stems, and words*

- Roots are lexical items with no part-of-speech characterization
 - Roots are not cyclic domains
- Stems are lexical items with POS characterization, but not inflectable words
 - Some stems define cyclic domains for stem-level phonological computation
 - Stem-level domains can be recursive
- Words are autonomous lexical items with the full set of inflections
 - Words are cyclic domains for word-level phonological computation
 - Word-level domains are not recursive
- Utterances are cyclic domains for phrase-level phonological computation
 - Phrase-level domains are not recursive

1.3 *The lexical syndrome*

- In Lexical Phonology and Morphology, ‘lexical’ rules had a number of properties³
 - Cyclic reapplication
 - Non-derived environment blocking
 - Categorical application
 - Exceptionality

³ Ellen M. Kaisse & April McMahon. 2011. Lexical Phonology and the lexical syndrome. In Marc van Oostendorp et al. (eds.), *The Blackwell companion to phonology*. Oxford: Blackwell Publishing.

– Structure Preservation

- Although the strong version of these principles is empirically problematic,⁴ the overall insights are often sound

⁴ Ricardo Bermúdez-Otero. 2013b. The stem-level syndrome. Presentation at the University of Pennsylvania Linguistics Department Speaker Series. <http://www.bermudez-otero.com/stemlevel.pdf> (16 October, 2018).

1.4 *Good evidence for stratification*

- Some languages provide good evidence for stem-level constituency
- Lexicon stratification: English,⁵ Hebrew⁶
- Spanish: morphological constituency⁷

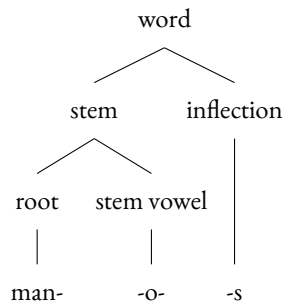
⁵ Heinz J. Giegerich. 1999. *Lexical strata in English: Morphological causes, phonological effects* (Cambridge Studies in Linguistics 89). Cambridge: Cambridge University Press.

⁶ Irit Meir. 2006. Morphological levels and diachronic change in Modern Hebrew plural formation. *Studies in Language* 30(4). 777–806.

⁷ Ricardo Bermúdez-Otero. 2013a. The Spanish lexicon stores stems with stem vowels, not roots with inflectional class features. *Probus* 25(1). 3–103.

⁸ Warning: not the actual analysis

(1) Spanish *manos* ‘hands’⁸



1.5 *Worse evidence for stratification*

- Not all languages offer such apparently clear evidence for the distinction between stem and word level
- How do we distinguish between
 - Evidence for process ordering;⁹ and
 - Evidence for stratification?
- Stratification is a middle ground between
 - Non-morphological process ordering¹⁰
 - Morpheme-specific domain structure¹¹

⁹ Or, perhaps more accurately *phonological non-homogeneity*?

¹⁰ As in rule-based phonology with extrinsic ordering, OT-CC with PREC constraints, or Harmonic Serialism

¹¹ As in Cophonology Theory

2 *Stems and parts of speech: Welsh svarabhakti*

2.1 *Welsh svarabhakti*

- Apparently well-behaved repair of sonority sequencing violations¹²

¹² S. J. Hannahs. 2009. Welsh svarabhakti: Sonority sequencing and foot structure. *Journal of Celtic Linguistics* 13. 21–44.

(2) Epenthesis in monosyllables

- a. [ˈoːχɔɾ] *ochr* ‘side’
- b. [ˈɔːχɾɛ] *ochrau* ‘sides’

(3) Deletion in polysyllables

- a. [pɛ:ɾɪɡ] *perygl* ‘danger’
 b. [pɛ'ɾɛɡlon] *peryglon* ‘dangers’

2.2 *Welsh svarabhakti and the stem level*

- It turns out that svarabhakti-related phenomena suffer from the stem-level syndrome¹³
- Part-of-speech specificity: √llwfr ‘cowardly’ in Nantgarw¹⁴

¹³ Pavel Iosad. 2017. Welsh svarabhakti as stem allomorphy. *Transactions of the Philological Society* 115, 141–175.

¹⁴ Ceinwen H. Thomas. 1993. *Tafodiaith Nantgarw: Astudiaeth o Gymraeg llafar Nantgarw yng Nghwm Taf, Morgannwg*. Caerdydd: Gwasg Prifysgol Cymru.

(4) Nouns: transparency

- a. [ʔɔvrɪn] *llyfryn* ‘coward’
 b. [ʔɔvrɔd] *llyfriaid* ‘cowards’

(5) Adjectives and deadjectival derivations: overapplication

- a. [ʔu:vɔr] *llwfr* ‘cowardly’
 b. [ʔu'vɔrdra] *llyfdrdra* ‘cowardice’
 c. [ʔu'vɔ'raɪ] *llyfrháu* ‘to become cowardly’

- Exceptionality

- (6) a. [ˈba:rav] *barf* ‘beard’
 b. [ˈfirv] *ffurf* ‘form’
 c. [ˈso:vɔl] *softl* ‘stubble’
 d. [ˈgwɛvl] *gwefl* ‘lip’

- Cyclicity: less in Modern Welsh, but rife in Middle Welsh
 - *am(y)l* ‘plentiful’, but <amylach> ‘more plentiful’
 - *kened(y)l* ‘nation’, but <kenedyloed> ‘nations’

2.3 *Where is the stem?*

- Phonologically, svarabhakti ‘looks like’ a stem-level pattern
- But: morphological evidence for stems is much weaker
 - No obvious stratification

- Little obvious stem-based morphology
- Some verbalizing suffixes¹⁵, but that is about it¹⁶

¹⁵ As in Adj *llufri* ~ V *llyfriha*- above

¹⁶ The finite inflection has a more obvious ‘stem-based’ morphology, but it is less relevant to the svarabhakti data

2.4 *Strata with weak morphological evidence*

- Crucially, patterns of cyclic misapplication
 - follow the derivational history
 - never straddle part-of-speech boundaries: no patterns like [$\text{t}u:v\text{or}$]_{Adj} ~ [$\text{t}u'vu:r\text{in}$]_N ~ [[$\text{t}u'v'r$]_{Adj}ai]_V
- Predicted by Stratal Phonology from first principles: stem-based storage

3 *Stems and overapplication: Irish vowels*

3.1 *Irish vowel inventory*

- Long vowels: at least 5 [i: u: e: o: a:]¹⁷
- Most consonants can be phonemically ‘non-palatalized’ or ‘palatalized’
- Long vowels have a free distribution

¹⁷ Depending on dialect, possibly also [u:], [ɛ:], [ɔ:]

- (7) a. [kʲu:nʲ] *ciúin* ‘quiet’
 b. [bʲ i:nʲ] *buíon* ‘band, company’

- Short vowels: more restricted distribution

3.2 *Irish short vowels: distribution*

- See Ó Maolalaigh¹⁸ for the generalizations
- All examples from Cois Fhairrge¹⁹ unless stated otherwise²⁰

- (8) a. [ˈtʲiʋimʲ] *tuitim* ‘I fall’²¹
 b. [ˈkur] *cur* ‘putting’²²
 c. [ˈdinʲə] *duine* ‘man’²³
 d. [ˈkudʲ] ~ [kidʲ] *cuid* ‘share’²⁴
 e. [ˈfʲis] *fios* ‘knowledge’²⁵
 f. [ˈtʲuki] *tiocfaidh* ‘will come’²⁶

¹⁸ Roibeard Ó Maolalaigh. 1997. *The historical short vowel phonology of Gaelic*. Edinburgh: The University of Edinburgh dissertation.

¹⁹ Tomás De Bhaldraithe. 1945. *The Irish of Cois Fhairrge, Co. Galway*. Dublin: Dublin Institute for Advanced Studies; Tomás De Bhaldraithe. 1953. *Gaeilge Chois Fhairrge: An deilbhíocht*. Baile Átha Cliath: Institiúid Ard-Léinn Bhaile Átha Cliath.

²⁰ The alternation between [a] and [æ] follows similar principles, but for our purposes they should be treated as straightforward allophones of /a/

²¹ Front in C₁C₂

²² Back in C₁C₂

²³ Front in C₁C₂ where C₁ is not velar(ized)

²⁴ Variation (?) in C₁C₂ where C₁ is velar(ized)

²⁵ Front in C₁C₂ where C₂ is not velar(ized)

²⁶ Back in C₁C₂ where C₂ is velar(ized)

3.3 Irish morphology: slenderization

- Irish morphology²⁷ makes extensive use of changes in the palatalization of final consonants

²⁷ Particularly nominal morphology

(9)	a.	[bɑ:d]	<i>bád</i>	‘boat.N S G’
	b.	[bɑ:ɲ]	<i>báid</i>	‘boat.G S G’
(10)	a.	[kru:n]	<i>coróin</i>	‘crown.N S G’
	b.	[kru:Nəx]	<i>corónach</i>	‘crown.G S G’

- Since the realization of short vowels depends on the palatalization of surrounding consonants, we expect short vowels to alternate

3.4 Irish short vowels: alternations

(11)	a.	[fɪl]	<i>fuil</i>	‘blood.N S G’
	b.	[fulə]	<i>fola</i>	‘blood.G S G’
(12)	a.	[tʁɛɲ]	<i>troid</i>	‘fight’
	b.	[tʁɛɲə]	<i>troda</i>	‘fight.G S G’

- But there are many vowel patterns

(13)	a.	[tʰɪl]	<i>toil</i>	‘will’
	b.	[tʰɪɲə]	<i>tola</i>	‘will.G S G’

3.5 Irish short vowels: analysis

- Three underlying vowels [i ə a]
 - Phonemic analysis with allophony²⁸
 - Rule-based phonology with ‘separation rules’²⁹
 - Non-linear analysis with feature-filling spreading³⁰
 - Element Theory analyses³¹
- Hence
 - /fɪl + i/ → /fɪl/ *fuil*
 - /fɪl + ə/ → /fulə/ *fola*
- Underlying ‘vertical’ system

²⁸ Michael Edward Krauss. 1958. *Studies in Irish Gaelic phonology and orthography*. Cambridge, MA: Harvard University dissertation; Richard Alexander Quayle Skerrett. 1967. Notes on the dialect of the Inishkea islanders. *Studia Celtica* 2. 196–201; A. J. Bliss. 1972. Languages in contact: Some problems of Hiberno-English. *Proceedings of the Royal Irish Academy* 72C. 63–82.

²⁹ Arndt Wigger. 1970. *Nominalformen im Conamara-Irischen*. Hamburg: Lüdtke Verlag; Mícheál Ó Siadhail & Arndt Wigger. 1975. *Córas fuaimneanna na Gaeilge*. Baile Átha Cliath: Institiúid Ard-Léinn Bhaile Átha Cliath; Mícheál Ó Siadhail. 1989. *Modern Irish: Grammatical structure and dialectal variation*. Cambridge: Cambridge University Press.

³⁰ Máire Ní Chiosáin. 1991. *Topics in the phonology of Irish*. Amherst, MA: University of Massachusetts, Amherst dissertation; Máire Ní Chiosáin. 1994. Irish palatalisation and the representation of place features. *Phonology* 11. 89–106.

3.6 *Irish short vowels: problems*

- The most worked-out rule-based analysis is by Ó Siadhail,³² which is problematic in many ways³³
- Ó Sé:³⁴ complementary distribution cannot be sustained due to exceptions in derived forms
- Ó Maolalaigh:³⁵ in underived forms, the vertical analysis can be sustained but for a few exceptions
 - *mionna* ‘oath’, *brionglóid* ‘dream’ with [i]

³² Ó Siadhail, *Modern Irish*.³³ Notably, he advocates a system where dialectal variation is derived by ‘dialect-specific’ rules from underlying forms common to all of Irish (Ó Murchú 1969)³⁴ Diarmuid Ó Sé. 1982. *Gaeilge Chorca Dhuibhne: An fhóineolaíocht agus an deilbhíocht*. University College Dublin dissertation.³⁵ Ó Maolalaigh, ‘The historical short vowel phonology of Gaelic’.3.7 *Separation rules are stem-level: interaction with morphology*

- Separation rules follow some morphology, notably slenderization
- In some varieties, evidence that they precede other morphology
- Corca Dhuibhne^{36,37}

- (14) a. [gidʲ] *goid* ‘steal.I M P . S G’
 b. [gitər] *goidtear* ‘steal.I M P E R S . P R E S’

³⁶ This is Munster Irish — a different dialect grouping but one for which the vowel separation facts are comparable to those of Cois Fhairrge³⁷ Ó Sé, ‘Gaeilge Chorca Dhuibhne’; Diarmuid Ó Sé. 2000. *Gaeilge Chorca Dhuibhne*. Baile Átha Cliath: Institiúid Teangeolaíochta Éireann.3.8 *Separation rules and opacity*

- Also in Corca Dhuibhne, word-final [xi] deletion counterbleeds vowel separation

- (15) a. [klɪx] *cloch* ‘stone.N S G’
 b. [klɛxə] *cloiche* ‘stone.G S G’
 c. [klɛ] *cloich* ‘stone.D S G’
 d. *[klɪ]

3.9 *Separation rules are stem-level*

- Pre-sonorant lengthening: vowels lengthen/diphthongize before coda ‘fortis’ sonorants³⁸

- (16) Case inflection
- a. [gʲlʲɑ:N] *gleann* ‘valley.N S G’
 b. [gʲlʲɑ:Ntə] *gleannta* ‘valley.N P L’
 c. [gʲlʲæNə] *gleanna* ‘valley.G S G’

³⁸ e.g. Raymond Hickey. 1986. Issues in the vowel phoneme inventory of western Irish. *Éigse* 21. 214–226; Ní Chiosáin, ‘Topics’.

- Backness separation transparently interacts with PSL

(17)	a.	[tu:N]	<i>tonn</i>	‘wave.N S G’
	b.	[ti:Nʲ]	<i>toinn</i>	‘wave.D S G’
	c.	[tiNʲə]	<i>toinne</i>	‘wave.G S G’

3.10 More interaction with morphology: diminutives

- The productive diminutive suffix *-in* slenderizes the final consonant of the stem

(18)	a.	[Lʲaur]	<i>leabhar</i>	‘book’
	b.	[Lʲaurʲi:nʲ]	<i>leabhairín</i>	‘book-DIM’

- This often leads to the expected alternations

(19)	a.	[kruk]	<i>cnoc</i>	‘hill’
	b.	[krikʲi:nʲ]	<i>cnuicín</i>	‘hillock’
(20)	a.	[sʌp]	<i>sop</i>	‘wisp, bundle (of straw)’
	b.	[sepʲi:nʲ]	<i>soipín</i>	‘id.-DIM’

- But crucially, short /a/ behaves differently in inflection-driven slenderization and before *-in*
- In inflection, /a/ in a slender context raises to [e] or [i]

(21)	a.	[lʲæk]	<i>leac</i>	‘flagstone’
	b.	[lʲekʲə]	<i>leice</i>	‘flagstone.G S G’
(22)	a.	[gʲlas]	<i>glas</i>	‘lock’
	b.	[glɛʲ]	<i>glais</i>	‘lock.G S G’
(23)	a.	[fʲær]	<i>fear</i>	‘man’
	b.	[fʲirʲ]	<i>fír</i>	‘man.G S G’

- In the diminutive context, we get cyclic misapplication rather than raising

- (24) a. [gʌd] *gad* ‘withe.N S G’
 b. [gʌdʲi:nʲ] *gaidín* ‘withe.D I M’

- We even get /a/ in a C_j_C_j context, which is basically impossible in underived forms³⁹

- (25) a. [bʲæn] *bean* ‘woman.N S G’
 b. [bʲænʲi:nʲ] *beainín* ‘woman.D I M’

³⁹ Similar overapplication is observed with alternations such as [ʃiəL] *siol* ‘seed’, genitive [ʃi:lʲ] *sil* but diminutive [ʃiəʲi:nʲ] *sióilín*

- However, many lexical items variably apply the ‘inflectional’ separation rules

- (26) a. [aLʲt] *alt* ‘joint.N S G’
 b. [æLʲtʲi:nʲ] *ailtín* ‘joint.D I M’
 c. [ɛLʲtʲi:nʲ] ‘id.’

3.11 *The stratal affiliation of separation rules*

- Separation rules can overapply before verbal inflectional suffixes (word-level?)
- Separation rules can overapply before the productive derivational diminutive *-ín*
- Separation rules interact transparently with Pre-Sonorant Lengthening, which itself is counterbled by diminutive slenderization

- (27) a. [kaiLʲ] *coill* ‘forest.N S G’
 b. [keLʲə] *coille* ‘forest.G S G’
 c. [kaiLʲi:nʲ] *coillín* ‘forest.G S G’

3.12 *Separation are stem-level: semantic evidence*

- Variable application of separation rules:
 - [sɛpʲi:nʲ] *soipín* is [[$\sqrt{səp}$ + ʲi:nʲ]_{S_L}]_{W_L}
 - [bʲænʲi:nʲ] *beainín* is [[$\sqrt{bʲæn}$]_{S_L} + ʲi:nʲ]_{W_L}
- Where De Bhaldraithe⁴⁰ reports a distinction in meaning between variants, it goes in the predicted direction
 - Stem attachment: cyclic misapplication, compositional meaning
 - * *raca* [rakə] ‘comb’, *raicín* [rækʲi:nʲ] ‘wee comb’
 - * *scead* [ʃkʲæd] ‘small piece’, *sceaidín* [ʃkʲædʲi:nʲ] ‘diminutive of *scead*’
 - Root attachment: transparent separation rules, idiomatic meaning

⁴⁰ De Bhaldraithe, *Gaeilge Chois Fhairrge*.

- * *roicín* [reki:ni] ‘cogwheel’
- * *sceidín* [ʃkiedj:i:ni] ‘small load’

3.13 Separation rules show the stem-level syndrome

- Exceptions in underived forms: [m̥iNə] *mionna*
- Failure to apply in some derived forms: [æri:mi] *airm*, G S G of [arəm] ‘weapon’
- Overapplication before plausibly word-level suffixes
 - Verbal inflection
 - Productive, compositional diminutive

3.14 But isn't it inflection?

- It appears that vowel separation rules and Pre-Sonorant Lengthening both belong to the stem level, as they overapply in word-level contexts such as diminutives
- These processes are particularly active in case and number inflection of nouns and adjectives
- Is case and number inflection stem-level?
- I would argue this is quite plausible

3.15 Stem structure in Irish

- In nouns,⁴¹ stem structure is not easily observable morphologically: there are no ‘thematic’ elements or overarching patterns of syncretism⁴²
- In verbs, stem structure is more visible: inflection combines a choice of ‘stem’ with a set of person-number suffixes to signal TAM features
- Nouns
 - Very few patterns are productive:⁴³ probably a good deal of lexical storage⁴⁴
 - See Acquaviva⁴⁵ for a morphosyntactic/semantic argument in favour of decomposing case and number inflections
- Verbs
 - Recent morphosyntactic work compatible with the idea that Irish verbal stems represent spans of morphosyntactic terminals, just as envisaged in stem-storage theories⁴⁶
 - Overapplication of PSL is at least possible in verbs: *cailleann* ‘loses’ [kaLjəN] or [ka:LjəN]⁴⁷

3.16 Conclusion

- ‘Vowel separation’ patterns in Irish show all signs of belonging to the stem level⁴⁸

⁴¹ And adjectives

⁴² There are more local patterns, such as the ‘first declension’ where N S G = G P L and G S G = N P L, but it remains unclear whether any of them can be taken to be the default; see Bennett (2015) for a discussion of defaults in Irish nominal inflection

⁴³ Andrew Carnie. 2008. *Irish nouns: A reference guide*. Oxford: Oxford University Press.

⁴⁴ It would be interesting to have a study à la Yang (2016)

⁴⁵ Paolo Acquaviva. 2006. Goidelic inherent plurals and the morphosemantics of number. *Lingua* 116(11). 1860–1887.

⁴⁶ Paolo Acquaviva. 2014. The categories of Modern Irish verbal inflection. *Journal of Linguistics* 50(3). 537–586; Jason Ostrove. 2018. Stretching, spanning, and linear adjacency in vocabulary insertion. *Natural Language and Linguistic Theory*. Pre-published.

⁴⁷ De Bhaldraithe, *Gaeilge Chois Fhairge*.

⁴⁸ This is true irrespective of whether we adopt an underlying ‘vertical’ analysis or stick to a less abstract five-vowel one. See Kiparsky (2018) for some discussion that supports the analysis of vowel separation as a stem-level process

- Cyclicity
- Exceptionality
- Variable application
- This is despite the direct evidence for internal stem constituency often being somewhere between ‘subtle’ and ‘non-existent’
- No obvious evidence for stratification, either
- Nevertheless, Stratal Phonology makes the right predictions

4 Converging evidence for stem structure: Russian

4.1 The [e] ~ [o] alternation

- A classic problem in Russian phonology⁴⁹
- In native vocabulary, surface [e] only follows palatalized consonants and [ʂ ʑ ts]⁵⁰
- Before a following non-palatalized consonant, some stressed [e]’s alternate with [o]

- (28) a. [sʲelʲ-skʲ-i-j] *сельский* ‘rural’
 b. [sʲol-a] *сѣла* ‘village-N PL’

- In some morphemes, [e] never alternates:

- (29) a. [bʲelʲ-i-j] *белый* ‘white’
 b. [bʲelʲ-inʲkʲ-i-j] *беленький* ‘white-DIM’

- Yet in others, [o] after a palatalized consonant never alternates

- (30) a. [tʲotʲ-a] *тѣтя* ‘aunt’
 b. [tʲotʲ-uʂk-a] *тѣтушка* ‘aunt-DIM’

4.2 The historical background and nature of the pattern

- Non-alternating [e] goes back to Old Russian *ě (written <ѣ>)
- Alternating [e] goes back to Old Russian *e (written <е>)⁵¹
- Old Russian *e, but not *ě, > o / Cʲ_C
- Later, [o] spread to a number of items where it is not motivated historically
- Lightner:⁵² underlying /ě/ and /e/, a backing rule, plus extra machinery to explain overapplication

⁴⁹ Nikolai S. Trubetzkoy. 1934. *Das morphologische System der russischen Sprache* (Travaux du Cercle linguistique de Prague 5.2). Prague: Jednota československých matematiků a fyziků; Theodore M. Lightner. 1969. On the alternation *e ~ o* in Modern Russian. *Linguistics* 7. 44–69; Anna Konstantinovna Polivanova. 1976. *Morfologiya russkogo substantivnogo slovoobrazovaniya*. Moscow: Moscow State University dissertation; Il’ya Borisovich Itkin. 1994. Eshche raz o cheredovanii *e ~ o* v sovremennom russkom yazyke. *Voprosy yazykoznaniiya* 1994/1. 126–133; Il’ya Borisovich Itkin. 2007. *Russkaya morfologiya*. Moscow: Gnozis.

⁵⁰ These consonants are historically palatalized, and pattern with palatalized consonants synchronically in a number of respects

⁵¹ And the yer [ɨ]

⁵² Lightner, ‘On the alternation *e ~ o* in Modern Russian’.

4.3 The morpheme-based analysis

- Lightner's analysis is beset with empirical difficulties,⁵³ but its use of juncture and constituency to deal with some of them signals morphological entanglement
- A better analysis: the presence of [ʼo] derives not from the Cj_C context but from the properties of the following morpheme
 - Polivanova:⁵⁴ suffixes can 'allow' or 'require' [ʼo] in the preceding morpheme
 - Itkin:⁵⁵ suffixes that palatalize a preceding consonant *also* block [ʼo] (to be revised)
 - Cubberley⁵⁶ gives a similar description

⁵³ Itkin, *Russkaya morfonologiya*.

⁵⁴ Polivanova, 'Morfonologiya russkogo substantivnogo slovoobrazovaniya'.

⁵⁵ Itkin, 'Eshche raz o cheredovanii $e \sim 'o$ v sovremennom russkom yazyke'; Itkin, *Russkaya morfonologiya*.

⁵⁶ Paul V. Cubberley. 2002. *Russian: A linguistic introduction*. Cambridge: Cambridge University Press.

4.4 Stem structure and palatalization

- A stratal analysis of Russian has been defended previously by Rubach;⁵⁷ Blumenfeld;⁵⁸ Gribanova,^{59,60}
- In many respects, it represents an attempt to rationalize earlier analyses with extrinsic ordering by positing strata
- Classic analysis⁶¹
 - Underlying /i/: palatalizes non-velars; coronalizes velars
 - Underlying /i/: does not affect non-velars; palatalizes velars (and fronts itself)

⁵⁷ Jerzy Rubach. 2000. Backness switch in Russian. *Phonology* 17(1). 39–64.

⁵⁸ Lev Blumenfeld. 2003. Russian palatalization and Stratal OT: Morphology and [back]. In Wayles Brown et al. (eds.), *Annual workshop on formal approaches to Slavic linguistics: The Amberst meeting 2002*, 141–158. Ann Arbor, MI: Michigan Slavic Publications.

⁵⁹ Vera Gribanova. 2008. Russian prefixes and prepositions in Stratal OT 26. 217–225.

⁶⁰ Vera Gribanova. 2009. Phonological evidence for a distinction between Russian prepositions and prefixes. In Gerhild Zybato et al. (eds.), *Studies in formal Slavic phonology, morphology, syntax, semantics and information structure: proceedings of FDSL 7, Leipzig*, 383–396. Frankfurt: Peter Lang.

⁶¹ Theodore M. Lightner. 1972. *Problems in the theory of phonology*. Vol. 1: *Russian phonology and Turkish phonology*. Edmonton: Linguistic Research; Rosemary Kuhn Plapp. 1996. Russian /i/ and /i/ as underlying segments. *Journal of Slavic Linguistics* 4. 76–108; Morris Halle & Ora Matushansky. 2002. [aback] assimilation in Russian: An overview. In Aniko Csirmaz et al. (eds.), *Phonological answers (and their corresponding questions)* (MIT Working Papers in Linguistics 42), 69–80. Cambridge, MA: MITWPL.

(31) Verbal /i/

a.	[kriik]	крик	'shout.N S G'
b.	[kriiʃ-it]	кричим	'to shout-PRES. 3 S G'
c.	[sviet]	свет	'light.N S G'
d.	[sviet-it]	светим	'to light-PRES. 3 S G'

(32) Nominative plural /i/

a.	[kriik]	крик	'shout.N S G'
b.	[kriki-i]	крики	'shout-NPL'
c.	[kʲit]	кит	'whale.N S G'
d.	[kʲit-i]	киты	'whale-NPL'

- The crucial stratal difference is
 - Stem-level /ki/ → [ʃi]
 - Word-level (/ki/ →) /ki/ → [kʲi]
 - ...and similarly /e/
- Gribanova:⁶² evidence for a stratal distinction from yer behaviour, supported by morphosyntactic evidence⁶³

⁶² Gribanova, 'Russian prefixes and prepositions in Stratal OT'; Gribanova, 'Phonological evidence for a distinction between Russian prepositions and prefixes'.

⁶³ But the analysis of yers is of course, hugely contested (e.g. Gouskova 2012)

- Problem: ample evidence that palatalization is not caused by the features of the vowel⁶⁴
- Cf. the ‘palatalizing morphophonemes’ of Itkin⁶⁵

- (33) a. [vor] вор ‘thief’
 b. [vari-ugja] ворюга ‘thief.PEJOR’
- (34) a. [krʲuk] крюк ‘hook.NSG’
 b. [krʲutʲ]-ok] крючок ‘hook-DIM-NSG’
 c. [krʲutʲ]-k-a] крючка ‘hook-DIM-GSG’

⁶⁴ Jaye Padgett. 2011. Russian consonant–vowel interactions and derivational opacity. In Wayles Brown et al. (eds.), *Formal Approaches to Slavic Linguistics 18: The second Cornell meeting, 2009*, 352–381. Ann Arbor, MI: Michigan Slavic Publications.

⁶⁵ Itkin, *Russkaya morfonologiya*.

- Suggested solution:⁶⁶ palatalization is caused by a floating feature
- Stratal differences in the outcome of the floating feature docking?

⁶⁶ Pavel Iosad & Bruce Morén-Duolljá. 2010. Rethinking palatalization in Russian. MS., University of Tromsø/CASTL.

4.5 *The [e] ~ [ʲo] alternation and suffixes*

- As Itkin⁶⁷ observes, *all* suffixes that require a preceding morpheme to have [e] *also* cause stem-level palatalization of preceding consonants⁶⁸

- (35) a. [grʲop] зрёб ‘row.PAST.SG.MASC’
 b. [griɐbʲini] зребень ‘comb’
- (36) a. [lʲod] лёд ‘ice’
 b. [gala-lʲedʲ-itʲs-a] гололедица ‘ice crust’
- (37) a. [grʲoza] зрёза ‘dream-NSG’
 b. [grʲiez-u] зрежу ‘I dream’
 c. [grʲiezʲ-it] зрезит ‘(s)he dreams’

⁶⁷ Itkin, *Russkaya morfonologiya*.

⁶⁸ Or at least the data is consistent with this observation: in many cases this action is obscured by more general phonotactic considerations

- And conversely, *all* suffixes that require [ʲo] do not palatalize a preceding consonant

- (38) a. [tvʲierdʲ] твердь ‘firmament’
 b. [tvʲiordʲ-ij] твёрдый ‘solid’
- (39) a. [pa-sʲeli-it] поселит ‘(s)he will settle’
 b. [pa-sʲol-ak] посёлок ‘settlement’

- Generalization: if a suffix causes stem-level palatalization, it also requires a preceding morpheme to take [e] if that morpheme has an [e] allomorph
- The fronting is caused by the presence of the palatalizing feature, and is active at the stem level

4.6 ‘Indifferent’ suffixes

- Some palatalizing suffixes do not require preceding morphemes to take [e]⁶⁹

⁶⁹ Itkin, *Russkaya morfoloġiya*.

(40) Case suffixes in /e/

- | | | | |
|----|----------|--------------|-----------------------|
| a. | [uʈos] | <i>ymĕc</i> | ‘cliff.N S G’ |
| b. | [uʈosʲi] | <i>ymĕce</i> | ‘cliff.P R E P . S G’ |

(41) Past tense plural /i/

- | | | | |
|----|---------------|-----------------|-------------------------|
| a. | [mʲorʒ-nu-tʲ] | <i>mĕrʒnutʲ</i> | ‘be cold.I N F’ |
| b. | [mʲorʒ-l-i] | <i>mĕrʒli</i> | ‘be cold.P A S T . P L’ |

(42) Diminutive /ik/

- | | | | |
|----|-------------|---------------|-------------|
| a. | [ʈʲort] | <i>čĕrt</i> | ‘devil’ |
| b. | [ʈʲortʲ-ik] | <i>čĕrtik</i> | ‘wee devil’ |

(43) Diminutive /eʈsʲ/ (with a yer)

- | | | | |
|----|----------------|-----------------|-----------------------------------|
| a. | [rʲiʂot] | <i>reʂĕt</i> | ‘sieve.G E N . P L’ ⁷⁰ |
| b. | [rʲiʂotʲ-sʲ-a] | <i>reʂĕtʲce</i> | ‘sieve.D I M’ |

⁷⁰ The citation form is [rʲiʂʲiʲto] *reʂĕto*, which does not show the quality of the underlying vowel

- Similarly, some non-palatalizing suffixes do not influence the [e] ~ [ʲo] alternation

(44) Female /ok/ (with a yer)

- | | | | |
|----|----------------------|--------------------|----------------------|
| a. | [ʈʲʲuzʲi-zʲemʲ-iʈsʲ] | <i>čʲuzĕzĕmĕc</i> | ‘foreigner’ |
| b. | [ʈʲʲuzʲi-zʲemʲ-k-a] | <i>čʲuzĕzĕmk-a</i> | ‘female foreigner’ |
| c. | [nava-sʲol] | <i>novosĕl</i> | ‘new settler’ |
| d. | [nava-sʲol-k-a] | <i>novosĕlk-a</i> | ‘female new settler’ |

- ‘Indifferent suffixes’ generalizations:

- Inflection or highly productive derivation
- Never trigger stem-level palatalization
- Itkin⁷¹ notes the contrast between ‘indifferent’ diminutive /ik/, /ets̄/ and [e]-requiring non-diminutive, non-compositional homophonous suffixes:

⁷¹ Itkin, *Russkaya morfoloġiya*.

- (45) a. [varʲ-on-ij] варѣнный ‘boiled’
 b. [varʲ-enʲ-ik] вареник ‘dumpling’
- (46) a. [liʃ-on-n-ij] лишѣнный ‘deprived’
 b. [liʃ-enʲ-its] лишенец ‘one deprived of civil rights’

4.7 Summary analysis

- The [e] ~ [o] alternation is a stem-level pattern
- In frameworks with stem storage, if a stem has an [e] allomorph, it is chosen before a palatalizing suffix⁷²
- This explains why only stem-palatalizing suffixes trigger fronting
- Instead of absolute neutralization with underlying /ě/, the applicability of [e] ~ [o] is a matter of lexical storage⁷³
- Word-level suffixes can palatalize preceding consonants, but do not affect stem allomorphy: obey locality and cyclicity
- Consilience of
 - Phonological evidence: palatalization
 - Phonological evidence: [e] ~ [o] alternation
 - Morphological and semantic evidence
 - ...despite the apparent lack of obvious stratification or stem morphology

⁷² For instance, via phonologically optimizing allomorph selection

⁷³ As an additional bonus, if stem-level storage is implemented via lexical redundancy rules (Bermúdez-Otero *passim*), this explains Itkin’s (2007) generalization that patterns of [e] ~ [o] alternations coincide with patterns of ablaut alternations (which are by definition stem-building)

5 Conclusion

5.1 Summary

- The three cases considered here all suggest that Stratal Phonology makes the right predictions in several areas
 - Welsh: relationship between the lexical syndrome and part-of-speech characterization
 - Irish: distinction between stem- and word-level domains in the absence of robust root-stem-word morphology
 - Russian: convergent evidence for cyclic domains from several phonological and morphological phenomena
- Stratal Phonology envisions just the right cyclic domain structure

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