

A bad case of excessive computation

The rôle of morphology in palatalization-related alternations in Russian

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Talk outline

1. Context
2. Two case studies from Russian
 - ▶ Backness switch
 - ▶ Palatalization
3. The advantages of modularity
4. Incursion of the idiosyncratic
5. Conclusion



Context Russian in the history of generative phonology

Historical context

- ▶ Generative phonology is said to basically start with Russian: Halle (1959)
- ▶ Classic generative accounts such as Lightner (1972); Hayes (1984)
- ▶ Also taken up within Lexical Phonology, figures in Kiparsky (1985)
- ▶ Most analyses very abstract, sometimes even more so than Chomsky & Halle (1968)
- ▶ Of course there is much work on Slavic within GP/DP (e. g. Gussmann 2007), but I am insufficiently familiar with that...



Context Russian in the history of generative phonology

A typical example

- ▶ From Halle & Matushansky (2002)
- ▶ The following rules are all extrinsically ordered:
 1. Palatalization: $[\alpha\text{back}]$ spreads $C \leftarrow V$
 2. Velar mutation: $\text{dorsal}_{[-\text{back}]} \rightarrow [\text{coronal} - \text{ant} + \text{strident}]$
 3. Iotacism: $V_{[-\text{high}]} \rightarrow [i] / C_{[-\text{back}]} -$
 4. Depalatalization: $\check{s} \check{z} c \rightarrow [+ \text{back}]$
 5. Velar palatalization: $k g x \rightarrow [-\text{back}] / -V_{[+\text{high} - \text{round}]}$
 6. Hi-switch: $[\alpha\text{back}]$ spreads $C \rightarrow V_{[+\text{high} - \text{round}]}$



Example derivation

šerstʲistʲij ‘furry’
 ↓ by Palatalization
 šʲerstʲistʲij
 ↓ by Iotacism
 šʲirstʲistʲij
 ↓ by Depalatalization
 šʲirstʲistʲij
 ↓ by Hi-switch
 šʲirstʲistʲij



The OT era

- ▶ Significant body of work arguing that Russian (and more broadly Slavic) data conclusively show that some sort of multiple-level serialism is unavoidable
 - ▶ Palatalization: Rubach (2000, 2005, 2007), Plapp (1999), Blumenfeld (2003) (Stratal OT)
 - ▶ Vowel reduction: Rubach (2000); Padgett (2004); Mołczanow (2007)
 - ▶ Yers: Mołczanow (2008); Gribanova (2009)
- ▶ Mostly occupied with recasting the SPE/LP analyses: well, of course you can't do them in parallel OT!
- ▶ Scheer (2010, §6.1.3): “[t]he whole derivational issue hinges on reranking, and on nothing else”.



What is at stake?

- ▶ The analysis of Russian
 - ☞ I am not aware of any work specifically refuting the serialism-based analysis of Russian
- ▶ The issue of intermediate levels
 - ☞ Where do the levels come from?
 - ☞ What is the distinction between a multi-level phonology and non-trivial components of a modular theory of grammar?
- ▶ The value of phonology-internal evidence
 - ☞ Can we say that purely phonological data can have a decisive say on the previous issue?
 - ☞ If yes, how overwhelming must the evidence be?



Goals of this talk

- ▶ The analysis of Russian
 - ☞ Discuss some specific alternatives to a serialism-based analysis
- ▶ The issue of intermediate levels
 - ☞ Show that given a narrow (essentially Trubetzkoyan) understanding of phonology and serious modularity, the case for serialism appears overstated
- ▶ The value of phonology-internal evidence
 - ☞ Discuss how the validity of the phonological analysis hinges on interface considerations which are rarely explored or even explicitly discussed (again cf. Scheer 2010 *passim*)



Assumptions I

- ▶ Minimalist feature theory (Morén 2003, 2007; Blaho 2008)
 - ▶ Only privative features
 - ▶ Contrastivist Hypothesis (Dresher 2009; Hall 2007): only contrastive features are active in the phonological computation (see Dresher *passim* on why this is essentially the Trubetzkoyan position)
 - ▶ Substance-free I: phonetic representation of a feature not necessarily uniform either across or within a language
 - ▶ Substance-free II: assignment of phonological features based on phonological activity within the language at hand
- ▶ Consequences:
 - ▶ Surface underspecification
 - ▶ Non-trivial phonetic component



Assumptions II

- ▶ Not every change you can write using IPA is the job of phonology
- ▶ Potential sources of variable realization of underlying phonological symbols (“phonetic grammar”)
 - ▶ Allomorphy (not phonology: e. g. lexical insertion)
 - ▶ Manipulation of phonological symbols (“phonology”, “computation”)
 - ▶ General (“phonology” *per se*)
 - ▶ Item-specific (“morpheme-specific phonology”)
 - ▶ Language-specific differences in the realization of (bundles of) symbols (“phonetics–phonology interface”)
 - ▶ Phonetic factors: speech rate, aerodynamics, elasticity effects etc. (“phonetics”)
- ▶ Consequence: even if “phonology” is monostratal, the feed-forward model of grammar still introduces a kind of serialism, but with principled restrictions



The basic facts

- ▶ Most consonants have a palatalized counterpart, e. g. [t tʲ] [x xʲ] [ʃ ʃʲ] etc.
- ▶ Exceptions: [ts ʃʷ zʷ] (only non-palatalized), [tʃʲ] (only palatalized)
- ▶ Palatalized consonants have a pretty free distribution
 - ▶ But [kʲ gʲ xʲ] are impossible word-finally
 - ▶ And rare before non-front vowels, though not impossible and even created by the morphophonology (Timberlake 1978; Flier 1982)
- ▶ Conversely, [k g x] are impossible (word-internally) before front vowels



The traditional assumptions

- ▶ Traditional as in going back to at least Halle (1959) and rarely challenged
- ▶ Six vowels, including [i] which is at least [+high +back –round]
- ▶ Complementary distribution of [i̟] and [i] depending on palatalization of the previous consonants
- ▶ Note this requires [ʃʷi] [zʷi] [tʃi] but [tʃʲi]
- ▶ Assumption: at least [ʃʷ] and [zʷ] are underlyingly palatalized (we’ll see why in a minute)
- ☞ Not available in a contrastivist theory: (non-)palatalization is redundant on the “unpaired” segments



The palatalizations I

- ▶ Mostly before front vowels:

- ▶ $C \rightarrow C^j$
- ▶ But the same affixes often trigger $[k \ g \ x] \rightarrow [tʃ^j \ ʃ^w \ z^w]$

- (1) a. (i) ['svʲet] 'light' (n.)
 (ii) [svʲɪ'tʲitʲ] 'to illuminate'
 b. (i) ['mukə] 'torment' (n.)
 (ii) ['mutʲjɪtʲ] 'to torment'

- ▶ Another type where only the velars are affected:

- (2) a. (i) ['stoɫ] 'table'
 (ii) [stɐ'ɫi] 'tables'
 b. (i) ['krʲuk] 'hook'
 (ii) [krʲɔ'kʲi] 'hooks'



The palatalizations II

- ▶ Yet another type where everything undergoes surface palatalization

- (3) a. (i) ['stoɫ] 'table'
 (ii) [stɐ'ɫe] 'table (loc. sg.)'
 b. (i) ['krʲuk] 'hook'
 (ii) [krʲɔ'kʲe] 'hook (loc. sg.)'

- ▶ Transitive palatalization: $[t \ d \ s \ z] \rightarrow [tʃ^j \ z^w \ ʃ^w \ z^w]$

- ☞ No relation to the frontness of the following vowel
- ☞ Same output as [i]-palatalization



The traditional approach

- ▶ Palatalization: triggered by [i]
 - ▶ $[ti \ ki] \rightarrow [tʲi \ kʲi]$
- ▶ The other palatalization: triggered by [i] with later fronting following velars; ordering crucial
 - ▶ $[ti \ ki] \rightarrow [ti \ ki] \rightarrow [ti \ kʲi]$
- ▶ Across-the-board surface palatalization: word-level (Blumenfeld 2003) or some boundaries reproducing this effect (Plapp 1996); multiple levels crucial for counterfeeding of [i]-palatalization
- ▶ Transitive palatalization: often ignored or relegated to morphology despite the clear affinity to [i]-palatalization



Reanalysis

- ▶ Joint work with Bruce Morén-Duolljá
- ▶ Email for details of analysis or see <http://www.hum.uit.no/a/iosad/cv.html>
- ▶ Redux:
 - ▶ There is no [i]
 - ▶ There is very little actual $C \leftarrow V$ spreading of [αback]
 - ▶ The various outcomes of palatalization are ascribed to a floating feature
 - ▶ Lexical indexation allows Russian to realize a fair bit of the factorial typology for this floating feature



Backness switch and [ɨ] I

- ▶ There is no /i/ in Russian
 - ▶ Phonetically it is a sort of diphthong: textbook knowledge in Russia, also Padgett (2001)
 - ▶ Basically the target is [i]
 - ▶ Phonologically it is not necessary
- ▶ The relationship between frontness and palatalization properties is complex
- ▶ Some non-front vowels trigger palatalization:

(4) a. [pʲɪ'sok] 'sand'
 b. [pʲɪ'ʃ:ʲanij] 'sandy'
- ▶ Vice versa: slightly complicated
- ▶ All /e/'s do trigger palatalization (historical accident)



Backness switch and [ɨ] II

- ▶ If all /i/'s are /i/'s, they are an example of front vowels failing to trigger palatalization
- ▶ Exception: /ki/ still comes out as [kʲi]
- ▶ It is in fact the only C ← V spreading process that does not fail
- ▶ The ban against [ki gi xi] is in fact a robust surface-true generalization (modulo boundary effects)
- ▶ Spreading of [αback] to [dorsal] but not other places can be achieved by **local conjunction**
- ▶ Obviates the frankly weird rule fronting /i/ following non-palatalized dorsals only in order to front them afterwards
- ▶ Also solves the problem of the postalveolars
- ▶ The only part of the **phonology** where [ɣʷ zʷ] behave like non-palatalized consonants is where they cause [ɨ] to appear instead of [i]



Backness switch and [ɨ] III

- ▶ But [i] → [ɨ] is not a phonological process: just the interface imposing velarization on non-palatalized consonants
- ▶ Therefore [ɣʷ zʷ] should in fact be palatalized in the output of phonology (corroborated by vowel reduction)
- ☞ Serialism involving non-contrastive features comes for free from the modular architecture
- ▶ Backness switch à la Rubach (2000) is unnecessary
- ☞ Promising general line of attack on much of “postlexical phonology”



Representational assumptions

- ▶ Based on a holistic approach to Russian phonology
- ▶ V-place[coronal]
 - ▶ Palatalization in consonants with a C-place (à la Clements)
 - ▶ The only place feature for the postalveolars
 - ▶ On its own: /i/
- ▶ Floating V-place[coronal] (unattached to a Root node) must attach to something to surface
- ▶ Factorial typology for floating feature



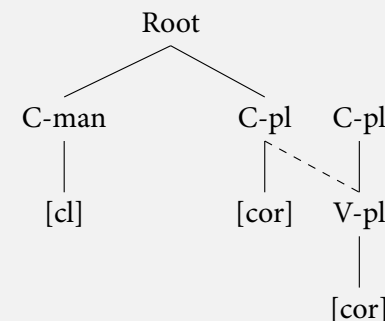
The constraints

- ▶ MAX(V-pl[cor]), or MAXFLT (Wolf 2007): self-explanatory
- ▶ DEPLINK(V-pl[cor]): do not create a new attachment for V-pl[cor]
- ▶ *C-pl[lab]/[cor]/[lab]: self-explanatory
- ▶ **Conjunction** of *C-pl and DEPLINK: “do not attach V-pl[cor] to this type of consonant”
 - ▶ Can be undominated \Rightarrow no docking
 - ▶ Can be repaired by undoing the violation of DEPLINK \Rightarrow no docking
 - ▶ Can be repaired by undoing the violation of *C-pl \Rightarrow deletion of C-pl and attachment of V-pl[cor] = postalveolars
 - ▶ Can be dominated \Rightarrow docking of V-pl[cor] leads to surface palatalization
- ▶ Ignoring additional complications which don't change the picture...



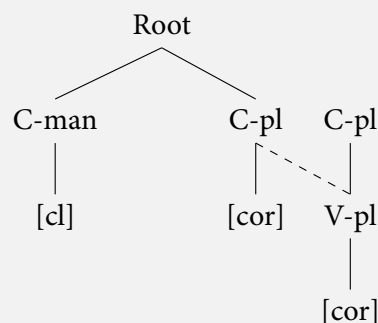
Surface palatalization

- ▶ MAX(V-pl[cor]), MAX(C-pl) \gg DEPLINK(V-pl[cor])
- ▶ Realize both the consonant's underlying feature and the floating feature



Place-changing palatalization

- ▶ Unified name for velar and transitive palatalization: same output, would be good to have a unified representation
- ▶ MAX(V-pl[cor]), *C-pl&DEPLINK(V-pl[cor]) \gg MAX(C-pl)



No-docking scenarios

- ▶ The feature may fail to surface at all \Rightarrow non-palatalizing suffixes, such as the /i/
- ▶ It may also force the epenthesis of some material to attach to
- ▶ Attested as labial epenthesis: /p b m f v/ \rightarrow /pʲ bʲ mʲ fʲ vʲ/
- ▶ But the ranking is clearly contradictory: how can all these be attested in a single language?



Lexical indexation I

- ▶ For the sake of the argument, I propose accommodating the different palatalizing properties of Russian suffixes via lexical indexation (Pater 2009)
- ▶ So each class of suffixes has a corresponding ranking of the relevant constraints
- ▶ Contrast this with the Stratal OT approach of Blumenfeld (2003):
 - ▶ SOT: velar palatalization happens at the stem level, surface palatalization happens at the stem level, differences accommodated via stratum-specific ranking
 - ▶ Proposed approach: differences in the outcome of palatalization are due to arbitrary lexical indexes
 - ▶ **Loss of generalization relative to SOT**, even though the insight can still be expressed (“such-and-such indexes are associated with word-level suffixes”)



Lexical indexation II

- ▶ Better empirical adequacy
 - ▶ Unified expression of place-changing palatalization
 - ▶ Correctly expresses the lack of a principled relationship between vowel frontness and palatalizing properties (other than diachronically)
 - ▶ Correctly expresses the types of palatalizing processes possible in Russian
- ▶ Give me empirical adequacy over loss of generalization any day



Marrying OT and modularity

- ▶ Scheer (2010): the “strict parallelism” rhetoric of OT tends to take (some of) its practitioners too far down the non-modular path
- ▶ One way of reconciling OT with modularity: letting go of many of the alternations commonly assumed to fall within the purview of phonology
 - ▶ Phonology = categorical operations on distinctive features
 - ▶ Operations on non-distinctive elements of the signal: phonetics–phonology interface, phonetics
 - ▶ Operations with non-phonological conditioning: allomorphy galore?
- ▶ Presumption of guilt: not phonological unless proved otherwise



The phonetics–phonology interface I

- ▶ Massive pile of “data”: until the rise of Laboratory Phonology, the working assumption is “if you can write it in IPA, it’s phonology”, appealing to Jakobson et al. (1951); Chomsky & Halle (1968) and the idea of a “universal phonetics”, where all differences among the sound grammars of different languages are phonological by definition; also Hale & Reiss (2008)
- ▶ In much of LabPhon and its ilk the pendulum swings the other way: there is no separate module catering for categorical phonology, it is at best emergent (too many references to do justice to)



The phonetics–phonology interface II

- ▶ Other options (a selection):
 - ▶ Phonetics and phonology are orthogonal but simultaneously present: “sound phenomena can be classified on several dimensions, most of them continuous, which all together make the phenomenon relatively phonetic or relatively phonological” (Tucker & Warner 2010)
 - ▶ Phonetics and phonology are in principle separate but difficult if at all possible to disentangle (Cohn 2006)
 - ▶ Phonetics and phonology are strictly separate:
 - ▶ No universal phonetics: phonetics (or the interface) is non-trivial, e. g. Kingston & Diehl (1994); Kingston (2007)
 - ▶ Phonetics–phonology duplication is not a problem but an empirical fact, and the two can be disentangled: Myers (2000); Przewdzicki (2005); Barnes (2006); Bermúdez-Otero (2010)



The phonetics–phonology interface III

- ▶ Some corollaries of a modular architecture
 - ▶ The interfaces must be non-trivial, and consequently they can do (some of) the job of an expansionist phonology
 - ▶ There are also clear consequences: we cannot cure opacity just by shunting the lateish processes to the interface: evidence required (Myers 2000)
 - ▶ We have to live with a lot of duplication such as Bermúdez-Otero’s (2010) “rule scattering”
 - ▶ But it’s OK if it gives better empirical adequacy
- ▶ What about the other side?



Handling incursions of the idiosyncratic

- ▶ Can we bite the bullet and accept enormous duplication?
- ▶ This means another rethink of the balance between storage and computation (Booij 2002; Embick 2010)
- ▶ If parochial phonology is out, morphology (e. g. lexical insertion) eats another big chunk of phonology: cf. Green (2006, 2007)
- ▶ “Frankly boring” (p. c.)
- ▶ But should we accept it, just as with phonetics?



How good is phonological evidence?

- ▶ It is not my purpose here to argue for this specific analysis
- ▶ But it does seem that many of the facts previously argued to absolutely require serial derivation in phonology could in principle be reanalyzed
- ▶ What would the compelling evidence look like?
 - ▶ Demonstrably phonological
 - ▶ Crucially ordered processes
 - ▶ Operating categorically on contrastive symbols
 - ▶ Not amenable to a representational analysis (e. g. preservation of subsegmental elements as opposed to spreading-and-deletion)
- ▶ Place to look for: languages with really long derivations: Sanskrit? Sámi? Finnish?



Battling the idiosyncratic I

- ▶ Going back to Russian palatalization, it is arbitrary in at least two ways:
 - ▶ Despite repeated attempts to analyze it as driven by the surface phonology, these analyses appear to be around ten centuries late: the mere triggering of palatalization is not a surface-phonological fact
 - ▶ The distribution of palatalization types among triggering morphemes is quite arbitrary
- ▶ The second point means that I am not enough of a syntactician to convince myself one way or another whether the different palatalization-related rankings have some principled morphosyntactic rationale



Battling the idiosyncratic II

- ▶ But I suspect it's a very tough nut to crack, especially considering the fact that allomorphs of the same morpheme can have differing palatalization properties.
- (5) a. [tʃi'ku] 'I flow'
 b. [tʃi'tʃot] 'it flows'
- (6) a. ['tku] 'I weave'
 b. ['tʃot] '(s)he weaves'
- ▶ The empirical advantages are not as clear as in the case of phonetics
 - ▶ In the case of phonetics, some manipulation is still there, just of a different kind
 - ▶ If morphologically conditioned phonology is morphology, this would seem to be selection, not computation
 - ▶ I wash my hands here



Summary

- ▶ Analysis of a number of phenomena in Russian which have traditionally been argued to support multiple-level derivations
- ▶ Claim: analysis more empirically adequate in terms of the phonological phenomena
- ▶ Loss of generality in terms of stating the conditioning, but arguably preferable over an elegant but insufficient analysis
- ☞ I am not really arguing **for** fully parallel OT, or even for OT as such
- ☞ My points regarding the proper domain of phonology hopefully apply to any theory of phonological computation, not just to OT
- ▶ Just showing that a number of reasonable assumptions in a modular theory phonological computation can help us run with this ball much further



Quis custodiet ipsos custodies?

- ▶ Can phonological data alone be used to resolve (e. g.) the number-of-levels debate?
- ▶ Answer: firm no
- ▶ “Empirical” arguments for or against this or that specific theory of phonological computation have little value outside of a fully fledged architectural theory
- ▶ My contribution in this is hopefully to raise the questions regarding the proper domain of phonological computation in a modular theory



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