Some Recent Developments in Slavic Phonology

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Abstract: This article presents an overview of the last two decades of research in synchronic Slavic theoretical phonology and the fields it interacts with, such as phonetics, morphology, and syntax. The overview is arranged around the properties of Slavic languages that prominently figure in the recent discussion of theoretical phonology. It concentrates on the specific phenomena in Slavic, such as vowel reduction, vowel/zero alternations, stress and pitch accent, vowel coalescence, voicing assimilation, word-final devoicing, and consonant clusters and syllabification, and on how these phenomena are relevant to phonological theory and Slavic linguistics.

1. Introduction

A description of recent phonological developments from an areal point of view is a daunting task. It can be approached from various angles, such as historical, typological, theoretical, or phenomenological. The latest article-size overview of Slavic phonology considered the vast literature of the 20th century, taking into consideration synchronic and diachronic phonology, descriptive and theoretical phonology, structuralist and generativist phonology, and phonology as approached by Slavists and general linguists (Bethin 2006a). In the present article, I will not cover topics in historical Slavic (for a short overview, see the article in this volume by Nesset) or dialectology but will attempt to present an overview of the last two decades or so of research in synchronic Slavic theoretical phonology. I will concentrate on the work done in the 21st century but occasionally discuss earlier work if the logic of the presentation requires it. The current overview will be arranged around the properties of Slavic languages that prominently figure in the recent discussion of theoretical phonology as well as phonetics/phonology, morphology/phonology, and syntax/phonology interfaces. The overview will thus concentrate on the specific phenomena in Slavic and on how these phenomena are relevant to phonological theory and Slavic linguistics.

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2. An Overview of Phonological Phenomena in Slavic

The Slavic language family has long provided phonological theory with puzzling data that in many cases has shaped the field, and Slavic phonology remains quite prominent in the linguistic research of the 21st century. The phenomena that have been recently discussed in connection with Slavic languages can be subdivided into the following general areas of research:

- Vowel reduction, mostly discussed on the basis of data from Russian and Bulgarian, has been one of the major examples in the more general research on perceptual salience and contrast neutralization;
- Vowel/zero alternations, present everywhere in Slavic, are relevant to research on the phonological representation of alternating vowels and morphological paradigm uniformity;
- Stress (lexical/mobile or fixed) in all Slavic languages and pitch accent in BCS dialects are relevant for questions of the representation of stress and tone;
- Compensatory lengthening and other vowel coalescence phenomena are important for the discussion of opacity as well as syllable structure and sonority;
- Palatalization, present almost everywhere in Slavic, is discussed in connection with segmental representation issues and its relationship to contrast maintenance and neutralization;
- Voicing assimilation, present everywhere in Slavic, and word-final devoicing, effective in most Slavic languages except Ukrainian, is relevant to the theoretically significant issues of incomplete neutralization and featural agreement;
- Consonant clusters and syllabification, present everywhere in Slavic, constitute the data, which are relevant to issues of syllable structure and sonority.

This list of phenomena is by no means complete and could be organized in many different ways, but I believe that this particular organization does reflect the major developments in Slavic phonology and thus provides a suitable organization for this article.

3. Literature on Slavic Phonology: *JSL* and Other Venues

The *Journal of Slavic Linguistics* (*JSL*) is a venue where work in Slavic phonology figures prominently. In the last two decades, *JSL* has published a number of articles that illustrate and resolve questions in phonological theory on the basis of a phenomenon in Slavic (Ćavar 2007; Łubowicz 2007; Rubach 2007b),

consider specific issues in depth through a phonological analysis and/or phonetic experimentation (Langston 1997; Bethin 2010; Mitrović 2012; Shrager 2012; Nesset 2016), look at phenomena in Slavic from a typological point of view (Ringen and Kulikov 2012) or a historical point of view (Padgett and Żygis 2007), provide studies in Slavic dialectology and dialect contact (Czaplicki 2010; Bethin 2007, 2010, 2014), or take an inter-disciplinary approach, combining phonology, syntax, and information structure (Féry et al. 2007), phonology and psycholinguistics (Kulinich, Royle, and Valois 2016), phonology and cognitive linguistics (Nesset 2016), and phonology and child language acquisition (Łukaszewicz and Opalińska 2007). In fact, the entire issue 15(2) of *JSL*, edited by Małgosia Ćavar and T. A. Hall and published in 2007, was devoted to phonology.

Work on Slavic phonology is also published in a wide variety of linguistic journals from the most general ones, such as *Language* and *Journal of Linguistics*, to ones that publish articles on novel theoretical developments, such as *Natural Language and Linguistic Theory (NLLT)* and *Linguistic Inquiry (LI)*, or specialize in phonological theory, such as *Phonology* and *Phonological Studies*, or in phonetics, such as the *Journal of Phonetics* and *Phonetica*. There are also several recurring conferences in Slavic linguistics, the most prominent being Formal Approaches to Slavic Linguistics (FASL) and Formal Description of Slavic Languages (FDSL), both of which publish proceedings.

4. Vowels and Vocalic Processes

In this section I provide an overview of the recent work in phonological theory that concentrates on vocalic phenomena in Slavic, such as vowel reduction, vowel-zero alternations, and syllable-structure issues related to vocalic alternations as well as stress and pitch-accent in Slavic.

4.1. Vowel Reduction

The phenomenon of vowel reduction has been at the center of the contemporary phonological theory, as it naturally coincides with the general discussion of neutralization. At the beginning of the century, Crosswhite (2000, 2001) introduced the discussion of vowel reduction in Optimality Theory (OT), proposing an analysis on the basis of perception- and sonority-driven constraints. Following Crosswhite's work, several researchers analyze vowel reduction phenomena (in Slavic and elsewhere) as sonority-based (de Lacy 2006; Mołczanow 2007a; Hermans 2008). Vowel reduction also prominently figures in dispersion-related research, such as Padgett (2004, 2011) and Padgett and Tabain (2005). Barnes (2006, 2007) considers the phonetic side of vowel reduction and discusses the division of labor between phonetics and phonology

with respect to contrast neutralization processes. While most of the work on vowel reduction concentrates on Russian and Bulgarian, Nowak (2007) discusses the acoustic characteristics of fronting and raising of vowels in the vicinity of palatal consonants in Polish, which he also terms vowel reduction.

Traditionally, the term vowel reduction is used to refer to neutralization patterns in unstressed syllables. Even though Russian has always been used as one of the clearest examples of vowel reduction, Iosad (2012) states that calling the patterns of contrast neutralization in unstressed syllables vowel reduction is something of a misnomer since they can lead to the appearance of higher-sonority vowels. Iosad (2012) presents a careful and detailed description of Russian vocalic neutralization patterns and then follows with an analysis that treats dispersion and sonority-driven effects in Russian as epiphenomenal, showing that, provided the correct choice of phonological representations, the only mechanism needed for a working account of phonological vowel reduction is positional markedness/faithfulness.

There are three sets of vowels in Russian with respect to the neutralization patterns: 1) vowels in stressed syllables; 2) vowels in the first pretonic syllable (the one that immediately precedes the stressed syllable) and in onsetless syllables, termed "moderate" reduction by Crosswhite (2000); 3) elsewhere case ("radical" reduction per Crosswhite (2000)). In unstressed phrase-final open syllables, both moderate and radical reductions are possible. The outcomes of reduction are different in the context of palatalized and nonpalatalized consonants.

Building on Barnes (2006, 2007), Iosad (2012) proposes that radical reduction in unstressed syllables is a phonetic process that involves reduced duration and does not require "any symbolic computation that is different from that employed in moderate reduction positions" (Iosad 2012: 566). Iosad argues that the data on Russian vowel reduction support Barnes's (2006) proposal that phonologized patterns become detached from the original phonetic motivation and that there is no direct access to the phonetics in phonological computation.

In an article that appears in the same year as Iosad's, Bethin (2012a) discusses an apparent exception in Russian vowel reduction, whereby in certain inflectional suffixes /a/ and /o/ reduce to [ə] rather than the expected [ɪ]. She proposes that vowel reduction after palatalized consonants is constrained by the morphology and can be accounted for by the interaction of Relativized Paradigm Uniformity and Paradigm Contrast constraints (Steriade 2000). Bethin (2012b) discusses the effects of vowel reduction on the inflectional morphology of Russian and Belarusian.

Finally, Mołczanow (2015) rejects the existing accounts of moderate vowel reduction in Russian, proposing an analysis that accounts for the reduction in the immediately pretonic syllable through the interaction of vowel quality

and tone and argues that the reduction is driven by the spread of the High tone.

4.2. *Okan'je, akan'je/jakan'je*

Certain patterns of vocalic contrast preservation and neutralization are traditionally described as *akan'je* and *okan'je* in Slavic linguistics. *Okan'je* refers to systems that do not exhibit vowel reduction, and the contrast between the mid vowels and /a/ is generally maintained (as in Standard Ukrainian and in several northern Russian dialects). *Akan'je* and *jakan'je* refer to systems that neutralize the contrast between the mid vowels and /a/ in unstressed positions; this type of neutralization is referred to as *akan'je* after nonpalatalized consonants and as *jakan'je* after palatalized consonants. *Akan'je/jakan'je* systems can be nondissimilative when the vowels neutralize to an [a]-like vowel in the pretonic syllable regardless of the quality of the stressed vowel, as for instance, in Standard Russian, described in section 4.1. They can also be dissimilative when neutralization happens only before a certain set of vowels in the stressed position (e.g., the quality of the vowel in the pretonic syllable is [a] before high vowels and [ə] or [i] before a stressed /a/). The latest research of dissimilative *akan'je* includes work by Crosswhite (2000, 2001), Kasatkina (2005), and Bethin (2008, 2010). Bethin (2010) surveys the spread of *akan'je* in East Slavic dialects, focusing on a pattern where *akan'je* unexpectedly spreads in strong positions before doing so in weak positions. She suggests that the unexpected pattern is the result of the contact with neighboring strong *akan'je* dialects and is a consequence of the greater perceptual salience of vowels in strong positions.

4.3. Vowel/Zero Alternations and the Question of Yers

Another topic in Slavic phonology that is particularly relevant to modern phonological theory relates to yers,[1] the vowels that idiosyncratically alternate with zero. While vowel/zero alternations are present in all Slavic languages, most current work on yers has been concentrated on Russian and Polish. The alternations in question are illustrated in (1) for Russian and in (2) for Polish, with alternating yer vowels in (1a) and (2a) vs. non-alternating full vowels in (1b) and (2b) vs. word-final consonant clusters that are not broken up by vowels in (1c) and (2c). The examples in (1) and (2) show that the distribution of yers is indeed idiosyncratic, since there is no generalization, phonological, morphological, or semantic, that can be made in order to differentiate between forms in (1a) and (2a) with yers and forms in (1b–c) and (2b–c) without yers.

[1] Rubach (1984) introduced the spelling 'yer' to distinguish these synchronically alternating vowels from the historical Slavic 'jer' vowels.

(1) Vowel/zero alternations in Russian

a.	son	'dream'	sna	'dream$_{GEN.SG}$'
	kʌvʲor	'rug'	kʌvra	'rug$_{GEN.SG}$'
b.	kot	'cat'	kʌta	'cat$_{GEN.SG}$'
c.	pʲɔtr	'Peter'	pʲɪtra	'Peter$_{GEN.SG}$'

(2) Vowel/zero alternations in Polish

a.	sɛn	'dream'	snu	'dream$_{GEN.SG}$'
	kɔtɕɔł	'cauldron'	kɔtɕła	'cauldron$_{GEN.PL}$'
b.	basɛn	'pool'	basɛnu	'pool$_{GEN.SG}$'
c.	pʲɔtr	'Peter'	pʲɔtru	'Peter$_{GEN.SG}$'

The analysis of yers became a question of considerable controversy in recent years. One of the 21st century's research programs dealing with Polish yers is represented by Jarosz (2006, 2008). Arguing with earlier proposals that rely on syllable structure constraints to derive vowel/zero alternations and treat yers as abstract vowels that differ from full vowels in some way (Rubach 1984, 1986; Szpyra 1989, 1992; Rowicka 1999; Gussmann 2007, among others), Jarosz proposes an output-output correspondence-based approach to the problem (Jarosz 2006) or different cophonologies for non-alternating vs. alternating vowels (Jarosz 2008).

In her article "Unexceptional Segments," Gouskova (2012) challenges the traditional analysis, arguing instead that exceptionality is not a property of segments but of morphemes. She accounts for Russian vowel/zero alternations using the theory of exceptionality, couched in OT with lexically indexed constraints (Pater 2000, 2006). In particular, she proposes that in Russian, the relevant constraint is *Mid, which penalizes mid vowels [e] and [o] and explains why only mid vowels alternate with zero in Russian. Gouskova argues that her account is superior to the representational ones since any vowel can be labeled as nonmoraic underlyingly.

In his 2013 article "Exceptional Segments," Rubach provides a response to Gouskova's (2012) analysis, pointing out that it requires a significant expansion of the constraint inventory in OT and showing that it cannot account for the full range of data in Polish. Morphemes that contain more than one mid vowel, but in which only one mid vowel is deleted, present a problem for Gouskova's (2012) analysis (cf. bɛrɛk 'tag', bɛrka 'tag$_{GEN.SG}$'). Thus, as Rubach (2013) argues, it is segments, and not morphemes, that need to be treated as exceptional.

The most recent phonological analysis of vowel/zero alternations and the representation of yers in Polish is proposed by Rubach (2016). Rubach argues that yers are better represented as floating melodic segments, drawing on the analysis of Rubach (1986).

Some phonetic work on the comparison of yers in their vocalized form with nonalternating vowels was done by Beňuš (2012). After the phonetic examination of yer vowels in Slovak, Beňuš (2012) offers tentative evidence that Slovak yers are weaker than their full-vowel counterparts.

Gouskova and Becker (2013) ran further studies, testing the predictability of alternating vowels in nonce-word paradigms. First, they analyzed the patterning of yers in a dictionary-based corpus (Zaliznjak 1977; Usachev 2004), assessing the speakers' phonological knowledge with respect to vowel/zero alternations. The experiments asked native speakers of Russian to rate the grammaticality of novel words with yer alternations. Speakers were shown to know that mid vowels cannot be deleted and that clusters that violate the sonority sequencing principle were disprefered. Gouskova and Becker (2013) thus conclude that, even though the deletion of yers is idiosyncratic (lexically restricted), it is still phonologically governed.

In the same year, Linzen, Kasyanenko, and Gouskova (2013) conducted two corpus studies and a nonce-word experiment, which showed that the vowel-zero alternation in Russian prepositions (e.g., [s trudom] 'with difficulty' vs. [sə stɪnoj] 'with the wall') exhibits both lexical variation (undergoes rules that apply to a subset of the lexicon) and stochastic variation (undergoes rules that apply optionally, depending on the phonological environment). The relevant stochastic factors, which interact additively, are similarity avoidance, stress position, and sonority profile. In addition to phonologically determined stochastic variation, lexical variation was also shown to be significant. The account of these experimental findings utilized a weighted-constraints approach augmented with lexical scaling factors.

Jarosz, Calamaro, and Zentz (2017) address the question of yers in an article on the acquisition of syllable structure in Polish. Using a longitudinal corpus of spontaneous child speech (available via CHILDES, MacWhinney 2000), they found that the development is sensitive to abstract higher-level representations, which supports the view that feature-based generalizations are crucial in defining vowel/zero alternations.

Finally, government phonology (GP) (Gussmann 2007; Scheer 2006, 2012a, 2012b) provides a different approach to the analysis of yers based on the assumption that syllables are underlyingly sequences of non-branching constituents, onsets and nuclei, some of which can be empty (e.g., the structure, which is phonetically a consonant-vowel-consonant sequence, is viewed as CV_1CV_2, where V_2 is an empty nucleus). According to this theory, the effects that are usually attributed to syllabic configuration follow from Government and Licensing relations between the constituents.

4.4. Stress and Pitch Accent

Stress is quite varied in the Slavic languages, ranging from lexical stress in Bulgarian, Belarusian, Russian, and Ukrainian to fixed stress, which is initial in Czech, Slovak, and Sorbian, penultimate in Polish, and antepenultimate in Macedonian (Comrie and Corbett 1993). The following major topics on stress emerge in the recent phonological literature on Slavic:

- The interaction of stress and vowel reduction (covered in section 4.1);
- Experimental evidence for stress and its relevance to phonological theory (Egger 2007; Newlin-Łukowicz 2012; Dubina 2012; Gouskova and Roon 2013);
- Lexical stress and its interaction with morphology (Alderete 2001; Felt 2002; Butska 2003; Gouskova 2010; Gouskova and Roon 2013; Lavitskaya and Kabak 2014);
- Stress and the phonology/syntax interface (Rudnitskaya 2003; Féry et al. 2007; Neeleman and Titov 2009; Gribanova 2010);
- Interaction of stress and tone (Langston 1997; Zec and Zsiga 2010; Zsiga and Zec 2012).

The experimental investigation of stress can shed light on various theoretical questions. Several recent studies do so by perception experiments or acoustic experiments that investigate the phonetic correlates of stress. For instance, Polish stress has been the only uncontested example of a bidirectional stress system with internal lapses (Kager 1999; McCarthy 2003). However, the study of the phonetic correlates of Polish stress by Newlin-Łukowicz (2012) shows that stress in Polish is noniterative, which casts serious doubt on this kind of analysis. As to the second type of investigation, Gouskova and Roon (2013) present a perception study of secondary stress in Russian compounds. The listeners were asked to rate compounds that were pronounced with and without secondary stress in various locations in a compound. The study revealed two interesting effects. First, a faithfulness effect showed that the realization of secondary stress was optional on lexically stressed stems, but movement of stress was strongly penalized. Second, a sonority sequencing effect showed that the acceptability of secondary stress on linker vowels in compounds improved when the linker was the only vowel in a stem with a falling sonority cluster. The presence of the second effect demonstrated that the Russian stress system distinguishes clusters with falling sonority from other types, at least in compounds.

There has been quite a lot of work done on the behavior of mobile stress in paradigms. Revithiadou (1999) analyzes surface-unpredictable stress in OT on the basis of Russian and Greek examples, and Alderete (2001) uses Russian as one of the major examples in his OT account of morphologically gov-

erned accent, along with Japanese. Building on generative accounts of mobile stress in Russian (e.g., Halle and Idsardi 1995; Halle 1997, among many others), Butska (2003) analyzes mobile stress in nominal paradigms in Russian and Ukrainian, using the output-output correspondence theory. Felt (2002) analyzes the accentuation patterns of prefixed nouns in Bulgarian and Russian, arguing that, while some lexical specification is required, the distribution of stress in prefixed nouns in Bulgarian and Russian is mostly predictable and can be accounted for with morphological, phonological, syntactic, and semantic rules. Dubina (2012) proposes a tonal analysis of Belarusian stress couched in OT, also arguing that, contra Hyman (2006), free stress in languages like Russian can be reanalyzed in purely tonal terms. Dubina then goes on to apply his tonal model of prominence to Slovak vowel length alternations with respect to both progressive shortening (the Rhythmic Law) and regressive shortening.

Alderete (2001) argues that the default location of stress in Russian is poststem, while Crosswhite et al. (2003) investigate morphological effects on default stress in novel Russian words of a CVCVC type, showing that there is a significant preference for stem-final accentuation, which they propose to interpret as evidence for direct encoding of the stem-final default stress position in Russian. Lavitskaya and Kabak (2014) run two production studies, investigating the realization of stress in novel words that lack morphological information. Their findings do not support Crosswhite et al.'s (2003) conclusions. Lavitskaya and Kabak (2014) argue that the default stress in Russian is best described by a metrical system that builds trochees at the right edge of the word.

Russian compounds, unlike single-root words, can have multiple stresses (cf. [səmʌˌlʲˈot-ə-strʌˈjenʲɪjə] 'airplane-*linker*-building'). Gouskova (2010) analyzes patterns of stress in Russian compounds and demonstrates that compounds are single phonological words that are required to be stressed on each sub-stem. Gouskova goes on to claim that her findings can shed light on the "mystery of Russian default stress" (Gouskova 2010), arguing that Russian has two fixed default stresses (prosodic-word-initial and prosodic-word-final) in addition to the mobile stress stems, which, unlike the fixed stress stems, are subject to a default phonology.

There is also investigation of the behavior of stress in specific morphemes, e.g., Ukiah (2003) on the stress in Russian nouns in *-a* and *-ja*, Lagerberg (2005) on the stress of Russian verbs with the suffix *-irovat'*, Lagerberg (2006) on the stress in Russian adjectives with the suffix *-čatɨj*, among others.

The topic that has been of quite considerable interest lately, generally and within Slavic, is the phonology-syntax interface. Bošković and Franks (2002) (and in their later work) discuss the existing approaches and further develop the account of the phonology-syntax interface in South Slavic. Rudnitskaya (2003) argues that the interaction of syntax and phonology is necessary to ac-

count for Russian yes-no *li*-questions in the minimalist framework. Neeleman and Titov (2009) investigate the correlates of [focus] in Russian and come to the conclusion that the evidence from Russian stress challenges accounts of focus-related word order in terms of stress, in particular the nuclear stress rule. Gribanova (2010) addresses the phonology and morphosyntax of the Russian verbal complex, and Féry et al. (2007) investigate information structure and intonation in nominal split constructions in Ukrainian.

Following the pioneering work by Inkelas and Zec (1988) that developed an autosegmental account of tone and stress in the dialects of Serbian traditionally described as "pitch accent," recent research in Slavic phonology has shown a considerable interest in the interaction of stress and accent in BCS. While relying on the main assumptions of Inkelas and Zec (1988), Langston (1997) proposes an autosegmental account of pitch accent in Croatian and Serbian, arguing for three, rather than two, accentual types (along the lines of the traditional analyses) and also positing that the syllable, not the mora, is the locus of tone. Zsiga and Zec (2012) report the results of an experiment that aims to determine the acoustic correlates and the phonological representation of rising and falling accents in Standard Serbian. On the basis of their experimental findings, they propose that both rising and falling accents consist of a single lexical high tone, and the distribution of these accents emerges from the interaction of stress and tone.

While East Slavic languages do not possess distinctive tone, some East Slavic dialects have an unusual type of word prosody: in addition to distinctive word stress, the pretonic vowel is as long or longer than the stressed vowel, and there is a fixed tonal contour over the pretonic and tonic syllable window. Bethin (2006b) proposes that in these dialects a lexical high tone is assigned not to the stressed syllable but to the pretonic syllable and thus is the source of additional duration on that syllable. Variations of stress and tone in these dialects suggest a typology of stress and tone mappings which depend on vowel duration and sonority to different extents. These East Slavic dialects are thus typologically unusual since they exhibit both lexical stress and non-contrastive tone and do not align high tone with stress. Following Bethin's (2006b) account, Mołczanow (2015) analyzes vowel reduction in the immediately pretonic syllable as driven by the tone that spreads from the tonic syllable (see discussion in section 4.1).

4.5. Other Vocalic Phenomena

A number of other vocalic phenomena in Slavic have recently been in the light of phonological investigation. These are either alternations in vowel quantity, such as vowel lengthening, shortening, and coalescence, and alternations in vowel quality, such as fronting/backing and raising/lowering. The work on vowel lengthening includes accounts of compensatory lengthening, such as

Kavitskaya (2002) and later work. As for coalescence, Bethin 2014 analyzes the contraction of VjV sequences to a single V, as in *aja* > *a*, *ojo* > *o*, *uju* > *u*, *eje* > *e*, *ije* > *i* in verbs and adjectives in northern and central Russian dialects, connecting the exceptionality of certain forms to the issues of paradigmatic contrast. Recent work on the alternations in vowel quality is represented by Rubach's (2005) account of mid-vowel fronting in Ukrainian.

5. Consonants

This section will consider consonantal phenomena, such as palatalization and processes connected to [voice].

5.1. Palatalization

Palatalization is one of the most frequently discussed phenomena in Slavic languages, but the traditional use of the term within Slavic has always been confusing to those outside of the field. In Slavic literature, palatalization is defined in several ways. First, palatalization describes the phonetic result of the coarticulation of a consonant with the neighboring high vowel or glide. Second, the phonologization of this effect produces phonemic palatalization as a secondary articulation (surface palatalization per Rubach 2007a). While the phonetic effect of palatalization is typologically common (Bateman 2007), contrastive phonological palatalization is quite rare outside Slavic, present only in a handful of languages, such as Irish, Marshallese, Japanese, Tundra Nenets, and some others.

Russian is used as an example of a system with palatalization as a secondary articulation more often than other Slavic languages since it exhibits the palatalization contrast for most pairs of consonants, except for [ts ʃ ʒ tʃʲ ʃʲː j], and marginally so for the velars (see the most recent comprehensive grammar of Russian by Timberlake (2004)). The contrast is present in most positions in Russian, including word-initially, word-medially (prevocalically and preconsonantally), and word-finally.

Other Slavic languages preserve the contrast for fewer consonantal pairs and/or in fewer environments. For instance, Bulgarian keeps palatalization for all consonantal pairs, but only prevocalically, neutralizing to the non-palatalized member of the opposition in other environments (cf. dɛn 'day' vs. dɛnʲat 'the day'), while Ukrainian differs from Russian in that it does not have the contrast in labials, as well as in the coda *r* (cf. hɔlub 'pigeon' (Russian golupʲ), hirkɨj 'bitter' (Russian gorʲkij). An overview of the typology on contrastive palatalization in Slavic is presented in Iskarous and Kavitskaya (forthcoming).

Yet another use of the term palatalization refers to the sound change under which the primary articulation of a consonant in the vicinity of a front

vowel becomes coronal (coronalization per Rubach 2007a).[2] Coronalization is present synchronically in Slavic, manifesting itself both as morpheme-internal contrasts, as in (3a), and as alternations, as in (3b), on the example of Polish.

(3) Morpheme-internal coronalization in Polish

a. Morpheme-internal contrast

t/tɕ:	tɛn	'that one'	tɕɛŋ	'shadow'
d/dʑ:	dam	'give$_{1SG}$'	dʑadɛk	'grandfather'
s/ɕ:	sadɔvʲitɕ	'to seat'	ɕadatɕ	'to sit down'

b. Coronalization alternations

matsɔx-a	'stepmother$_{NOM.SG}$'
/macɔx-ɛ/ macɔʃɛ	'stepmother$_{DAT.SG}$'
kɔzak	'Cossack$_{NOM.SG}$'
/kɔzak-ɛ/ kɔzatʃɛ	'Cossack$_{VOC.SG}$'

During the last two decades or so, Slavic palatalization has been at the center of research in phonetics and phonology. This research covers representational issues, the issues of contrast, such as dispersion and neutralization, and interfaces, such as phonetics/phonology and phonology/morphology. A general overview of palatalization in Slavic is provided in Rubach (2011a).

The most notable work on the phonetics of palatalization in Russian and its interaction with phonology is by Alexei Kochetov (Kochetov 2002, 2004, 2006). In his 2002 dissertation, Kochetov conducts a study of the distribution of the plain-palatalized contrast in labial and coronal stops in Russian. In particular, he runs articulatory, acoustic, and perceptual experiments to investigate plain and palatalized stops across a word boundary from the point of view of positional asymmetries and neutralization. Kochetov (2006) tests the "licensing by cue" or the "P-map" hypothesis (Steriade 2008) by examining the distribution of the palatalization contrast in Russian. The licensing by cue hypothesis holds that the neutralization of phonological contrast happens in less perceptually salient positions, while the contrast is licensed in more perceptually salient positions. Kochetov (2006) shows that palatalization neutralization patterns in Russian strongly correlate with the relative salience of releases, providing support for the hypothesis. However, the Russian data also suggest that the salience of some perceptual cues, e.g., release, is more relevant than others, e.g., VC transitions, which shows that the actual inter-

[2] The discussion of sound change is outside of the scope of this article.

action between phonetics and phonology is more complex than predicted by the P-map.

The phonetics of the non-palatalized (velarized) counterparts of the palatalized consonants in Russian is addressed in a recent dissertation by Litvin (2014). A recent dissertation addresses the production and perception of palatalized consonants (Pritchard 2012), and the phonetics of the palatalized Russian [r^{j}] in particular is investigated by Kavitskaya et al. (2009) and Iskarous and Kavitskaya (2010).

Rubach (2007a) considers the current models of feature geometry from the perspective of palatalization in Polish, Russian, and Ukrainian. He shows that a working analysis of palatalization alternations in these three languages rejects the tenet of strict parallelism in phonological theory and that derivational stages cannot be avoided in such an analysis. On the basis of the Slavic palatalization data, he argues for the superiority of the Halle-Sagey articulator theory (AT) of feature geometry (Halle 2005) to the Clements-Hume unified feature theory (UFT) of feature geometry (Clements and Hume 1995). Rubach (2007a) analyses surface palatalization, coronalization, and depalatalization in the framework of comparative markedness (McCarthy 2003), arriving at the conclusion that the constraint Pal-*i* that requires agreement in backness in a CV sequence leads to a conspiracy that results in the processes illustrated in (4).

(4) Pal-*i* conspiracy (after Rubach 2007a: 133)

a. //C + i// → [C^{j}i]: palatalization

Polish:

brat 'brother'	'Iwona'	[brat^{j} iwoni]	'Ivonne's brother'

b. //C + i// → [Cɨ]: retraction

Russian:

brat 'brother'	'Ivan'	[brat ɨvana]	'Ivan's brother'

c. //C^{j} + ɨ// → [C^{j}i]: fronting

Russian:

kon^{j} 'horse'	/kon^{j}-ɨ/	[kon^{j}i]	'horse-NOM.PL'

d. //C^{j} + ɨ// → [Cɨ]: depalatalization

Ukrainian:

los^{j} 'moose'	/los^{j}-ɨk/	[losɨk]	'moose-DIM'

Ćavar (2007) proposes a different and novel representation of Polish palatalized consonants, utilizing the [ATR] feature that is traditionally used for the description of vowels.

Rubach (2008a) also discusses "nasal breaking" in Slovenian, where the prepalatal [ɲ], originally from a palatalized [nʲ], alternates with a sequence of dental [n] followed by a palatal glide [j] prevocalically, cf. *kɔɲ* 'horse$_{NOM.SG}$' vs. *kɔnja* 'horse$_{GEN.SG}$.'

Padgett (2001, 2003a, 2003b) uses Russian palatalization to talk about contrast dispersion. This work is relevant for phonological theory, as it makes several points about dispersion theory and formalizes Russian velar palatalization in this framework. It also provides a development to an old debate over whether [i] and [ɨ] are phonemes in Russian (Plapp 1996) as well as to the discussion on the nature of Russian nonpalatalized (plain) consonants.

Contrast preservation has been a central issue in phonology, starting at least with Trubetzkoy (1939), and has been a widely discussed topic in recent phonological literature (Steriade 2007; Avery, Dresher, and Rice 2008; Ní Chiosáin and Padgett 2009; Hall 2011, among many others). Łubowicz (2016) discusses contrast preservation with respect to Polish coronalization (Rubach 1984; Gussmann 2007), using the framework of PC (preserve contrast) theory of contrast, developed in Łubowicz (2012). Łubowicz proposes that contrast preservation is an independent principle in the grammar; in OT, there is a family of constraints on preserving contrasts, or antineutralization constraints. Thus, opaque allomorph distribution in Polish is interpreted in terms of contrast preservation. This analysis adds some insight to the research on opacity, which is one of the most widely discussed problems in the 21st century phonological literature (Kiparsky 2000; McCarthy 2007; Baković 2011, among many others).

The loss of contrastive palatalization in various Slavic languages is discussed in Iskarous and Kavitskaya (2010) and Iskarous and Kavitskaya (forthcoming).

Finally, palatalization in Slavic presents a case of a classical derived environment effect (DEE). DEE in Polish is discussed in Łubowicz (2002), who models Polish palatalization in OT with a local constraint conjunction. Blumenfeld (2003) addresses a DEE in Russian palatalization, accounting for counterfeeding opacity and grandfathering effects within the theory of comparative markedness.

5.2. Voicing

Voicing assimilation and word-final devoicing are well-attested in the languages of the world. Voicing assimilation is common to all Slavic languages, and word-final devoicing occurs in most Slavic languages, with the notable exception of Ukrainian (East Slavic) and Štokavian dialects of BCS (South Slavic).

5.2.1. Voicing Assimilation

Descriptively, voicing assimilation in Slavic languages is regressive, is triggered by the last obstruent in a cluster (both within and across words), and affects all obstruents in the cluster. Sonorants do not undergo or trigger voicing assimilation. Recent work on voicing assimilation in Slavic includes Daniel Currie Hall 2007 on the neutralization of voicing contrast in Czech, Slovak, Polish, and Russian (chapter 2 of the dissertation), Ringen and Kulikov 2012 and Kulikov 2013 on Russian, and Rubach 2008b and Cyran 2014 on Polish.

Two controversial issues were lately discussed with respect to voicing assimilation. First, it has been claimed by Jakobson (1978) that in Russian, sonorants are transparent to voicing assimilation, and therefore underlying /iz mtsenska/ 'from the town of Mtsensk' surfaces as [is mtsenska]. This example found itself in much recent phonological literature (e.g., Padgett 2002; Petrova 2003; Petrova and Szentgyörgyi 2004; Rubach 2008b), even though Robblee and Burton (1997) and Kavitskaya (1999) have challenged the data, if anecdotally so. Kulikov (2013) addresses this question in an instrumental study and shows that obstruents do not assimilate in voicing across sonorants, and thus sonorants are not transparent to voicing in Russian.

A similar claim about sonorant transparency was made for word-final consonant clusters in Polish. Dukiewicz and Sawicka (1995) provide examples like [kɑtr̥ fʲilmu] /kɑdr fʲilmu/ 'film frame,' where /r/ is transparent to the spread of [–voice] to the underlyingly voiced /d/. Rubach (2008b) notes that in word-initial consonant clusters, sonorants block the spread of voicing, attributing the difference to prevocalic faithfulness of segments in the syllable. However, Strycharczuk (2012) shows that the phonetic data do not support the claim that sonorants are phonologically transparent in Polish. The rare exceptions are not considered as due to the phonological grammar of Polish but rather to the coarticulation in certain consonant sequences.

Second, it has been noted that in several Slavic languages, /v/ behaves anomalously, or ambiguously, for the purposes of voicing assimilation, and this behavior is dependent on its position in the syllable. As the examples from Russian illustrate in (5), when /v/ is an undergoer of voicing assimilation, as in (5a), it patterns with obstruents; however, when it is a potential trigger and occupies an immediately prevocalic position, it patterns with sonorants and does not trigger voicing assimilation, as (5b) shows.

(5) /v/ in Russian voicing assimilation

a. korofka 'cow' (dim.) (cf. korov-a 'cow')
f tomʲe 'in the volume'
v domʲe 'in the house' /v/ 'in'

(5) b. tv^{j}er^{j} 'Tver' (city)
dv^{j}er^{j} 'door'

ot vorot	/ot v/	'from gates'
nad vorotam^{j}i	/nad v/	'above gates'
v moskv^{j}e		'in Moscow'
v arm^{j}ii		'in the army'

The special behavior of /v/ has been described by Jakobson (1956), among many others. The literature on /v/ is rather large and here we will focus on the latest analyses.

Cyran and Nilsson (1998) look into the historical development of the Common Slavic **w* and then analyze the behavior of the historical reflexes of **w* in government phonology, deriving the typology of Slavic *v*/*w*. Padgett (2002) treats /v/ as a segment of intermediate sonority. Hall (2003, 2004) analyzes voicing assimilation in Czech and Polish using a theory of contrastive specification based on the successive division algorithm (Dresher 1998) and proposes an underspecification analysis to account for the behavior of /v/, arguing that Padgett's treatment of Russian is untenable at least for Czech. Lulich (2004) looks at the acoustics of the Russian /v/, supporting the claim that /v/ is partially a sonorant and partially an obstruent but providing justification for the underlyingly [–son] /v/. Petrova and Szentgyörgyi (2004), analyzing /v/ in Hungarian and Russian in OT, posit that the behavior of /v/ is the result of the interaction of a constraint, enforcing input-output faithfulness in sonorancy, and a constraint, specific to /v/, requiring it to be a sonorant before a syllabified sonorant. Mołczanow (2007b) defines this segment as the underlyingly laryngeally underspecified sonorant /w/, which strengthens to the obstruent [v] on the surface, but does not receive [+voice] specification. Finally, Bjorndal (2013, 2015) proposes a way to capture the intermediate behavior of /v/ by placing it under different nodes with respect to the general typology of laryngeal voicing vs. sonorant voicing.

5.2.2. Word-final Devoicing

Incomplete neutralization has been the focus of the phonological literature for a while, and specifically Russian surfaced as a topic of interest after Kharlamov's (2014a, 2014b, 2015) work in incomplete word-final devoicing. Kharlamov (2014a, 2014b) shows that minimal pairs that end in phonologically voiced vs. voiceless obstruents, e.g., /kod/ 'code' vs. /kot/ 'cat' are rarely phonetically homophonous and thus present an instance of incomplete neutralization. Kharlamov (2015) studies how perception of the word-final voicing is influenced by orthography (reading vs. non-reading tasks) and by the presence of minimal pairs during the task. The study confirms that the listeners' perception of

voicing is indeed influenced by orthography and lexical competition, but the neutralization is incomplete even without these factors.

6. Consonant Clusters and Syllabification

Slavic languages are known for consonant clusters that do not obey the sonority sequencing generalization (SSG) (Selkirk 1984). Recent work on consonant clusters includes syllabification in Macedonian, Polish, Russian, and Slovak.

Rubach (2011b) investigates a conspiracy of syllabic repairs in Macedonian that eliminates extrasyllabic consonants through disparate processes, such as the syllabification of sonorants, *a*-insertion before rhotics, *a*-insertion before nasals, and schwa insertion. Rubach (2011b) shows that derivational OT is necessary to model the Macedonian data, and that even this theory needs to allow for an additional level of evaluation: the clitic phrase level. Thus, Rubach's analysis of Macedonian syllabification adds to the theoretical discussion of opacity in OT.

While there is quite a large literature on consonant extrasyllabicity in Polish (Rubach 1997; see Bethin 2011 for the summary of the facts on the Polish syllable), recently attention has shifted to the acquisition of the syllable. Łukaszewicz (2006) and Łukaszewicz and Opalińska (2007) look at the strategies that children use to deal with consonants in clusters that present difficulty for the acquisition. Among these strategies are deletion, epenthesis, and consonant adjunction, a strategy that was argued to be utilized in adult Polish, but not in child speech at the stage where the syllables are present as units of organization but prosodic words are not.

Kavitskaya and Babyonyshev (2011) and Kavitskaya et al. (2011) discuss the issues of syllable compexity, sonority, and consonant clusters on the basis of the speech of Russian children with specific language impairment (SLI), comparing the results with typically developing children and showing that the repetition performance is affected by syllable structure complexity for both groups.

Davidson and Roon (2008) investigate durational correlates in the production of Russian biconsonantal sequences in different phonotactic environments, such as word-initial CC clusters and CC sequences across the word boundary, comparing them to CəC sequences. The results show that the second consonant in the sequence is significantly longer in the across the boundary environment than in other sequences and that Russian listeners use durational cues to distinguish between phonotactically identical consonant sequences that differ lexically.

Pouplier and Beňuš (2011) look at the articulatory correlates of syllabic consonants in Slovak. The primary conclusion of the paper is that syllabic

liquids in Slovak do not become more vowel-like in the nucleus, but rather consonantal syllables show less overlap than vocalic syllables.

7. Conclusion

In this article, I have attempted to create a comprehensive overview of recent developments in Slavic phonology, concentrating on the research in phonological theory and the fields it interfaces with. While it is impossible to mention all the work that has been done in the last two decades, I believe that I have identified the most significant directions the research in Slavic phonology has taken and that this overview will serve as a useful tool for Slavic scholars and general phonologists alike. Bethin (2006a) in her overview of Slavic phonology in the United States divides the researchers working on Slavic linguistics into specifically Slavists "primarily interested in Slavic languages and secondarily, if at all, in what the Slavic languages have to say about any given theory" (Bethin 2006a: 9–10) and "general linguists of all theoretical persuasions" (Bethin 2006a: 9). To my mind, the current overview suggests that the dividing line between the two groups of researchers is becoming less distinct and that, while the division is still clear in historical phonology and dialectology (not covered in the present article), only ten years after Bethin's overview it has become more difficult to separate Slavic synchronic phonology from general linguistics. Indeed, there is a tendency to have less Slavic phonology associated with graduate programs in Slavic departments. However, this does not mean that Slavic phonology is in decline. On the contrary, Slavic languages prominently figure in theoretical phonology discussion and provide important and significant data points to the topics of major theoretical interest, and the data analyses by phonologists, Slavic or otherwise, contribute to the most complex and state-of-the-art research in phonological theory.

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