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Underlying contrasts and the East Slavic post-velar fronting

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Extract from Dresher (2009: §8.3)

8.3. Dispersion-theoretic approaches to contrast

Another way of incorporating contrast into phonological theory has been explored in Dispersion Theory (Flemming 2002, 2004, Ní Chiosáin and Padgett 2001, Padgett 2003a, b), an approach that derives from the work of Liljencrants and Lindblom 1972 and Lindblom 1986. In §8.3.2 I present Padgett's account of the East Slavic post-velar fronting. Padgett (2003a) argues that the contrastive status of the velar consonants is a key to understanding a sound change in East Slavic whereby velars fronted before [ɨ]. While this insight is correct, I will take issue with another aspect of Padgett's analysis: whereas Padgett sees the contrast between [i] and [u] as being a crucial part of the motivation for the change, I will propose a MCS analysis in which the relation between [i] and [ɨ] is what drives the change (§8.3.3). I will argue (§8.3.4) that Padgett's approach raises intractable issues of implementation, and that the MCS analysis is much simpler.

Padgett (2003a, b) proposes that Dispersion Theory (DT) is not just a theory of inventories, but also plays a role in the workings of the phonology; in particular, he proposes an instantiation of DT which he argues is the way that considerations of contrasts are brought to bear on the phonology. He illustrates this approach with an analysis of an East Slavic sound change known as post-velar fronting.

8.3.1. A dispersion-theoretic analysis of the East Slavic post-velar fronting

8.3.1.1. The velars and /i/ in Russian

Modern Russian consonants contrast in palatalization: palatalized consonants are paired with nonpalatalized (or perhaps velarized) counterparts (3). The consonants /j, ts, tʃʲ, ʒ, ʃ, ʃʲː/ are unpaired (/ʃʲː/ may actually be a sequence of consonants and not a phoneme; it does not act like the partner of /ʃ/).

(3) Russian consonant phonemes

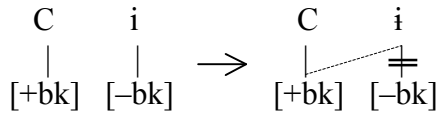
	Labial		Dental		Post- alveolar		Palatal	Velar	
Stop	p	pʲ	t	tʲ				k	kʲ
	b	bʲ	d	dʲ				g	gʲ
Fricative	f	fʲ	s	sʲ	ʃ	ʃʲː		x	xʲ
	v	vʲ	z	zʲ	ʒ				
Affricate			ts			tʃʲ			
Nasal	m	mʲ	n	nʲ					
Lateral			l	lʲ					
Rhotic			r	rʲ					
Glide							j		

Russian has five vowel phonemes, /i, e, a, o, u/. Both palatalized and nonpalatalized consonants can occur before back vowels, word finally, and pre-consonantally. Both palatalized and nonpalatalized

consonants may occur before /i/, which varies allophonically: it is pronounced [i] after palatalized consonants and [ɨ] after nonpalatalized consonants.[1]

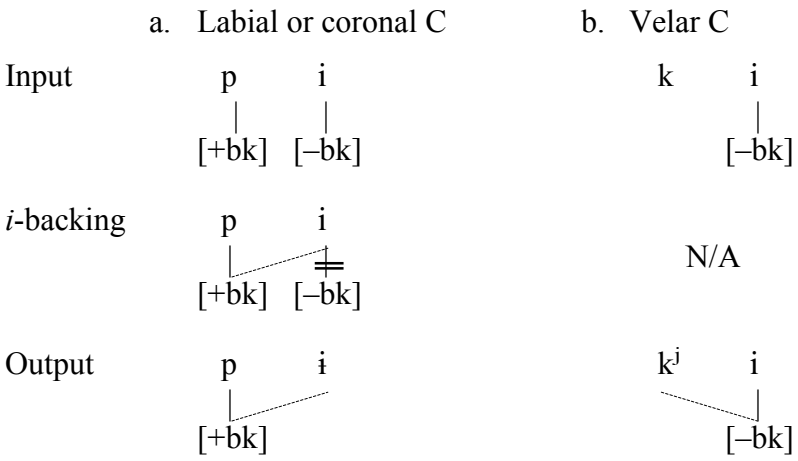
Padgett (2003a: 45) follows Farina (1991) in supposing that palatalized consonants are specified [–back], and 'plain' (actually velarized) consonants are specified [+back]. The vowels /i/ and /e/ are specified [–back], and /a/, /o/, and /u/ are specified [+back]. The allophony of /i/ is accounted for by the rule in (4).

(4) Backing of /i/ after [+back] consonants



Velars /k, g, x/ behave differently from other consonants: they have front allophones before /i/ and /e/, and back allophones before /a, o, u/. Padgett observes that this patterning follows naturally if velars have no specification for [back] at the point that the backing rule (4) would apply, as shown in (5).[2] *i*-backing fails to apply; instead, the [–back] /i/ causes the velar to palatalize.

(5) Sequences of /Ci/



Padgett (2003a) argues that this solution is not satisfactory, however, because it depends on specifying the underlying representation of /i/ as [–back]; according to the principle of richness of the base (Prince and Smolensky 2004), the grammar should give the correct output for any input, including an input /i/ that is [+back] (i.e., [ɨ]). Clearly, an underlying sequence /kɨ/ will result in surface [kɨ], not [kʲi].

8.3.1.2. Diachronic changes

Padgett proposes further that, whatever one may think of richness of the base, there was a time when /kɨ/ *was* the input to velar fronting. There was a time in the history of Russian when velars occurred before [ɨ] but not before [i] (6c). Between the twelfth and fourteenth centuries East Slavic underwent a change, post-velar fronting, whereby sequences like [kɨ], [gɨ],and [xɨ] fronted to [kʲi], [gʲi], and [xʲi],

[1] Before /e/, only palatalized consonants may appear across word boundaries; some speakers have unpalatalized consonants before /e/ within roots in some loan words (Padgett 2003a: 43, Timberlake 2004: 58).

[2] Given that the chart in (8.3) shows both palatalized and unpalatalized phonemic velars, readers may wonder why velars have no contrastive specification for [back]. We will see below that in earlier Russian there were no phonemic palatalized velars; a contrast was created through borrowings and analogy (Padgett 2003a: 46–47, Timberlake 2004: 59–60). In native words only non-palatalized velars occur before /i, e/ within morphemes, a legacy of the earlier situation. We could suppose that an underlying [–back] feature is deleted from velars in this context.

respectively (6d). This fronting did not cause a merger with sequences deriving from historical /ki/, /gi/, and /xi/ (6a), because these sequences had mutated to palato-alveolars, such as [tʃʲi/, prior to post-velar fronting (6b). This change, traditionally known as the First Velar Palatalization (FVP), opened up a gap in the inventory that could be exploited by post-velar fronting.

(6) Slavic sound changes

a. Prior to changes

pi	pɨ	pu
kʲi	kɨ	ku

b. First Velar Palatalization (Common Slavic)

pi	pɨ	pu
tʃʲi		
	kɨ	ku

c. Rise of palatalized consonants (post-Common Slavic)

pʲi	pɨ	pu
tʃʲi		
	kɨ	ku

d. Post-velar fronting (East Slavic)

pʲi	pɨ	pu
tʃʲi		
kʲi		ku

8.3.1.3. The dispersion-theoretic analysis of Padgett (2003a)

Since Jakobson (1962 [1929]), there have been attempts to relate post-velar fronting to the contrastive status of the velars following FVP. Analysts differ, however, in the way they incorporate contrast into the analysis. Padgett (2003a) proposes that post-velar fronting occurred because [kʲi] makes a better contrast with [ku] than does [kɨ]. The labial and coronal consonants participate in a three-way contrast (represented by [pʲi] ~ [pɨ] ~ [pu]); therefore, the contrast between [pɨ] and [pu] cannot be 'improved' by fronting [pɨ] to [pʲi] without neutralizing the contrast between [pɨ] and [pʲi]. Following FVP, there were no longer sequences [kʲi] in contrast with [kɨ] or [ku].

To implement this analysis, Padgett follows Flemming's 1995 dissertation (published in revised form as Flemming 2004) in assuming that possible inputs and candidate forms within OT can include not only individual forms, but sets of forms. In Ní Chiosáin and Padgett's (2001) interpretation, the objects of analysis are taken to be entire languages. Padgett (2003a: 51) writes that 'this daunting prospect is made manageable by means of extreme idealization.' The idealization starts by limiting the set of relevant forms to the ones in (7).

(7) Set of East Slavic 'words' (Padgett 2003a: 53)

pi	pɨ	pu	pau
pʲi	pʲɨ	pʲu	pʲau
tʃi	tʃɨ	tʃu	tʃau
tʃʲi	tʃʲɨ	tʃʲu	tʃʲau
ki	kɨ	ku	kau
kʲi	kʲɨ	kʲu	kʲau

Padgett posits a family of SPACE constraints that penalize sets of forms that do not allow for sufficient perceptual contrast along designated dimensions. As part of the extreme idealization of his analysis, Padgett restricts attention to the colour dimension, that is the properties of backness and roundness that are primarily signalled by the second vowel formant. The SPACE constraint employed in his analysis is defined as in (8). This definition, which is one instantiation of the general definition that would apply for any dimension and any portion of the range, refers to 'potential minimal pairs', which Padgett defines as in (9).

(8) SPACE constraint for East Slavic (Padgett 2003a)

SPACE$_{COLOR}$ ≥ 1/2: Potential minimal pairs differing in *vowel color* differ by at least 1/2 of the full *vowel color* range.

(9) Potential minimal pairs (Padgett 2003a: 54)

A potential minimal pair is a pair of words having the same number of segments, and all but one of whose corresponding segments are identical.

It would take us too far afield to review Padgett's entire analysis, but it will suffice to focus on the crucial step when post-velar fronting took place, which Padgett represents as in (10).

(10) Post-velar fronting: SPACE >> IDENT(COLOR) (Padgett 2003a: 74)

	pi$_1$ pɨ$_2$ pu$_3$ kɨ$_5$ ku$_6$ tʃ^{j}i$_4$	*Merge	*au	Space	Id-Col
a.	pi$_1$ pɨ$_2$ pu$_3$ kɨ$_5$ ku$_6$ tʃ^{j}i$_4$			***!	
b. ☞	pi$_1$ pɨ$_2$ pu$_3$ k^{j}i$_5$ ku$_6$ tʃ^{j}i$_4$			**	*
c.	pi$_1$ pɨ$_2$ pu$_3$ k^{j}i$_5$ kɨ$_6$ tʃ^{j}i$_4$			***!	**
d.	pi$_{1,2}$ pu$_3$ k^{j}i$_5$ ku$_6$ tʃ^{j}i$_4$	*!			**

Padgett (2003a) supposes that the input to (10) is essentially the set of surface forms in (6b), a stage after FVP, but immediately before post-velar fronting (Padgett (2003a: 73n25) notes that he omits the palatalization in [pi$_1$], though this form was undoubtedly palatalized). He proposes that what precipitated post-velar fronting was a reranking of the constraints SPACE and IDENT(COLOR). Prior to this reranking, IDENT(COLOR) ensured that an underlying /kɨ/ would surface as such. Following the reranking, the faithful candidate (10a) becomes less optimal than (10b), with [k^{j}i] as the surface correspondent to input /kɨ/, because the latter has better separation from [ku]. Candidate (10d) has optimal spacing on the colour dimension, but violates *Merge, which penalizes any surface mergers of forms that are underlyingly distinct.

The intuition behind the DT analysis is that the trigger for post-velar fronting is the possibility of input /kɨ/ gaining better separation from /ku/ by fronting. To implement this idea formally, Padgett must resort to a series of 'extreme idealizations' that are rather problematic, for reasons I will discuss below.

First, however, I will present an alternative analysis of post-velar fronting that also crucially depends on the contrastive status of the sequence /kɨ/, but which puts the emphasis on the relationship between [i] and [ɨ] rather than on the relationship of these vowels to [u].

8.3.2. A Modified Contrastive Specification analysis of post-velar fronting

The theory of MCS allows for a different solution to post-velar fronting, one that does not require the problematic selection of sets of inputs, and which is actually closer to the spirit of Jakobson's 1929 analysis. Following standard chronology, I assume the sequence of grammars in (11), starting with post-Common Slavic at a point after FVP but before the East Slavic post-velar fronting. In this stage, which I arbitrarily designate as Stage 1, vowels but not consonants have contrastive values of [back] (11). Palatalization applies to spread [–back] from /i/ to a preceding consonant.

(11) Stage 1: Vowels, not consonants, are contrastively [back]

Underlying	/p i/	/p ɨ/	/tʃ i/	/k ɨ/
	[–bk]	[+bk]	[–bk]	[+bk]
Palatalization	pʲ i	—	tʃʲ i	—
	[–bk]		[–bk]	
Phonetic	[pʲi]	[pɨ]	[tʃʲi]	[kɨ]

A major event in the history of Slavic was the fall of the jers. Jers were short vowels, one front and one back; like other front vowels, the front jer caused palatalization. When the jers fell, palatalization that had been triggered by the front jer became opaque as a synchronic process. This situation led to a reanalysis of palatalized consonants as underlying (Jakobson 1962 [1929]: 57, Shevelov 1964: 497). Now vowels as well as most consonants had contrastive values for [back], as shown in (12).

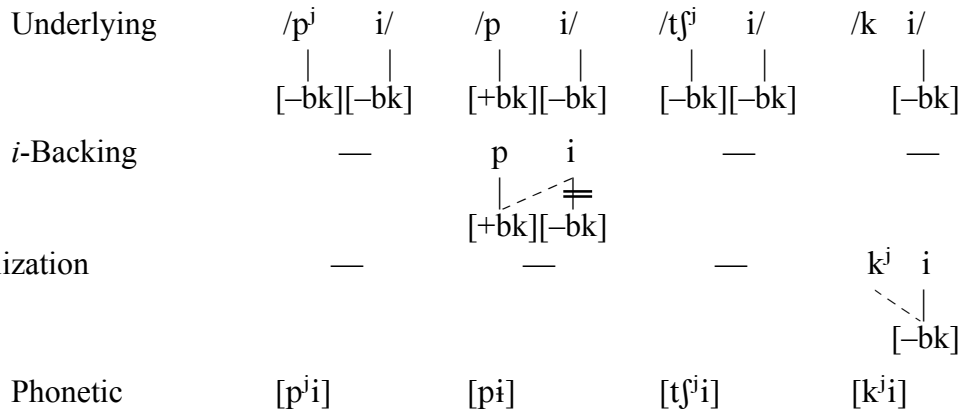
(12) Stage 2: Vowels and paired consonants are contrastively [back]

Underlying	/pʲ i/	/p ɨ/	/tʃʲ i/	/k ɨ/
	[–bk][–bk]	[+bk][+bk]	[–bk][–bk]	[+bk]
Palatalization	—	—	—	—
Phonetic	[pʲi]	[pɨ]	[tʃʲi]	[kɨ]

In the grammar (12) the velars, unlike the labials and dentals, do not have contrastive values for [back]. This is because velars are unpaired, original [kʲ] having become [tʃʲ]. Palatalization does not apply synchronically in the forms in (12), but presumably remains in the grammar to account for palatalization of consonants by front vowels across morpheme boundaries.

By this stage the contrastive status of [ɨ] was becoming unclear: in most cases, [i] follows a front consonant and [ɨ] follows a back consonant. Other developments, such as the disappearance of [ɨ] at the beginning of words, led to [i] and [ɨ] being in complementary distribution: [ɨ] followed back consonants and [i] occurred elsewhere. This regularity led to a reanalysis of the contrastive status of [ɨ], which ceased being an independent phoneme, and became a conditioned allophone of /i/, as shown in (13) (Jakobson 1962 [1929]: 70, Shevelov 1964: 503).

(13) Stage 3: /ɨ/ reanalyzed as [+back] allophone of [–back] /i/



Once [ɨ] was reanalyzed as a [+back] allophone of [–back] /i/, it required an adjacent [+back] consonant, or some other donor, to give it a [+back] feature; lacking that, underlying /i/ would surface as [i]. Labial and dental consonants had a contrastive [+back] feature to spread, but velars did not. Hence, an original sequence [kɨ], once reanalyzed as deriving from /ki/, would begin to surface as [kʲi].

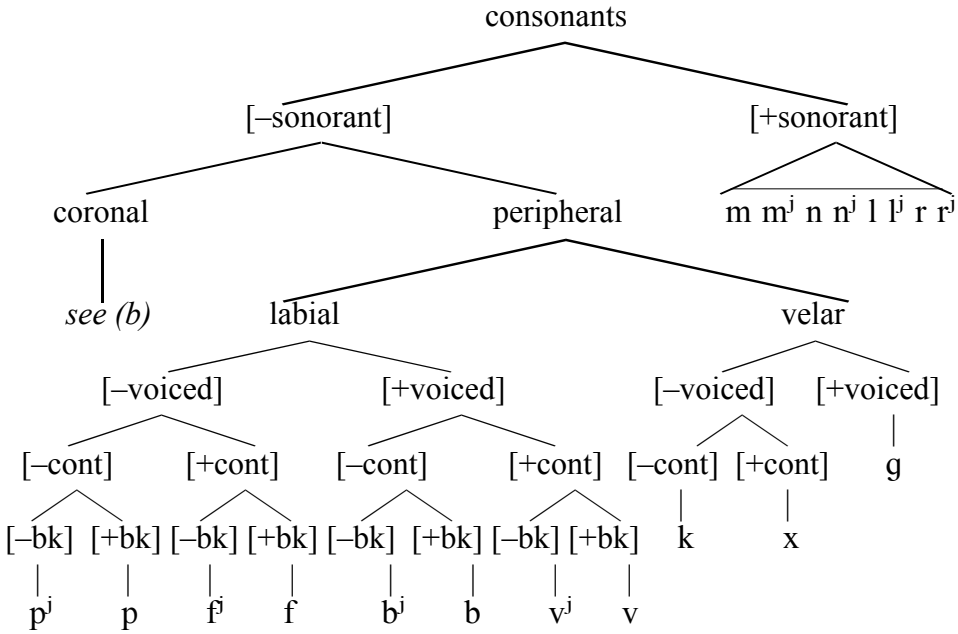
The above analysis requires a contrastive hierarchy for East Slavic along the lines of (14), generating the tree in (15).[3]

(14) Contrastive feature hierarchy for East Slavic obstruents

[sonorant] > major place features > [voiced] > [continuant] > [back] > other coronal features

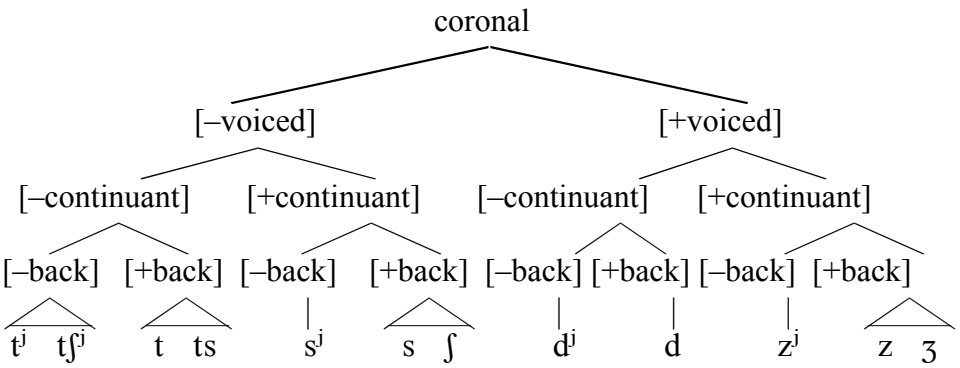
(15) Contrastive feature tree for East Slavic obstruents

a. Labials and velars



[3] I disregard here the special status of Russian /v/ with respect to voicing and devoicing assimilation (Hayes 1984, Kiparsky 1985, Padgett 2002, Hall 2007). Hall (2007: 65–66) proposes that Russian has three classes of consonants: sonorants, specified for [Sonorant Voice]; obstruents, specified for [Laryngeal]; and /v/, which has neither specification.

b. Coronals



In the analysis sketched above what drives the fronting of [kɨ] to [kʲi] is the contrastive status of the velar together with the reanalysis of [ɨ] as a conditioned allophone of [–back] /i/.[4] The distance of [ɨ] from [u] plays no direct role in the analysis, hence there is no need for the phonology to compute the relative spacing of vowels from each other.[5]

8.3.3. Comparing the analyses

Padgett's DT analysis and the MCS analysis presented above have in common that they connect the East Slavic post-velar fronting to the contrasts obtaining in the East Slavic inventory. However, the way in which this idea is implemented in each theory is very different. I believe that the version of DT presented in Padgett 2003a runs into significant conceptual and technical difficulties.

8.3.3.1. Richness of the base

Padgett (2003a: 47) rejects any solution that requires the input to post-velar fronting to be specified as /i/ (and not /ɨ/) on grounds of richness of the base.

As discussed in §6.4, in the conception of phonological organization proposed here the appropriate place for richness of the base to be observed is at the phonological level that produces well-formed contrastive specifications as its output. A learner of East Slavic at the stage just prior to post-velar fronting (13), for example, would acquire the contrastive inventory of that stage. The above analysis assumes a partial contrastive hierarchy for the five vowel phonemes /i, e, a, o, u/ as shown in (16).[6] This hierarchy translates into the OT constraint hierarchy in (17).

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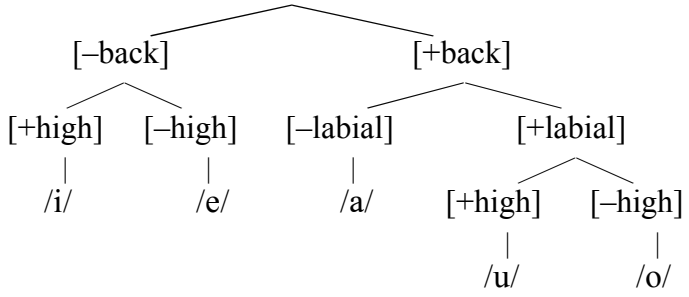
[4] This analysis is close in spirit to Jakobson's. According to Jakobson (1962: 70), once the vowels [*i*] and [*ɨ*] were transformed into allophones of a single phoneme, there was a tendency to unify the phoneme, which manifested itself by generalizing the fundamental allophone after an unpaired (i.e., velar) consonant. In other words, the underlying contrastive features of a phoneme (the 'fundamental allophone', or basic variant) will tend to surface in the absence of a process that would act to change them.

[5] The presence of /u/ in the inventory plays an indirect role, for it enters into a determination of the system of contrasts for the language.

[6] This hierarchy is underdetermined by the data we have seen: it could be that [low] was higher in the order than [labial], for example. What is important for our analysis is that /i/ is contrastively [–back].

(16) East Slavic partial contrastive hierarchy: [back] > [low] > [high]



(17) Constraint hierarchy corresponding to (16)

MAX [back] >> *[labial, –back] >> MAX [labial] >> *[high, –labial] >> MAX [high] >> *[F]

Richness of the base holds at the level of the input to the constraint hierarchy in (17). Any vowel that is input to the constraints in (17) will emerge as one of the five contrastive vowel phonemes in (16). These vowels, in turn, serve as the input to the phonology proper. At this point, richness of the base is no longer a factor. Therefore, there can be no input /kɨ/ to the phonology of East Slavic at the stage immediately preceding post-velar fronting.

Padgett (2003a) must assume something similar. In order to be able to describe a sequence of sound changes, he adopts, 'as an expository convenience', the synchronic base hypothesis (Hutton 1996, Holt 1997), which holds that the input at each historical stage is the output of the previous stage.

This hypothesis appears to be too limited. Taken literally, the synchronic base hypothesis is a return to the Neogrammarian conception of sound change as applying to surface forms (see Dresher 1993 for discussion). In the view of classical generative phonology, which I adopt here, sound change must be understood relative to the entire grammar. Some sound changes may cause restructuring of underlying forms, so that the input (underlying form) of one stage approximates the output (surface form) of an earlier stage. More typically, however, sound change does not result in a complete restructuring of underlying forms, but rather remains in the grammar as a synchronic rule.

Post-velar fronting provides a good illustration of this principle. In the MCS analysis, the immediate input to the stage that produced post-velar fronting, /ki/, is *not* the output of the previous stage, which was [kɨ]. In this case, the important change occurred at the underlying level: the previously independent phoneme /ɨ/ was reanalyzed as an allophone of /i/.

Leaving aside the adequacy of the synchronic base hypothesis, the essential point is that in Padgett's DT analysis, as in the MCS analysis, the input to the relevant part of the phonology does not adhere to richness of the base. Therefore, Padgett's original objection to the analysis in (5) loses its force.

8.3.3.2. 'Extreme idealization'

The evaluation of sets of input and candidate forms, required in order to implement the DT analysis, is an obvious departure from standard OT, and from standard generative phonology, more generally. While evaluating a set of forms takes more resources than evaluating single forms, what I wish to focus on here is the arbitrary nature of the set of forms in (7). These forms were chosen because they have just the properties that allow the analysis to proceed.

Padgett (2003a: 50–53) defends this approach as being an idealization that is common practice in phonology: 'Limiting the words considered for an analysis actually makes explicit what is implicit in the practice of phonology.' He compares a phonologist demonstrating an analysis of English aspiration by

choosing only a small number of words and relevant candidate forms, say the word *pat* and the three candidates [pʰæt], [pæt], and [bæt]. Padgett points out that the analyst is unlikely to choose words or forms that do not effectively illustrate the important aspects of the analysis.

While this is certainly true, this case is entirely different from what Padgett is proposing. In the example of English aspiration, the limitation occurs only in the *demonstration* of the analysis: there is no limitation on what forms may be *considered by the grammar*. A correct analysis of English aspiration ought to give the correct results for any arbitrarily chosen list of English words. Padgett's 'extreme idealization' goes beyond the mere demonstration of his analysis: it is built into the evaluation procedure of the grammar. To compare with the English aspiration example, Padgett would have to show that the same results would be obtained if other sets of forms were presented to the grammar.

It is hard to see how this could be the case, since the DT analysis limits not only the forms that could be considered, but the dimensions of contrast as well. Thus, the only SPACE constraint that is allowed to play a role in the analysis is SPACE$_{(COLOR)}$, which evaluates vowel spacing along the second formant. But other dimensions of contrast also exist, some of them quite relevant to this case. For example, the grammar in (10) rates candidate (b) as better than candidate (a) because [kʲi, ku] is a better contrast than [kɨ, ku]. At the same time, though, [kʲi, tʃʲi] is a *worse* contrast than [kɨ, tʃʲi]. It has not been shown that this contrast is less important. Indeed, we could argue the opposite: while there is no real evidence that there is something problematic about keeping [kɨ] distinct from [ku], we know from the history of Slavic that [kʲi] *is* liable to be turned into [tʃʲi]. It was this very change that created the gap in the inventory in the first place.[7] Therefore, it is unclear that the DT analysis can go through if we take into account other dimensions of contrast. This, again, is very different from the example of English aspiration.

8.3.3.3. Minimal pairs

The SPACE constraints in the DT analysis refer crucially to the notion of 'potential minimal pairs', that is, words distinguished by a single segment. Just as phonemes distinguished by a single phonetic property are hard to find at the phonetic level, so surface minimal word pairs are more elusive than one might suppose.

First, the existence of genuine minimal pairs that satisfy the definition in (9) is greatly compromised by phonetic effects. As pointed out by Chomsky (1964: 94), the substitution of a segment [Q] in place of [P] in the phonetic frame [RPS] will not necessarily result in [RQS], since [Q] might affect the neighbouring segments differently from [P]. The result is more likely to be [R'QS'], where R' and S' differ from R and S, respectively. An example arises in (10), where [pi, pɨ, pu] are supposed to differ minimally only in the vowel. However, [pi] is in fact [pʲi], which does not form a minimal pair with either [pɨ] or [pu]. Strictly speaking, then, the SPACE constraint would not be able to evaluate the separation between [pʲi] and [pɨ] or [kʲi] and [ku].

Second, although the definition in (9) refers to 'a pair of words', Padgett (2003a: 78–79) makes clear that the SPACE and *MERGE constraints do not operate with actual East Slavic words, but with *possible* words. For if they evaluated actual words, the analysis would predict that post-velar fronting would occur only in cases where a word containing the sequence [kɨ] actually formed a minimal pair with a word containing the sequence [ku]. In words containing [kɨ] for which there was no minimal pair with [ku], SPACE would evaluate the vowel [ɨ] as having 100% of the colour space to itself, in which case [ɨ] is actually the optimal vowel. In fact, post-velar fronting applied to all cases of [kɨ]. As Padgett (2003a: 79) correctly observes, 'the absence of forms such as [kʲi] was a systematic gap, not an accidental one'. But then the existence of minimal pairs as defined in (9) plays no role in this change.

[7] Padgett (2003a: 59) cites Guion 1998 as showing that [kʲ] is easily confusable with [tʃʲ].

8.3.3.4. Why are velars treated separately?

In comparing the merits of the DT and MCS analyses it is necessary to clarify what each analysis explains and leaves unexplained. Up to here I have been pointing out problems for the DT analysis, so fairness requires that we subject the MCS analysis to comparable scrutiny.

Let us look again at the proposed East Slavic contrastive hierarchy in (14) and (15). If this analysis is a descriptively adequate hypothesis about the phonology of East Slavic, then (14) should be part of the grammar internalized by native speakers. As in other cases, however, the MCS analysis does not answer how a learner would know to arrive at this particular feature ordering. To that extent, the analysis does not meet the criterion of explanatory adequacy, as set out in Chomsky 1957: given the data of a language, we cannot explain how learners are led to the (presumably) correct grammar.

Let us consider in particular why the velars are not contrastively specified for the feature [back]. This follows from the ordering of the major place features, as well as [voiced] and [continuant], ahead of [back]. If the feature [back] were ordered higher in the hierarchy, then the velar consonants would also receive contrastive specifications for [back], despite the fact that they are 'unpaired'. Therefore, how the features come to be ordered in the right way is an unexplained step in the analysis. One might suspect, then, that some of the complexity of Padgett's DT theory could arise from an effort to make explicit this aspect of the analysis. That is, the learner who in the MCS theory has to arrive at a contrastive hierarchy must be making some sort of comparisons between forms; perhaps we could understand the evaluation of idealized sets like (7) as an attempt to explain how this sort of comparison works.

Examination of the DT analysis shows, however, that this is not at all the case. The DT analysis *also* has to assume, without explanation, that labials and coronals are somehow treated together, but that velars are distinct. Thus, Padgett (2003a: 52–53) writes in connection with the set of forms in (7), 'I am assuming that only the kinds of distinctions evident in this group of forms are relevant to an analysis of the sound changes of interest. For example, it will be important to treat velars on the one hand separately from dentals and labials on the other. In this idealization, non-velars are represented by [p]. Differences among the various labials and dentals of Slavic are not relevant to the analysis.'

In other words, the DT analysis does not attempt to explain how it comes about that velars are treated separately from labials and dentals: rather, it presupposes that this is so, and builds the difference into the representations presented to the grammar. Therefore, the DT analysis has no advantage with respect to explanatory adequacy to compensate for its descriptive problems.

Given that neither theory (nor any other one, to my knowledge) can explain how learners of East Slavic come to know that velars should be regarded as noncontrastive for [back], the advantage shifts back to the MCS analysis. For in the MCS theory, it is a given that learners must arrive at *some* contrastive hierarchy for their language. Moreover, this same hierarchy must account not just for the behaviour of velar consonants and the feature [back], but also for the other phonemes and features as well. Thus, multiple sources of evidence exist bearing on the construction of the contrastive hierarchy of a language.

It is not clear whether there are comparable limits on DT theory. The idealizations made to account for post-velar fronting are particular to that problem. Nothing in the theory as presented in Padgett 2003a would prevent us, for example, from grouping together East Slavic velars and labials against coronals if that suited a different problem.

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