Trade-offs in the contrastive hierarchy: Voicing *versus* continuancy in Slavic

The Successive Division Algorithm for phonological feature specification (SDA; Dresher 2009, *inter alia*) holds that features are assigned by recursively subdividing the phonological inventory, so that no feature is specified unless it serves to mark some phonemic contrast. Because it does not stipulate a universal hierarchical ordering of features, the SDA can assign different specifications to similar inventories in different languages. Some critics (e.g., Blaho 2008; de Lacy 2010) have suggested that this means the SDA does not make sufficiently strong predictions—if feature hierarchies are inferred from phonological activity rather than being posited *a priori,* is the SDA merely reflecting phonological patterns rather than predicting them? While the SDA does not directly predict feature specifications from the shape of the inventory alone, it does predict that the inventory constrains specifications in a non-trivial way. Any two (sets of) phonemes can be featurally distinguished only once; even if they differ phonetically in more than one property, only one of the corresponding phonological features can actually be assigned to them. There is thus a trade-off: where one feature is designated contrastive (and thus assigned), another cannot be. In this paper, we examine a case from Russian in which the SDA correctly predicts such a trade-off between voicing and continuancy.

In arguing against the structuralist conception of the phoneme, Halle (1957, 1959) pointed out that Russian voicing assimilation creates some surface segments that are not underlyingly contrastive. Although /ts tʃ x/ do not have underlying voiced counterparts *\/dz dʒ ɣ/, they trigger regressive assimilatory devoicing (like the other voiceless obstruents) and undergo regressive assimilatory voicing (resulting in surface [dz dʒ ɣ]). This implies that, like the voiceless obstruents that have voiced counterparts, /ts tʃ x/ are phonologically specified for [−voice].

Although Halle (1959) assigns features on the basis of a contrastive hierarchy, he does not do so with a view to phonological activity; rather, he constructs the hierarchy so as to minimize the number of underlying specifications (see also Cherry *et al.* 1953). In particular, he gives [±voice] relatively low scope, so that it is not underlyingly specified on /ts tʃ x/; the tree in Fig. 1a shows his specifications for the palatal and velar consonants. Because Halle does not assume that non-contrastive features remain unspecified throughout (any particular part of) the derivation, this simply means that redundant [−voice] is added to /ts tʃ x/ by a phonological rule that applies before regressive assimilation (Halle 1959: 63, rule P 1b).

Halle's approach thus ultimately gives very little special importance to the contrastive features designated by the hierarchy. If we instead assume that underspecification persists through (some well-defined part of) the derivation, however, the hierarchy in Fig. 1a cannot be the right one. If

Figure 1: Two possible contrastive hierarchies for Russian palatal and velar obstruents

a. continuant ≫ voice (Halle 1959: 46)   b. voice ≫ continuant
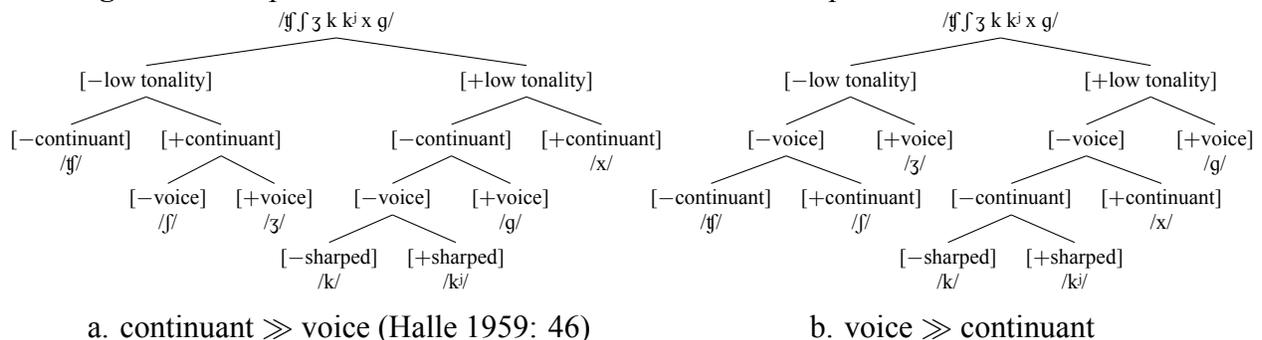
[±voice] is phonologically active on /ts ʧ x/, it must be specified; if it is specified, it must have sufficiently high scope; and if [±voice] has higher scope than in Halle's tree, some other feature must have lower scope. The simplest revision to Halle's hierarchy is to reorder [±voice] and [±continuant], as in Fig. 1b. Given this hierarchy, [±voice] will be specified on all obstruents, including /ʧ/ and /x/ (and /ts/, not shown here for reasons of space). This ordering is suggested by the voicing assimilation facts, but it predicts other consequences as well. Promoting [±voice] over [±continuant] leaves the latter unspecified on /ʒ/ and /g/.

As it turns out, this is entirely in accord with other phonological patterns in Russian. Circumstantially, we note that in some varieties of Russian, /g/ is realized phonetically as [ɣ] or [ɦ], consistent with (though not entailing) the proposition that it is unspecified for [±continuant]. In morphophonological alternations between velars and palatals arising from the historical First Palatalization, underlying continuancy is preserved in the pairs /x/∼/ʃ/ and /k/∼/ʧ/, but /g/ alternates with /ʒ/, as in the positive/comparative pairs in (1) and the 3pl/3sg pairs in (2) (Lightner 1965):

(1) a. tʲi**x**-ij tʲi**ʃ**-e 'quiet(er)' (2) a. ma**x**-ut ma**ʃ**-et 'wave(s)'
     b. ʒar**k**-ij ʒar**ʧ**-e 'hot(ter)'   b. pe**k**-ut pe**ʧ**-et 'bake(s)'
     c. doro**g**-oj doro**ʒ**-e 'dear(er)'   c. stri**g**-ut stri**ʒ**-et 'shear(s)'

Given the specifications in Fig. 1b, the alternations can produced by a rule that simply changes a [+low tonality] consonant to [−low tonality] in the appropriate morphophonological context.

Indeed, the predicted underspecification of continuancy on /g/ and its cognates can contribute to explaining a range of synchronic and diachronic phenomena in the Slavic languages, most of which have the same asymmetry in the velar obstruents as Russian (with /k x/ opposed to a single voiced segment of variable continuancy). E.g., in Ukrainian, historical */g/ has become /ɦ/, making its alternations with coronal continuants more phonetically transparent and also allowing the introduction of a new, marginally contrastive stop /g/ through borrowings (Shevelov 1977). In Lower Sorbian, in contexts where /k/ alternates with /ts/ and /x/ with /ʃ/, /g/ alternates with /z/ unless it is preceded by /z/, in which case it becomes /ʣ/ instead (Schaarschmidt 1998):

(3) a. ru**k**-a ru**ts**-e 'hand' (nom./dat.)   c. no**g**-a no**z**-e 'leg' (nom./dat.)
     b. mu**x**-a mu**ʃ**-e 'fly' (nom./dat.)   d. roz**g**-a roz**ʣ**-e 'twig' (nom./dat.)

Though the SDA permits variability in feature ordering, contrast still restricts the features that can be assigned. These restrictions make clear predictions, borne out in these Slavic examples.

Blaho, Sylvia (2008). *The syntax of phonology*. Phd thesis, Universitetet i Tromsø.

Cherry, E. Colin, Morris Halle & Roman Jakobson (1953). Toward the logical description of languages in their phonemic aspect. *Language* **29:1**. 34–46.

Dresher, B. Elan (2009). *The contrastive hierarchy in phonology*. Cambridge: CUP.

Halle, Morris (1957). On the phonetic rules of Russian. Presented to the LSA, Chicago, 1957.

Halle, Morris (1959). *The sound pattern of Russian*. The Hague: Mouton.

de Lacy, Paul (2010). Review of Dresher (2009). *Phonology* **27:3**. 532–536.

Lightner, Theodore (1965). *Segmental phonology of Modern Standard Russian*. Phd thesis, MIT.

Schaarschmidt, Gunter (1998). *The historical phonology of the Upper and Lower Sorbian languages*. Heidelberg: C. Winter.

Shevelov, George Y. (1977). On the chronology of *h* and the new *g* in Ukrainian. *Harvard Ukrainian Studies* **1:2**. 137–152.