

A contrastive hierarchical account of positional neutralization

Christopher Spahr, University of Toronto

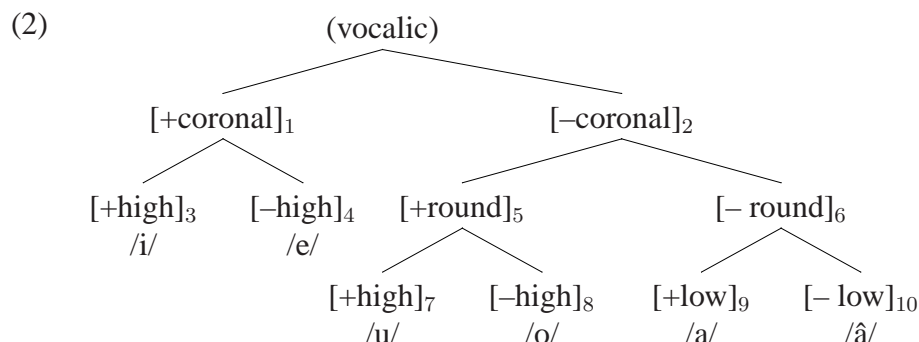
Positional neutralization can be defined as the categorical inability to realize a given contrast within some phonologically defined environment. This occurs e.g. with phonological vowel reduction. For example, in stressed positions, Bulgarian contrasts six different vowels, as seen in (1a). When these underlying vowels occur in unstressed positions, the contrasts between them are neutralized in up to three pairs, depending on variety and register, as in (1b).

(1)	a.	front	central	back	b.	/â, a/ → [ə]
			non-round	round		/o, u/ → [ʊ]
	high	i		u		/e, i/ → [ɪ]
	mid	e	â	o		
	low		a			

Standard descriptions, such as Scatton (1984), assume that phonological vowel reduction is the result of limiting the phonemes which can be used in unstressed positions. Thus /â/ and /a/ correspond to unstressed /a/, /o/ and /u/ correspond to unstressed /u/, and /e/ and /i/ correspond to unstressed /i/. The centralized and laxed realizations of the unstressed vowels are considered positional allophones of unstressed /a/, /u/, and /i/.

It is implicit in any such analysis that the phonemic identity of a segment in reduced position can be known based purely on its phonetic realization, such that a neutralized phoneme is identical to its phonetically most similar non-neutralized counterpart. However, this approach fails to capture the fact that phonological vowel reduction results in a true loss of contrast between phonemes and not merely the restriction of the use of certain phonemes. More recent theoretical work in vowel reduction by Crosswhite (2001) also restricts itself to surface-driven analysis. Both phonetic realization and phonological neutralization are explained by either perceptual constraints licensing only peripheral vowels in less prominent positions or articulatory constraints requiring unstressed vowels to be less sonorous.

I suggest instead that neutralization is a core concern of contrast, and that the notion of the Contrastive Hierarchy (Dresher 2009) plays a key role in the way neutralization functions phonologically. Let us assume that the contrastive specifications for stressed vowels in Bulgarian are assigned by the hierarchy in (2).



I propose that rather than vowels in reduced position being a subset of the stressed inventory, they are archiphonemic, being represented by non-terminal nodes of the contrastive hierarchy. Thus instead of a reduction rule or constraint neutralizing the pair /a/–/â/ by turning all instances of /â/ (node 10) to /a/ (node 9), the reduction process instead changes all instances of both /â/ (node 10) and /a/ (node 9) into node 6. Likewise, the neutralization of /u/ and /o/ involves

changing instances of nodes 7 and 8 into node 5, and the neutralization of /i/ and /e/ involves changing instances of nodes 3 and 4 into node 1. In this way, all nodes of the hierarchy, not only terminal nodes, are viable as members of the inventory. I argue that this contrastive hierarchical approach better conceptually reflects phonological reduction as the conflation of a contrast between two phonemes, and that it furthermore offers a number of theoretical advantages.

First, centralization of reduced vowels follows from the phonetic implementation of the phonological specifications of the non-terminal nodes with which they are represented. Because the reduced pair /a/–/â/ represented with node 6 is not specified for height (as opposed to /a/, which is specified as [+low]), it is free to move to a somewhat more central position in the vowel space, *viz.* [ə], as predicted Hall's (2011) model of contrastive feature-based dispersion. Likewise, the pairs /u/–/o/ (node 2) and /i/–/e/ (node 1) lack any specification for [±high], and so they are predicted to be realized somewhere between high and mid vowels, *viz.* [ʊ] and [ɪ].

Second, because it does not rely on constraints operating on specific features for particular functional reasons, but rather on the relationship between the hierarchical ordering of contrastive features and the patterns in which segments neutralize for those features, the non-terminal node model is applicable to all kinds of neutralization affecting contrastive members of the inventory, as opposed to being unique to vowel reduction. For example, in a language with positional neutralization of an obstruent voicing contrast between two terminal nodes /t/ and /d/, the neutralization process resolves not to /t/ or /d/, but to a non-terminal node dominating both /t/ and /d/, which has no contrastive specification for [±voice]. The phonetic voicing of a neutralized segment can then be understood as predictable allophonic realization of the non-terminal node, rather than alternation between the two terminal nodes. What is important is that contrastive features are only present in positions where they realize a contrast, and so the notion of neutralization of contrast is better reflected by not using the relevant feature at all.

Third, non-terminal nodes provide a better way to represent non-alternating neutralized positions. If a Bulgarian speaker is faced with a morpheme in which a certain vowel is never stressed, and so always heard as [ə], a non-archiphonemic model would require that speaker to arbitrarily posit either /a/ or /â/ as the underlying phoneme in that position. In terms of economy, such a situation is less than ideal, as it requires the implementation of a reduction process in every instance that the morpheme is interpreted. The model I propose handles this by allowing the use of non-terminal nodes of the hierarchy in underlying representations. Hence we gain an underlying /ə/ without the addition of any new elements to the inventory, since the hierarchical structure from which it is derived is motivated independently. Furthermore, because non-terminal nodes contain fewer contrastive features, representations are more economical.

Most importantly, it provides restrictive and principled predictions about possible phonological neutralizations which can occur within a given language, relative to its contrastive hierarchy. A set of terminal contrasts can neutralize only to a non-terminal node by which it is exhaustively dominated.

References

- Crosswhite, Katherine. 2001. *Vowel reduction in Optimality Theory*. New York: Routledge.
- Dresher, B. Elan. 2009. *The contrastive hierarchy in phonology*. Cambridge: Cambridge University Press.
- Hall, Daniel Currie. 2011. Phonological contrast and its phonetic enhancement: Dispersedness without dispersion. *Phonology* 28:1–54.
- Scatton, Ernest A. 1984. *A reference grammar of modern Bulgarian*. Columbus, OH: Slavica Publishers, Inc.