

## Formalizing contrast and redundancy in phonological representations

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**The motivation for a formal theory of representations** As discussed in depth by Anderson (1985), theories of phonology have divided their attention in various ways between phonological representations and the rules (or, more recently, constraints) that operate on them. Any fully formalized theory necessarily encompasses both—but, as noted in the call for papers for this workshop, it is not always practical or useful to attempt to formalize all aspects of a theory at once. This does not mean that those aspects that are not made explicit remain unconstrained. In particular, a formal theory of representations will restrict the kinds of things that rules and constraints can do. To take a colourful example from Hale & Reiss (2008), a theory in which bananas are not licit linguistic objects will have no need of a NOBANANA constraint, nor can it have rules that insert, delete, or slice bananas. More generally, and more realistically, theories that restrict the information content of representations thereby also restrict the power of rules and constraints: the phonological computation can only work with what it is given. There is thus a clear methodological reason to pursue parsimonious theories of representations, in that they can easily be falsified by the discovery that the rule system needs access to more information than they provide.

**Application to contrast** It has often been observed that contrastive features—ones that serve to mark phonemic distinctions—appear to have some kind of special status in phonology; specifically, there are at least some phonological patterns that refer to contrastive features but ignore redundant ones. Broadly speaking, theories of representations have responded to this observation in two kinds of ways: either by positing that redundant features are unavailable to some or all of the phonological computation (e.g., Archangeli 1988; Dresher 2009; Mackenzie 2013), or by positing that both kinds of features are phonologically visible, but that the computation is able to distinguish between them (e.g., Calabrese 1995; Halle et al. 2000; Nevins 2010). In other words, the special status of contrastive features can be encoded either by subtracting information from phonological representations (excluding redundant features), or by adding information (marking specifications as contrastive or redundant). In the additive approach, one might posit that contrastive feature specifications have a special ‘colour’ (akin to the colours used by van Oostendorp 2007 to mark morphological affiliation) that makes them visible to a superset of the rules that can see redundant features.

**A case in point: Uyghur vowels** Halle et al. (2000) take an additive approach to the formalization of contrast, but their account of Uyghur vowel harmony is striking in that it suggests that a feature cannot be coloured contrastive once and for all; rather, they claim, its status must be re-assessed during the course of the derivation.

Uyghur has the vowel inventory shown in Table 1, which is also that of Finnish. As in Finnish, the vowels /i/ and /e/, which have no minimally different back counterparts, are transparent to vowel place harmony. Harmony spreads [ $\pm$ back] rightward to alternating suffixes such as the plural *-lær/-lar*, as in (1) and (2).

	FRONT		BACK	
	UNRND	ROUND	UNRND	ROUND
HIGH	i	y		u
MID	e	ø		o
LOW	æ		ɑ	

Table 1: Vowel inventory of Uyghur

- (1) a. [jyz] [jyz-lær] ‘face(s)’           (2) a. [pul] [pul-lar] ‘money’/‘monies’  
 b. [køł] [køł-lær] ‘lake(s)’           b. [jol] [jol-lar] ‘road(s)’  
 c. [xæt] [xæt-lær] ‘letter(s)’        c. [at] [at-lar] ‘horse(s)’

The transparency of /i/ is illustrated in (3).

- (3) a. [køł-imiz-gæ] ‘lake-our-DATIVE’  
 b. [jol-imiz-ɞɑ] ‘road-our-DATIVE’

There are also non-alternating suffixes such as *-tʃæ*, which not only remains [–back] after [+back] stems, but can also transmit [–back] to a subsequent suffix:

- (4) a. [tyrk-tʃæ] ‘(in the) Turkish (manner/language)’  
 b. [ujɞur-tʃæ] ‘(in the) Uyghur (manner/language)’  
 c. [kitɑp-tʃæ] ‘booklet’  
 d. [kitɑp-tʃæ-m-dæ] ‘in my booklet’

Low vowels in medial open syllables are raised to [i], and strikingly, this causes them to become transparent to harmony:

- (5) a. [bɑɫɑ] ‘child’ [bali-lar] ‘children’  
 b. [iʃæɫ] ‘donkey’ [iʃiɣ-i] ‘his/her/its donkey’  
 c. [næj-tʃi-dæ] ‘child+tʃæ+LOCATIVE’  
 d. [kitɑp-tʃi-dɑ] ‘book+tʃæ+LOCATIVE’

In Halle et al.’s (2000) account, all features are specified, but harmony spreads, and can be blocked by, only contrastive values of [ $\pm$ back]. In their account, then, the transparency of an [i] derived from /æ/ means that its [–back] specification must become non-contrastive as soon as it becomes high.

However, an alternative account is possible within the more restrictive information-subtracting approach to contrast. Suppose that segments are assigned only contrastive features as designated by a contrastive hierarchy (Dresher 2009). A partial such hierarchy for Uyghur vowels is shown in Fig. 1. Underlying /e i/ are transparent to harmony because they have no value for [ $\pm$ back]. The process that changes low vowels to [i] is not merely raising, but reduction, both in the sense that it involves a decrease in sonority and in the sense that it involves the deletion of marked structure. Note that this process, as shown in (5), neutralizes the place contrast between underlying /æ/ and /ɑ/. In the underspecification account, the neutralization and concomitant harmonic neutrality are neatly captured by saying that reduction involves deletion of [ $\pm$ back], rather than changing the status of the feature from contrastive to redundant (and, in the case of /ɑ/, its value from + to –).

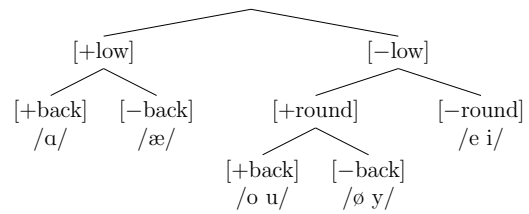


Figure 1: Partial contrastive hierarchy for Uyghur vowels

Formalizing the difference between contrastive and redundant features by saying that the latter are simply absent from phonological representations is both conceptually more elegant and methodologically more useful than formalizing it by painting the two types of features different colours. In Uyghur, it also yields a more satisfactory account of the interaction between reduction and harmony.

## References

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