

# Formalizing contrast and redundancy in phonological representations

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## 1 Introduction: Theoretical motivations

### 1.1 Why (just) representations?

- Two components of a formal model of phonology:
  1. Operations (e.g., rules, or GEN and EVAL)
  2. Representations (to which the operations apply)
- Anderson (1985) describes the field as alternately paying more attention to one of these, then the other. Phonological theories seldom fully formalize both aspects.
- This isn't a bad thing. In particular, focusing on representations can tell us things about what operations can and can't do, independently of any specific theory of operations.
- E.g., Hale & Reiss (2008) point out that 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: theories that restrict the information content of representations thereby also restrict the power of operations: the phonological computation can only work with what it is given.
- So there's a methodological reason to pursue parsimonious theories of representations: they can easily be falsified by the discovery that the rule system needs access to more information than they provide.
- Lexical contrast provides a logical minimum amount of information: phones that contrast underlyingly must be specified with enough features (or elements, etc.) to be distinguishable.
- At the opposite extreme, we could have detailed phonetic information about every token of a phone the speaker has ever been exposed to. But, given that operations don't have to use all the information available to them, it's not clear how this could be falsified—how would we know if there's too much information in our representations?

### 1.2 Two approaches 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.

## 2 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.

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

Table 1: *Vowel inventory of Uyghur*

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  $[\pm\text{back}]$  rightward to alternating suffixes such as the plural *-lær/-lær*, as in (1) and (2).

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

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

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

There are also non-alternating suffixes such as *-æ*, which not only remains  $[-\text{back}]$  after  $[\text{+back}]$  stems, but can also transmit  $[-\text{back}]$  to a subsequent suffix:

- (4) a. [tyrk-tʃæ] ‘(in the) Turkish (manner/language)’  
 b. [ujʁur-tʃæ] ‘(in the) Uyghur (manner/language)’  
 c. [kitap-tʃæ] ‘booklet’  
 d. [kitap-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:



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