

Contrast in the Twentieth Century and Beyond

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1. Two absurd languages

Havel (1991): *The Memorandum (Vyrozumění)*

- Ptydepe:
 - Maximal redundancy / surface contrast
 - Words of the same length must differ by at least 60%
 - Length assigned according to frequency
 - Easy for the listener / reader—words are very distinct
- Chorukor:
 - Minimal redundancy
 - Semantically related words cluster together phonetically
 - Easy for the learner

2. Anderson's challenge

2.1. Why contrastive features?

Anderson (1985): *Phonology in the Twentieth Century*

- Are we making URs too much like Chorukor?

- It is widely assumed that redundant information is omitted from the lexicon.
- Reasons for this are not very compelling:
 - Information theory: efficient encoding
 - ↪ But the brain has lots of storage space
 - Saussure: « *Il n’y a que des différences* »
 - ↪ Even if this is what he meant, we shouldn’t take his word for it
- The assumption should be re-examined.
Contrast needs another look!

2.2. How to identify contrastive features?

Anderson (1985) and Archangeli (1988) identify a challenge for contrastive underspecification:

- If we want to eliminate redundant features, we must be able to identify them.
- Suppose that a feature value [F] occurs **always and only** in the presence of another feature value [G].
- [F] is redundant, because it is predictable from [G].
- But [G] is redundant, too, because it occurs **only and always** in the presence of [F].
- But (suppose) neither [F] nor [G] is predictable from anything else.
- If we omit both [F] and [G], we can’t recover either of them.

Reciprocal dependencies (including more complex ones) are easily identified by Archangeli’s (1988) minimal pairs test:

- Start with full specifications for all segments.
- Identify all minimal pairs of segments—ones that differ by a single feature specification.
- The feature values that distinguish minimal pairs are contrastive.
- All other feature values are redundant.

A concrete example:

	i	e	a	o	u
high	+	–	-	–	+
low	-	-	+	-	-
back	-	-	+	+	+
round	-	-	-	+	+

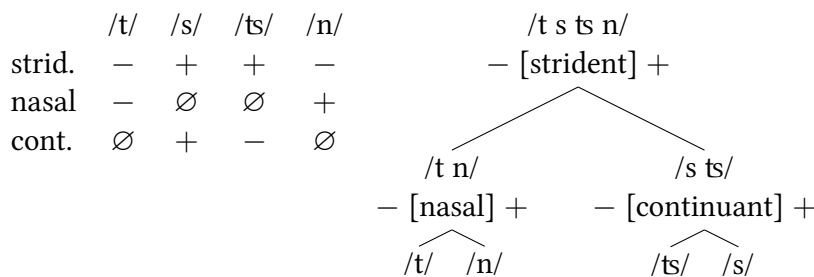
3. Our claims

- There is a better way of identifying contrastive features, based on the notion of a **contrastive hierarchy**.
- This method is not new—it was being used at least sporadically through most of the 20th century.
- Feature specifications based on the contrastive hierarchy make good predictions about phonological patterns.

4. The contrastive hierarchy in SPR

Halle (1959: 34) presents the notion of a contrastive hierarchy as a means of “mapping a distinctive feature matrix into a branching diagram.”

- The root node of the tree corresponds to “one feature for which there are no zeros.”
- Each lower node corresponds to a feature that is contrastive in that subset of the inventory.

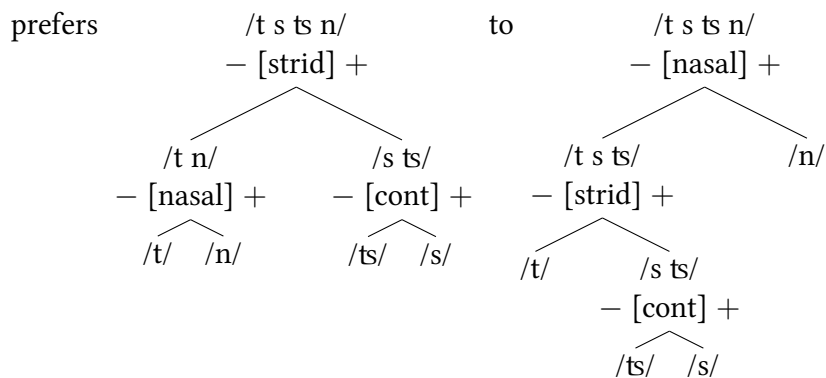


- Not every feature matrix can be turned into a tree:

	A	B	C
Feature 1	∅	+	–
Feature 2	+	∅	–
Feature 3	+	–	∅

- One feature must take scope over the entire inventory, and thus be specified + or – on all segments (assuming binary features).

- Halle (1959) – Condition (5): Minimize specifications (maximize zeros)



In the SPR system:

- Redundant features are absent from the lexicon, but not necessarily from the phonological computation.
- Predictable features may be filled in at any time.
- Empirical consequences of omitting redundant features might be expected to be more psycholinguistic than purely phonological.

Halle's (1959: 46) tree for Russian segments:

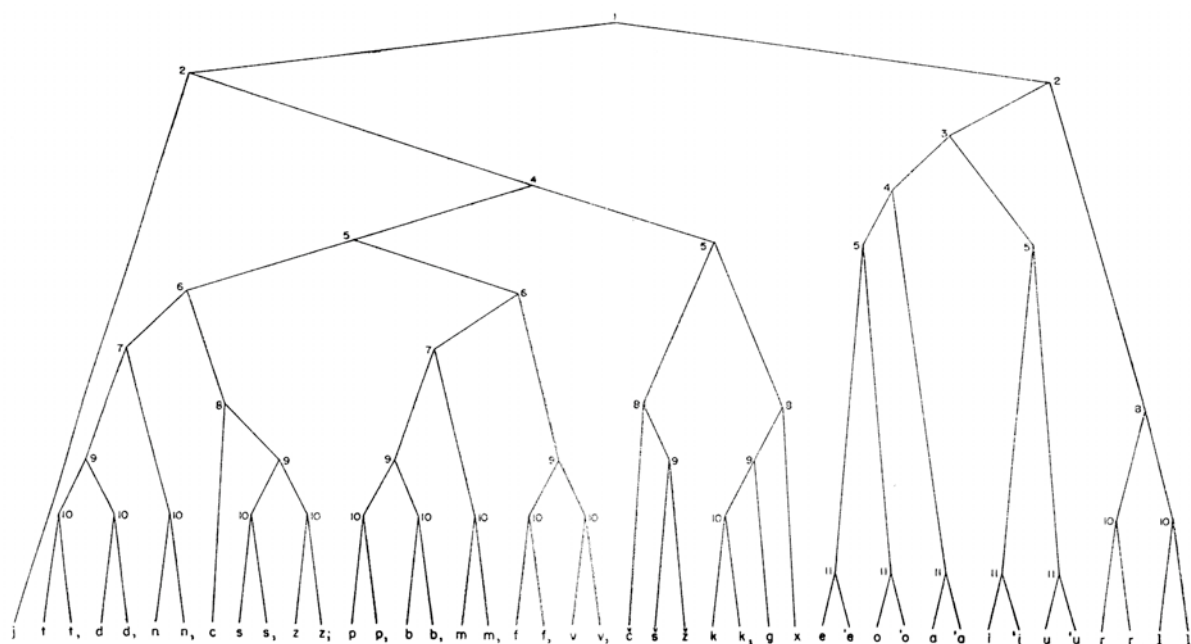
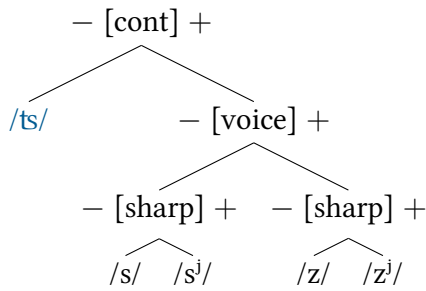


Fig. I-1. Branching diagram representing the morphemes of Russian. The numbers with which each node is labelled refer to the different features, as follows: 1. vocalic vs. nonvocalic; 2. consonantal vs. nonconsonantal; 3. diffuse vs. nondiffuse; 4. compact vs. noncompact; 5. low tonality vs. high tonality; 6. strident vs. mellow; 7. nasal vs. nonnasal; 8. continuant vs. interrupted; 9. voiced vs. voiceless; 10. sharpened vs. plain; 11. accented vs. unaccented. Left branches represent minus values, and right branches, plus values for the particular feature.

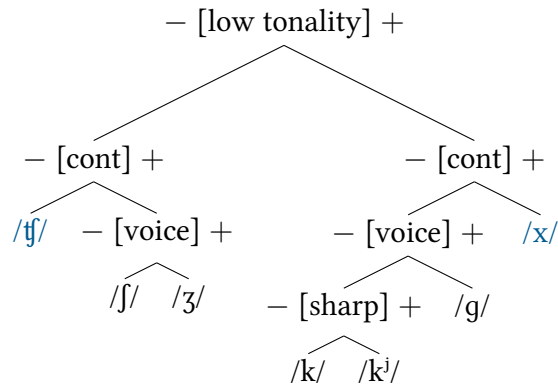
One consequence of this hierarchy: Unpaired voiceless obstruents are not specified for voice.

$[\pm\text{low tonality}] \gg [\pm\text{continuant}] \gg [\pm\text{voiced}] \gg [\pm\text{sharpened}]$

Strident dentals:



Palatals and velars:



This is consistent with Condition (5).

However (as Halle famously pointed out), /ts/, /tʃ/, and /x/ behave phonologically like other voiceless obstruents with respect to voicing assimilation. In *SPR*, this is accounted for by the following rules:

Rule P 1b: Unless followed by an obstruent, /ts/, /tʃ/, and /x/ are voiceless.

Rule P 3a: If an obstruent cluster is followed [...] by a sonorant, then with regard to voicing the cluster conforms to the last segment.

E.g.: /sovxoʒ/ [safxos] ‘state farm’

UR:		P 1b:		P 3a:
so v x oʒ	→	so v x oʒ	→	so f x oʒ
[voiced]: +∅		+−		−−

5. The Contrastivist Hypothesis

What if we give the distinction between contrastive and redundant features more work to do?

The Contrastivist Hypothesis:

The phonological component of a language L operates only on those features which are necessary to distinguish the phonemes of L from one another.

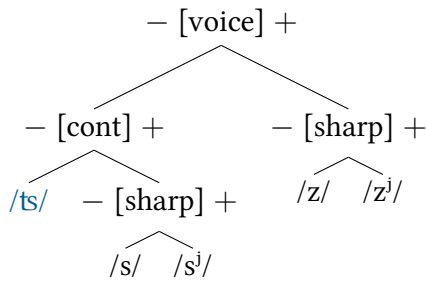
This suggests an alternative criterion to Condition (5)—evidence that features are phonologically active can be taken as evidence that they are ranked high enough in the contrastive hierarchy to be specified.

Suppose we apply this to Russian. What are the consequences of specifying /ts, tʃ, x/ for [−voice]?

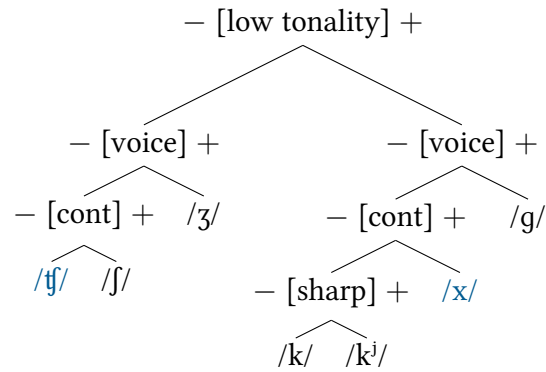
A revised contrastive hierarchy:

[±low tonality] ≫ [±voice] ≫ [±continuant] ≫ [±sharped]

Strident dentals:



Palatals and velars:



- The contrastive hierarchy forces a tradeoff, and the Contrastivist Hypothesis predicts that this tradeoff will have empirical consequences.
- If we want /ts/, /tʃ/, and /x/ to have [-voiced], then we must give up [-continuant] on /g/ and [+continuant] on /ʒ/ (or consider some more complicated reorganization of the hierarchy).
- Is this a good result?
- Some circumstantial phonetic evidence: In some southern dialects of Russian, /g/ is realized as [ɣ] or [ɦ].
- Some (morpho)phonological evidence:
Alternations resulting from the First Velar Palatalization

		[+low tonality] → [-low tonality]		
[-voiced]	[+continuant]	x	→	ʃ
[-voiced]	[-continuant]	k	→	tʃ
[+voiced]	∅	g	→	ʒ

Examples:

Adjectives		
Positive (m.sg.)	Comparative	Gloss
tʰixij	tʰife	‘quiet(er)’
zarkij	zarʲfe	‘hot(ter)’
dorogoj	doroʒe	‘dear(er)’

Verbs		
3rd plural	3rd singular	Gloss
maxut	maʃet	‘wave(s), wag(s)’
pekut	peʃet	‘bake(s)’
strigut	striʒet	‘shear(s)’

Denominal adjectives		
Noun	Adjective	Gloss
tʃerexaxa	tʃerexaʲij	‘turtle’ / ‘testudinian’
volk	volʲtʃij	‘wolf’ / ‘lupine’
vraǰ	vraʒij	‘enemy’ / ‘hostile’

- The hierarchy that assigns [–voiced] to /ts/, /tʃ/, and /x/ also correctly identifies /g/ and /ʒ/ as counterparts.
- See Radišić (2009) for a detailed analysis along these lines of similar phenomena in Serbian.

6. The Contrastivist Hypothesis in Grundzüge

6.1. SPR vs. Grundzüge

- Halle (1959):
 - explicit contrastive hierarchy
 - no correlation between contrastive/redundant and active/inactive
- Trubetzkoy (1939):
 - correlation between contrastive/redundant and active/inactive
 - implicit contrastive hierarchy

6.2. German vs. Czech

Trubetzkoy (1939):

- German /h/ does not enter into any minimal contrast.
- The laryngeal/non-laryngeal contrast takes scope over other distinctions that might place /h/ in a class with /x/.
- Czech /ɦ/ minimally contrasts (in voicing) with /x/.
- Other contrasts take wider scope, and the fact that /ɦ/ is phonetically laryngeal is phonologically irrelevant.

German consonants:

p	pf	t	ts	k	
b		d		g	
	f		s	ʃ	x
	v		z		
		r			
m		n		ŋ	
		l		j	

Czech consonants:

p		t	ts	tʃ	k
b		d			
	f		s	ʃ	x
	v		z	ʒ	ɦ
		r		ř	
m		n		ɲ	
		l		j	

- Trubetzkoy’s term “minimal contrast” suggests something like the minimal pairs test.

- However, his treatment of German and Czech indicates that one cannot identify minimal contrasts simply by considering the inventory alone.
- The scope of contrasts matters, and can vary from one language to another.
- The phonological behaviour of segments is key to identifying the scope of contrasts.
- E.g., Czech /fi/ (which happens to be cognate with Russian /g/) becomes [x] when it undergoes final or assimilatory devoicing.

7. Conclusions

- Two key pieces of the answer to Anderson’s challenge:
 - Q: **How** can we reliably identify contrastive values and remove redundant ones?
 - A: We can use a **contrastive hierarchy** of features.
 - Q: **Why** should we bother to do so?
 - A: The **Contrastivist Hypothesis** makes interesting predictions.
 - Both ideas have been present in phonological theory for quite some time...
 - ...but they haven’t always been connected—or even stated—explicitly.
- ⇒ A project for the 21st century

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