Contrast in the Twentieth Century and Beyond

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Václav Havel: *The Memorandum* (*Vyrozumění,* 1965)
A dysfunctional bureaucracy with two perverse artificial languages

Ptydepe:

- Maximal redundancy / surface contrast
- Words of the same length must differ by at least 60%
- Length assigned according to frequency
  Shortest word is *gh* 'whatever'
- Easy for the listener / reader—words are very distinct

Vyrozumění – Slovácké Divadlo, 2007   (photo: Jan Karásek)

Chorukor:

- Minimal redundancy
- Semantically related words cluster together phonetically
  Days of the week:
  ilopagar ilopager ilopagur ilopagir ilopageur ilopagoor ilopagor
- Easy to learn (especially if you're not worried about accuracy)

The Memorandum – Lex-Ham Community Theatre, 2008   (photo: U. Landreman)

Anderson's challenge

Stephen 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!

Stephen R. Anderson – http://bloch.ling.yale.edu/

Reciprocally dependent properties

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/

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|	i	e	a	o	u
high	+	−	−	−	+
low	−	−	+	−	−
back	−	−	+	+	+
round	−	−	−	+	+

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.

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

- Root node: "one feature for which there are no zeros"
- Each lower node: a feature that is contrastive in that subset

	/t/	/s/	/ts/	/n/
strid.	−	+	+	−
nasal	−	∅	∅	+
cont.		+	−	

/t s ts n/
− [strident] +

/t n/
− [nasal] +

/s ts/
− [continuant] +

/t/   /n/

/ts/   /s/
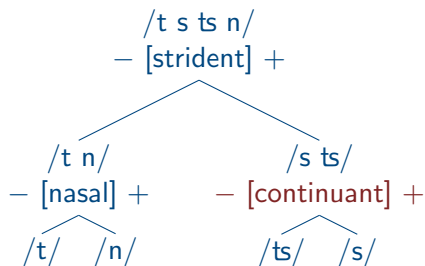
Halle (1959):

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

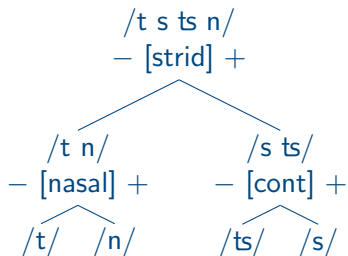 | | A | B | C |
  |-----------|---|---|---|
  | Feature 1 | $\varnothing$ | $+$ | $-$ |
  | Feature 2 | $+$ | $\varnothing$ | $-$ |
  | Feature 3 | $+$ | $-$ | $\varnothing$ |

- One feature must take scope over the entire inventory, and thus be specified $+$ or $-$ on all segments (assuming binary features).
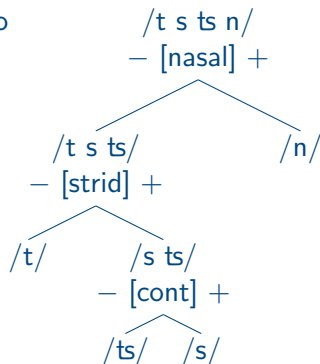
Halle (1959):

- Condition (5): Minimize specifications (maximize zeros)

prefers   /t s ts n/   to   /t s ts n/
                 − [strid] +   − [nasal] +

        /t n/   /s ts/   /t s ts/   /n/
     − [nasal] +   − [cont] +   − [strid] +

     /t/   /n/   /ts/   /s/   /t/   /s ts/
                                                  − [cont] +

   /ts/   /s/

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.
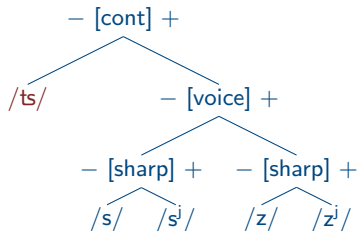
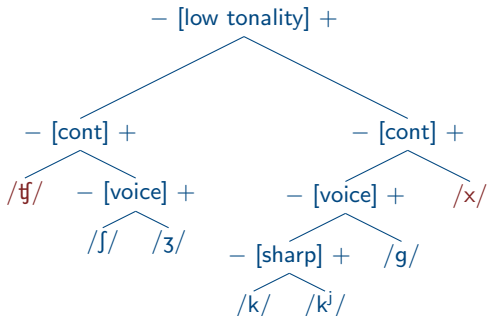Halle's (1959: 46) (sub)tree for [+consonantal] Russian segments:
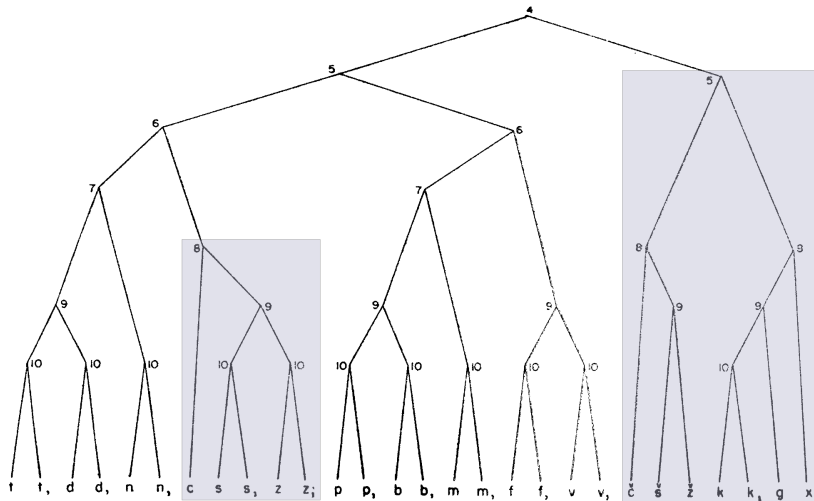
$[\pm\text{low tonality}] \gg [\pm\text{continuant}] \gg [\pm\text{voiced}] \gg [\pm\text{sharped}]$
Unpaired voiceless obstruents are not specified for voice:

Strident dentals:

Palatals and velars:

This is consistent with Condition (5).

However, /ts/, /tʃ/, and /x/ behave phonologically like other
voiceless obstruents:

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 sono-
           rant, then with regard to voicing the cluster con-
           forms to the last segment.

/sovxoz/ [safxos] 'state farm'

	UR:		P 1b:		P 3a:
	so **v x** oz	$\rightarrow$	so **v x** oz	$\rightarrow$	so **f x** os
[voiced]:	$+\varnothing$		$+-$		$--$

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.
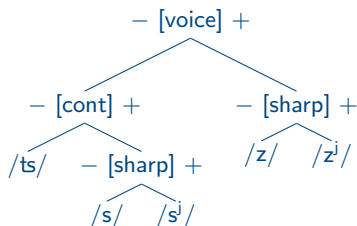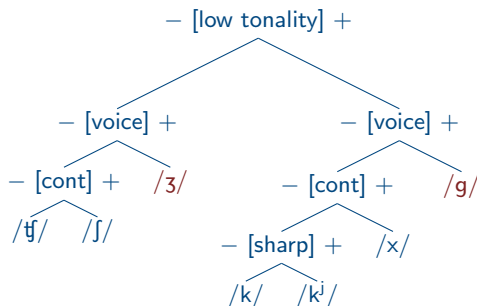
What are the consequences of specifying /ts, tʃ, x/ for [−voice]?

A side effect: /g/ and /ʒ/ are not specified for [±continuant].

Strident dentals:

$$− \text{[voice]} +$$

$$− \text{[cont]} + \qquad − \text{[sharp]} +$$

/ts/   − [sharp] +   /z/   /zʲ/

/s/   /sʲ/

Palatals and velars:

$$− \text{[low tonality]} +$$

$$− \text{[voice]} + \qquad\qquad − \text{[voice]} +$$

− [cont] +   /ʒ/   − [cont] +   /g/

/tʃ/   /ʃ/   − [sharp] +   /x/

/k/   /kʲ/
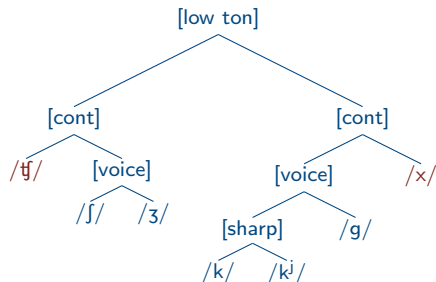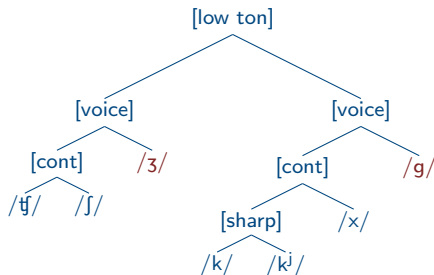
The Contrastivist Hypothesis

- The contrastive hierarchy forces a tradeoff, and the Contrastivist Hypothesis predicts that this tradeoff will have empirical consequences.
- If we want /ʧ/ and /x/ to have [−voiced], then we must give up [−continuant] on /g/ and [+continuant] on /ʒ/ (or consider some more complicated reorganization).

No [−voice] on /ʧ/ and /x/:

No [±cont] on /g/ and /ʒ/:

- Is this a good result?
- Some circumstantial phonetic evidence: In some southern dialects of Russian, /g/ is realized as [ɣ] or [ɦ].

The Contrastivist Hypothesis

Some (morpho)phonological evidence:
Alternations resulting from the First Velar Palatalization

		[+low tonality]	$\rightarrow$	[−low tonality]
[−voiced]	[+continuant]	x	$\rightarrow$	ʃ
[−voiced]	[−continuant]	k	$\rightarrow$	ʧ
[+voiced]	∅	g	$\rightarrow$	ʒ

- The hierarchy that assigns [−voiced] to /ʦ/, /ʧ/, 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.

- Halle (1959) *The Sound Pattern of Russian*:
  - explicit contrastive hierarchy
  - no correlation between contrastive/redundant and active/inactive

- Trubetzkoy (1939) *Grundzüge der Phonologie*:
  - correlation between contrastive/redundant and active/inactive
  - implicit contrastive hierarchy

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	h
		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 /ɦ/ (which happens to be cognate with Russian /g/) becomes [x] when it undergoes final or assimilatory devoicing.

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

Contrast: Jediná cesta vpřed!

For further reading:

📕 B. Elan Dresher
The Contrastive Hierarchy in Phonology
Cambridge Studies in Linguistics, no. 121
coming August 2009

📕 Daniel Currie Hall
The Role and Representation of Contrast in Phonological Theory
Ph.D. thesis, University of Toronto, 2007

📄 Daniel Currie Hall
"Contrast"
to appear in van Oostendorp, Ewen, Hume, and Rice (eds.)
The Blackwell Companion to Phonology