Slavic Linguistics Society

September 23–25, 2016

Slavic Languages & Literatures
UNIVERSITY OF TORONTO

Halle's *Sound Pattern of Russian*: The road not taken

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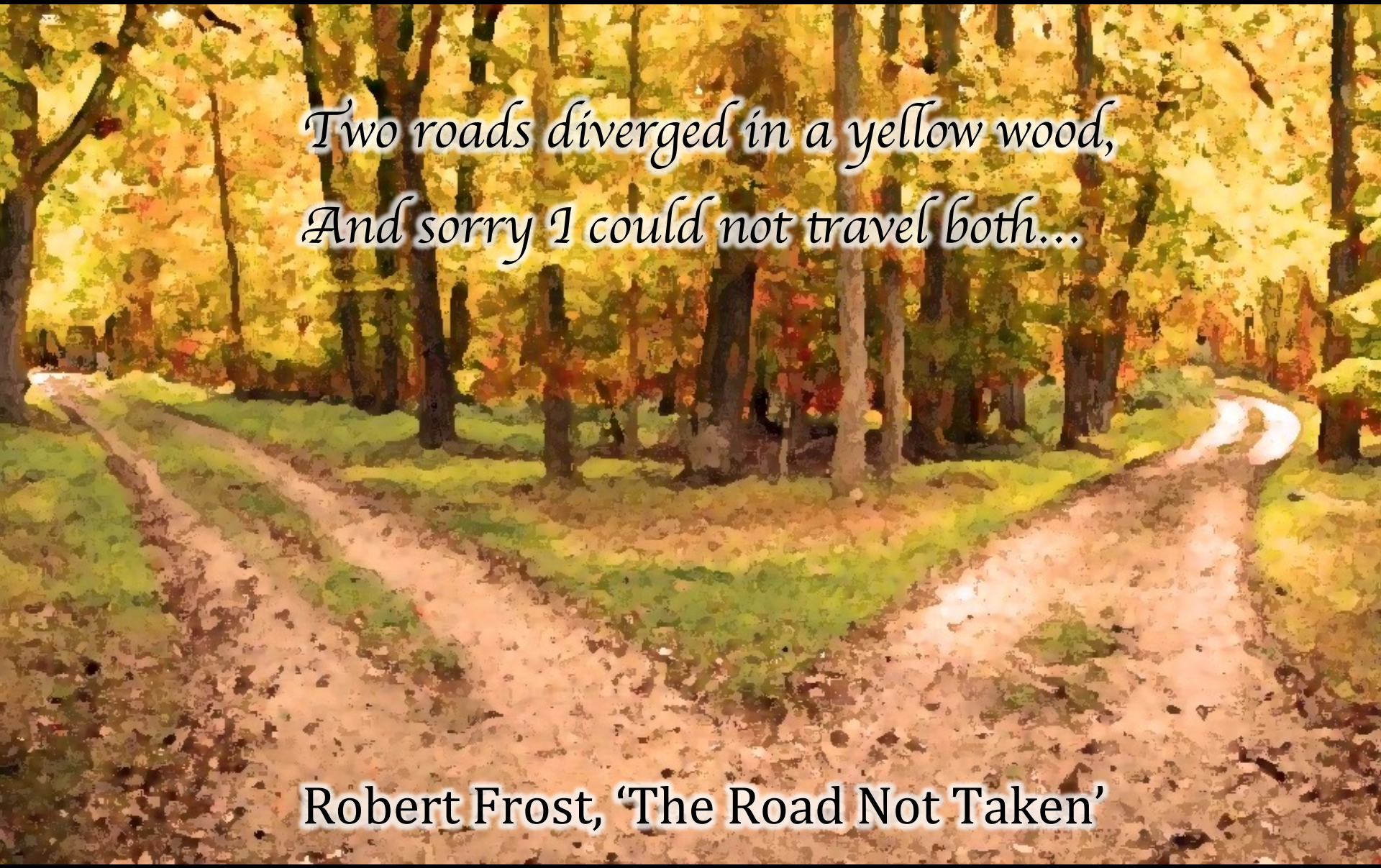

Two roads diverged in a yellow wood,
And sorry I could not travel both…
Robert Frost, ‘The Road Not Taken’

Introduction

Morris Halle's *Sound Pattern of Russian* (1959) sits at a major fork in the road in the development of phonological theory.

Halle's analysis of Russian regressive voicing assimilation (RVA) became a major argument against the structuralist phoneme.

At the same time, his analysis devalued the importance of contrastive feature hierarchies and the branching trees that generate them.

Introduction

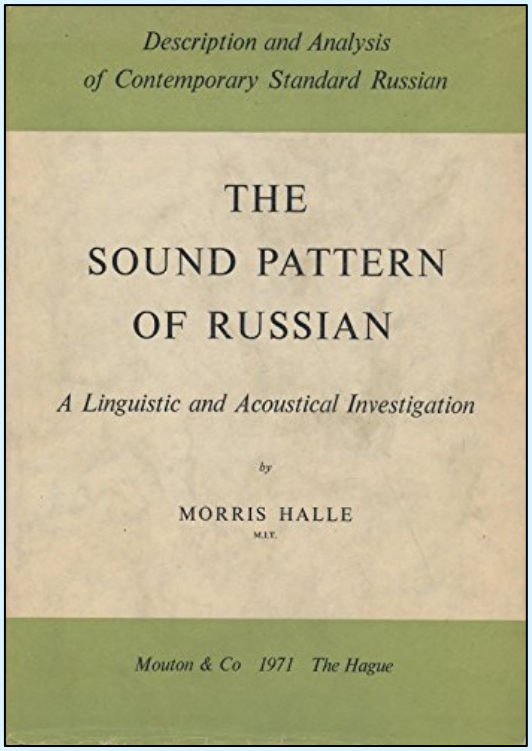
As a consequence, Chomsky and Halle's *Sound Pattern of English* (1968) abandoned contrastive underspecification and feature hierarchies.

The result, in our view, was that generative grammar gave up some major insights of the Prague School phonologists N. S. Trubetzkoy and Roman Jakobson, as well as, ironically, Halle himself.

However, Halle could have taken a different path in *Sound Pattern of Russian* that would have made all the difference.

Halle (1959): The branching tree and the branching road

On page 46 of *The Sound Pattern of Russian* (*SPR*) is Figure I–1, a magnificent tree diagram that shows the contrastive feature specifications of every phoneme of Russian.



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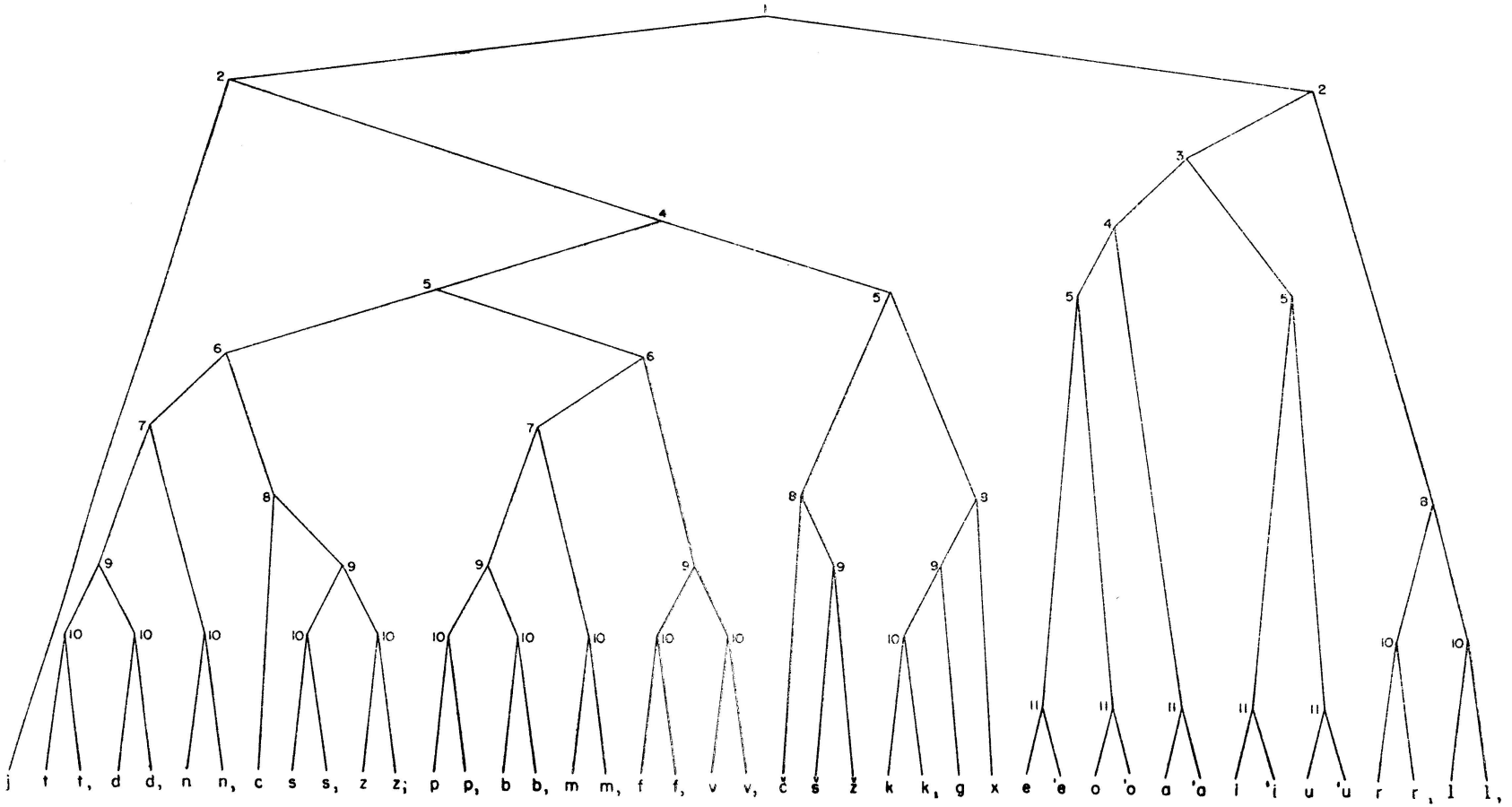
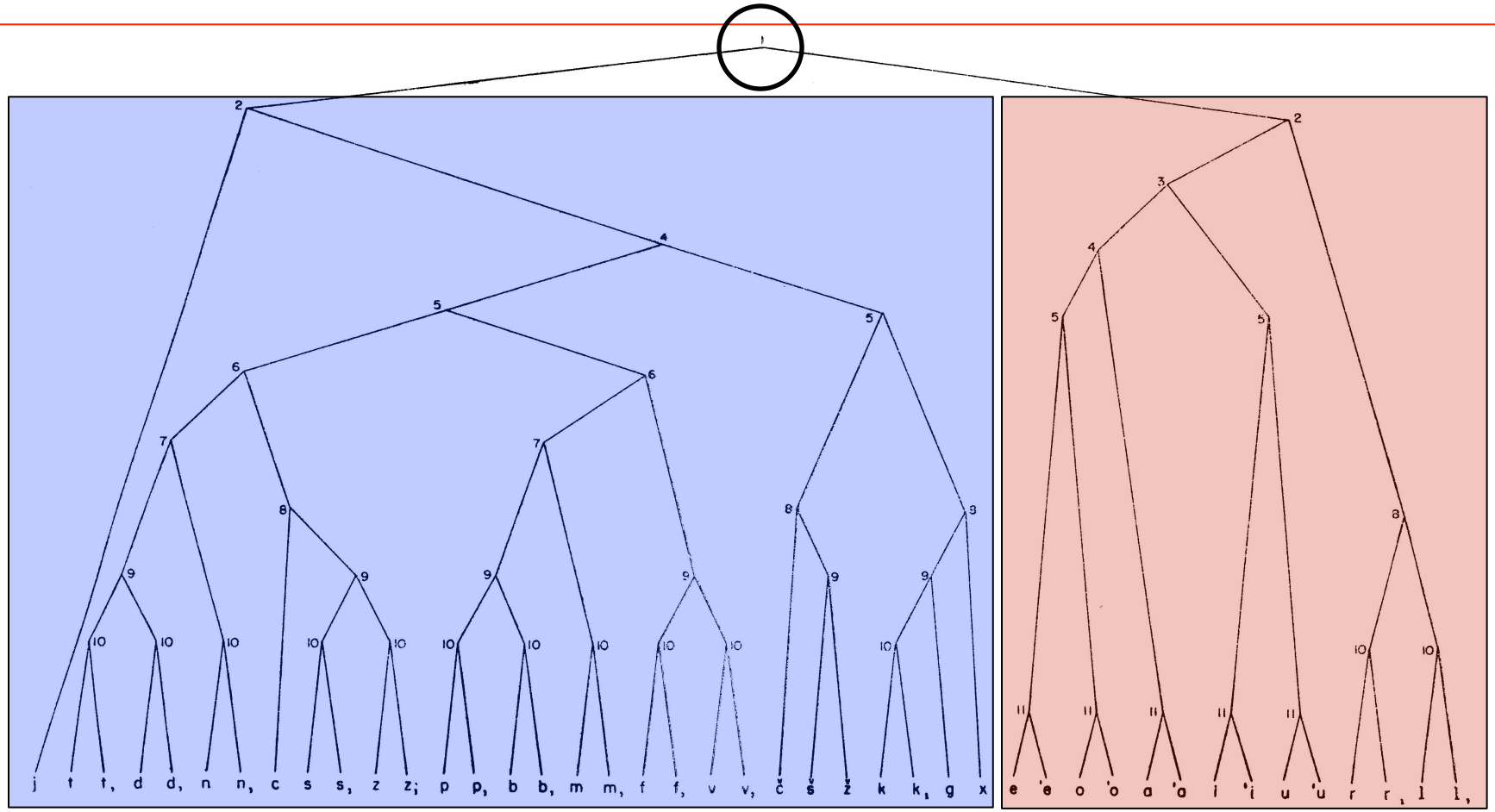


Fig. I-1. Branching diagram representing the morphonemes of Russian. The numbers with which each node is labelled refer to the different features, as follows: 1. vocalic vs. nonvocalic; 2. consonantal vs. nonconsonantal; 3. diffuse vs. nondiffuse; 4. compact vs. noncompact; 5. low tonality vs. high tonality;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

The highest feature is [±vocalic]: all the phonemes on the left in blue are [–vocalic] glides and consonants, and the ones on the right in red are [+vocalic] vowels and liquids.



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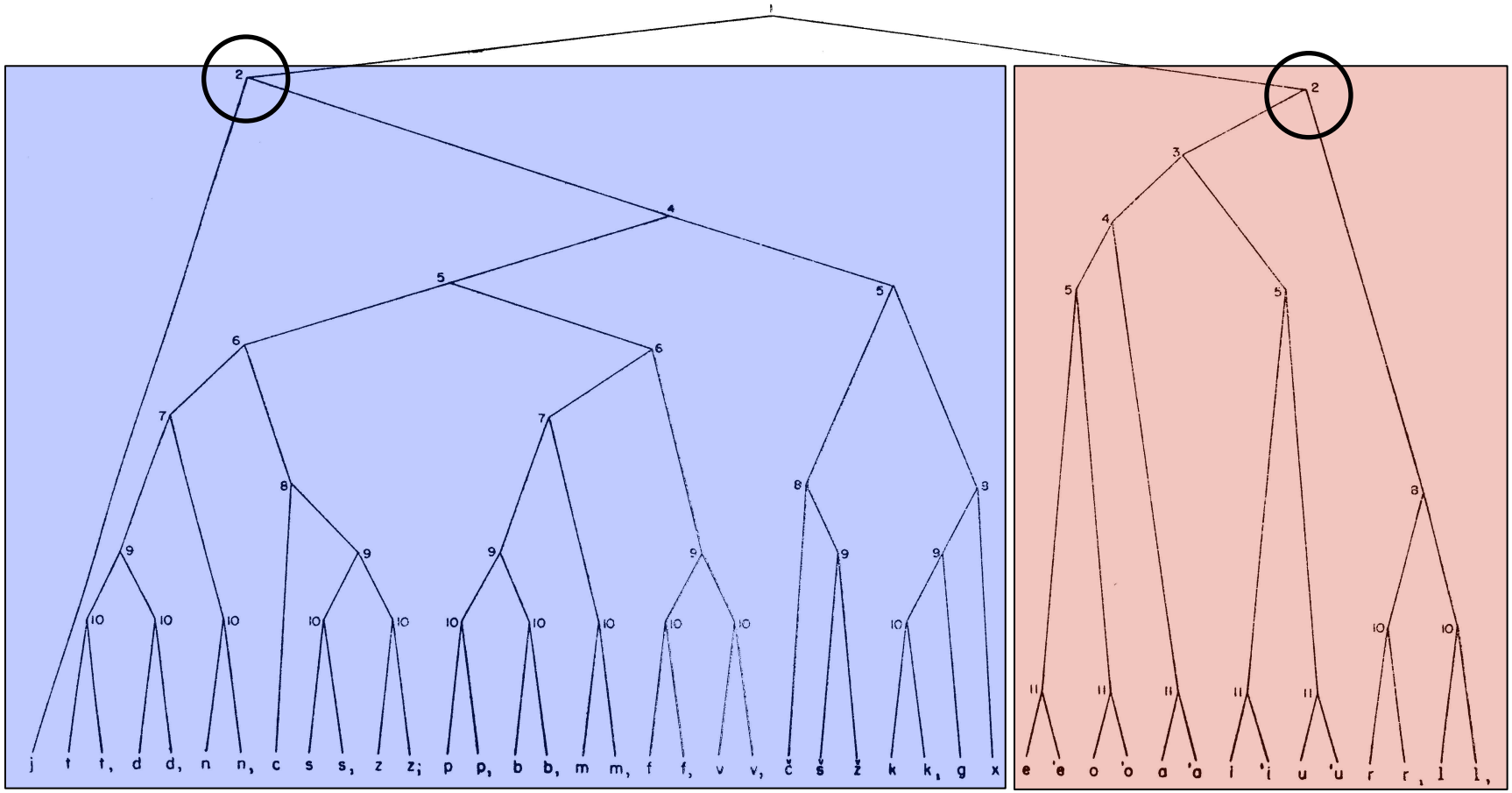
The next feature is [±consonantal], which is contrastive in both major branches of the tree.



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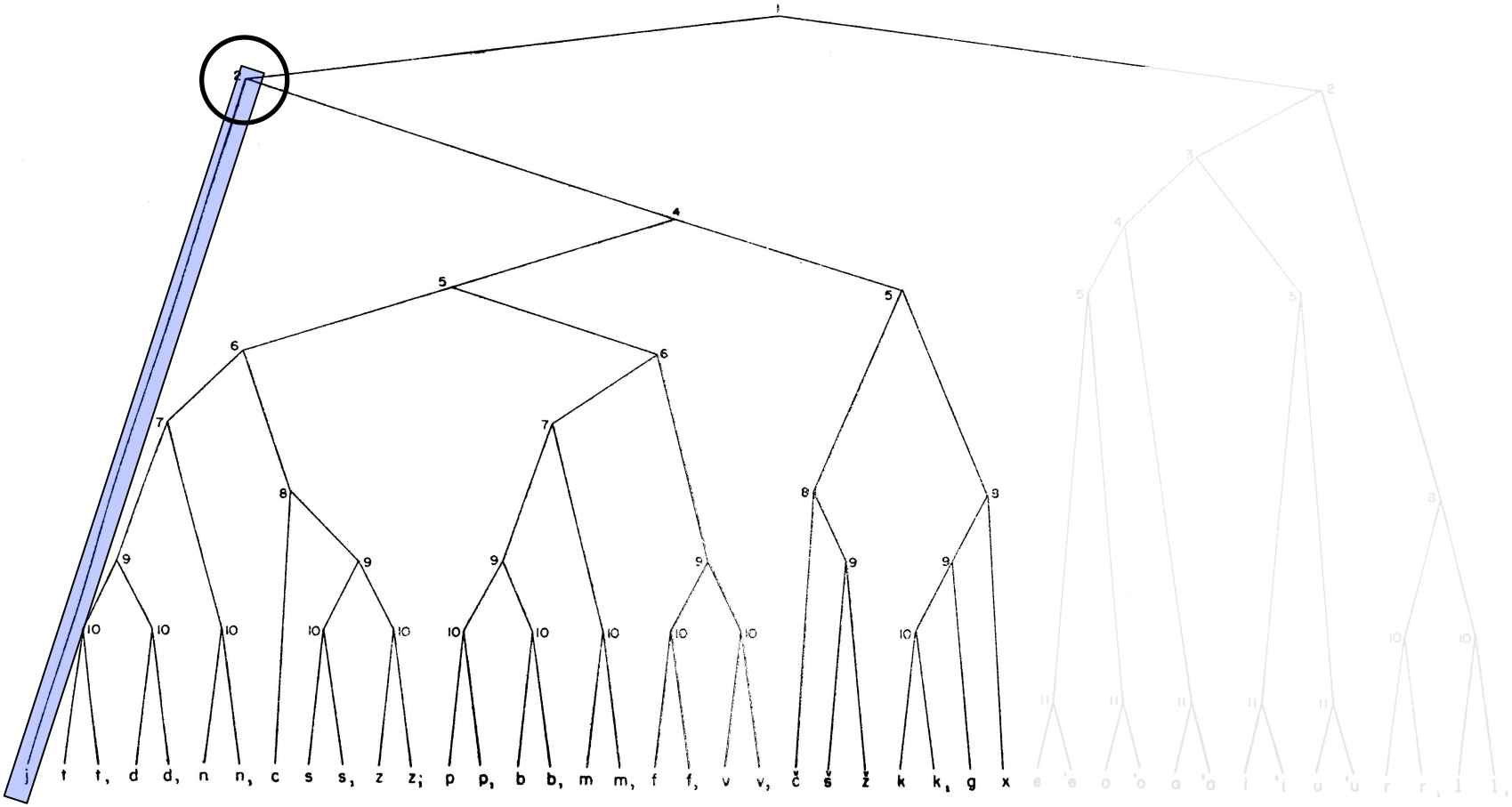
Looking first at the left branch of the tree, only the glide /j/ is contrastively [–consonantal]. As it is now unique, no further features are assigned to /j/.



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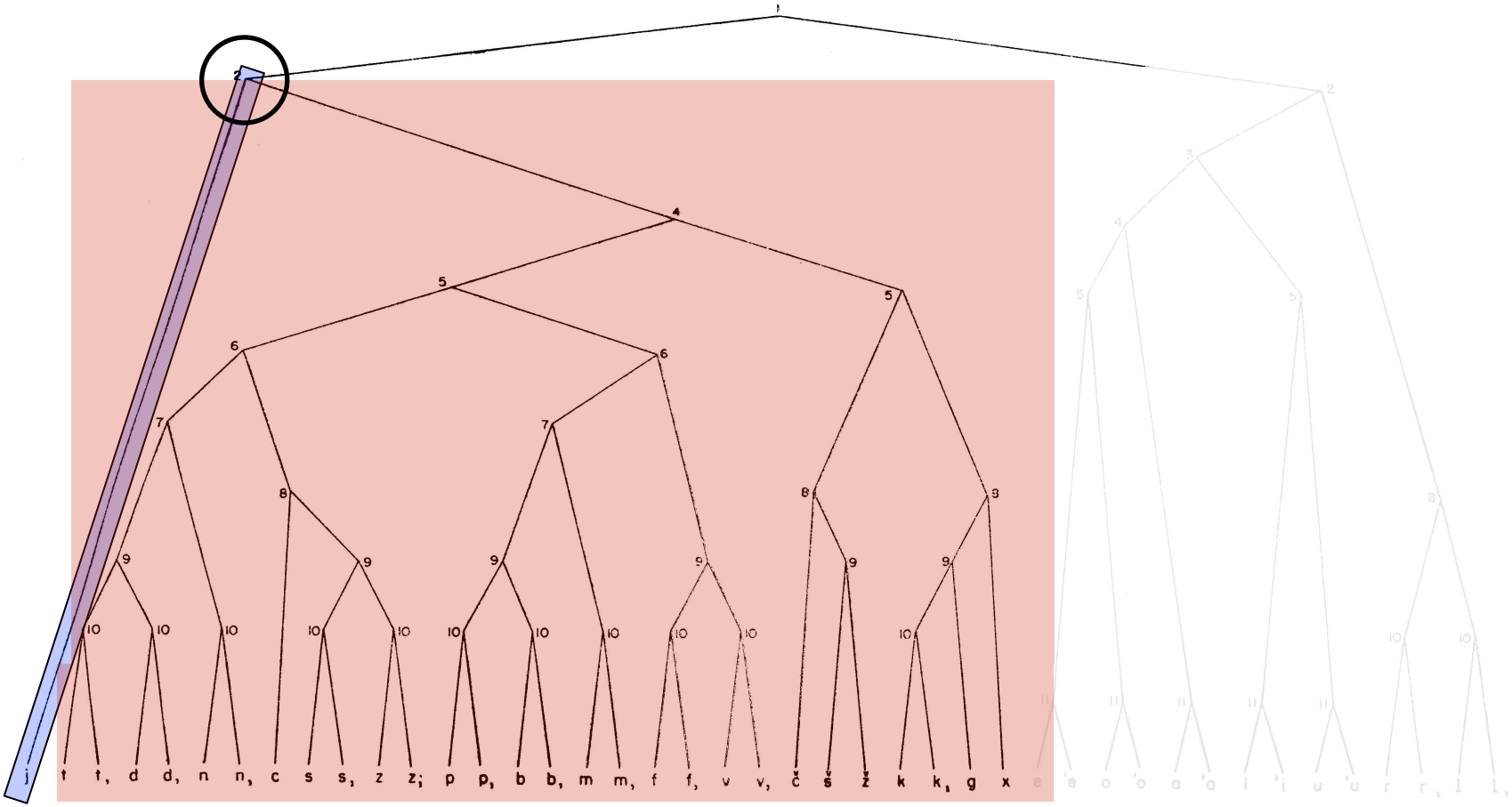
All the other segments are [+consonantal], and therefore need to be distinguished from each other by additional features.



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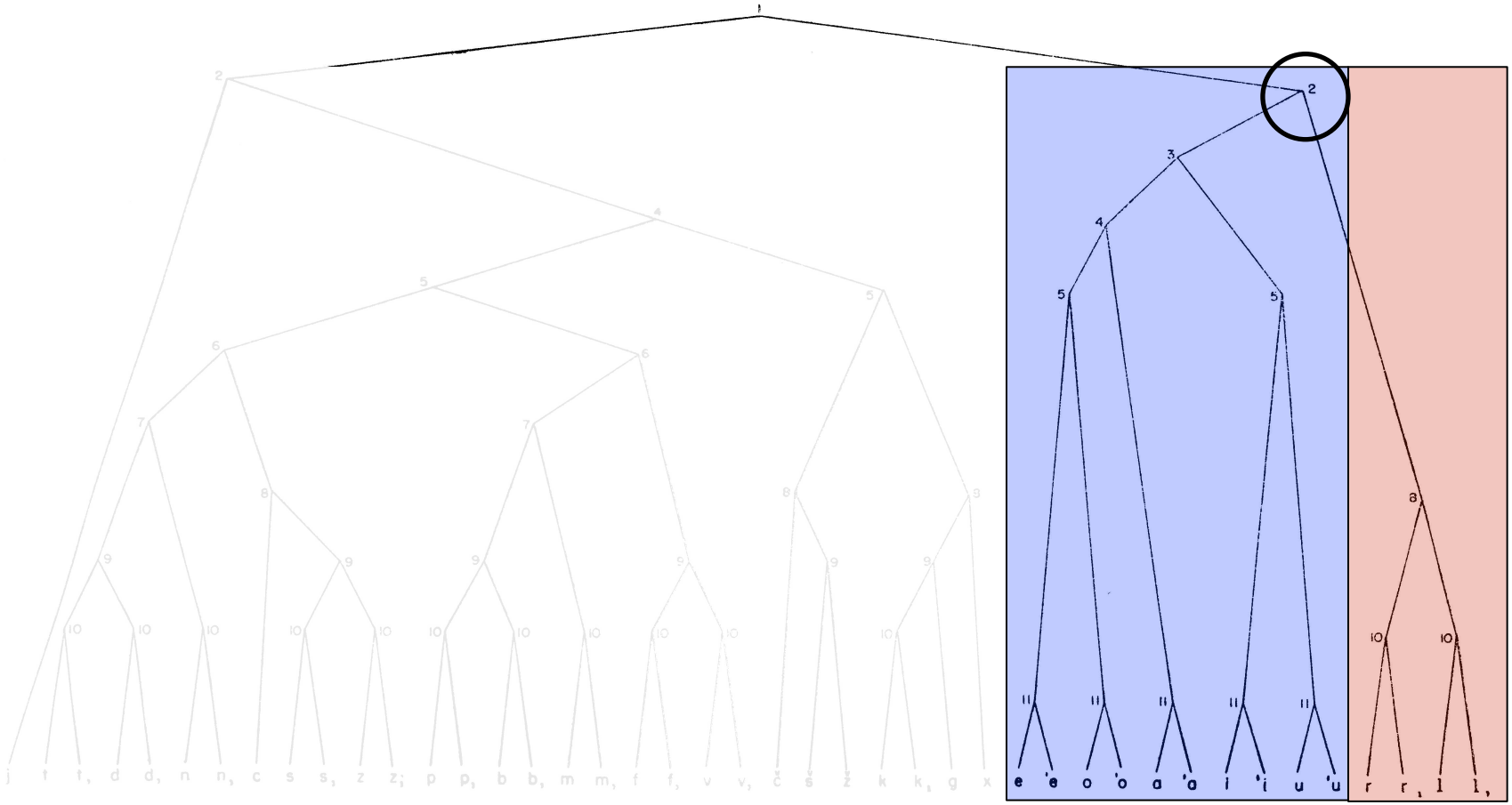
On the [+vocalic] side of the tree, vowels are [–consonantal] and liquids are [+consonantal].



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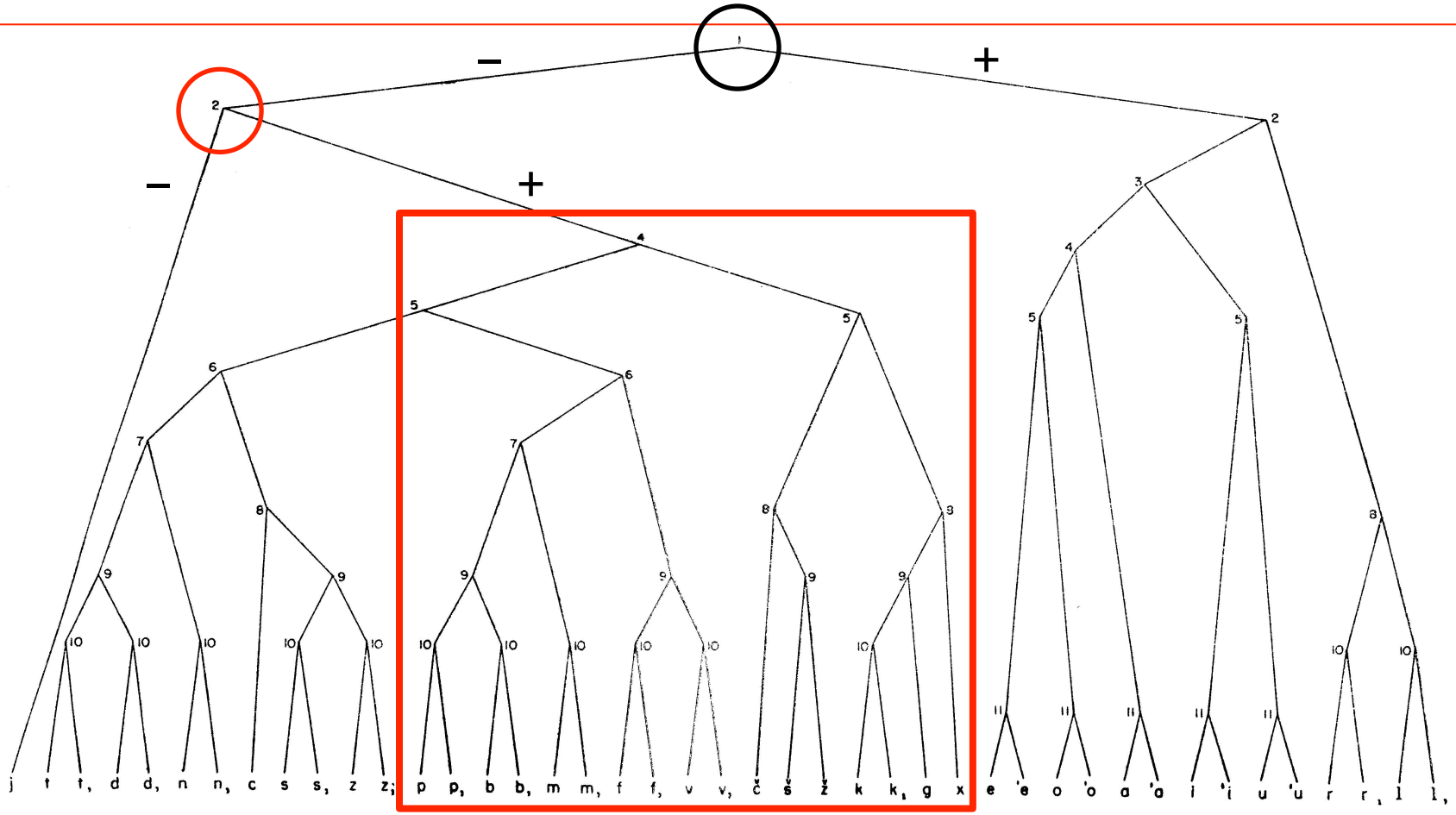
Feature ordering

We continue dividing the tree by contrastive features until every phoneme has been uniquely distinguished.

Note that the *ordering* of the features is crucial: different orders can result in different contrastive specifications.

The potentially dramatic effects of ordering on specification can be illustrated with one section of the Russian tree.

The red box includes consonants that are [–vocalic] (to the left under the circled node at the top of the tree) and [+consonantal] (to the right under the node circled in red).



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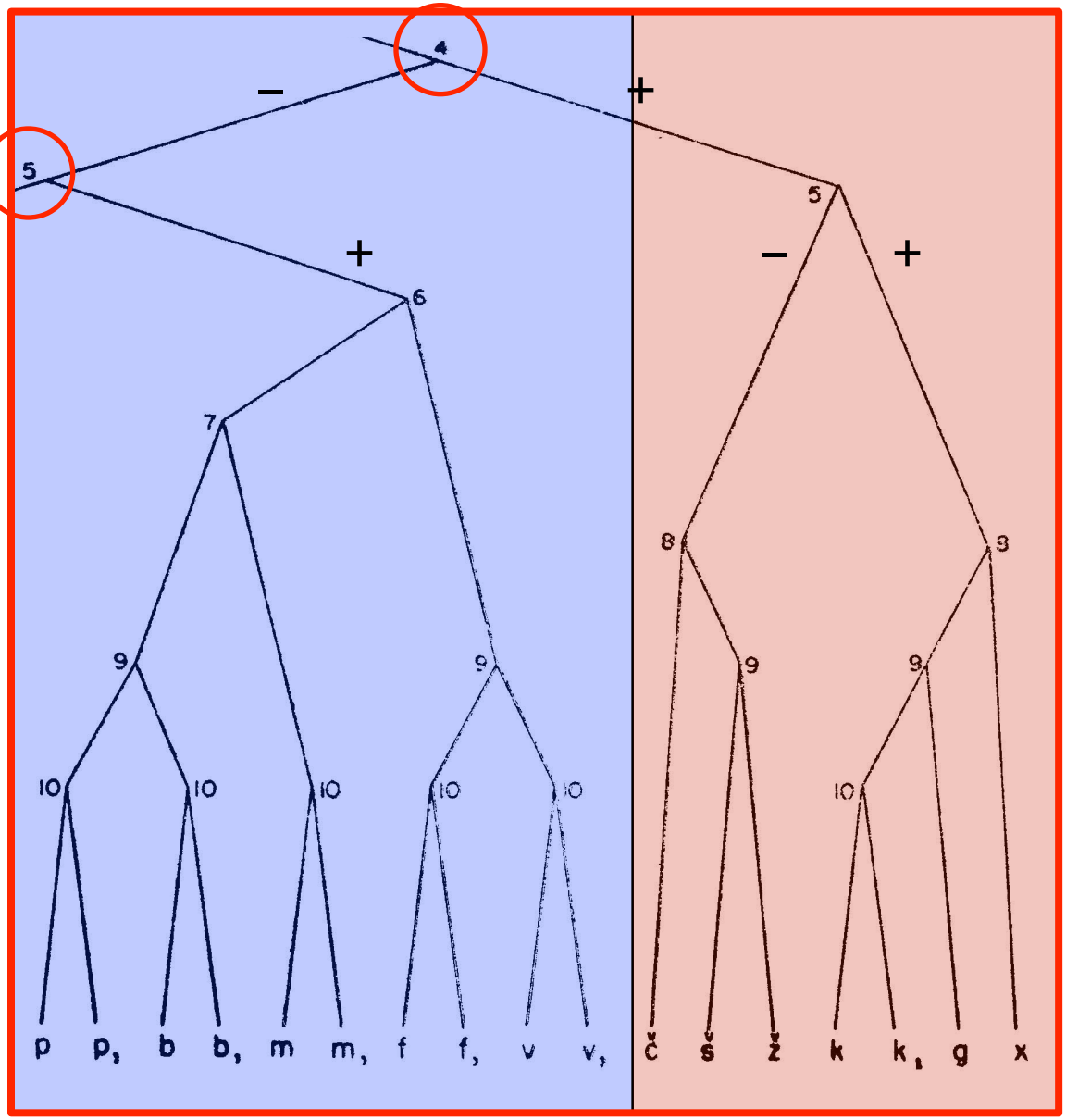
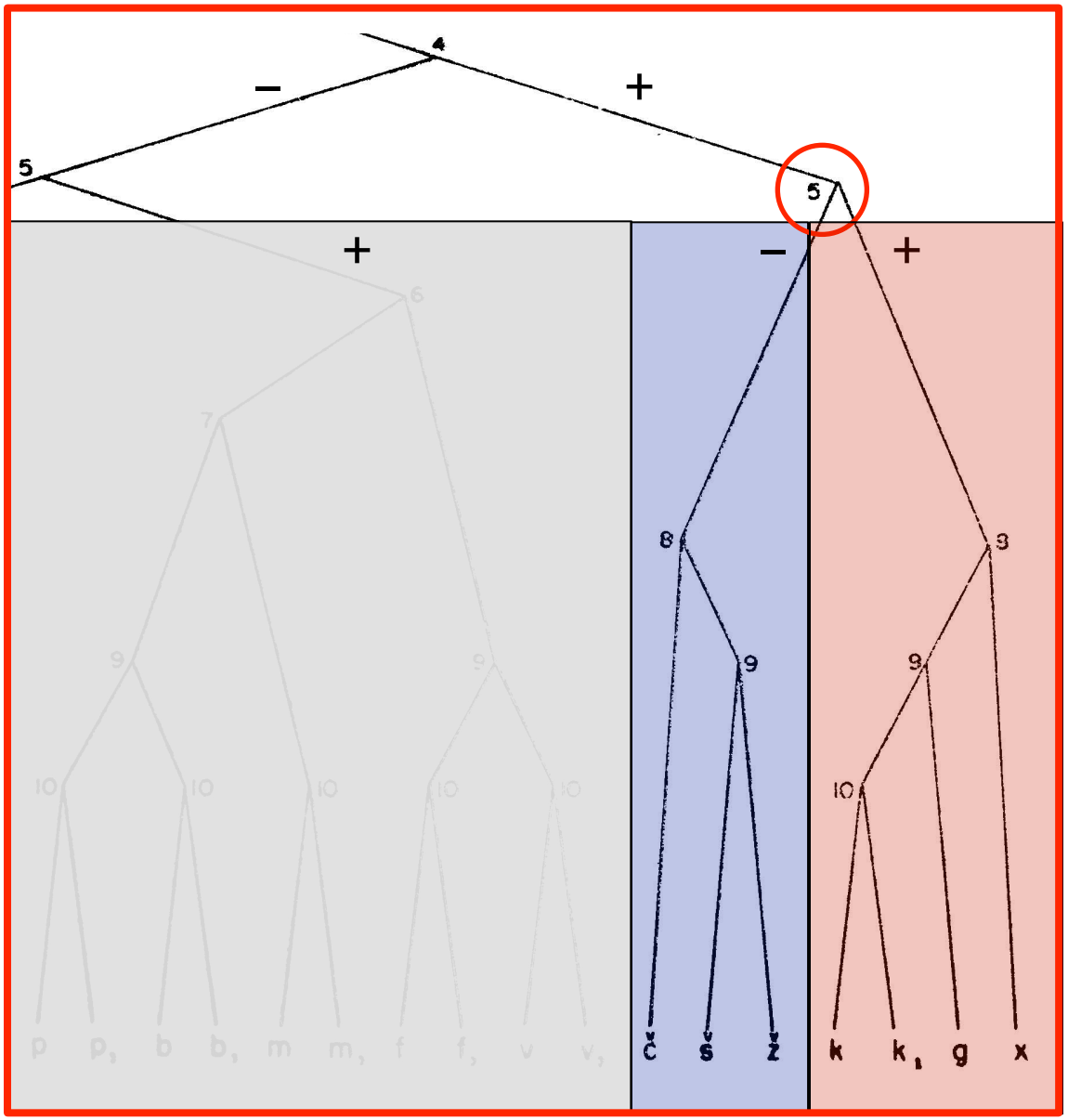
In a larger view:



Under [–compact] (node 4 at the top to the left) and [+low tonality] (under node 5) are the labial consonants (stops, nasals, and fricatives).

Under [+compact] (node 4 at the top to the right) are the posterior coronal and velar consonants.

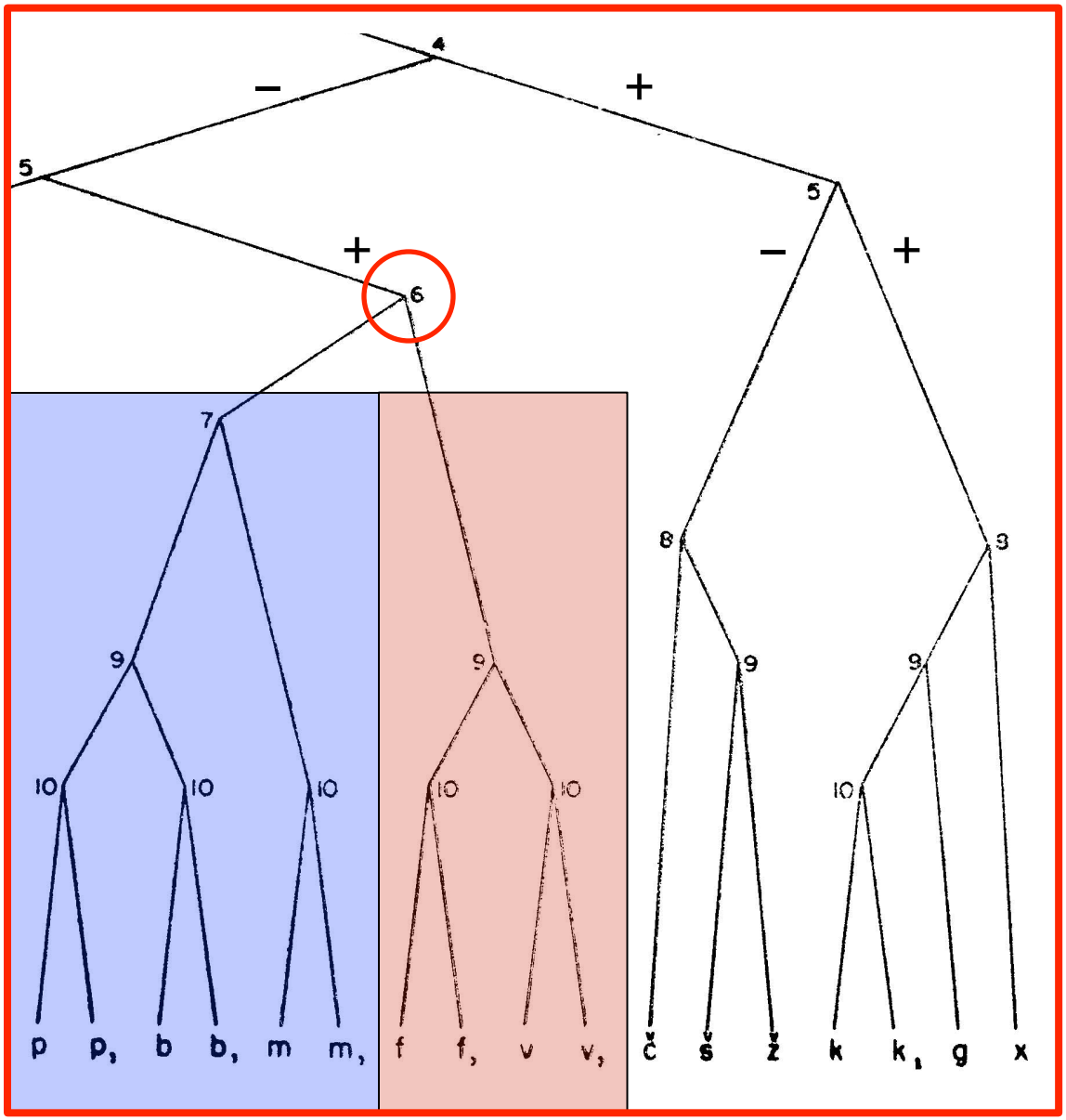
Effects of feature ordering



The posterior coronals *č, š, ž* are [–low tonality] (in blue).

The velars are [+low tonality] (in red).

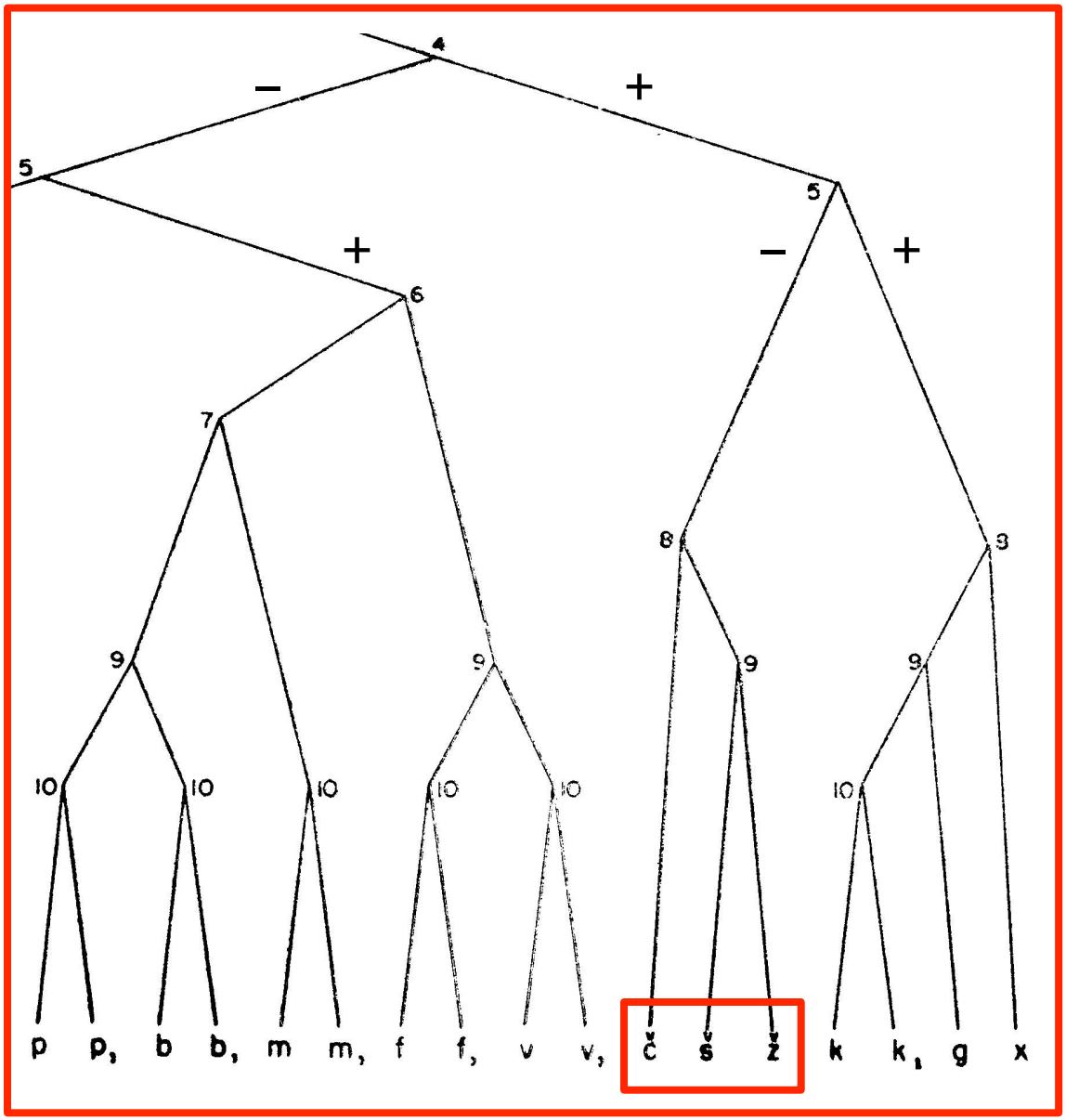
Effects of feature ordering



Feature 6 (circled) stands for [strident]. It applies within the labials to distinguish [–strident] stops from [+strident] fricatives.

Consequently, feature 8, [continuant], does not apply to the labials because the stops and fricatives have already been distinguished by [strident].

Effects of feature ordering



Perhaps unexpectedly, [strident] does not apply to the proto-typically strident *č, š, ž* (IPA /tʃ, ʃ, ʒ/) because they already form a separate group.

All these specifications could be altered if the features were ordered differently.

Rationale for feature hierarchies

Given the importance of the ordering of features in determining what the feature specifications are, it is important to know why Halle (1959) chose to order the features the way he did.

Halle (1959: 29–30) provides the rationale, in his Condition (5):

> **Condition (5)**
>
> In phonological representations the number of specified features is consistently reduced to a minimum compatible with satisfying Conditions (3) and (4).

(Roughly speaking, Conditions (3) and (4) require that the phonological description meet basic conditions of adequacy.)

Rationale for feature hierarchies: Minimality of specifications

That is, the main criterion for deciding on how to order features in *SPR* is to minimize the number of feature specifications.

We will call this the *Minimality Principle*, which can be restated as follows:

> **Minimality Principle for Feature Ordering**
>
> The criterion for ordering features into a hierarchy is to minimize redundancy in phonological representations and to maximize the amount of information conveyed by each feature.

Rationale for feature hierarchies: Minimality of specifications

Halle's concern with Minimality is reflected in his observation (1959: 44–5) that his analysis of Russian contains 43 phonemes specified by 271 feature specifications, or 6.3 distinctive feature statements per phoneme.

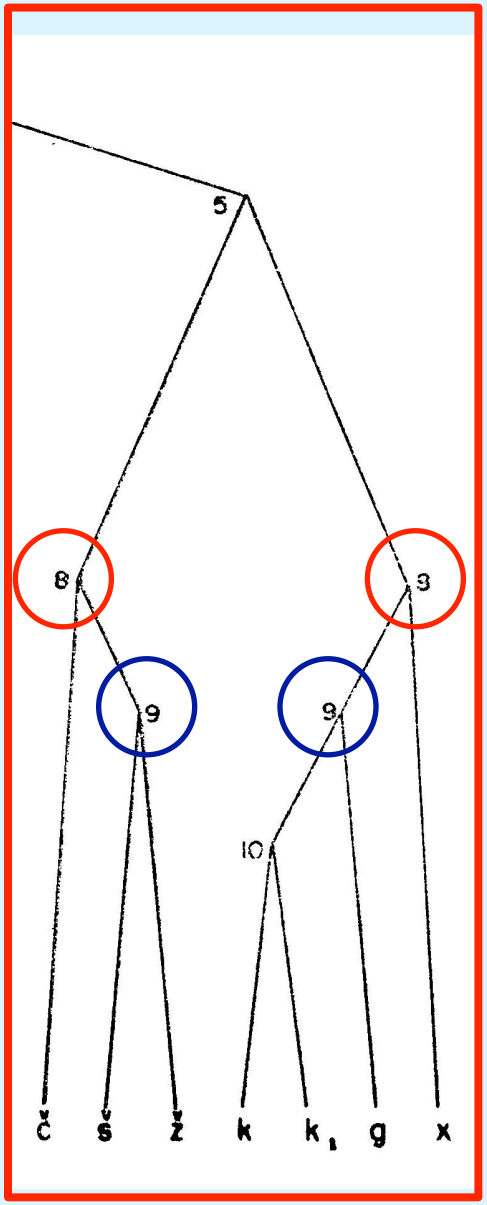
He compares 6.3 with the lower limit of $\log_2 43 = 5.26$ specifications, which would represent the most efficiently branching tree for 43 phonemes.

The principle of Minimality can lead to feature orderings that may strike us as counter-intuitive, or orderings that do not closely reflect phonological patterning.

Effects of feature ordering

The ordering of two features in the part of the tree we looked at earlier had momentous consequences for the development of phonological theory.

These are features 8, [±continuant], in the red circles, and 9, [±voiced], in the blue circles.

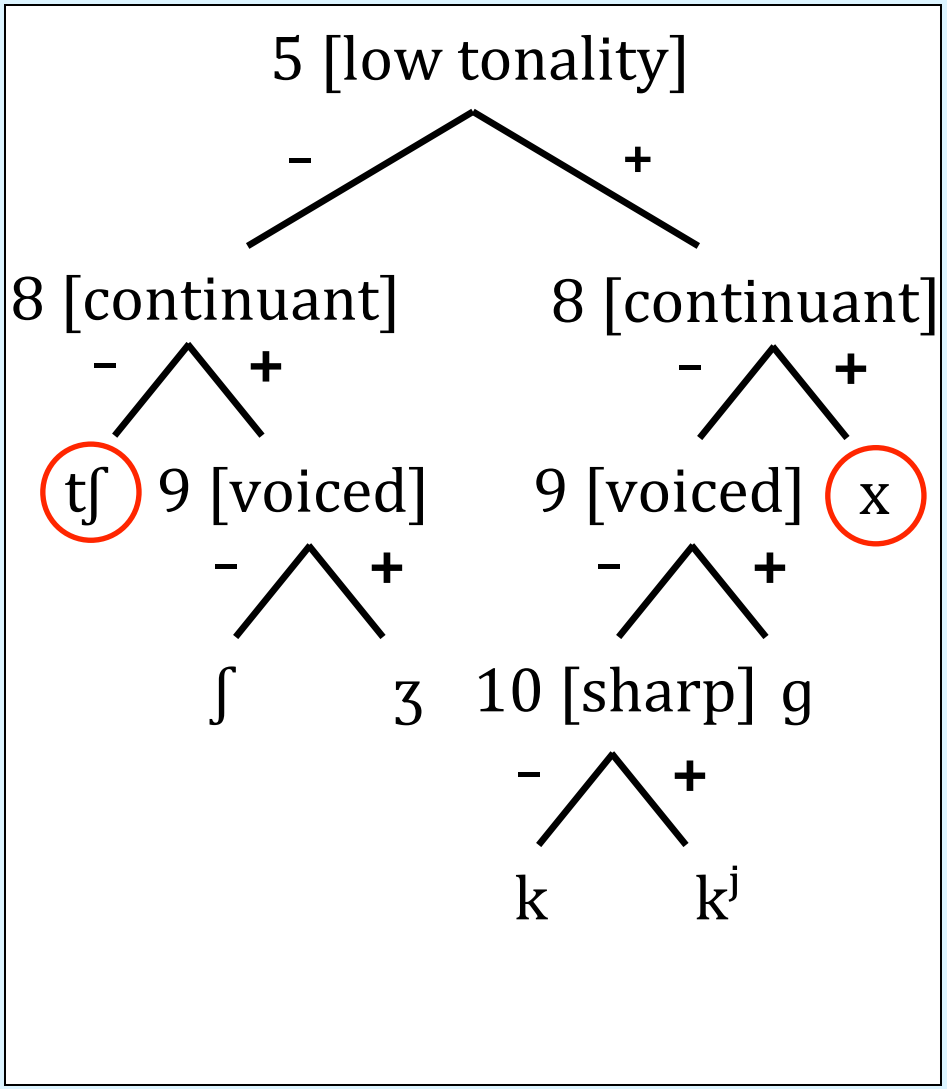


[continuant] is ordered above [voiced]; every phoneme in this diagram has a specification for [continuant].

The same is not the case for [voiced]!

The ‘unpaired’ phonemes

In a larger and more legible view:



In the ordering shown, /tʃ/ and /x/ are unspecified for [voiced].

But as Halle famously pointed out, these segments (as well as /ts/) behave phonologically like other voiceless obstruents with respect to voicing assimilation.

Derivation with ‘unpaired’ phoneme

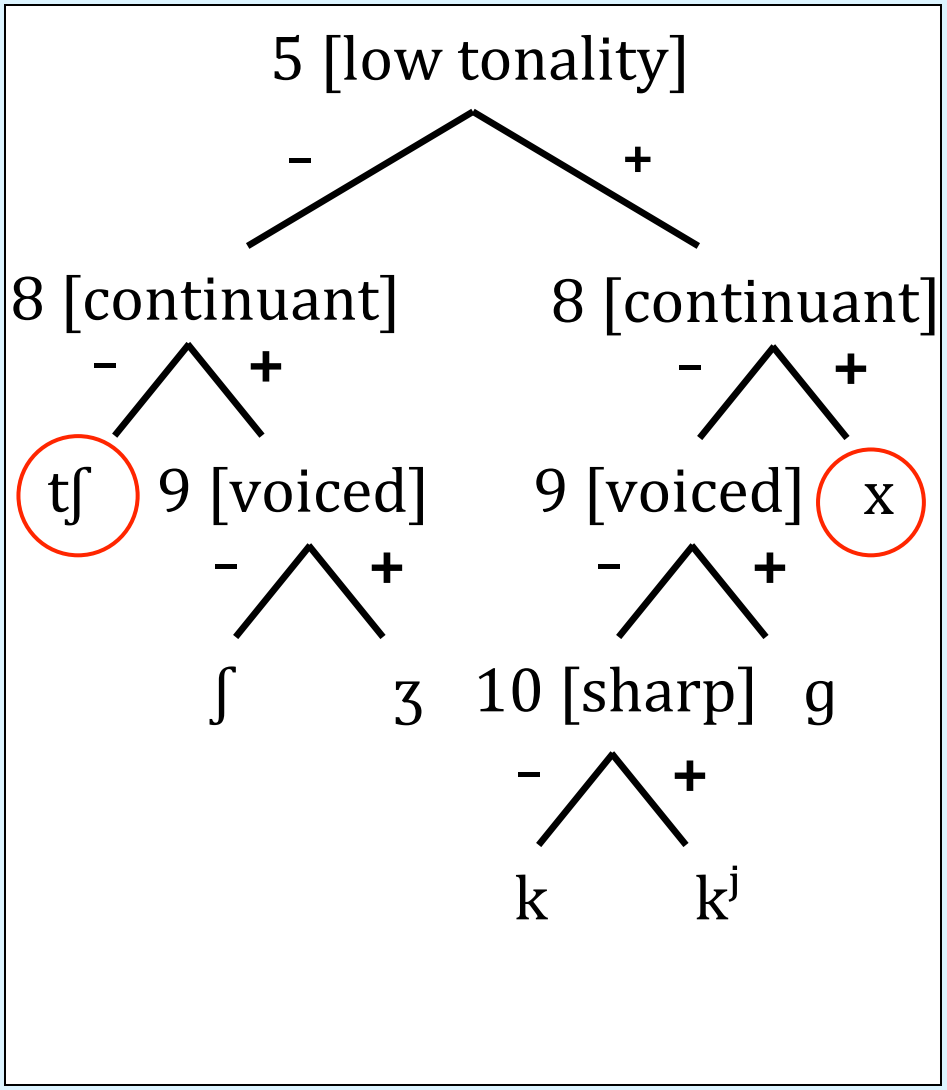
In *SPR*, this is accounted for by the following rules:

Rule P 1b:	Unless followed by an obstruent, /ts/, /tʃ/, and /x/ are voiceless.
Rule P 3a: *Regressive Voicing Assimilation (RVA)*	If an obstruent cluster is followed […] by a sonorant, then with regard to voicing the cluster conforms to the last segment.

An example is the derivation of [safxos] ‘state farm’ from /sovxoz/. The Ø specification for [voiced] of /x/ is immediately filled in, so it has no effect on the phonology.

	Underlying		Rule P1b		Rule P3a
	/s o v x o z/	⟶	s o v x o z	⟶	s o f x o z
[voiced]	+ Ø		+ –		– –

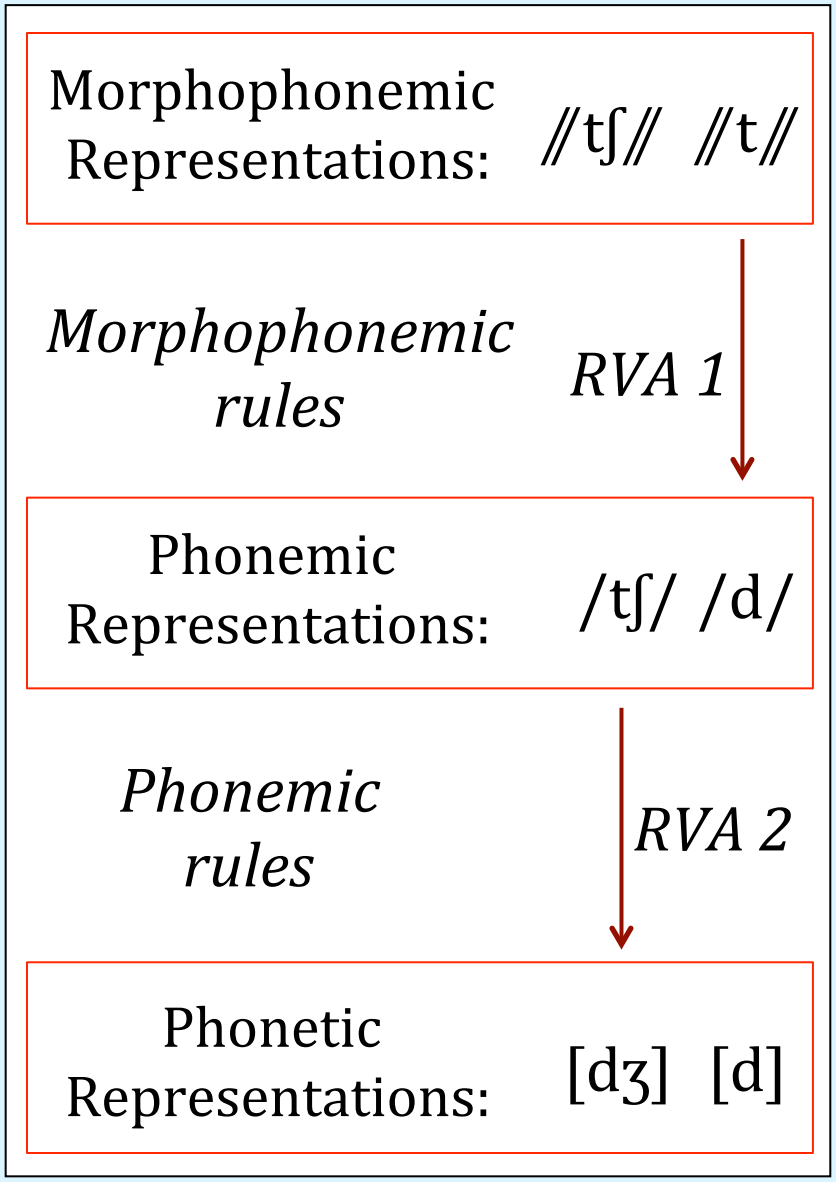
The ‘unpaired’ phonemes



So although ‘unpaired’ /tʃ, x, ts/ are not specified for [±voiced] underlyingly by the branching tree, they are assigned [–voiced] early in the derivation, and subsequently behave like other voiceless segments.

This analysis formed the basis of Halle’s famous argument against the structuralist, or ‘taxonomic’, phoneme:

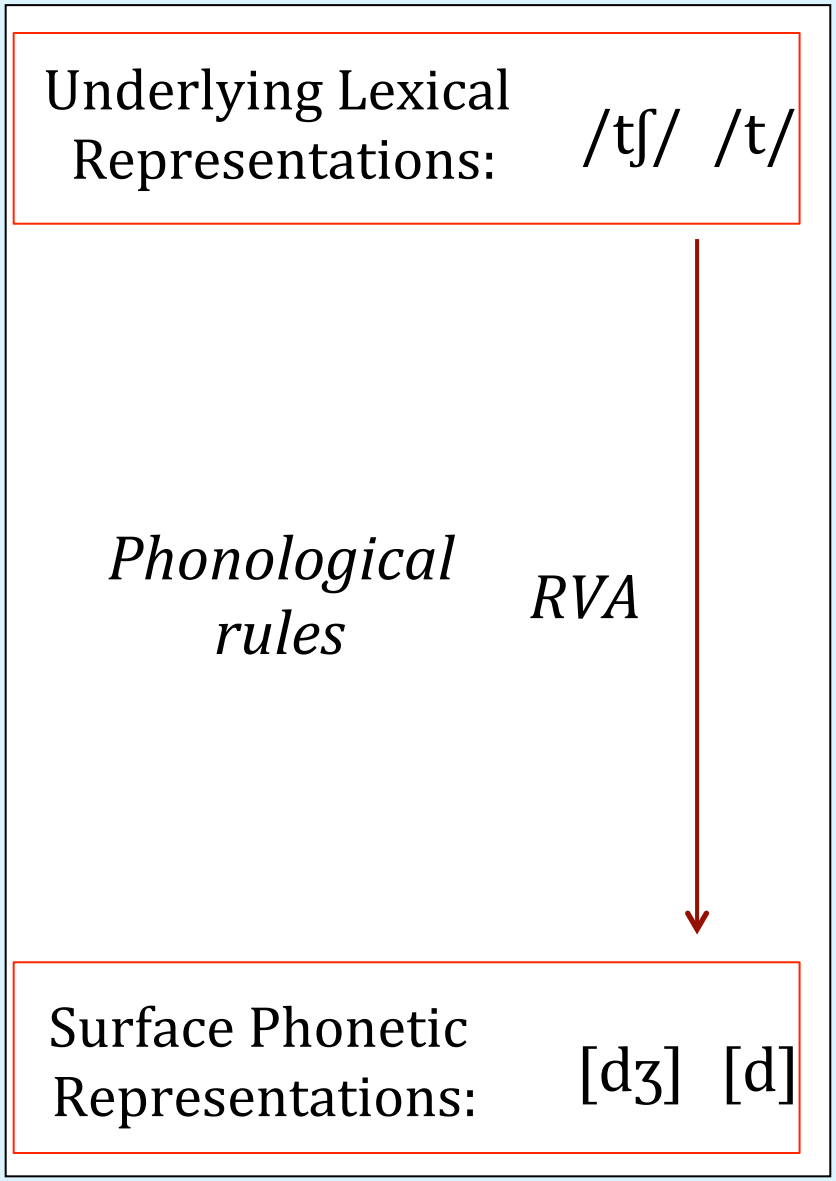
Against the taxonomic phoneme



The same rule of Regressive Voicing Assimilation (RVA) that applies in the morphophonemic component to change one (morpho)phoneme into another (say, //t// into /d/)…

must apply again in the later component that turns phonemes into allophones (e.g. /tʃ/ to [dʒ]).

Against the taxonomic phoneme



Thus, the grammar can be simplified by rejecting the phonemic level and allowing a smooth transition from underlying lexical representations to surface phonetic representations, with no intermediate level (such as the old phonemic level) accorded special status

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The demise of underspecification and the branching trees in generative phonology

The end of underspecification

Although not much (if at all) remarked upon at the time, there was a further far- reaching consequence of the *SPR* analysis:

The distinction between *contrastive* and *non-contrastive* features became unimportant as far as the workings of the phonology are concerned, as illustrated by the derivations shown earlier.

After all, if a phoneme (like /x/ or /tʃ/) is not assigned a contrastive feature by the branching tree, it can nevertheless acquire that feature in the course of the derivation, whenever it is needed.

The end of underspecification

This made the whole notion of contrastive underspecification vulnerable to arguments such as those of Stanley (1967),

which soon led to the abandonment of underspecification altogether in Chomsky and Halle's *Sound Pattern of English* (*SPE,* 1968), along with the branching trees that generate them.

The result was that language-particular feature contrasts did not play a role in the theory of generative grammar that developed from *SPE*.

Consequences of Minimality

As a result, the branching trees, or more properly, contrastive feature hierarchies, disappeared from generative phonology for a generation.

This whole sequence of events began with the decision to order features on the basis of the Minimality Principle; but Halle could have taken another path…


And both that morning equally lay
In leaves no step had trodden black.
Oh, I kept the first for another day!

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Prague School phonology: Contrastive properties and the original rationale for ordering features into a hierarchy

Origins of contrastive feature hierarchies

Although the main criterion for ordering features in *SPR* is Minimality, that is, minimizing the number of feature specifications, this was not the original rationale.

The notion of specifying phonemes in terms of contrastive features ordered into hierarchies can be traced back to the work of the Prague School phonologists, Roman Jakobson and N. S. Trubetzkoy, in the 1920s and 1930s.

Though branching trees did not yet make an appearance, they implicitly underlie some of their analyses (Dresher 2009).

Active properties are contrastive

An idea that can be traced to the beginnings of modern phonology is that only some properties of a segment are *active*, or *relevant* (Trubetzkoy 1939) to the phonology, and these are the *distinctive*, or *contrastive*, properties.

An early expression of this idea can be found in Jakobson's (1962 [1931]) discussion of the difference between the Czech and Slovak vowel systems.

In this work, as well as in later publications, such as Jakobson & Lotz 1949 and Jakobson, Fant & Halle 1952, features are specified (or unspecified) in order to account for synchronic phonological behaviour, or patterns of loanword adaptation.

Another rationale for feature hierarchies: Phonological activity

It is thus *phonological activity* that determines what the features are, and how they are ordered, where feature activity can be defined as follows (based on Clements 2001: 77):

Feature activity

A feature can be said to be *active* if it plays a role in the phonological computation; that is, if it is required for the expression of phonological regularities in a language, including both static phonotactic patterns and patterns of alternation.

Another rationale for feature hierarchies: Phonological activity

That is, the original rationale for ordering features was not Minimality, but what we call the *Activity Principle*:

> **Activity Principle for Feature Ordering**
>
> The criterion for ordering features into a hierarchy is to reflect patterns of phonological activity in a language.

The original intuition behind feature hierarchies is that there is a connection between phonological activity and contrast (Dresher 2009, 2015).

The Contrastivist Hypothesis

This connection is made explicit by what Hall (2007: 20) calls the *Contrastivist Hypothesis:*

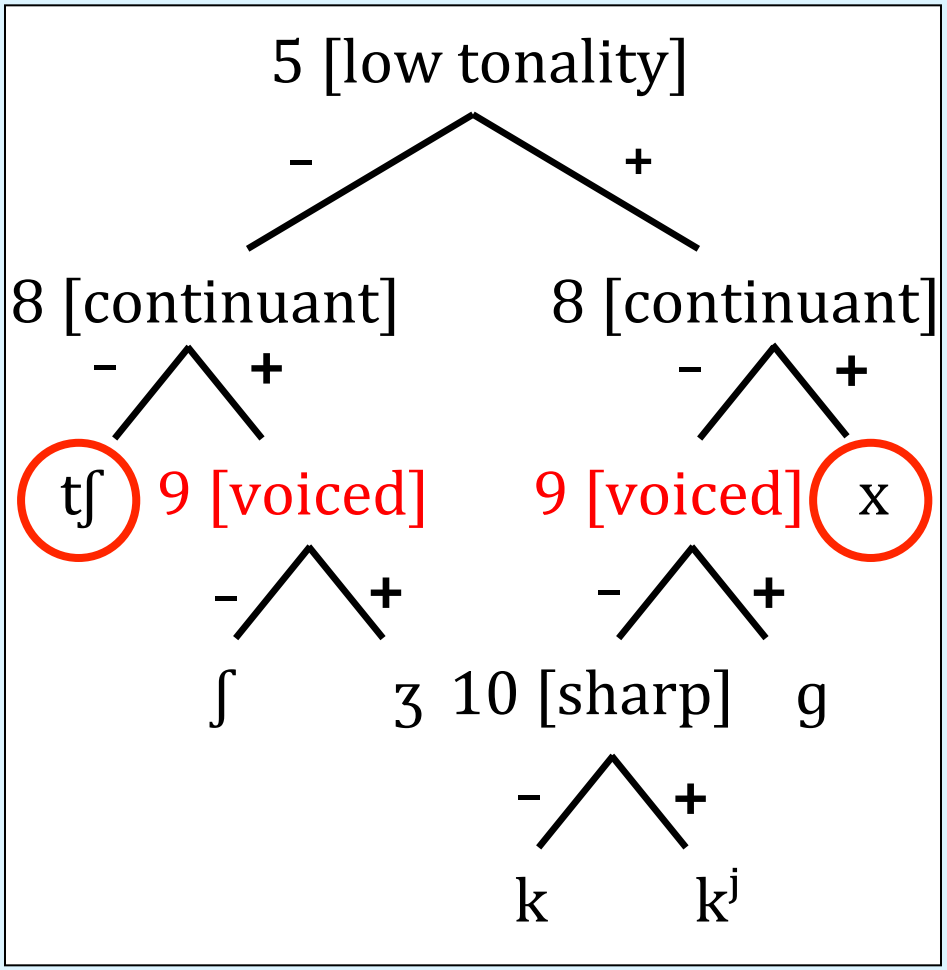
> **The Contrastivist Hypothesis**
>
> The phonological component of a language L operates only on those features which are necessary to distinguish the phonemes of L from one another.

It follows that only *contrastive* features can be *active* in phonological processes.

Let us revisit the Russian example assuming now that Activity is our guiding principle.

The ‘unpaired’ phonemes redux

Halle’s ordering in *SPR*

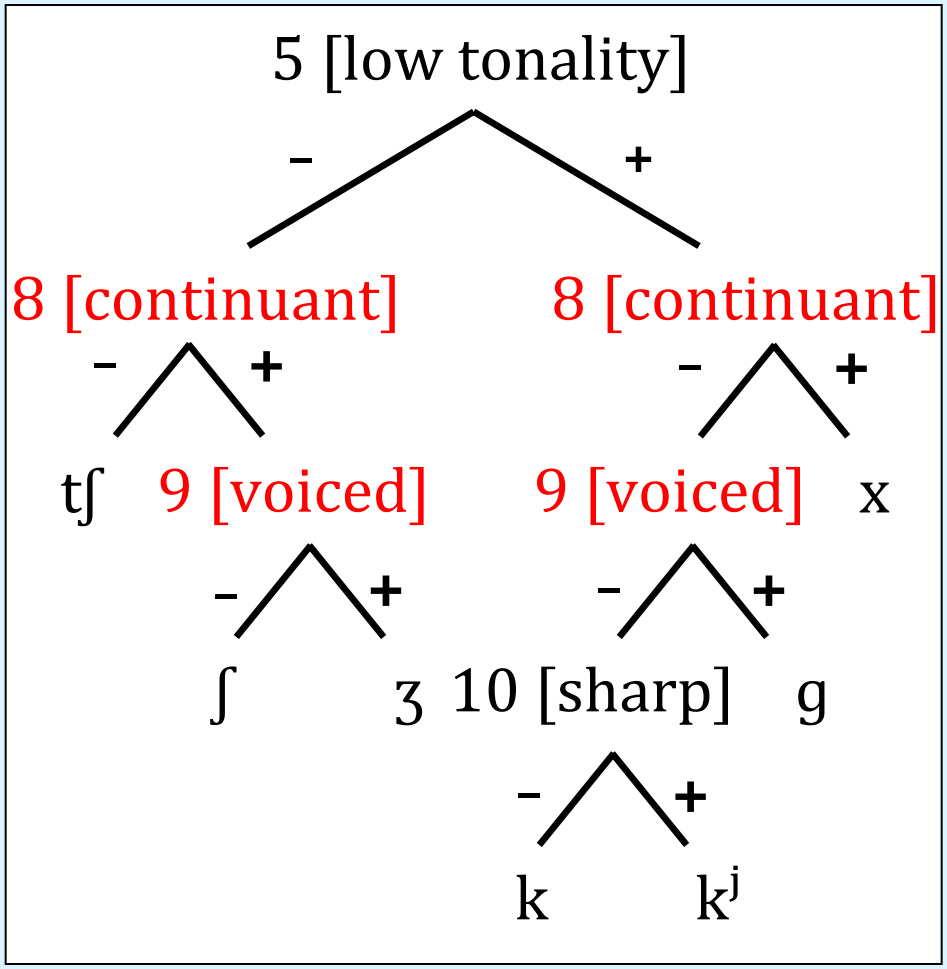


We have seen evidence from activity that the ‘unpaired phonemes’ /tʃ, x/ (and /ts/) must have a specification for [–voiced] with respect to the rule of RVA.

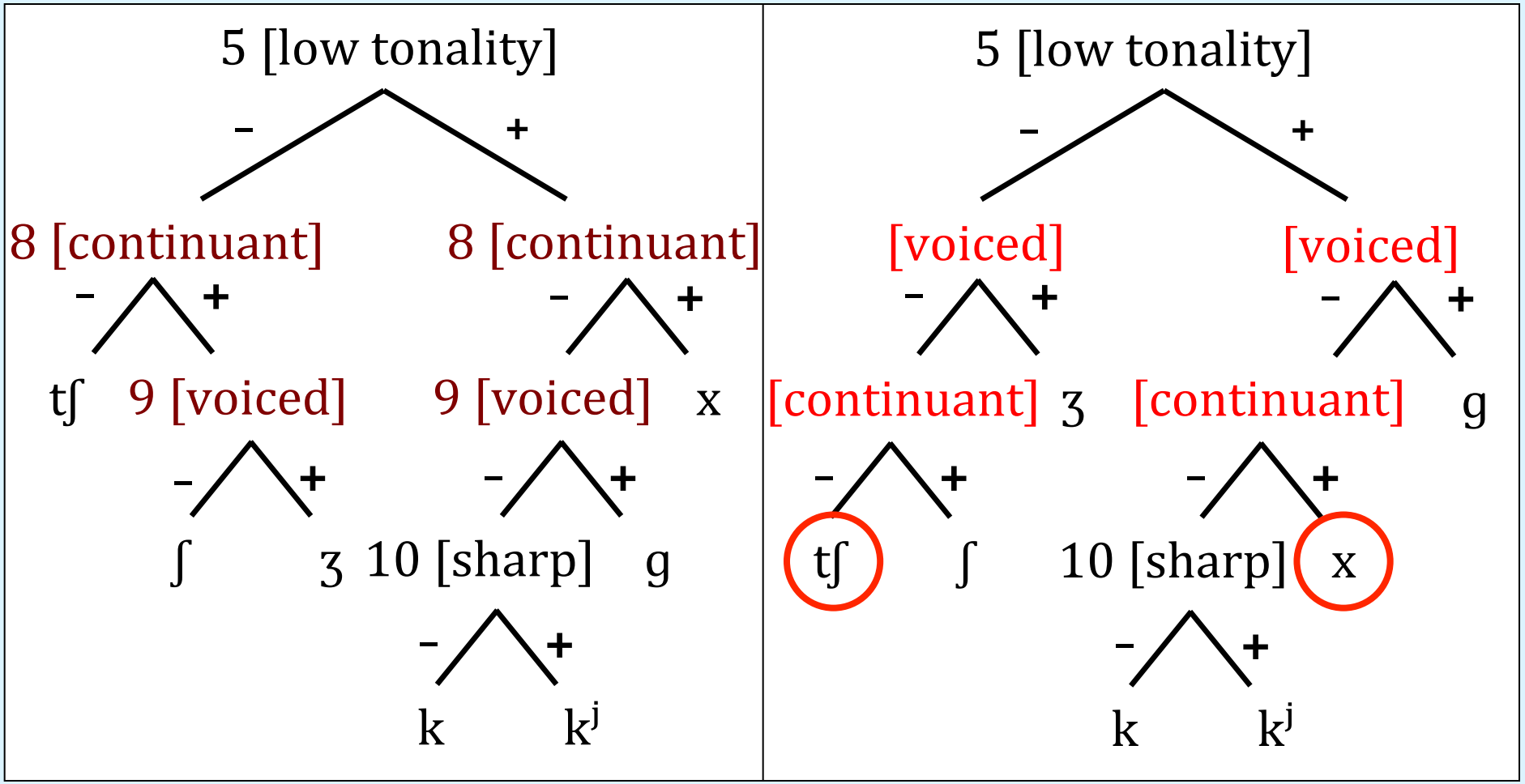
According to the Contrastivist Hypothesis, then, we conclude that these phonemes must be contrastively specified for that feature in the tree, contrary to the ordering in *SPR*.

A minimal change in the ordering of [continuant] and [voiced] is enough to achieve this result and put this problem in a different light.

Halle's ordering in *SPR*

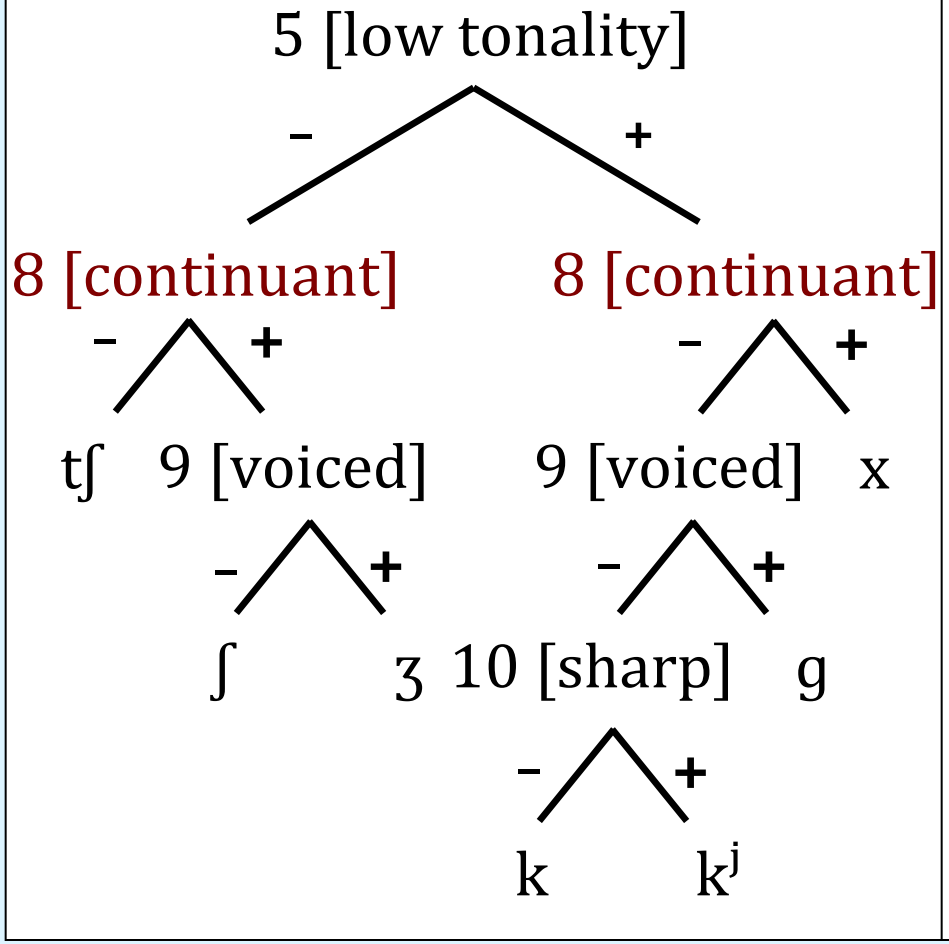


By ordering [voiced] slightly higher, the ‘unpaired’ phonemes become contrastively [–voiced], even though they have no voiced counterparts that are minimally different.

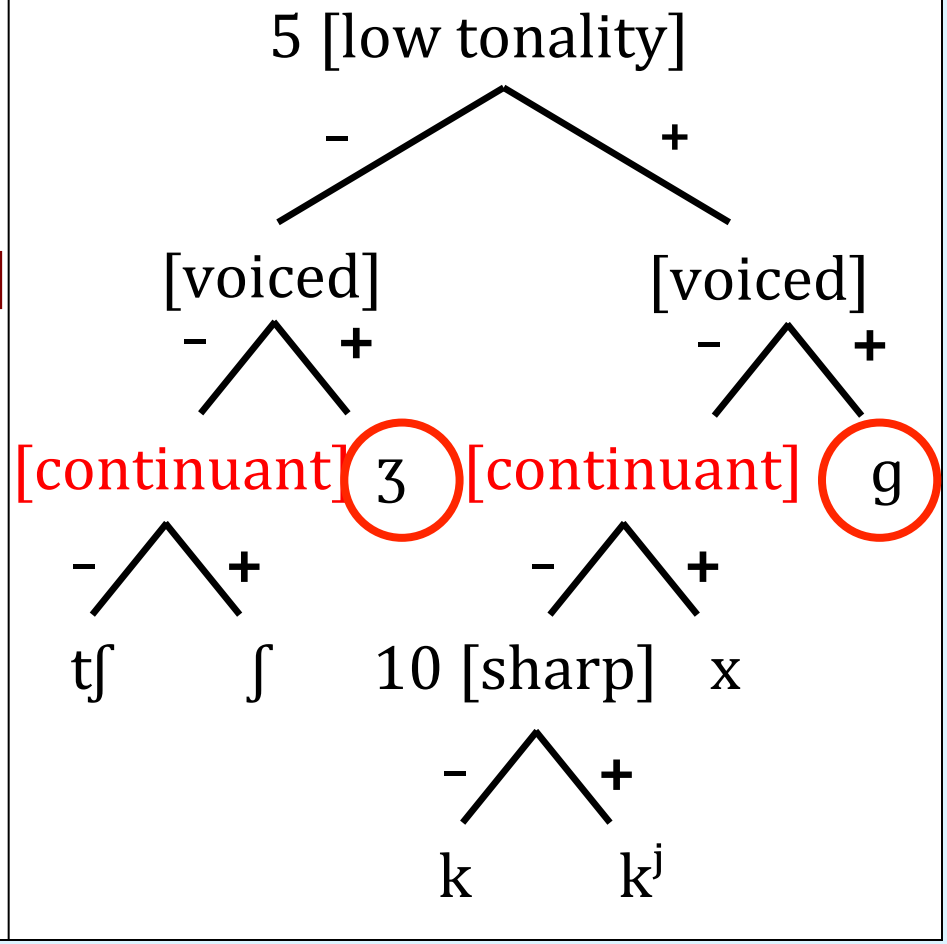


But the contrastive hierarchy forces a tradeoff: now the voiced consonants /ʒ/ and /g/ are unspecified for [continuant]. Is this a good result?

Halle's ordering in *SPR*



Revised ordering



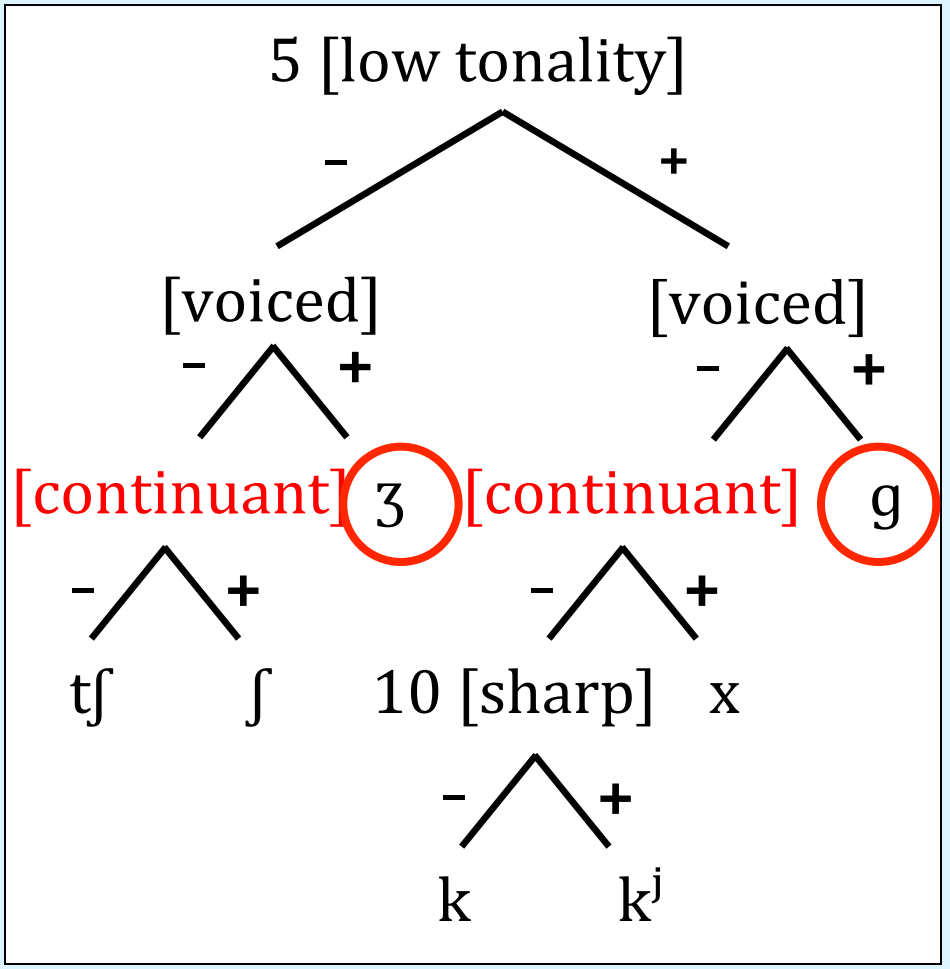
A revised Russian feature hierarchy

Dresher & Hall (2009) argue that there is circumstantial phonetic evidence that it is:

In some southern dialects of Russian, /g/ is realized as continuant [ɣ] or [ɦ].

This is a first indication that the status of /g/ as a stop may not be contrastively important.

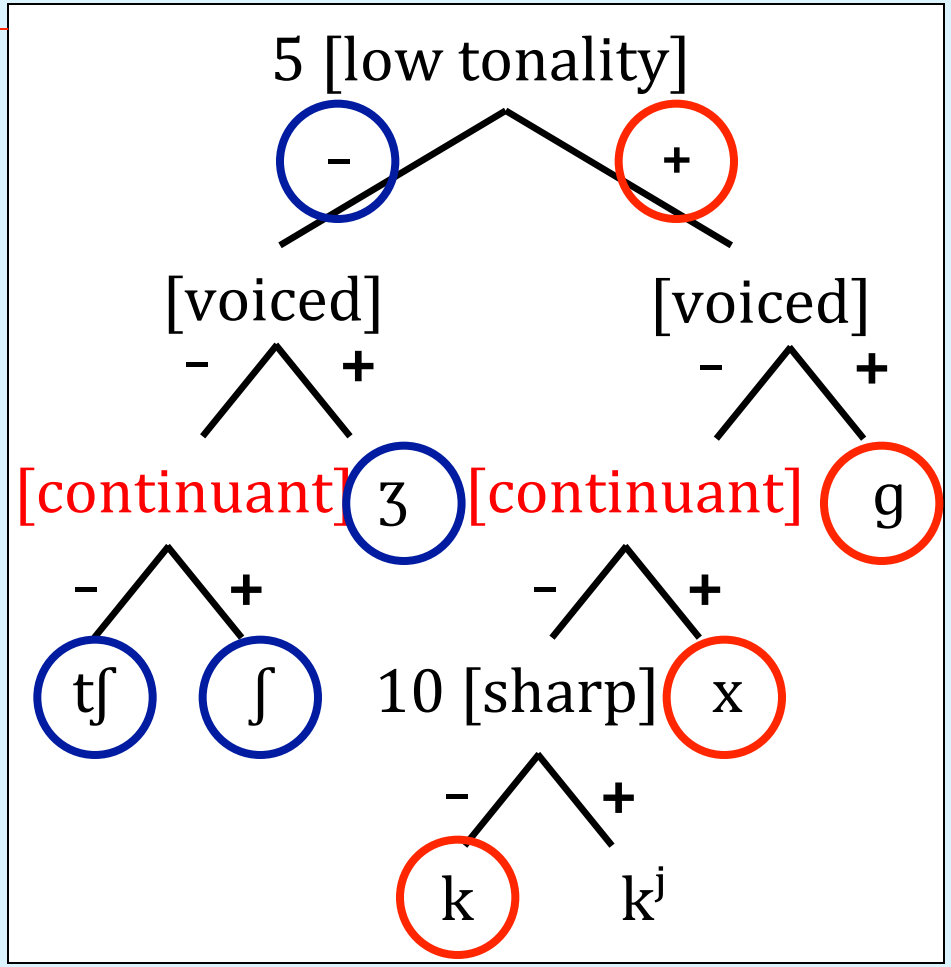
Revised ordering



There is also some (morpho)phonological evidence in the alternations resulting from the First Velar Palatalization; in terms of Halle (1959), the main change is in [low tonality]:

[+low tonality] ⟶ [–low tonality]

Revised ordering



Whereas continuant /x/ remains continuant [ʃ], and non-continuant /k/ remains non-continuant [tʃ], stop /g/ changes to fricative [ʒ].

[+low tonality] ⟶ [–low tonality]

/x/ ⟶ [ʃ]

[–voiced
  +continuant]

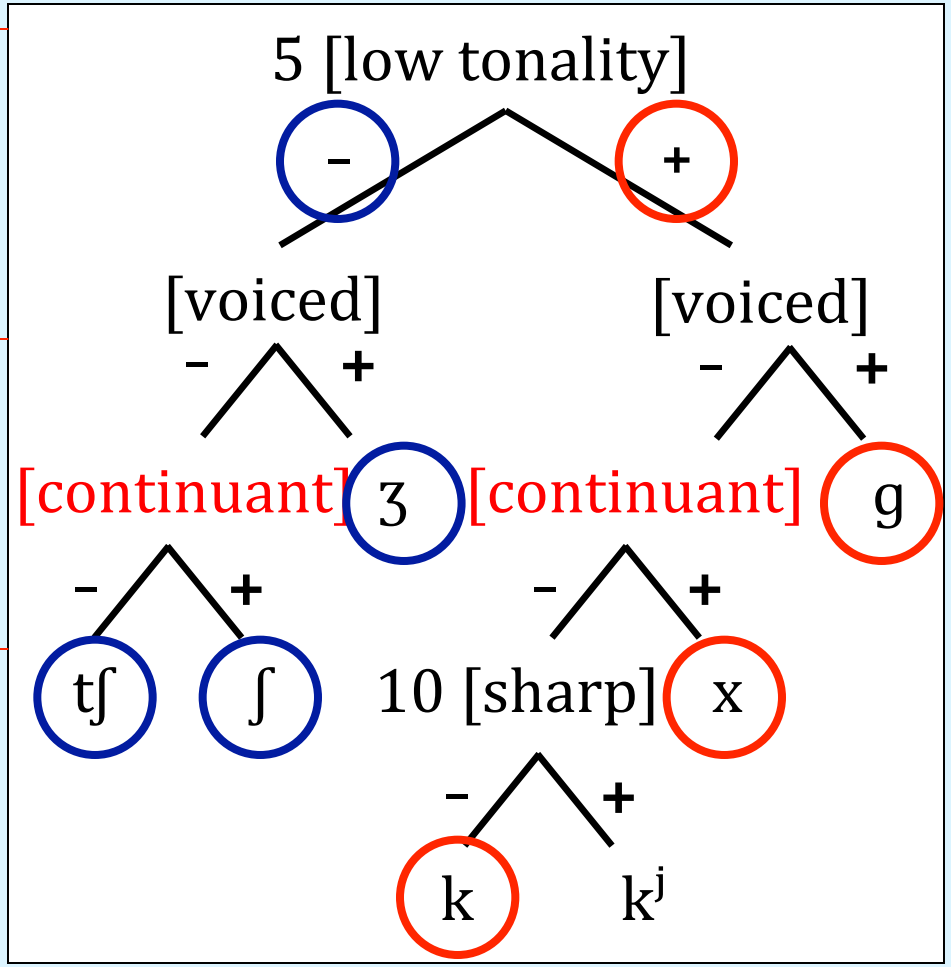
/k/ ⟶ [tʃ]

[–voiced
  –continuant]

/g/ ⟶ [ʒ]

[–voiced
  Ø continuant]

Revised ordering



Some examples are given below (Lightner 1965); see Radišić (2009) for a similar analysis of Serbian alternations.

Adjectives:

POSITIVE	COMPARATIVE	
tʲix-ij	tʲiʃ-e	‘quiet(er)’
ʒark-ij	ʒartʃ-e	‘hot(ter)’
dorog-oj	doroʒ-e	‘dear(er)’

Verbs:

3RD PL.	3RD SG.	
max-ut	maʃ-et	‘wave(s)’
pek-ut	petʃ-et	‘bake(s)’
strig-ut	striʒ-et	‘shear(s)’

Denominal adjectives:

NOUN	ADJECTIVE	
tʃerepax-a	tʃerepaʃ-ij	‘turtle’/‘testudinian’
volk	voltʃ-ij	‘wolf’/‘lupine’
vrag̊	vraʒ-ij	‘enemy’/‘hostile’

Consequences of the reordering

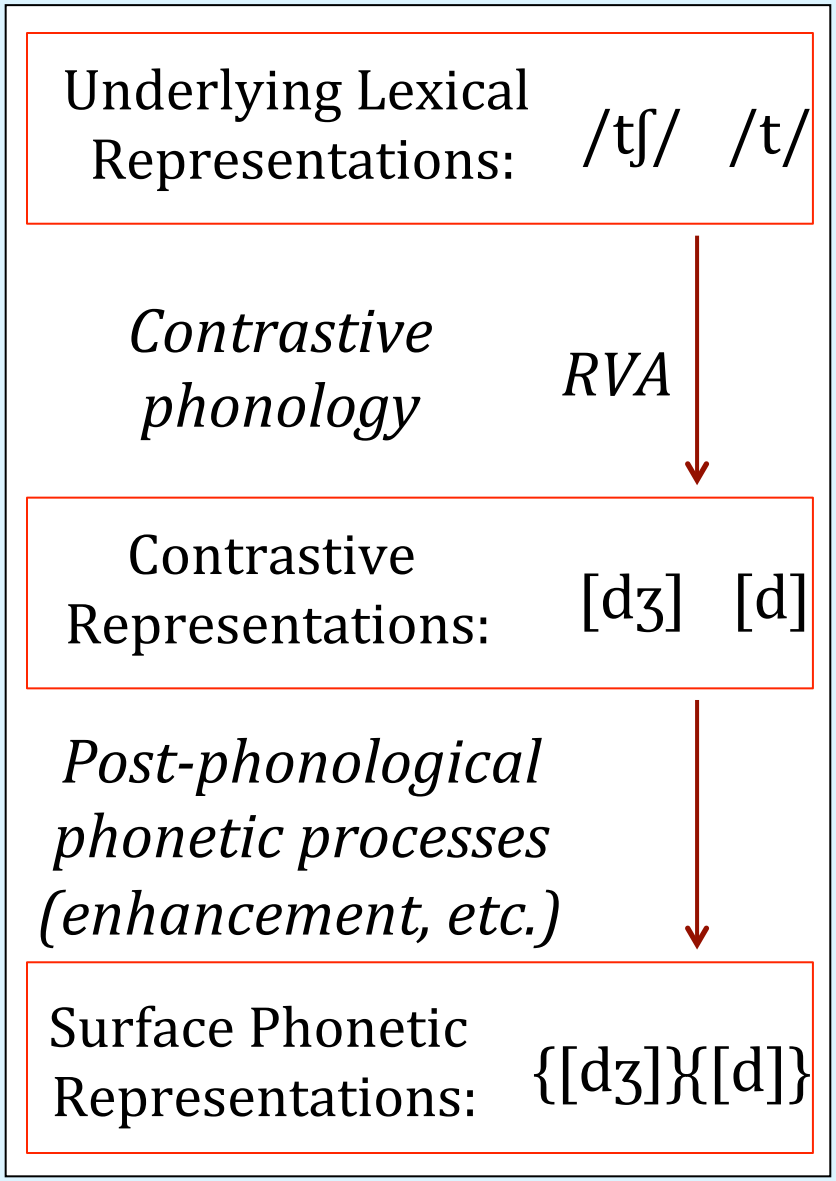
This analysis suggests a different picture of phonological levels.

The Halle-Chomsky arguments against the structuralist phoneme, defined by a series of conditions as discussed in Chomsky (1964), still go through; but the duplication problem raised by RVA disappears.

This is because the rule applies one time to segments bearing a *contrastive* specification of [±voiced], whether the result is an already existing phoneme or a new allophone of a phoneme.

While the phonemic/allophonic distinction does not mark out a special level, the difference between contrastive and non-contrastive phonology does.

Contrast in phonology



Phonology proper is governed by the Contrastivist Hypothesis.

These forms are the output of the contrastive phonology, made up only of contrastive features.

The post-phonological component admits non-contrastive features, enhancement, etc. (Hall 2011).

Conclusion

In short, if Halle had favoured Activity over Minimality as the principle governing feature ordering in Russian:

- [voiced] would be ordered above [continuant];
- the 'unpaired segments' would be contrastively specified as [–voiced];
- the connection between contrast and phonological activity would be maintained;
- contrastive feature hierarchies (branching trees) would remain the way to generate contrastive representations.

In sum, on this path, language-particular contrast remains an important means of accounting for phonological patterning.


Thank you!
Two roads diverged in a wood, and I—
I took the one less traveled by,
And that has made all the difference.

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