Contrastive Hierarchy Theory: An Overview

These are the combined slides presented at talks at the University of Connecticut, February 2015, and at the University of Massachusetts, Amherst, September 2015.

PART 1: Start to end of Section 6

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Introduction

In these slides I present an overview of Contrastive Hierarchy Theory, aka Contrast and Enhancement Theory, aka Modified Contrastive Specification (MCS) or 'Toronto School' phonology.

I will set out the main tenets and empirical claims of this theory, and briefly review their antecedents in the history of phonology.

I will then illustrate applications of the theory to topics in synchronic and diachronic phonology, as well as its implications for typology.

Outline

These slides contain the following sections:

- Section 1 presents the main ideas and assumptions of this approach to contrast.
- Section 2 is about the nature of features.
- Section 3 is a brief review of some historical antecedents to Contrastive Hierarchy Theory.
- Section 4 illustrates how the theory works synchronically with an extended example (the Classical Manchu vowel system).
- In section 5, I show how this theory allows for a novel account of the typology of vowel systems, with a focus on labial (round) harmony.

Outline

- Section 6 applies contrastive hierarchies to vowel reduction, following Spahr (2014).
- Section 7 shows why contrast must be computed hierarchically, and why approaches relying on 'minimal contrast' are incorrect.
- Sections 8–10 show how contrastive hierarchies can illuminate phonological change in terms of contrast shift.
- Section 8 reviews Oxford's (2015) account of Algonquian vowel systems, which shows how diverse differences between Central and Eastern Algonquian languages can be understood if we posit a single contrast shift.

Outline

- Section 9 recounts evidence adduced by Harvey (2012) that contrastive shifts in the Ob-Ugric Mansi and Khanty languages show clear areal isoglosses, and are borrowed between languages.
- Section 10 concerns the relationship between phonetic substance and features constructed on the basis of activity via Krekoski's (2013) analysis of the tone systems of some languages that descend from Middle Chinese.
- Section 11 considers how contrastive hierarchies can be implemented in OT.
- Section 12 presents some conclusions, followed by a list of readings and references.

1.

Contrastive Hierarchy Theory: Main Ideas

Phonological primes

I will assume that phonology computes binary features; I will assume further that every feature has a marked and unmarked value.

I assume also that markedness is language particular (Rice 2003; 2007) and accounts for asymmetries between the two values of a feature, where these exist.

To emphasize the asymmetrical aspect of feature values, we can designate the marked value of a feature F as [F], and the unmarked value as (*non-F*).

Other times it will be more convenient to use [+F] and [–F]. I consider the two notations to be interchangeable.

Phonological primes

As mentioned, the working assumption here is that the phonological primes are binary features.

It is an empirical hypothesis that the learner creates binary features and not other sorts of entities, such as privative elements or dependency structures of various kinds.

Elements can also be organized into contrastive hierarchies, with similar results, in many cases, as can be obtained with binary features.

There already exist a number of proposals to apply the Successive Division Algorithm to unary elements.

Contrastive hierarchies with unary primes

- Carvalho (2011) analyzes the European Portuguese vowel system by applying contrastive hierarchy theory to unary primes partially based on Schane's (1984) Particle Phonology.
- Voeltzel & Tifrit (2013) propose a contrastive hierarchy with binary features for Scandinavian consonants, then show how the hierarchical concept can be applied to representations based on Element Theory (KLV 1988; Angoujard 1997; Scheer 1999; Backley 2011).
- Van der Hulst (2014) illustrates how the Successive Division Algorithm can be applied to elements in the context of Radical cv Phonology (van der Hulst 1995; 1996; 2005).

Phonological primes

Contrastive hierarchies are thus applicable whether phonological primes are binary or unary.

My main reason for preferring binary features is that they appear to better account for the type of co-occurrence restrictions discussed by Mackenzie (2011; 2013).

Therefore, for the rest of this talk I will assume binary features, though the major claims about contrast do not crucially depend on this assumption.

A theory of contrast



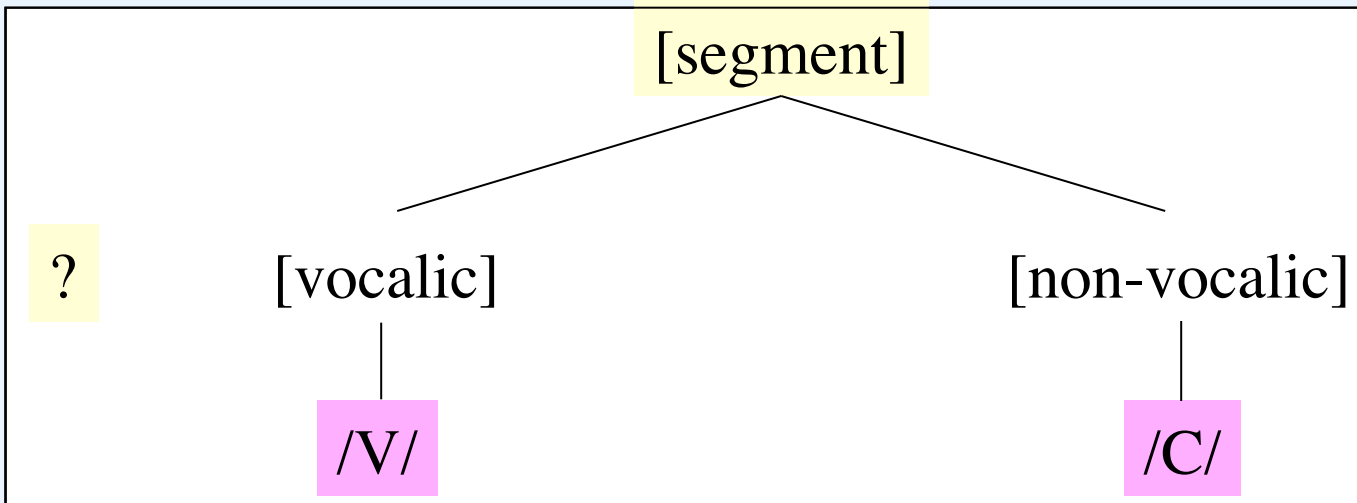
To implement contrast in an explicit theory, I build on an idea from Jakobson and his collaborators (Jakobson, Fant & Halle 1952, Jakobson & Halle 1956), that was called 'branching trees' in the literature of the 1950s and 1960s.

The contrastive hierarchy

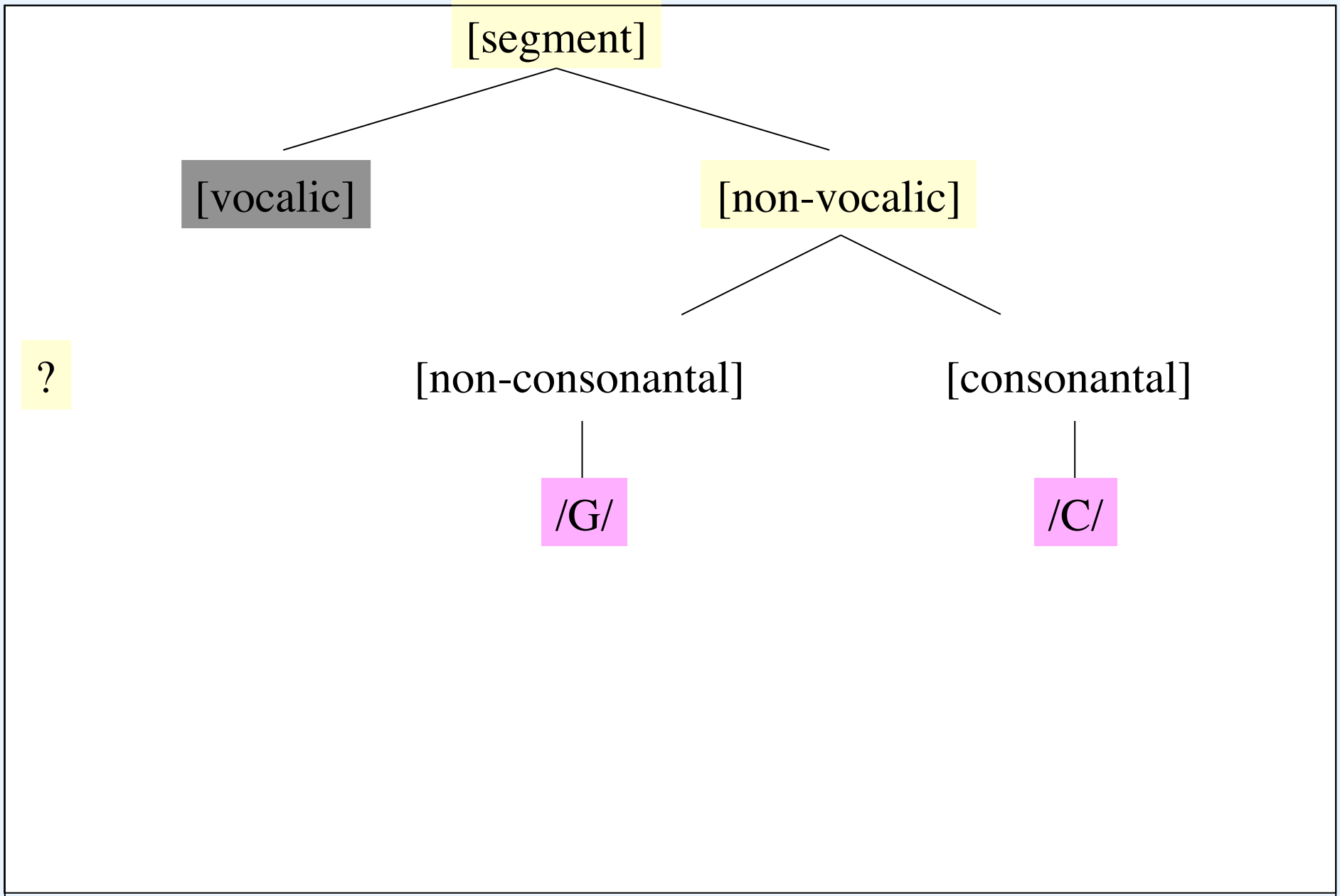
Contrastive features are assigned by language-particular feature hierarchies.

Jakobson, Fant & Halle (1952) proposed that listeners distinguish phonemes by making a series of ordered binary choices that correspond to the oppositions active in their language.

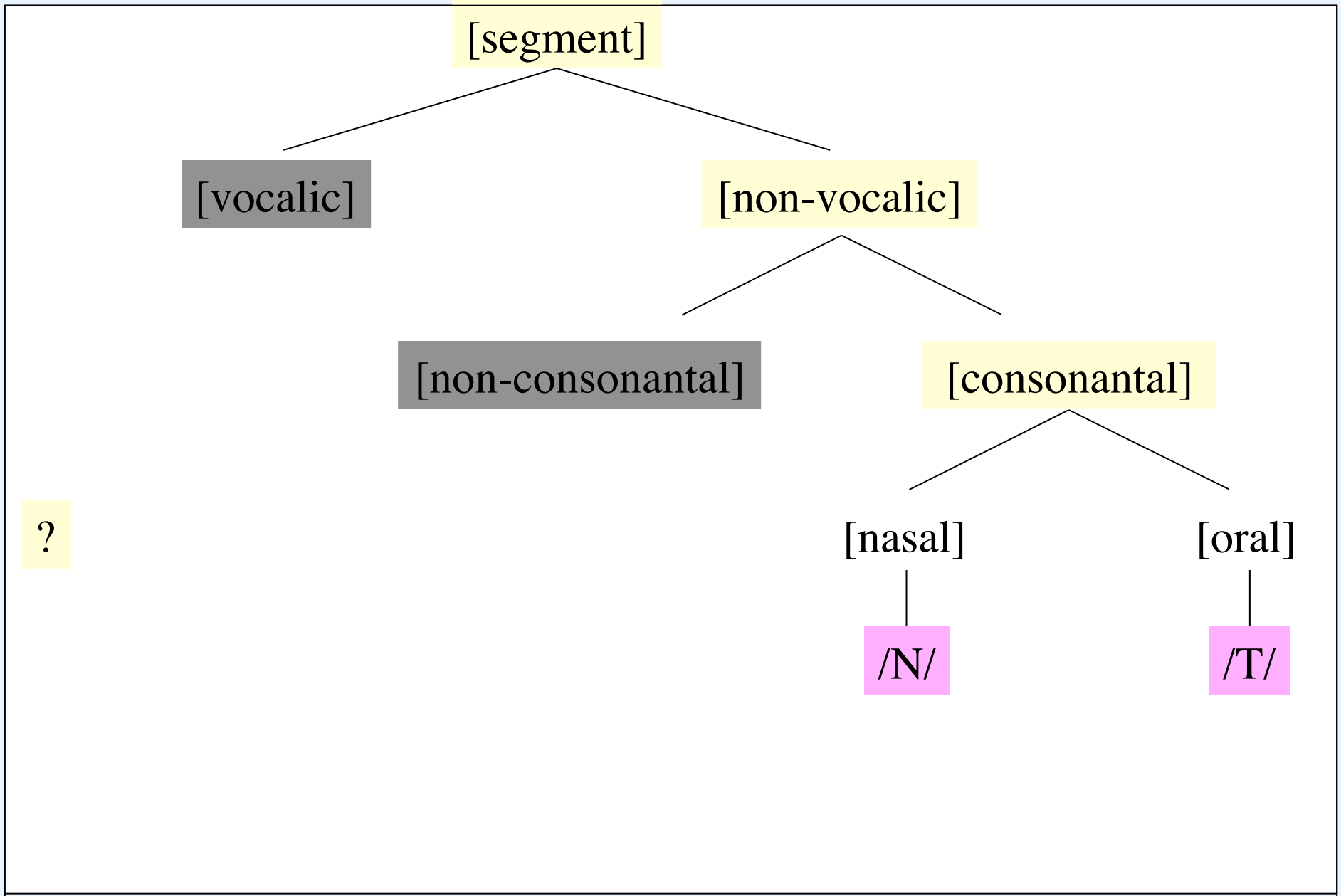
For example, suppose we hear [ŋ] in a language in which this is a phoneme. One possible way of ordering the series of binary choices might be as follows:



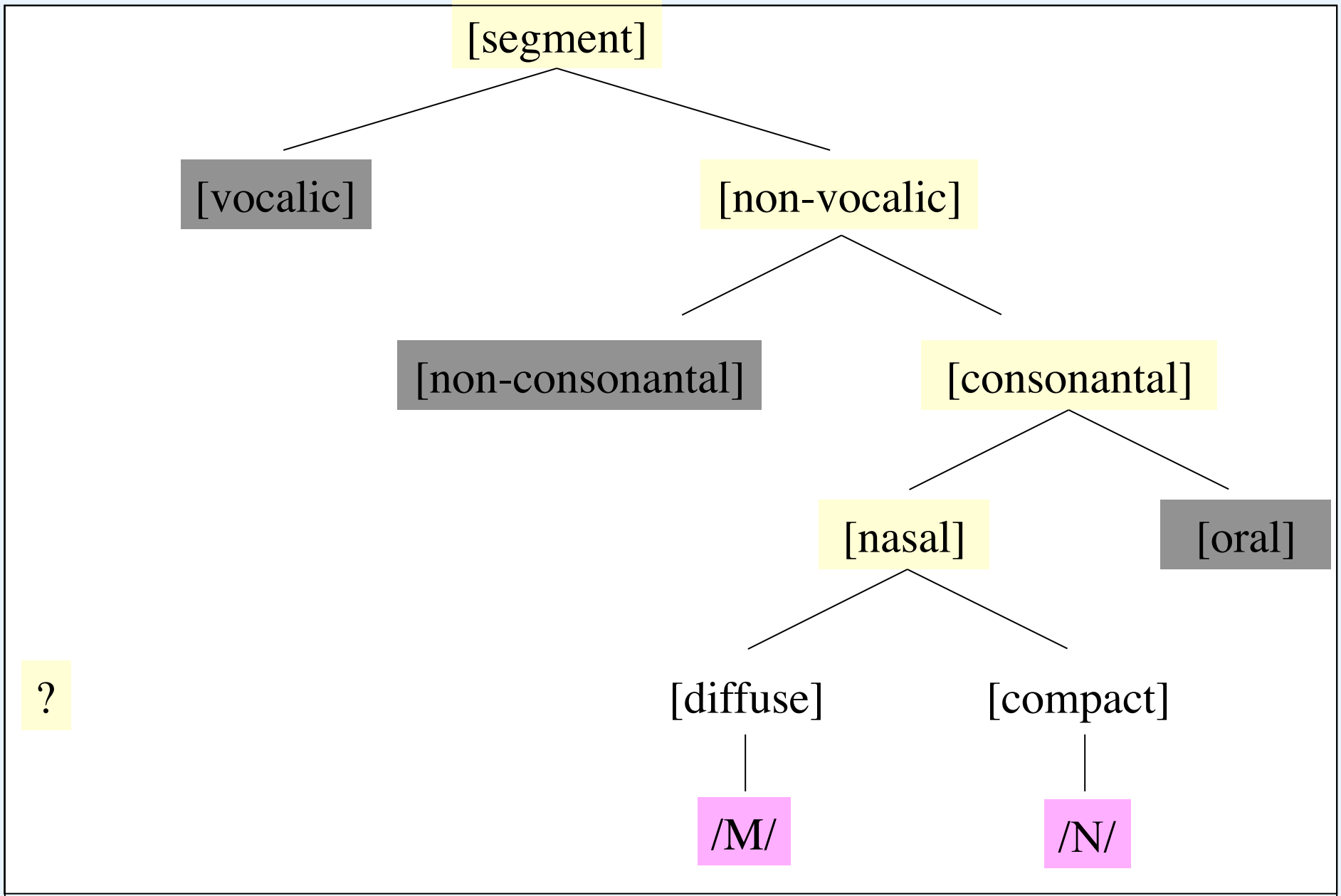
Given a segment, the first choice is if it is vocalic or non-vocalic.



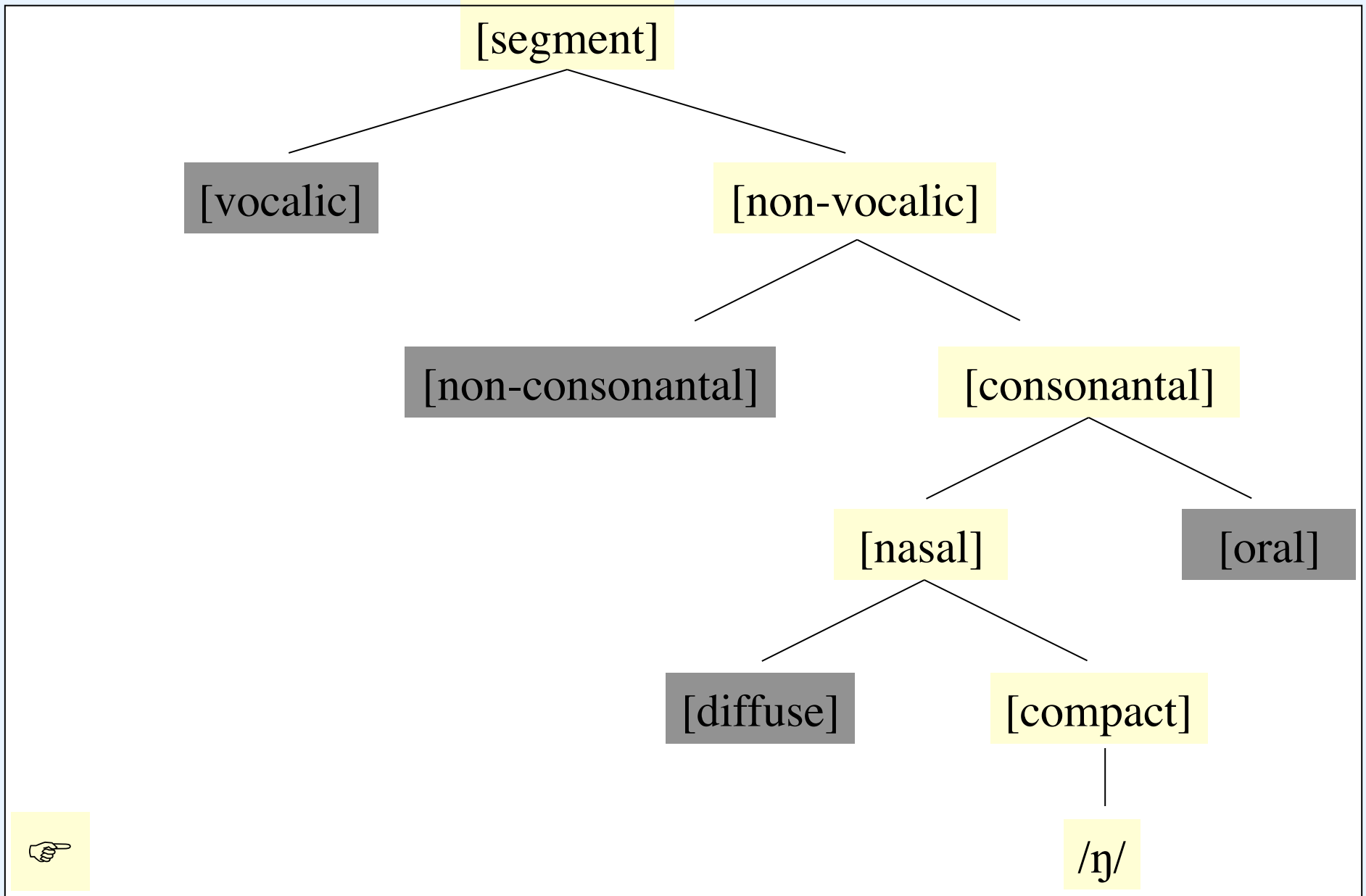
If non-vocalic, the next choice is consonantal or non-consonantal.



If consonantal, there is a contrast between nasal and oral.



If nasal, it can be diffuse or compact.



If compact there are no further choices in this language.

The contrastive hierarchy

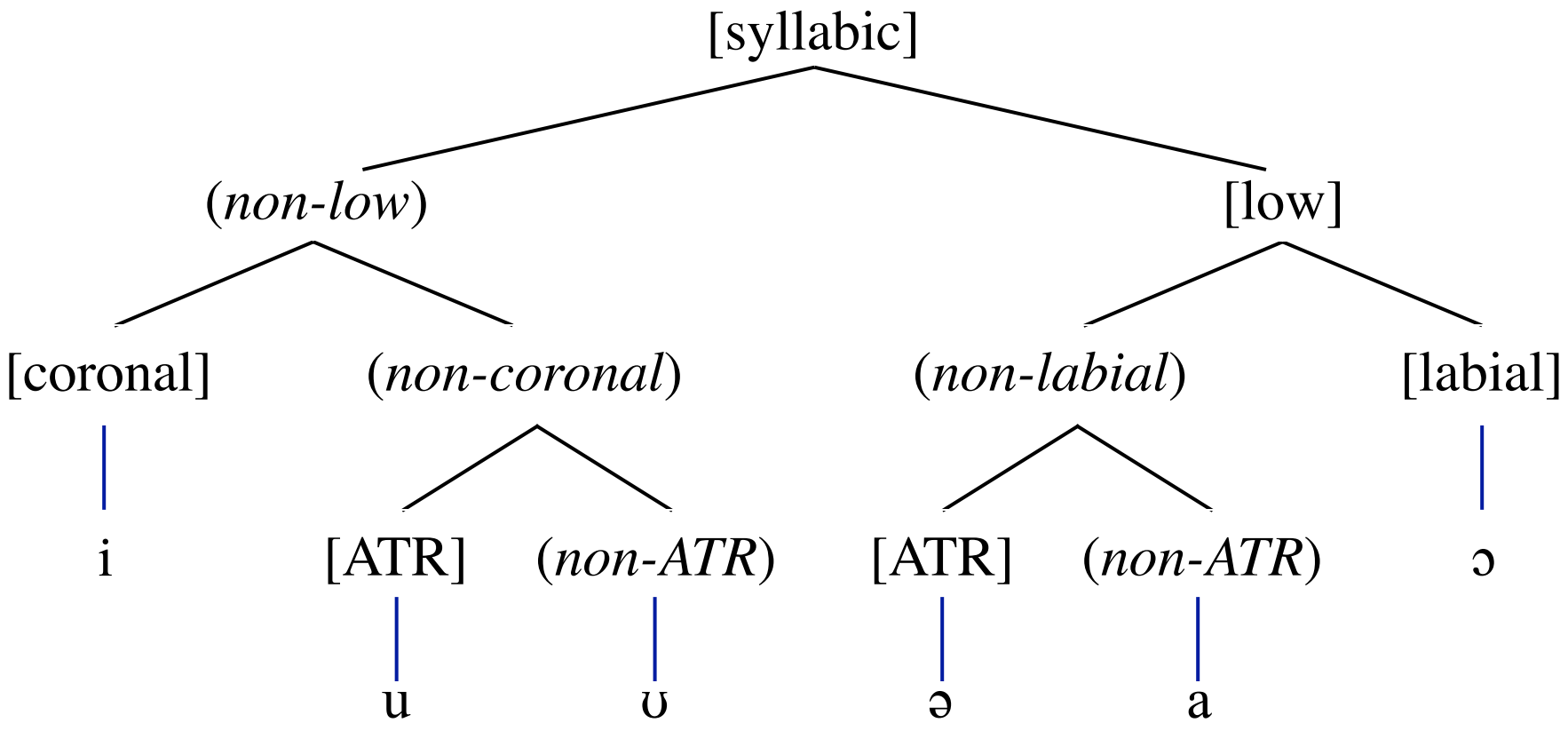
I call this procedure the Successive Division Algorithm (Dresher 1998, 2003, 2009):

Assign contrastive features by successively dividing the inventory until every phoneme has been distinguished.

The contrastive hierarchy

For example, here is the contrastive hierarchy for the Classical Manchu vowel system, which will be discussed in detail later:

[low] > [coronal] > [labial] > [ATR]



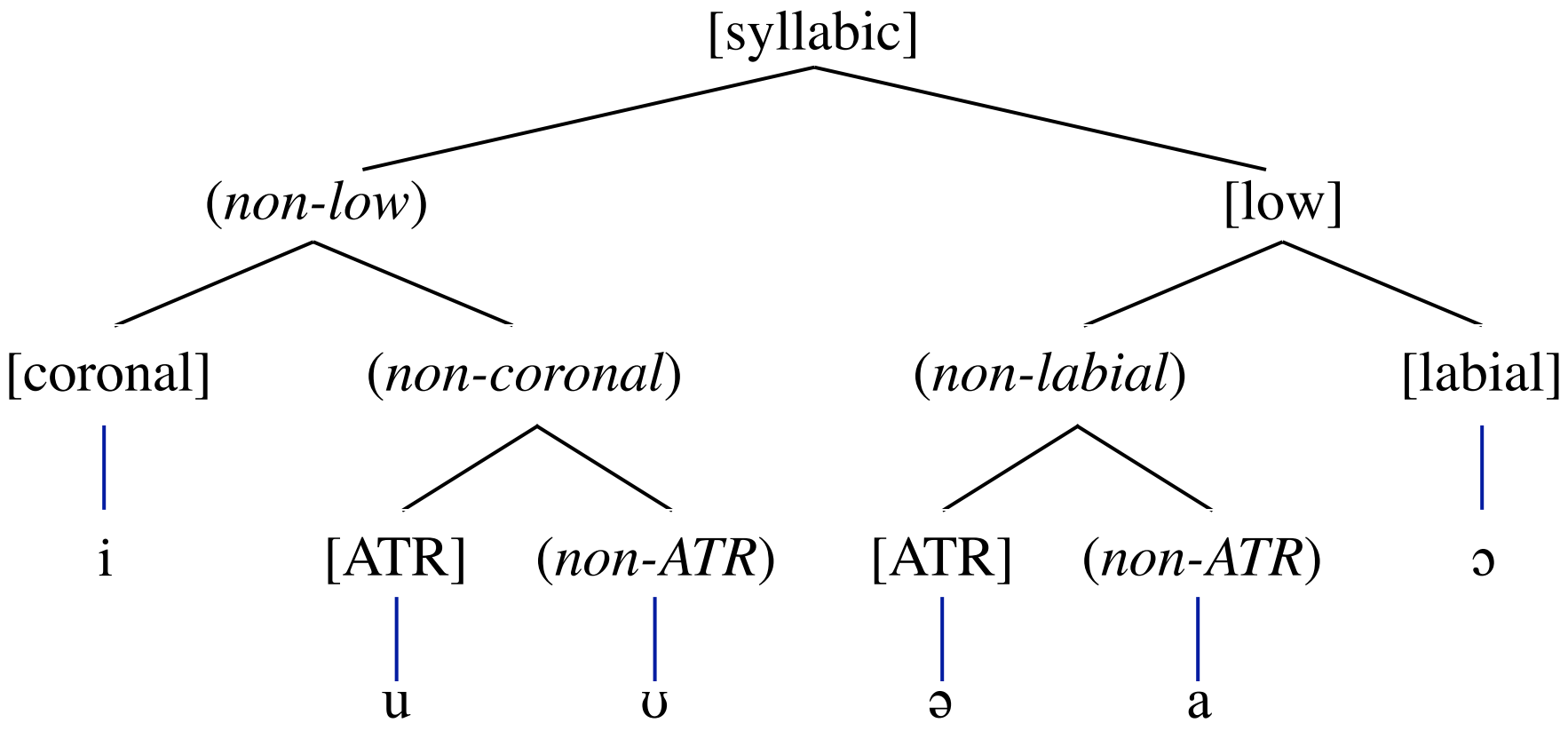
The Contrastivist Hypothesis

As a first approximation I assume further that phonology computes only contrastive features, in keeping with the Contrastivist Hypothesis (Hall 2007):

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

The Contrastivist Hypothesis

That is, once we have picked the contrastive features, as in the example below, these are the only ones the phonology can operate on.



Contrast and phonological activity

It follows from the Contrastivist Hypothesis that only contrastive features can be phonologically active, where feature activity is defined as follows (adapted from Clements (2001: 77):

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.

If only contrastive features can be active, then it follows as a corollary to the Contrastivist Hypothesis that

If a feature is phonologically active, then it must be contrastive.

A theory of contrast

This corollary suggests a working heuristic: assume that active features are contrastive, and find, if possible, a feature ordering that fits the observed patterns of activity.

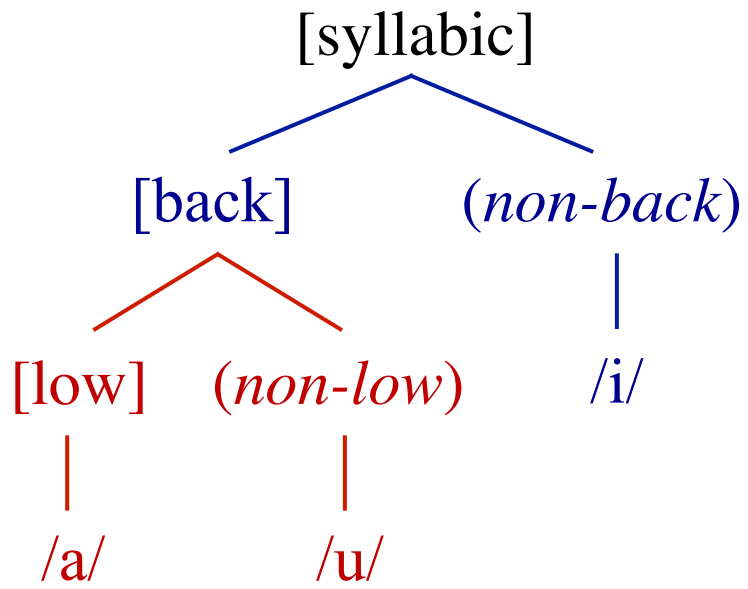
I believe that this heuristic represents the practice of many descriptive phonologists.

That is, phonologists typically limit their analyses to those features that are relevant to the workings of the language, and these active features also serve as the contrastive features, as far as possible.

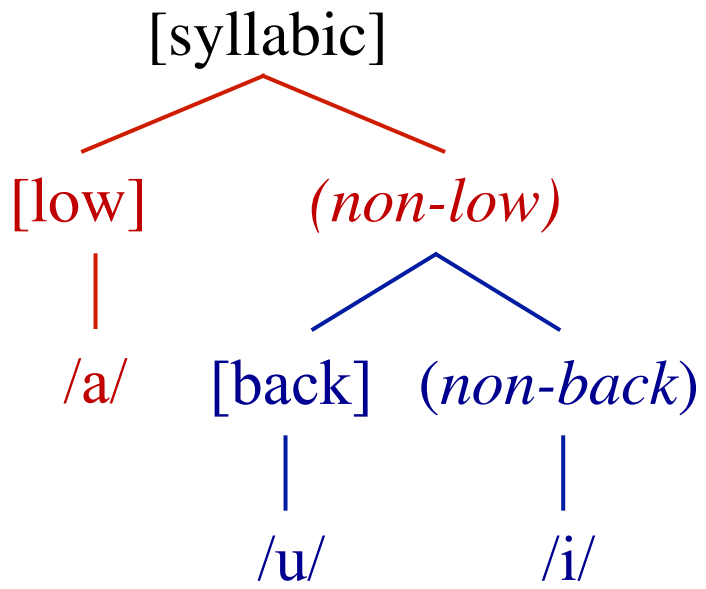
How the contrastive hierarchy works

For the hypothetical inventory /i, a, u/, here are two possible contrastive hierarchies and the feature specifications that they produce:

[back] > [low]



[low] > [back]

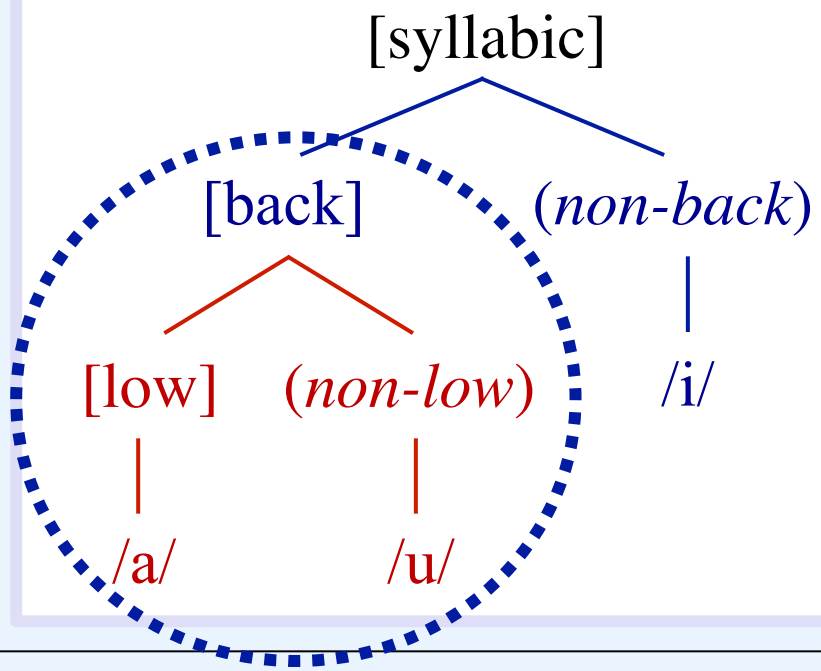


What does the hierarchy do? Synchrony

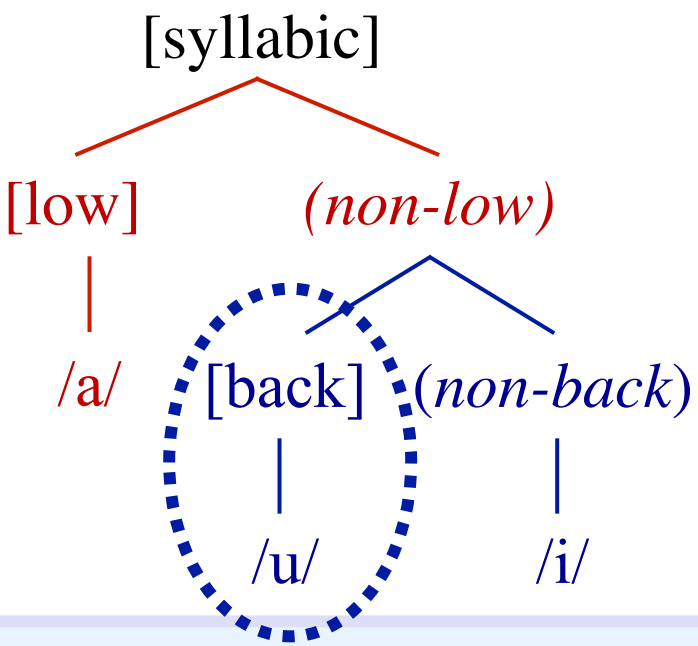
1. The hierarchy constrains phonological activity:
Only contrastive features can be phonologically active.

Which phonemes can trigger backing?

[back] > [low]



[low] > [back]

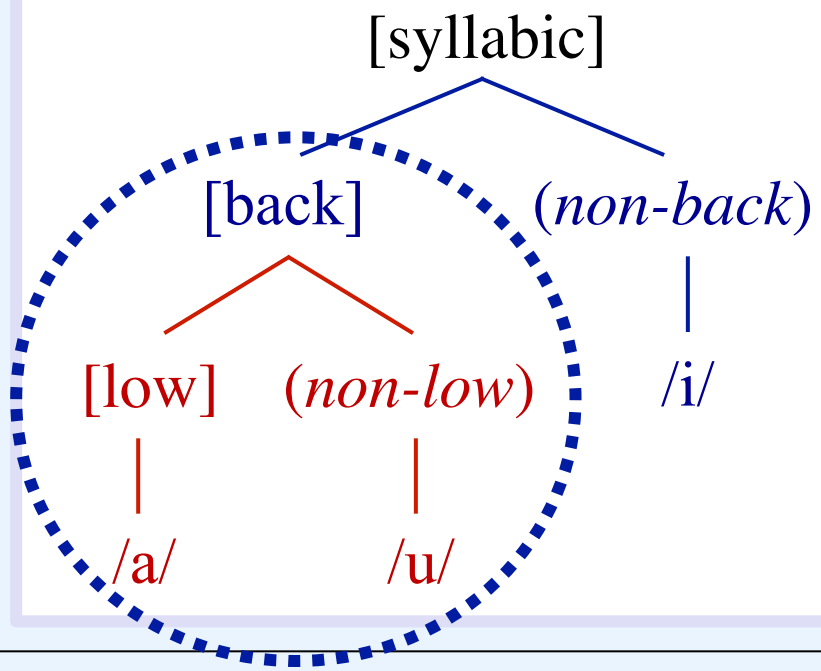


What does the hierarchy do? Diachrony

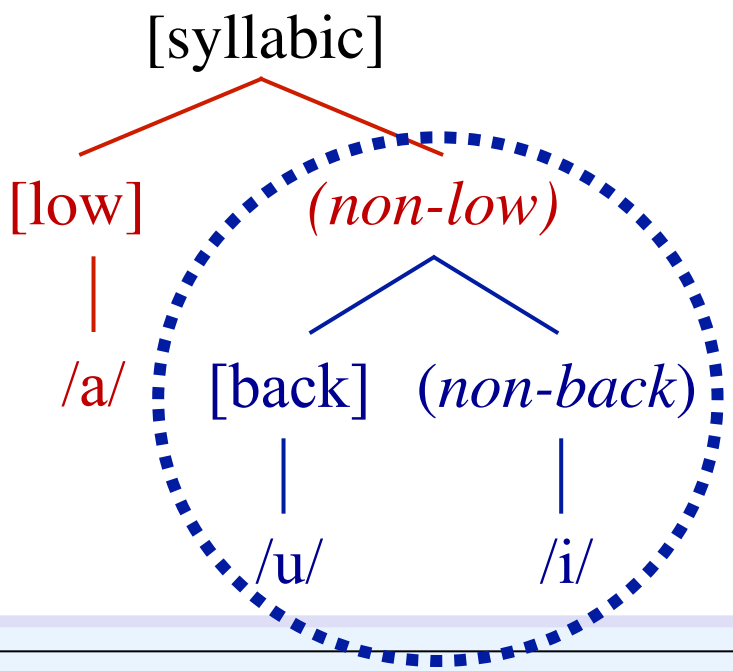
2. The hierarchy constrains neutralization and merger:
Mergers affect phonemes that are contrastive sisters.

Which phoneme can* /u/ *merge with?

[back] > [low]



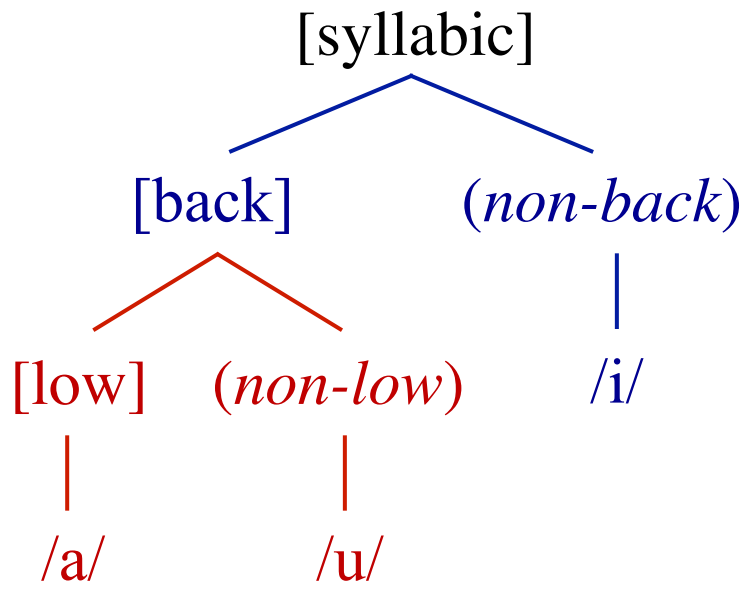
[low] > [back]



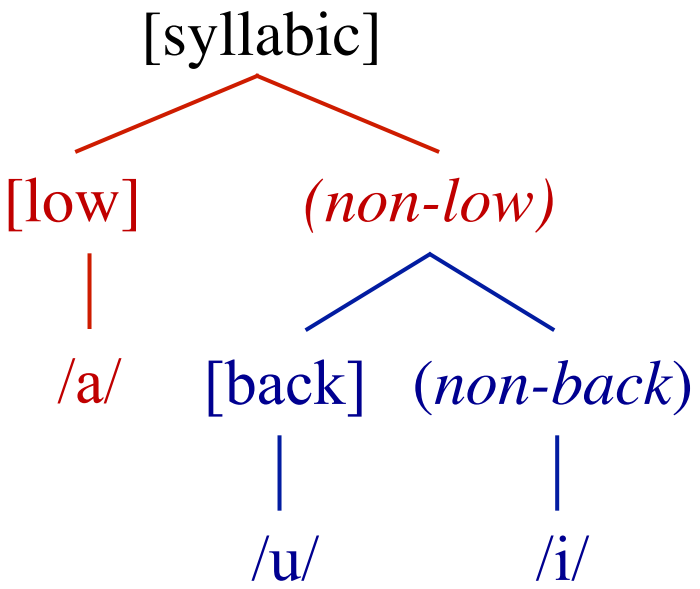
Where can we find typological generalizations?

On this approach, typological generalizations cannot be found by looking at inventories alone (say, /a, u, i/), or at individual phonemes (say, /a/), or phones ([a]), without also considering the relevant contrastive feature hierarchy.

[back] > [low]



[low] > [back]



Is this approach to contrast circular?

It has been suggested from time to time (p. c.) that this approach is circular: we find active features, label them contrastive, then conclude that only the contrastive features are active.

So is this theory unfalsifiable? Or, in the words of one anonymous commenter, both false and unfalsifiable?

No.

Note that the notions of contrast and activity are defined independently:

Contrast and activity are independent notions

The definition of phonological activity does not mention contrast:

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.

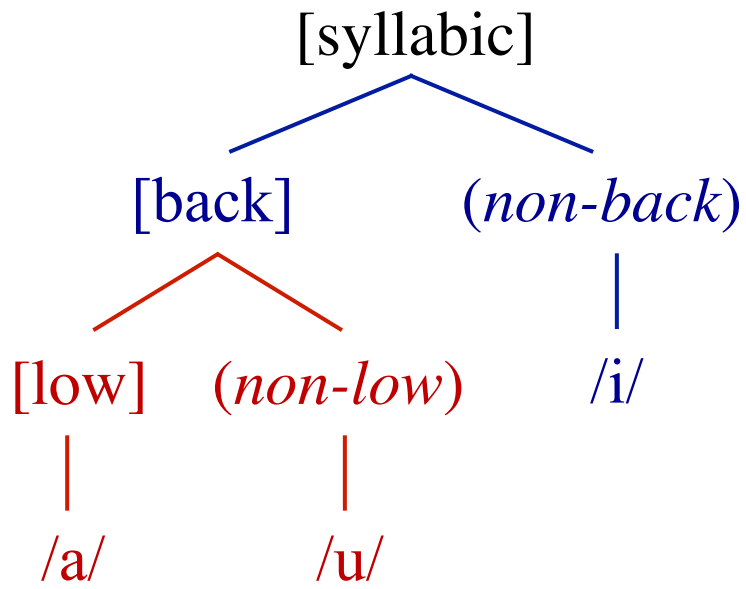
And the definition of contrast does not mention activity:

A feature is contrastive in a segment if it can be assigned to that segment by the Successive Division Algorithm.

Contrast and activity are independent notions

The claim that only active features are contrastive is an empirical claim that is easily falsifiable.

[back] > [low]



For example, a three-vowel system admits only two contrastive features.

If we find that three or more vowel features are active in such a language, that would be a counter-example to the Contrastivist Hypothesis.

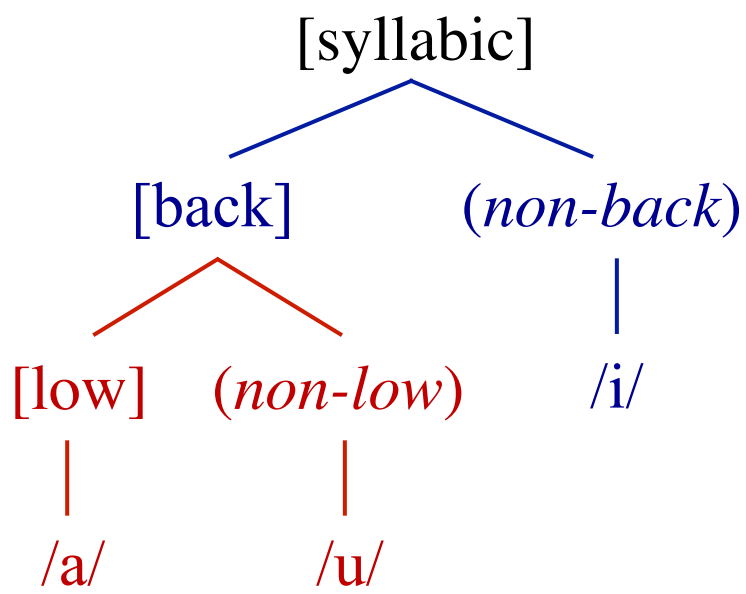
2.

On the Nature of Features

Phonological features are cognitive entities

It is important to emphasize that, though phonological features may make use of innate auditory dispositions, they are not the same as those, but are cognitive entities created by learners.

[back] > [low]



Thus, the contrasts indicated by [back] and [low] may be cross-linguistically common because our perceptual system is sensitive to formant transitions.

Phonological features are cognitive entities

It is important to emphasize that, though phonological features may make use of innate auditory dispositions, they are not the same as those, but are cognitive entities created by learners.

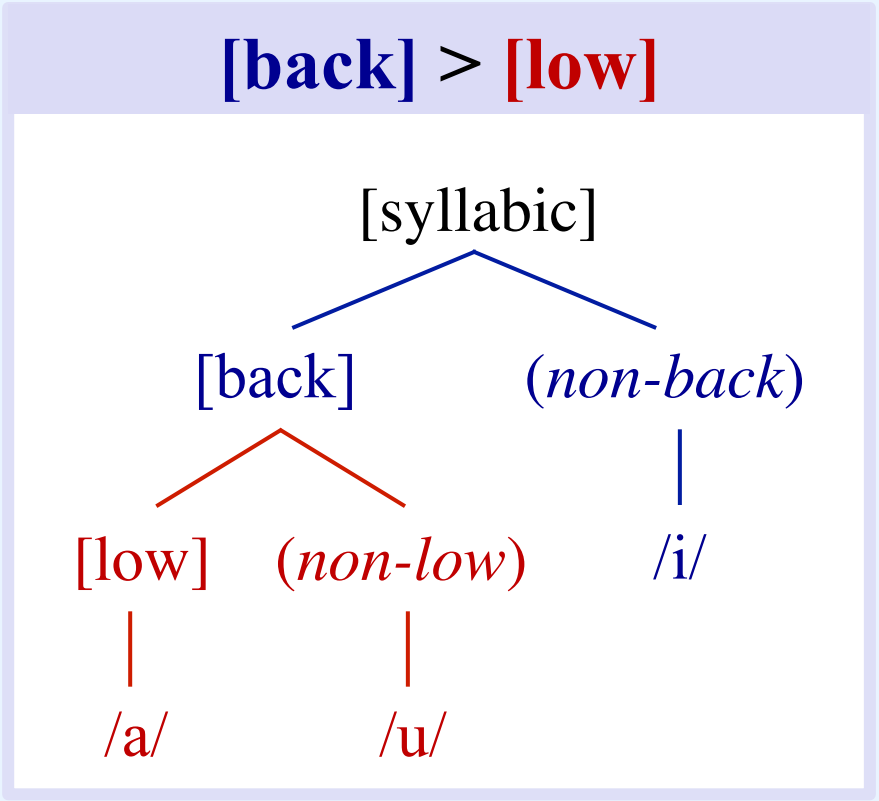
[back] > [low] ?

Thus, the contrasts indicated by [back] and [low] may be cross-linguistically common because our perceptual system is sensitive to formant transitions.

The same is true, it appears, of ferrets (Mesgarani et al. 2008). But ferrets do not necessarily have our kind of phonological representations.

Underspecified features

Notice that on this view, lexical specifications are limited to contrastive features, so are not pronounceable.



In this example, the phoneme designated /u/ has only two features: [back] and *(non-low)*.

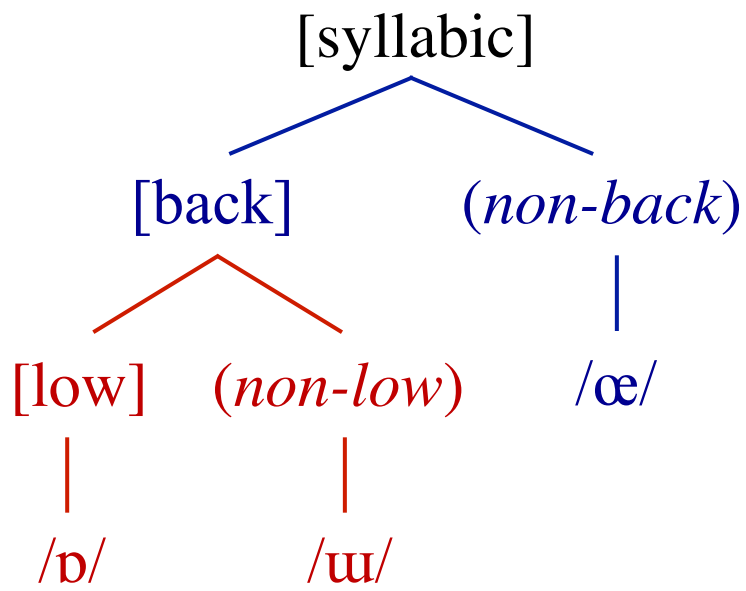
Why, then, is it designated /u/ and not /ʊ/, /ʌ/, /ɯ/, /ɨ/ or /o/, among other choices?

As far as its contrastive status goes, any of these alternatives would be equally appropriate.

Underspecified features

We could indicate the phonemes as below, for example, though these symbols are typographically less convenient.

[back] > [low]

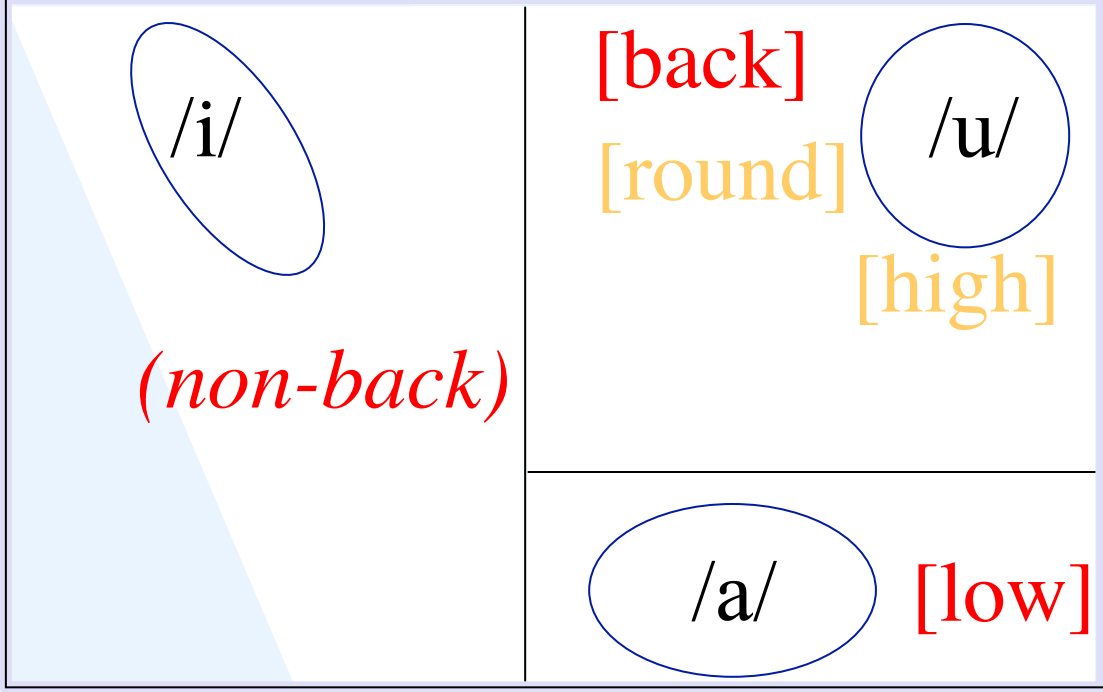


Unless the vowels are further specified in the phonology by other contrastive features (originating in the consonants, for example), they are made more specific only in a post-phonological component.

Enhancement of underspecified features

Stevens, Keyser & Kawasaki (1986) proposed that feature contrasts can be enhanced by other features that have similar acoustic effects.

Hall (2011b) shows how the enhancement of contrastive features can result in configurations predicted by Dispersion Theory (Liljencrants & Lindblom 1972; Lindblom 1986; Flemming 2002).



Thus, a non-low back vowel can enhance these features by being round and high, that is, /u/.

These enhancements are not necessary, however, and other realizations are possible.

Emergent features

There is a growing consensus that phonological features are not innate, but rather 'emerge' in the course of acquisition.

In a recent volume titled *Where do phonological features come from?* (Clements & Ridouane 2011), most of the papers take an emergentist position; none argue for innate features.

Mielke (2008) and Samuels (2011) summarize the arguments against innate features:

Against innate features

- from a biolinguistic perspective, phonological features are too specific, and exclude sign languages (van der Hulst 1993; Sandler 1993);

- empirically, no one set of features have been discovered that 'do all tricks' (Hyman 2010 with respect to tone features, but the remark applies more generally);

- since at least some features have to be acquired from phonological activity, a prespecified list of features becomes less useful in learning.

Why do features emerge at all?

But if features are emergent, we need to explain why they are required at all, and what UG principles account for the way they function in the phonology.

I propose that the task of the learner is to arrive at a set of features that account for the contrasts and the phonological activity in a given language.

Emergent features and UG

For the content of features (or whatever primes are assumed), learners make use of the available materials relevant to the modality:

- for spoken language, acoustic and articulatory properties of speech sounds;
- for sign language, hand shapes and facial expressions.

On this view, the concept of a contrastive hierarchy is an innate part of UG, and is the glue that binds phonological representations and makes them appear similar from language to language.

3.

Contrastive Hierarchy Theory: Historical Antecedents

The importance of contrast in phonology

The notion that contrast is central to phonology has its roots in the earliest work in phonological theory in the late 19th and early 20th centuries.

In the very first issue of *Language*, Edward Sapir (1925) argues that 'sound patterns', not simply phonetics, should be the main focus of phonological theory.

But what does he mean by sound patterns? I think that sound patterns refer to the contrastive properties of the phonemes of a language.

The importance of contrast in phonology

To illustrate, Sapir constructs four languages, A, B, C, and D, that drew on languages he was familiar with

Languages A and B have identical sounds but distinct sound patterns; that is, their contrastive properties are not comparable.

Languages C and D illustrate the converse situation: phonetically their sounds are quite different, but their 'pattern alignments' are isomorphic.

Different phonetics, similar pattern alignments

	h		w	j	l	m	n
p		t	k	q			
b		d	g	ɢ			
f		s	x	χ			

Language C

Sapir arranges the phonemes this way (recall he did not have a theory of features).

	h		v	ʒ	r	m	ŋ
p^h		t^h	k^h	q^h			
β		ð	ɣ	ʁ			
f		ʃ	ç	ħ			

Language D

He justifies the positions of /v/ and /ʒ/ by their phonological behaviour.

Sapir (1925)

"And yet it is most important to emphasize the fact, strange but indubitable, that a pattern alignment does not need to correspond exactly to the more obvious phonetic one."

Edward Sapir, Sound patterns in language, *Language* 1: 37–51, 1925.

Different phonetics, similar pattern alignments

	h		w	j	l	m	n
p		t	k		q		
b		d	g		ɢ		
f		s	x		χ		

	h		v	ʒ	r	m	ŋ
p^h		t^h	k^h		q^h		
β		ð	ɣ		ʁ		
f		ʃ	ç		ħ		

Language C

The isomorphic alignments can be understood as indicating that corresponding phonemes have the same *contrastive* values.

Language D

Contrastive specifications

The chart below represents one possible way of suggesting what the contrastive specifications might be.

		labial	coronal	dorsal	post-dorsal
obstruent	voiceless stop	p/p^h	t/t^h	k/k^h	q/q^h
	voiceless spirant	f/f	s/ʃ	x/ç	χ/ħ
	voiced	b/β	d/ð	g/ɣ	ɢ/ʁ
sonorant	nasal	m/m	n/ŋ		
	liquid		l/r		
	glide	w/v	j/ʒ	h/h	

Contrastive specifications

In each cell, the first sound is from C, the second from D. The differences between them do not involve contrastive features.

		labial	coronal	dorsal	post-dorsal
obstruent	voiceless stop	p/p^{h}	t/t^{h}	k/k^{h}	q/q^{h}
	voiceless spirant	f/f	s/ʃ	x/ç	χ/ħ
	voiced	b/β	d/ð	g/ɣ	ɢ/ʁ
sonorant	nasal	m/m	n/ŋ		
	liquid		l/r		
	glide	w/v	j/ʒ	h/h	

Contrastive specifications

Some phonemes appear to be in the wrong place, suggesting that their underlying specifications are like their counterparts.

		labial	coronal	dorsal	post-dorsal
obstruent	voiceless stop	p/p^h	t/t^h	k/k^h	q/q^h
	voiceless spirant	f/f	s/ʃ	x/ç	χ/ħ
	voiced	b/β	d/ð	g/ɣ	ɢ/ʁ
sonorant	nasal	m/m	n/ŋ		
	liquid		l/r		
	glide	w/v	j/ʒ	h/h	

Contrastive specifications

Some phonemes appear to be in the wrong place, suggesting that their underlying specifications are like their counterparts.

These types of examples in particular have been much discussed in connection with how abstract Sapir's theory of phonology was (Chomsky 1964; McCawley 1967).

Less attention has been paid to the other examples, which don't appeal to abstractness, but which show the importance of establishing the contrastive properties of segments.

sonorant	nasal	m/m	n/ŋ	
	liquid		l/r	
	glide	w/v	j/ʒ	h/h

Contrastive specifications

For example, the obstruents in red are contrastively voiced and redundantly stops or spirants.

		labial	coronal	dorsal	post-dorsal
obstruent	voiceless stop	p/p^h	t/t^h	k/k^h	q/q^h
	voiceless spirant	f/f	s/ʃ	x/ç	χ/ħ
	voiced	b/β	d/ð	g/ɣ	ɢ/ʁ
sonorant	nasal	m/m	n/ŋ		
	liquid		l/r		
	glide	w/v	j/ʒ	h/h	

Contrastive specifications

No abstractness is at issue here, but we have to distinguish between contrastive and non-contrastive properties.

		labial	coronal	dorsal	post-dorsal
obstruent	voiceless stop	p/p^h	t/t^h	k/k^h	q/q^h
	voiceless spirant	f/f	s/ʃ	x/ç	χ/ħ
	voiced	b/β	d/ð	g/ɣ	ɢ/ʁ
sonorant	nasal	m/m	n/ŋ		
	liquid		l/r		
	glide	w/v	j/ʒ	h/h	

Contrast and synchronic analysis

Thus, for Sapir the pattern alignment of a phoneme amounts to its contrastive status, which is not determined by its phonetics, but is a function of its phonetic and phonological behaviour.

Therefore, a synchronic analysis of the phonology should, among other things, give an account of the contrastive features of each phoneme.

Contrast and diachronic analysis

Prague School phonologists (notably Jakobson and Trubetzkoy) have argued that the contrastive properties of phonemes also play an important role in phonological change.

The insight that phonological change may involve a reorganization of the phonemes of a language goes back to Jakobson (1931):

Contrast and phonological change

'Once a phonological change has taken place, the following questions must be asked:

What exactly has been modified within the phonological system?

…has the structure of individual oppositions [contrasts] been transformed? Or in other words, has the place of a specific opposition been changed…?'

Roman Jakobson, Principles of historical phonology, first published in German in *TCLP*, IV (Copenhagen, 1931).

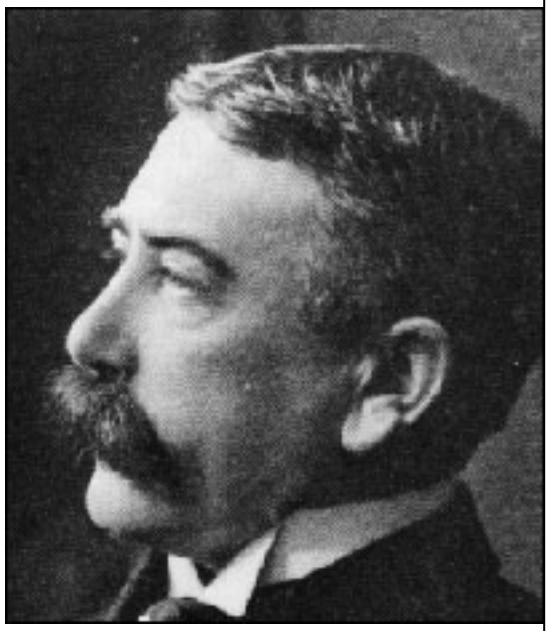
Problems of contrast-only theories

It should be noted that phonological theories that put the emphasis on contrast have not been unproblematic.

In pre-generative structuralist theories, synchronic grammars were composed of contrasting elements locked into systems of oppositions.

Problems of contrast-only theories

If one takes too literally Saussure's (1972 [1916]: 166) dictum that

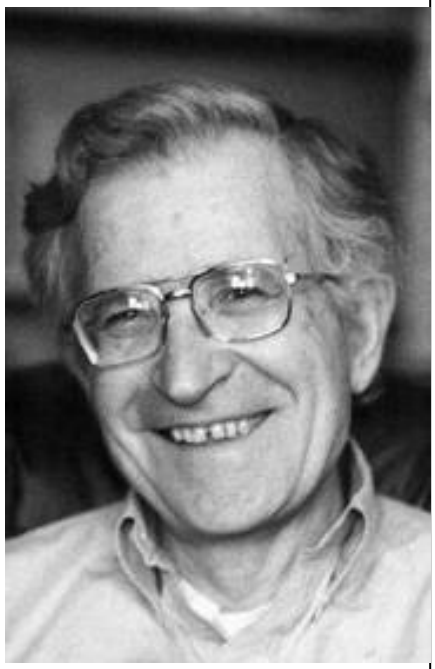


'dans la langue il n'y a que des différences . . . sans termes positifs'

then grammars become incommensurable, and one has no way to relate successive stages of a language, or even closely related dialects (Moulton 1960).

Rule systems

Generative grammar (Chomsky & Halle 1968) solves this problem by construing phonology as a system of rules that mediate between underlying (lexical) and surface (phonetic) forms.



Now, grammar change takes the form of the addition, loss, reordering, or restructuring of rules.

Rule systems versus only contrast

Kiparsky (1965) demonstrated that a series of changes in Armenian dialects can be understood in terms of the spreading of three rules; furthermore, his analysis

'highlights the pointlessness of a structural dialectology that… distinguishes dialects according to points of structural difference [i.e. the number of contrasting phonemes] rather than according to the innovations through which they diverged'.

Contrast in rule-based phonology

The above show the inadequacy of a phonology that deals only in structural points of contrast ('differences'), without also including substantive properties ('positive terms'), including features and a system of rules or constraints.

I think that generative grammar went overboard, however, in jettisoning the structuralist notion of language-particular contrast.

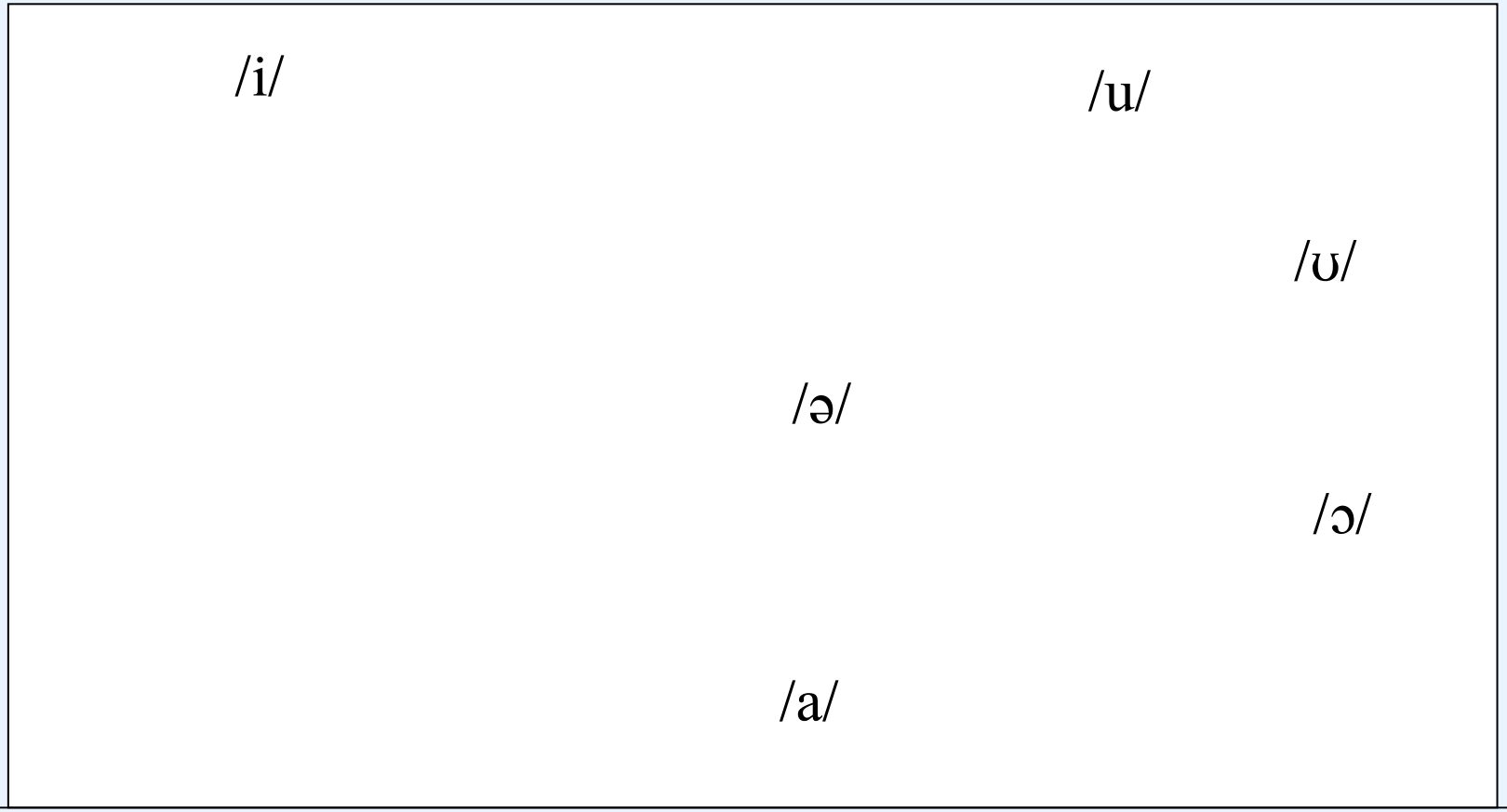
I will argue that contrast plays a crucial role in synchronic and diachronic phonology, and hence in phonological typology.

4.

Example of Contrast and Activity: The Classical Manchu Vowel System

Classical Manchu vowel system (Zhang 1996)

Classical Manchu has 6 vowel phonemes



Activity in Classical Manchu

The three most notable kinds of phonological activity involving vowels are:

- ATR harmony
- Labial (rounding) harmony
- Palatalization

ATR harmony

The vowels /ə/ and /u/ trigger ATR harmony within a word: /ə/ alternates with /a/ and /u/ alternates with /ʊ/

/ə/ alternates with /a/

[ATR]	xəxə	'woman'	xəxə-ŋgə	'female'
(*non-ATR*)	aGa	'rain'	aGa-ŋGa	'of rain'

/u/ alternates with /ʊ/

[ATR]	xərə-	'ladle out'	xərə-ku	'ladle'
(*non-ATR*)	paqt'a-	'contain'	paqt'a-qʊ	'internal organs'

ATR harmony

An apparent exception is caused by the fact that /ʊ/ changes to [u] everywhere except after dorsal (velar ~ uvular) consonants:

Underlying /u/: ATR harmony

[ATR]	s**u**sə	'coarse'	s**u**sə-t**ə**-	'make coarsely'
[ATR]	xət'**u**	'stocky'	xət'**u**-k**ə**n	'somewhat stocky'

Underlying /ʊ/: non-ATR vowels

(*non-ATR*)	t**u**lpa	'careless'	t**u**lpa-t**a**-	'act carelessly'
(*non-ATR*)	tat'ʂ**u**n	'sharp'	tat'ʂ**u**-q**a**n	'somewhat sharp'

ATR harmony

The vowel /i/ is neutral:

/ə/ ~ /a/ suffix

[ATR]	pəki	‘firm’	pəki-lə	‘make firm’
(*non-ATR*)	paqtʂ’in	‘opponent’	paqtʂ’i-la-	‘oppose’

/u/ ~ /ʊ/ suffix

[ATR]	sitərə-	‘hobble’	sitərə-sxun	‘hobbled/lame’
(*non-ATR*)	panjin	‘appearance’	panji-sχʊn	‘having money’

/i/ suffix

[ATR]	əmt’ə	‘one each’	əmt’ə-li	‘alone; sole’
(*non-ATR*)	taχa-	‘follow’	taχa-li	‘the second’

ATR harmony

When /i/ is in a position to trigger harmony, it occurs only with non-ATR vowels:

/ə/ ~ /a/ suffix

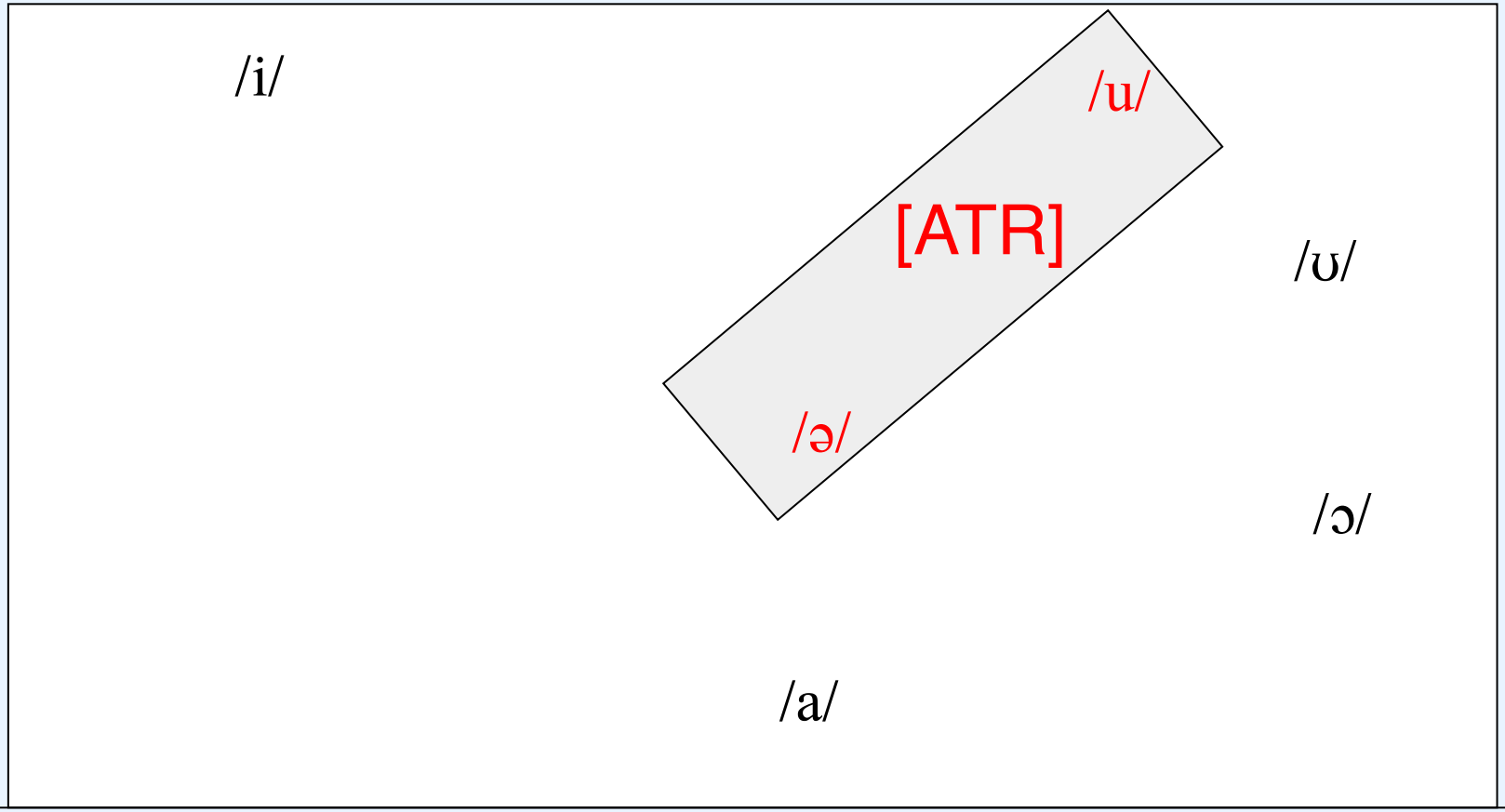
(*non-ATR*)	**i**l**i**-	'stand'	**i**l**i**-χ**a**	'stood'
(*non-ATR*)	f**i**l**i**	'solid'	f**i**l**i**-q**a**n	'somewhat solid'

/u/ ~ /ʊ/ suffix

(*non-ATR*)	tʂ'**i**l**i**-	'to choke'	tʂ'**i**l**i**-q**ʊ**	'choking'
(*non-ATR*)	s**i**f**i**-	'stick in the hair'	s**i**f**i**-q**ʊ**	'hairpin'

ATR harmony

The evidence from activity, therefore, is that /ə/ and /u/ have an active [ATR] feature, which, by hypothesis, must be contrastive; but the same is not necessarily the case with /i/.



Labial (rounding) harmony

Two successive /ɔ/ vowels cause
a suffix /a/ to become /ɔ/:

Two successive /ɔ/ vowels trigger labial harmony

ɔ…ɔ	pɔtʂ'ɔ	'colour'	pɔtʂ'ɔ-ŋɢɔ	'coloured'
Compare	aɢa	'rain'	aɢa-ŋɢa	'of rain'

A single /ɔ/, short or long, does not suffice

Single ɔ	tɔ-	'alight (birds)'	tɔ-na-	'alight in swarm'
Single ɔɔ	tɔɔ-	'cross (river)'	tɔɔ-na-	'go to cross'

Labial (rounding) harmony

Note that /u/ and /ʊ/ do not trigger labial harmony:

/u/

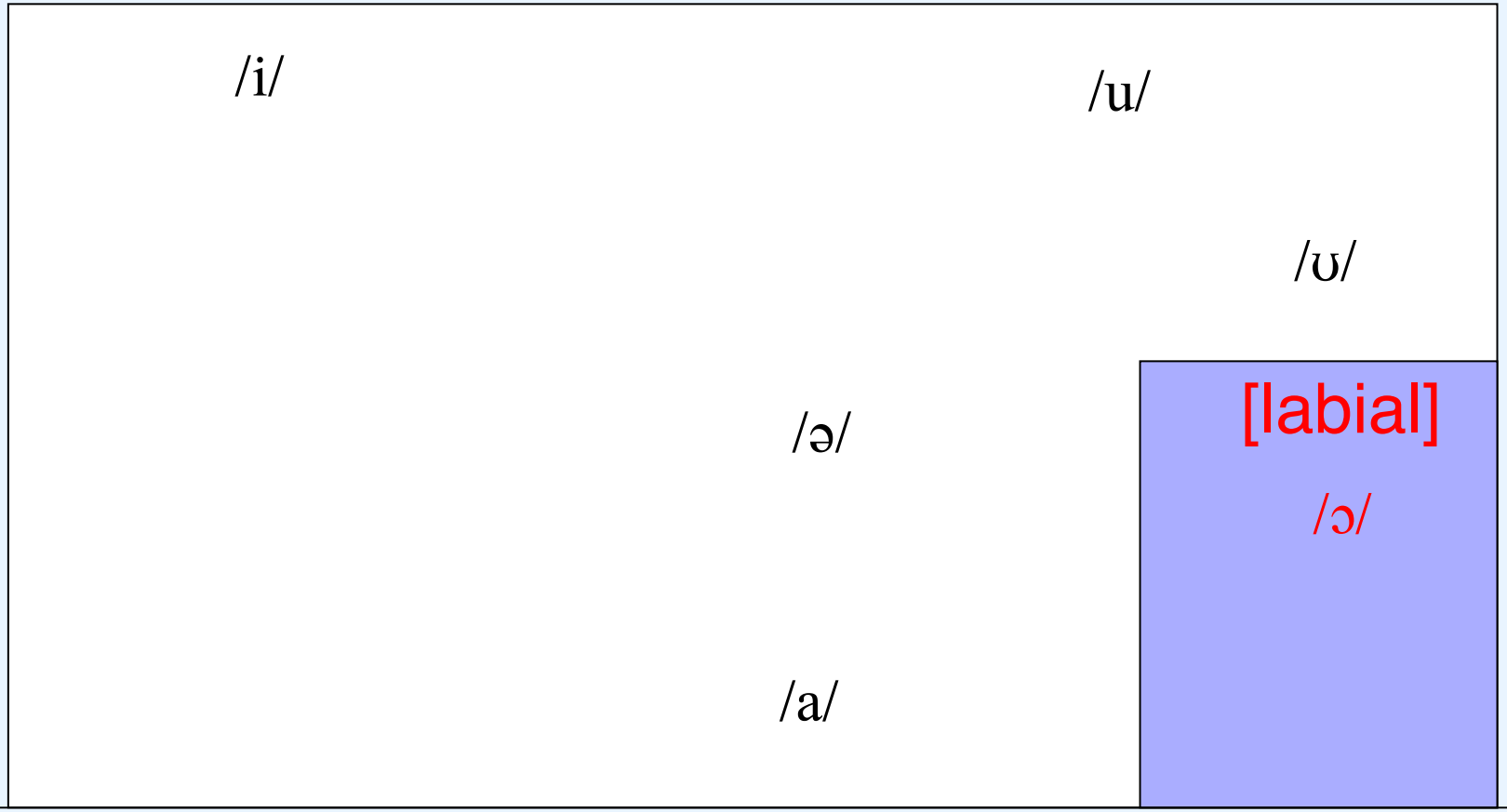
gulu	‘plain’	gulu-kən	‘somewhat plain’
kumun	‘music’	kumu-ŋgə	‘noisy’

/ʊ/ (/ʊ/ becomes [u]except after a back consonant)

χʊtun	‘fast’	χʊtu-qan	‘somewhat fast’
tursun	‘form’	tursu-ŋɢa	‘having form’

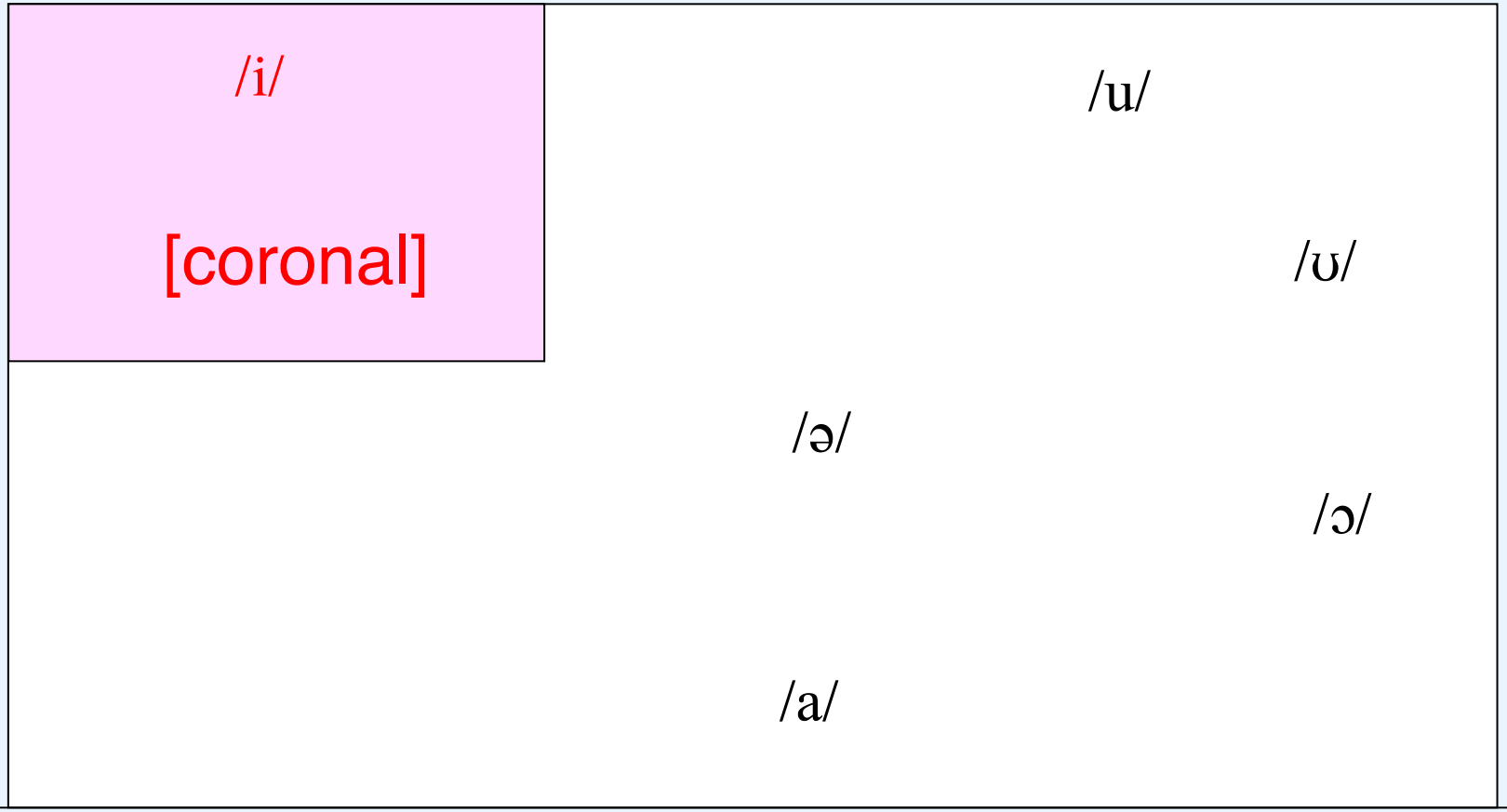
Labial (rounding) harmony

The evidence from activity here, then, is that /ɔ/ must have an active, therefore contrastive, [labial] feature; but the same is not necessarily the case with /u/ and /ʊ/.



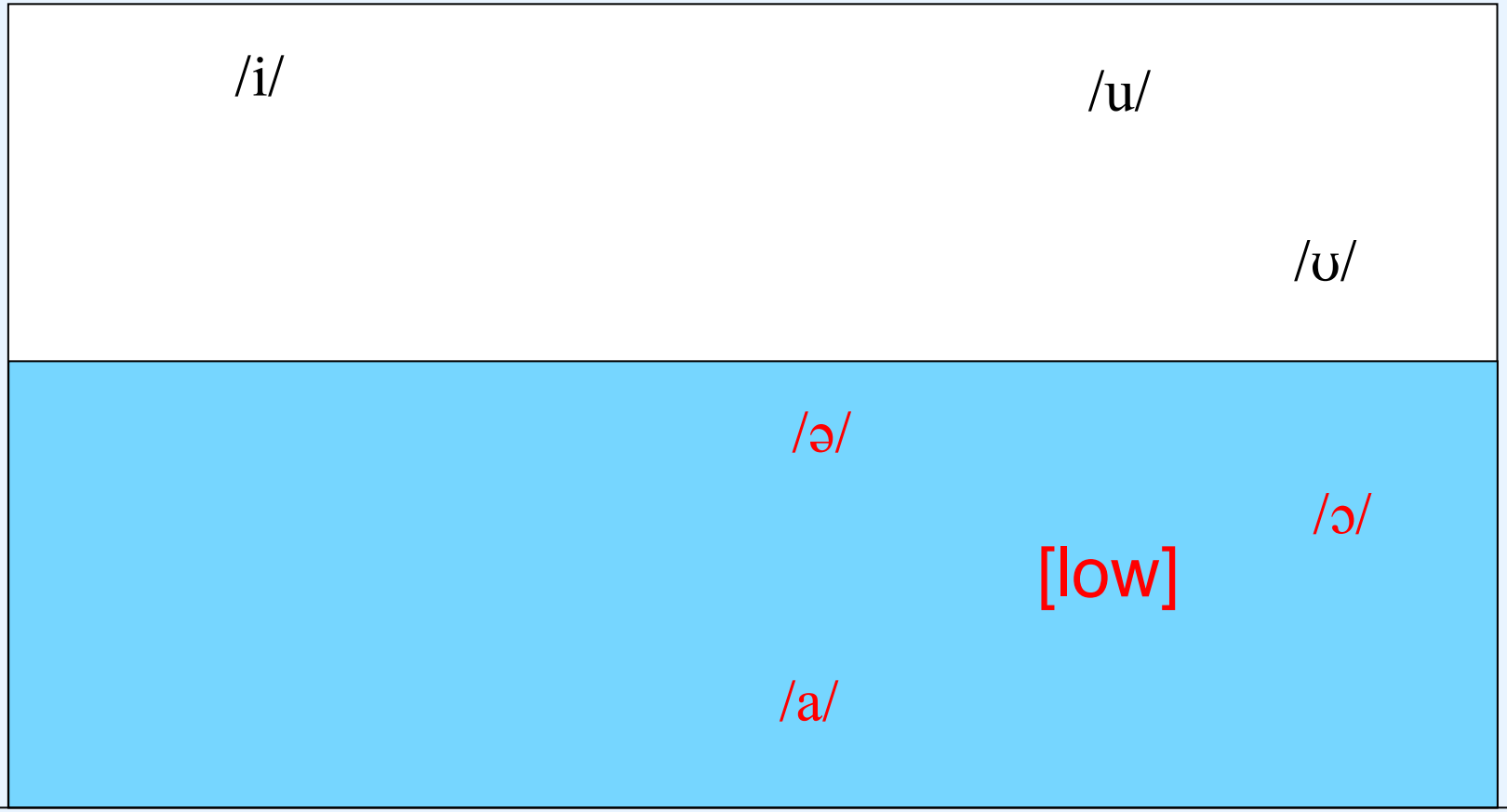
Palatalization

The vowel /i/ uniquely causes palatalization of a preceding consonant, which suggests it alone has a contrastive triggering feature we call [coronal].



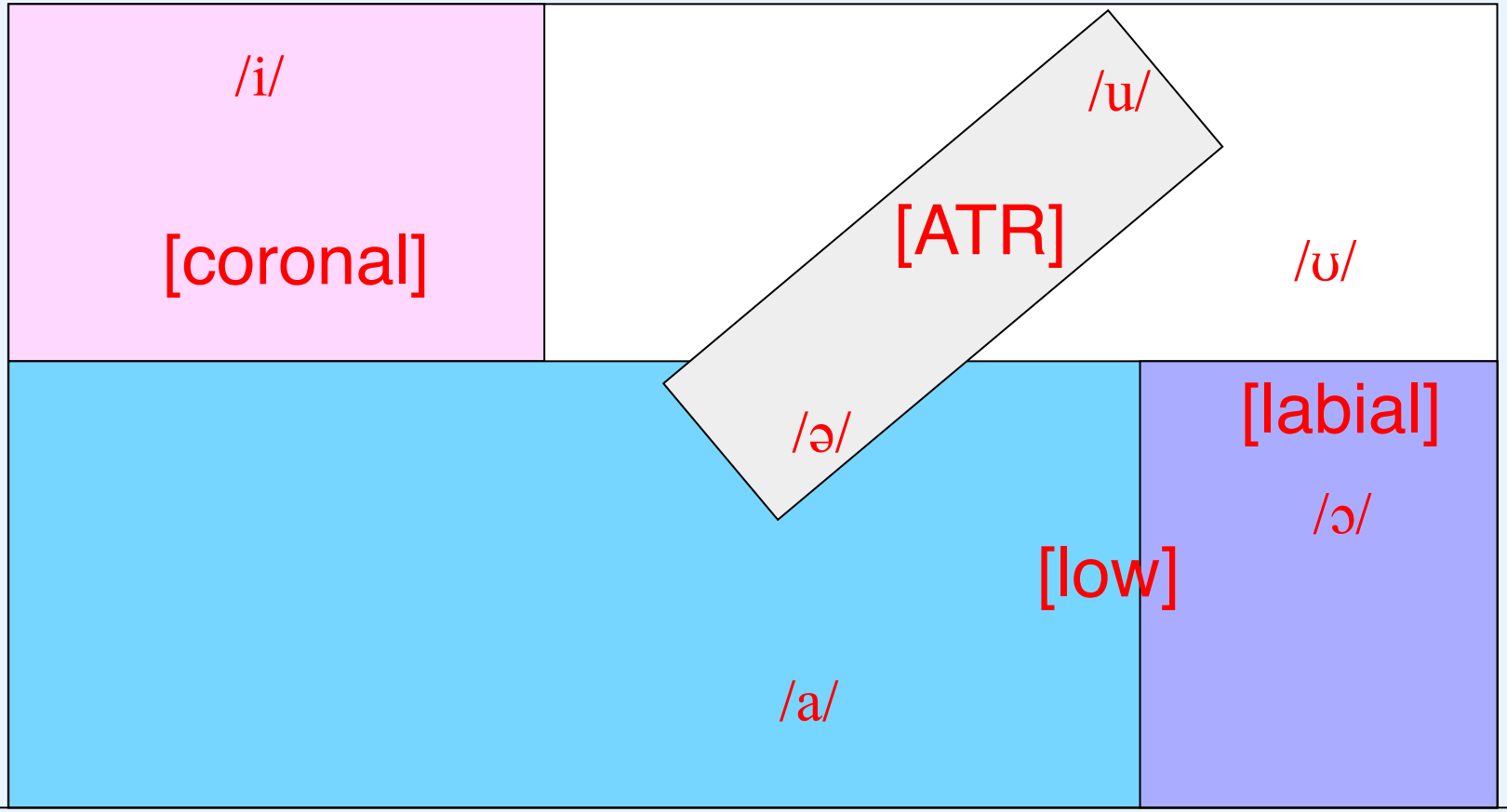
One height contrast

The alternations /ə/ ~ /a/ ~ /ɔ/ and /u/ ~ /ʊ/ are limited to a height class, and we still need to distinguish /ə/ from /u/ and /a/ from /ʊ/. We need one height feature, which we call [low].



Classical Manchu contrastive features

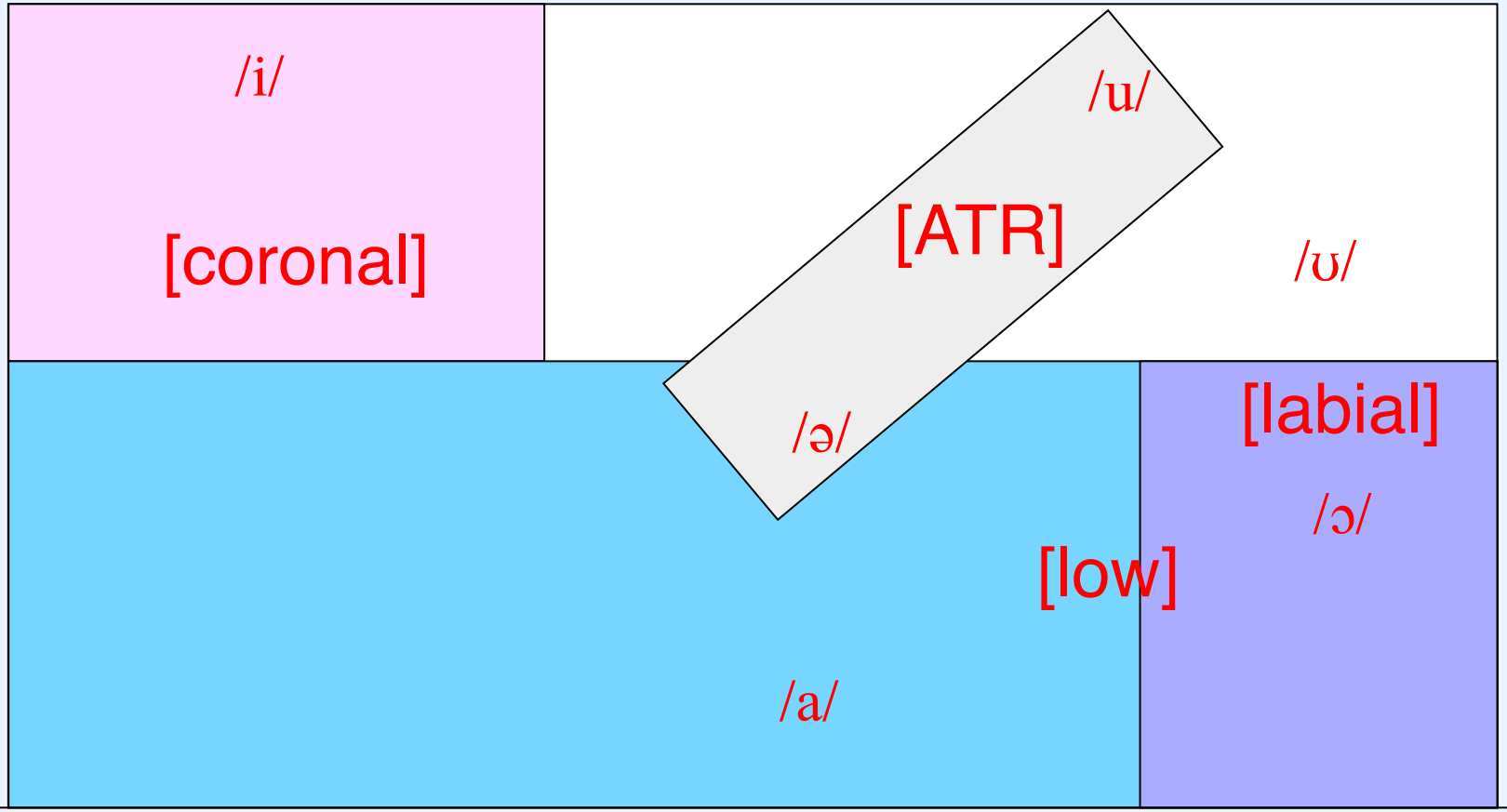
Putting together the evidence of phonological activity surveyed to here, we need to arrive at a feature hierarchy that yields the values below.



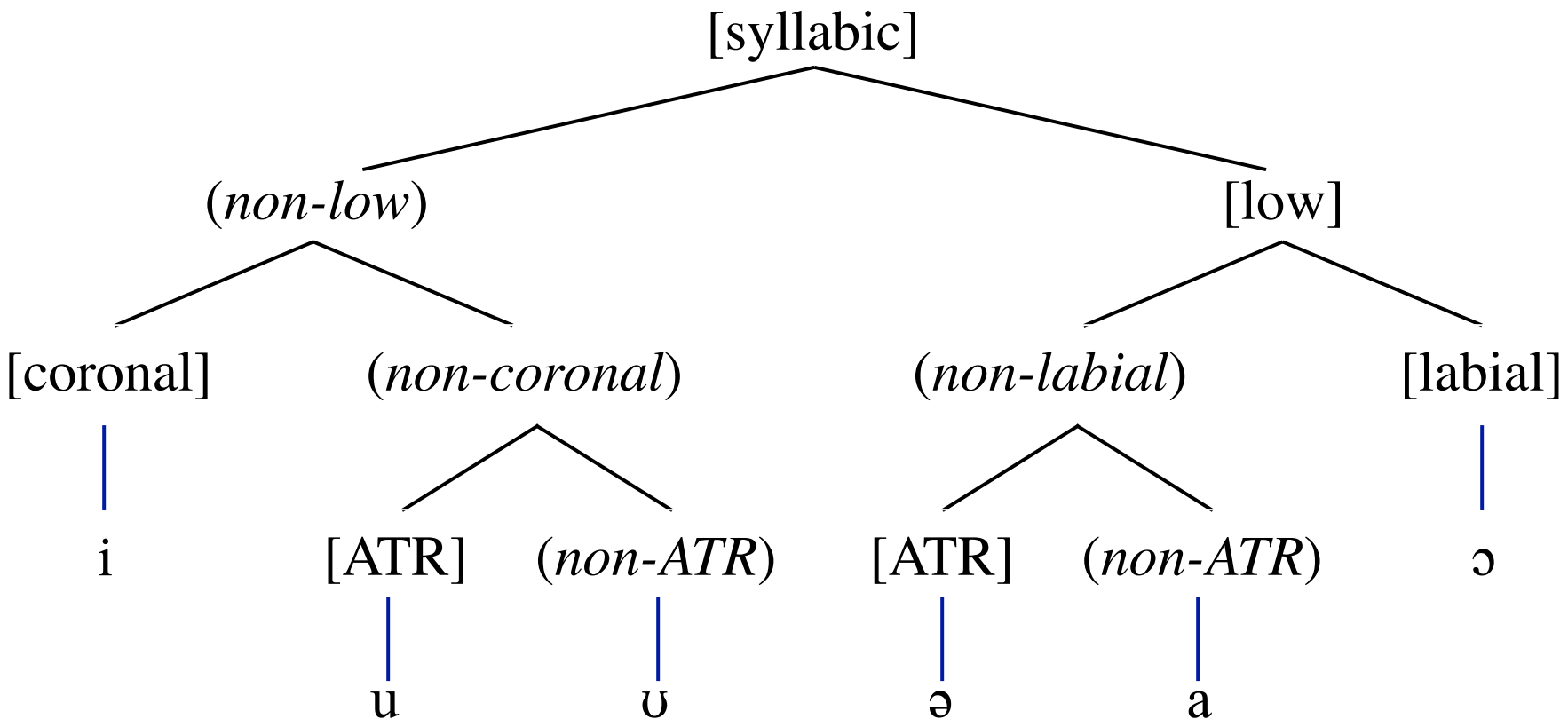
Classical Manchu contrastive features

Zhang (1996) proposes the hierarchy:

[low] > [coronal] > [labial] > [ATR]

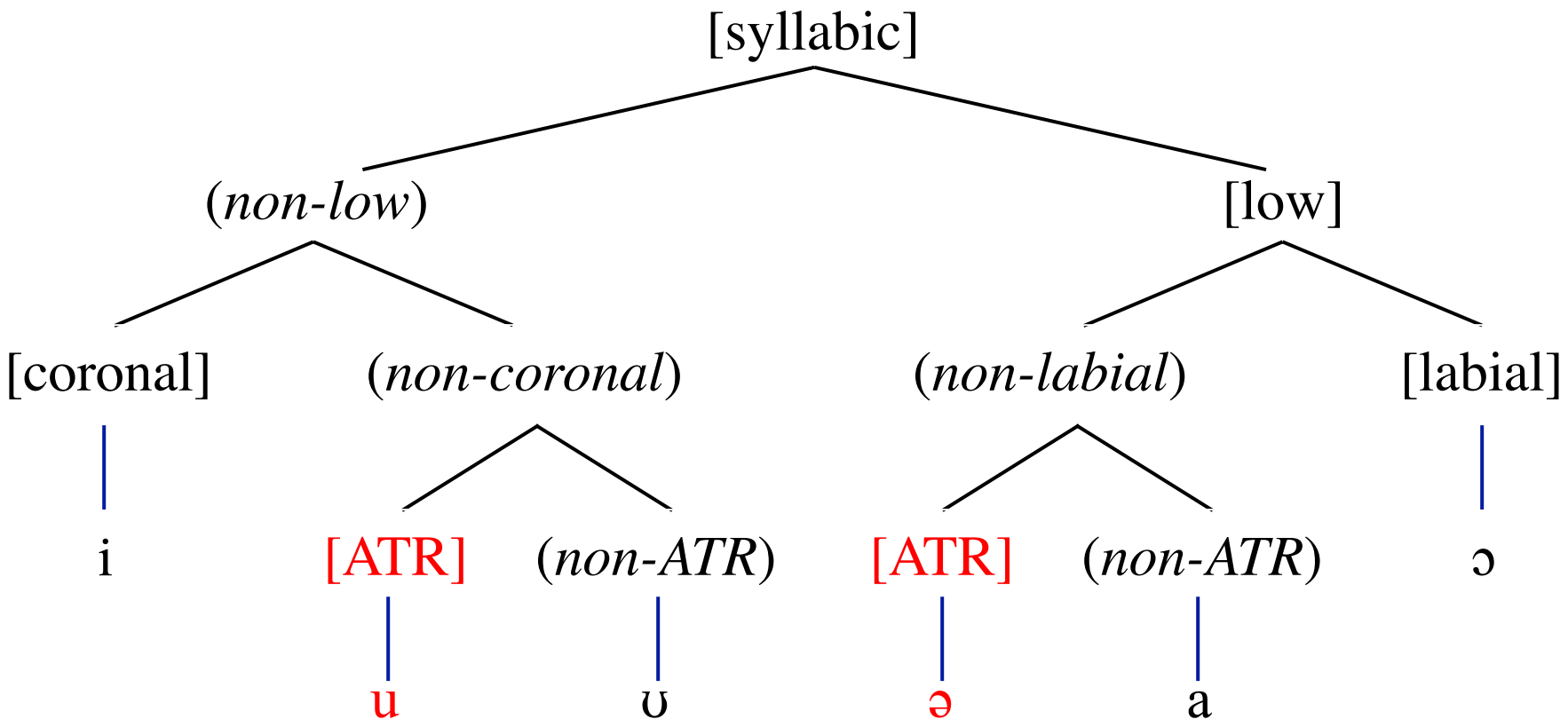


Classical Manchu contrastive hierarchy (Zhang 1996)



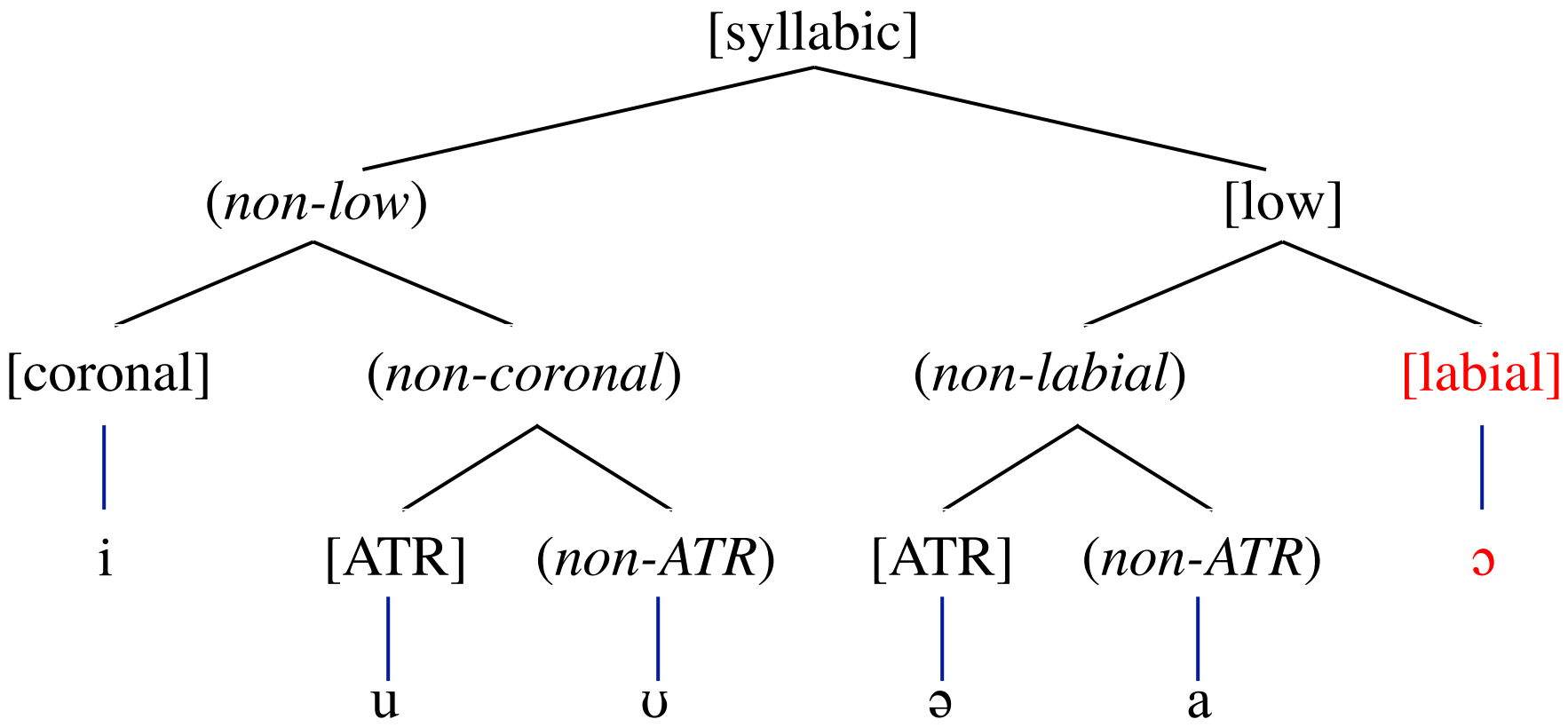
[low] > [coronal] > [labial] > [ATR]

Classical Manchu contrastive hierarchy (Zhang 1996)



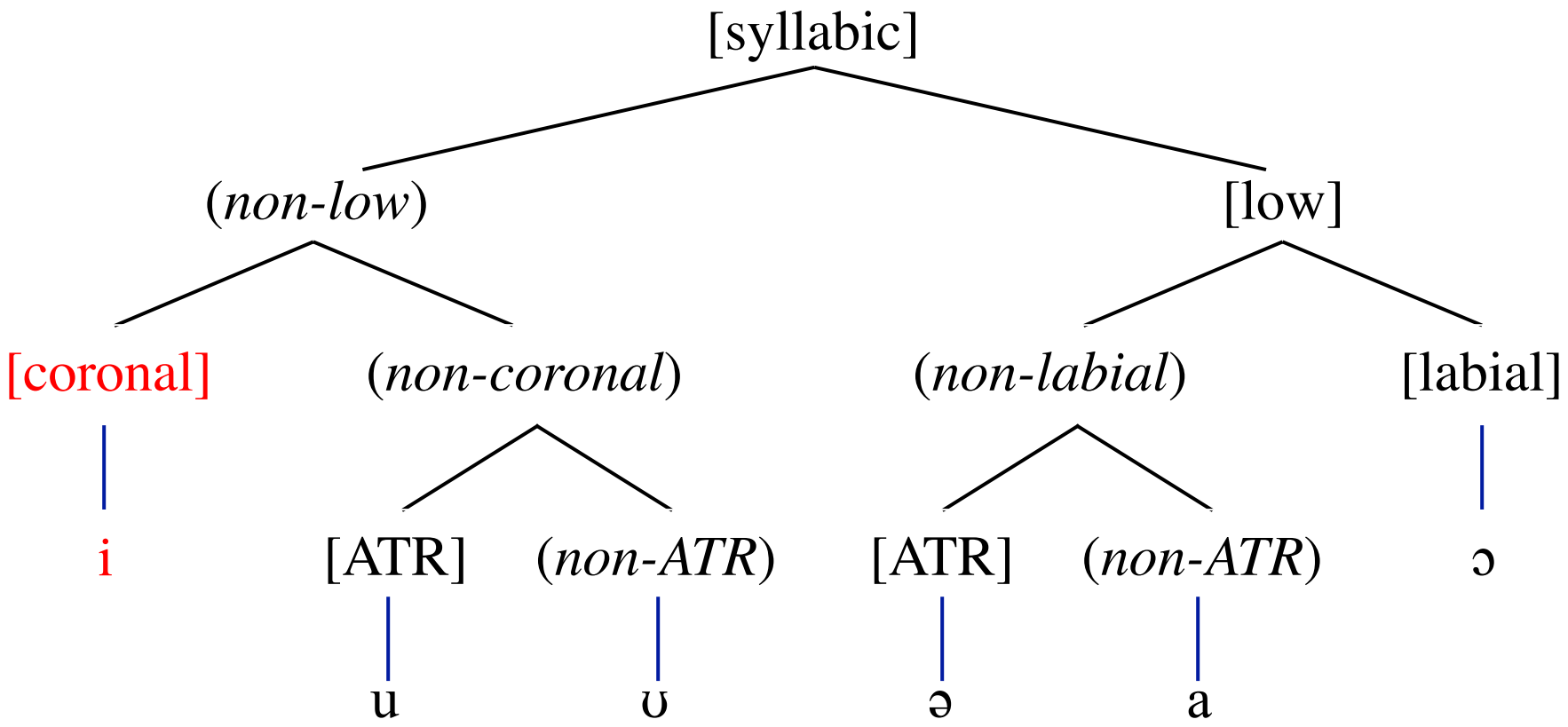
/u/ and /ə/ have a contrastive [ATR] feature, /i/does not.

Classical Manchu contrastive hierarchy (Zhang 1996)



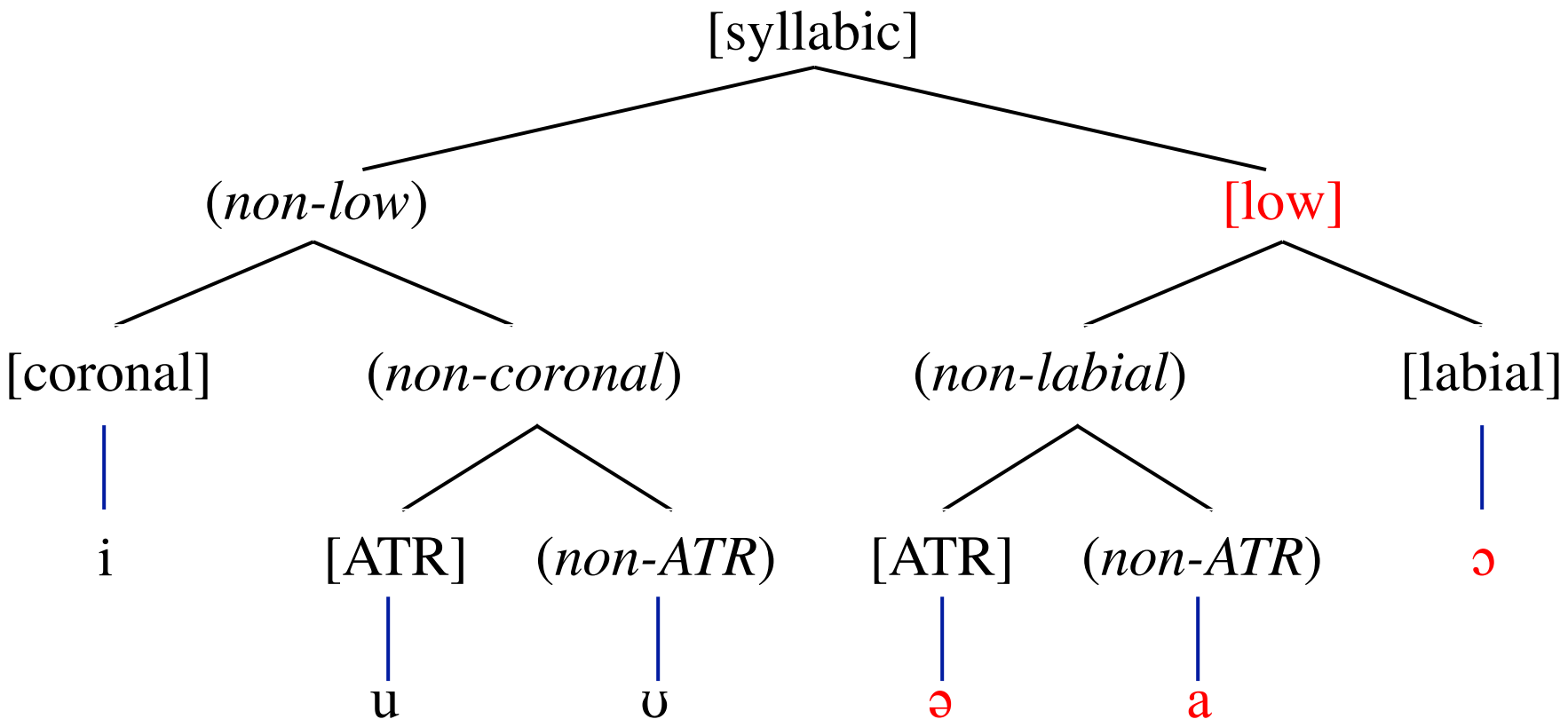
/ɔ/ has a contrastive [labial] feature, /u/ and /ʊ/ do not.

Classical Manchu contrastive hierarchy (Zhang 1996)



/i/ alone has a contrastive [coronal] feature.

Classical Manchu contrastive hierarchy (Zhang 1996)



There is one contrastive height feature, [low].

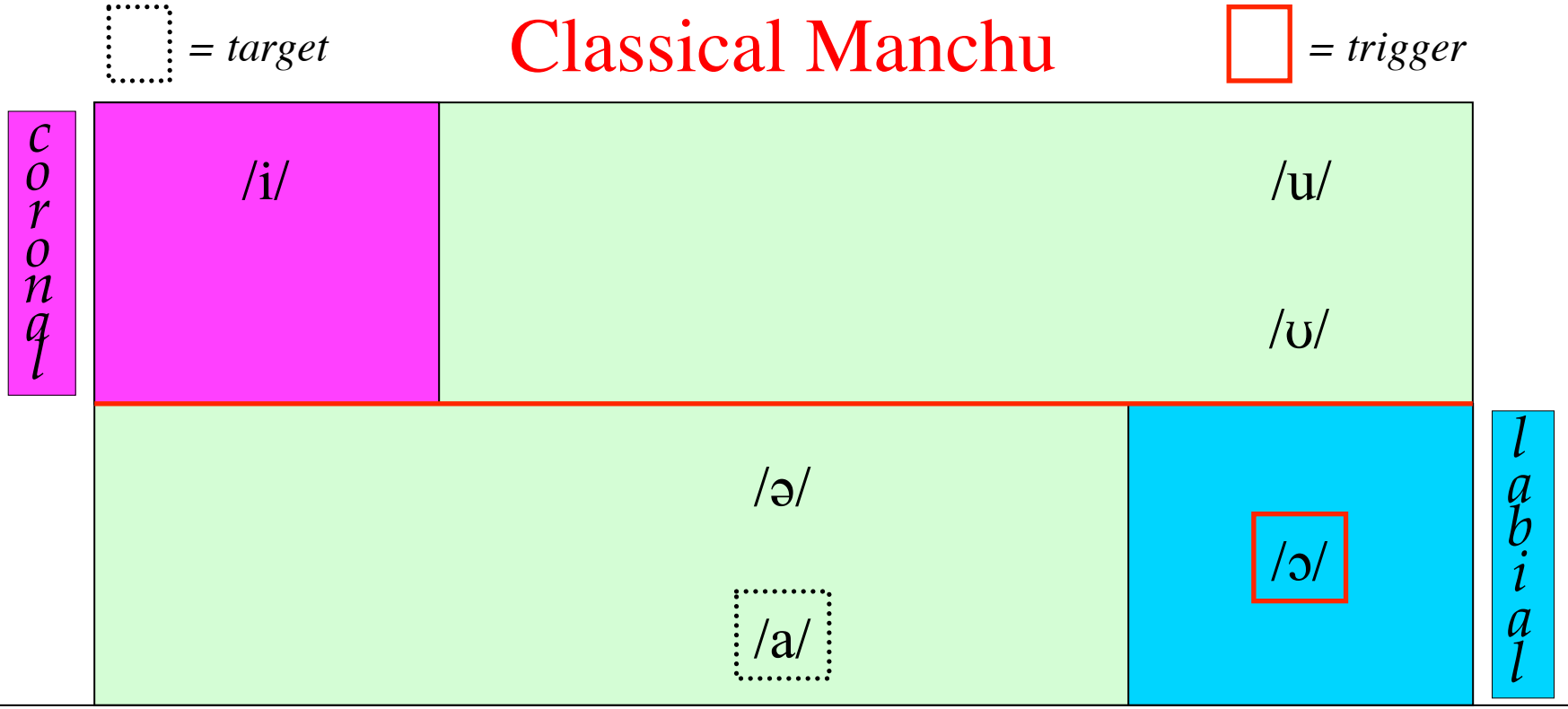
5.

Typology with Contrastive Hierarchies: Labial Harmony

The contrastive feature hierarchy of Classical Manchu sheds light on the results of typological surveys of labial (rounding) harmony in Manchu-Tungusic, Mongolian, and Turkic (Korn 1969; Kaun 1995).

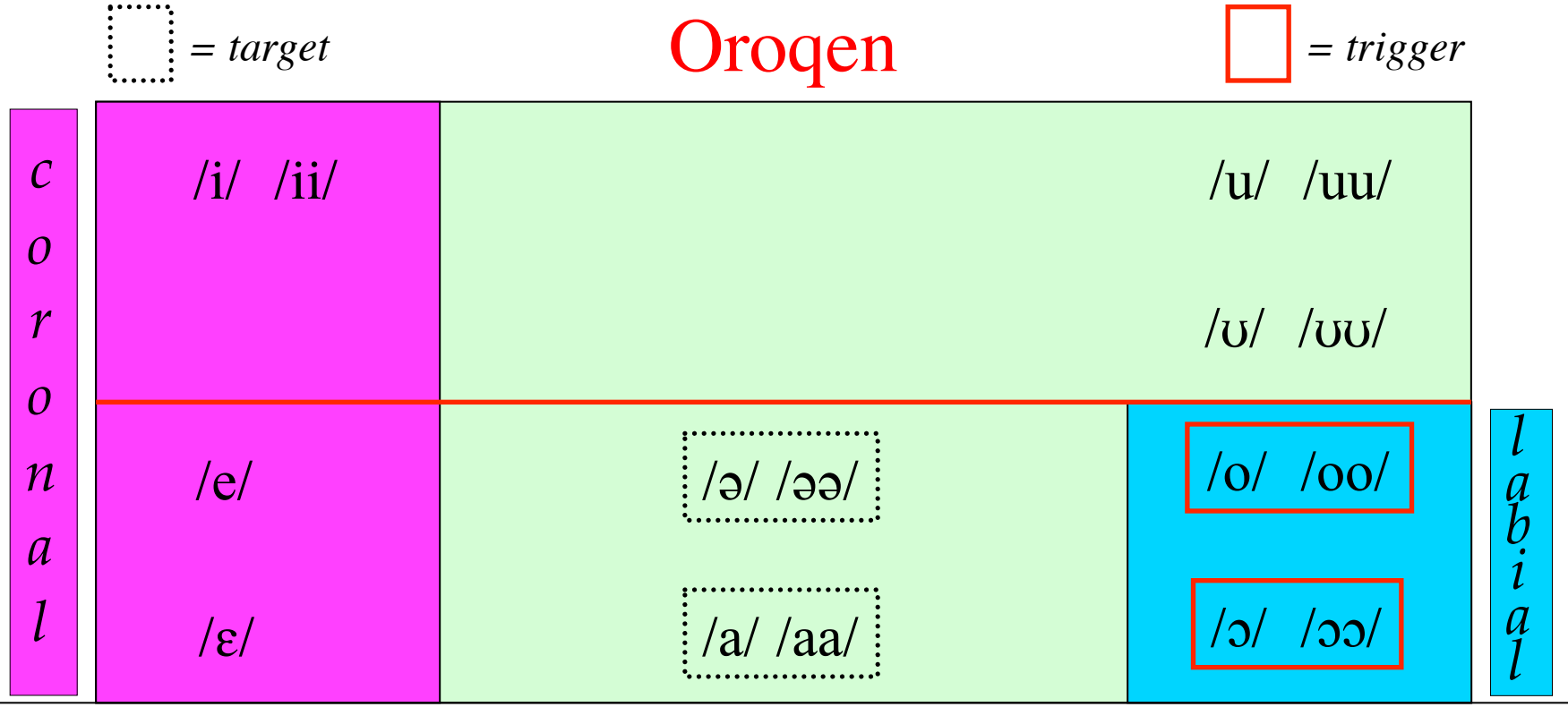
Labial harmony in Manchu-Tungusic

We have seen that labial harmony in Classical Manchu is limited to the [low] vowels. On my account, only the low vowel /ɔ/ is contrastively [labial] in this inventory.



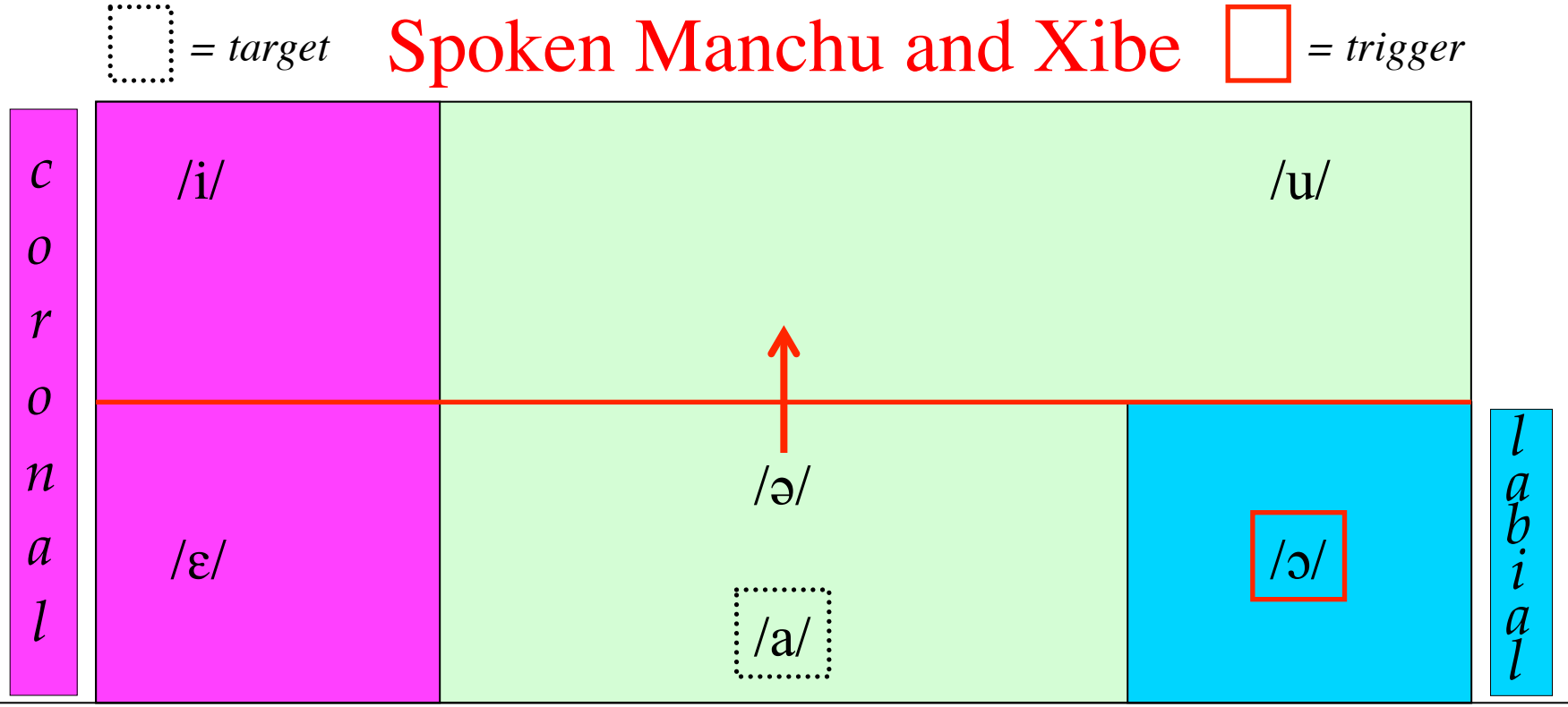
Labial harmony in Manchu-Tungusic

The same holds for other Manchu-Tungusic languages with similar inventories. A Tungusic example is Oroqen (Li 1996; Zhang 1995, 1996): again, only low vowels are triggers and targets of harmony. Oroqen has ATR and non-ATR low vowels.



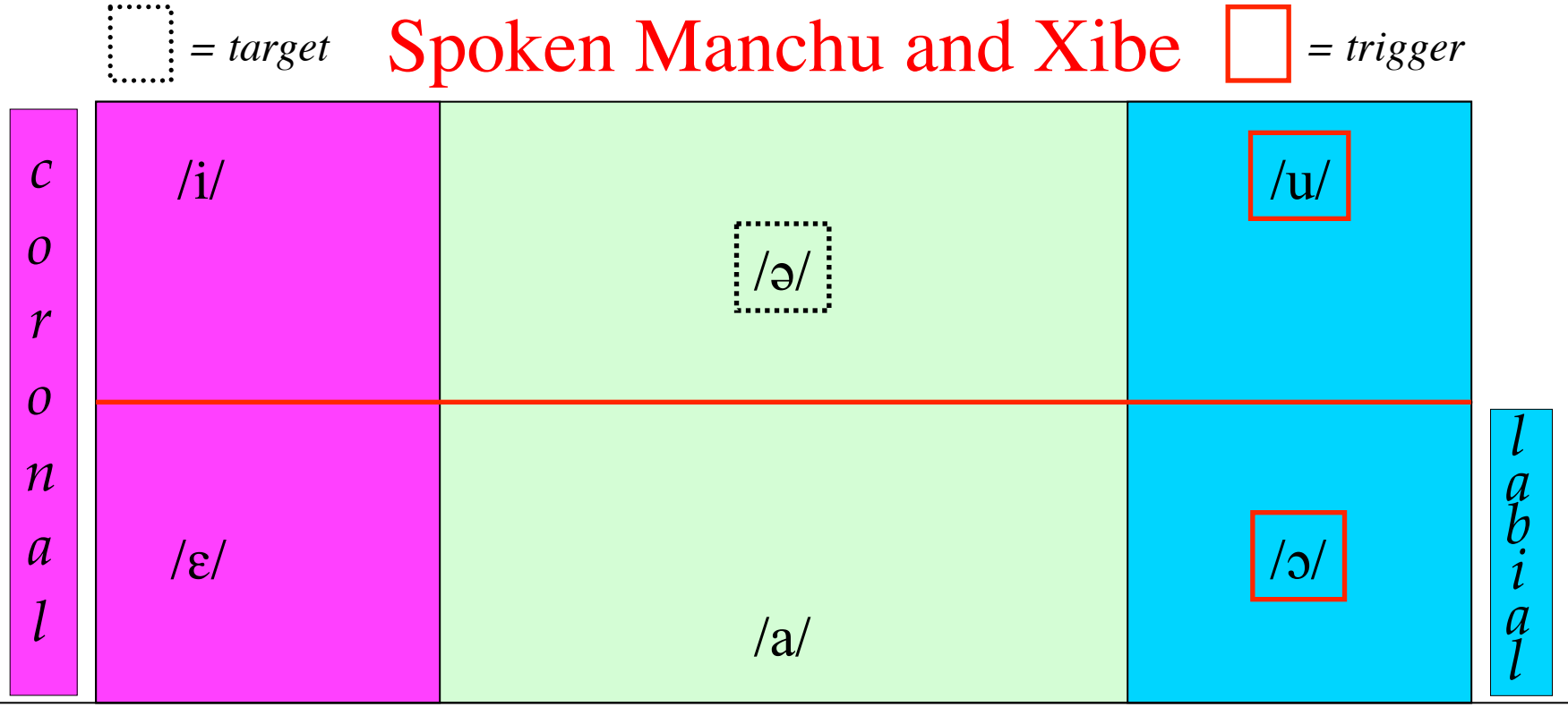
Labial harmony in Manchu-Tungusic

Notable exceptions to this pattern are Spoken Manchu and Xibe. Here [ATR] has been lost and /ə/ has become a (*non-low*) vowel (Zhang 1996; Dresher & Zhang 2005).



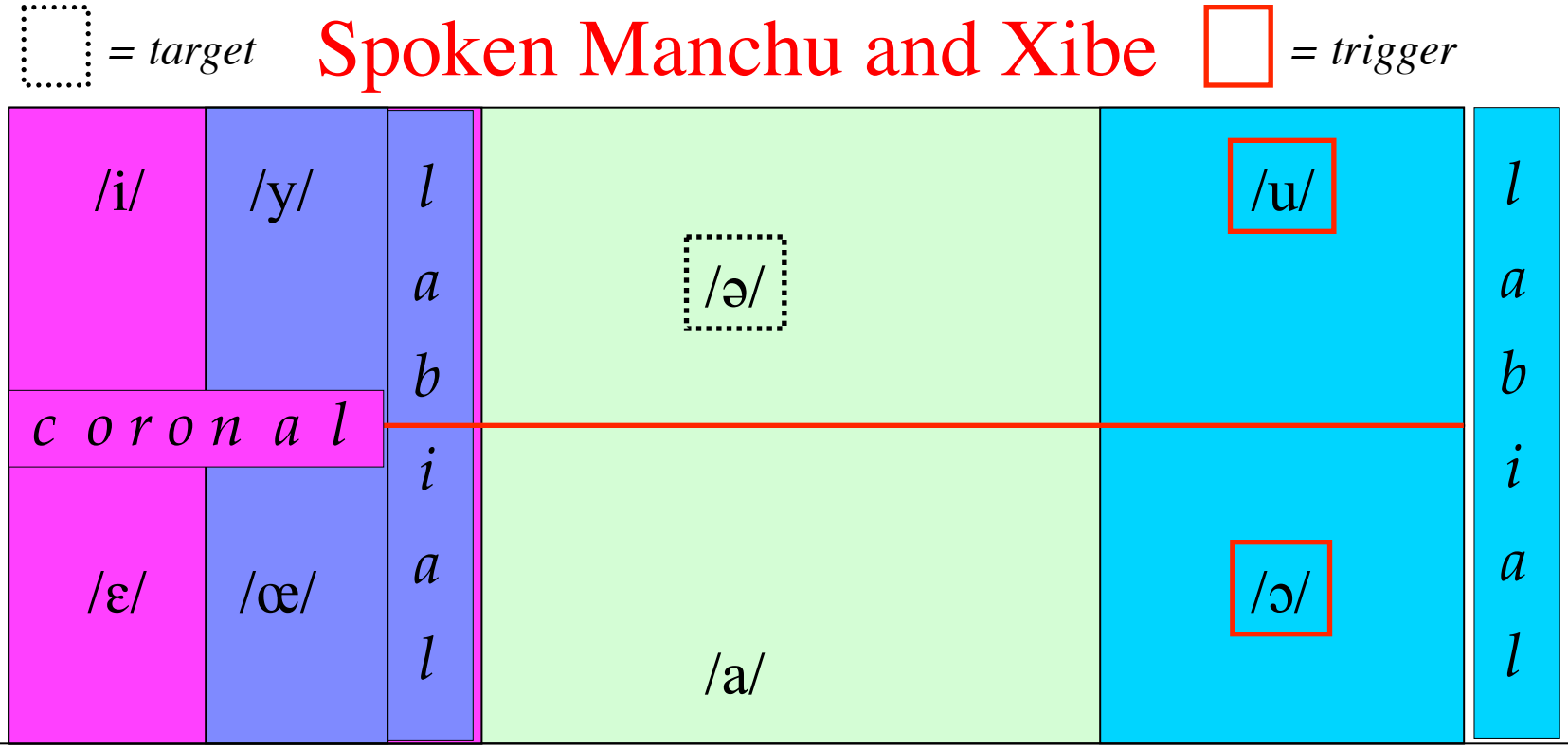
Labial harmony in Manchu-Tungusic

As a result, /ə/ now needs to be distinguished from /u/. [labial] is already in the grammar, and is extended to become contrastive on /u/. In Xibe, /u/ as well as /ɔ/ trigger rounding of /ə/.



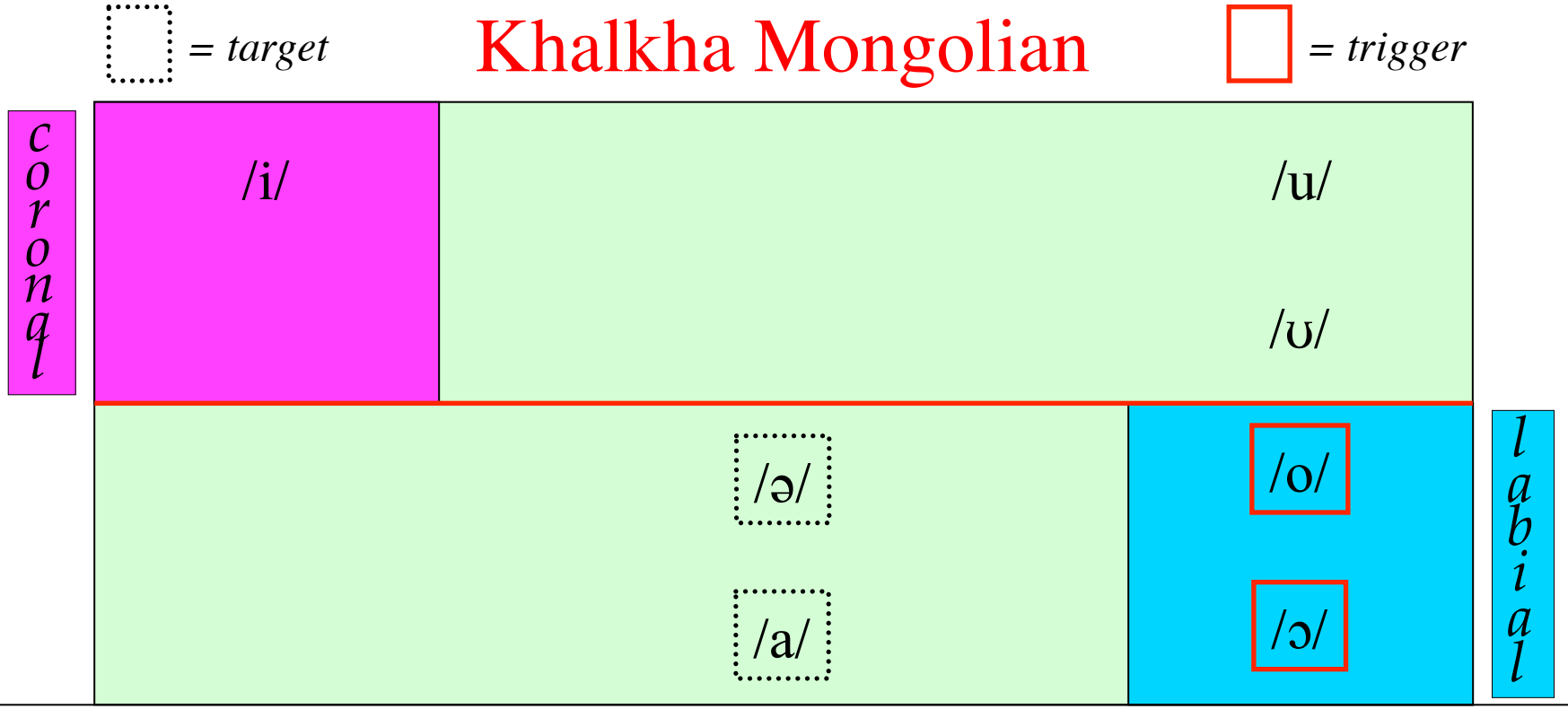
Labial harmony in Manchu-Tungusic

Xibe has also developed new front round phonemes /y/ and /œ/ that developed from sequences of front and round vowels, further attesting to the contrastive status of [labial] on /u/.



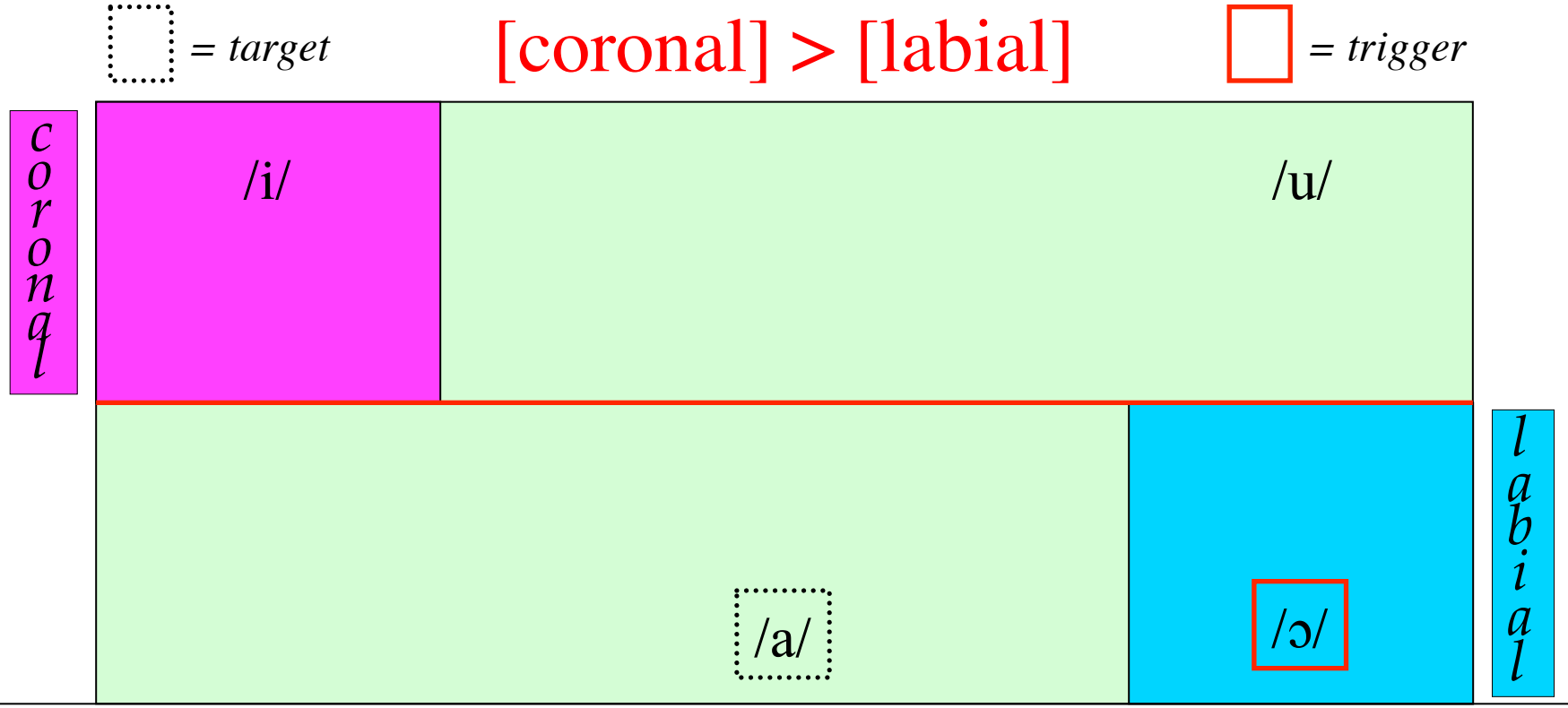
Labial Harmony in Eastern Mongolian

Eastern Mongolian languages also have labial harmony limited to low vowels. A typical example is Khalkha Mongolian (Svantesson 1985, Qinggertai 1982). I assume they have similar feature hierarchies as most of the Manchu-Tungus languages.



Labial Harmony triggered by [low] vowels

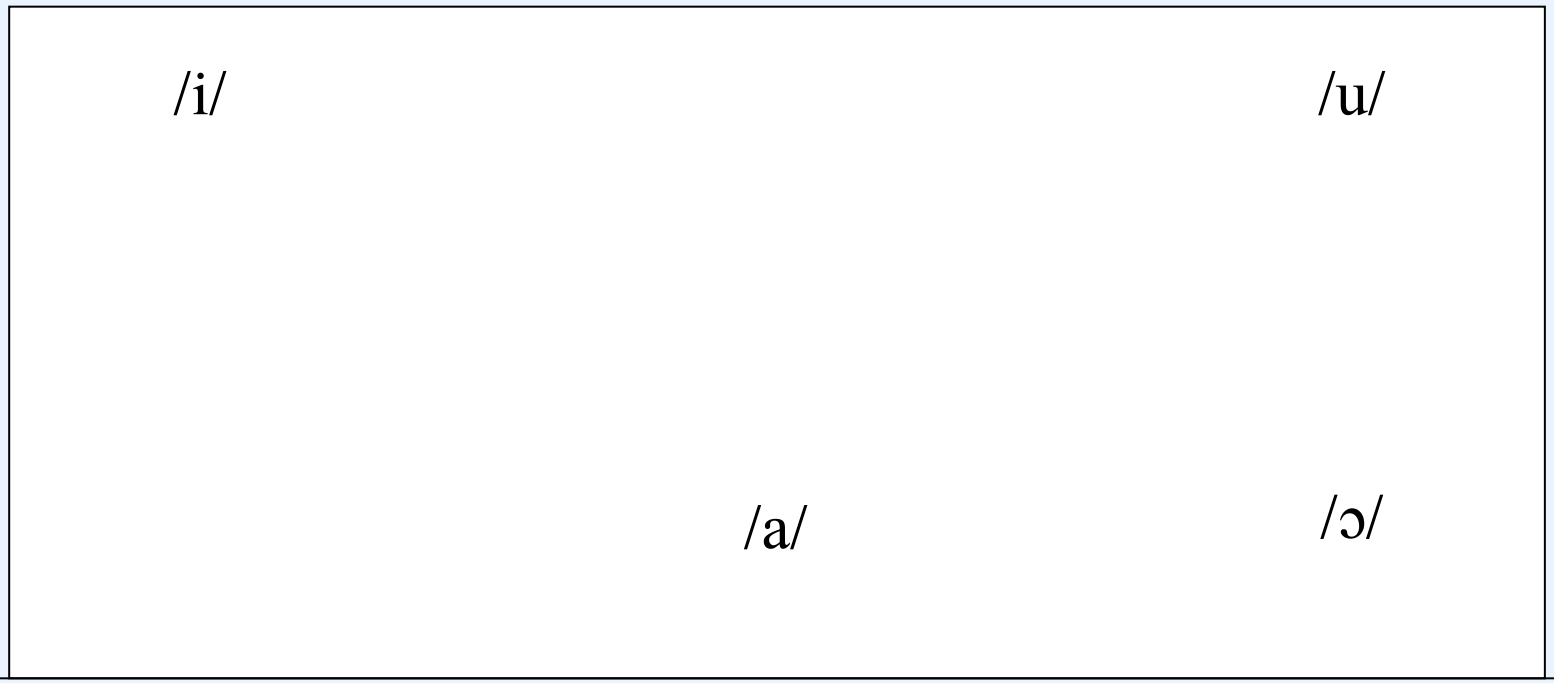
In these languages harmony triggers are non-high because only non-high vowels are contrastive for [labial], a limitation that follows from the fact that [coronal] (as well as a height feature) is higher in the hierarchy than [labial].



Labial Harmony in Yowlumne Yokuts

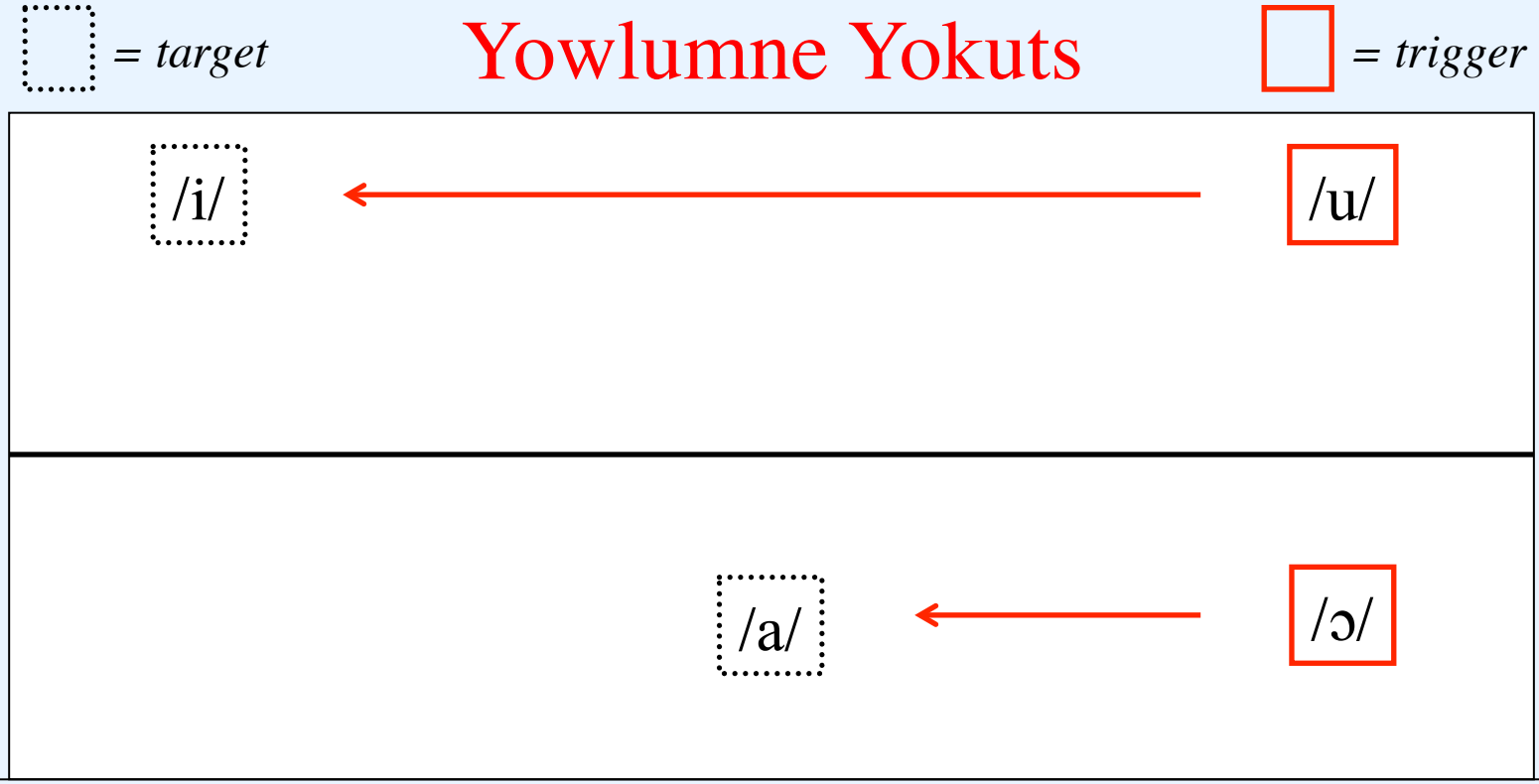
It is interesting to compare this type of language with Yowlumne Yokuts (Newman 1944), which has a vowel inventory whose basic configuration looks similar; but it is a completely different type of language.

Yowlumne Yokuts



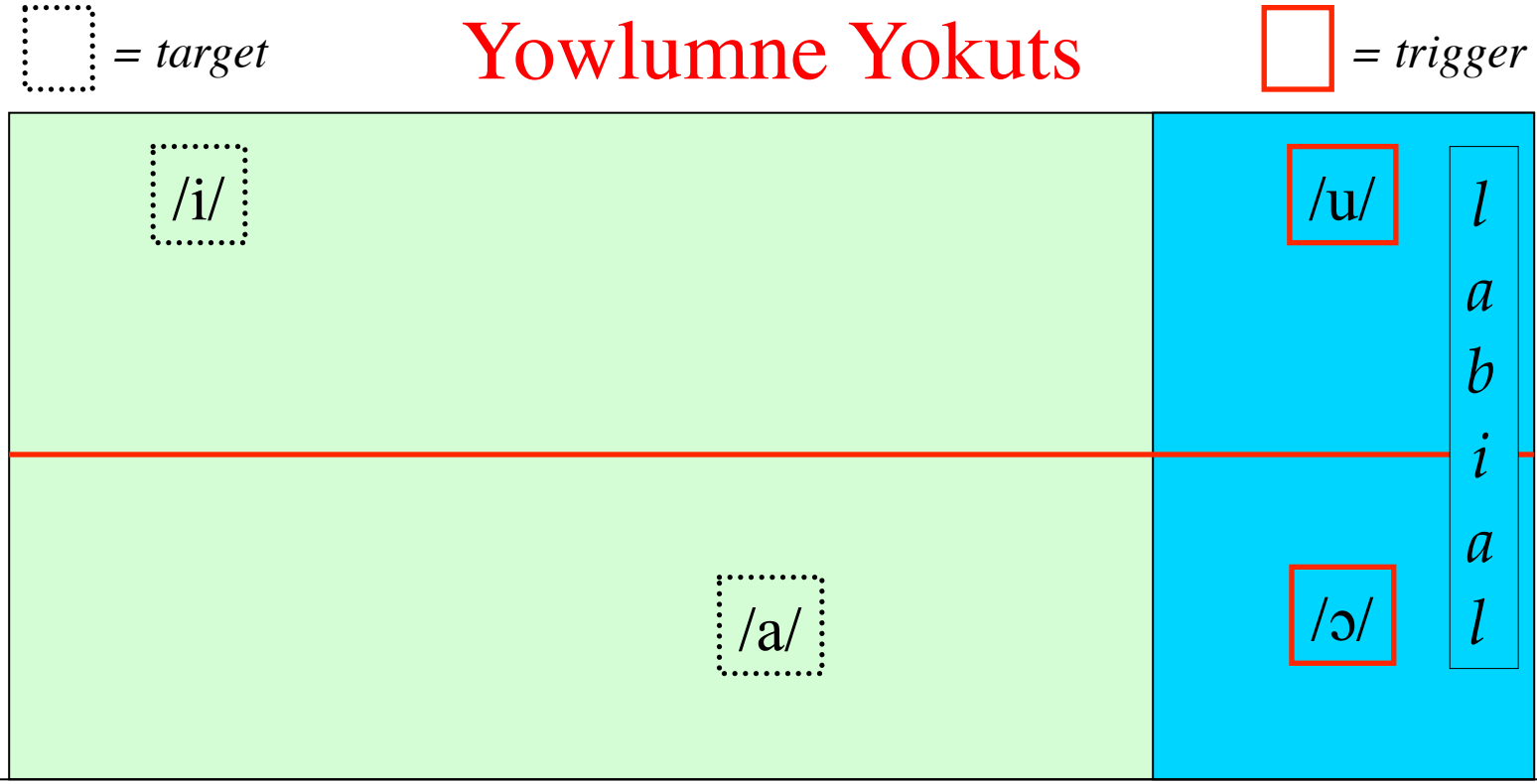
Labial Harmony in Yowlumne Yokuts

In Yokuts both /u/ and /ɔ/ trigger height-bounded labial harmony: /u/ rounds only /i/, and /ɔ/ rounds only /a/. Why can /u/ trigger harmony here, but not in Manchu-Tungusic and Eastern Mongolian?



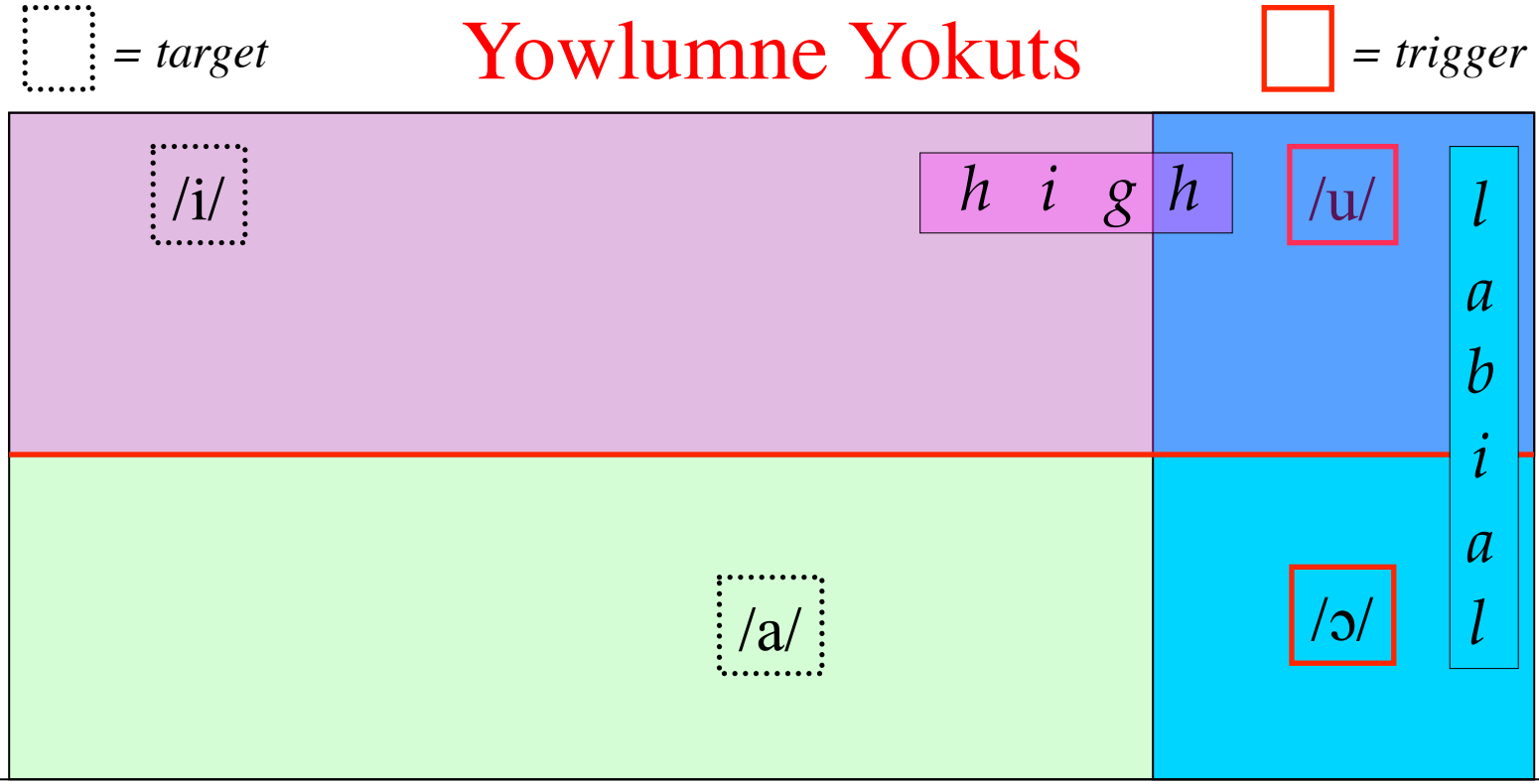
Labial Harmony in Yowlumne Yokuts

A simple solution is available in terms of the contrastive hierarchy: in Yowlumne, [labial] is ordered ahead of [coronal]. Hence, both /u/ and /ɔ/ are [labial].



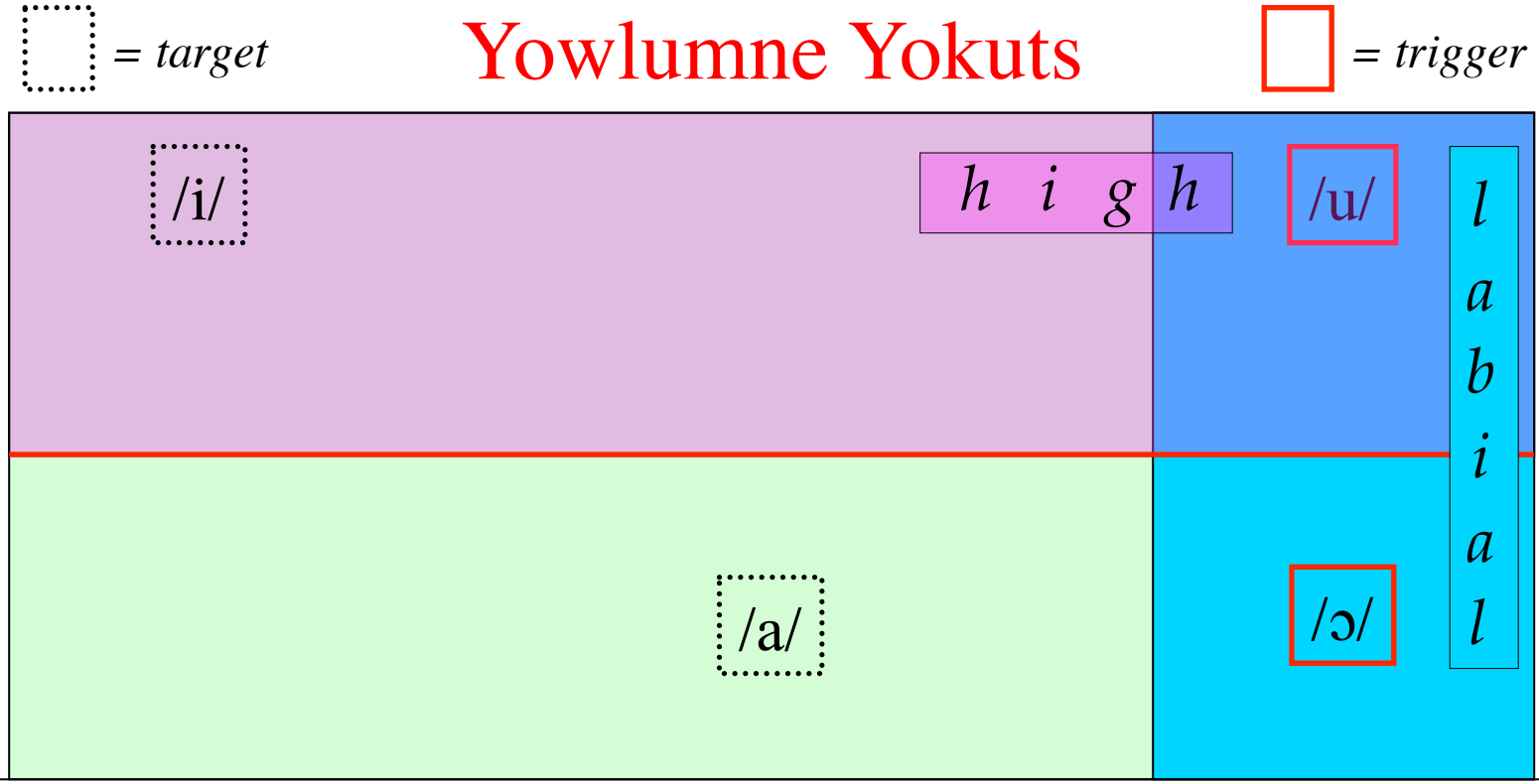
Labial Harmony in Yowlumne Yokuts

Since we need only two features in this inventory—[labial] and a height feature, say [high]—it follows that [coronal] is not a contrastive feature for vowels in this language.



Labial Harmony in Yowlumne Yokuts

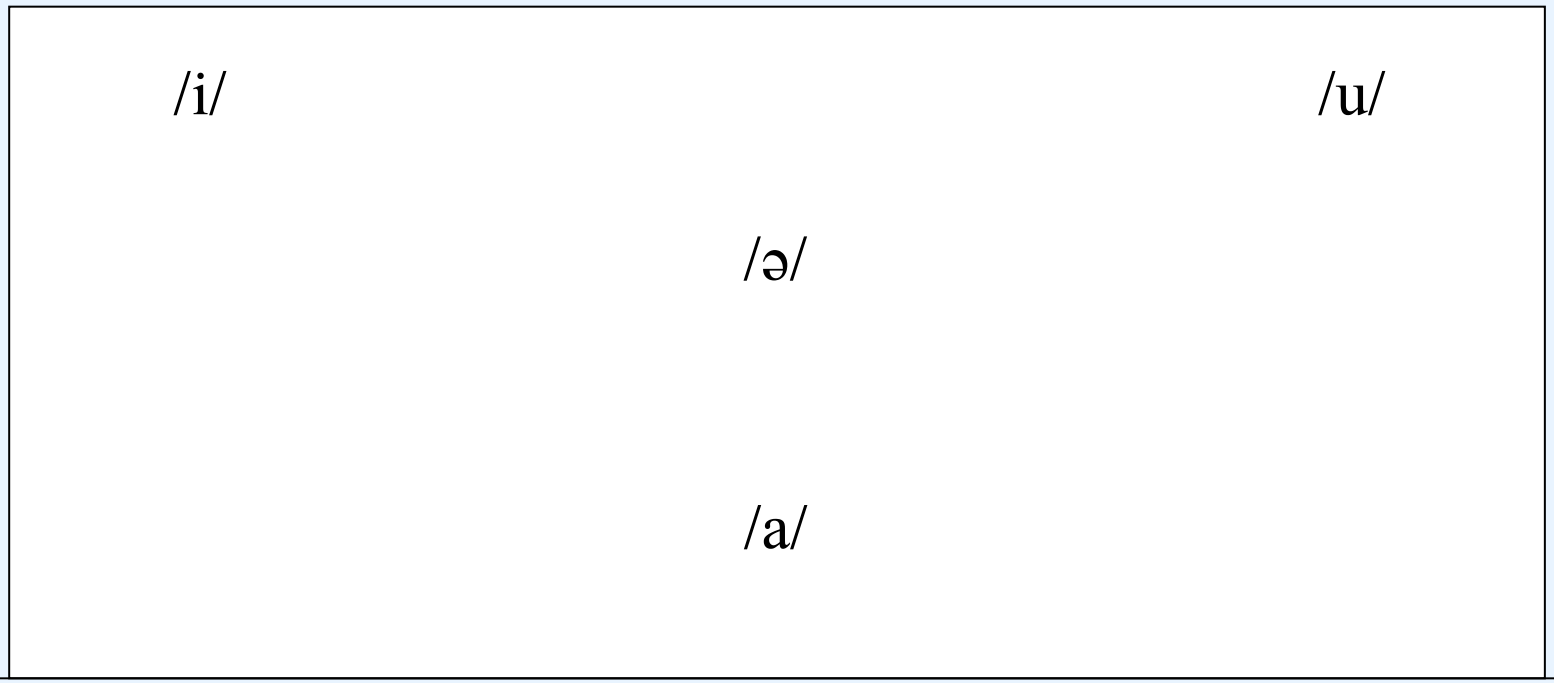
In support of this analysis, note that /i/ in Yowlumne is phonologically inert, and serves also as the epenthetic vowel. This is in sharp contrast to the [coronal] /i/in Manchu-Tungusic and many Mongolian languages.



Inuit dialects

Another language family in which [labial] is typically ordered ahead of [coronal] are the Yupik and Inuit languages that descend from Proto-Eskimo, which is reconstructed to have vowels */i/, */a/, */u/, and a fourth vowel assumed to be */ə/.

Proto-Eskimo

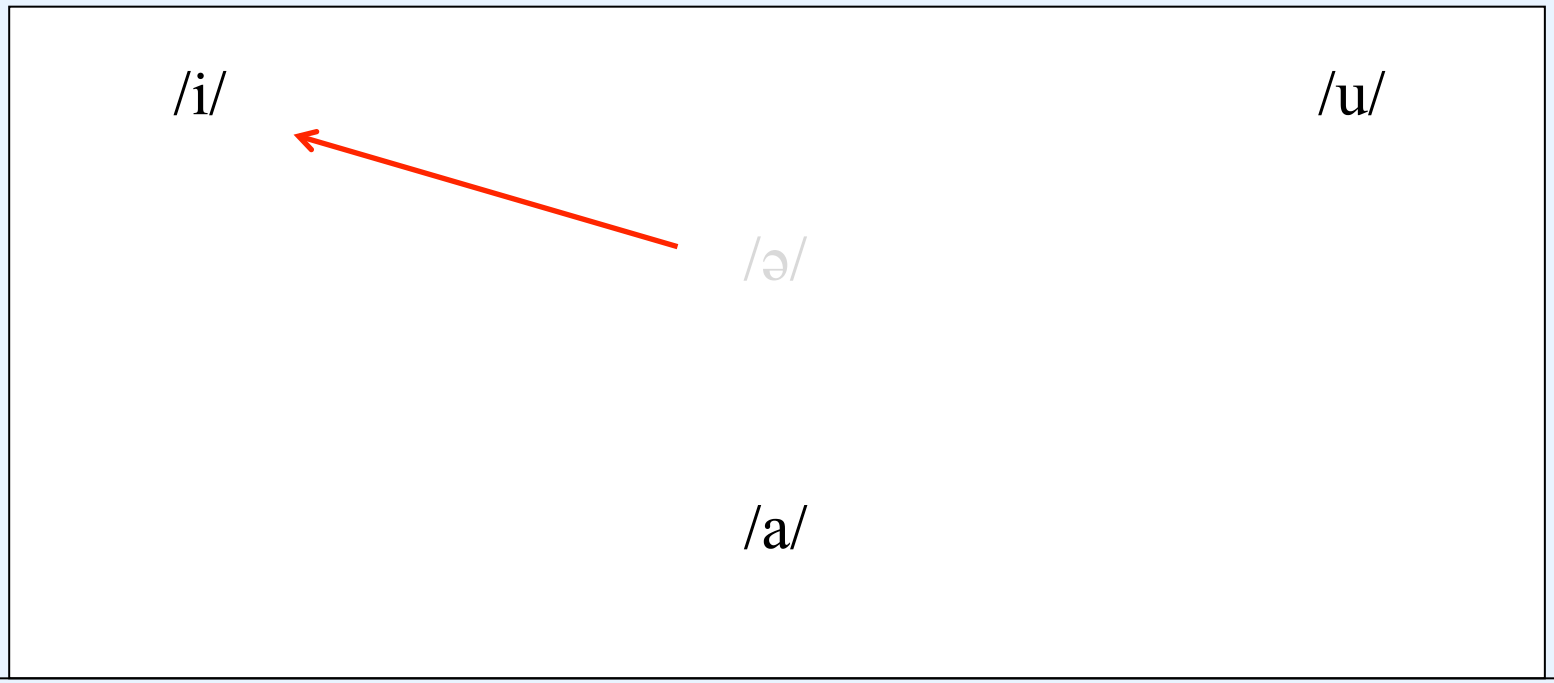


Inuit dialects

In most dialects this vowel has merged with /i/.

In some of these dialects merger is total, resulting in a three-vowel system; other dialects retain a trace of the distinction between */i/ and */ə/.

Proto-Eskimo



Inuit dialects

Original */i/ could cause palatalization of consonants, and some Inuit dialects show palatalization (or traces of former palatalization) (Dorais 2003: 33).

In the word 'foot', *i* causes a following *t* to change to *s*. This assibilation is the most common manifestation of palatalization in Inuit.

*itəɣaʁ	>	isiɣak	'foot'

Inuit dialects

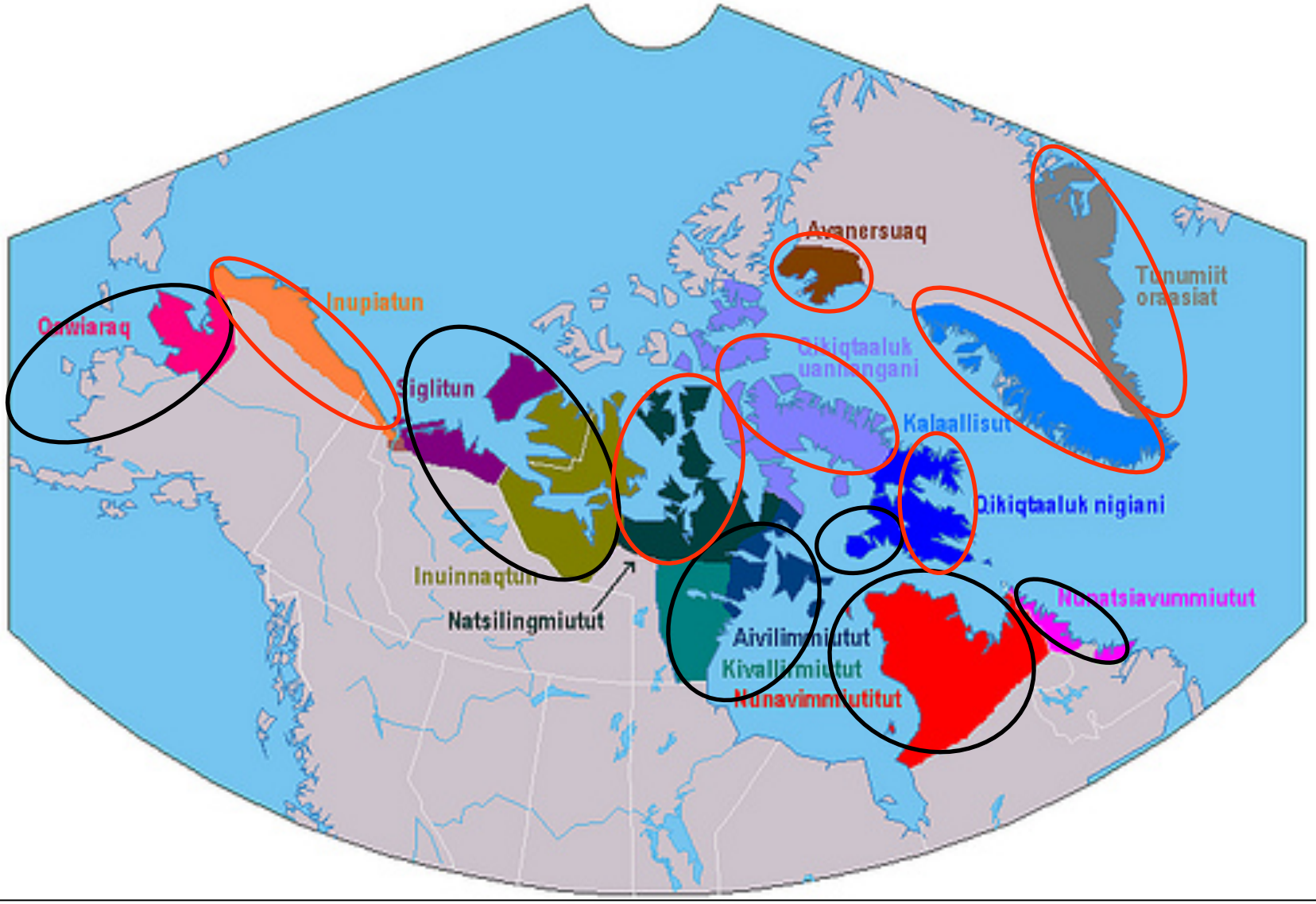
In these dialects it is traditional to distinguish between 'strong *i*', which descends from */i/ and causes palatalization, and 'weak *i*', which descends from */ə/ and does not.

In some of these dialects the two types of *i* exhibit other kinds of distinct behaviour as well.

Strong *i*	*itəɣaʁ	>	isiɣak	'foot'
Weak *i*	*ətəmaɣ	>	itimak	'palm of hand'

Inuit dialects

Dialects with (red circles) and without (blue circles) Palatalization



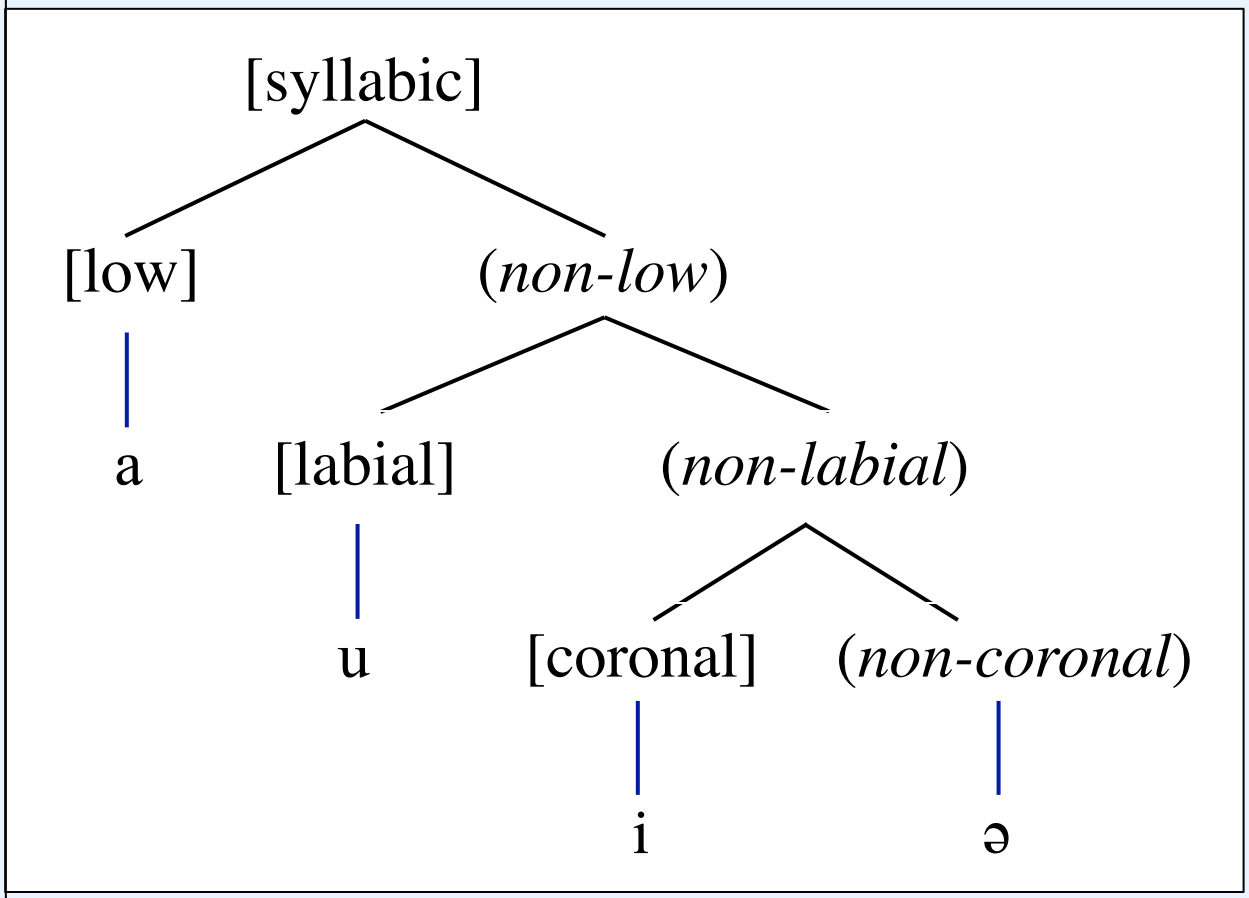
Inuit dialects

Compton and Dresher (2011) observe a generalization:

Inuit /i/ can cause palatalization (assibilation) of a consonant only in dialects where there is evidence for a (former) contrast with a fourth vowel; where there is no contrast between strong and weak *i*, /i/ does not trigger palatalization.

This generalization follows if we assume that the feature hierarchy for Inuit and Yupik is [low] > [labial] > [coronal]:

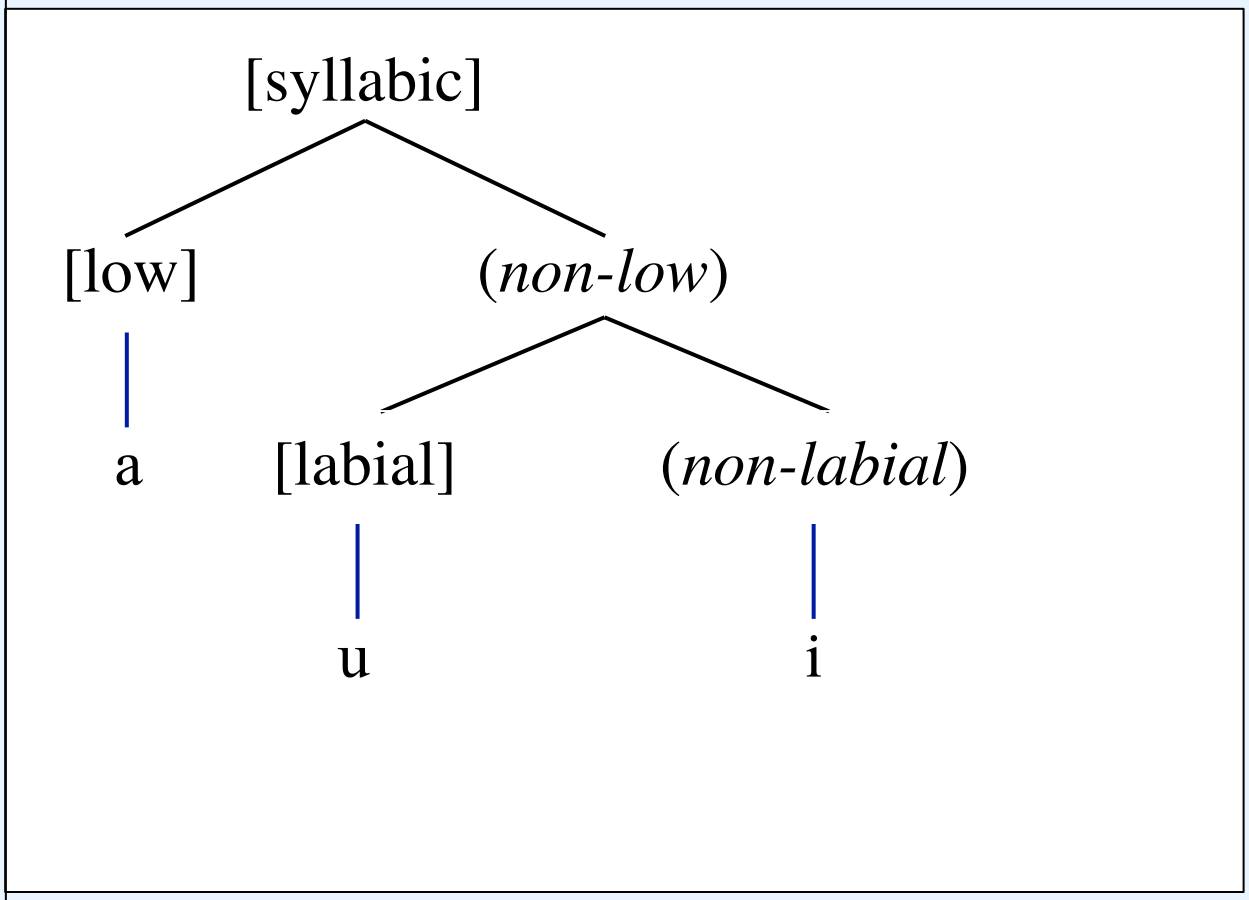
Inuit-Yupik contrastive hierarchy (Compton and Dresher 2011)



When the fourth vowel is in the underlying inventory, /i/ has a contrastive [coronal] feature that enables it to cause palatalization.

[low] > [labial] > [coronal]

Inuit-Yupik contrastive hierarchy (Compton and Dresher 2011)



But in the absence of a fourth vowel, [coronal] is not a contrastive feature.

[low] > [labial]

Labial Harmony in Turkic

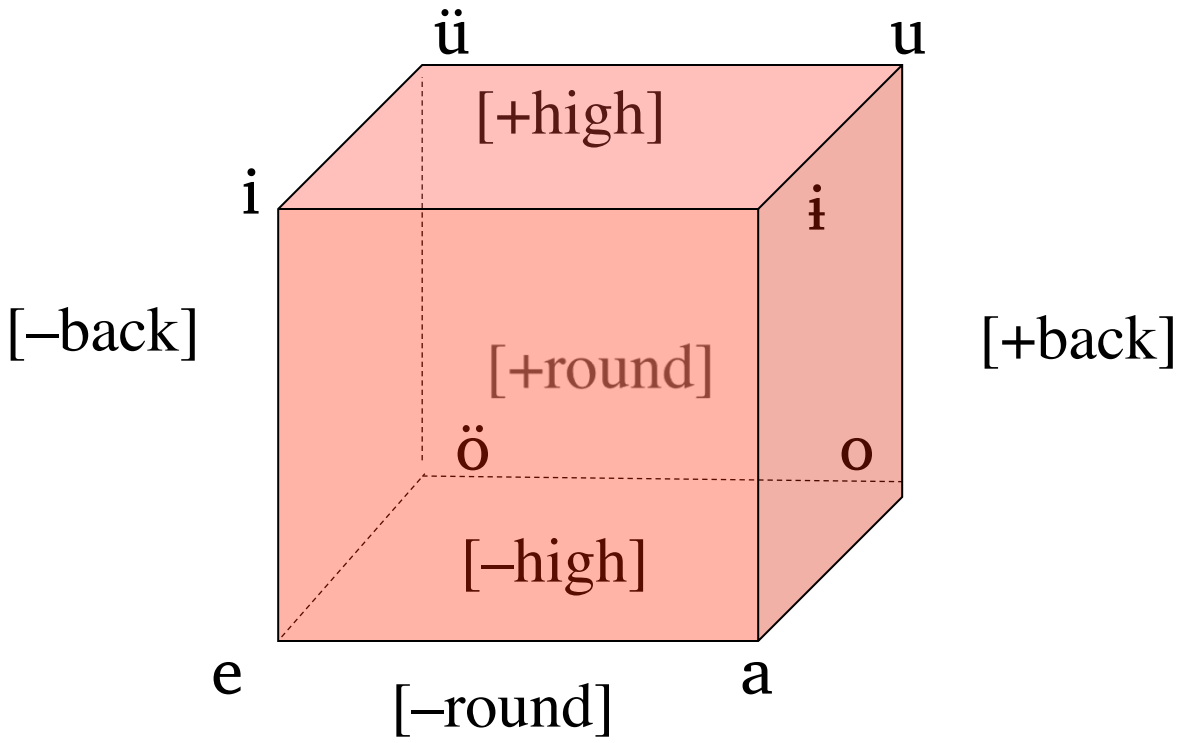
Turkic languages have symmetrical inventories. They are typically analyzed with 3 features: 1 height feature and 2 place features, as below (cf. Nevins 2010: 26).

Turkish

	coronal		non-coronal	
	non-labial	labial	non-labial	labial
high	/i/	/ü/	/ɨ/	/u/
low	/e/	/ö/	/a/	/o/

Turkish Vowels

Here, every feature specification is contrastive in any order; the vowels completely fill the 2 x 2 x 2 = 8 cell vowel space.



Labial Harmony in Turkic

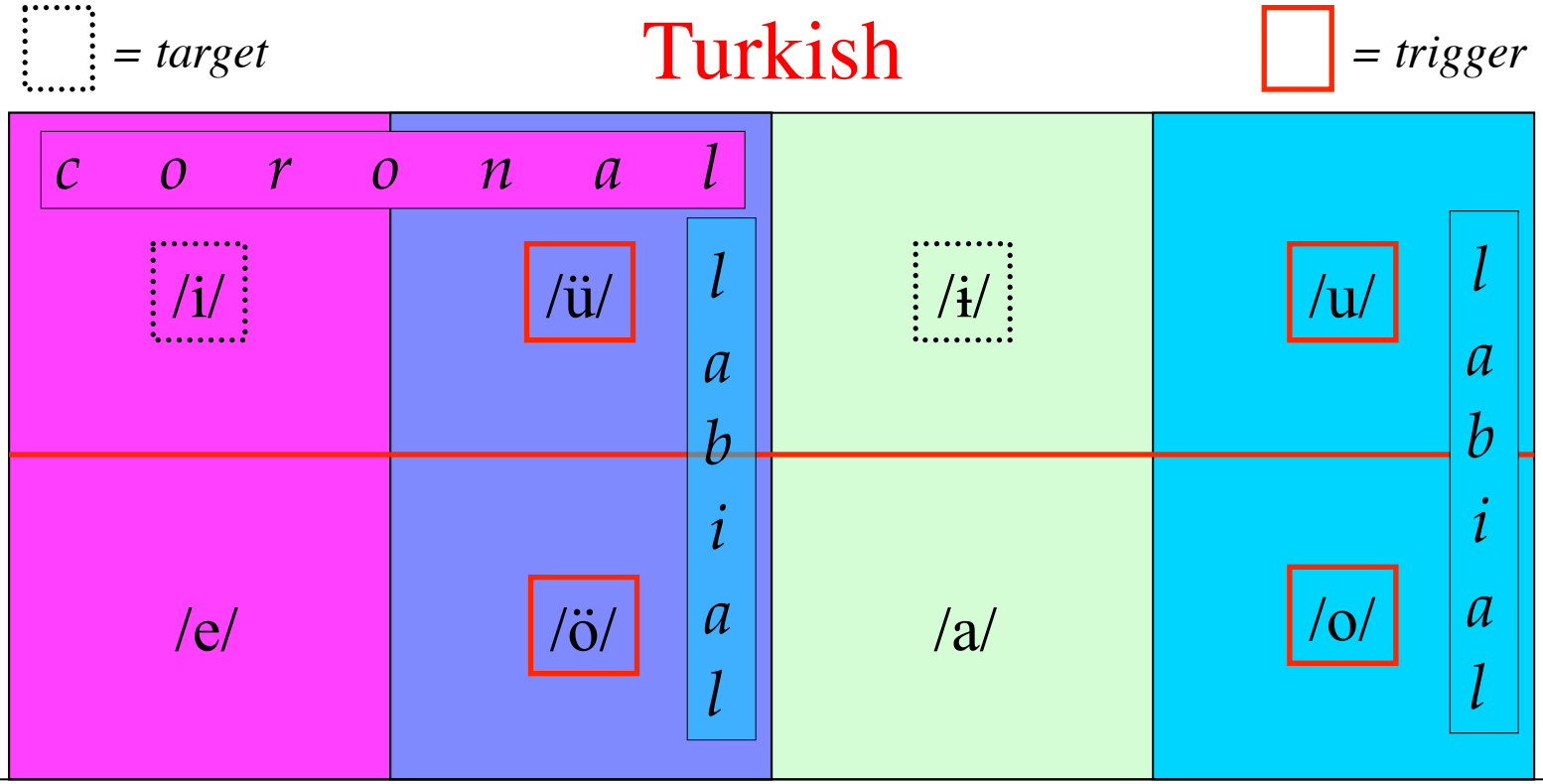
We predict, therefore, that all round vowels could potentially be triggers of labial harmony in such languages. This prediction is correct, though harmony observes limitations that are not due to contrast, but to other factors.

Turkish

	coronal		non-coronal	
	non-labial	labial	non-labial	labial
high	/i/	/ü/	/ɨ/	/u/
low	/e/	/ö/	/a/	/o/

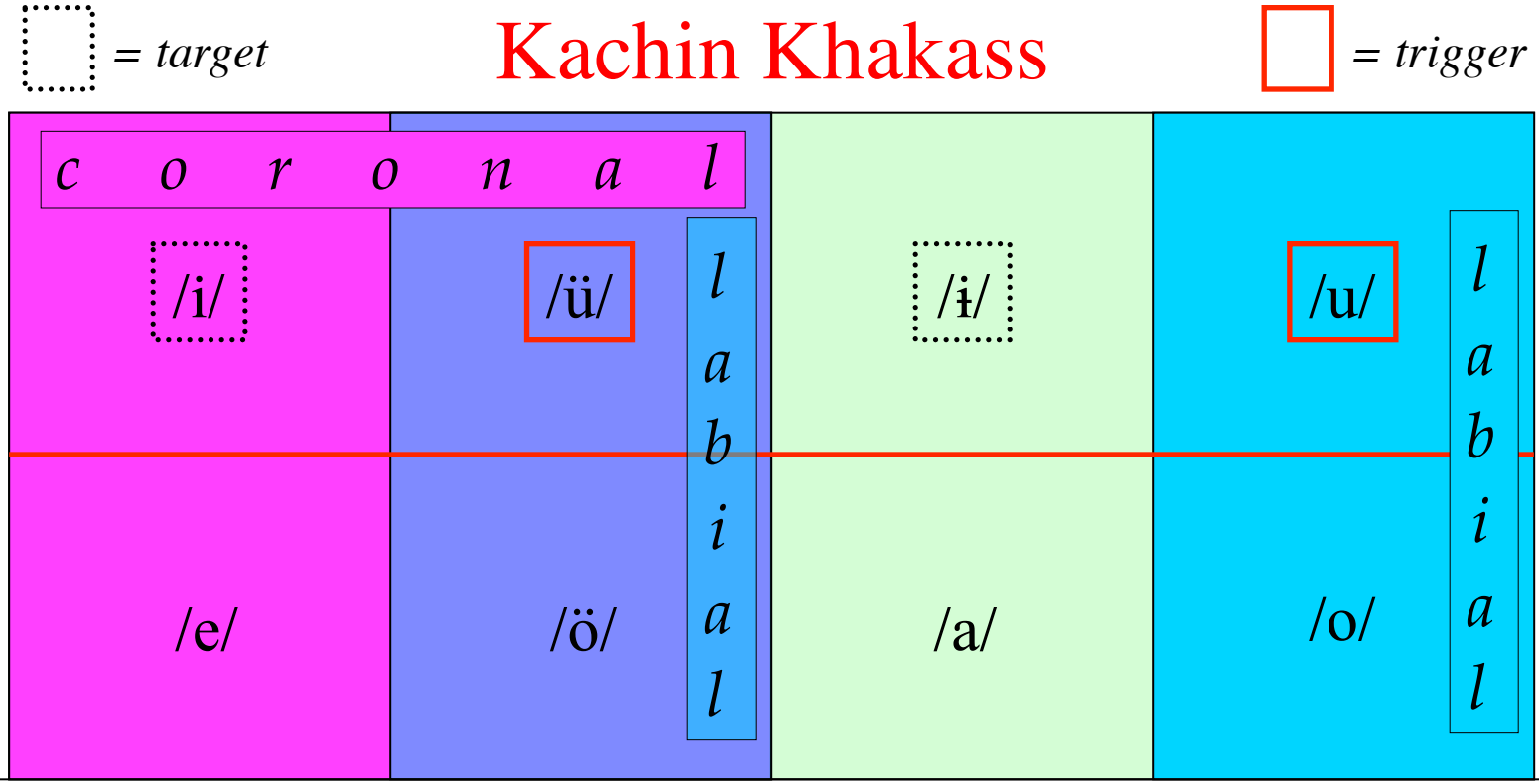
Labial Harmony in Turkic

In Turkish, for example, harmony triggers can be high or low, but targets are typically limited to high vowels.



Labial Harmony in Turkic

In Kachin Khakass (Korn 1969), both triggers and targets of labial harmony must be high, the opposite of the Manchu-Tungus-Eastern Mongolian pattern.



Summary

To sum up, we can classify languages into types based on the contrastive scopes of the vowel features [coronal] (or [front]) and [labial] (or [round]):

- if [coronal] > [labial] and [labial] is non-contrastive, /i/ can cause palatalization or front harmony, but /u/ may not trigger rounding or labial harmony;
- if [labial] > [coronal] and [coronal] is non-contrastive, /u/ may trigger rounding or labial harmony, but /i/ may not cause palatalization or front harmony;
- in languages where [labial] and [coronal] are both contrastive, these features may both be active in the vowels they are contrastive for.

Alternative accounts

I account for why labial harmony in Manchu-Tungusic-Eastern Mongolian differs from Turkic by appealing to differences in which vowels are contrastively [round] in these languages.

For a different account of this difference see Moskal 2012, 2013, and van der Hulst & Moskal 2013; they draw a connection between labial harmony and the existence of ATR harmony.

See also Godfrey (2012) for an account of Khalkha Mongolian harmony that attempts to reconcile the Contrastivist Hypothesis with the locality theory of Nevins (2010).

Godfrey also proposes that there is a connection between labial and ATR harmony.

6.

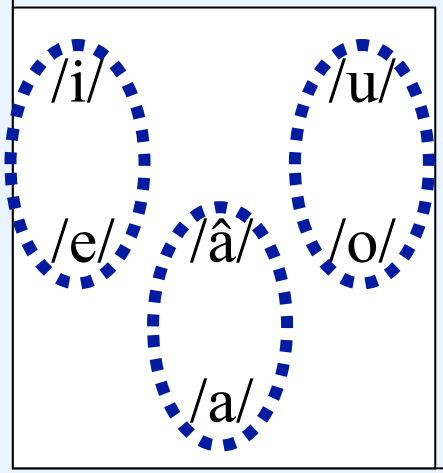
Contrastive Hierarchies and Vowel Reduction

Vowel reduction in Bulgarian

Spahr (2014) shows how contrastive hierarchies provide a natural way to account for vowel reduction in certain languages.

In stressed position Bulgarian has the 6 vowels shown below (Barnes 2006).

Stressed Vowels



Depending on the dialect, these vowels neutralize in 3 pairs in unstressed positions (Scatton 1984).

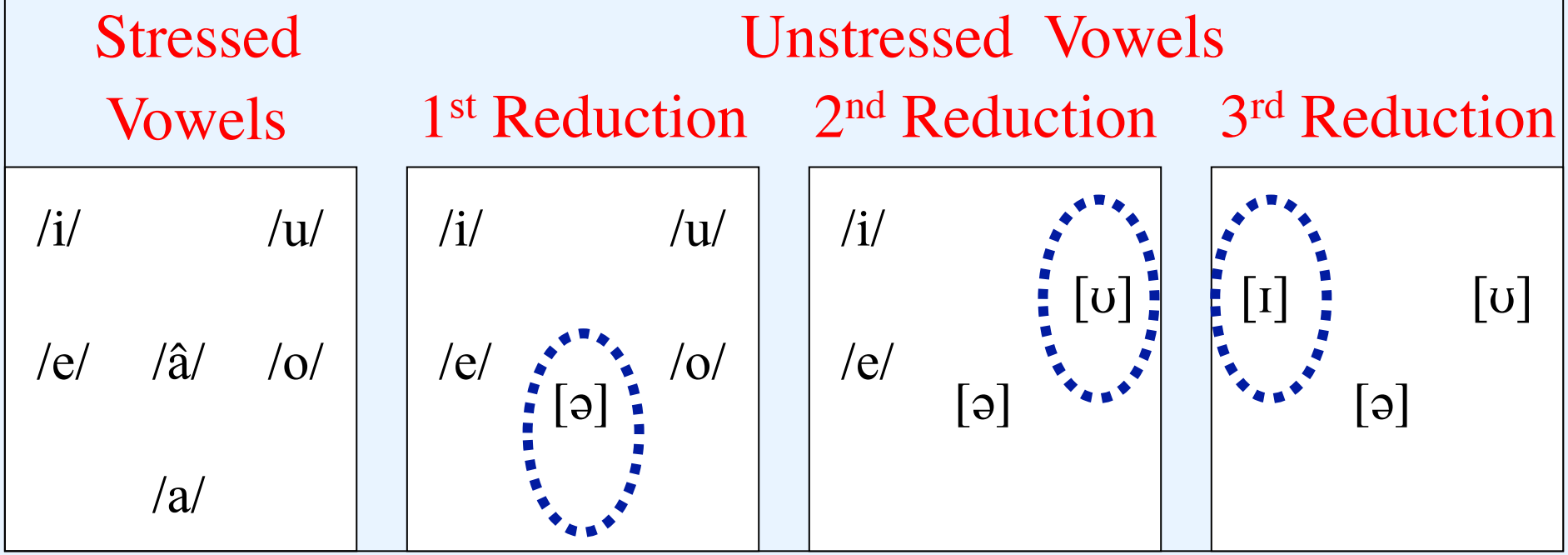
Scatton (1984) observes that these neutralizations occur in a hierarchy.

Vowel reduction in Bulgarian

All dialects and registers neutralize unstressed /a/ and /â/, realizing them as [ə].

In informal registers some dialects also neutralize /u/ and /o/ to [ʊ].

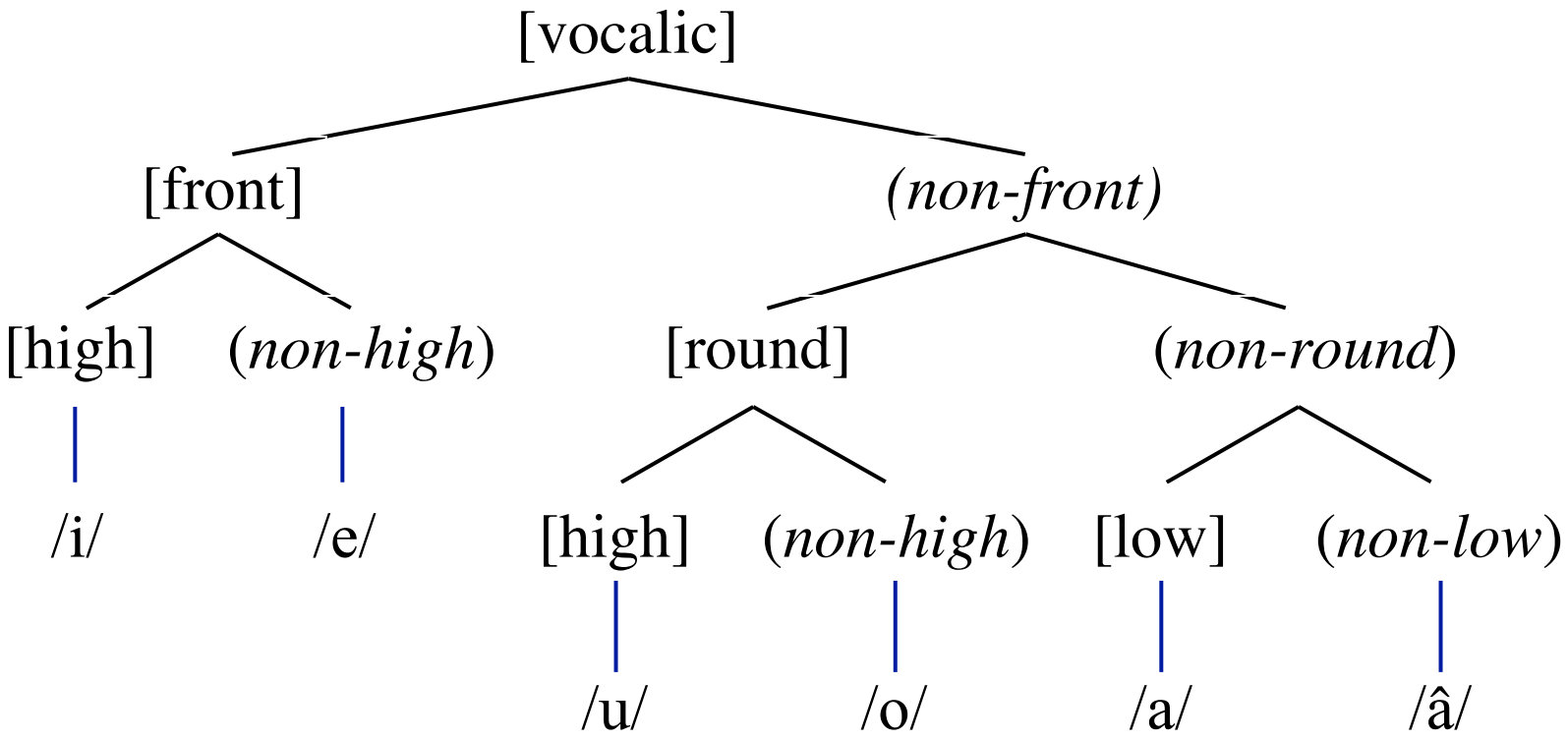
Some 'non-literary varieties' neutralize /i/ and /e/ to [ɪ].



Bulgarian hierarchy (Spahr 2014)

Spahr (2014) proposes that the vowel reduction patterns point to a contrastive hierarchy such as the one below.

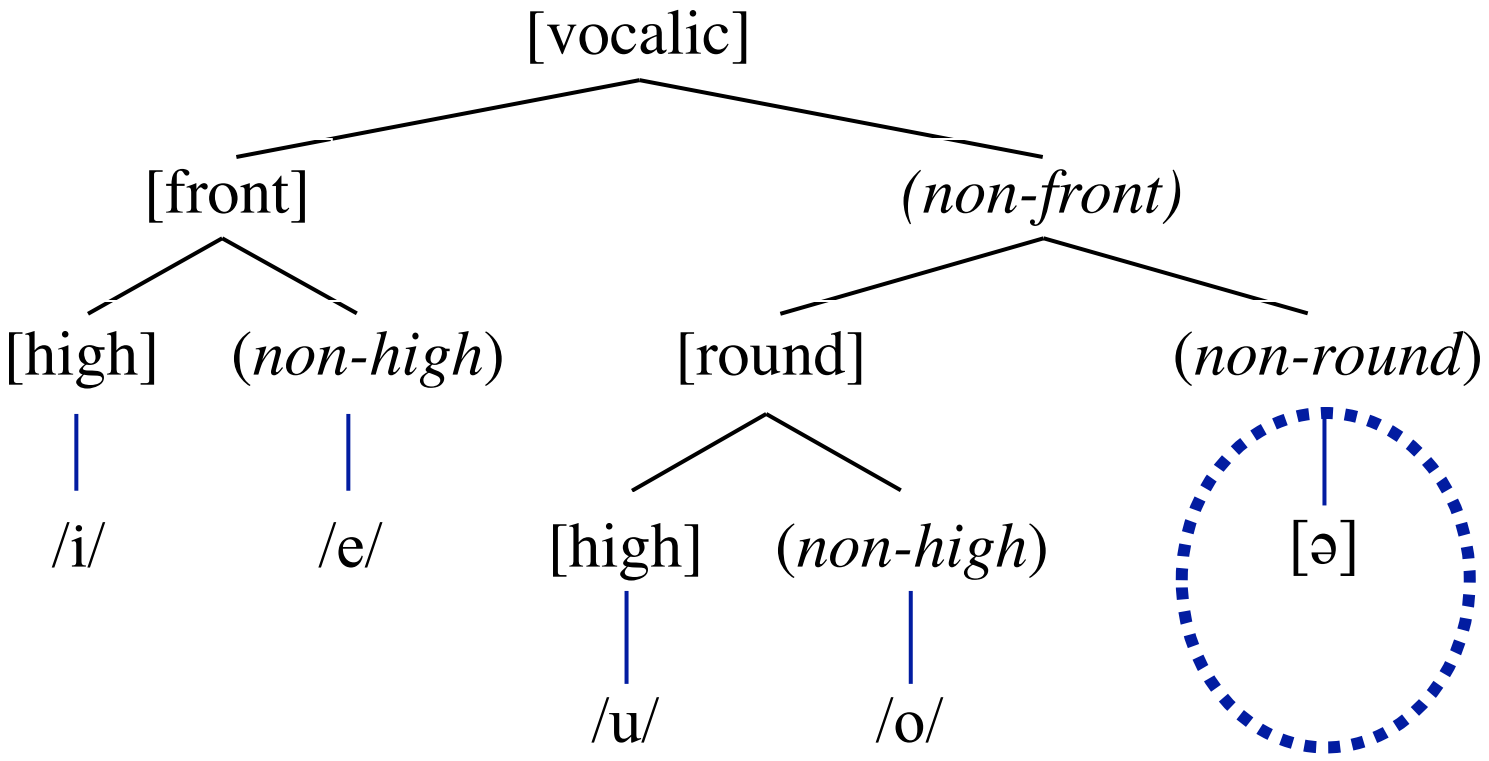
The various reductions can now be represented as the suspension of a contrast at the bottom of the feature tree.



Bulgarian hierarchy (Spahr 2014)

The first reduction neutralizes the [low] contrast.

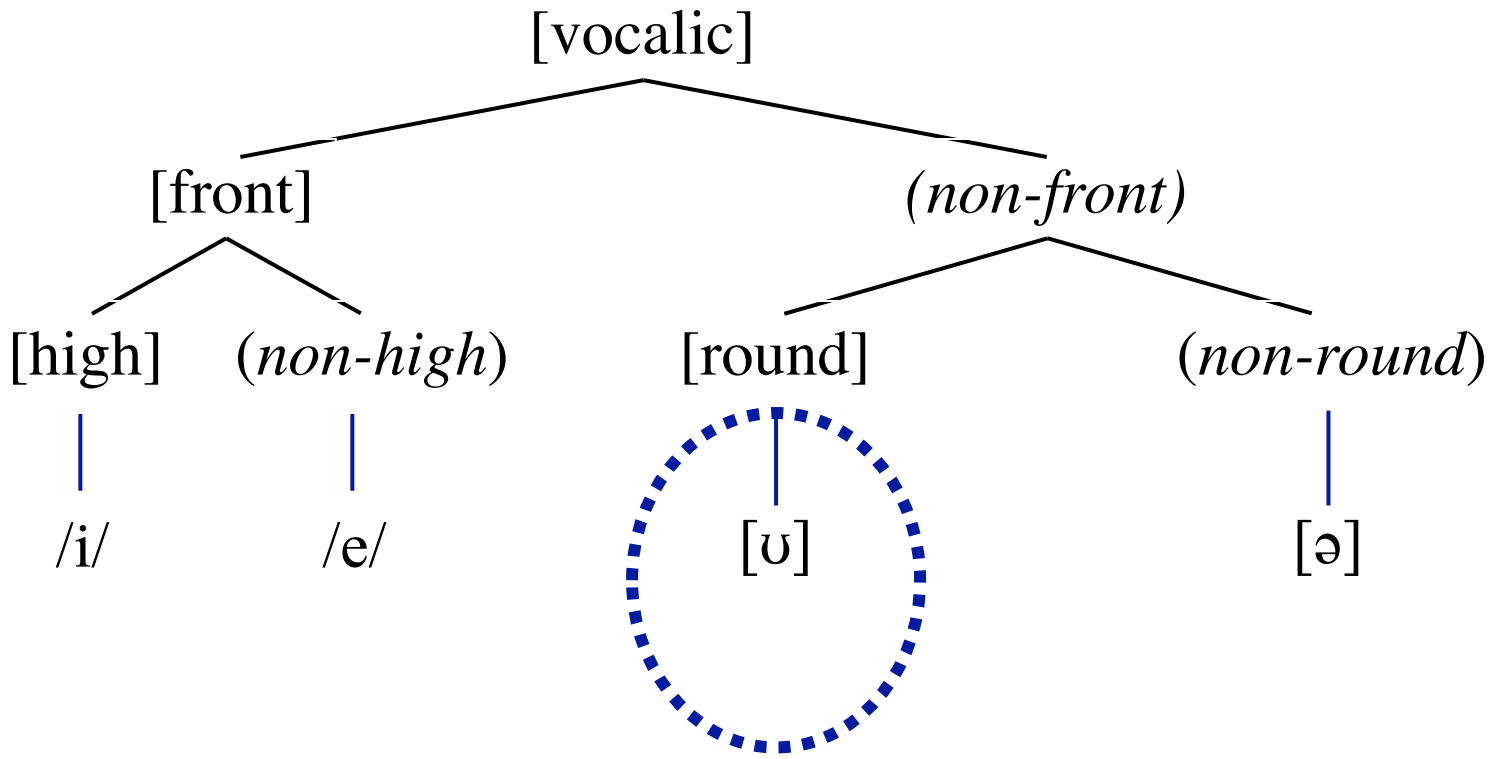
Spahr proposes that [ə] is neither [low] /a/ nor (*non-low*) /â/, but bears the features [vocalic], *(non-front)*, *(non-round)*.



Bulgarian hierarchy (Spahr 2014)

The second reduction neutralizes the [high] contrast under [round].

The resulting [ʊ] is neither [high] nor (*non-high).*



Bulgarian hierarchy (Spahr 2014)

The third reduction neutralizes the [high] contrast under [front].

This analysis of neutralization thus instantiates the Prague School notion of 'archiphoneme' (Trubetzkoy 1939; Davidsen-Nielsen 1978).