Themed session: The representational consequences of marginal contrasts

2013 Annual Meeting of the Linguistics Association of Great Britain
28 - 31 August 2013

Phonologization of Predictable Allophones in West Germanic

B. Elan Dresher
University of Toronto

Introduction

In this talk I will consider how a Contrastivist approach to phonology can deal with certain types of 'marginal contrasts' or 'quasi-phonemes'.

A key to a solution that adheres to the Contrastivist Hypothesis is to recognize that in a hierarchical approach to contrast, 'contrastive' does not necessarily equal 'unpredictable'.

Because of this, it is possible to create allophones in the lexical phonology whose distribution is entirely predictable, without weakening or departing from the core assumptions of the Contrastivist Hypothesis.

Introduction

The talk is organized as follows:

- General remarks on contrast and (un)predictability
- Ways of creating 'deep allophones' in the contrastive phonology
- Old English fricatives
- The problem of the phonologization of *i*-umlaut
- Analysis of the West Germanic and early Old English vowel systems
- Conclusions

Remarks on contrast and (un)predictabilty

A theory of contrast



I assume that the correct way to implement contrast in an explicit theory was proposed by Jakobson and his collaborators (Jakobson, Fant & Halle 1952, Jakobson & Halle 1956), namely:

The contrastive hierarchy

Contrastive features are assigned by language-particular feature hierarchies.

This method was called 'branching trees' in the literature of the 1950s and 1960s: I call it the Successive Division Algorithm (Dresher 1998, 2003, 2009):

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

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

A theory of contrast

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.

That is, only contrastive features can be phonologically active.
If this hypothesis is correct, it follows as a corollary that

Corollary to the Contrastivist Hypothesis

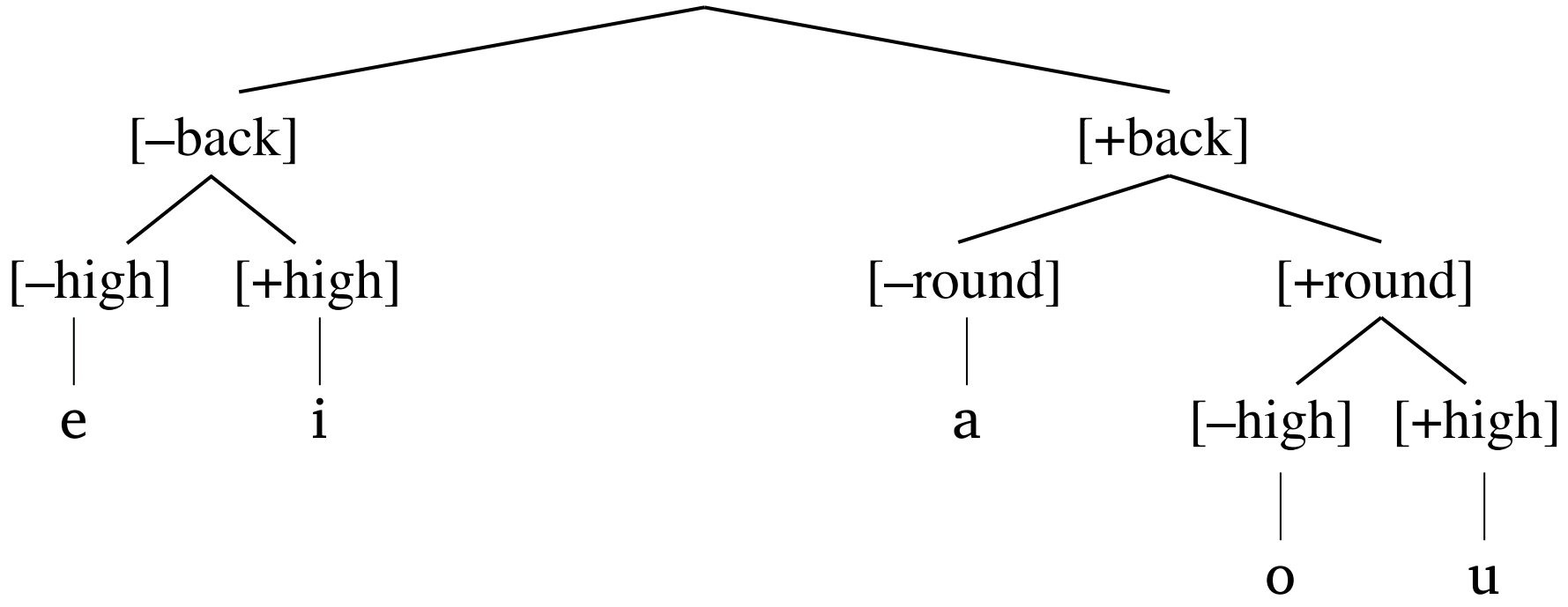
If a feature is phonologically active, then it must be contrastive.

Contrast via feature ordering

Suppose we have a 5-vowel inventory with the hierarchy:

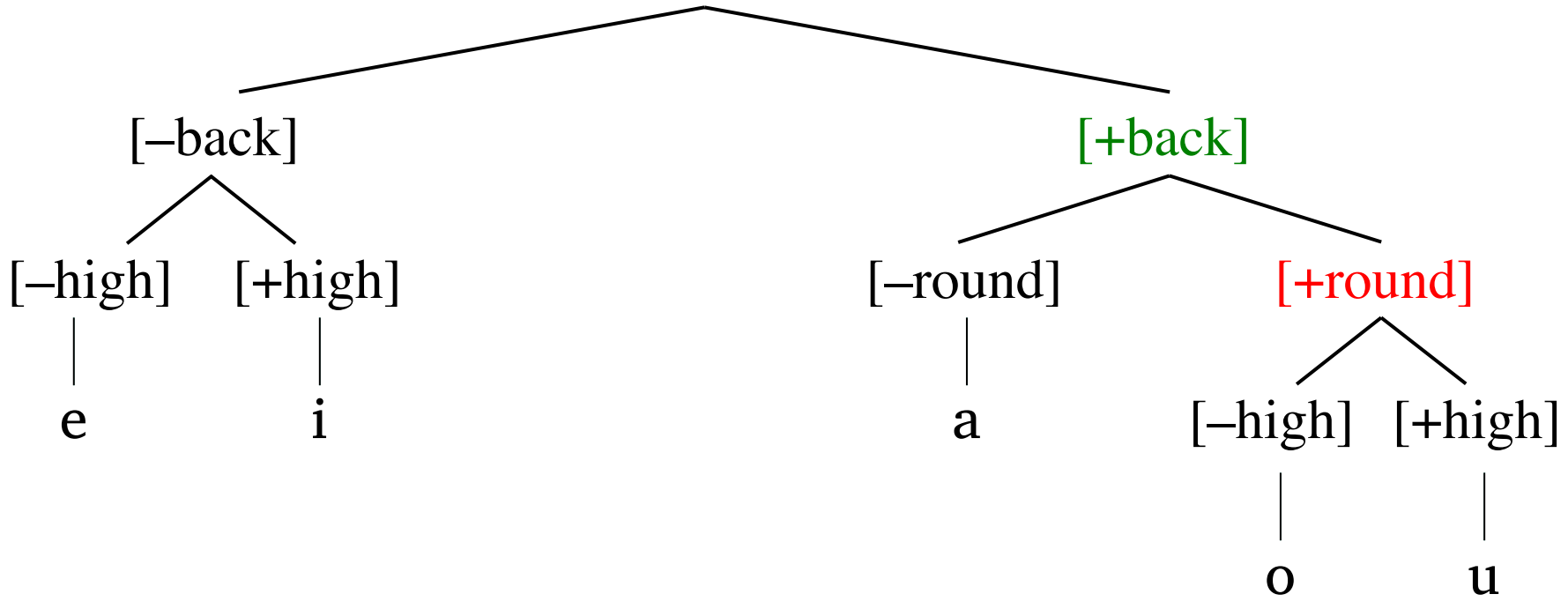
[back] > [round] > [high]

3 binary features have a maximum potential to encode 8 vowels; so a number of specifications are technically predictable given other features.



Contrast via feature ordering

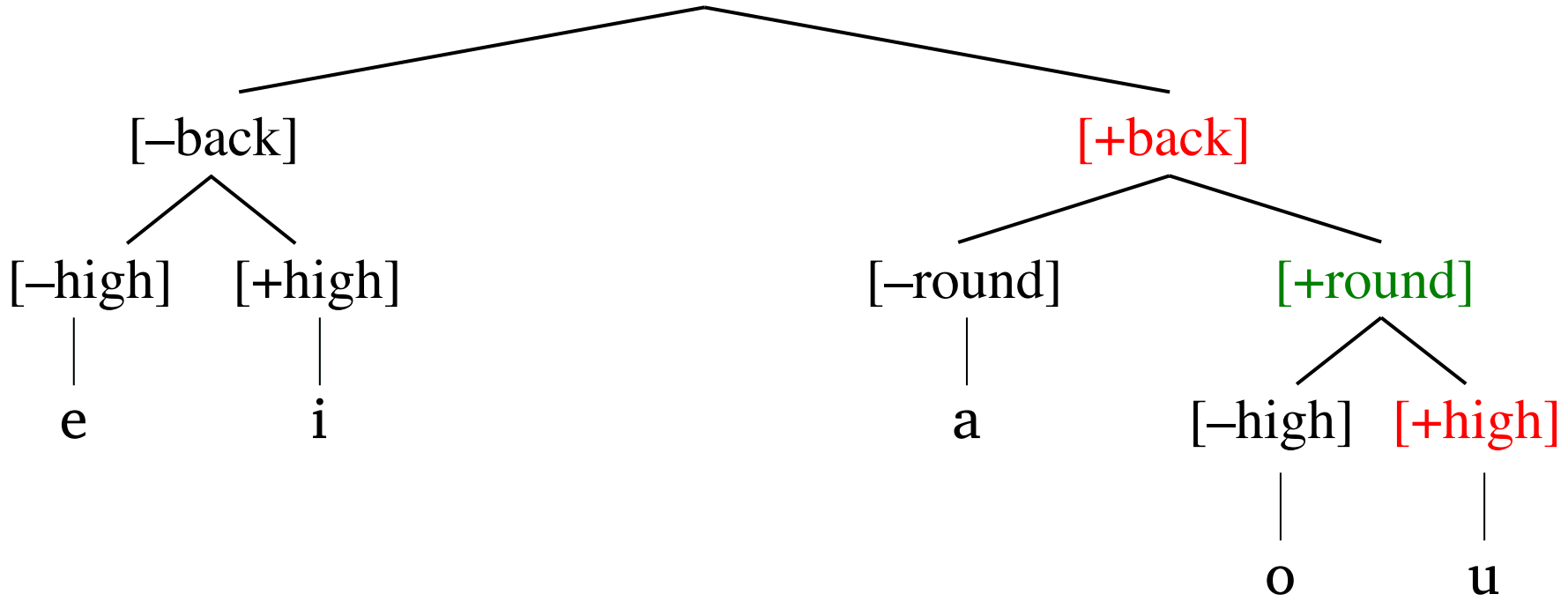
For example, if a segment is [+round], it must be [+back]. The latter specification is thus predictable on /o/ and /u/.



Contrast via feature ordering

For example, if a segment is [+round], it must be [+back]. The latter specification is thus predictable on /o/ and /u/.

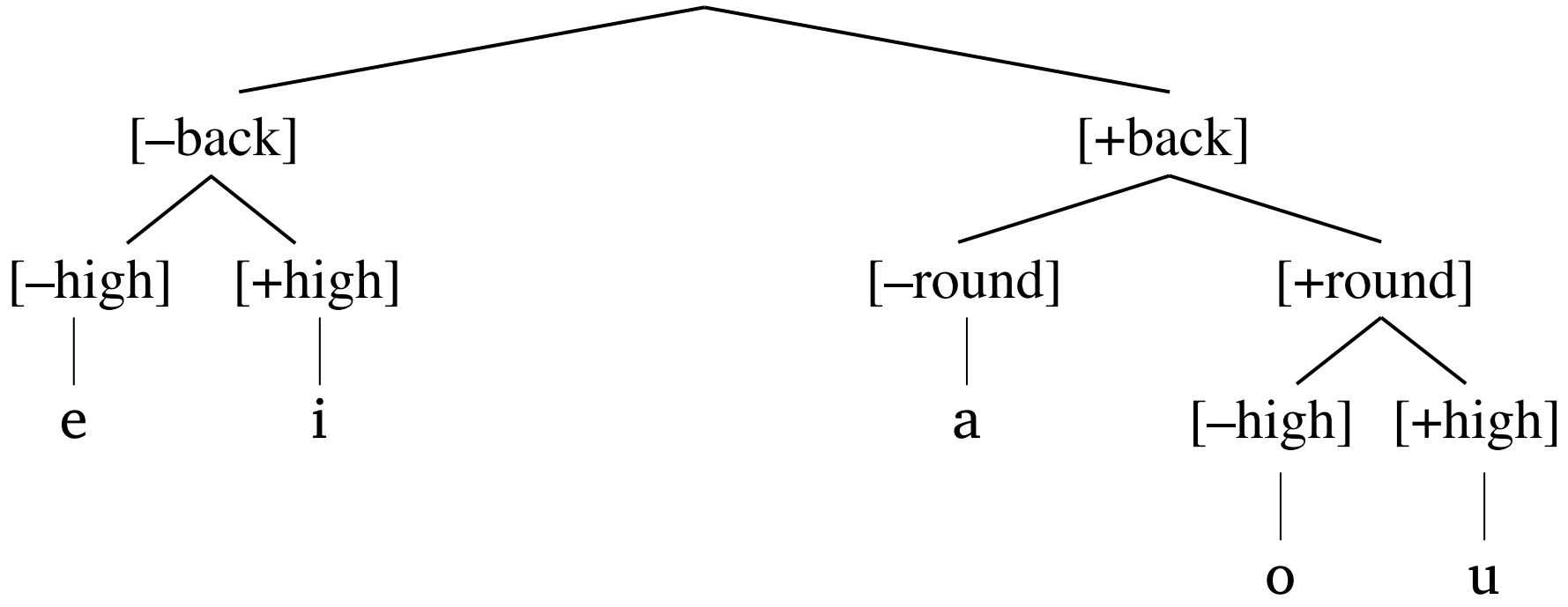
It is also the case that /u/ is predictably [round], given that it is [+back] and [+high].



Contrast via feature ordering

Therefore, it is not the case that every feature deemed contrastive by the SDA is unpredictable from other features.

This property of top-down assignment of contrasts distinguishes it from other approaches (like minimal pairs).

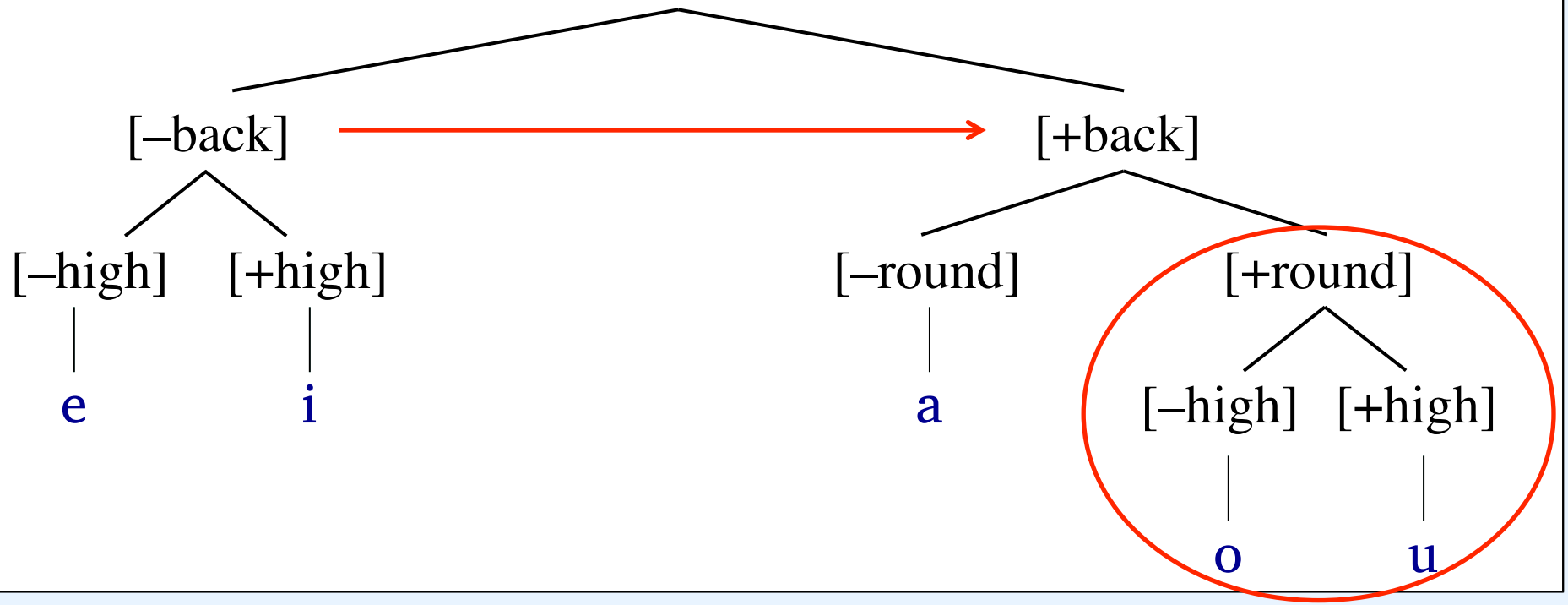


Ways of creating ‘deep allophones’ in the contrastive phonology

‘Deep allophones’

There are various ways of creating allophones using contrastive features, consistent with the Contrastivist Hypothesis.

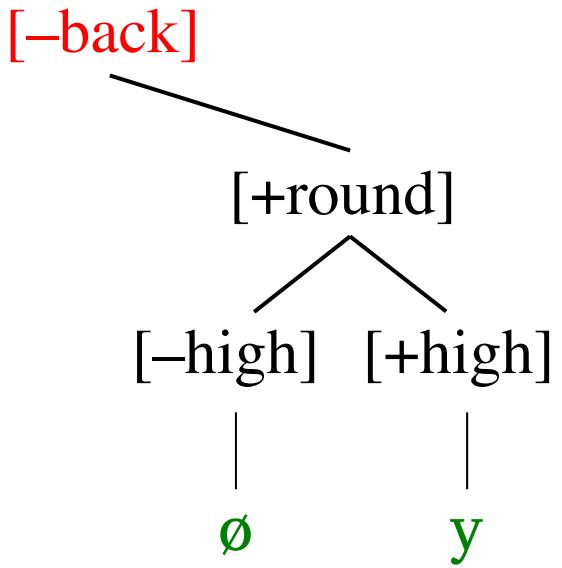
Suppose a rule spread [–back] from /i/ or /e/ to the [+round] vowels /o/ and /u/ in the following inventory.



‘Deep allophones’

The result, if the other features remain unchanged, would be allophones /ø/ and /y/.

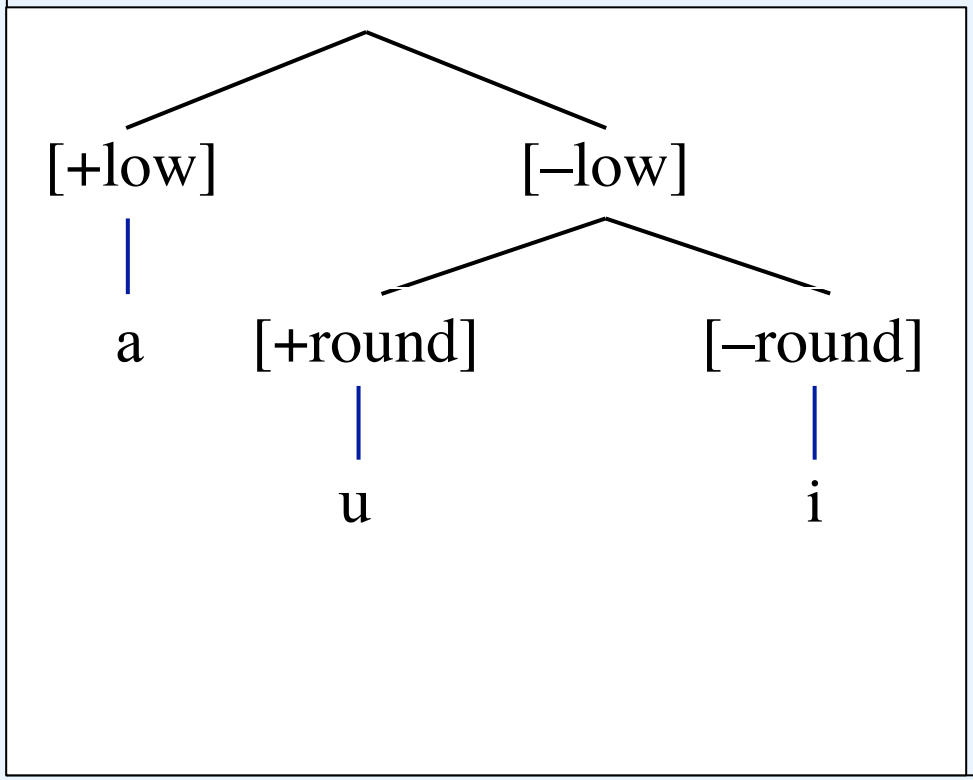
The phonology may or may not allow rules to apply in this kind of ‘non-structure-preserving’ mode.



‘Deep allophones’

Another way to create allophones with contrastive features is if a feature that is contrastive on a consonant spreads to a vowel.

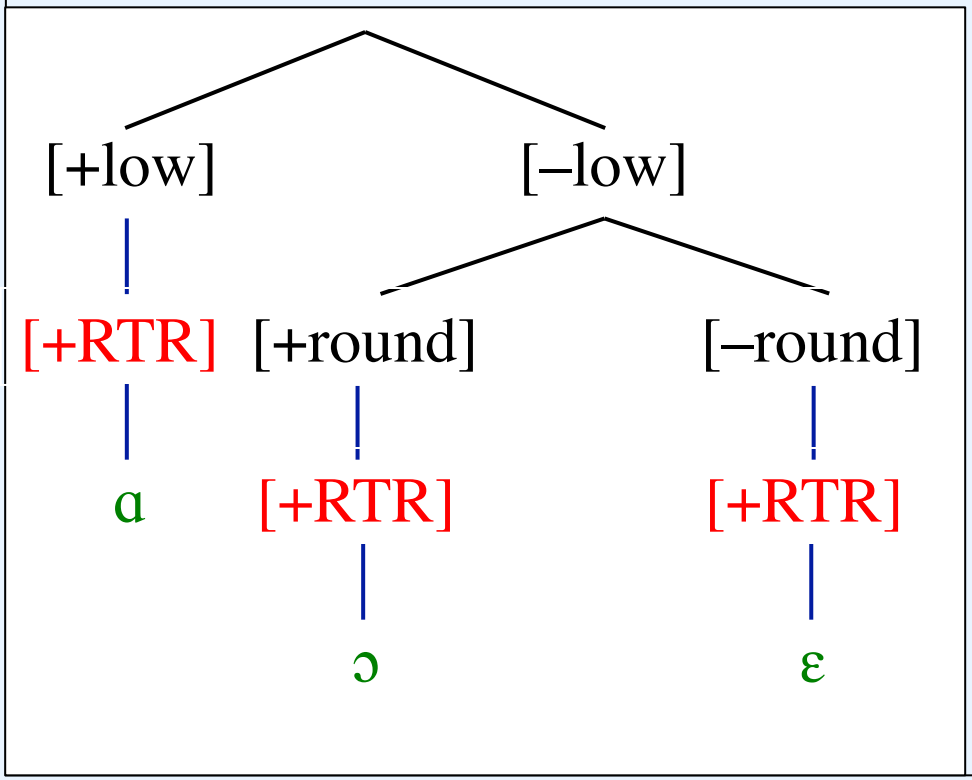
For example, [+RTR] might spread from a uvular consonant to some or all of the vowels in the 3-vowel system below.



‘Deep allophones’

Another way to create allophones with contrastive features is if a feature that is contrastive on a consonant spreads to a vowel.

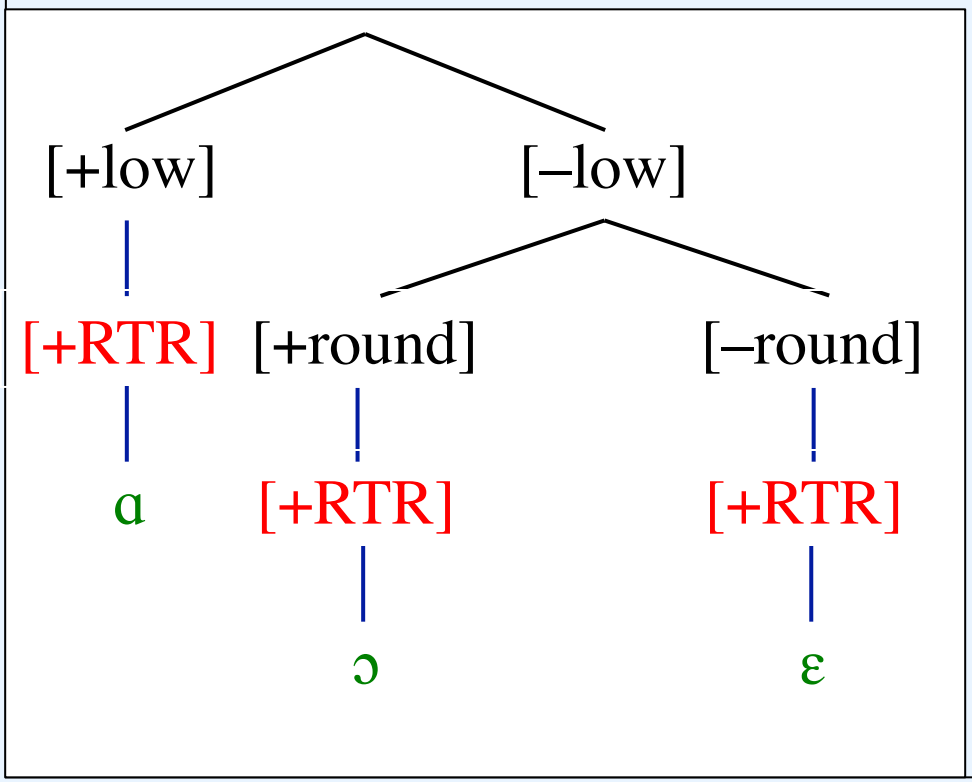
For example, [+RTR] might spread from a uvular consonant to some or all of the vowels in the 3-vowel system below.



The result is a set of allophones that could arise in the lexical phonology, though their distribution is entirely predictable.

‘Deep allophones’

Moulton (2003) calls such allophones ‘deep allophones’, and this term seems to me to be preferable to ‘quasi-phonemes’, which can be misleading.



Old English fricatives

Old English fricatives (Moulton 2003)

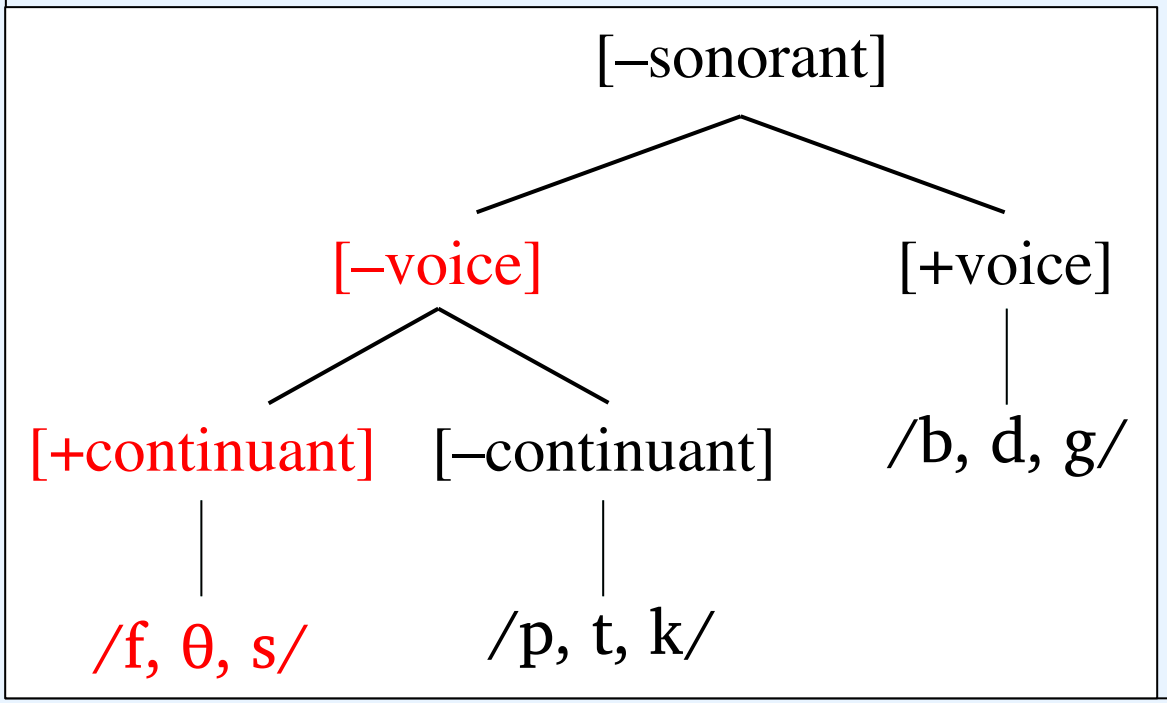
It happens that Moulton (2003) was referring specifically to Old English voiced fricatives as being 'deep allophones'.

As this is the subject of the next talk, I would just briefly like to mention Moulton's (2003: 157) remarks in this connection:

'Specifically, voicing assimilation processes offer evidence that the voiceless fricatives are underlyingly specified for voicelessness—contrary to all expectations given the predictability of this feature.'

Old English fricatives (Moulton 2003)

'We will see that [v ð z] have a curious status in the voicing contrasts of OE: they are neither phonemes nor canonical surface variants, but, for lack of a better description, they are "deep" allophones.'

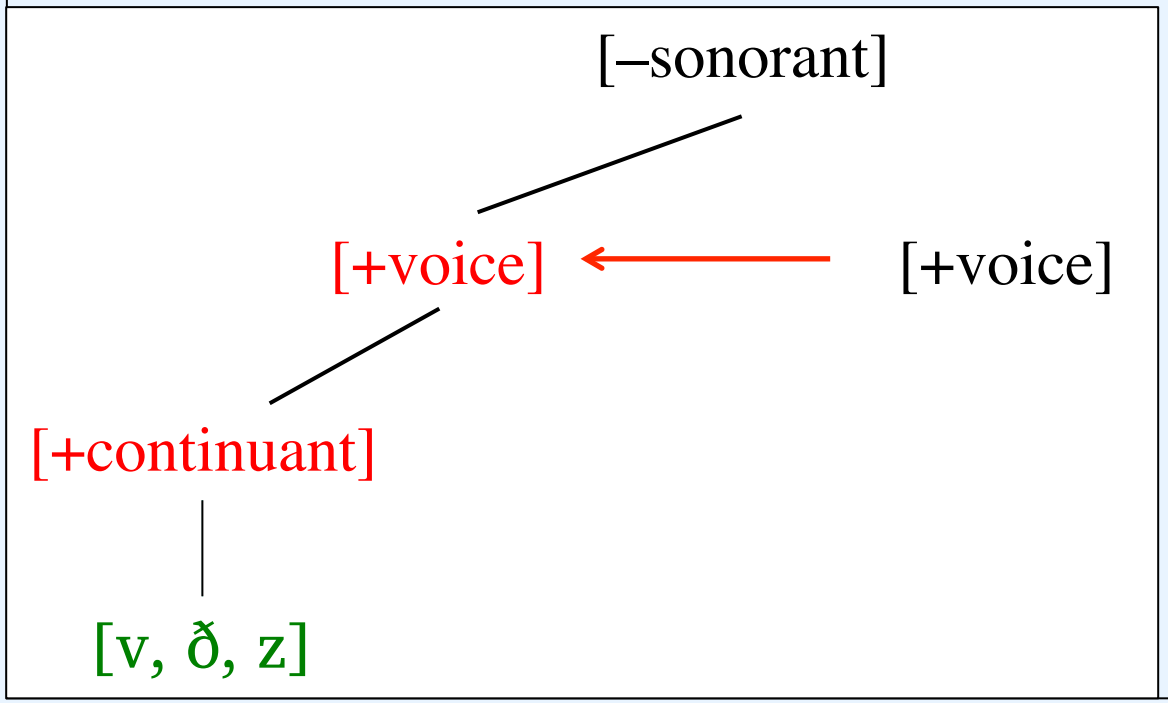


Moulton posits this feature hierarchy: underlying fricatives are contrastively voiceless.

Old English fricatives (Moulton 2003)

Spreading contrastive [+voice] to fricatives thus results in voiced fricatives specified [+voice, +continuant].

These allophones can arise in the lexical phonology, which accounts for their apparently paradoxical behaviour.



The problem of the phonologization of *i*-umlaut

i-umlaut

Kiparsky (to appear) calls attention to an apparent paradox at the heart of the familiar account of the phonologization of front rounded allophones created by *i*-umlaut in Old High German.

As first proposed by V. Kiparsky (1932) and Twaddell (1938), front rounded vowels [y] and [ø] first arose as positional allophones of stressed /u/ and /o/, respectively, when these vowels were followed by /i/ or /j/.

I will illustrate with examples from Old English, in which similar facts obtained.

i-umlaut

For example, *u(:) becomes *y(:)*, as in ‘evil’, and *o(:) becomes *ø(:)*, as in ‘feet’.

Already in early Old English, the /i/ trigger of *i*-umlaut was either lowered after a light syllable or deleted after a heavy syllable, making *i*-umlaut opaque on the surface.

In many cases, the *i*-umlaut trigger became unrecoverable to learners.

Gloss	‘evil’	‘foot N.P.’
Pre-OE	*ufil	*fo:t + i
i-umlaut	yfil	fø:t + i
i-lowering/deletion	yfel	fø:t Ø

i-umlaut Becomes Opaque

According to standard accounts, this led to the phonologization of [y(:)] and [ø(:)] as new phonemes; an example is 'evil', whose underlying form is restructured from /ufil/ to /yfel/.

I assume that *i*-umlaut persisted as a synchronic rule in forms with alternations, like *foːt* ~ *føːt* 'foot ~ feet'.

Gloss	'evil'	'foot N.P.'
Underlying	/yfel/	/foːt + i/
i-umlaut	—	føːt + i
i-lowering/deletion	—	føːt Ø

Phonologization Paradox

Kiparsky (to appear) points out a problem with this scenario: as long as *i*-umlaut remains postlexical, there is no way it can survive the loss of its triggering contexts.

Before loss of *i*-umlaut trigger

Lexical Phonology

Underlying /ufil/

Postlexical Phonology

i-umlaut yfil

i-lowering yfel

Phonologization Paradox

Thus, in the example below, once /ufil/ is restructured to /ufel/, there is no reason for *i*-umlaut to continue to apply; the expectation is that [yfel] would revert to [ufel].

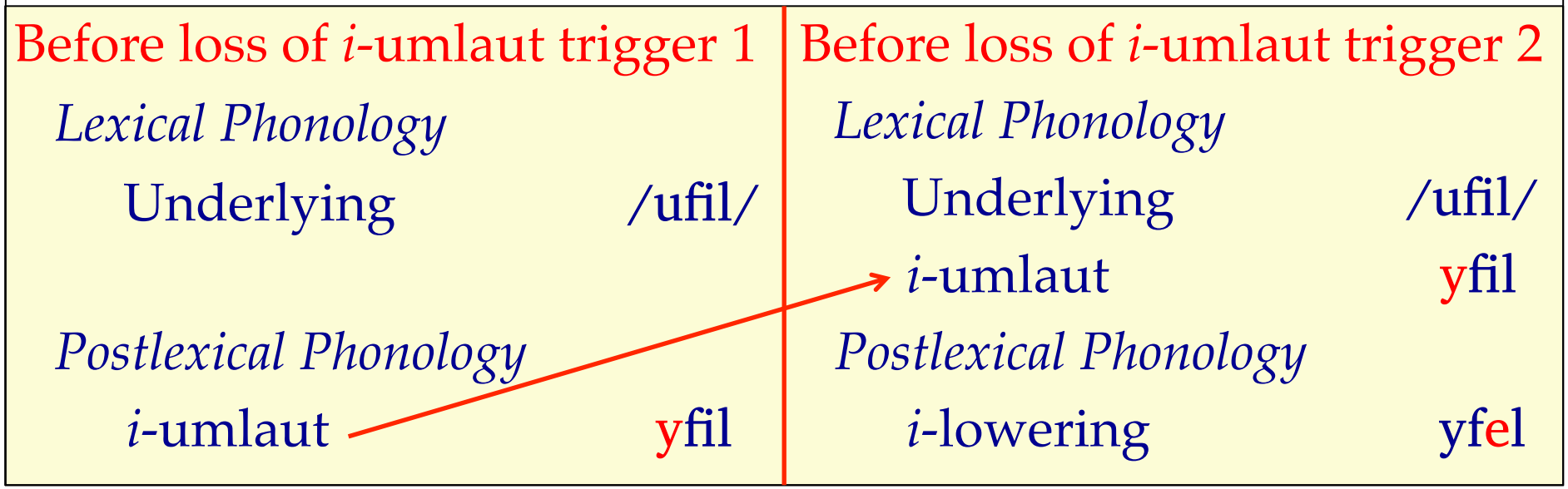
Kiparsky (to appear) points out that this kind of reversion is a typical occurrence: the various vowel-influenced allophones of English /k/ do not persist after a change in their contexts.

Before loss of *i*-umlaut trigger		After loss of *i*-umlaut trigger	
Lexical Phonology		*Lexical Phonology*	
Underlying	/ufil/	Underlying	/ufel/
Postlexical Phonology		*Postlexical Phonology*	
i-umlaut	yfil	*i*-umlaut	—
i-lowering	yfel		*ufel

Phonologization Paradox

The only way for *i*-umlaut to persist is if it enters the lexical phonology *before* the [y(:)] and [ø(:)] allophones become contrastive, that is, while they are still predictable allophones of [u(:)] and [o(:)], respectively.

Then, the subsequent loss of the triggering *i* or *j* will not affect the results of *i*-umlaut, which can then be lexicalized.



Salience and Contrast

Why does *i*-umlaut enter the lexical phonology while its products are not contrastive?

Kiparsky (to appear) suggests that it is because the new front rounded allophones are more perceptually *salient* than their triggers (Jakobson, Fant & Halle 1952).

That salient phones can become quasi-phonemic without being distinctive "severs the structuralist link between contrastiveness (unpredictable distribution), a structural notion, and distinctiveness, a perceptual notion."

- Phonemes are contrastive and distinctive
- Allophones are non-contrastive and non-distinctive
- Quasi-phonemes are non-contrastive but distinctive — that is, they are predictable but perceptually salient

Undermining the Phoneme?

"The upshot is that while delinking contrastiveness and distinctiveness in a sense preserves the phoneme as a theoretical construct, it does so only by negating the founding intuition behind it."

The approach to contrast presented earlier, together with the notion that contrast shift is a type of grammar change, allows us to keep the more appealing aspects of Kiparsky's analysis, while still maintaining the Contrastivist Hypothesis and the phoneme as a contrastive unit.

Analysis of the West Germanic and early Old English vowel systems

A West Germanic Feature Hierarchy

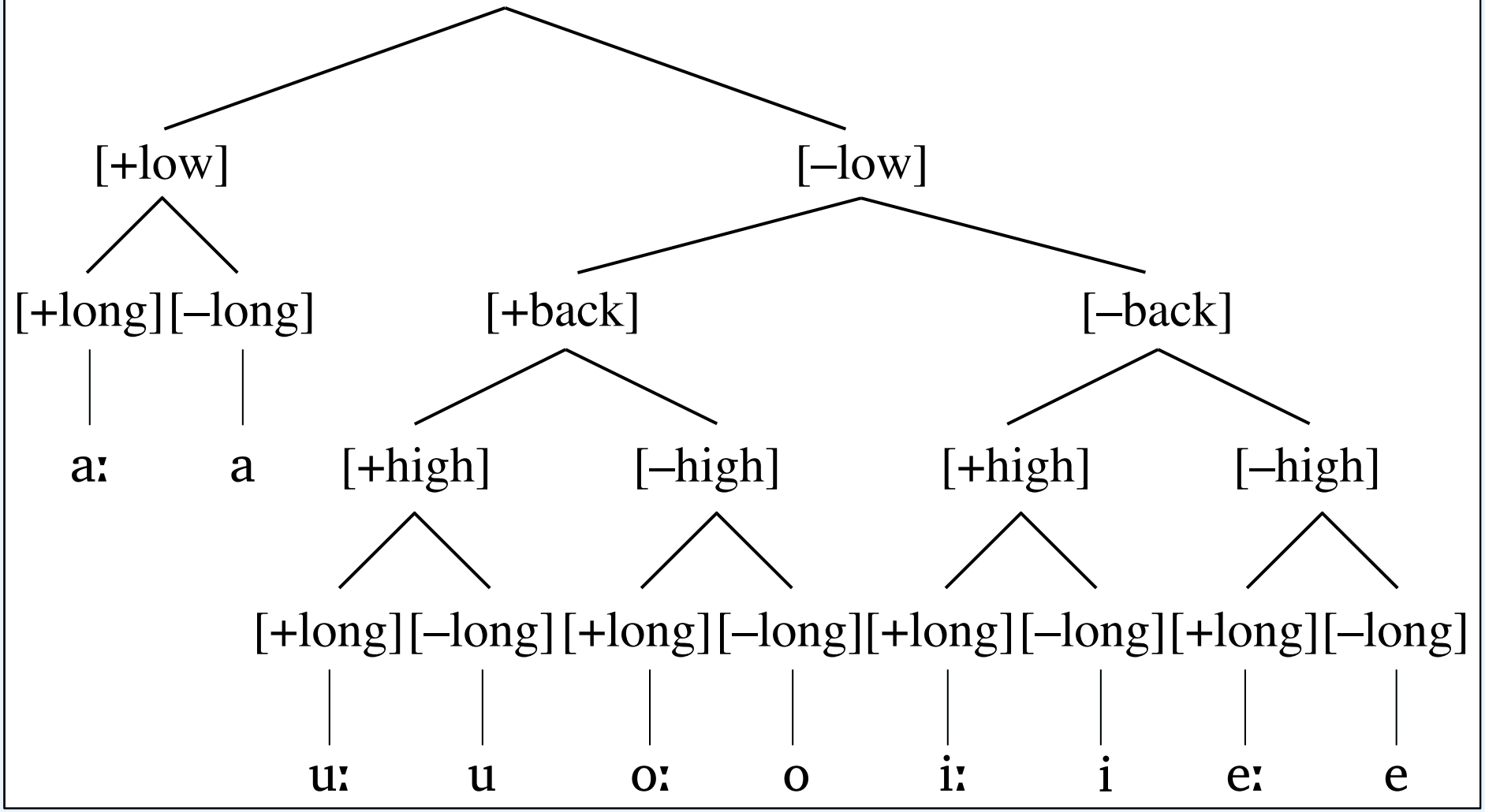
Building on ideas by Hogg (1992) and an analysis by Purnell & Raimy (to appear), I have proposed the feature hierarchy below for the West Germanic vowel system prior to its branching into Old English and Old High German.

West Germanic

Vowel system	Feature hierarchy
/i(ː)/ /u(ː)/ /e(ː)/ /o(ː)/ /a(ː)/	[low] [back] [high] [long]

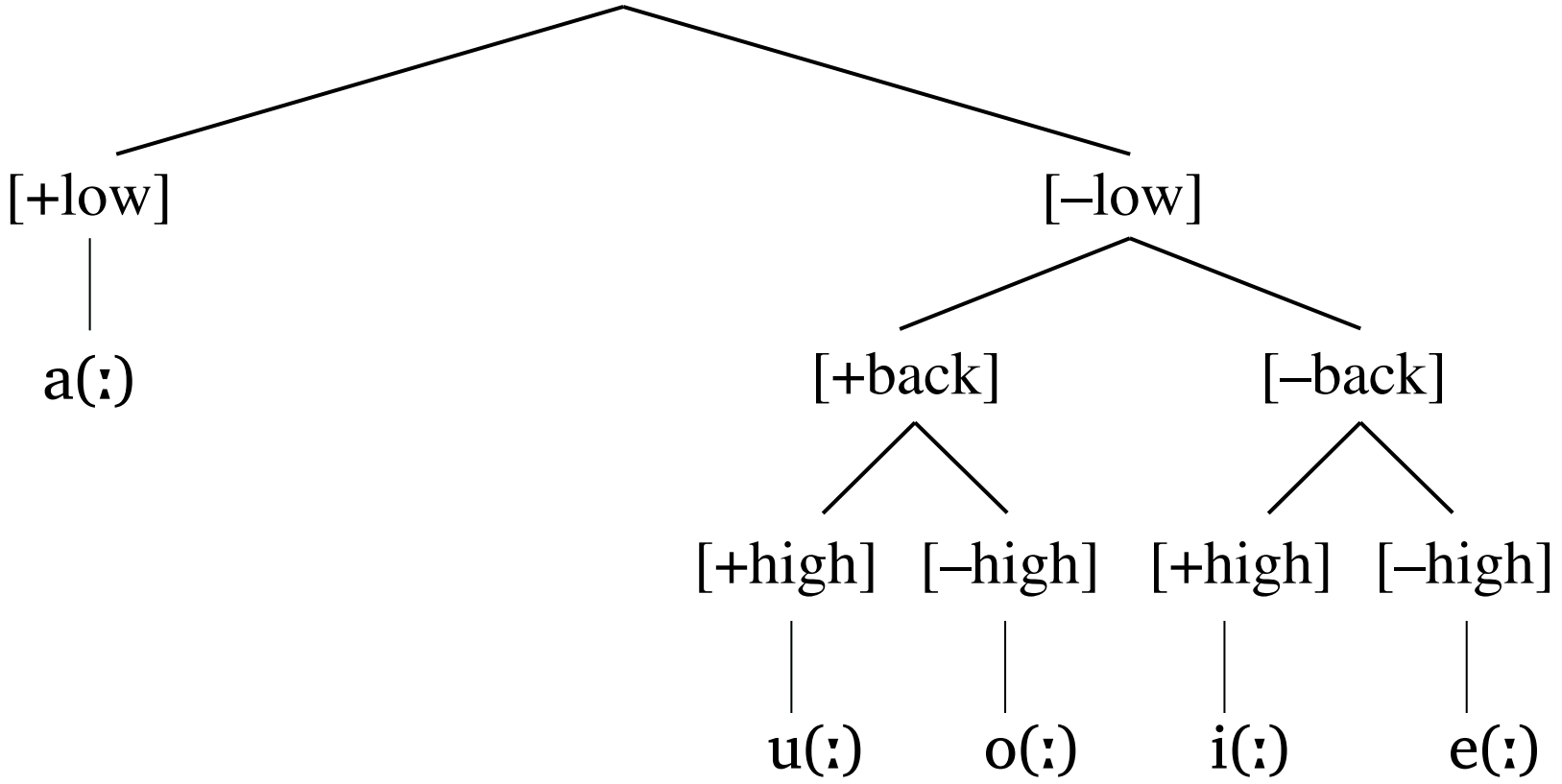
A West Germanic Feature Hierarchy

[low] > [back] > [high] > [long]



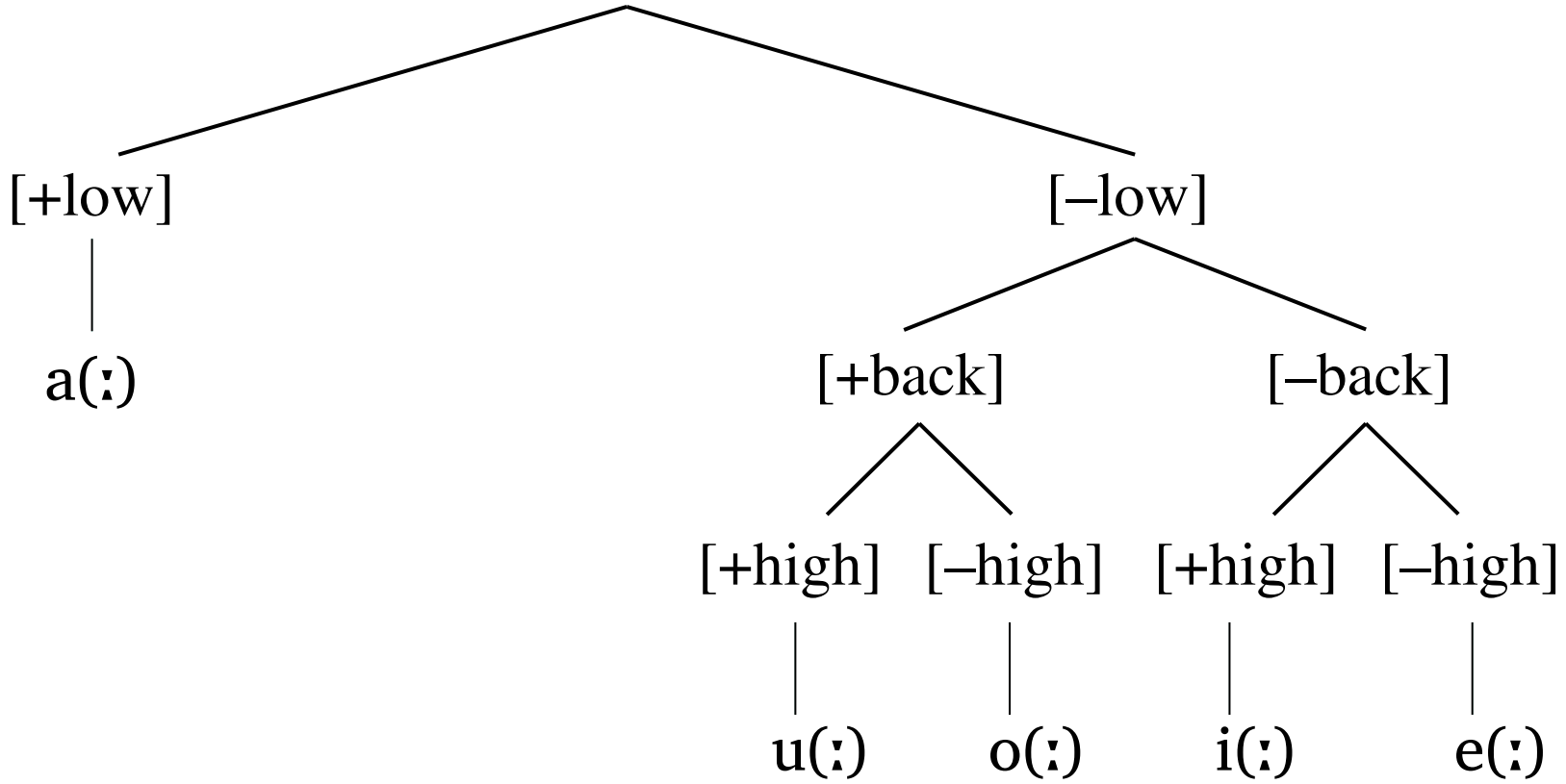
A West Germanic Feature Hierarchy

To simplify the diagram, I will omit the length contrast for now.



A West Germanic Feature Hierarchy

Note that /a(ː)/ has no specification for [back], and [round] does not appear at all as a contrastive feature (cf. Lass 1994).



A West Germanic Feature Hierarchy

These contrastive specifications account for phonological generalizations about West Germanic.

These properties of the vowel system would be missed by a theory that requires every phoneme to be specified for every distinctive feature that might apply.

Vowel system		Feature hierarchy
/i(ː)/	/u(ː)/	[low]
/e(ː)/	/o(ː)/	[back]
/a(ː)/		[high]
		[long]

West Germanic to Old English

As West Germanic evolved into Old English, the grammar changed not just in the rules and underlying representations, but also in the system of contrastive specifications.

Even phonemes that do not appear to change overtly may come to have different contrastive features.

Vowel system

/i(:)/	/u(:)/
/e(:)/	/o(:)/
/a(:)/	

Feature hierarchy

[low]

[back]

[high]

[long]

Old English Vowel System

In Old English a new contrast developed between front /æ(ː)/ and back /ɑ(ː)/.

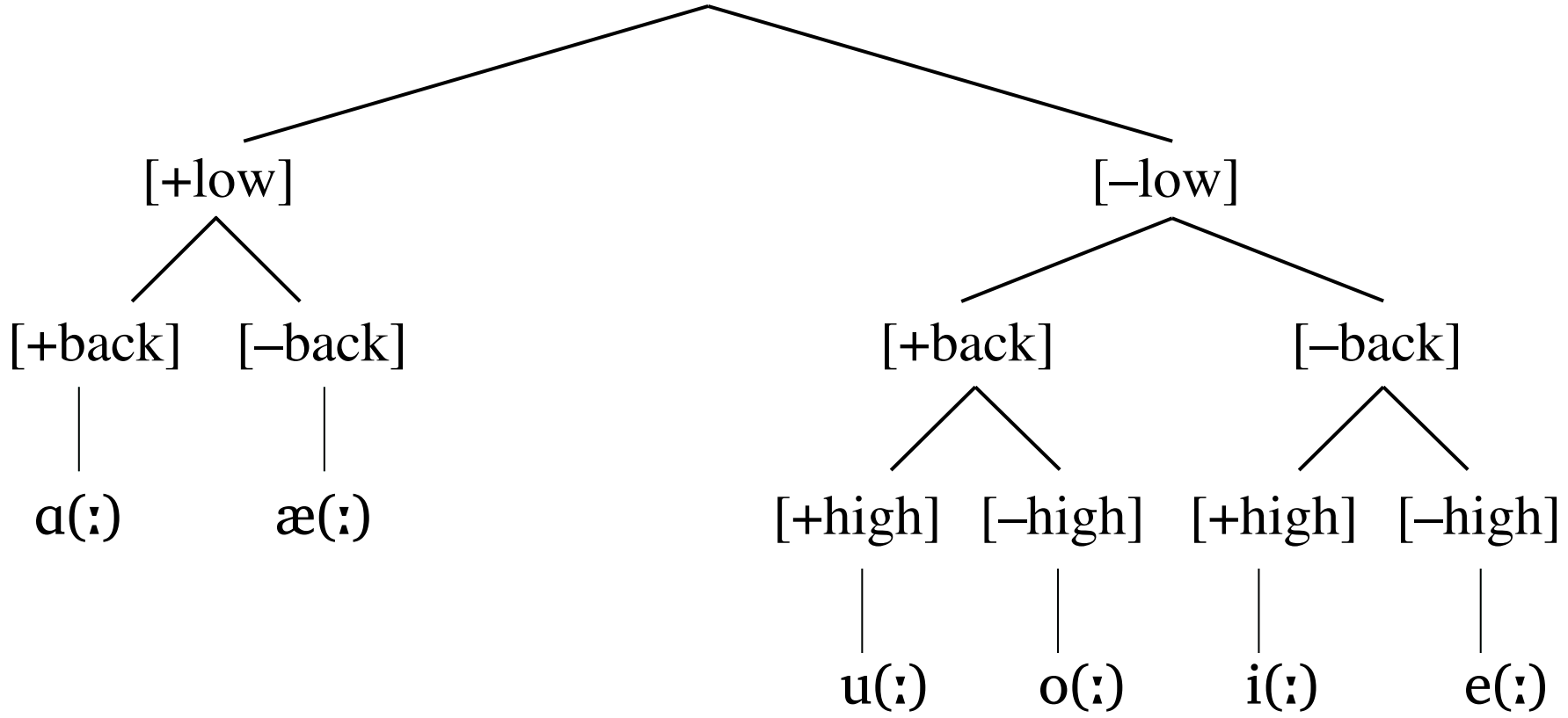
The feature hierarchy proposed for West Germanic can accommodate this expansion of the vowel system by simply extending the [back] contrast to the [+low] branch.

Old English

Vowel system		Feature hierarchy
/i(ː)/	/u(ː)/	[low]
/e(ː)/	/o(ː)/	[back]
		[high]
/æ(ː)/	/ɑ(ː)/	[long]

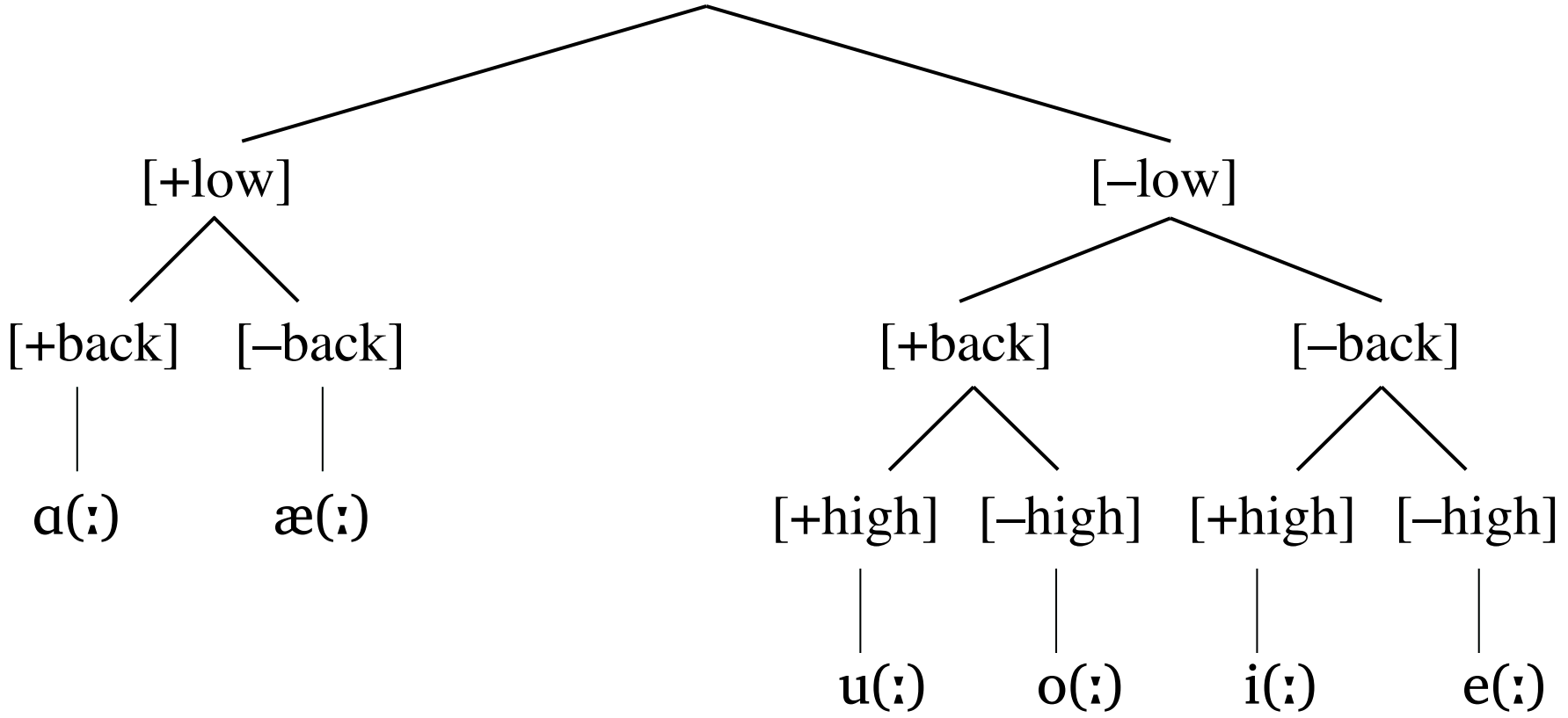
Early Old English Feature Hierarchy

Extending the [back] contrast to the [+low] vowels yields:



Early Old English Feature Hierarchy

This hierarchy, however, cannot account for *i*-umlaut; at some point there must have occurred a contrast shift.



Contrast Shift: A New Perspective on the Phonologization of *i*-umlaut

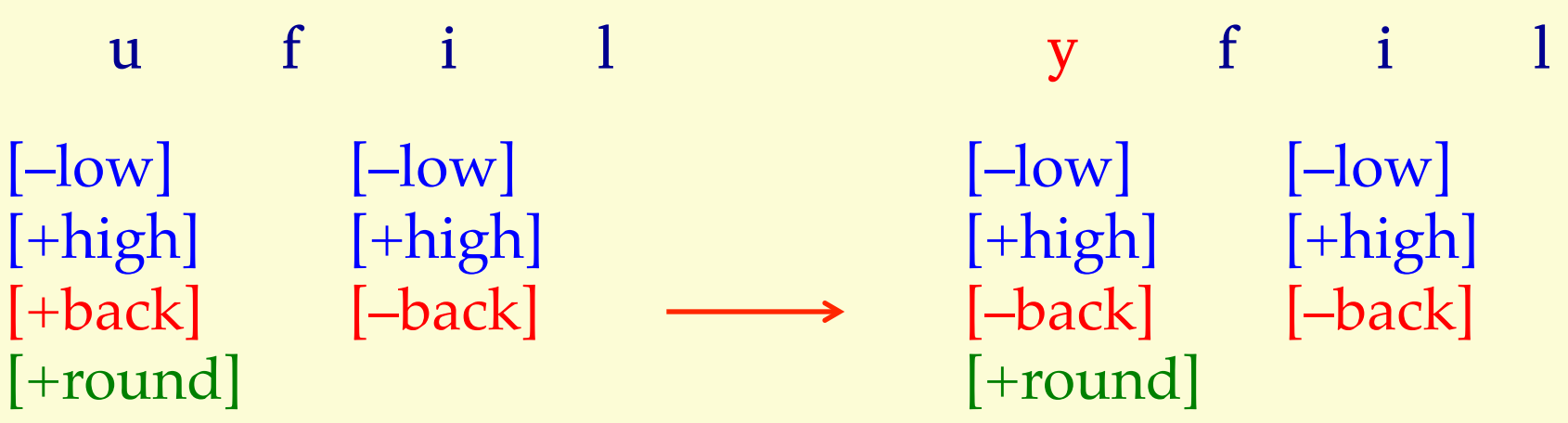
The notion that contrast shift is a type of grammar change has proved to be fruitful in the study of a variety of languages.

Examples include: Zhang (1996) and Dresher and Zhang (2005) on Manchu; Barrie (2003) on Cantonese; Rohany Rahbar (2008) on Persian; Dresher (2009: 215–225) on East Slavic; Compton & Dresher (2011) on Inuit; Gardner (2012), Roeder & Gardner (2012), and Purnell & Raimy (2013) on North American English vowel shifts; and large-scale studies by Harvey (2012) on Ob-Ugric (Khanty and Mansi), Ko (2010, 2011, 2012) on Korean, Mongolic, and Tungusic, and Oxford (2012a, b) on Algonquian.

i-umlaut

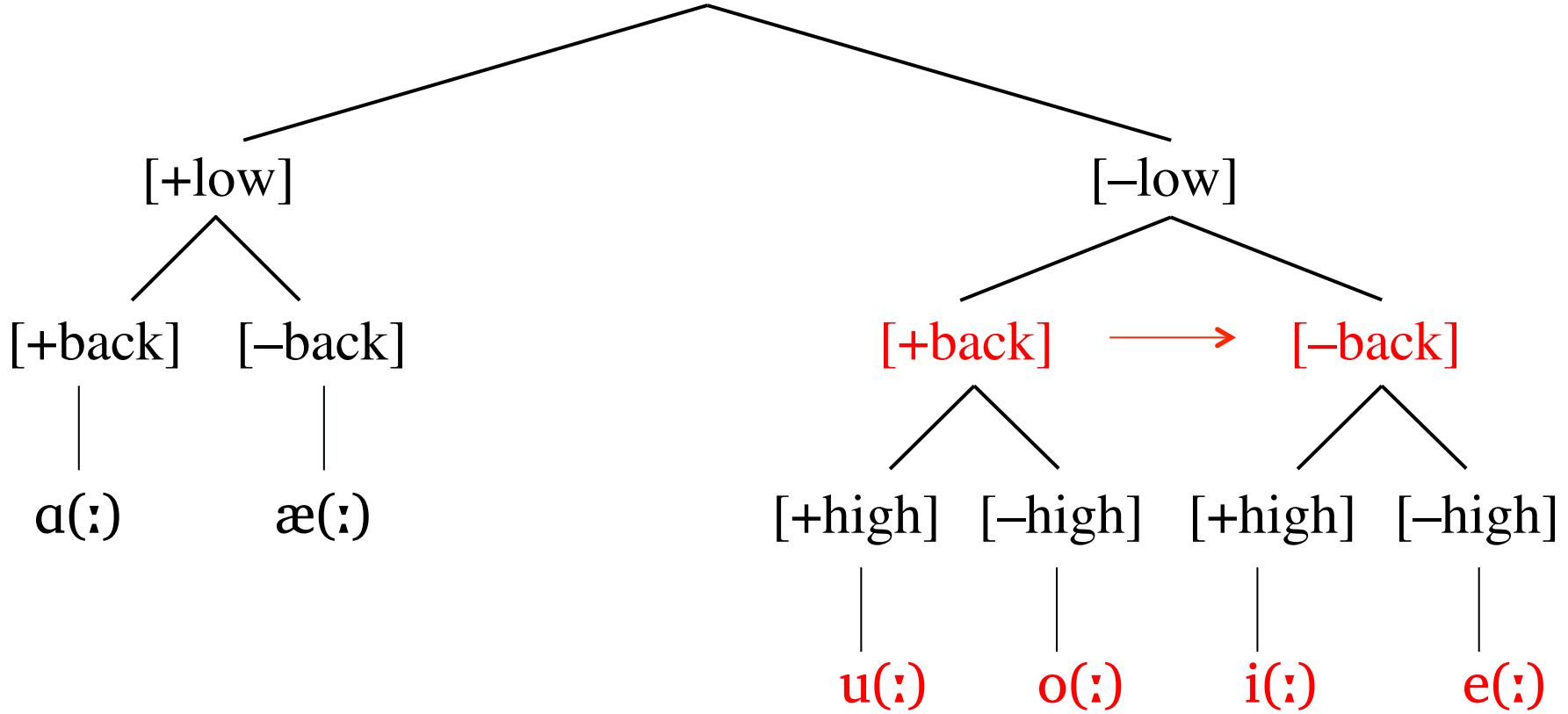
Notice that *i*-umlaut results in front round vowels: in the example below, the front feature comes from the /i/, and the round feature must come from the /u/.

We have assumed, however, that [round] is not a contrastive feature of the earliest stage of Old English. Recall:



Early Old English Feature Hierarchy

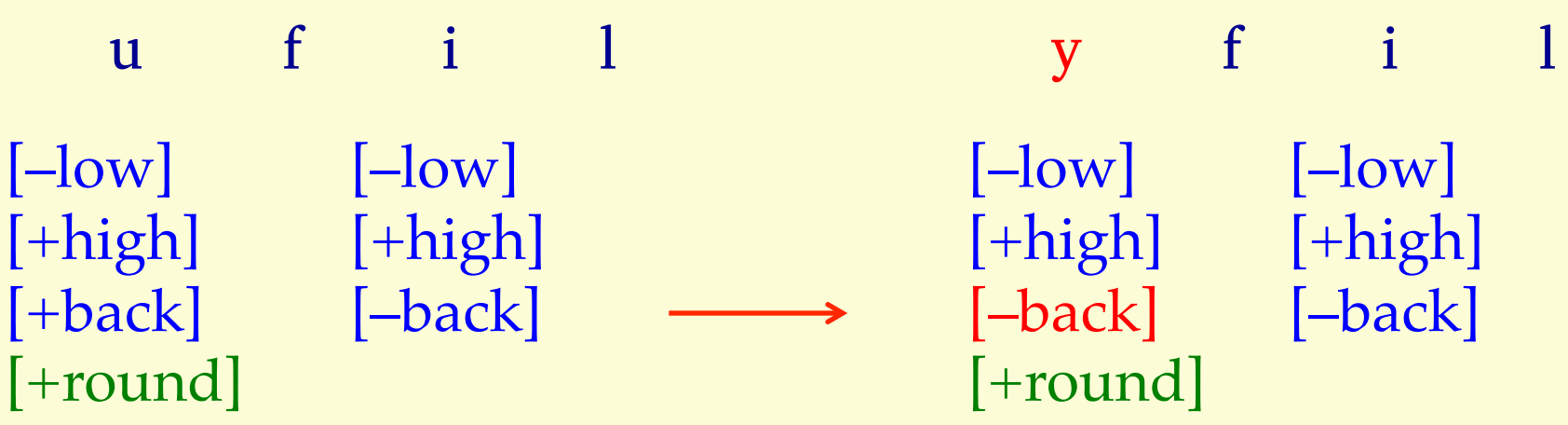
Changing non-low [+back] to [–back] in this structure results in *[i(:)] and *[e(:)], not [y(:)] and [ø(:)]. To get front rounded vowels, the non-low [+back] vowels must also be [+round].



i-umlaut: Post-enhancement

Therefore, following many commentators, beginning with V. Kiparsky (1932) and Twaddell (1938), I assume that *i*-umlaut began as a late phonetic, that is, postlexical, rule.

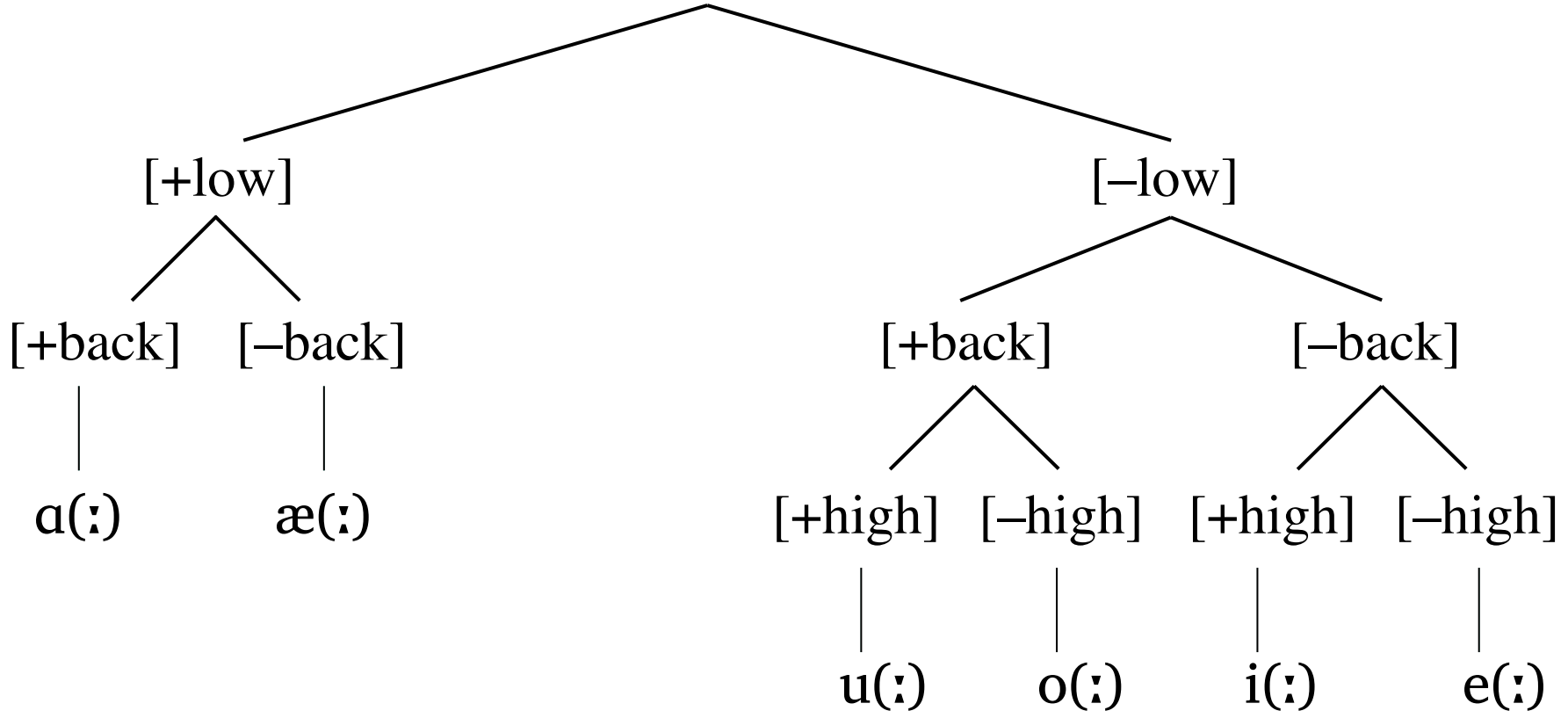
In other words, it applies after the [–low, +back] features of /u/ have been enhanced by [+round] (Stevens, Keyser & Kawasaki 1986; Hall 2011).



Early Old English Feature Hierarchy 1

[low] > [back] > [high] > [long]

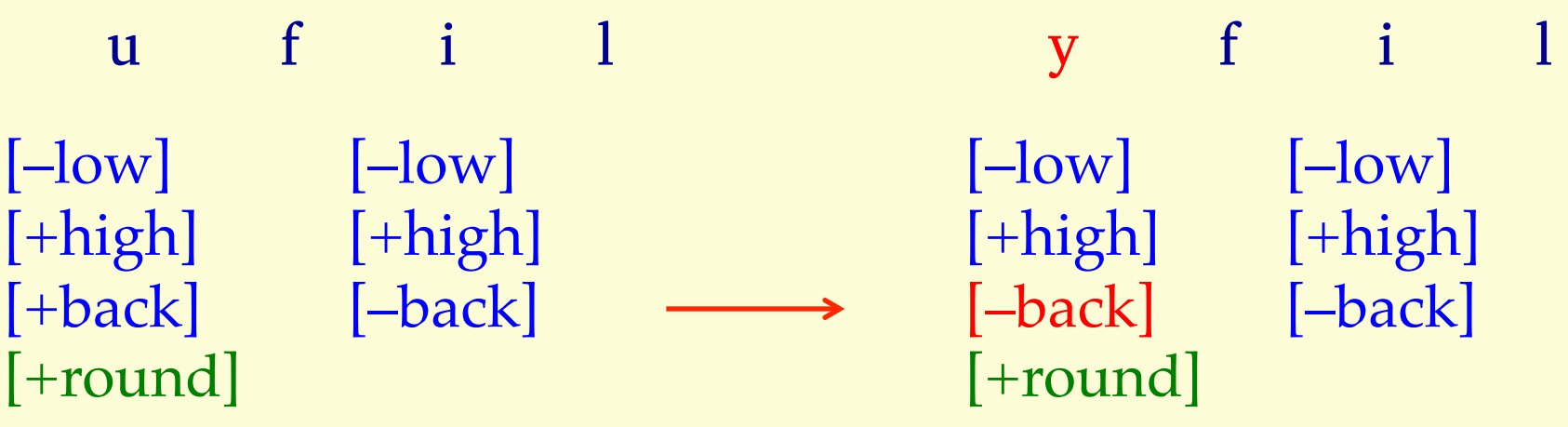
Recall the hierarchy of West Germanic and early Old English, in which [round] does not appear.



Salience and Contrast Shift

Let us consider again the early stage of *i*-umlaut as a postlexical and post-enhancement rule, and ask what effect this might have on learners.

Adapting Kiparsky's formulation, I propose that the perceptual salience of the front rounded allophones could have led learners to hypothesize that [round] is a contrastive feature.



Contrast Shift in Old English Vowels

Indeed, another feature hierarchy can be constructed that includes [round] as a contrastive feature.

This hierarchy requires demoting [low] to allow [round] to be contrastive over the non-low back vowels, as in the next tree:

Earlier hierarchy

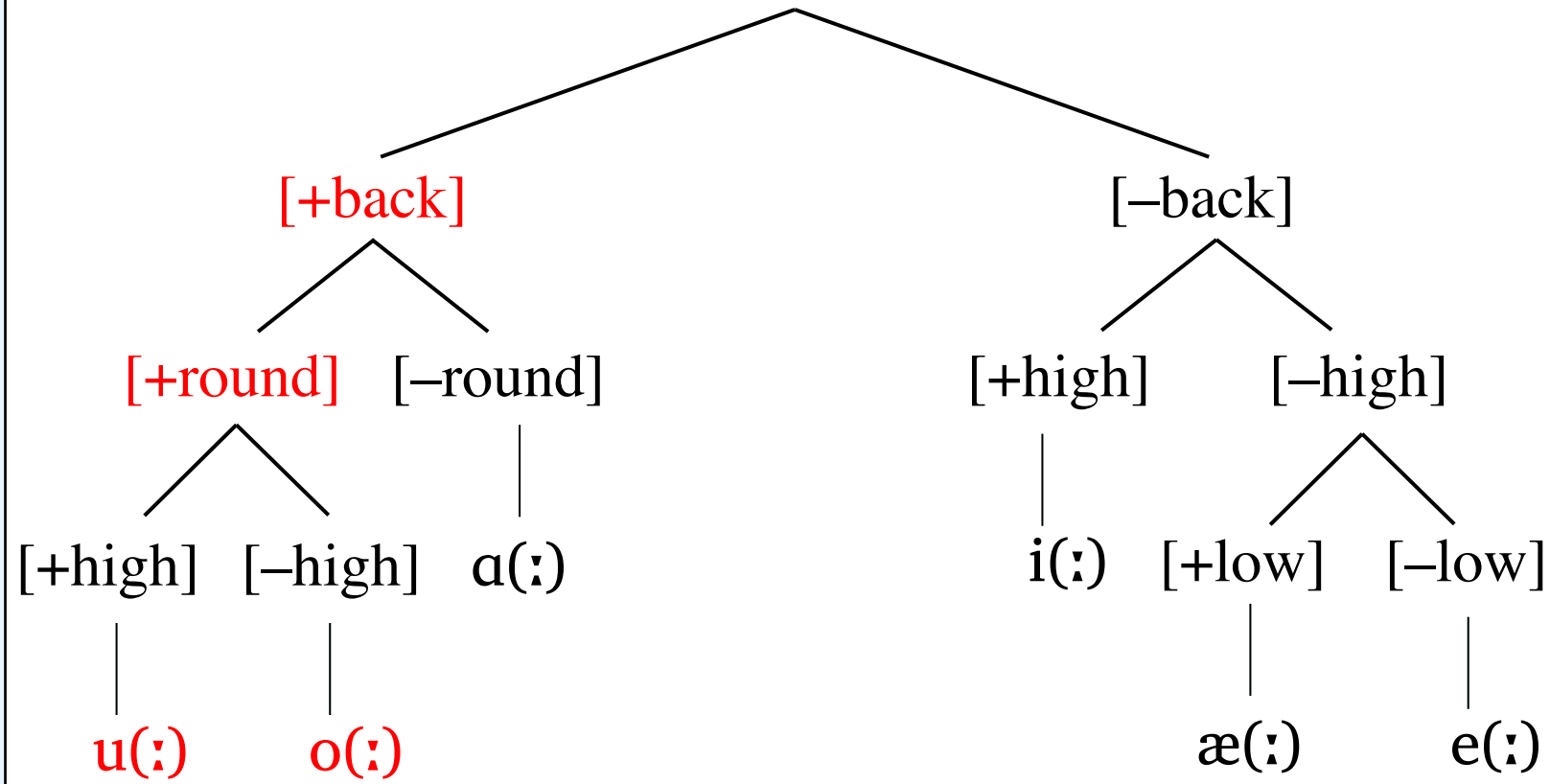
/i(:)/	/u(:)/	[low]
/e(:)/	/o(:)/	[back]
/æ(:)/	/ɑ(:)/	[high]
		[long]

Later hierarchy

/i(:)/	/u(:)/	[back]
/e(:)/	/o(:)/	[round]
/æ(:)/	/ɑ(:)/	[high]
		[low]
		[long]

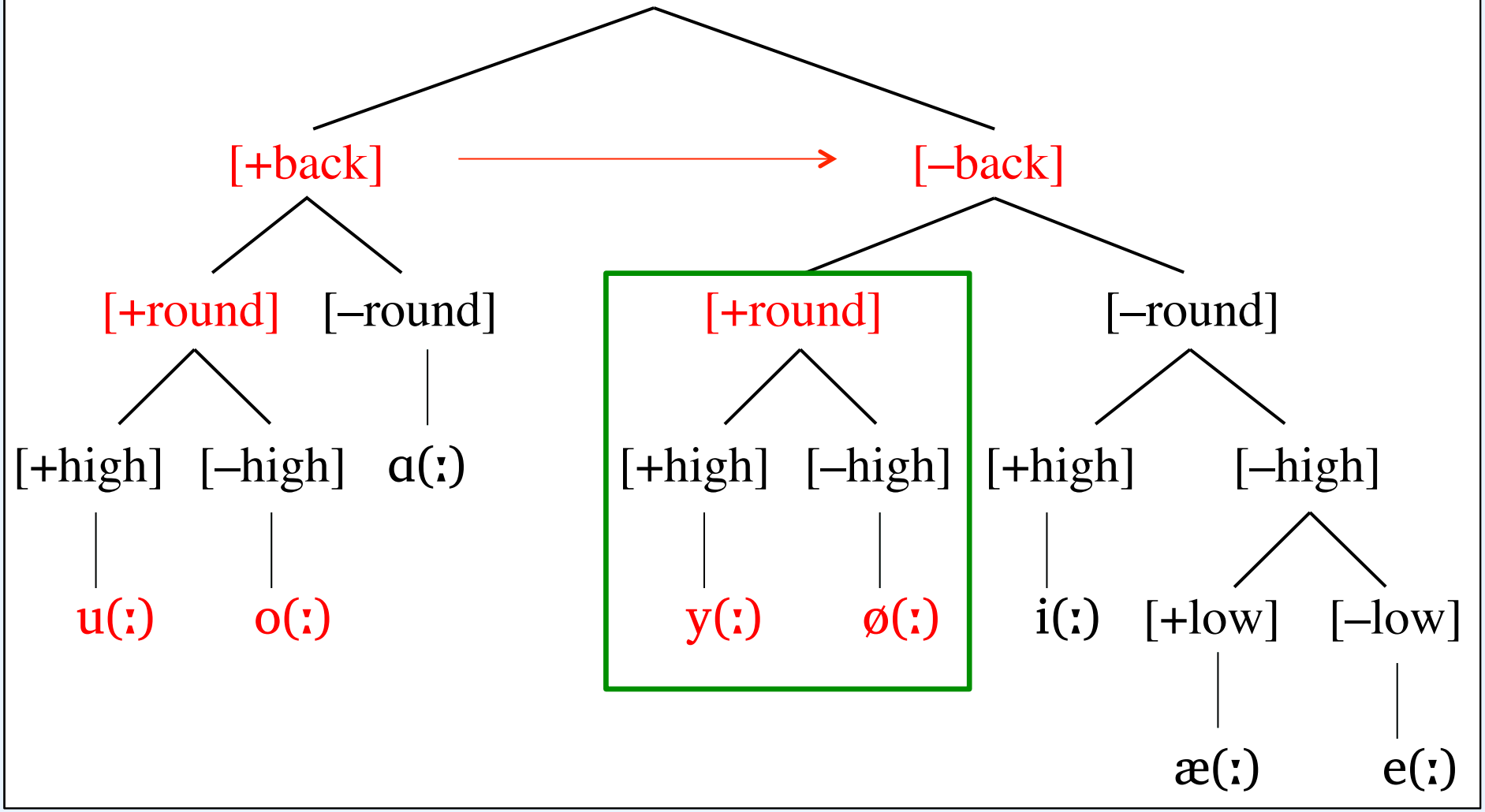
Old English Feature Hierarchy 2

[back] > [round] > [high] > [low] > [long]



Old English Feature Hierarchy 2

Now changing the [+back, +round] vowels to [–back] results in new front rounded vowels, which begin as allophones.



From allophone to phoneme

To sum up, [y(:)] and [ø(:)] begin their careers in English as late, post-enhancement phonetic positional allophones.

The salience of these new sounds, combined with the increasing weakness of their triggering contexts, could have lead learners to reanalyze [round] as a contrastive feature.

At this point *i*-umlaut could still have been a postlexical rule, but the contrastive status of [round] opened the door for the rule to be promoted to the lexical (contrastive) phonology by a later generation.

From phoneme to extinction

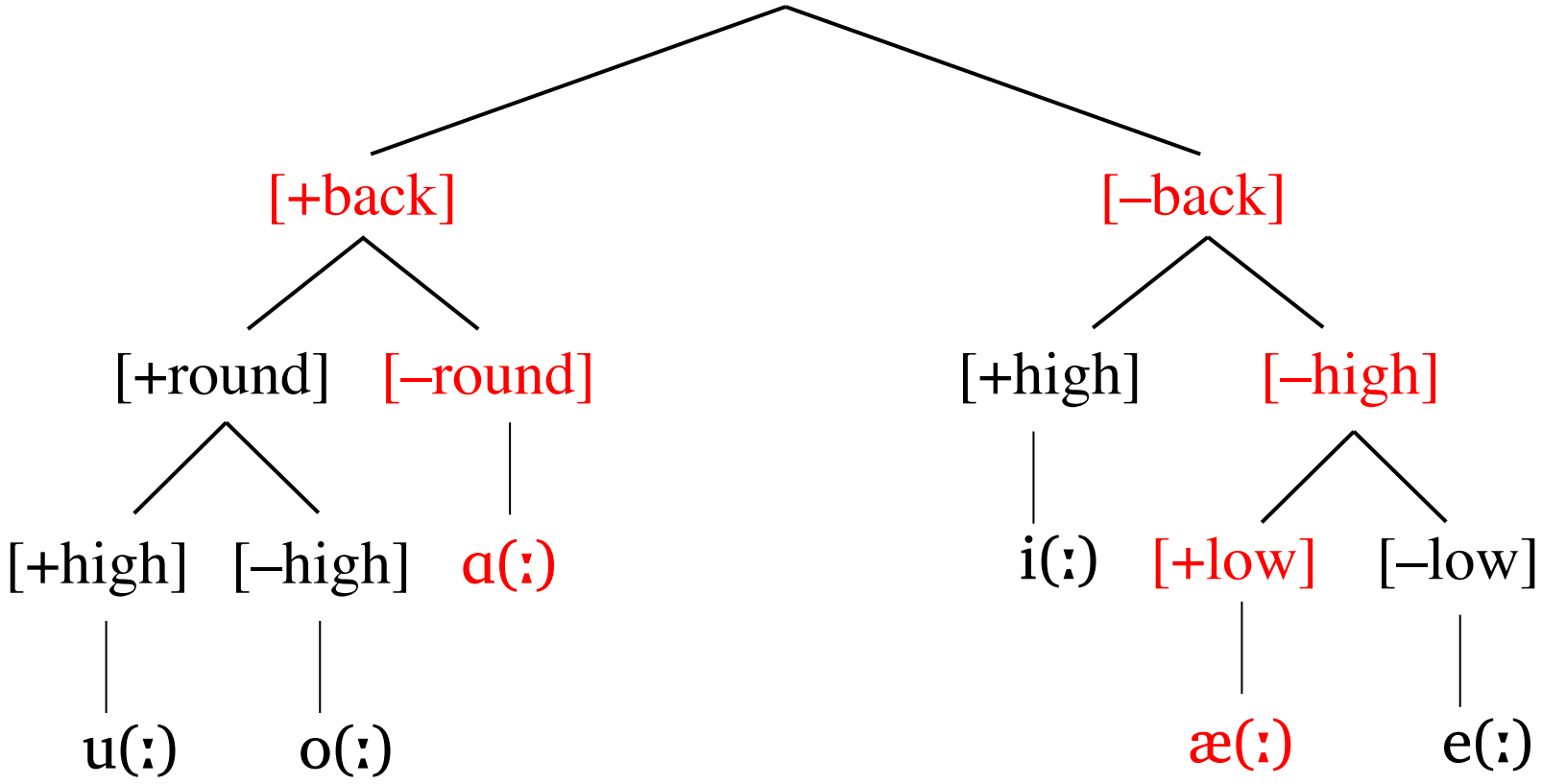
Once in the lexical phonology, the front round allophones can survive the loss of their triggering contexts by being reanalyzed as underlying phonemes.

Some generations later, however, these vowels were unrounded again, merging with unrounded front vowels.

At this point, [round] again becomes questionable as a contrastive feature, and is liable to lose this status. Indeed, phonological descriptions of English and recent contrastivist accounts of contemporary North American vowel shifts assign [round] at best a very limited contrastive scope.

A side-effect of contrast shift

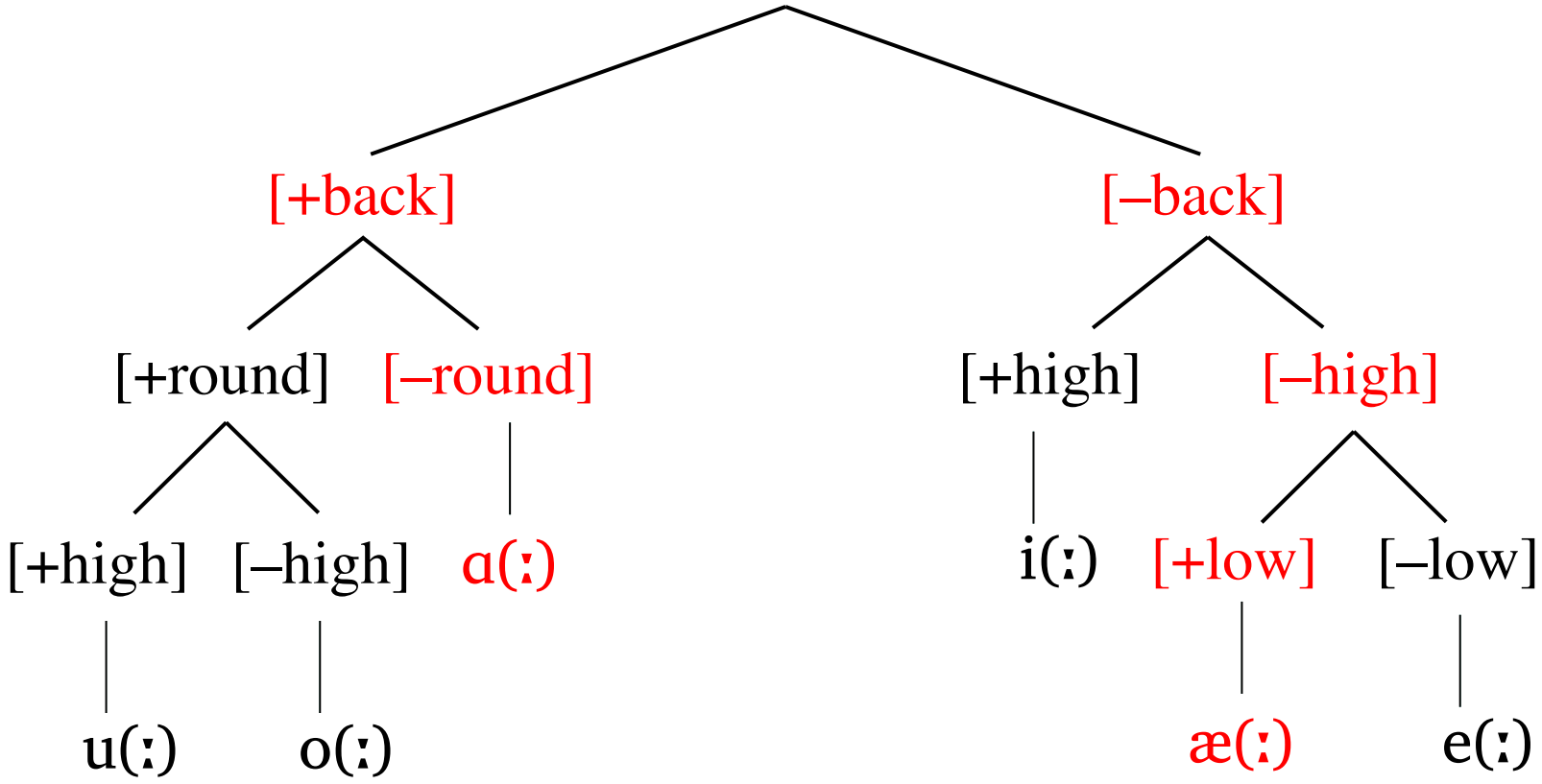
Note a consequence of the proposed contrast shift for the specification of the low vowels:



/æ(ː)/ retains its [+low] specification, but /ɑ(ː)/ does not, thus setting up an asymmetry between these two vowels.

A side-effect of contrast shift

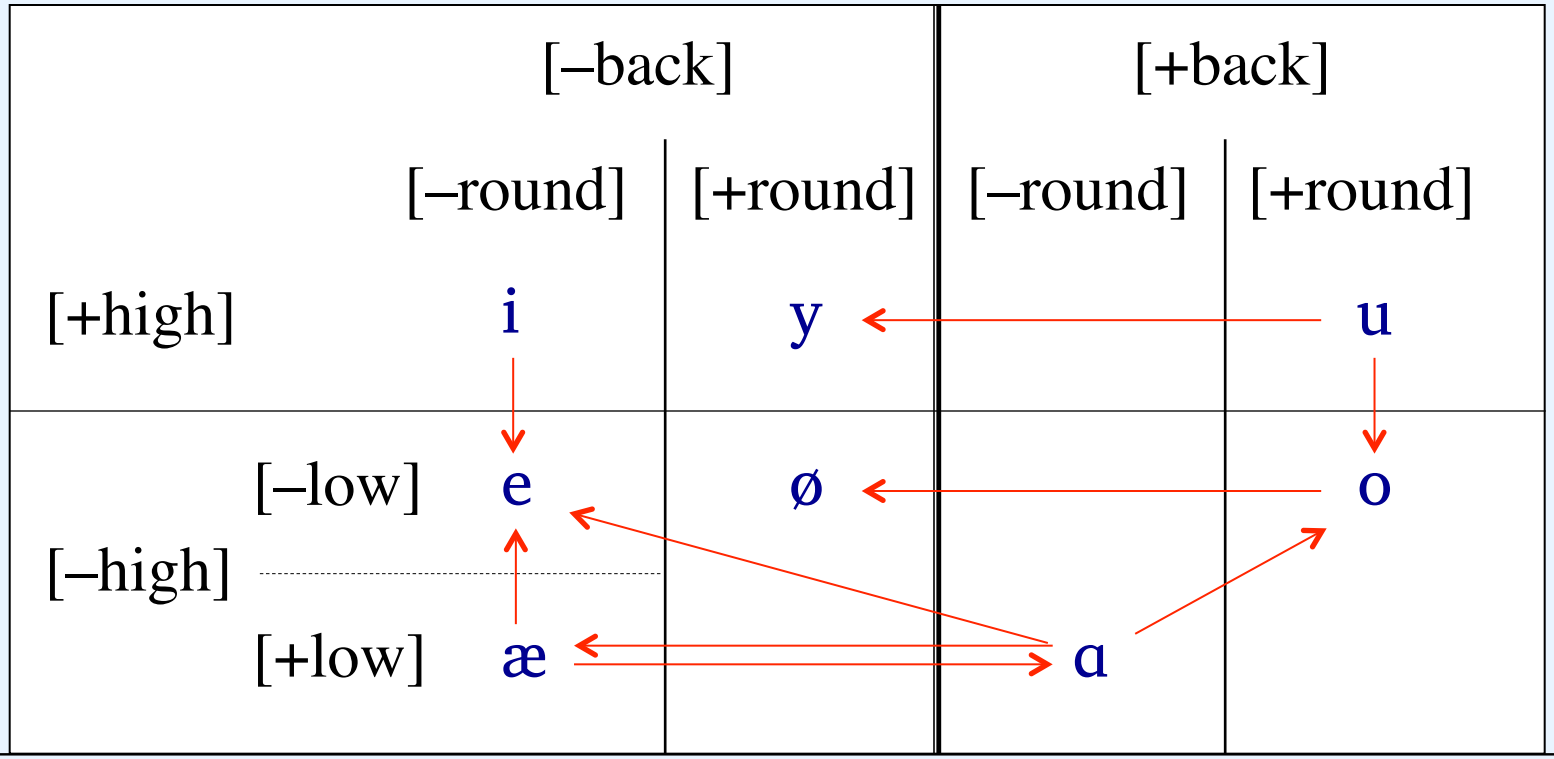
The asymmetry arises because [+back, –round] is sufficient to isolate /ɑ(ː)/; but [round] plays no role in the [–back] vowels.



These types of trade-offs are typical in contrastive hierarchies. Is this a good result, though? Consider:

Old English Vowel Activity

The arrows schematically show the major types of vowel activity in Old English, abstracting away from vowel length: fronting (*i*-umlaut), backing, lowering of high vowels, and raising and rounding of low vowels.



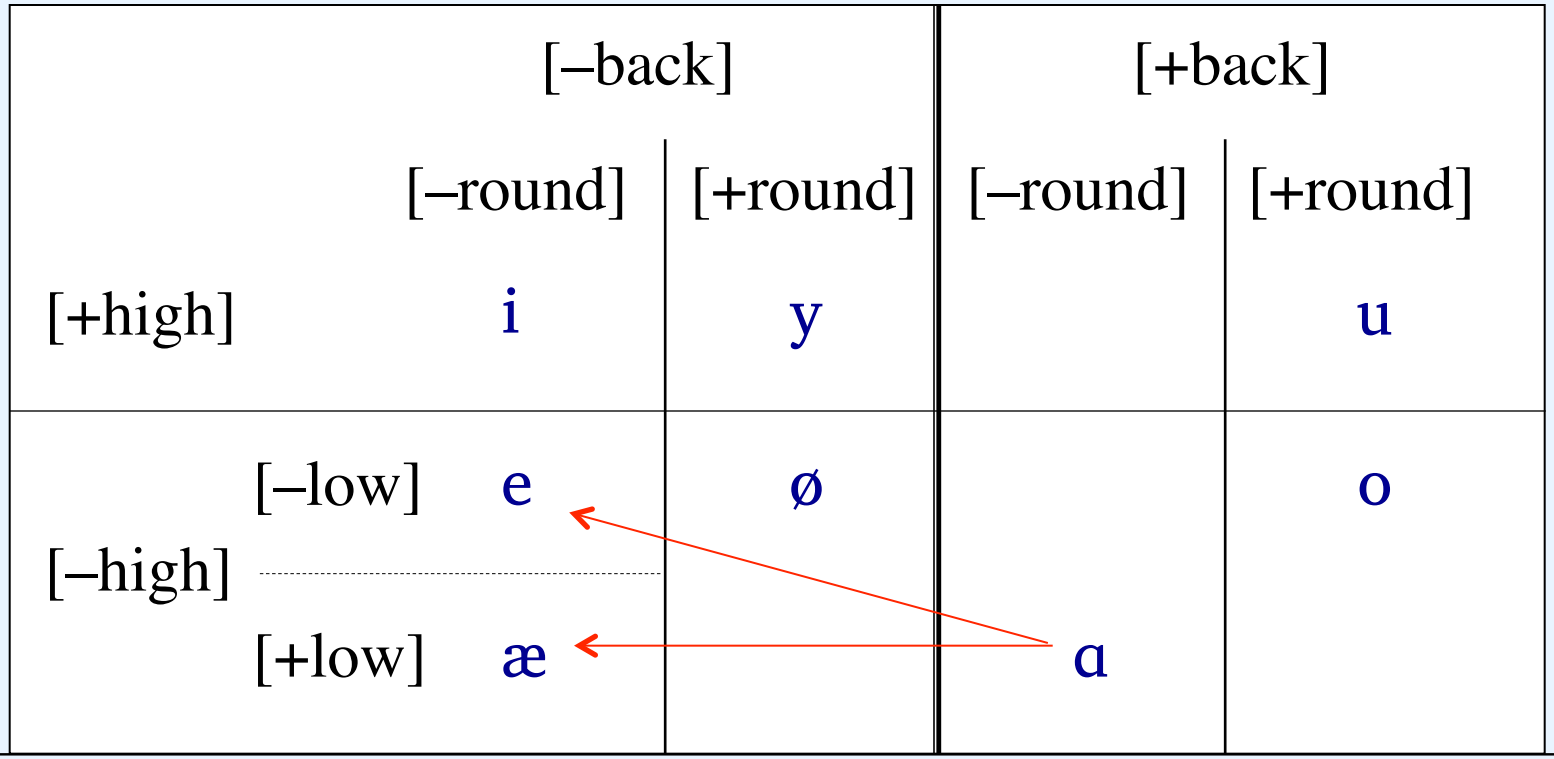
The *i*-umlaut of /ɑ(ː)/

The results of the umlaut of /ɑ(ː)/ are interesting: generally speaking, in the earlier period the *i*-umlaut product of /ɑ(ː)/ was [æ(ː)]; later, however, it was [e(ː)].

	[–back]		[+back]	
	[–round]	[+round]	[–round]	[+round]
[+high]	i	y		u
[–high] [–low]	e	ø		o
[–high] [+low]	æ		ɑ	

The *i*-umlaut of /ɑ(:)/

Though not conclusive, pending closer investigation, the results suggest that the analysis is on the right track.



Conclusion

Conclusion: Deep Allophones

I have discussed several examples of allophones that can arise in the lexical phonology because they consist only of contrastive features.

Sometimes called 'quasi-phonemes', I think a more accurate term is 'deep allophones': they are not separate phonemes, though their lexical status puts them in a possition to develop into phonemes in the right circumstances.

Deep allophones are possible because contrastive features are not all necessarily unpredictable in a hierarchical approach.

THANK YOU!

Thanks to Tom Purnell and Eric Raimy, whose analysis inspired the one proposed here, and Patrick Honeybone and Joe Salmons for bringing their work to my attention. Thanks also to Daniel and Kathleen Currie Hall, Yuni Kim, and Pavel Iosad for discussion of the issues in this talk.

I am grateful to members of the project on *Markedness and the Contrastive Hierarchy in Phonology* at the University of Toronto (Dresher and Rice 2007):

http://homes.chass.utoronto.ca/~contrast/

This research was supported in part by grant 410-08-2645 from the Social Sciences and Humanities Research Council of Canada.

References

Barrie, Mike. 2003. Contrast in Cantonese vowels. *Toronto Working Papers in Linguistics* 20: 1–19.

Compton, Richard and B. Elan Dresher. 2011. Palatalization and 'strong' *i* across Inuit dialects. *Canadian Journal of Linguistics/ Revue canadienne de linguistique* 56: 203–228.

Dresher, B. Elan. 2009. *The contrastive hierarchy in phonology*. *Cambridge: Cambridge University Press.*

Dresher, B. Elan and Keren Rice. 2007. Markedness and the contrastive hierarchy in phonology. http://homes.chass. utoronto.ca/ ~contrast/.

Dresher, B. Elan and Xi Zhang. 2005. Contrast and phonological activity in Manchu vowel systems. *Canadian Journal of Linguistics/ Revue canadienne de linguistique* 50: 45–82.

Gardner, Matt Hunt. 2012. Beyond the phonological void: Contrast and the Canadian Shift. Ms., Department of Linguistics, University of Toronto.

Hall, Daniel Currie. 2007. The role and representation of contrast in phonological theory. Doctoral dissertation, University of Toronto.

Hall, Daniel Currie. 2011. Phonological contrast and its phonetic enhancement: Dispersedness without dispersion. *Phonology* 28: 1–54.

Harvey, Christopher. 2012. Contrastive shift in Ob-Ugric Vowel systems. Ms., Department of Linguistics, University of Toronto.

Hogg, Richard M. 1992. *A grammar of Old English. Vol. 1: Phonology*. Oxford: Blackwell.

Jakobson, Roman. 1962 [1931]. Phonemic notes on Standard Slovak. In Roman Jakobson, *Selected writings I. Phonological studies*, 221–230. The Hague: Mouton. [Published in Czech in *Slovenská miscellanea (Studies presented to Albert Pražak)*. Bratislava, 1931.]

Jakobson, Roman, C. Gunnar M. Fant and Morris Halle. 1952. *Preliminaries to Speech Analysis.* MIT Acoustics Laboratory, Technical Report, No. 13. Reissued by MIT Press, Cambridge, Mass., Eleventh Printing, 1976.

Jakobson, Roman and Morris Halle. 1956. *Fundamentals of Language.* The Hague: Mouton.

Kiparsky, Paul. 1965. Phonological change. Doctoral dissertation, MIT.

Kiparsky, Paul. to appear. Phonologization. In Patrick Honeybone and Joseph Salmons, eds., *The handbook of historical phonology*. Oxford: Oxford University Press.

Kiparsky, Valentin. 1932. Johdatusta fonologiaan. Virittäjä 36: 230–250.

Ko, Seongyeon. 2010. *A contrastivist view on the evolution of the Korean vowel system. MIT Working Papers in Linguistics (MITWPL) 61: Proceedings of the Sixth Workshop on Altaic Formal Linguistics (WAFL 6)*.

Ko, Seongyeon. 2011. Vowel contrast and vowel harmony shift in the Mongolic languages. *MIT Working Papers in Linguistics (MITWPL) 62: Proceedings of the Seventh Workshop on Altaic Formal Linguistics (WAFL 7)*.

Ko, Seongyeon. 2012. Tongue root harmony and vowel contrast in Northeast Asian languages. Doctoral dissertation, Cornell University.

Lass, Roger. 1994. *Old English: A historical linguistic companion*. Cambridge: Cambridge University Press.

Moulton, Keir. 2003. Deep allophones in the Old English laryngeal system. *Toronto Working Papers in Linguistics* 20: 157–173.

Oxford, Will. 2012a. 'Contrast shift' in the Algonquian languages. *Proceedings from the Montreal-Ottawa-Toronto (MOT) Phonology Workshop 2011: Phonology in the 21st Century: In Honour of Glyne Piggott. McGill Working Papers in Linguistics* 22.1.

Oxford, Will. 2012b. Patterns of contrast in phonological change: Evidence from Algonquian vowel systems. Ms., Department of Linguistics, University of Toronto. To appear in *Language*.

Purnell, Thomas, and Eric Raimy. 2013. Contrastive features in phonetic implementation: The English vowel system. Presented at the CUNY Phonology Forum Conference On The Feature, January 2013.

Purnell, Thomas and Eric Raimy. to appear. Distinctive features, levels of representation and historical phonology. In Patrick Honeybone and Joseph Salmons, eds., *The handbook of historical phonology*. Oxford: Oxford University Press.

Prokosch, Eduard. 1939. *A comparative Germanic grammar.* Philadelphia: Linguistic Society of America, University of Pennsylvania.

Roeder, Rebecca, and Matt Hunt Gardner. 2012. The phonology of the Canadian Shift revisited: Thunder Bay and Cape Breton. Presented at NWAV 41 (New Ways of Analyzing Variation 41).

Rohany Rahbar, Elham. 2008. A historical study of the Persian vowel system. *Kansas Working Papers in Linguistics* 30: 233–245.

Salmons, Joseph and Patrick Honeybone. to appear. Structuralist historical phonology: Systems in sound change. In Patrick Honeybone and Joseph Salmons, eds., *The handbook of historical phonology*. Oxford: Oxford University Press.

Stevens, Kenneth N., Samuel Jay Keyser and Haruko Kawasaki. 1986. Toward a phonetic and phonological theory of redundant features. In Joseph S. Perkell and Dennis H. Klatt (eds.), *Symposium on invariance and variability of speech processes*, 432–469. Hillsdale, NJ: Lawrence Erlbaum.

Twaddell, W. Freeman. 1938. A note on OHG umlaut. Monatshefte für deutschen Unterricht 30: 177–181.

Voyles, Joseph B. 1992. *Early Germanic grammar: Pre-, proto-, and post-Germanic languages*. San Diego, CA: Academic Press.

Wright, Joseph and Elizabeth Mary Wright. 1925. *Old English grammar* (third edition). London: Oxford University Press.

Zhang, Xi. 1996. Vowel systems of the Manchu-Tungus languages of China. Doctoral dissertation, University of Toronto.


LAGB
Themed session: The representational consequences of marginal contrasts
SOAS
University of London
2013 Annual Meeting of the Linguistics Association of Great Britain
28 - 31 August 2013