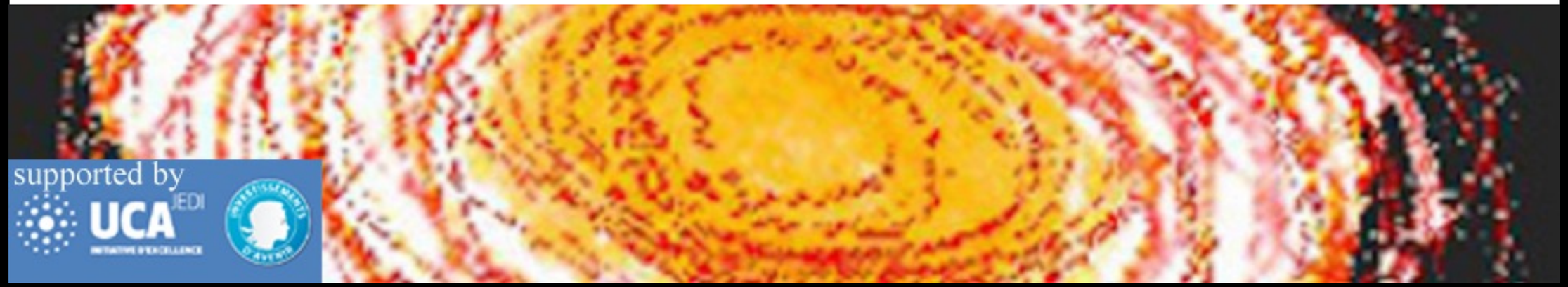
Eastern Generative Grammar (EGG)

EGG 2021 online, 26 July to 6 August



Foundations of Contrastive Hierarchy Theory

B. Elan Dresher

Class 2: A theory of phonological contrast

Course information

Readings and slides from each class are posted at the class page for this course:

http://www.eggschool.org/classes/intro-foundations-of-contrastive-hierarchy-theory/

Everyday I have an office hour at Gather at 17:30–18:15 CEST. I can stay longer if needed. If you can't make these hours, please contact me and we can arrange another time.

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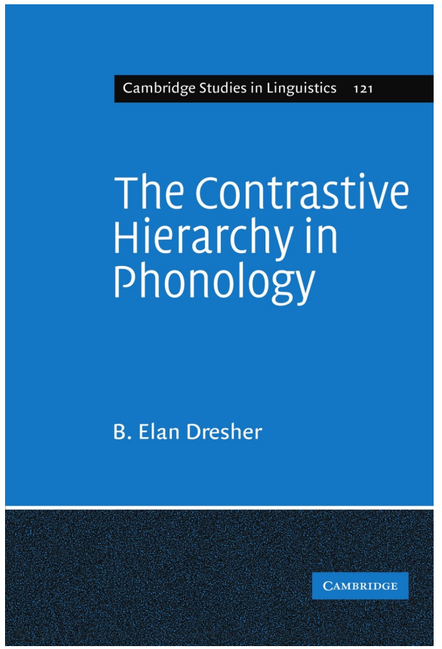
My website: https://dresher.artsci.utoronto.ca/

The main book relevant to this course (lots of publications since) is Dresher (2009): *The Contrastive Hierarchy in Phonology* (CUP).

https://www.cambridge.org/core/books/contrastive-hierarchy-in-phonology

I will post individual chapters on our page.



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Tuesday 27 July 2021

Department of Linguistics
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Introduction

Introduction

Yesterday we did a quick tour through the history of phonology; the purpose was to show that the main ideas of Contrastive Hierarchy Theory (CHT) have been around since the beginning of modern phonology.

I mentioned briefly that a ‘branching tree’ (a contrastive feature hierarchy) appeared prominently in Morris Halle’s *Sound Pattern of Russian* (1959).

In fact, such branching trees were a part of early generative phonology, but they fell out of favour during the 1960s and were excluded from Chomsky & Halle’s *Sound Pattern of English* (1968).

Introduction

As a theory of phonological representations, branching trees were revived by Clements (2001, 2003, 2009) and independently around the same time at the University of Toronto.

For Clements, the feature hierarchy first took the form of an accessibility hierarchy (Clements 2001) and then of a robustness scale (Clements 2009); these are not quite the same as the old branching trees.

At Toronto the branching trees, called contrastive feature hierarchies, were revived in their original form (Dresher, Piggott, & Rice 1994; Dyck 1995; Zhang 1996; Dresher 1998b; Dresher & Rice 2007; Hall 2007; Dresher 2009; Mackenzie 2009; etc.).

Introduction

This is the approach I will be presenting here. It has gone under various names:

- Modified Contrastive Specification (MCS), *or*
- 'Toronto School' phonology, *or*
- Contrast and Enhancement Theory;
- I call it Contrastive Hierarchy Theory (CHT).

Today we will look at how CHT works, and implications it has for the issue of emergent versus innate features.

We will work through an example of how we would go about analyzing a sample case, the vowel system of Xunke Oroqen (a Tungusic language).

We will conclude by showing how CHT can account for differences in loan phonology between Hawaiian and New Zealand Māori.

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1. Main Tenets of Contrastive Hierarchy Theory (CHT)

Contrast and hierarchy

The first major building block of our theory is that contrasts are computed hierarchically by ordered features that can be expressed as a branching tree.

Branching trees are generated by the Successive Division Algorithm (Dresher 1998b, 2003, 2009):

The Successive Division Algorithm

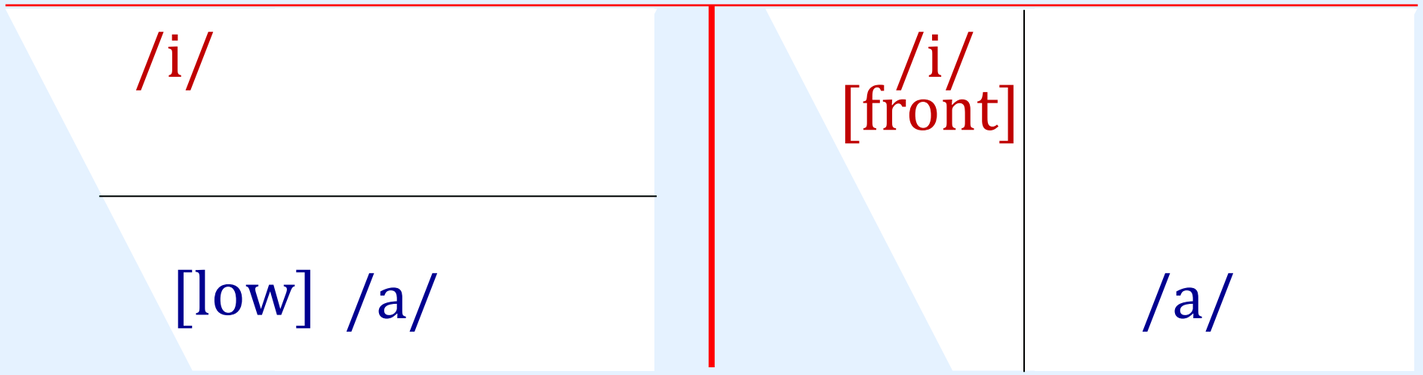
> Assign contrastive features by successively dividing the inventory until every phoneme has been distinguished.

Criteria for ordering features

What are the criteria for selecting and ordering the features?

Phonetics is clearly important, in that the selected features must be consistent with the phonetic properties of the phonemes.

For example, a contrast between /i/ and /a/ would most likely involve a height feature like [low] or [high], though other choices are possible, e.g. [front] or [advanced/retracted tongue root].

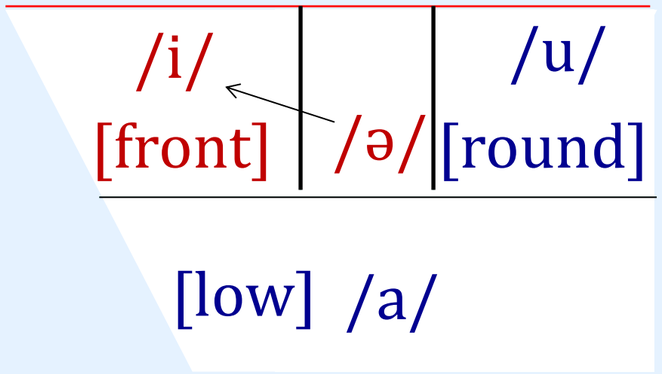


Criteria for ordering features

Of course, the contrastive specification of a phoneme could sometimes deviate from the surface phonetics.

In some dialects of Inuktitut, for example, an underlying contrast between /i/ and /ə/ is neutralized at the surface, with both /i/ and /ə/ being realized as phonetic [i] (Compton & Dresher 2011).

In this case, /i/ and /ə/ would be distinguished by a contrastive feature, even though their surface phonetics are identical.



Contrast and phonological activity

As the above example shows, the way a sound patterns can override its phonetics (Sapir 1925).

Thus, we consider as most fundamental that features should be selected and ordered so as to reflect the phonological activity in a language, where activity is defined as follows (adapted from Clements (2001: 77):

Phonological 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.

A theory of contrastive specification

The second major tenet has been formulated by Hall (2007) as 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.

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

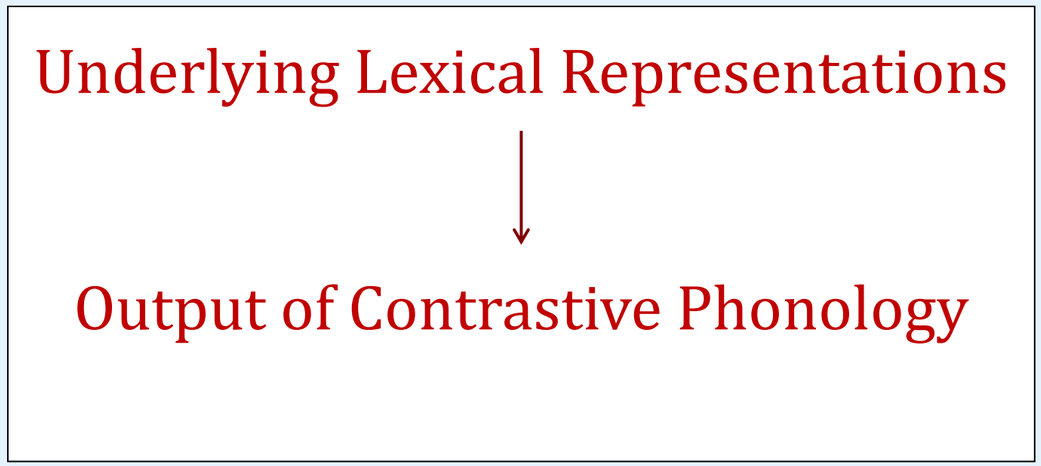
Corollary to the Contrastivist Hypothesis

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

Domain of the Contrastivist Hypothesis

On this hypothesis, underlying lexical representations consist only of contrastive specifications.

These representations form the input to the contrastive phonology, which is the domain in which the Contrastivist Hypothesis applies.



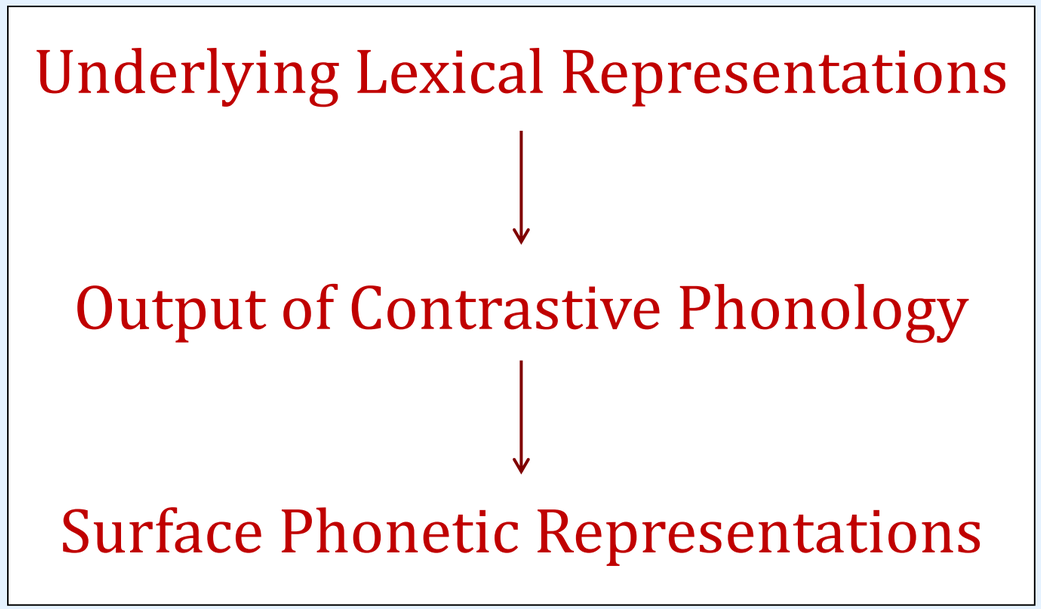
Contrastive features only

Phonology governed by the Contrastivist Hypothesis

Domain of the Contrastivist Hypothesis

Stevens, Keyser & Kawasaki (1986) propose that feature contrasts can be enhanced by other features with similar acoustic effects (see also Stevens & Keyser 1989; Keyser & Stevens 2001, 2006).

Our hypothesis is that enhancement takes place after the contrastive phonology, when further phonetic detail is specified.



Contrastive features only

Phonology governed by the Contrastivist Hypothesis

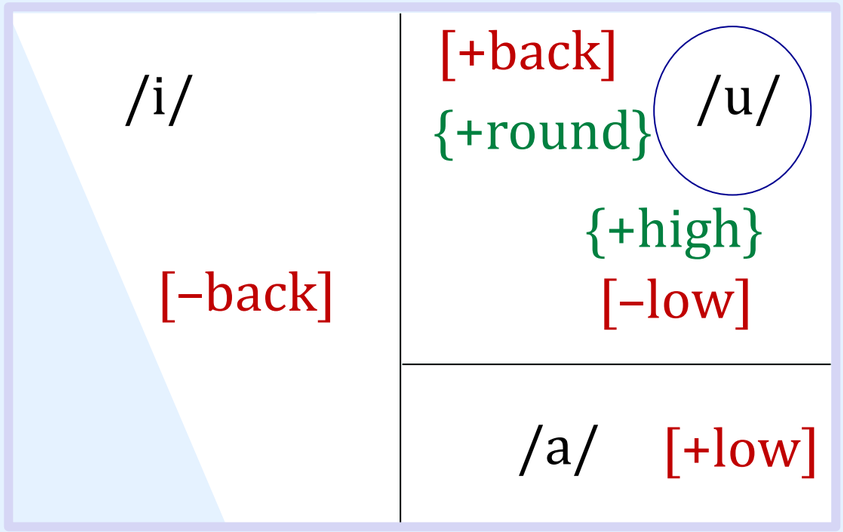
Phonetic processes: enhancement, non-contrastive features

Enhancement of underspecified features

For example, a vowel that is contrastively underspecified as [+back] and [–low] can potentially be any of these vowels: [ɨ, ɯ, ɤ, ʌ, u, ʊ, o, ɔ].

Adding {+round} enhances [+back] (low F2) (gives [u, ʊ, o, ɔ], not [ɨ, ɯ, ɤ, ʌ]

Adding {+high} enhances [–low] (low F1) (gives [u, ʊ], not [o, ɔ]



I designate enhancement features with green curly brackets { }.

These enhancements are not necessary, however, and other realizations are possible (Dyck 1995; Hall 2011).

Markedness

A further assumption is that features are binary, and that every feature has a marked and unmarked value.

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

For example, we expect that unmarked values serve as defaults, and may be more or less inert.

Where it is relevant to indicate markedness, we can designate the marked value of a feature F as [F], and the unmarked value as (non-F). [±F] designates both values.

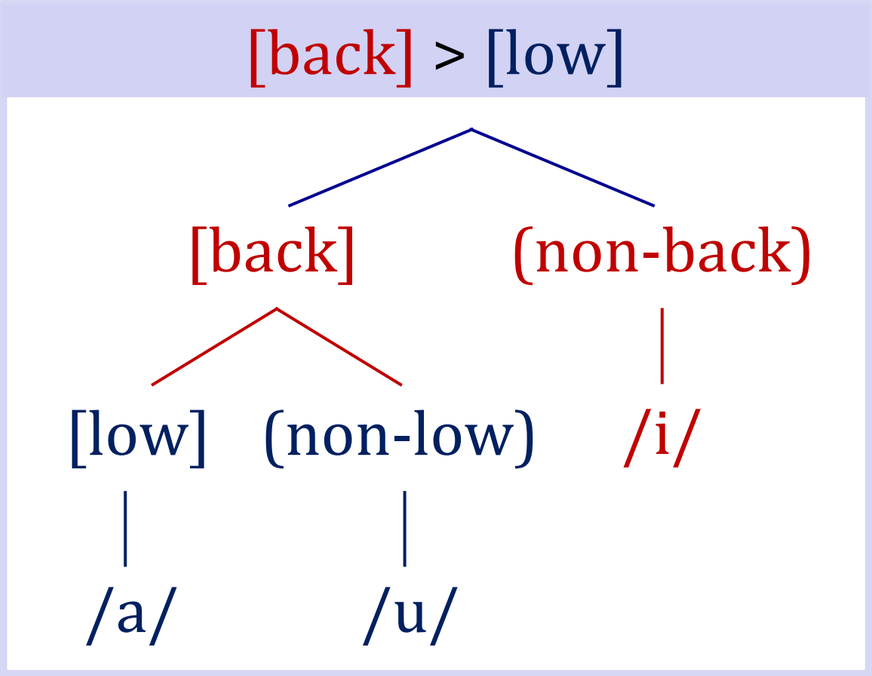
How the contrastive hierarchy works

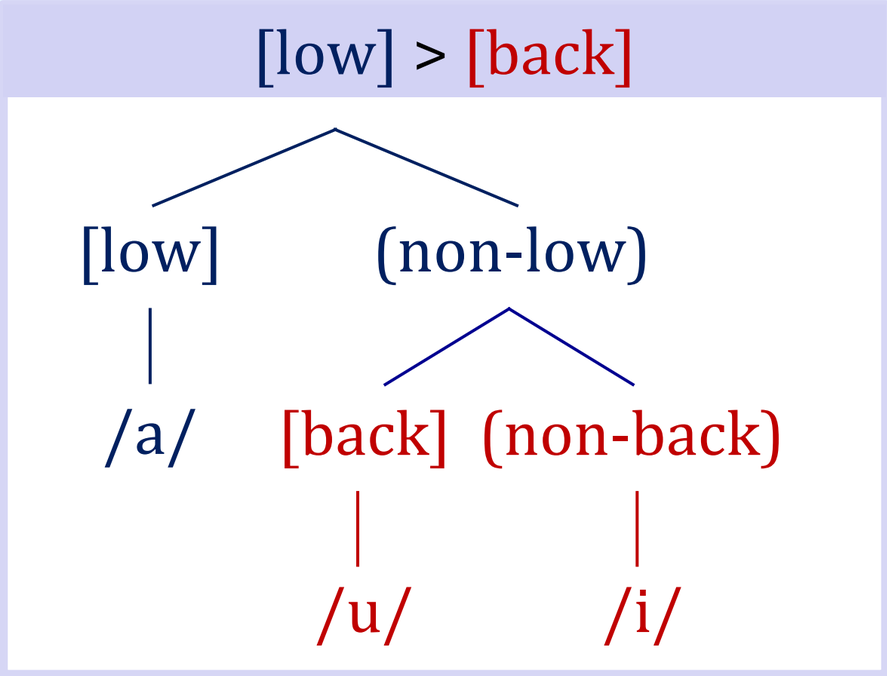
For example, if a language has three vowel phonemes /i, a, u/, and if the vowels are split off from the rest of the inventory so that they form a sub-inventory, then they must be assigned a contrastive hierarchy with two vowel features.

Though the features and their ordering vary, the limit of two features constrains what the hierarchies can be.

How the contrastive hierarchy works

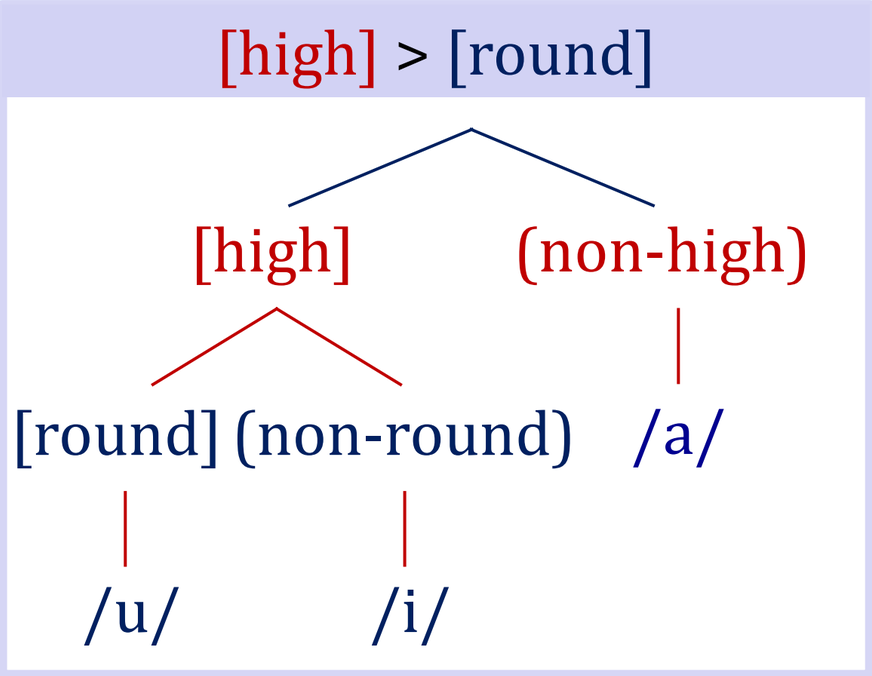
Here are two possible contrastive hierarchies using the features **[back]** and **[low]**.

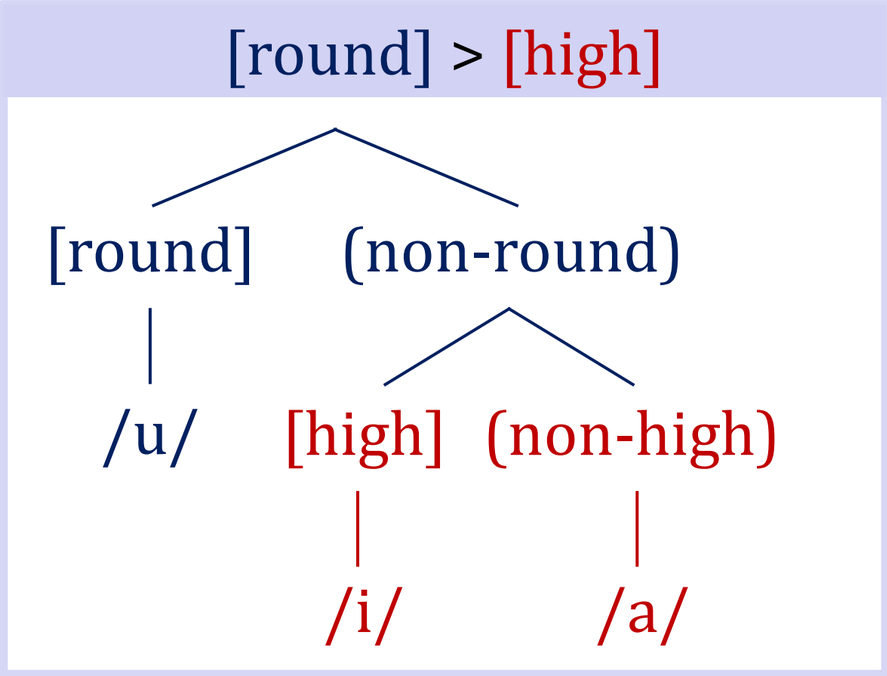




How the contrastive hierarchy works

Here are two more hierarchies, using **[high]** and **[round]**.

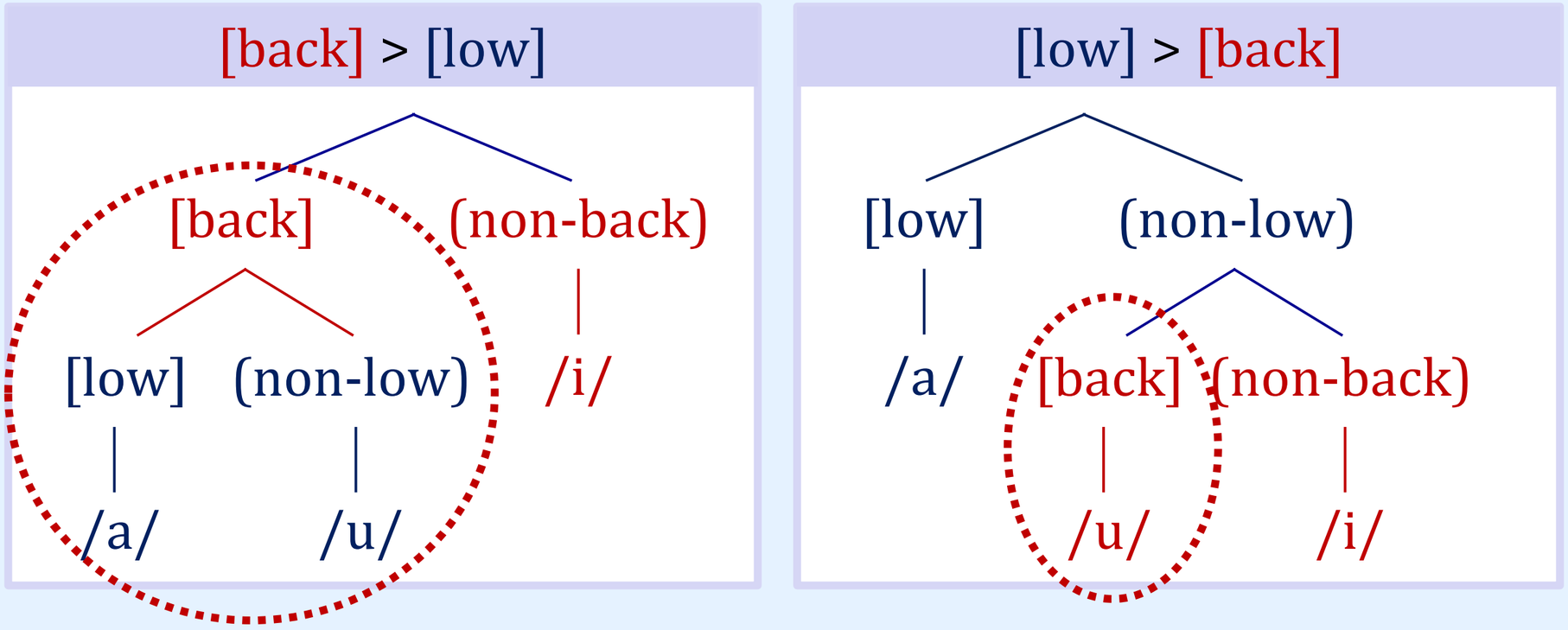




What does the hierarchy do? Synchrony

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

Which phonemes can trigger backing?



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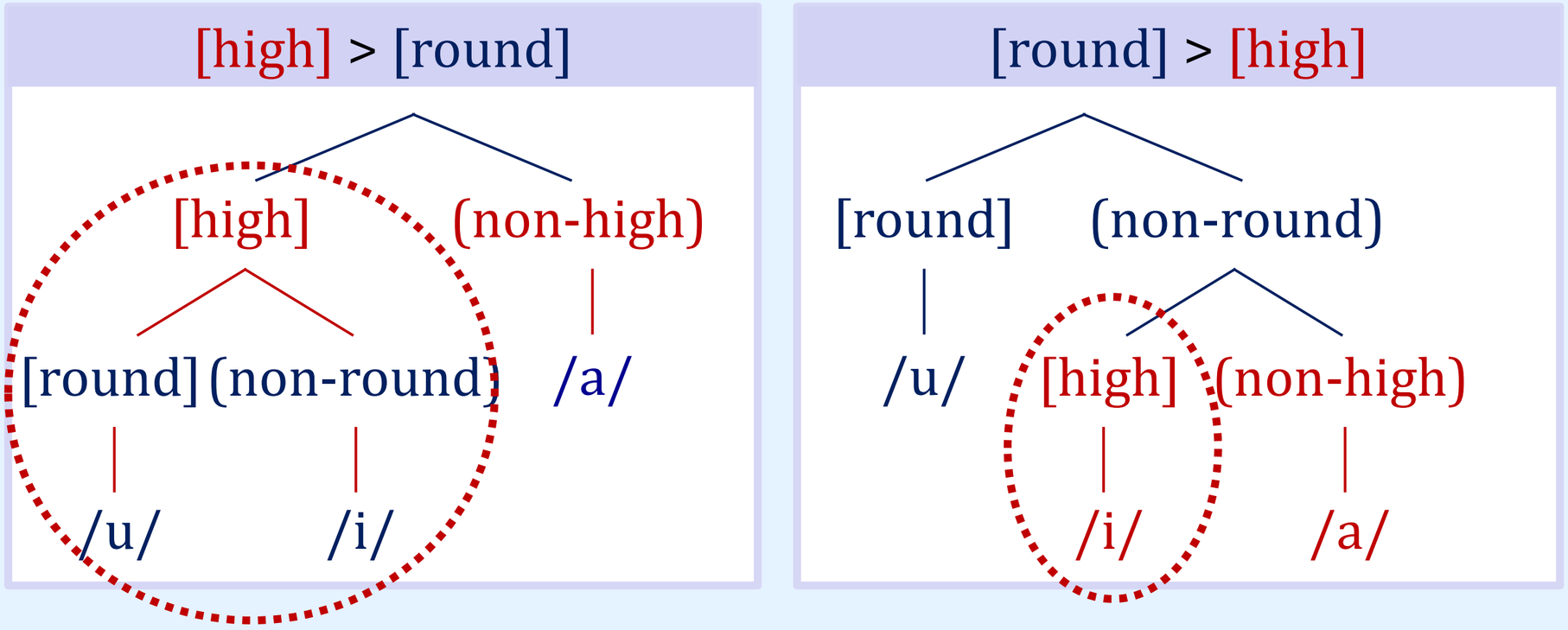
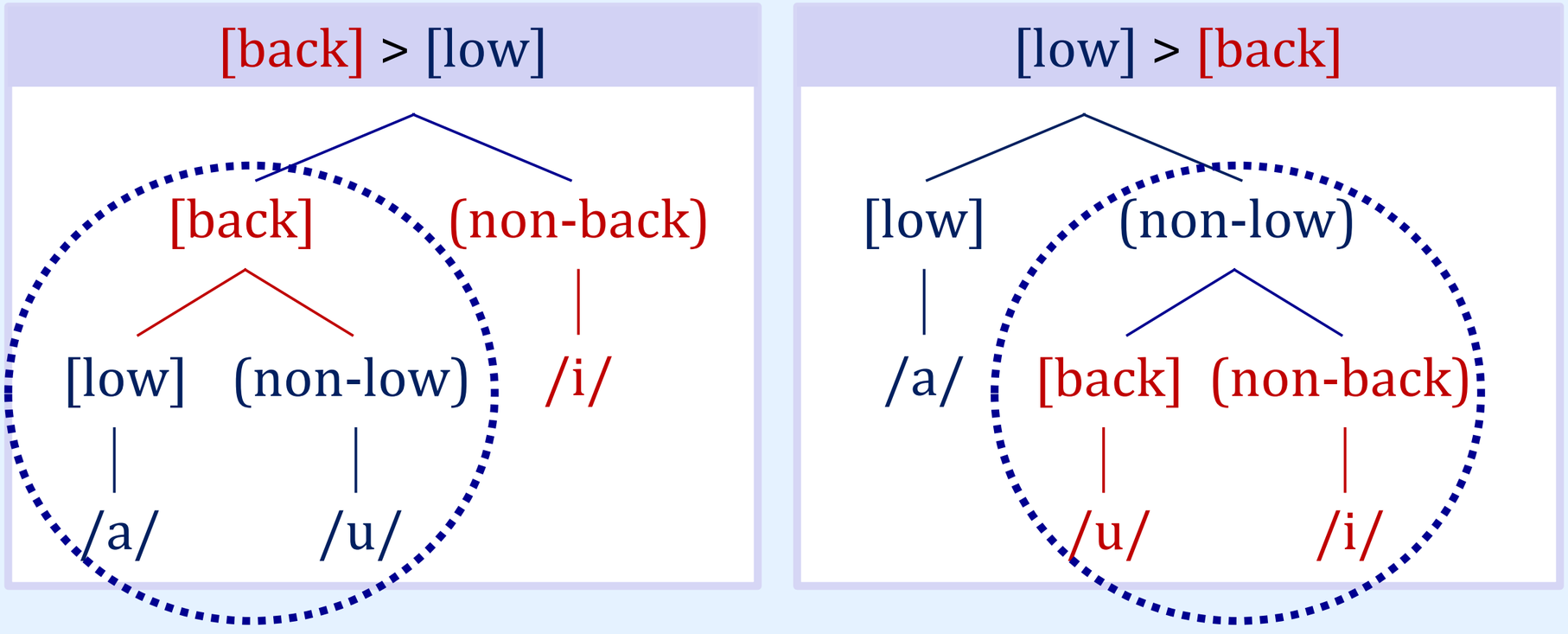


What does the hierarchy do? Diachrony

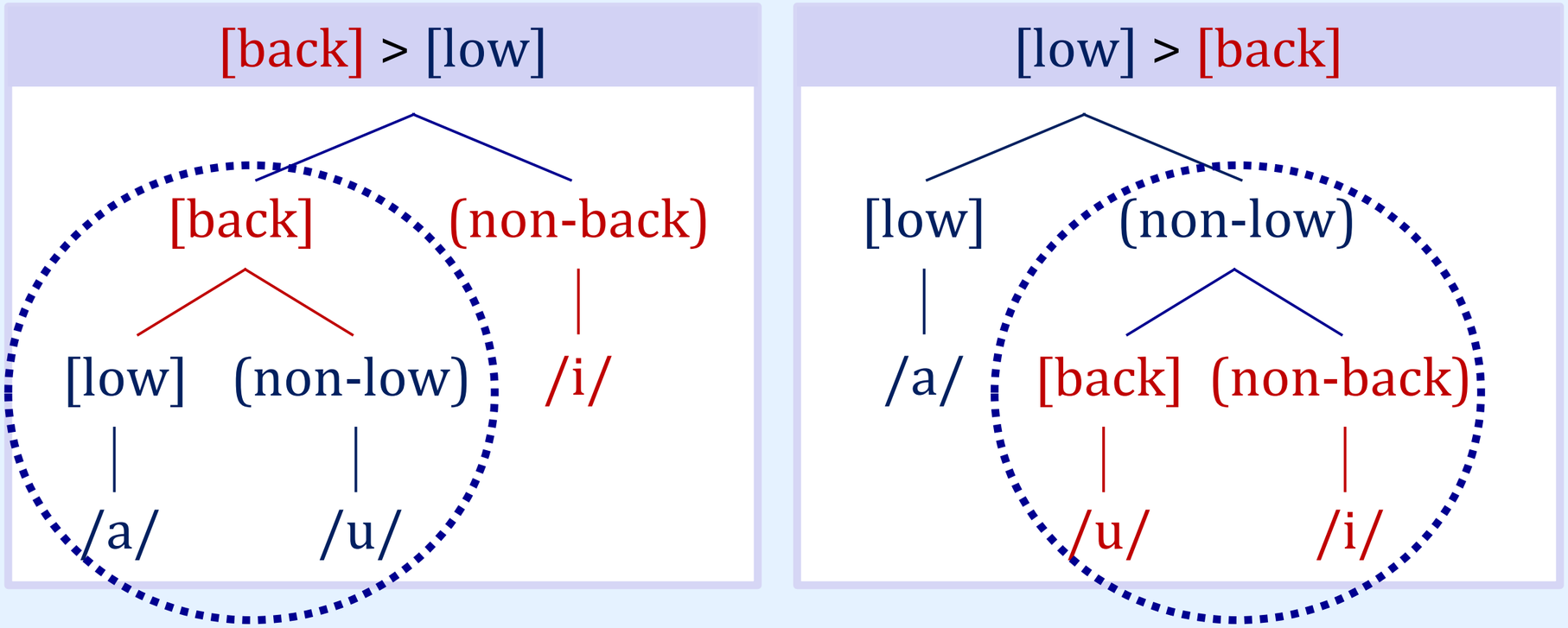
2. The hierarchy constrains neutralization and merger: Mergers affect phonemes that are contrastive sisters.

Which phoneme can /u/ merge with?



What does the hierarchy do? Synchrony

Oxford (2015) gives examples of merger patterns just like these in the history of Algonquian languages. We will look at his analysis later in the course.



References and further reading

For further reading see Dresher (2009: chapter 7); Hall (2011):

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

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

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2. Features in Contrastive Hierarchy Theory

Emergent features?

Mielke (2008) and Samuels (2011) argue that phonological features are not innate, but rather 'emerge' in the course of acquisition.

They argue that innate features are too specific, and no single set of proposed features works in all cases.

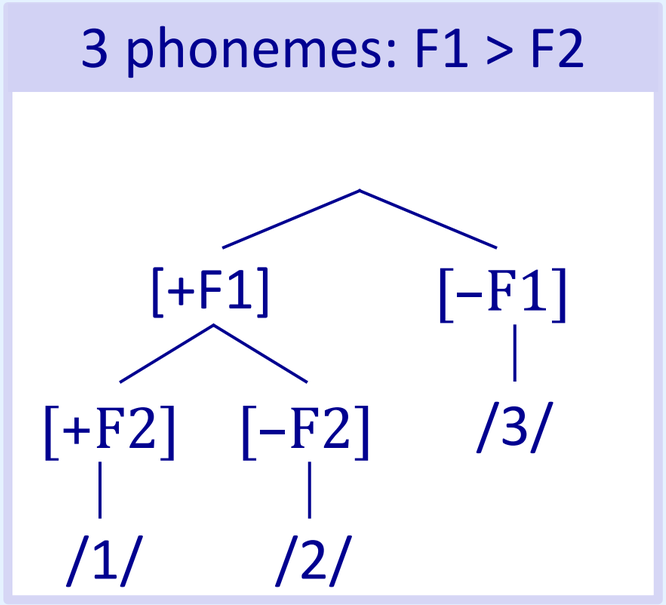
But if features are not innate, what compels them to emerge?

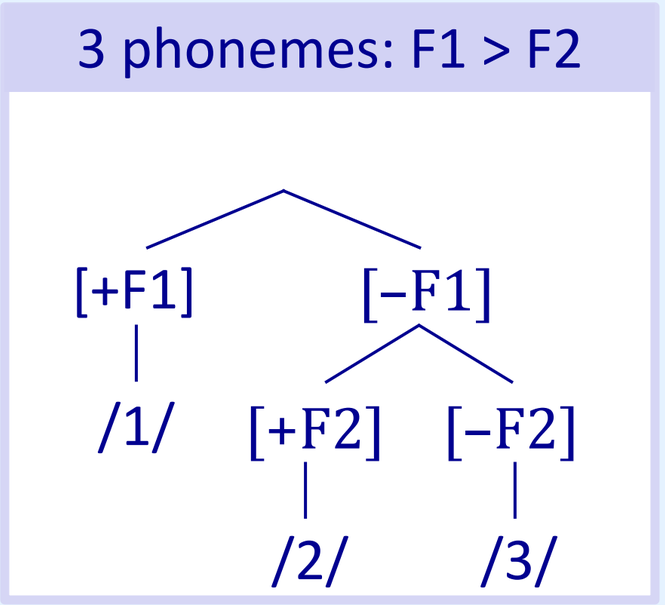
We need to explain why features inevitably emerge, and why they have the properties that they do.

CHT provides an answer to this question: learners must arrive at a set of hierarchically ordered contrastive features.

How many features are there?

An inventory of 3 phonemes allows exactly 2 contrastive features. Two variants are shown, differing in how marked features are distributed.

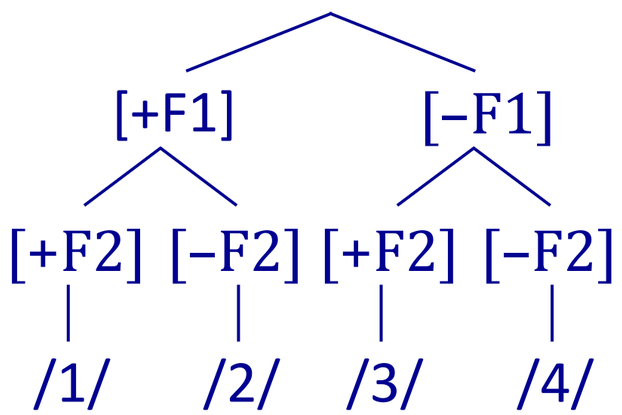




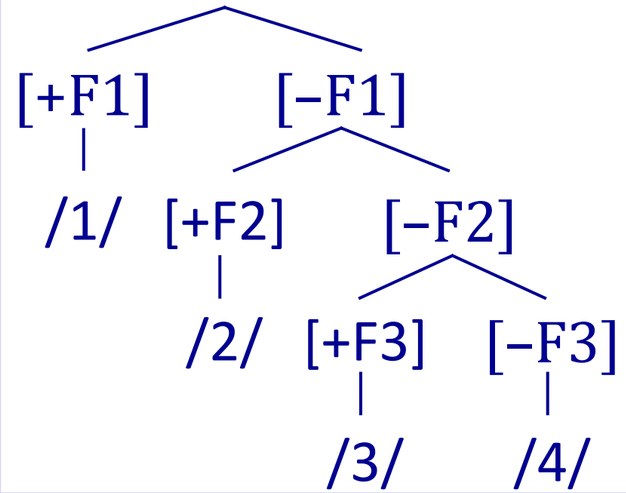
How many features are there?

A 4-phoneme inventory can have a minimum of 2 features and a maximum of 3.

4 phonemes: minimum



4 phonemes: maximum



How many features are there?

In general, the number of features required by an inventory of n elements will fall in the following ranges:

the minimum number of features = the smallest integer ≥ $\log_2 n$

the maximum number of features = $n-1$

Phonemes	$\log_2 n$	min	max
3	1.58	2	2
4	2	2	3
5	2.32	3	4
6	2.58	3	5

How many features are there?

The minimum number of features goes up very slowly as phonemes are added.

The upper limit rises with n.

Phonemes	$\log_2 n$	min	max
7	2.81	3	6
8	3	3	7
10	3.3	4	9
12	3.58	4	11

How many features are there?

However, systems that approach the upper limit are extremely uneconomical.

At the max limit, each new contrast uses a unique feature unshared by any other phonemes.

Phonemes	$\log_2 n$	min	max
16	4	4	15
20	4.3	5	19
25	4.64	5	24
32	5	5	31

Emergent features and UG

Thus, the contrastive hierarchy and Contrastivist Hypothesis account for why phonological systems resemble each other in terms of representations, without requiring individual features to be innate.

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

References and further reading

For further reading see Dresher (2021):

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