Bidirectional use of constraints predicts diachronic merger

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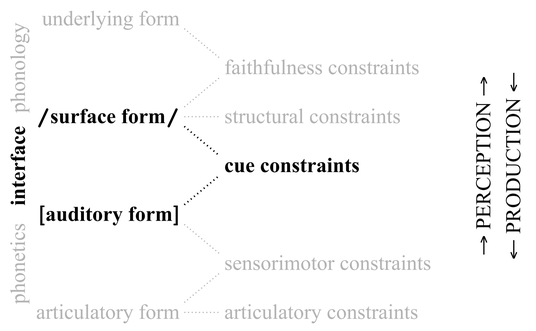
Summary

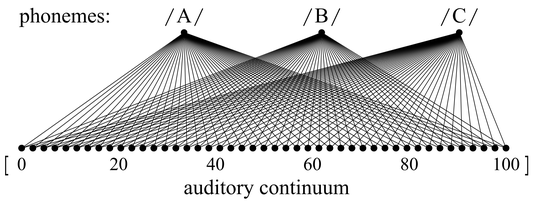
Boersma & Hamann (*Phonology* 2008) showed that bidirectional use of cue constraints can lead to auditory dispersion effects.

Here we show that it can also lead to merger.

Bidirectional phonology & phonetics



Exhaustive set of cue constraints



The grammar is *bidirectional*, so that */C/[35] means:

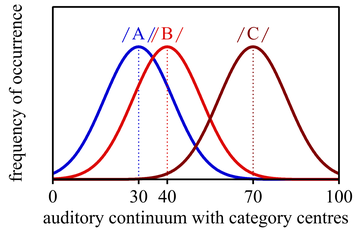
- "Don't perceive [35] as /C/" (in perception)
- "Don't implement /C/ as [35]" (in production)

Gradual perceptual learning algorithm

[45]	*/A/[45]	*/C/[45]	*/B/[45]
/A/	*!		
☞ /B/			←*
√ /C/		*!→	

Low variation

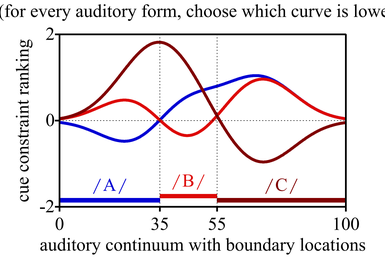
The baby's input distributions for the phonemes /A/, /B/ and /C/
(three Gaussians: p_A , p_B , p_C ; standard deviation: 12)



perceptual learning with the GLA

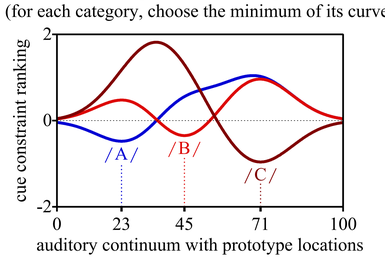
The resulting initial bidirectional phonology-phonetics interface grammar
(e.g., the ranking for /A/ is proportional to $p_B + p_C - p_A$)

The resulting behaviour in perception
(for every auditory form, choose which curve is lowest)



Optimal perception

The resulting behaviour in production
(for each category, choose the minimum of its curve)

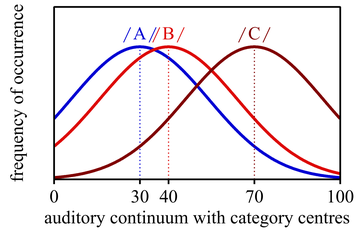


Dispersion

as shown in Boersma & Hamann (2008)

High variation

The baby's input distributions for the phonemes /A/, /B/ and /C/
(three Gaussians: p_A , p_B , p_C ; standard deviation: 24)



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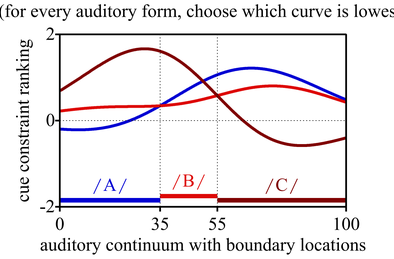

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The resulting behaviour in production
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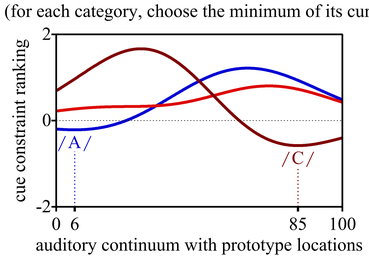

Merger (where's /B/?)

not shown in Boersma & Hamann (2008)