

Allophonic Emergence: three ways allophonic rules come to be

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Formal Ways of Analyzing Variation (FWAV)
Háskóli Íslands

Emergence of Phonological Categories

(inspired by Fruehwald 2013)

Phonetic processes

- Operate over continuous phonetic dimensions

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- Are mechanical, part of the physical implementation of language (e.g. coarticulation), or instructions to that system.

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Phonological processes

- Are categorical, and operate over featural representations
- Are part of the mental representation of language

Introduction

In this talk, we'll argue that there are at least three ways that allophonic categories can emerge.

We provide evidence that they have all been attested in recent sound changes, and outline a research program with the goal of supporting or falsifying these hypotheses.

Introduction

Three paths to allophony

- Mechanical Means

- Spontaneous Phonologization

- Phonological Specialization

Testing for the types

- Effect of duration

- Rate of change

Conclusions

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Traditionally assumed scenario (Ohala, 1981)

- A **mechanical**, non-grammatical effect skews the distribution of outputs perceived by the learner

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Mechanical Means

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- A **mechanical**, non-grammatical effect skews the distribution of outputs perceived by the learner
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- **Our interpretation:** some generation reanalyzes a phonetic effect as an allophonic rule, introducing a new rule variant into the populations (of utterances within speakers, of speakers in a speech community).



Mechanical Means

- Some generation reanalyzes a phonetic effect as an allophonic rule, introducing a new rule variant into the populations (utterances, speech community).
- **Preaspiration and coda-devoicing in Icelandic** (Árnason, 1980, 1986):

/hattur/ ('hat') → [hahtyr]
 /henta/ ('to suit') → [hɛnt̚a]



Mechanical Means

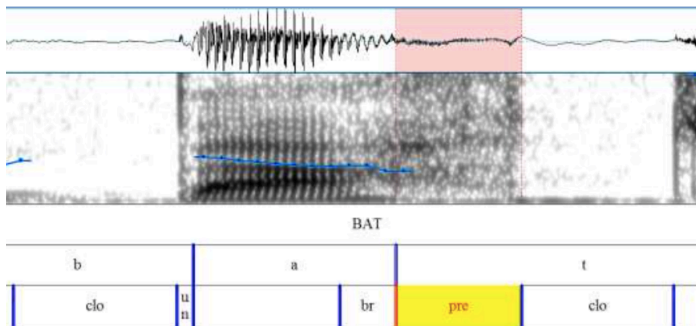
/hattur/ ('hat') → [hahtyr]
 /henta/ ('to suit') → [hɛnta]

Diachrony (Árnason, 1980, 1986):

1. Icelandic loses contrastive vowel length.
 2. Lengthening Rule: vowels in open syllables lengthen, closed syllables shorten (active rule)
 3. In short syllables, spread glottis gesture is (mis-)timed in the segment preceding voiceless non-continuant codas.
 4. Speakers reanalyze the early-timed gesture as an allophonic rule (our interpretation of Árnason 1986).
- The new rule spreads (and is possibly still spreading in Northern Iceland).

Preaspiration in Aberystwyth English (Hejná, 2014)

- The same change appears to be in progress in Aberystwyth English, Northwest British English, and possibly other British Englishes.
- As in Icelandic, it effects both vowels preceding voiceless codas and liquids preceding a voiceless consonant in codas (Hejna, p.c.).

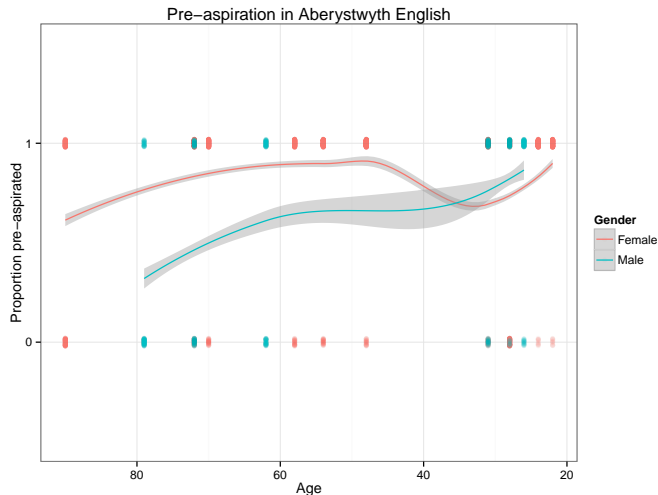


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Preaspiration in Aberystwyth English (Hejná, 2014)

- New allophone is still spreading:



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Spontaneous Phonologization

Scenario proposed by Janda and Joseph (2003); Fruehwald (2013)

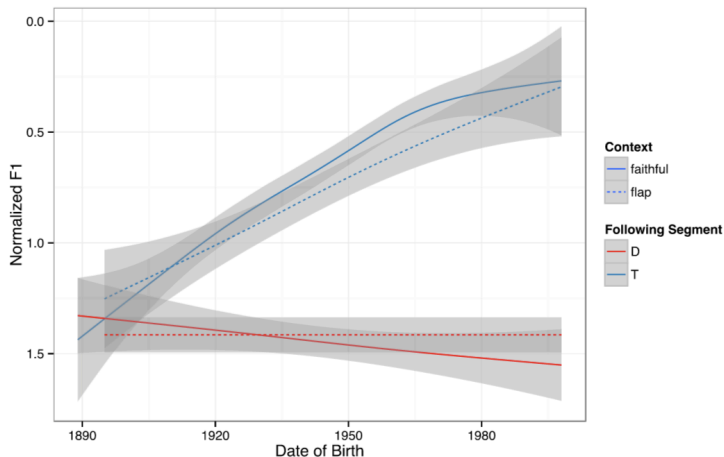
- Speakers **spontaneously** create an allophone without any phonetic motivation.
 - Allophonic categories emerge in individual speakers' grammars before any phonetic motivation

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Spontaneous Phonologization:

PRICE-raising in Philadelphia English (Fruehwald 2013)



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Phonological Specialization

Proposed by us:

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Phonological Specialization

Proposed by us:

- A phonetic change begins, creating variation in phonetic space.

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- A phonetic change begins, creating variation in phonetic space.
- This variation is reanalyzed as an allophonic distinction for a generation of speakers.

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 - Different from Mechanical Means because the phonologization is **not** the result of reanalyzed perception or production errors.

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- A phonetic change begins, creating variation in phonetic space.
- This variation is reanalyzed as an allophonic distinction for a generation of speakers.
 - Different from Mechanical Means because the phonologization is **not** the result of reanalyzed perception or production errors.
 - Different from Spontaneous Phonologization because it **is** a reanalysis of existing phonetic space.

Phonological Specialization

In a categorical dimension (e.g. a consonant changes from k > t, as in Hawaiian):

- A phoneme changes from A to B, but while A and B are in variation, they become reanalyzed as allophones, specialized for different phonological contexts, and they both survive.

(The case of categorical specialization, as in Kroch 1994, Fruehwald and Wallenberg 2013, In preparation.)

$$/k/ \rightarrow [k] / \text{Context}_1$$

$$/k/ \rightarrow [t] / \text{Context}_2$$

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Phonological Specialization

In a continuous dimension (e.g. a vowel fronts):

Suppose:

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Phonological Specialization

In a continuous dimension (e.g. a vowel fronts):

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Phonological Specialization

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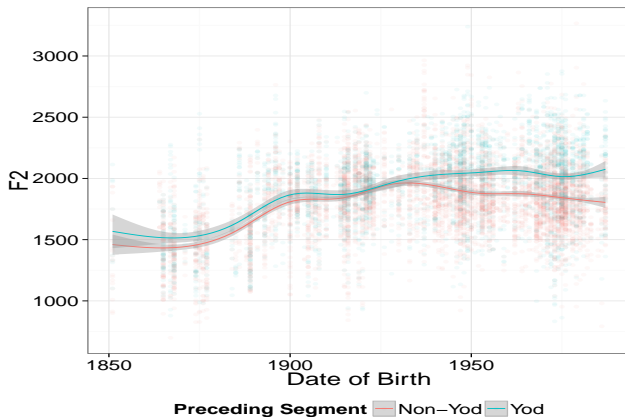
1. A vowel change in vowel V begins, creating variation in phonetic space.
2. Speakers do not control the variance of their vowel production around their phonetic target for V, and assume uniform variance.
3. They hear larger than expected, asymmetrical variance around V in the last two generations of the speech community.
4. Speakers reanalyze half of the variance as allophone A_1 for V, and the other half of the variance as allophone A_2 for V, and assume they are supposed to occur in different phonological contexts.
5. The allophonic rule spreads after the split, spreading at the expense of the old, unitary V system.

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Phonological Specialization:

GOOSE-NEW split in New Zealand English (Seyfarth and Sneller 2014)



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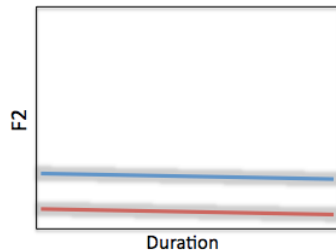
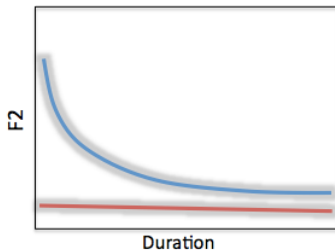
Conclusions

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Effect of duration: coarticulation vs. allophony

- If a difference in acoustic output is caused by coarticulation rather than allophony, then the difference will be bigger for shorter tokens
- If the difference is caused by allophony, then long and short tokens will all show a difference



Effect of duration: Mechanical means

Mechanical means

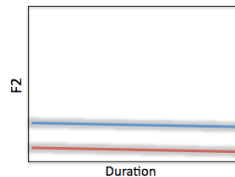
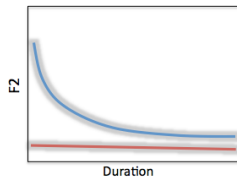
- Because the allophonic split is the result of accruing phonetic effects, we should see an effect of duration for most speakers, until a reanalysis has been made.
- After the reanalysis, as the new allophone spreads, the earlier effect of duration should decrease over time.

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Effect of duration: Mechanical means

Mechanical means



Effect of duration: Spontaneous phonologization

Spontaneous phonologization

- Because there is no phonetic effect that precedes the phonological effect, we should see no effect of duration at any time

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 1. Speakers with one category show no coarticulation (no difference to be found)

Effect of duration: Spontaneous phonologization

Spontaneous phonologization

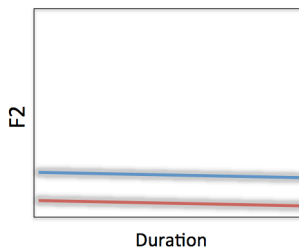
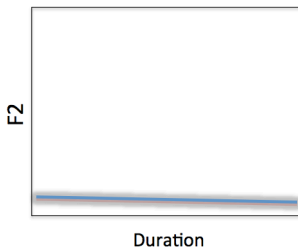
- Because there is no phonetic effect that precedes the phonological effect, we should see no effect of duration at any time
 1. Speakers with one category show no coarticulation (no difference to be found)
 2. Speakers with two categories show two phonological categories (no effect of duration)

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Effect of duration: Spontaneous phonologization

Spontaneous phonologization



Effect of duration: Phonological specialization

Phonological specialization

- Because the phonologization is the result of reanalyzed coarticulation, we should see older speakers showing an effect of duration (shorter tokens more distinct)

Effect of duration: Phonological specialization

Phonological specialization

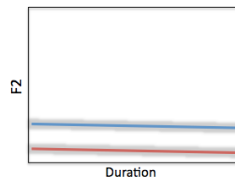
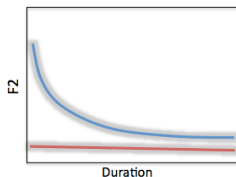
- Because the phonologization is the result of reanalyzed coarticulation, we should see older speakers showing an effect of duration (shorter tokens more distinct)
- and younger speakers with two distinct categories for tokens of all duration

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Effect of duration: Phonological specialization

Phonological specialization

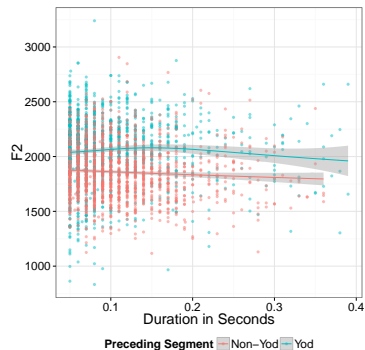
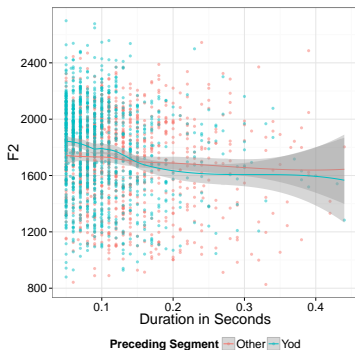


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Effect of duration: Phonological specialization

Phonological specialization in New Zealand English



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Rate of change: coarticulation

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Rate of change: coarticulation

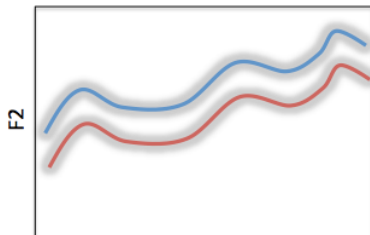
- A phonological rule operates on a single phonological category (Fruehwald, 2013).
- If two variables have different rates of change, it means there are two rules at work (Fruehwald 2013's application of the Constant Rate Effect, Kroch 1989).

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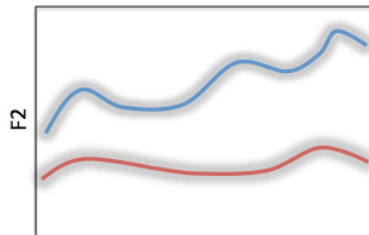
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Date of Birth



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Rate of change: Mechanical means

Mechanical means

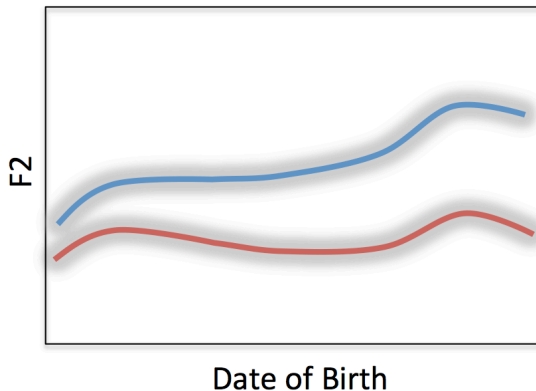
- Because the allophonic split is the result of accruing phonetic effects, we should see a gradual drift in the two variables

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Rate of change: Mechanical means

Mechanical means



Rate of change: Spontaneous phonologization

Spontaneous phonologization

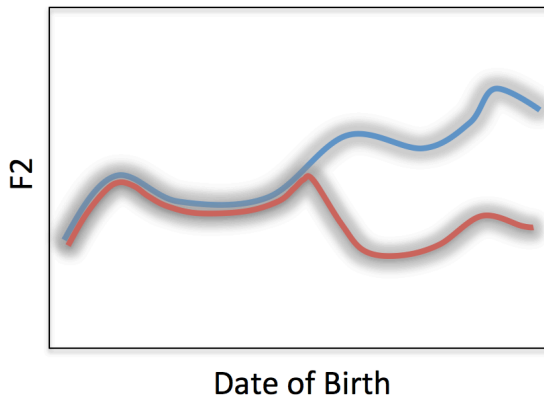
- Because the allophonic split occurs suddenly, we should see both variables in lock step until the community spontaneously creates a new category

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Rate of change: Spontaneous phonologization

Spontaneous phonologization



Rate of change: Phonological specialization

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Rate of change: Phonological specialization

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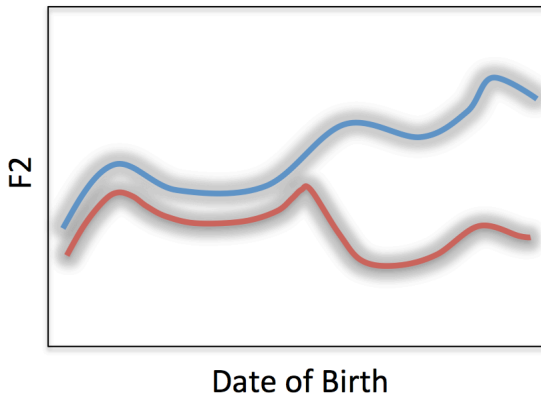
- Because the allophonic split occurs suddenly, we should see both variables in lock step until the community spontaneously creates a new category
- However, we may still see an effect of coarticulation for the early speakers

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Rate of change: Phonological specialization

Phonological specialization

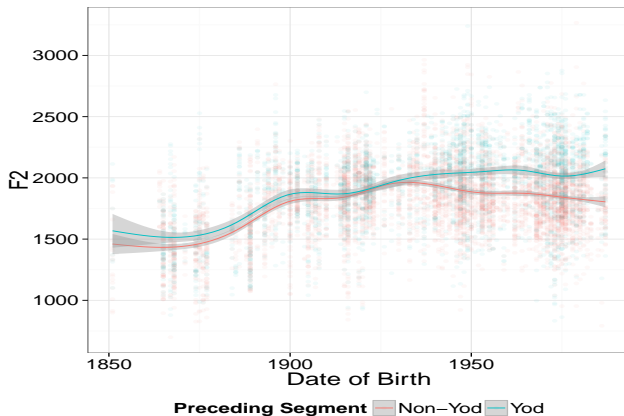


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Rate of change: Phonological specialization

Phonological specialization in New Zealand English /u/-fronting

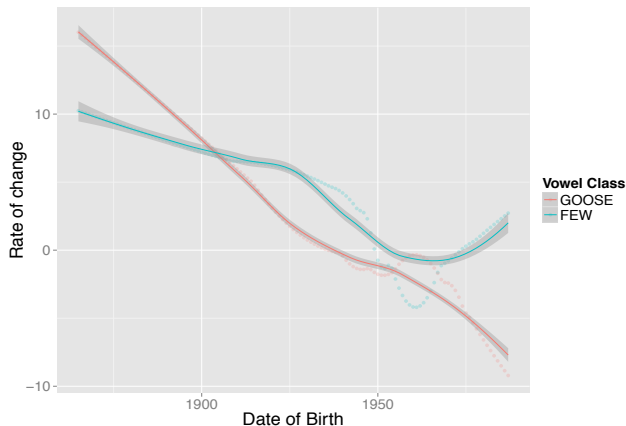


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Rate of change: Phonological specialization

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Conclusions: 3 types of allophonic splits

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- Effect of duration for the whole change until reanalysis
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Spontaneous phonologization

- No effect of duration (pre-split don't have a distinction and post-split don't coarticulate)
- Immediate split in rate of change

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Final thoughts and questions

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 - Duration and ROC are good metrics for vocalic and consonantal change

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 - Duration and ROC are good metrics for vocalic and consonantal change
 - Cho (2015) Development of pitch contrast in Korean prosody
- Questions going further: how does allophone emergence relate to phoneme emergence?
- What's the role of learned phonetic targets (pre-phonological) in allophonic split, or gradient phonological rules in Bermúdez-Otero's work?

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Thank you!