Quantity-quality interactions in Welsh
Phonologization across dialects

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Outline

- Length and quality: mutually predictable distributions in Welsh — and a contrastivist conundrum
- Phonologization of quality: evidence and criteria
- South-West Welsh: a different dialect
- Dialect variation in feature specification: contrast and emergent features
- Where does contrast come from?
Outline

1. Quantity and quality in Welsh
   - A contrastivist conundrum
   - Quantity and quality in Welsh
   - South-West Welsh

2. Dialect variation
   - South-West Welsh
   - Standard system
   - The non-enhanced system

3. Phonologization across dialects
   - Diachronic interpretation
   - Rule scattering in South-West Welsh
   - Emergent features and phonologization
A hypothesis and a challenge

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 (D. C. Hall 2007, p. 20)

- Question here: how do you decide the set of phonemes to be distinguished by features?
Mutually predictable distributions

- A well-known problem for phonemic theory: mutually predictable distributions

- North Germanic, e.g. Norwegian: [taːk] ‘roof’ $\neq$ [takː] ‘thanks’
Mutually predictable distributions in vowels

- English *key*: /kiː/ or /ki/?
- English *kit*: /kit/ or /kɪt/?
- Or even syllable cuts?

**The problem**

Any contrastivist approach appears **forced** to make a choice, even when purely empirical adjudication is difficult.
The received view

- Descriptions of Welsh argue it to be essentially like English
- Mutually predictable distribution of length and quality
  - Long vowels are tense \([iː uː eː oː]\]
  - Short vowels are lax \([ə ɪ ʊ ɛ ɔ]\]
  - Disagreement about \([a]/[αː]\)
The evidence: quality is phonemic

- English borrowings like ['brɔːn] \textit{brawn}: length does not predictably lead to tenseness
  - Unclear status in the grammar
  - Not empirically shown that borrowed [ɛː ɔː] qualitatively identical to native [ɛ ɔ]
  - Unclear whether [a]/[aː] are distinct qualitatively

- Difficult to account for patterning
The evidence: quantity is phonemic

- Distribution within ‘short-long’ or ‘lax-tense’ pairs is largely predictable
  - Long before [b d g f θ χ v ð]
  - Short before (most) clusters
  - Short before [p t k s j l m n]
  - Lexical contrast before [n l r]

(1) South Welsh

a. [ˈθɔˑnɛ] \(\text{tonau}\) ‘tunes’

b. [ˈθɔnˑɛ] \(\text{tonnau}\) ‘waves’
Dialect variation in length

- All dialects: long and short vowels in stressed monosyllables
  - $ton$ ‘wave’ $[\text{'tʰɔn'}] \neq tôn [\text{'tʰoːn}]$ ‘tune’

- South Welsh: long and short vowels in stressed penults
  - $[\text{'tʰɔn˪ɛ}] tonnau$ ‘waves’ $\neq [\text{'tʰo˪nɛ}]$ tonau ‘tunes’

- North Welsh: only short vowels in penults
  - $[\text{'tʰɔn˪a}]$ tonnau $=$ $[\text{'tʰɔn˪a}]$ tonau

- Mid Welsh and NE (Awbery 1984): ‘free variation’ in penults
A different pattern


- Description: mid long vowels are lax before a high vowel

(2) a. ['eːdɛ] edau 'thread'
b. ['oːɡɔv] ogof 'cave'

(3) a. ['tʰɛːbɪɡ] tebyg 'similar'
b. ['kʰɔːdi] codi 'rise'

(4) Alternations
[['kʰoːdɔð]] cododd ‘((s)he) rose’
Outline of argument

- Are there criteria we can use beyond surface predictability?
  - Yes: modularity
  - If a distinction participates in a pattern that involves proprietary phonological information, it should be phonological
  - ‘Tenseness’ is likely phonologized both in SW Welsh and other varieties
  - Predictable distribution of distinct categories is an expected result of the life cycle, not a problem for the Contrastivist Hypothesis
  - Contrastivity is defined as non-redundancy in feature assignment along the lines of the contrastive hierarchy
Acoustic study

- 8 speakers in study: 6 show the system described for the south-west
- Carmarthen, rural W Carmarthenshire, Pembrokeshire
- 149 items \( \times \) 3 repetitions, controlled for consonantal context, vowel length, height of following vowel
- Carrier phrase *Glywes i'r gair ___ ddoe* ‘I heard the word ___ yesterday’
- Basically: descriptions are correct
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Figure: Vowel qualities for south-western speakers, by vowel length

Normalized F2

Normalized F1

Vowel quality

i
e
o
u
Analysis

- The ‘tense-lax’ distinction in mid vowels is sensitive to the ‘high-nonhigh’ distinction among all vowels
- The height specification of vowels is a proprietary phonological feature
- Hence, the ‘tense-lax’ distinction in mid vowels is phonological
- Emergent/substance-free feature theory (e.g. Mielke 2007, Morén 2007): these two distinctions pattern together, so they are encoded by the same feature
- Important fact: patterning of vowels in unstressed (post-tonic) syllables
  - [i u] in open syllables, [ɪ ʊ] in closed syllables
  - Only [ɛ ɔ] for mid vowels
A contrastive hierarchy

$i\ i\ u\ e\ e\ o\ o\ a$

$V$-$\text{man}[\text{op}]$

$e\ e\ a$

$V$-$\text{pl}[\text{lab}]$

$V$-$\text{man}[\text{cl}]$

$\varepsilon$

$V$-$\text{man}[\text{cor}]$

$V$-$\text{pl}[\text{cor}]$

$e\ e$

$V$-$\text{man}[\text{cl}]$

$V$-$\text{pl}[\text{dor}]$

$V$-$\text{man}[\text{cl}]$

$\varepsilon$

$\varepsilon$

$\varepsilon$

$\varepsilon$

$V$-$\text{pl}[\text{dor}]$
The ‘tenseness’ distinction shows signs of **phonologization** (Hyman 1976, 2013) or **stabilization** (Bermúdez-Otero & Trousdale 2012, Bermúdez-Otero 2014, Ramsammy 2015): reference to phonological information

- Distribution in high vowels is sensitive to the presence of a coda
- Modelling shows this is not a durational effect
- Distribution in mid vowels is sensitive to contrastive phonological specification
- We return to possible continuous effects below

Most speakers consistently show unexpected [ɛː] in **ffenestr** ['fɛːnɛst] ‘window’

**Phonemicization**: contrastive by any criterion
Vowel duration

Figure: Vowel duration by vowel category and length. Sp1

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Vowel quality

Figure: Formant values by vowel length, Sp1

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A contrastive hierarchy

Figure: Contrastive hierarchy for the standard system
Summary on standard system

- ‘Tenseness’ probably phonologized: sensitive to phonological information
  - High vowels: presence of codas
  - Mid vowels: moraic structure
  - Not a duration effect

- The features used for the ‘tenseness’ distinction do not interact with anything else or with each other

- No evidence this is the same feature
Vowel duration

![Diagram showing vowel duration for different vowels and vowel lengths.](image)

- **i**: Long vowel duration is slightly longer than short vowel duration.
- **e**: Long and short vowel durations are comparable.
- **o**: Long vowel duration is notably longer than short vowel duration.
- **u**: Short vowel duration is significantly shorter than long vowel duration.

Figure: Duration by vowel category, Sp8

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Vowel quality

![Diagram showing vowel quality by length (Long and Short). The diagram includes contour plots for F1 and F2 frequencies, with different colors representing different vowels (e, i, o, u).]
Duration effect

Figure: Effect of vowel duration on F1, Sp8
Summary for non-enhanced system

- No evidence for a phonological ‘tenseness’ distinction in mid vowels
- Some evidence for a distinction in high vowels sensitive to codas, but only apparent word-finally
- Note the broader domain of the requirement compared to the standard system
- No analysis here due to lack of data from stressed monosyllables
- Potentially: ‘free variation’ in quantity really means ‘(some) continuous variation in quality’
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- Suggested diachronic interpretation for stressed vowels
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Suggested diachronic interpretation for stressed vowels

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2. Length is enhanced by (continuous) tensing (Stevens & Keyser 1989, 2010, Keyser & Stevens 2006) \(\approx\) non-enhanced system
3. All short-long pairs are interpreted as featurally distinct, but the features are inert otherwise \(\approx\) standard system
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- Features used for the tenseness distinction participate in alternations involving other segments ≈ south-western system
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   4. Features used for the tenseness distinction participate in alternations involving other segments ≈ south-western system
   5. Tenseness becomes phonemicized (see also Iosad 2014 for another scenario)
Where does contrast come from?

- If features are emergent, they must be extracted from categorical distributions in the data.
- Categorical distributions arise from phonetic processes with predictable outcomes via the life cycle.
- At early stages of the life cycle, the categories will be in predictable (‘complementary’) distribution.
- Some learning models are biased to collapse such distinctions (e.g., Peperkamp et al. 2006, Dillon, Dunbar & Idsardi 2012).
- But the distribution may also be interpreted to be driven by the grammar (K. C. Hall 2013, Kiparsky 2014).
The origin of height dissimilation

- Height dissimilation: phonologization of a trade-off in inherent length
- Irish: synchronically (Munster; Ó Sé 1989) and diachronically (Connacht; Ó Sé 1984) ⇒ categorical (?)
- East Slavic: categorical (Crosswhite 2000) or continuous (Kasatkina & Ščigel’ 1996, Kniazev & Shaulskiy 2007), potentially coexisting
- Kera: continuous? (Pearce 2007)
The trade-off

**Figure:** Effect of post-tonic vowel duration on V1/V2 duration ratio, by stressed vowel, south-western speakers
Emergent/substance-free feature theory is compatible with theories of the life cycle

Entities to be labelled emerge from categorical distributions in the data

Categorical distributions in behaviour may be generated by underlyingly non-categorical processes (cf. Ladd 2006)

Phonologized distinctions participate in ‘narrowly phonological’ patterns even when the evidence for their exact nature is weak
Emergent features and contrast

- Phonologization in this sense is an alternative to surface contrast as a criterion for ‘redundancy’
- Features like ‘tenseness’ in systems like Welsh are not ‘redundant’ even if they may be predictable on the surface from the context
- The Contrastivist Hypothesis is worth pursuing with a revised definition of ‘redundancy’
- Consistency with the Successive Division Algorithm (Dresher 2009) is a good candidate criterion (cf. Dresher 2014)
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Diolch yn fawr!