What's in the features?

Phonetic Change, Splits, and Mergers in Southern England

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Issues in Feature Theory, EGG, 08/08/2019

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Today's session

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Main aims

- Describe a current change in South-Eastern English phonology, with a focus on London
  - Potentially interesting: gradient (phonetic) change spawning categorical (phonological) changes, potentially restructuring the vowel system of that variety
  - Raises questions about the phonetics-phonology interface
- Provide a phonological analysis (however informal)
- Discuss how this contributes to our discussion of features so far.
- Bigger question: How can we account for rich phonetic variation in phonology? Can phonology theory shed light on such variation?

Features and phonetics

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Where we are now

- One claim, exemplified by Hale & Reiss: There is a tight fit between features and phonetic parameters, which is deterministic.
  - Concept of innate and invariant transducers.
  - Any perceptible phonetic change is phonological in nature, involves different feature specifications.
- The other claim, raised by phoneticians like Ladefoged and Kingston: much looser fit between abstract phonological units and phonetic parameters.
- Looking at class of rhotics and interactions among 'guttural' features yesterday supports this view.
- Today I want to go more phonetic again.

(Socio)phonetic variation

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What's phonological?

- Kingston & Diehl (1994) argue for a controlled phonetics.
- A recent surge in sociophonetic studies seems to support thios claim:
  - There are fine-grained phonetic differences in the realisation of segments depending on social factors like class, age, gender …
- Should we put all of that in the phonology?
- Somewhat related, if we allow for some phonetic variation: At what point should we consider this phonological? When does phonetic microvariation become phonological change?
- Idea to explore today: This decision should only be guided by phonological principles.
- This requires great freedom in the phonetic realisation of phonological contrasts.

An example

Sociophonetic variation at work

- Lawson (2011) ethnographic study on white male adolescents in a Glasgow high school.
- Identifies different friendship groups, focuses on 4 of them.
- On opposite poles: the "schoolies" and the "neds".
- Prototypical ned: adolescent working class male involved in antisocial behavioural practices.
- The different groups differ most in the CAT /a/ vowel.
- Neds lower CAT most – low /a/ indexical as anti-institutional marker.
- Other speakers are aware of this. When another adolescent imitates neds, CAT lowering is the most salient strategy.
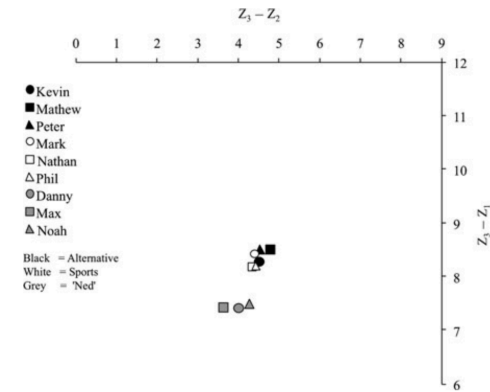
Lawson (2011)

The CAT vowel

Figure 4: Year 2 mean CAT $Z_3 - Z_1/Z_3 - Z_2$ values across speakers (n = 1762)

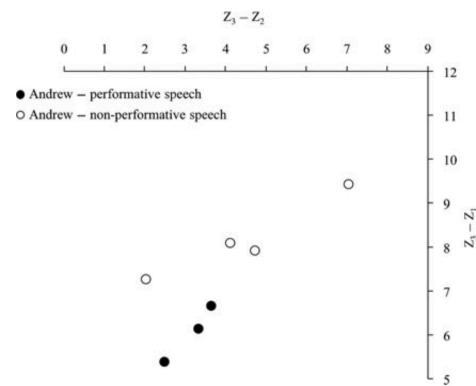## CAT lowering

This can be controlled

Figure 6: Comparison of CAT values for tokens of *man* produced by Andrew (n = 7)

Beyond neds

and into Westminster

- Hall-Lew, Friskney & Scobbie (2017) look at the vowels of Scottish politicians in Westminster.
- Focus on two groups: Labour and SNP, both left-wing parties. Difference: SNP wants independence, Labour is unionist.
- Finding: SNP politicians have a lower cat vowel than Labour politicians, although the difference is small.
- Again, the anti-establishment value of low /a/ at work.
- Important for us here: small phonetic differences can be under the control of speakers, and these differences can have social indexical meaning.
- Is this phonology? If not, evidence for fine phonetic control.

Politicians and vowels
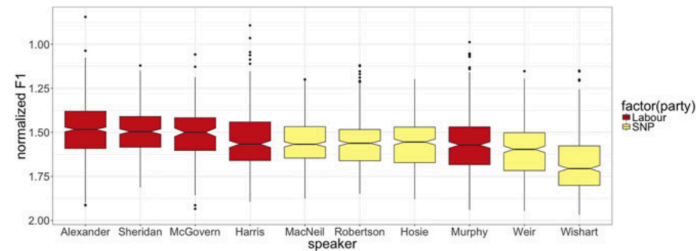
CAT: Labour vs SNP

FIGURE 3. Individual MPs arranged by mean CAT F1. Shading indicates political party (darker = Labour).

Back to the SPE

Vowel contrasts (the classical view)

- Limited number of vowel features, slicing up the vowel space coarsely.
  - [±high, ±low] for 3 degrees of vowel height
  - [±back] (and perhaps [±front]) for tongue position
  - [±round] for lip rounding
  - [±tense/ATR] for tenseness / tongue root advancement
- More isn't necessary from a contrastive viewpoint: These oppositions can capture all existing vowel systems
- For finer distinctions in the phonology, we have to assume the Hale/Reiss view and proliferate the number of features.


Distinctive Features

For example vowels

Back to sociophonetics
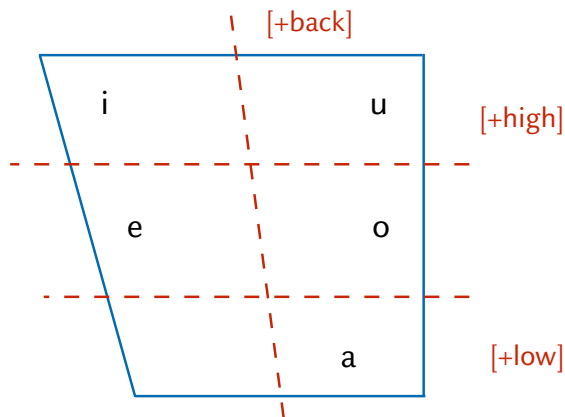
The view from sociolinguistics

- Sociophonetic studies show pervasive small phonetic differences – how does this relate to the course feature matrix?
- Are different systems phonologically equivalent? And when are they not?
- The accretion of small changes can lead to more significant shifts over time (e.g. chain shifts of vowels).
  - Then, when does the change phonologise?
  - Additional problem: these shifts can lead to non-dispersed systems and near-mergers: How can distinctive feature theory account for those?
- Example relevant today: Labov's (1994) "Pattern 3" chain shift, found, among others, in Swedish, French, Albanian …

Variation and Chain Shifts

A problem

Labov's (1994)
Pattern 3 Shift

[+back]

[+high]

[+low]

i u

e o

a

Problems
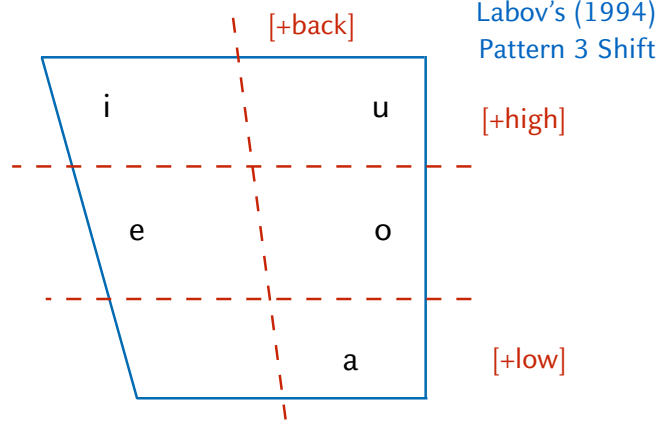
Why phonetic implementation isn't automatic

- Gradience and variation in phonetic realisations demonstrate that phonetic interpretation can't be automatic, and there is more:
  - Multiple cues for single features, cue enhancement strategies (e.g. Raphael 1971, Kingston & Diehl 1994)
  - Gradient effects, including seemingly categorical processes (e.g. partial voicing, cases of incomplete neutralisation, see e.g. Röttger et al. 2014), or non-contrastive reduced articulatory gestures (e.g. Boyce et al. 1991)
  - Influence of non-phonological factors, e.g. frequency effects (e.g. Gahl 2008, Lohmann 2018), morphological constituency (e.g. Plag et al. 2017), other lexical item-specific phonetic 'quirks' (e.g. Pierrehumbert 2002, Drager 2011), etc.

Back to phonology

How to handle phonetic detail

- The realisation that there is a lot of phonetic detail that is language-specific allows for two types of response:
- Phonological representations must be enriched, either à la Hale & Reiss, or they contain phonetic detail (e.g. Kirchner 1997, Flemming 1997).
  - Phonology still "does all the work", but loss of the contrastive function of features.
  - Most radical approach: Exemplar Theory (e.g. Pierrehumbert 2002)
- Phonological representations are reduced to their contrastive function, are more abstract.
  - 'Substance-free phonology'
  - A rich interface, adding non-contrastive detail to phonological representation

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Some ideas

Recap

- Feature specifications are minimal (contrastive) (see also Dresher 2009).
- Features are privative, not binary (see e.g. Blaho 2008, Iosad 2012).
- No full specification at the interface; the output of phonology remains underspecified (pace e.g. Archangeli 1988).
- Features are not universal but emergent (constructed by learners). They define salient phonetic targets as well, but language-specifically.
- Other articulatory specifications are added in phonetics, thus are inherently gradient. Underspecification gives rise to phonetic variation (see also Hall 2011; Ramsammy & Strycharczuk 2016).
- Phonetics is not automatic, but autonomous.

The Pattern 3 Shift Reanalysed

Contrastive specifications

i   u   [high]

o

/i/ = [high, front]
/u/ = [high]
/o/ = [back]

/i/ = [high, front]
/ʉ/ = [high]
/u/ = [**high, back**]
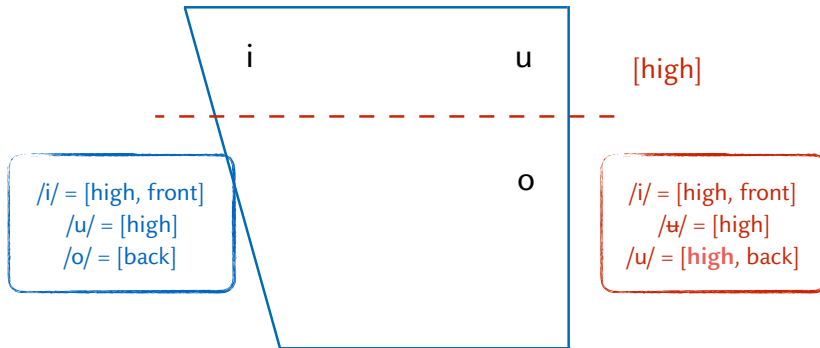
A first discussion

Implications

- ⚠️ The feature specifications of fronting [u] never change. Raised [o] acquires an additional specification, fixing its height.
- Underspecification is a necessary consequence of contrastive privative specifications.
- If specification = phonetic target, then variability on unspecified dimensions is a possible consequence.
  - Conversely, underspecification predicts where variation may be found.
- Near-mergers are also easily explained by underspecification: one of the two members is underspecified for one feature.
- Autonomous phonetic implementation is another consequence, as the output of phonology is underdetermined.
- Now let us put these claims to a test.

Current change in Southern England

The main facts

- A comprehensive vowel shift is occurring in South-Eastern England, not yet well described in the literature. (but see e.g. Bjelakovic 2016, Chladkova & Hamann 2011, Fabricius 2007, Harrington et al 2008, Hawkins & Midgley 2005, Wikström 2013)
- Patterns described here based on analyses of own recordings.
- Best described/known: fronting of high back vowels /uː, ʊ, əʊ/ (GOOSE, FOOT, GOAT)
- Some raising of back /ɔː, ɒ/ (THOUGHT, LOT) and /ʌ, ɑː/ (STRUT, PALM) = Labov's Pattern 3
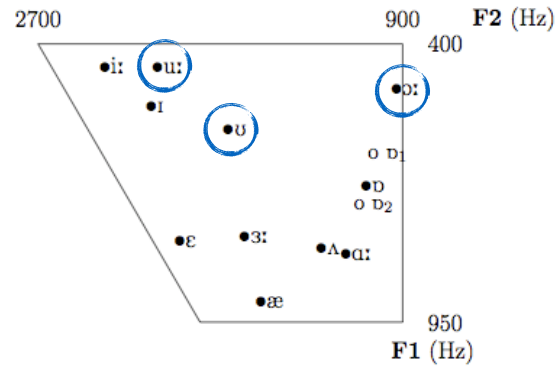- And lowering of front /ɛ, æ, ɜː/ (DRESS, TRAP, NURSE)

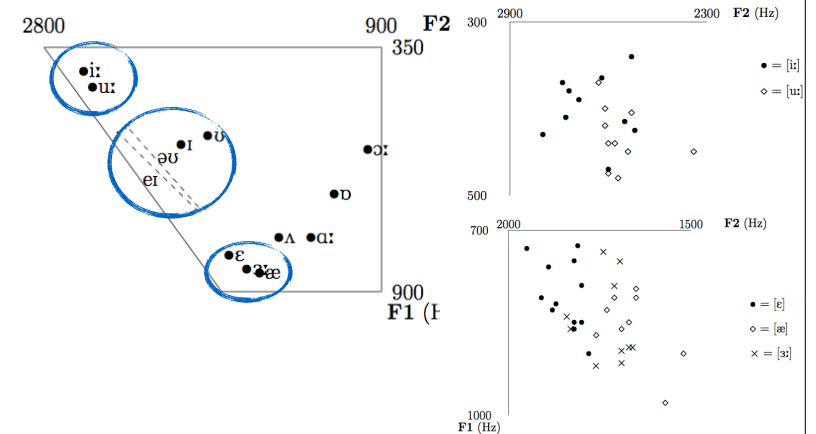## The Southern Vowel Shift

Schematically
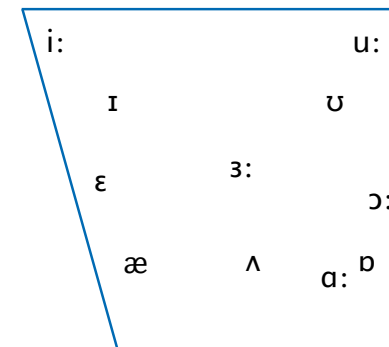
The Southern Vowel Shift

A typical shifter (f, born 1993)

The Southern Vowel Shift

An advanced shifter (f, born 1990)

The Shift

Some examples

- *could* (not *kid*)
- *go* (not *gay*)
- *true* (not *tree*)

Gradience

Variation in /u:/-fronting

- How gradient is /u:/-fronting? Does the phonetics gives us any clue about where to roughly put possible feature boundaries?
- Are there "steps" in the fronting?
- It doesn't look like it. Plus, there is synchronic variation.
- Should we assume different phonologies? If not, the fronting provides evidence that phonetic variation can go much further than small detail. The /u:/ found range from somewhat back to fully front.
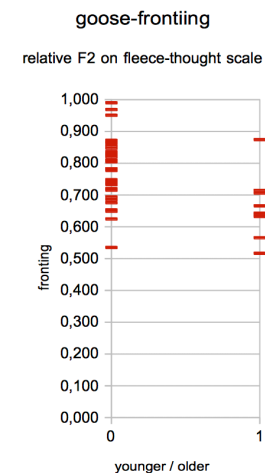
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Hawkins & Midgley (2005)

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Some of my own data

goose-frontiing

relative F2 on fleece-thought scale
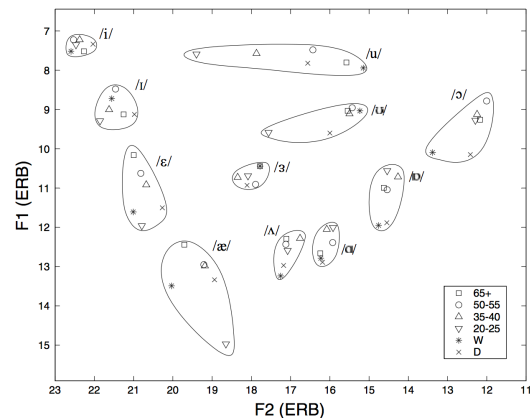
gradient individual differences

Hale & Reiss: how many features?

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Suspended fronting

- The fronting of GOOSE, FOOT, GOAT is blocked or weakened before coda /l/ (see also Hughes et al. 2012 for Northern English). Why?
- /l/ is velarised or even vocalised in codas (as a back vowel [ʊ ~ ɤ]) in Southern England (e.g. Wells 1982, Johnson & Britain 2007) — coarticulatory effect of vocalised /l/
  - and possible cue enhancement: weak perceptual cues for vocalised /l/ are strengthened by backing the preceding V
- How categorical and how strong is this backing before /l/?
- /uː/ and /ɔː/ before /l/ (*call—cool, fall—fool* etc.) sound very similar (owing to the raising of THOUGHT) – a conditioned merger?
- PS. No backing before heterosyllabic /l/ (e.g. in *hula*).

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Methodology

- First empirical study: BA dissertation by Slight (2010); Uffmann & Slight (2011).
  - Not a full-blown variationist study but a pilot study, which nevertheless manages to tease out the main patterns.
- Originally 12 speakers, now 20; all female, from London and the Home Counties (50/50). Today: only focus on London speakers.
- Reading passage containing many vowel+/l/ sequences plus word list (ignored today, but I can comment).
- Analysis in PRAAT: measuring F1 and F2 for vowels, creating vowel space plots.

The call-cool merger

Possible outcomes

- **No merger**; additional question: is backing of /u:/ categorical (possibly phonological) or gradual (phonetic)? call ≠ cool
- **Neutralisation**: same before coda /l/ call = cool
  but: difference reemerges in derived forms calling ≠ cooling
  when /l/ no longer in coda
- **Merger**: same in all contexts — call = cool
  possible lexical restructuring calling = cooling
- Note: basic assumption that *call = caught*; same vowel (THOUGHT)
- Next: main findings of Slight (2010), and more recent data.

The plots

Categories
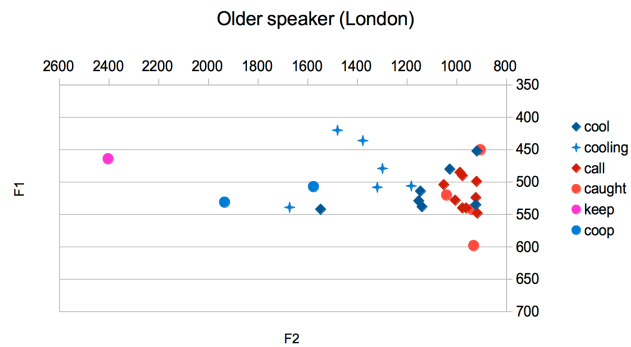
- ■ COOL words
- ■ CALL words
- ✦ COOLING words
- ● CAUGHT words
- ● COOP words
- ● KEEP words

Stage 1: approximation

London, born 1930s

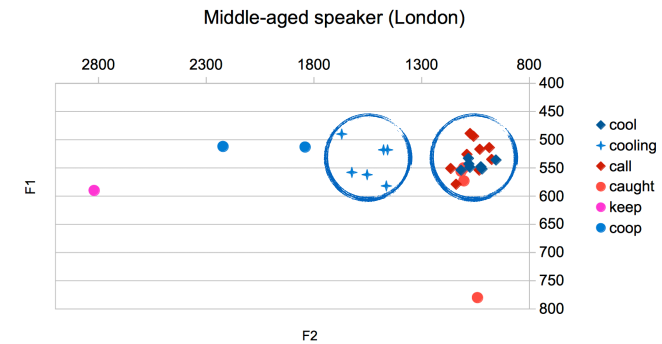call/caught ≠ cool ≠ cooling ≠ coop

Older speaker (London)

from Uffmann & Slight (2011), adapted

Stage 2: neutralisation

London, born 1960s

call = cool ≠ cooling

Middle-aged speaker (London)

from Uffmann & Slight (2011), adapted

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London, born 1980s

call = cool = cooling

Younger speaker (London)

F1

F2

Legend: ◆ cool | + cooling | ◆ call | ● caught | ● keep | ● coop

from Uffmann & Slight (2011), adapted

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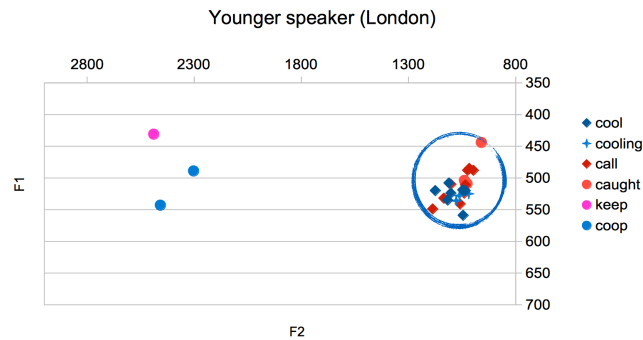
London, born 1990s

call / cool / cooling ≠ caught

young speaker (London)

F1

F2

Legend: ◆ cool | + cooling | ● coop | ◆ call | ● caught | ● keep

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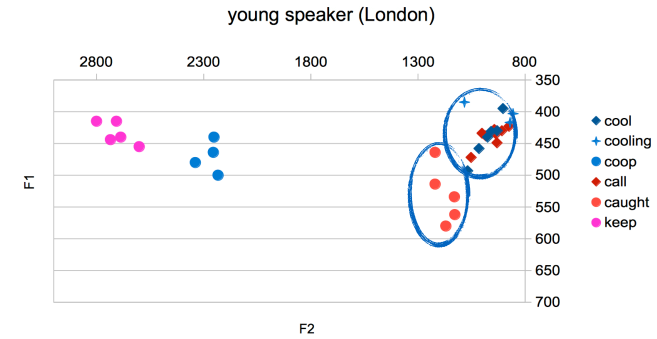
The general pattern

- Diachronically, we see a pattern in which the *cool* words are gradually pulled into the *call* set, while GOOSE is increasingly fronting.
- **Stage 1:** gradient and variable backing of /u:/ before /l/ (phonetic)
- **Stage 2:** backing is phonologised, neutralisation (*cool = call* before coda-/l/), but distinct derived forms; *calling ≠ cooling*)
- **Stage 3:** backed vowel also in derived forms – *cool = call* and *calling = cooling*: merger, possible lexical restructuring (same vowel in underlying forms)

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The emergent pattern (Stage 4)

- Merger *call = cool* but ≠ *caught* – suggests that for some speakers the *call* words are pulled into a *cool* category!
- Note: this is a new category.
  - Old merger: 2 categories (*coop* vs *call, cool, caught*)
  - New merger: 3 categories (*coop* vs *call, cool* vs *caught*)
- Suggests that on top of a merger, we're dealing with a split.
  - GOOSE set splits into core GOOSE and new COOL; CALL words from THOUGHT set join new category.
- But why? And how?

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# Formal Analysis

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Feature specifications

- Recap: feature specifications are minimal; underspecification allows for variation.
- I assume the specifications motivated in the discussion of Pattern 3:
  - /i:/ and /u:/ are [high] vowels (consistently low F1).
  - /i:/ has a clear front articulatory target = [high, front]
  - /u:/ varies in backness, is underspecified = [high]
  - /ɔː/ is back but varies in height, underspecified = [back]
- All the rest is phonetic implementation.

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Formal Analysis

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3 questions

- How can we analyse the backing of /u:/ as a phonological process?
- How does this create a merger?
- How can we account for the emergent pattern where *call = cool* but *caught* is different (a split)?

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Formal Analysis

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The phonologisation of backing
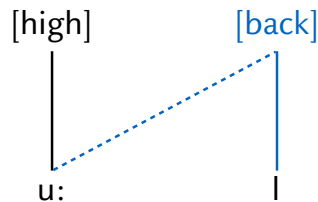
[high]   [back]   velarisation/
                      vocalisation

u: l

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Formal Analysis

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Understanding neutralisation

- This spreading process creates a three-way contrast:
  - [high, front]   [i:]   FLEECE
  - [high]   [ʉː]   GOOSE
  - [high, back]   [u:]   COOL
- But how does this yield neutralisation with *call*, and why in London?
- Another Cockney process: closed syllable raising of /ɔː/ (Wells 1982): *saw* [sɔː] but *sword* [suːd ~ soʊd]
  - Proposal: This raising involves the addition of [high]
- Two ways to create a [high, back] segment:
  - Spreading [back] to a [high] segment (*cool*)
  - Adding [high] to a [back] segment (*caught, call*)

Raising and backing

Example of neutralisation

young speaker (trad. London)

Legend:
- ◆ cool
- + caw
- ● coop
- ◆ call
- ● caught
- ● keep

Axes: F1 (vertical, 350–700), F2 (horizontal, 2800 2300 1800 1300 800)
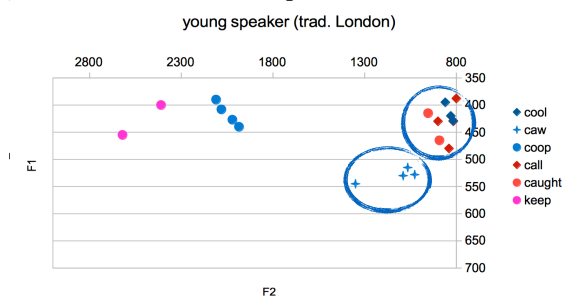
Formal Analysis

Explaining neutralisation

- Takeaway from chart: raised /ɔː/ and backed /uː/ are identical.
- Neutralisation is a consequence of the phonologisation of backing:
  - *call* is [back], and [high] because of closed syllable raising
  - When [high] *cool* becomes [back] via spreading from /l/, a phonologically identical segment is created.
- Neutralisation is thus a consequence of the structural properties of the phonological system of London English.
- But how can we account for the merger, beyond neutralisation (*calling = cooling*)? And about the emergent pattern?

Formal Analysis

Explaining the merger

- One factor: paradigm uniformity, same vowel in related forms.
- But also loss of traditional Cockney features in London vowel system (e.g. Cheshire et al. 2011).
  - Hardly any evidence of closed syllable raising in my younger data.
  - Also: no traces of Cockney Diphthong shift, raised TRAP, DRESS, low STRUT
- Young speakers acquire the neutralisation but not its motivation (closed syllable raising).
- Why should backing of /uː/ then lead to neutralisation?
  - One option: reclassify THOUGHT as [high] in the lexicon (keep the raised variant when the alternation for /ɔː/ goes).
  - Other option, leading to merger: assume *cool* words are underlyingly [back], same as *call* words — neutralising pattern quickly lexicalises.

Formal Analysis

Explaining the split

- Reminder: for some young speakers *call = cool*, but *caught* is separate. Why?
- Loss of closed syllable raising but surface neutralisation gives a second option:
  - Retain [back] for *caught* words; lexicalise both *cool/call* as [high, back]
  - Rather than treating the raised variant of /ɔː/ as underlying, the non-raised variant remains.
  - For *call=cool* a separate [high] specification must be posited.
- Phoneme split, as the merger is pushed into the lexicon.
- Note: lower THOUGHT vowel for the splitters!

Summary of the changes

Recap

- Gradient backing of GOOSE (unspecified for backness) before /l/, more before coda /l/; increased backing = overlap with raised THOUGHT.
- Backing phonologises, is interpreted as spreading of [back] before coda /l/ — neutralisation with raised THOUGHT.
- Then loss of closed vowel raising; neutralisation reinterpreted as lexical merger.
- New category of [high, back] vowel not only in derived forms but enters lexicon — emergent phoneme split (*call-caught* split).


Evidence for a split?

Really? A new category?

- Is there independent evidence for a new underlying (phonemic) category?
- Is the distribution of fronted [ʉː] and backed [uː] starting to become unpredictable? Evidence for lexicalisation.
- Informal experiment: paper and pencil task with 21 young speakers of Southern English who have this split and recognise it.
  Task; which vowel do you have in the following word (all pre-L)?

The GOOSE Split

Data
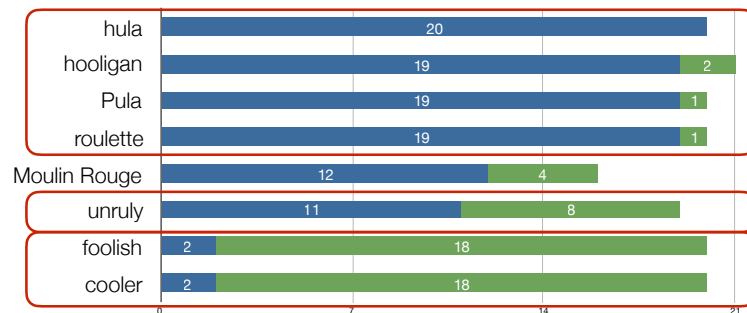
The Split

Discussion

- There is variation, even though the basic generalisation (front variant in monomorphemic items, back variant in morphologically complex items) still holds.
- But considerable variation in less transparent forms: *unruly* evenly split for front/back variant. Other potential words: *coolant*, *tomfoolery*.
- For several speakers, a split for the word *ruler*:
  - [ruːlə] 'someone who rules' (transparently *rule+er*)
  - [rʉːlə] 'stationery item' (not transparent)
- Evidence for an emergent phoneme split!

Beyond GOOSE

A second split

- the same alternation is known for GOAT /əʊ/ – also undergoing fronting to [əʏ], except before coda /l/.
- This alternation is a well-known feature of Cockney phonology, known as the GOAT split or the *wholly-holy* split, though it is analysed as an allophonic alternation, not an actual split (Wells 1982, Harris 1990).
- Front goat vowel /əʊ ~ əʏ/ has a back variant [ɔʊ] before coda /l/.

goat	[gəʊt]	goal	[gɔʊl]
poke	[pəʊk]	pole	[pɔʊl]

- The derived variant is retained under affixation, even though /l/ resyllabifies – surface minimal pairs (paradigm uniformity).

holy	[həʊli]	wholly	[hɔʊli]	(whole+ly)
polar	[pəʊlə]	roller	[rɔʊlə]	(roll+er)

The GOAT split

Split or allophony?

- While morphological constituency is a fairly reliable predictor, there are a number of exceptions and critical cases.
- As with /uː/, there is variation in less transparently complex words.
  - Evidence that in speech processing, morphological structure is gradient, linked to transparency (Hay & Baayen 2005).
- Some observations:
  - While *polar* (complex but Level 1 / Latinate) has front [əʊ], simplex *molar* has back [ɔʊ]. Back [ɔʊ] also in *roly-poly*.
  - Other words show variation: I found *Polish* and *holey* ('having holes') both with front and back variants.
- Conclusion: Same split for mid long GOAT /əʊ/!

Summary

The Southern English vowel system

- What starts out as phonetic change (fronting of back vowels) has profound phonological consequences.
  - Neutralisation leading to a conditioned merger leading to a split.
- Emergence of new (still somewhat marginal) back phonemes, currently restricted to pre-/l/ contexts.

Old system:		New system:		
iː	uː	iː	ʉː	uː
eɪ	əʊ	eɪ	əʏ	ɔʊ
	ɔː			(ɔː)

The new system

in terms of distinctive features

- Originally two-way backness contrast among high vowels: [high, front] /iː/ vs. [high] /uː/
- Non-specification of /uː/ for backness consequence of contrastive specification, fixed on surface by phonetic implementation, which gives rise to phonetic variation, then change (fronting).
- New surface [high, back] segment created via phonological processes (raising/backing).
- New segment gradually percolates into lexicon.
- Result: three-way backness contrast: [high, front] /iː/ vs. [high] /ʉː/ vs. [high, back] /uː/

Summary

Conclusions

- Gradient phonetic change can have radical phonological consequences (emergence of a new set of back vowel phonemes).
- A formal analysis of the changes helps us understand what is going on – a phonological analysis can inform a variationist study!
- Important here: a 'minimalist' theory of distinctive features in which segments are heavily underspecified.
  - Underspecification can accommodate variation. Addition of a specification makes a gradient process categorical.
- Mergers and splits are driven by the structural properties of London English phonology.

Feature Theory

Implications

- Model used here: contrastive specifications; output of phonology is underspecified/underdetermined; autonomous phonetics.
  - Gradient change (e.g. /u:/-fronting) not phonological, but emerging categorical processes are — allows us to maintain distinction between the two.
  - Makes a prediction about what can vary.
  - Autonomous phonetics needed anyway (gradience and detail are ubiquitous).
- Traditional approach (full specifications) is problematic.
  - Why do we get variation and phonetic shifts in the first place?
  - How do new categories emerge?
  - (see e.g. Chladkova & Hamann 2011 claim that fronted /u:/ is still [+back])

Feature Theory

Alternatives

- Alternative: everything language-specific is phonological.
- Consequence: phonetic detail in phonological representations.
  - A fundamental point: substance abuse? (Hale & Reiss 2008) Should a formal symbolic system of representation contain concrete phonetic info?
  - Or we need to explode the number of features.
  - Can it predict the emergence of categorical processes (neutralisation and merger)? How and why? Qualitatively, fronting and merger would be the same.
  - Given variation and change in the Southern English system, does it mean that there are hundreds of different phonologies?
  - As for Exemplar Theory ... that's another talk-

Emergent features

Comparison

- The model proposed here sounds a bit like Mielke's theory of emergent features (Mielke 2008).
  - Language-specific assignment of contrastive (=phonologically relevant) features; autonomous phonetics.
- But: For Mielke features have no phonetic function; the interface to phonetics is elsewhere.
  - Here: Although segments are surface-underspecified, features that are there have clear phonetic correlates.
  - Not clear how the changes could be modelled in a Mielkean system if features have no phonetic correlates at all. Why do new phonological processes emerge?
- More tomorrow!

Emergent features

Reconceptualised

- Feature specifications are language-specific but not exclusively built on phonological patterns.
- Clues from language acquisition.
  - Infants are phonotactic learners, no knowledge yet of morphophonological alternations.
  - Features needed to encode contrast in representations.
  - Attention to salient stable phonetic properties in the signal, mapped on to emergent categories.
  - Process repeated until all segments are contrastively specified (à la Dresher 2009).
  - Consequence: variation in the signal won't be mapped onto features.
  - Are features universal? Yes and no. They are not provided with a priori content.

Questions?

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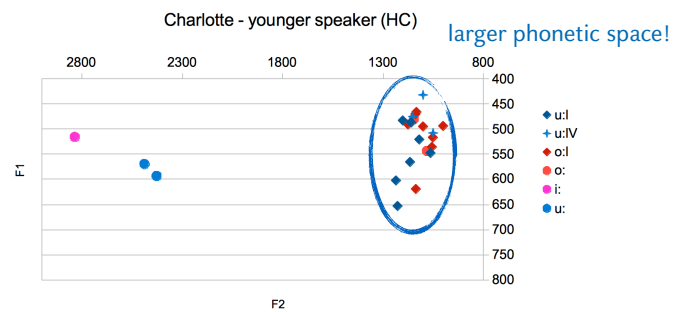

The Home Counties

Comments

- Some preliminary findings:
- More variation; pattern originated in London, is variably adopted: contact-induced merger.
- For some speakers, *call* and *cool* are still distinct, some show the neutralisation pattern,
- when there is a merger, the merged phoneme occupies a larger phonetic space,
- possibility of lexical exceptions (not found in London).
- Explanation: merger not phonologically motivated, as in London — [high, back] segment not available, or when created doesn't lead to merger. Thus, merger only possible in the lexicon.
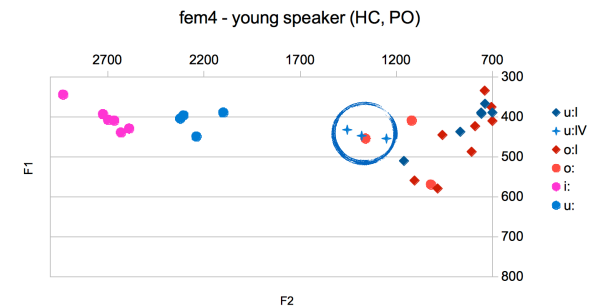

Home counties merger

Kent, born 1980s

larger phonetic space!

from Uffmann & Slight (2011), adapted

Home counties: variation

Portsmouth, born 1990s

HEINRICH HEINE
UNIVERSITÄT DÜSSELDORF

Surrey, born 1960s

fem3 - middle-aged speaker (HC>L)