Phonologization of redundant contrasts and the Contrastivist Hypothesis

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Outline

- Underlying vs. surface contrast in an emergent-features framework
- Smuggling redundant features into the input
- Two case studies:
  - Split with no underlying contrast: Ulster English FACE
  - Split with no surface contrast: Welsh mid vowels
- Refocusing the Contrastivist Hypothesis

1 Emergent features and underlying contrast

1.1 The framework

Basics

- Basically, in this talk I try to reconcile some facts with a framework that I like to think makes sense
  - Phonological representation is not trivial and based on phonological activity
  - Features (and other categories) are not universal but arise through learning ('emergent')
  - Only positive evidence acceptable to construct representations: methodological minimalism (for some definition thereof)

Emergent features

- Basic assumption: hearing a sound doesn't immediately let the learner know what its phonological representation is
- Bottom-up constructionism, cf., among many others, Boersma (1998), Boersma, Escudero & Hayes (2003), Escudero & Boersma (2003), Boersma (2009), Mielke (2007), Morén (2006, 2007), Blaho (2008)
- Some insights here might be compatible in broad outline with an 'unlearning' system à la Hale, Kissock & Reiss (2007), Hale & Reiss (2008), if it is coupled with a contrastivist approach
- Minimalism: no requirement for a substantial, universal statement of substance-to-phonology mapping, categories only arise when needed

Contrastivism

- The Contrastivist Hypothesis (D. C. Hall 2007, p. 20): 'The phonological component of a language *L* operates only on those features which are necessary to distinguish the phonemes of *L* from one another'
- See also Dresher, Piggott & Rice (1994), Dresher & Zhang (2005), Mackenzie & Dresher (2003), Dresher (2009), Compton & Dresher (2011), Mackenzie (2013)
- Minimalism: lexical contrast provides independent evidence for the existence of the relevant categories, no need to draw on other sources

1.2 Quasi-phonemic contrast and its discontents

What is 'phonemic contrast'?

- The Contrastivist Hypothesis as defined above makes a strong prediction: if some distinction is involved in phonological computation, it must be used for 'phonemic' contrast
- 'Phonemic' contrast used to mean *surface* contrast
- Under this interpretation, a simple version of Contrastivist Hypothesis has been argued to be untenable since at least Halle (1959) with the Russian [d͡z] and [d͡ʒʲ]
- One possible response: define 'phonemic' contrast in terms of contrast in *underlying* representations

☞ Cf. the reanalysis of Russian by Dresher (2009), where [d͡z] and [d͡ʒʲ] can get non-redundant [±voice] specification

Secondary splits and quasi-phonemes

- It has long been recognized that the classic approach to secondary split by Twaddell (1938) makes the mysterious assumption that the loss of the conditioning environment does not lead to a reversion of allophony (e. g. Kiparsky 1995, Janda 2003, Bermúdez-Otero 2007)
- If Germanic pre-umlaut [mȳsiz] is /mūsiz/ and /i/ is lost, why does it become /mȳs/ and not /mūs/?
- Solution: phonologization before phonemicization (Hyman 1976, Bermúdez-Otero 2007, Kiparsky 2014)
- The fact of surface contrast is irrelevant if there is clear evidence of phonologization

Derived contrasts

- This set of issues is closely related to the problem of 'derived contrasts' (e. g. Harris 1990, K. C. Hall 2013)
- Scottish Vowel Length Rule / Aitken's Law: complementary distribution in underived forms, contrast (?) in derived forms
- *tide* ['tʌɪd] ≠ *tied* ['tɑɛd], but only because of *tie* [tɑɛ]
- Kiparsky (2014) calls such predictably distributed segments 'quasi-phonemes', seemingly rejects the last remains of contrastivist thinking by disavowing Structure Preservation (which hinges on the notion of 'allophony')

The problem

- Can these facts can be reconciled with the framework I'm trying to adopt?
- If surface contrast cannot tell us anything useful about phonological status, what use is the Contrastivist Hypothesis?
- What is 'contrast' if not 'surface contrast'?

1.3 Proposal

Computation: part of the answer

- All solutions to the 'absent contrast problem' agree in recognizing the importance of computation
- It is what forces the underlyingly distinct segments into predictable distributions

- A phenomenon is 'phonological' if it is involved in *proprietary* phonological computation, i. e. the mapping from sets of proprietary phonological symbols to other sets of proprietary phonological symbols; *modularity* (Reiss 2007, Hale & Reiss 2008, Scheer 2010, Bermúdez-Otero 2012, Hale, Kissock & Reiss 2014; also Foley 1977, Keating 1984, 1988, Morén 2007, Samuels 2011)
- Predictability of *distribution* does not come into this definition of being phonological

Proposed solution

- The motivation for contrastivism here is methodological minimalism: minimize the use of entities for which there is no independent evidence
- This independent evidence is provided by the entities being stored in the lexicon
- The *presence* of something (e. g. a feature) in lexical entries is sufficient to achieve our goals
- Stating 'contrast' in terms of predictability of distribution is an unnecessary additional stipulation

Case studies today

- How do features get into underlying representation?
- Bottom-up learning promotes the lexicalization of predictably distributed categories

2 Case studies

2.1 Ulster English FACE vowel: no underlying contrast

No contrast in underlying representations

- Classic case of 'derived contrast'
- If learning is bottom-up, the setting-up of the categories precedes the learning of relevant rules
- I suggest that the OT principle of Richness of the Base 'smuggles' the surface categories into underlying representations before they can be derived by rule
- Even after the rule is learned, there is no incentive to realign the underlying representations
- Distribution in URs technically predictable, but that's OK

The facts

- Allophony of the Mid Ulster English FACE vowel (Wells 1982, Harris 1985, 1990; Warren Maguire p. c.)
- Two allophones:
  - Lower, monophthongal, written as [ɛː] but not necessarily identical to DRESS in quality (may be [ɛ̝ː])
  - Higher, usually diphthongal [eə]/[e̝ə]/[ɪə], but may be [ɪ], e. g. in some Co. Londonderry varieties (McCafferty 1999)
- Basic distribution: lower allophone when final in a stress domain at the stem level
  - Lower
    * Morpheme-final, underived: *day* [ˈdɛː], *lay* [ˈlɛː]
    * Foot-final, underived: *Mayhew* [ˈmɛːˌhjʉː], *latex* [ˈlɛːˌtɛks]
    * Non-final, derived: *days* [ˈdɛːz], *laid* [ˈlɛːd]
  - Higher: elsewhere
    * Non-final, underived: *daze* [ˈdɪəz], *table* [ˈtɪəb̩]

Surface vs. underlying contrast

- Under a classic phonemic account, there is clearly a contrast between *days* [ˈdɛːz] and *daze* [ˈdɪəz]
- Boundary symbols complicate things a bit: /de-z/ vs. /dez/
- Problem for Lexical Phonology: Lowering is allophonic (non-neutralizing) but stem-level (to account for $[\![^{WL}[\![^{SL}\text{dɛː}]\!]\text{z}]\!]$)

☞ The allophonic issue is a bit blurred: recall that in some varieties we do get [ɪ] for the higher allophone, presumably neutralizing with KIT

- Issue for classic Structure Preservation, although accounted for in Stratal OT, which, like most post-Halle (1959) approaches, refuses to give theoretical status to 'phonemes': see the discussion of Chung's Generalization by Bermúdez-Otero (2012)
- Crucial assumption: both *day* and *daze* actually have the same vowel underlyingly: /de/ vs. /dez/

Why economical URs?

- Basic assumption in early generative phonology: storage is expensive, computation is cheap
- If you *can* derive something, you *should*
- Fewer 'phonemes' (= possible segments in URs) is more economical and thus preferable

Argument here

- Bottom-up learning promotes redundant URs
- No reason to think Ulster English [dɪəz] is anything but /dɪəz/
- Both 'allophones' of FACE are possible in URs ⇒ phonology making reference to them is consistent with the Contrastivist Hypothesis

Bottom-up learning

- A learner faced with Ulster English pairs like [dɛːz]/[dɪəz] is likely to set up [ɪə] and [ɛː] as distinct categories
  - Phonetically robust distinction
  - Relatively little variability
  - Distinction arguably unavoidable if *days* and *daze* are to be distinguishable at all (cf. Hale & Reiss 2008)
- To 'undo' the distinction, the learner has to learn additional conditions
  - Finality in stress domain (opaque generalization!)
  - Stem-level affiliation
- Segmental learning comes first (Bye 2011, Uffmann 2014), so it has to be unlearning

Lexicon Optimization

- If we assume an OT-based grammar, what are the consequences of the learner parsing *daze* as ['dɪəz] and *days* as ['dɛːz]?
- Before the additional stipulations come in, *and given the lack of alternations*, they will be stored faithfully

(1)

		FAITH-[ɪə]	FAITH-[ɛː]	*[ɪə]	*[ɛː]
[dɪəz]	a. ☞ /dɪəz/∼[dɪəz]			*	
	b. /dɛːz/∼/dɪəz/		*!	*	
[dɛːz]	c. ☞ /dɛːz/∼[dɛːz]				*
	d. /dɪəz/∼[dɛːz]	*!			*
[dɛː]	e. ☞ /dɛː/∼[dɛː]				*
	f. /dɪə/∼[dɛː]	*!			*

Refined learning

- The next step is promoting the horribly descriptive constraint *ɪə]$_{\text{Ft}}$
- It doesn't really influence the URs

(2)

		*ɪə]$_{\text{Ft}}$	FAITH-[ɪə]	FAITH-[ɛː]	*[ɪə]	*[ɛː]
[dɪəz]	a. ☞ /dɪəz/∼[dɪəz]				*	
	b. /dɛːz/∼/dɪəz/		*!		*	
[dɛːz]	c. ☞ /dɛːz/∼[dɛːz]					*
	d. /dɪəz/∼[dɛːz]		*!			*
[dɛː]	e. ☞ /dɛː/∼[dɛː]					*
	f. /dɪə/∼[dɛː]		*!			*

What does the constraint actually do?

- The job of *ɪə]$_{\text{Ft}}$ is to rule out a candidate contained in the rich base (McCarthy 2005, Jarosz 2006)

(3)

/dɪə/	*ɪə]$_{\text{Ft}}$	FAITH-[ɪə]	*[ɪə]	*[ɛː]
a. ['dɪə]	*!		*	
b. ☞ ['dɛː]		*		*

- This would otherwise be useful if we had [ɪə]∼[ɛː] alternations, but we don't, as far as I am aware
- This is the stem-level ranking: what about other levels?

☞ Since the stem level never produces candidates with foot-final [ɪə], we don't have to worry about it

Derived contrasts aren't derived

- The fact that the outputs of stem-level computation only allow [ɪə] foot-finally emerges from the learning of the lexicon
- While the relevant rankings are required to exclude phonotactically illicit candidates supplied by the rich base, without alternations there is no evidence that actual lexical items undergo unfaithful mappings
- The 'complementary' distribution in ['dɪəz] vs. ['dɛː] is a fact of the lexicon, not of the grammar

☞ Actually, it is not obvious how complementary it is: not all prosodic structure is stored, so in what sense are the distributions in /dɛː/ vs. /dɪəz/ 'complementary'?

Summary

- As long as the learner sets up the categories, they will become available to enter underlying representations
- Later, the learner needs to set up the grammar that promotes complementary distributions at the stem level

☞ This crucially presupposes that the same categories should be available to Richness-of-the-Base arguments, conceived of as possible elements of underlying representations

- There is no pressure anywhere in the learning mechanism to realign the URs of non-alternating morphemes to make the complementary distribution derived
- 'Derived contrast' does not stop distinctions from entering underlying representations

☞ No problem for the Contrastivist Hypothesis

2.2 South-West Welsh mid vowels: no surface contrast

No contrast in surface representations

- Predictable distribution in surface representations: 'categorical allophony' (Ladd 2006, Kim 2013)
- Phonologized: sensitive to proprietary phonological attributes (feature specification)
- Markedness outranks faithfulness, but presence in underlying representations relies on non-alternating cases and Richness of the Base

Vowel length: North Welsh

- In most Welsh varieties, short and long vowels contrast at least in some positions: examples from Dyffryn Alyn (Thomas 1966)
  - ☞ Minimally, in stressed monosyllables before [n l r]

(4) a. [ˈtʰaːn] *tân* 'fire'
b. [ˈkʰan] *can* 'hundred'

  - Also not strictly speaking a contrast (Wells 1979), but vowels can be short or long depending on following consonants

(5) a. [ˈmaːb] *mab* 'son'
b. [ˈkʰum] *cwm* 'valley'

Vowel quality: North Welsh

- Six vowels enter the length contrast in North Welsh: /i ɨ u e o a/ (G. E. Jones 1984, Mayr & Davies 2011)
- The non-low vowels can be either 'tense' or 'lax': [i]/[ɪ], [u]/[ʊ] etc.
- Unstressed syllables: poorly understood variation, may be to some extent influenced by open/closed character of the syllable (e. g. Thomas 1966, G. E. Jones 1984), but certainly no contrast
- Stressed syllables: long vowels are 'tense' [iː uː eː oː], short vowels are 'lax' [ɪ ʊ ɛ ɔ]

(6) a. [ˈtʰoːn] *tôn* 'tune'
b. [ˈtʰɔn] *ton* 'wave'

Vowel length: South Welsh

- South Welsh has a generally similar system, but the length contrast is also found in stressed penultimate syllables (G. E. Jones 1971, Awbery 1984, 1986, Wmffre 2003)

(7)	a.	[ˈtʰoːn]	*tôn*	'tune'
	b.	[ˈtʰo·ne]	*tonau*	'tunes'
	c.	[ˈtʰɔn]	*ton*	'wave'
	d.	[ˈtʰɔn·e]	*tonnau*	'waves'

- In most dialects, the quality system is generally similar to that seen in North Welsh

Analysis so far

- Vowel length appears to be contrastive, or at least phonologized: witness its interaction with clearly contrastive things like [n l r] moraicity or other segmental features in consonants
- The status of the 'tenseness' distinction is ambiguous: it is fully predictable, but it does not seem to participate in phonological computation in interesting ways
- The neutralization in unstressed syllables — precisely where there is no contrast — is somewhat suggestive of a [±tense] feature only present in stressed syllables (cf. Dyck 1995, 1996, Dresher 2009)

Vowel quality: South-West Welsh

- In south-western dialects of Welsh, *long mid* vowels show an additional type of allophony (Awbery 1986, 2009, C. Jones & Thorne 1992): 'lax' before high vowels, 'tense' before low vowels

(8)	a.	[ˈkʰɔ·di]	*codi*	'to rise'
	b.	[ˈkʰo·dɔð]	*cododd*	'((s)he) rose'
	c.	[ˈgwɛ·dʊχ]	*dywedwch*	'say!'
	d.	[ˈgwe·dɔð]	*dywedodd*	'((s)he) said'

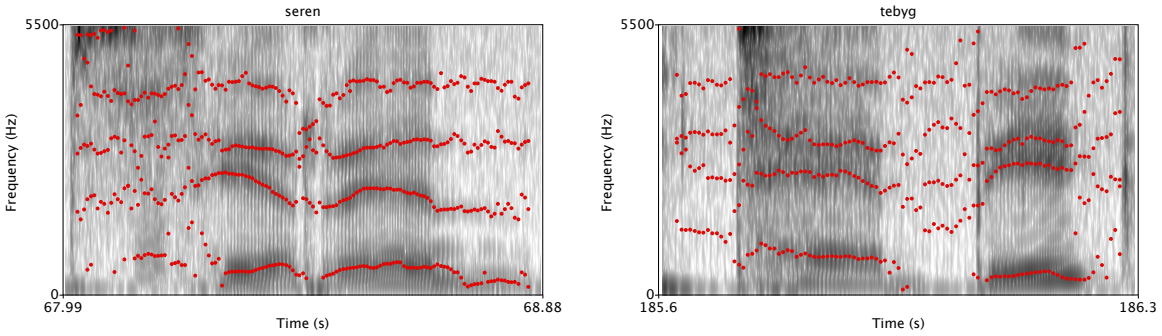
- I suggest that this distinction is *phonologized*
  - Categorical (tbc)
  - Sensitive to phonological structure

Not just undershoot

- Representative examples (speaker from Goodwick, Pembs.)

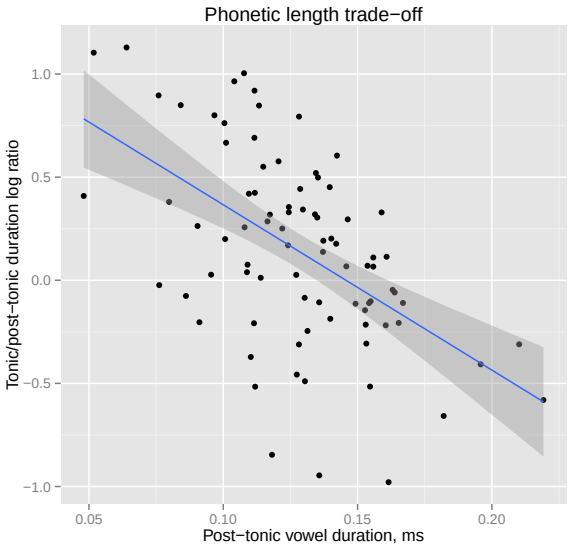
(9) a. ['sɛːrɛn] *seren* 'star'

b. ['tʰɛːbɪg] *tebyg* 'similar'



Phonologization

- Plausible origin: trade-off in inherent length, cf. East Slavic (Crosswhite 2000), Munster Irish (Ó Sé 1984)



- But there does not appear to be a continuous relationship between the length of the post-tonic vowel and the F1 value of the stressed vowel
- (Data analysis ongoing)
- It would seem that the key characteristic of the allophony is its sensitivity to the *phonological* feature [±high] of the following vowel: dissimilation within a foot?
- Precise analysis depends on what high vowels do: again, analysis ongoing

Underlying representations

- How would the learner deal with these cases, assuming they set up the separate categories [ɛː ɔː]?
- We do get alternations, as in *codi* vs. *cododd* (ex. 8)
- Under a classic Lexicon Optimization scenario along the lines of Inkelas (1994), we expect alternating cases to be unspecified for the relevant feature

☞ Crucially, we still expect non-alternating forms to be specified, using the same scenario is above

- Non-alternating instances exist, of course: *wedyn* 'after', *nefodd* 'heaven' (Owens 2013)

Computation is king

- If we assume that [ɛː ɔː] can be phonological categories, the grammar has to provide mechanisms to ensure the correct complementary distribution
- The precise analysis hinges on the representational approach chosen
  - The binary option: alternating mid vowels are underlyingly unspecified for '[tense]', grammar adds the correct specification in stressed position, leaves unstressed vowels unspecified to derive variation
  - The privative option: one of the categories is distinguished by an extra feature, grammar ensures its presence/absence in correct contexts

Obscuring URs

- Either way, /ɛː ɔː/ are *allowed* in underlying representations, they just surface in predictable ways
- If the grammar is set up correctly, we do not, in fact, have to posit underspecified inputs

(10) a. [ˈtʰreː] *tref* 'town'

b. [ˈtʰrɛːvɪð] *trefi* 'towns'

- Lexicon Optimization leads us to expect an underspecified /E/ here, but forms such as these do not really show the sort of variation associated with underspecification
- Might the learner converge on /tre(ː)v/ as the UR, with an unfaithful mapping in the plural?
- Little additional cost, since the grammar needs to deal with disharmonic rich-base inputs

- The precise analysis here really depends on the featural solution, and to an extent on the interpretation of faithfulness constraints

☞ See Krämer (2012, ch. 8) for discussion of the latter point

- (Happy to answer questions)

Summary

- In the case of exceptionless complementary distribution, non-alternating instances will make their way into the lexicon
- The grammar still needs to coerce the categories into the correct distribution:
  - Rich-base forms
  - Possibly unfaithful mappings rather than underspecification in the case of alternations
- No contradiction with the Contrastivist Hypothesis, since the relevant categories are at least possible to *entertain* entering the lexicon, and in all probability found there due to the existence of non-alternating forms

3 Discussion

3.1 Integrating marginal contrasts

Abandoning surface contrast

- There are obviously more types of 'marginal' contrasts than could be covered here
- The combination of bottom-up learning, Lexicon Optimization, and Richness of the Base can lead to categories with predictable distributions appearing in the lexicon
- If phonologization is involvement in phonological computation, we do expect phonologization and lexicalization to go hand in hand
- In that sense, the Contrastivist Hypothesis is true, but has little to do with predictability of distribution

Leaky patterns

- In at least one of the cases discussed here, the conditioning is fairly categorical: foot-final vs. non-foot-final
- We do expect cases where the distributions emerge from fuzzier phenomena, giving the learner substantially more uncertainty in the categorization of the data

- Such patterns may 'leak', with learners assigning an 'unexpected' category (perhaps under pressure from hypercorrection à la Ohala 1981, eventually also morphological factors)
- Exactly the situation found by Uffmann (2014) for GOAT and GOOSE fronting in Southern England
  - Generally coda [ɬ] inhibits fronting, with some cyclic transfer: *r*[oʊ]*ll*, *r*[oʊ]*ller*
  - But cyclic transfer may fail: *p*[oʊ]*le* but *p*[əʏ]*lar*
  - And plenty of variation in genuinely monomorphemic items, as in *m*[oʊ]*lar*
- This is, of course, even less of a problem for the Contrastivist Hypothesis
  - Exceptional (lack of) fronting in monomorphemic items must definitely be stored in the lexicon
  - Same goes for stem-level derivatives like *polar* under some stratal approaches (Bermúdez-Otero & McMahon 2006, Collie 2007, Bermúdez-Otero 2012)

☞ The Ulster English pattern might leak too: Warren Maguire (p. c.) reports ['rɪəˌdar], essentially a minimal pair with ['lɛːˌtɛks]

Summary

- The marginality, or complete absence, of a surface contrast need not prevent its phonologization
- In the present framework, phonologization (as participation in phonological computation) entails lexicalization more or less automatically
- A major prediction here is that even fully predictable distinctions may be phonologized

☞ In a way, this isn't much more than Halle's Russian [d͡ʒʲ] argument

- But now we know these things can be much more 'allophonic', witness the case of post-coronal GOOSE (=/Tuw/) in Philadelphia (Labov, Rosenfelder & Fruehwald 2013)

3.2 Whither the Contrastivist Hypothesis?

Refocusing the CH

- If any of the preceding works, the Contrastivist Hypothesis appears to lose much of its power
- Surface, or even underlying, *contrasts* are of little importance to determining what counts as phonological
- That is actually a desirable result: the true criterion of phonological status is *modularity*

> 'The phonological component of a language L operates only on those features which are necessary to *distinguish* the phonemes of L from one another'

☞ ... and not more than that

No redundant features

- The CH retains its importance when we focus on the 'no redundancy' aspect
- The reasoning is as follows:
  1. Establish the set of phonological elements using *independent* criteria
  2. Assign a set of minimally contrastive specification, e. g. using the Successive Division Algorithm (Dresher 2003, D. C. Hall 2007)
  3. The CH tells us that *no other features* should be available to the phonology
- This arguably preserves the bulk of the empirical results achieved so far through contrastivist enquiry

Conclusion

- It is possible to reconcile contrastivist thinking and bottom-up learning
- The price to pay is the rejection of traditional distributional criteria as diagnostic of 'contrastive', and consequently phonological, status
- This move is overdue in any case, even for avowed contrastivists
- A leaner Contrastivist Hypothesis still retains much of its attraction

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