Representation and variation in substance-free phonology: a case study in Celtic

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1 Plan

- The substance-free approach
- Modularity as motivation for the substance-free framework
- A case study: laryngeal contrast in Brythonic Celtic

2 Substance-free phonology

- Any theory of phonology should have both a representational side and a computational side
- Mainstream SPE-style (with a twist in the Concordia School; Hale and Reiss 2008, *et passim*), much of OT: representations are phonetically grounded and thus relatively easy to recover, computation is paramount
- Unification-based approaches (e. g. Scobbie, Coleman, and Bird 1996; Coleman 1998): computation is trivial, representations are all that matters
- Representations make a contribution, but computation is also important: autosegmental and geometric approaches (McCarthy 1988), various types of underspecification (Archangeli 1988; Steriade 1995; Dresher 2009), structural markedness (Causley 1999; de Lacy 2006), Tromsø-style substance-free (Morén 2006, 2007; Blaho 2008; Youssef 2010), also Odden (2013)

2.1 This thesis: the representational side

- The contrastivist hypothesis: as far as possible, phonology makes use only of features allowed in the lexicon (Dresher 2009; Hall 2007)
- Substance-free representations

  - Features are emergent and language-specific
  - No *a priori* connection to substance (e. g. phonetics)
  - Phonological patterns are the main evidence
  - Non-trivial but constrained phonetics-phonology interface: the phonological analysis does not make *simplistic* predictions about how things should be pronounced

- Geometric approach: the Parallel Structures Model (Morén 2003, 2006, 2007; Krämer 2009; Youssef 2010; Iosad 2012)
  - Tier structure: recursion of tiers
  - Privative (unary) features: no reference to minus values
  - Structural size defines markedness relations without stipulation (contrast de Lacy 2006; Nevins 2010)

- Ternarity and the contrastive hierarchy
  - Unlike other versions of the PSM (and other privative approaches), I allow a contrast between a bare node and the absence of a node
  - So $\langle \times \rangle$ is not the same as $\langle \times, \text{C-lar} \rangle$
  - Tier specification comes from the contrastive hierarchy à la Dresher (2009): when a feature is used for some subset of the hierarchy, the complement that does not get the feature gets the node (Ghini 2001)
  - Potential for ternary contrasts (Inkelas 1994; Krämer 2000; Strycharczuk 2012)

  ☞ Not a free-for-all: since tier structure also defines markedness relationships and feature interaction, this is not (necessarily) a notational variant of binary features

2.2 This thesis: the computational side

- Most flavours of modern phonological theory work with seriously powerful computation that can do just about anything
- This has to be recognized
- Division of labour on two sides
  - With a definition of phonology this narrow, many transcribable patterns will end up in the phonetics–phonology interface even if they reach statistical significance (Scobbie 2007)
  - Conversely, some patterns may be part of the morphosyntactic module rather than phonology (Trommer 2012, especially Bermúdez-Otero 2012; Bye and Svenonius 2012)
- In this thesis, I use stratal rather than fully parallel OT: several passes of computation over morphosyntactically defined domains (Kiparsky 2000; Bermúdez-Otero 2012)

☞ Most importantly: whole-language analysis

- An advantage of OT is that analyses have implications: analysing a part of a grammar is never conclusive
- But a full analysis is impossible without an explicit representational framework
- Extended demonstration in the present thesis
- But why do we need to go substance-free?

3 Modularity in phonology

- Modularity is important for generative theorizing, which is predicated on a type of knowledge that is specific to language
- The *locus classicus* is Fodor (1983), but see also Jackendoff (2000, 2002)
- Contrast parallel architectures in the mould of Rumelhart and McClelland (1986)

3.1 Modularity vs. parallelism in phonology

- A modular approach should involve some domain-specificity
- An uneasy position for classic generative phonology because of the Jakobsonian legacy of substantive markedness and universal features (Jakobson, Fant, and Halle 1951; Chomsky and Halle 1968)
- Contrast Fudge (1967); Foley (1977): generative phonology is wrong because it is 'transformational phonetics'
- Burton-Roberts (2000): phonology is not specifically linguistic in the generative sense, because it is so bound to substance
- Optimality Theory has its roots in PDP, see especially Smolensky and Legendre (2006); Scheer (2010)
- On the other hand, these days OT is often associated with 'formal theorizing', with episodic (laboratory, variationist) approaches on the parallel, non-modular side

3.2 The importance of representations

- A modular theory is more restrictive than a fully parallel one
- In principle, OT can be done in a modular way (van Oostendorp 2007; Bermúdez-Otero 2012)
- This requires serious discipline in formulating constraints

- But constraints are always constraints on representations (Morén 2007)
- If phonology is a module, an aspect of its encapsulation should be the existence of a dedicated universe of discourse (i. e. 'alphabet'; Hale and Reiss 2008)
- So phonetic substance should not come into it: a non-trivial representational theory is needed
- Answering Burton-Roberts' (2000) charge: if the phonological alphabet is not substance-bound, there is still a place for a *linguistic* phonological module

4 An example: Celtic languages vs. laryngeal realism

4.1 Brythonic laryngeal phonology

- In terms of laryngeal phonetics and phonology, Welsh is like English or German
  - Aspirated vs. partially voiced stops
  - Activity of the 'aspiration' feature in the phonology
  - Accords well with the theoretical literature
- Phonetically, Breton is like French (with full voicing of stops)
- But phonologically it is like Welsh
- I analyse Breton with a ternary contrast between voiceless ($\langle \times, \text{C-lar}, [\text{voiceless}] \rangle$), voiced ($\langle \times, \text{C-lar} \rangle$), and delaryngealized ($\langle \times \rangle$) obstruents
- Delaryngealized obstruents only appear word-finally, so we expect two things
  - Cues for laryngeal features should depend on the phonetic rather than phonological context in word-final position (lack of phonological specification)
  - Confirmed: pre-sonorant voicing, phrase-final devoicing, obscuring of all laryngeal-feature cues
  - Word-final obstruents should be inactive in processes implicating laryngeal features, unless they can receive a C-laryngeal node
  - Confirmed: table 1 shows how spreading of C-laryngeal[voiceless] to a preceding obstruent is blocked unless a floating node (coming from the morphosyntax) intervenes
  - Table 1 also shows that C-laryngeal[voiceless] is the active feature/value

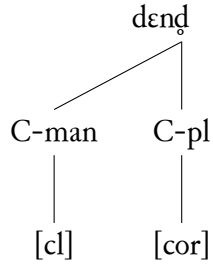
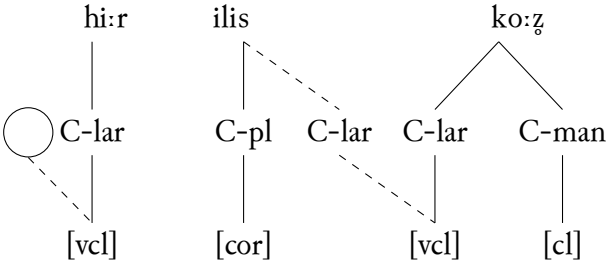
No interaction	Interaction via floating node
	

Table 1: Two types of laryngeal feature interaction

4.2 Resolving problems with laryngeal realism

- Laryngeal realism (Iverson and Salmons 1995, 1999, 2003; Jessen and Ringen 2002; Petrova et al. 2006; Beckman, Jessen, and Ringen, forthcoming; Jansen 2004; Honeybone 2005, 2012) is similar to the present approach in that it ties together phonological behaviour and featural representation
- But there are extra predictions linking those to phonetics
- English-like 'H languages' must have phonologically unspecified lenis stops with *variable* voicing
  - Here, they may have a C-lar specification with no fixed realization (substance-free)
  - Confirmed: consistent prevoicing of lenis stops in Swedish (Helgason and Ringen 2008; Beckman et al. 2011), consistent devoicing of lenis stops in Scottish Gaelic (Ladefoged et al. 1998; Nance and Stewart-Smith, forthcoming)
  - Corollary: incomplete voicing in English does not follow from lack of specification
  - Confirmed (Westbury 1983; Kingston and Diehl 1994)
- French-like 'L languages' must have an active voicing feature
  - Falsified by Breton
- Takeaway: laryngeal realism goes off the rails as soon as it attempts to tie phonology into phonetics

4.3 Recap

- Attention to the phonological rather than to the phonetic patterning shows that phonology trumps phonetics for representational purposes
- The representation can only be uncovered through whole-language analysis
- Analysis of alternations rather than statistically significant distributions is crucial
- Descriptions cannot be taken for granted

5 Where does this leave us?

- Phonological representations are necessary and non-trivial
- Computational theories cannot be verified without inspection of the representations
- Consequence: the analytic focus of mainstream OT on factorial typology with very narrow predictions may be premature
- The predictions of formal phonology are architectural rather than specific and substance-bound (Odden 2013, also Strycharczuk 2012)

References

Archangeli, Diana. 1988. Aspects of underspecification theory. *Phonology* 5:183–207.

Beckman, Jill, Pétur Helgason, Bob McMurray, and Catherine Ringen. 2011. Rate effects on Swedish VOT: evidence for phonological overspecification. *Journal of Phonetics* 39 (1): 39–49.

Beckman, Jill, Michael Jessen, and Catherine Ringen. forthcoming. Empirical evidence for laryngeal features: aspirating vs. true voice languages. *Journal of Linguistics*.

Bermúdez-Otero, Ricardo. 2012. The architecture of grammar and the division of labour in exponence. In Trommer 2012, 8–83.

Blaho, Sylvia. 2008. The syntax of phonology: a radically substance-free approach. PhD diss., University of Tromsø.

Blaho, Sylvia, Patrik Bye, and Martin Krämer, eds. 2007. *Freedom of analysis?* Studies in Generative Grammar 95. Berlin: Mouton de Gruyter.

Burton-Roberts, Noel. 2000. Where and what is phonology? In *Phonological knowledge: concepts and empirical issues,* ed. Noel Burton-Roberts, Philip Carr, and Gerard Docherty, 39–66. Oxford: Oxford University Press.

Bye, Patrik, and Peter Svenonius. 2012. Non-concatenative morphology as epiphenomenon. In Trommer 2012, 427–495.

Causley, Trisha. 1999. Complexity and markedness in Optimality Theory. PhD diss., University of Toronto.

Chomsky, Noam, and Morris Halle. 1968. *The sound pattern of English.* New York: Harper / Row.

Coleman, John. 1998. *Phonological representations: their names, forms and powers.* Cambridge Studies in Linguistics 85. Cambridge: Cambridge University Press.

De Lacy, Paul. 2006. *Markedness: reduction and preservation in phonology.* Cambridge: Cambridge University Press.

Dresher, B. Elan. 2009. *The contrastive hierarchy in phonology.* Cambridge: Cambridge University Press.

Fodor, Jerry. 1983. *Modularity of the mind: an essay on faculty psychology.* Cambridge, MA: MIT Press.

Foley, James. 1977. *Foundations of theoretical phonology.* Cambridge Studies in Linguistics 20. Cambridge: Cambridge University Press.

Fudge, Eric C. 1967. The nature of phonological primes. *Journal of Linguistics* 3 (1): 1–36.

Ghini, Mirco. 2001. Place of articulation first. In *Distinctive feature theory,* ed. T. Alan Hall, 147–176. Phonetics and Phonology 2. Berlin: Mouton de Gruyter.

Hale, Mark, and Charles Reiss. 2008. *The phonological enterprise.* Oxford: Oxford University Press.

Hall, Daniel Currie. 2007. The role and representation of contrast in phonological theory. PhD diss., University of Toronto.

Helgason, Pétur, and Catherine Ringen. 2008. Voicing and aspiration in Swedish stops. *Journal of Phonetics* 36 (4): 607–628.

Honeybone, Patrick. 2005. Diachronic evidence in segmental phonology: the case of obstruent laryngeal specification. In *The internal organization of phonological segments,* ed. Marc van Oostendorp and Jeroen van de Weijer, 319–354. Studies in Generative Grammar 77. Mouton de Gruyter.

———. 2012. Lenition in English. In *Handbook on the history of English: rethinking approaches to the history of English,* ed. Terttu Nevalainen and Elizabeth Closs Traugott, 773–787. Oxford: Oxford University Press.

Inkelas, Sharon. 1994. The consequences of optimization for underspecification. *NELS* 27:287–302.

Iosad, Pavel. 2012. Vowel reduction in Russian: no phonetics in phonology. *Journal of Linguistics* 48 (3): 521–571.

Iverson, Gregory K., and Joseph C. Salmons. 1995. Aspiration and laryngeal representation in Germanic. *Phonology* 12 (3): 369–396.

———. 1999. Laryngeal bias in Germanic. *Linguistische Berichte* 178:135–151.

———. 2003. Laryngeal enhancement in early Germanic. *Phonology* 20 (1): 43–74.

Jackendoff, Ray. 2000. Fodorian modularity and representational modularity. In *Language and the brain: representation and processing,* ed. Yosef Grodzinsky, Lew Shapiro, and David Swinney, 4–30. San Diego: Academic Press.

———. 2002. *Foundations of language: brain, memory, grammar, evolution.* Oxford: Oxford University Press.

Jakobson, Roman, Gunnar Fant, and Morris Halle. 1951. *Preliminaries to speech analysis.* Cambridge, Mass.: MIT Press.

Jansen, Wouter. 2004. Laryngeal contrast and phonetic voicing: a Laboratory Phonology approach to English, Hungarian and Dutch. PhD diss., University of Groningen.

Jessen, Michael, and Catherine Ringen. 2002. Laryngeal features in German. *Phonology* 19 (2): 189–218.

Kingston, John, and Randy L. Diehl. 1994. Phonetic knowledge. *Language* 70 (3): 419–454.

Kiparsky, Paul. 2000. Opacity and cyclicity. *The Linguistic Review* 17 (2–4): 351–367.

Krämer, Martin. 2000. Voicing alternations and underlying representations: the case of Breton. *Lingua* 110 (9): 639–663.

———. 2009. *The phonology of Italian.* Oxford University Press.

Ladefoged, Peter, Jenny Ladefoged, Alice Turk, Kevin Hind, and St. John Skilton. 1998. Phonetic structures of Scottish Gaelic. *Journal of the International Phonetic Association* 28 (1): 1–41.

McCarthy, John J. 1988. Feature geometry and dependency: a review. *Phonetica* 45:84–108.

Morén, Bruce. 2003. The Parallel Structures model of feature geometry. In *Working Papers of the Cornell Phonetics Laboratory,* 194–270. Vol. 15. Ithaca, NY.

Morén, Bruce. 2006. Consonant–vowel interactions in Serbian: features, representations and constraint interactions. *Lingua* 116 (8): 1198–1244.

———. 2007. The division of labour between segment-internal structure and violable constraints. In Blaho, Bye, and Krämer 2007, 313–344.

Nance, Claire, and Jane Stewart-Smith. forthcoming. Pre-aspiration and post-aspiration in Scottish Gaelic stop consonants. *Journal of Phonetics.*

Nevins, Andrew. 2010. *Locality in vowel harmony.* Linguistic Inquiry Monograph 55. Cambridge, MA: MIT Press.

Odden, David. 2013. Formal Phonology. In X years of CASTL phonology and L years of Curtness, ed. Sylvia Blaho, Martin Krämer, and Bruce Morén-Duolljá. *Nordlyd* 40 (1): 24–43.

Petrova, Olga, Rosemary Plapp, Catherine Ringen, and Szilard Szentgyörgyi. 2006. Voice and aspiration: evidence from Russian, Hungarian, German, Swedish and Turkish. *The Linguistic Review* 23 (1): 1–35.

Rumelhart, David E., and James L. McClelland. 1986. *Parallel distributed processing.* Vol. 1. Cambridge, MA: MIT Press.

Scheer, Tobias. 2010. *A guide to morphosyntax–phonology interface theories: how extra-phonological information is treated in phonology since Trubetzkoy's* Grenzsignale. Berlin: Mouton de Gruyter.

Scobbie, James M. 2007. Interface and overlap in phonetics and phonology. In *The Oxford handbook of linguistic interfaces,* ed. Charles Reiss and Gillian Ramchand, 17–52. Oxford: Oxford University Press.

Scobbie, James M., John S. Coleman, and Steven Bird. 1996. Key aspects of declarative phonology. In *Current trends in phonology: models and methods,* ed. Jacques Durand and Bernard Laks, 685–710. Salford: European Studies Research Institute, University of Salford.

Smolensky, Paul, and Géraldine Legendre. 2006. *The harmonic mind: from neural computation to Optimality-Theoretic grammar.* Cambridge, MA: The MIT Press.

Steriade, Donca. 1995. Underspecification and markedness. In *The handbook of phonological theory,* ed. John Goldsmith, 114–174. Oxford: Blackwell.

Strycharczuk, Patrycja. 2012. Phonetics–phonology interaction in pre-sonorant voicing. PhD diss., University of Manchester.

Trommer, Jochen, ed. 2012. *The phonology and morphology of exponence: the state of the art.* Oxford Studies in Theoretical Linguistics 41. Oxford: Oxford University Press.

Van Oostendorp, Marc. 2007. Derived environment effects and Consistency of Exponence. In Blaho, Bye, and Krämer 2007, 123–149.

Westbury, John R. 1983. Enlargement of the supraglottal cavity and its relation to stop consonant voicing. *Journal of the Acoustical Society of America* 73 (4): 1322–1336.

Youssef, Islam. 2010. Laryngeal assimilation in Buchan Scots. *English Language and Linguistics* 14 (3): 321–345.