

# Improving the Formalism of Phonological Parameter Hierarchies

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## 1 Introduction

- building on Ulfsbjorninn (2017), we investigate Phonological Parameter Hierarchies in the domain of syllable structure
- these hierarchies capture and formalize the observation that phonological parameters are not always independent of each other - there are implicational universals that relate possible and impossible parameter settings and the resulting grammars to the representations they build/permit in a specific way
- the setting of certain parameters *depends* on having set another parameter to Yes because due to the hierarchical organization of the relevant parameters, only Yes settings lead to the next parameter
- the effect: if a parameter that is high up in the hierarchy is set to No, not only is the specific part of the structure that would have been licensed by *this* parameter not licensed, any other parameter below it can never be set to Yes - this accounts for the existence of implicational universals
- as a side-effect, this gives new life to the notion of markedness: syllable structure markedness converts directly into the complexity of a representation (R), and the corresponding number of positive setting of parameters (P) required to describe/permit it

## 2 Background A: Universals and Markedness

- universals and markedness mean different things to different people: if we are aiming to formalize phonology (like we are today), vague concepts have to either be eliminated or formalized (with the result that they are not vague anymore)
- the way that universals are understood in modern phonology is largely a product of how the concept is treated in the Sound Pattern of English (SPE) (Chomsky & Halle 1968): accepting the poverty of stimulus argument, the language faculty must have internal properties. Being internal, they must be universal.

- universals are distinguished as being either formal or substantive (see Nevins 2009 for discussion), where “formal universals [...] determine the structure of grammars and the form and organization of rules. In addition, there are substantive universals that define the sets of elements that may figure in particular grammars.”
- SPE’s Chapter 9 decision to include substantive universals in phonological theory causes a core dividing line across phonologists to this day:
- Optimality Theory embraces it, phonetically natural tendencies are encoded in phonological ‘markedness constraints’. Constraints are universal, but they are ranked, so that one constraint may be violated to satisfy another. The content of the constraints limits possible grammars to those which can be generated by their ranking.
- contrastingly, Substance Free Phonology (Hale & Reiss 2008; Samuels 2006; 2017 and articles within; Blaho 2008; Scheer 2010; Iosad 2017), argues that markedness has no place in a formal theory of phonological competence. In SFP and in GP (cf. Kaye 2005), phonology and phonetics are distinct modules and phonology is prior to the phonetics. Therefore substantive properties are all exterior to phonology and therefore cannot be part of phonological competence
- this is overlapping with Evolutionary Phonology and Blevins’ program for eliminating phonological universals (2004, 2009, 2017). Because there is no phonology-internal consideration for what is phonetically natural, and this approach seems to claim that all universals related to the shape of representations are empirically falsified (Blevins *ibid.*)
- this is an overextension: **we claim that universals and markedness have a place in phonology: typological universals are *explained* by universal parameter hierarchies (in that principles and parameters are not independent in this model), and markedness turns out to be an epiphenomenon of depth in the hierarchy**

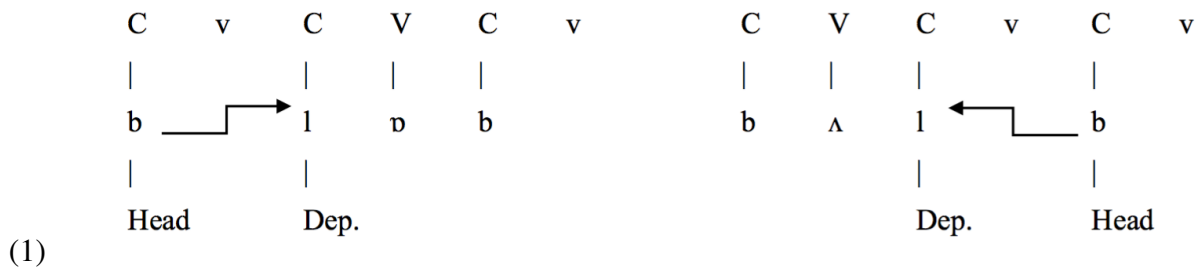
### 3 Background B: Syllable Structure

- the basics:
- CV syllabification is a universal and no language allows only vowel-initial and consonant-final words (Arernte is not a counterexample cf. Topinzi & Nevins 2017).<sup>1</sup>
- Strict CV is a theory of representation where there is a strictly alternating skeleton of C and V slots which may remain empty creating phonetically adjacent Cs and Vs (Lowenstamm 1996; Scheer 2004). All positions are interpretable, so the silencing of each position requires an explicit instruction
- in Strict CV, a vowel-initial word requires the initial onset to be marked as empty and not interpreted by the phonetics: it requires the parameter **Empty Onset** to be set to Yes, whereas **Onset** is a principle and thus not subject to variation

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<sup>1</sup>Languages with only consonant-final words are vanishingly rare. Blevins (2017) cites Semai languages, in particular Jahai, however these are explained as conditions on feet (Ulfsbjorninn in prep.)

- following Charette (1990, 1992), monomorphemic CCs are always composed of two members (excluding s+C(C) clusters): a head and a dependent. In rime-onset sequences the head is on the right, while in branching onsets the head is on the left. Branching onsets are called Indirect CCs, and coda-onset clusters: Direct CCs.



- every CC has to be licensed by a nucleus to its right: **crucially, which nuclei are able to license which CCs is subject to parametric variation:**
- **Filled<sub>CC</sub>** is the parameter which determines whether or not a filled nucleus licenses a preceding CC
- the parameters **Final Empty<sub>CC</sub>** and **Medial Empty<sub>CC</sub>**, respectively, determine whether empty nuclei in final or medial positions may also license a preceding CC
- the parameter **Indirect** determines whether Indirect CCs or only Direct CCs are licensed in the language
- the resulting typology is the one in (2) (cf. Ulfsgjorninn 2017)
- from that, the following implicational relationships can be extracted:

- (2)
- a. **Empty** implies **Filled**
  - b. **Medial** implies **Final**
  - c. **Indirect** implies **Direct**<sup>2</sup>

- in Strict CV, syllable structure conforms to a universal template. Crucially, in the default and unmarked state, each C and V position is filled with featural content or would otherwise receive phonetic interpretation (epenthesis)
- under this view, every positive parameter setting means moving away from the CV-CV baseline: a positive parameter setting can, for example, allow the presence of an empty category or introduce a new licensing relation
- importantly, all parameters have the same polarity, so that only positive settings allow more complex representations

<sup>2</sup>We are aware of apparent counterexamples to this claim, which amounts to saying that monomorphemic tautosyllabic consonant clusters ‘TR’ imply the presence of heterosyllabic ‘RT’ consonant clusters (Charette 1990, 1992), from Malagasy, Kru/Gbe languages, and Tai-Kadai, but these can all be discounted.

- phonological parameter hierarchies formalize this crucial difference between No and Yes settings as a matter of depth

		Filled Nuclei				Empty Nuclei			
		Medial		Final		Medial		Final	
		Direct	Indirect	Direct	Indirect	Direct	Indirect	Direct	Indirect
1	Yoruba & Ewondo	no	no	no	no	no	no	no	no
2	Pulaar & Sinhala	yes	no	yes	no	no	no	no	no
3	Côte d’Azur FR	yes	yes	yes	yes	no	no	no	no
4	Korean & Pohnpeian	yes	no	yes	no	no	no	yes	no
5	English	yes	yes	yes	yes	no	no	yes	no
6	Quebec FR	yes	yes	yes	yes	no	no	yes	yes
7	Morin’s FR	yes	yes	yes	yes	yes	no	yes	yes
8	Polish	yes	yes	yes	yes	yes	yes	yes	yes
		A	B	C	D	E	F	G	H

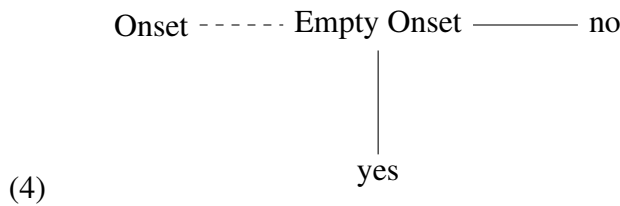
(3)

## 4 Phonological Parameter Hierarchies

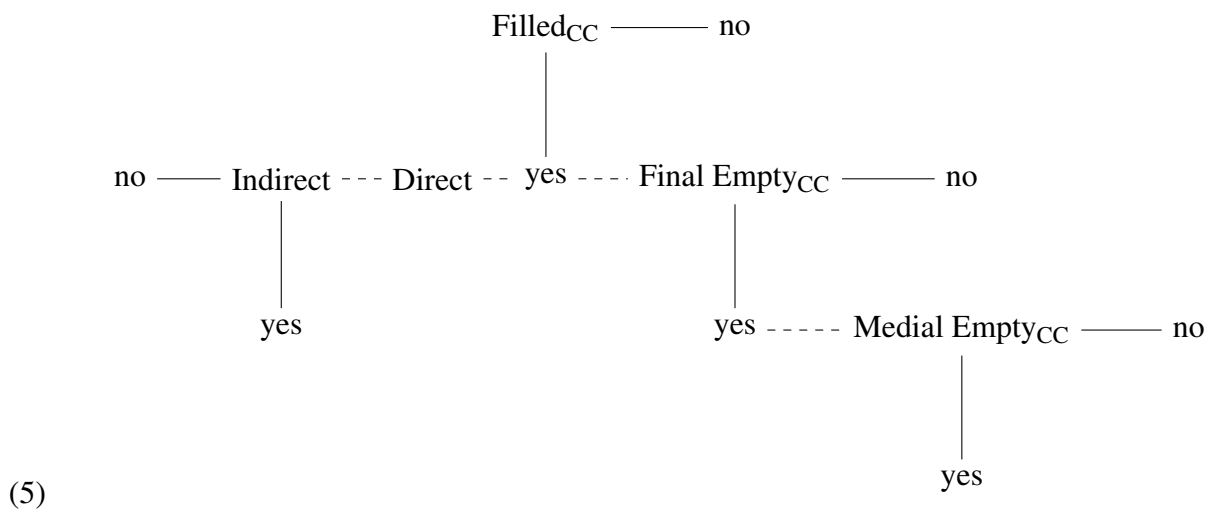
- fixed parameter hierarchies have already been applied in the syntax (Baker 2001; Roberts 2012; Biberauer & Roberts 2012a,b, 2014a,b; Biberauer et al. 2013; Biberauer 2013; 2014a,b; Sheehan 2013; Andriani 2016) (although they are not without criticism in that domain (Boeckx & Leivada 2013)), their extension to phonology improves our understanding of universals and typological variation
- following Ulfsgjorninn (2017), we take as a starting point the relationship between the principle **Onset** and the parameter **Empty Onset**
- **Onset** and **Empty Onset** are both on the highest level of the parameter hierarchy in (4)
- **Onset**, as a principle, does not have a decision point
- if the language has only consonant-initial words, **Empty Onset** will remain set to No. No is the default setting, it does not *allow* a move away from the CVCV

baseline, and it does not *require* moving to a more deeply embedded level of the hierarchy

- a vowel-initial word requires the parameter **Empty Onset** to be set to Yes
- Yes settings correspond to a descent in the hierarchy
- they are like falling through a trapdoor to a more complicated place: Yes settings increase markedness



- the hierarchy in (4) gives a formal account of a typological fact. Moreover, it makes markedness epiphenomenal on the representation in an interesting way
- things get more exciting if we turn to CC clusters:

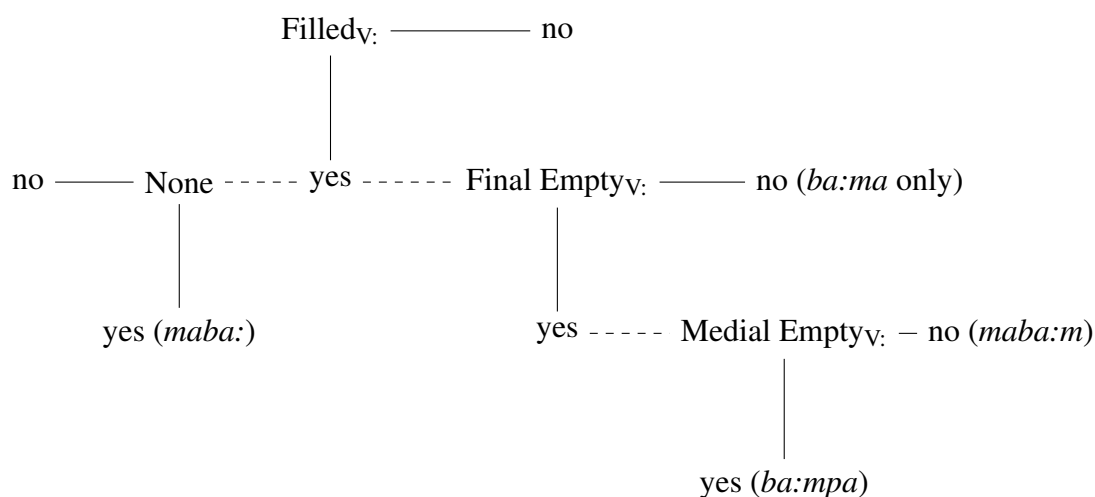


- the typological universals identified in the previous section are explained by the hierarchy because the setting of a parameter can now be contingent on the Yes (!) setting of a higher parameter
- every Yes setting corresponds directly to an extra piece of empty structure or an extra licensing relation *and* to greater depth in the hierarchy. Markedness reduces to “the number of Yes settings”.
- interestingly, a similar hierarchy emerges with respect to another category that has been argued to require licensing from a following nucleus: vowel length (Yoshida 1993; Kaye 1995; Scheer 2004)
- a representative typology of vowel length is shown here based on Ulfsgjorninn & Balogné-Bércecs (2018)

Long vowel typology (° indicates clarification required which we don't have space to go into here)

Env	V:C.CV/#	V:C#	V:#
Lang	ba:mpi/Ø	ba:m	bama:
Licensor type	MEN	FEN	None
<b>Type 1</b>			
Chugach	*	*	*
<b>Type 2</b>			
Turkish	*	*	✓ <sup>°</sup>
Hausa	*	*	✓
<b>Type 3</b>			
Icelandic	* <sup>°</sup>	✓	✓ <sup>°</sup>
<b>Type 4</b>			
Cairene Arabic	*	✓	*
<b>Type 5</b>			
Palestinian Arabic	✓ <sup>°</sup>	✓	*
<b>Type 6</b>			
Hungarian	✓ <sup>°</sup>	✓ <sup>°</sup>	✓

(6)



(7)

- these parameters are not the same, but they pattern in the same way, again, it is again the case that **Empty** implies **Filled** and **Medial** implies **Final**
- this shows us yet another advantage of this formalism: it allows us to ask the question *Why is the hierarchy this way?*
- interestingly, the implicational statements “Empty implies Filled” and “Indirect implies Direct” have third factor explanations. First, Emptiness is more marked than Filledness considering that phonology is a module devoted to externalisation (Chomsky, Hauser & Fitch 2002; Chomsky 2005) and therefore phonological objects that will receive no phonetic interpretation need extra licensing and extra stipulations in the grammar (not less). Second, the fact that Indirectness implies Directness follows from the principle of locality, which has far deeper foundations than just linguistics – a true ‘third factor’.
- two of the implicational relationships that we identify have clear ‘third factor’ explanations but the third does not. Which begs the question: how did it become this

way? Crucially these questions can only be asked with such clarity due to the formalism employed in the analysis of the typology (specifically Strict CV principles). In an instance of McCarthy's famous edict: "if the representations are right, the rules will follow" (1988:84).

### To conclude:

- comparing the consonant cluster and long vowel distributions reveal some interesting observations. It reveals three implicational universals: (a) Empty implies Filled, (b) Medial implies Final, and (c) Indirect implies Direct. Of these, a & b are shared by both parameter hierarchies.
- the parameter hierarchy model that we have presented distinguishes formally between principles and parameters and explains the typological universals by the hierarchical structure of the parameters
- moreover, representational complexity always implicates a Yes setting which takes us deeper into the parameter hierarchy. Markedness in this model is an epiphenomenon corresponding to the amount of empty structure or licensing conditions in the representation (R) which also corresponds directly to the number of Yes settings in the parameter hierarchy (P) which licenses it.
- the next step will be to establish why the implicational relationship in the parameters are what they are (we've offered some initial speculations). This question only becomes accessible once the proper formalism has been adopted.

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