

Creating Boundaries and Stops in German: A Universal Boundary Theory analysis

Introduction This paper discusses representations of prosody in Universal Boundary Theory (UBT). UBT uses no tiers or hierarchies, and has only a single boundary symbol |, which is part of the segmental string. We illustrate UBT with German, which has distinct processes applying at the syllable level (obstruent devoicing) and the foot level (?-insertion). Despite this, a single boundary symbol is sufficient to account for the data. German ?-insertion in particle verbs is handled through *derivation by phase*, a substance-free approach to the syntax-phonology interface (Samuels 2009, 2010). Finally, we consider how UBT naturally accounts for lexically-specific phonology with contrastive boundaries, an advantage over theories which assume that prosodic structure (e.g. syllabification) is not stored. In conclusion, UBT is a promising theory of how prosody is represented phonologically. UBT also provides analyses of syntax-phonology interactions, and lexically-specific processes, two important areas of research in phonology.

?-insertion There is interspeaker variation for ?-insertion in German. The varieties of interest to us behave as in (1) (Kloeke 1982, Booij 1985, Kohler 1994, Wiese 2000: 58-61, i.a.). Irrelevant details are left out of IPA transcriptions throughout. Stress is marked with IPA tone diacritics.

- (1) Exhaustive list of environments where ? can appear for some German speakers
- | | | | |
|----|---------------------------------------|-------------------|---------------------------------|
| a. | Word-initial (stress-independent) | [ʔýb-ʊŋ], [ʔatóm] | 'practice (n.)', 'atom' |
| b. | Foot-initial (morpheme-internal) | [kaʔót-ɪ] | 'chaotic' |
| c. | Foot-initial (morpheme-initial) | [dóʊç-ʔátmən] | 'breathe deeply' |
| d. | With certain suffixes | [ʃtúdént-ʔm] | 'student (any gender)' |
| e. | Not with otherwise identical suffixes | [ʃtúdént-m] | 'student (female)' ¹ |

These generalizations have been described in terms of feet in previous literature (Wiese 2000: 58). We will assume the following rule for ?-insertion ([syll] abbreviates [syllabic]):

?-Epenthesis $\emptyset \rightarrow ? / _ [+syll]$. We will then place | symbols so as to capture (1) a.-e. UBT assumes that inputs to the phonology are automatically padded with initial and final |. (1) a. follows automatically from this assumption: |ýbʊŋ| \rightarrow |ʔýbʊŋ| (**?-Epenthesis**). For (1) b., we need to insert | before stressed vowels in hiatus. Since stress is contrastive in German ([ténœ] 'substance' vs [tenóʊ] 'tenor singer'; Wiese 2000: 9), we assume it is present underlyingly. Stress is represented with the feature [stress], giving: |-Epenthesis $\emptyset \rightarrow | / [+syll] _ [+syll, +stress]$. (1) b. is then: |kaótɪ| \rightarrow |ka|ótɪ| (**|-Epenthesis**) \rightarrow |ka|ʔótɪ| (**?-Epenthesis**).

For (1) c., we rely on derivation by phase (Samuels 2009, 2010), where each syntactic phase is subject to a separate round of phonological computation. The relevant German particles in (1) c. are generated in a separate phase from the lexical verb (Biskup et al. 2010). With this background, (1) c. follows: |átmən| \rightarrow |dóʊç|átmən| (next phase added, automatic |-padding)² \rightarrow |dóʊç|ʔátmən| (**?-Epenthesis**).

This leaves only (1) d. and e. Since both suffixes here only add information about gender, it seems unmotivated to assume that different phases are involved. Instead, the patterns appear to be genuinely suffix-specific. In many theories, prosodic structure is not stored (see Blevins 1995 for discussion), so that (1) d.-e. would require either lexically-specific processes or a marginally-

1 For the distinction between the gender-neutral [ʔm] <-In> in (1) d. and the female [m] <-in> in (1) e., see Banovics (2012), Stratton (2018), Zinfoun (2018), Kolek (forthc.), i.a. The same contrast can be shown with other suffixes, e.g. [régən-ʔɛçt] 'rainproof' (? with <-echt>) vs. [dró-ʊŋ] (no ? with <-ung>; see Booij 1985).

2 It is irrelevant for our purposes how primary and secondary stress are assigned, and so this is left out here.

contrastive /ʔ/ in German. In UBT, however, | is simply part of the segmental string. Just like other segments, we expect it to be contrastive in some languages. We suggest that this is exactly what is found in (1) d.-e., with the female suffix /ɪn/, and the gender-neutral suffix /ɪn/. The surface forms then follow from **ʔ-Epenthesis**. To summarize, the data in (1) are accounted for as follows in UBT (presented in the order (1) a.-e. from left to right):

(2)	Phase 1	ýbʊŋ	kaótiʃ	átmən	ʃtʊdént ɪn	ʃtʊdéntɪn
	Phase 2	-----	-----	dóʋɛç átmən	-----	-----
	-Epenthesis	-----	ka ótiʃ	-----	-----	-----
	ʔ-Epenthesis; SR	ʔýbʊŋ	ka ʔótiʃ	dóʋɛç ʔátmən	ʃtʊdént ʔɪn	ʃtʊdéntɪn

Final devoicing Apart from the data in (1), German has other prosodically-conditioned phonology, such as syllable-final obstruent devoicing. In theories with a prosodic hierarchy, it is not a problem to have processes applying at different levels (e.g. syllable-based devoicing and foot-based epenthesis), something which is intuitively more difficult with only one boundary. UBT can, however, account for the data rather easily. We proceed as above, first stating the devoicing rule, and then placing boundaries so that the rule applies correctly: **Devoicing** [+voice, -sonorant] → [-voice] / . Two syllabification rules take care of those syllable boundaries which are not already marked with | by virtue of being foot boundaries.

- (3) **Tautosyllabic Clusters (TC)** Ø → | / V_ [-sonorant, -continuant][-syll, +sonorant]
Syllable-Crossing Clusters (SCC) Ø → | / VC_ C

As (4) below shows, we now have everything we need for the syllable- and foot-level patterns:

(4)	Phase 1	kaótiʃ	públikʊm	óʋgtə	ébən
	Phase 2	-----	-----	bə óʋgtə	áb ébən ²
	-Epenthesis	ka ótiʃ	-----	-----	-----
	ʔ-Epenthesis	ka ʔótiʃ	-----	bə ʔóʋgtə	ʔáb ʔébən
	TC	-----	pú bli kʊm	-----	-----
	SCC	-----	-----	bə ʔóʋg tə	-----
	Devoicing; SR	ka ʔótiʃ	pú bli kʊm	bə ʔóʋk tə	ʔáp ʔébən
	Translation	'chaotic'	'audience'	'eyed (3sg)'	'fade, ebb out'

Conclusion This paper attempts to show that accounting for prosodic phonology may not require much representational complexity. UBT's single boundary | is sufficient for intricate syllable- and foot-level patterns in the phonology of German, including certain syntax-phonology interactions. With the possibility of contrastive |, UBT also provides a natural account for the lexically-specific aspects of ʔ-insertion, which are difficult to analyze in theories where prosodic structure is not stored. In conclusion, UBT is a promising theory of prosodic phonology, which can account for a wide range of empirical data with a very simple set of representations.

Selected references Biskup, P., Putnam, M., & Smith, L. C. (2010). German Particle and Prefix Verbs at the Syntax-Phonology Interface. *Leuvense Bijdragen*, 97, 106–135. Kolek, V. (Forthc.). Options for Labelling Non-heteronormative People in a German-Czech Comparison. In D. Scheller-Boltz (Ed.) Frankfurt: Peter Lang. Samuels, B. (2009). *The Structure of Phonological Theory*. PhD: Harvard. Wiese, R. (1996). *The Phonology of German*. Oxford: OUP.