

## Gradient Symbolic Representations and the Typology of Ghost Segments: An Argument from Gradient Markedness

Eva Zimmermann (UBC Vancouver)

Eva.Zimmermann@uni-leipzig.de

**Main Claim:** Ghost segments are best analysed as weakly active elements. This analysis, *first*, allows a unified explanation for the typology of ghost segments where both phonological and lexical factors are relevant in determining whether a ghost segment is realized and, *second*, predicts that ghost segments can only gradiently contribute to markedness if they surface. This latter phenomenon is straightforwardly predicted under an account based on Gradient Harmonic Grammar and impossible under alternative accounts of ghost segments.

**Ghost segments:** Ghost segments alternate with zero and only surface if their realization either 1) solves a markedness problem, 2) does not create a new markedness problem, or 3) if they appear in certain lexical contexts (Archangeli, 2011). An example for type 1)+3) can be found in *Catalan* (Bonet et al., 2007) where masculine nouns are realized with an /u/ to avoid a sibilant cluster that would be created after adding the plural suffix /-s/ (1-b) (vs. regular epenthetic /ə/). In addition, an arbitrary class of masculine nouns always surface with this additional /u/, independently of any markedness (1-c). The masculine suffix in Catalan can hence be analysed as a ghost segment /u/ that only surfaces if it avoids a marked structure or receives lexical support from certain nouns. An example for a ghost segment of type 2) is found in *Ahousaht Nuu-chah-nulth* (Kim, 2003) where certain suffixes begin with consonants that only surface post-vocally (2). The non-realization of the ghost consonants thus avoids two marked structures: A coda for (C)V-suffixes ((2-a): \*/tʰis.qumʔ/) and a complex coda for (C)CV-suffixes ((2-b): \*/kʷisk.ʔa:/). Both structures are possible outside the context of ghost consonants in *Ahousaht*.

<p>(1) <i>Catalan</i> (Bonet et al., 2007, 916+917)</p> <p>a. sál    sáls    ‘salt(s)’ (fem)</p> <p>b. pás    pásus    ‘step(s)’ (masc)</p> <p>c. mosu    mosus    ‘lad(s)’ (masc)</p> <p style="padding-left: 2em;">(cf. mos-ə ‘lad’ (fem.Sg))</p>	<p>(2) <i>Ahousaht</i> (Kim, 2003, 178)</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"></td> <td style="width: 50%; border-left: 1px solid black; padding-left: 10px;">a. /-(q)umʔ/    b. /-(k)ʔa:/</td> </tr> <tr> <td></td> <td style="border-left: 1px solid black; padding-left: 10px;">‘round’    ‘to be called’</td> </tr> <tr> <td style="border-top: 1px solid black; padding-top: 5px;">V__</td> <td style="border-left: 1px solid black; border-top: 1px solid black; padding-left: 10px; padding-top: 5px;">ʔatʔa-qumʔ    ʔu-kʔa:</td> </tr> <tr> <td style="border-top: 1px solid black; padding-top: 5px;">C__</td> <td style="border-left: 1px solid black; border-top: 1px solid black; padding-left: 10px; padding-top: 5px;">tʰis-umʔ    kʷis-ʔa:</td> </tr> </table>		a. /-(q)umʔ/    b. /-(k)ʔa:/		‘round’    ‘to be called’	V__	ʔatʔa-qumʔ    ʔu-kʔa:	C__	tʰis-umʔ    kʷis-ʔa:
	a. /-(q)umʔ/    b. /-(k)ʔa:/								
	‘round’    ‘to be called’								
V__	ʔatʔa-qumʔ    ʔu-kʔa:								
C__	tʰis-umʔ    kʷis-ʔa:								

**A unified account of ghost segments based on gradient activity:** Under the assumption of Gradient Symbolic Representations, phonological elements can have different degrees of presence in underlying representations, expressed as numerical activities (Smolensky and Goldrick, 2016; Rosen, 2016). Deletion of a weakly active element hence does not violate MAX to the same degree as deletion of a fully active element does. I argue in this talk that together with the assumption of Harmonic Grammar (Legendre et al., 1990), gradient activity predicts the typology of ghost segments. The masculine suffix /-u/ in *Catalan*, for example, is taken to be weakly active in the underlying representation. Since all output elements have to be fully active in Catalan, realization of such a weakly active vowel implies adding activity (under violation of DEP) and is hence more costly than realization of a fully active segment. In Catalan, this additional violation of DEP is only tolerated if it helps to reduce markedness. The second context in which the weak vowels are realized are those where the DEP violations can be avoided altogether since the weak vowel receives additional lexical activity. The latter is taken to be another weakly active /u/ in the representation of those nouns that always surface with /u/. These two weak elements can then coalesce in order to pass the activity threshold for realization.

**Gradient activity and gradient markedness:** The ghost consonants in *Ahousaht* are also taken to be underlyingly weakly active with an activity of only 0.5. Since MAX is only violated by -0.5 if such a weakly active segment remains unrealized, deletion of a ghost consonant is the

preferred option to avoid a syllable coda (cf. (4)) or coda cluster although fully active segments are never deleted to avoid such marked structures in Ahousaht. Under the new assumption that elements can retain their weak activity in the output, weak activation also has crucial consequences for the evaluation of markedness constraints. More concretely, a weakly active consonant in Ahousaht only violates \*COD by -0.5 if it surfaces in coda position (3-a) – a weak violation of a constraint that is tolerated. If realization of a weakly active consonant pushes a fully active consonant into coda position, however, a full violation of \*COD results (4-a) and non-realization of the weakly active consonant becomes optimal (4-b). The asymmetry between marked structures that are created by weakly active segments and those created because of weakly active segments we observe in Ahousaht hence straightforwardly falls out under the assumption of Gradient Harmonic Grammar: Weakly active elements are not only easier to delete, they also can surface in more marked environments than fully active segments.

(3) /-(C)CV/: Coda tolerated

(4) /-(C)V/: Coda avoided

$\tau_1 u_1 - k_{0.5} \tau_1 a_1$	MAX 20	*COD 14		$\tau_1 i_1 s_1 - q_{0.5} u_1 m_1 \tau_1$	MAX 20	*COD 14	
a. $\tau_1 u_1 k_{0.5} \tau_1 a_1$		-0.5	-7	a. $\tau_1 i_1 s_1 - q_{0.5} u_1 m_1 \tau_1$		-2	-28
b. $\tau_1 u_1 \tau_1 a_1$	-0.5		-10	b. $\tau_1 i_1 . s_1 u_1 m_1 \tau_1$	-0.5	-1	-24

**Alternative accounts:** The gradient markedness contribution of ghost segments that is exemplified in the Ahousaht case study cannot be analysed under alternative accounts based on autosegmental defectivity (=ghost segments are phonologically defective and lack, for example, a segmental root node, cf. Archangeli (1983, 1991); Hyman (1985); Szypra (1992); Zoll (1998, 2001)) or listed allomorphs (Bonet et al., 2007). In Ahousaht, the constraint preferring non-realization of the ghost segment (e.g. DEPRIVATION under a defectivity account or PRIORITY under an allomorphy account) must be ranked/weighted above \*COD for a context where the weak consonant would cause a fully active consonant to surface in coda position (Cf. (4-a)) but ranked/weighted below \*COD for a context where the weak consonant itself is expected in coda position (Cf. (3-a)) – a ranking/weighting paradox emerges.

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