Segmental Constraints on Geminates and their Implications for Typology

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Phonological analyses of geminate consonants traditionally appeal to constraints on or rules referring to prosodic well-formedness (Hayes 1989, Samek-Lodovici 1992) and are largely concerned with geminate representation (Davis 1999). This focus on prosody alone carries the implication that all geminates behave the same, regardless of segmental composition. In point of fact, few languages permit gemination of all consonants in their inventories, suggesting that independent of prosodic acceptability some geminate types are more well-formed than others. I argue here that to explain this fact constraints on geminates must refer to segmental composition.

Working in the framework of Optimality Theory, I propose a set of segmental constraints on geminates, against geminate voiced obstruents (*DD), sonorants (*RR), fricatives (*SS), and gutturals (*GG). Each constraint is motivated on articulatory or perceptual grounds. When undominated these constraints occasion phonological alternations between geminates and non-geminates (e.g., consonant sequences, long vowels), as illustrated here:

Language		*Buginese*	*Selayarese*	*Wolof*	*Biblical Hebrew*
Relevant Constraint		*DD	*RR	*SS	*GG
Gemination Permitted	Input	maC + nasu	taʔ + pelaʔ	ub + Ci	haC + yad
	Output	ma**nn**asu	ta**pp**elaʔ	u**bb**i	ha**yy**ad
	Gloss	‘go to market’	‘get lost’	‘open’	‘the hand’
Gemination Prohibited	Input	maC + deceŋ	taʔ + lesaŋ	sof + Ci	haC + ʔav
	Output	ma**ʔd**eceŋ	ta**ʔl**esaŋ	so**pp**i	h**aːʔ**av
	Gloss	‘ask forgiveness’	‘be removed’	‘disjoin’	‘the father’

The proposed set of constraints predicts a number of implicational universals holding on the shape of geminate inventories cross-linguistically:

(1) *The presence of any geminate implies the presence of geminate voiceless obstruents*, since the set contains no constraint prohibiting geminate voiceless obstruents.
(2) *The presence of geminate fricatives implies the presence of geminate stops.* This universal is due to the articulatory motivation of *SS. The articulation of fricatives differs from that of stops in that the upward moving gesture must be counteracted in geminate fricatives by another gesture preventing the constriction from being realized too fully, which could result in a stop articulation (Kirchner 2000).
(3) *The presence of geminate sonorants implies the presence of geminate sonorants of lower sonority*. This pattern stems from the perceptual motivation of *RR. Length contrasts are perceived most easily when accompanied by major jumps in intensity (Kato et al. 1997). Geminate sonorants exhibit intensity levels comparable to the vowels that surround them, thus making difficult the perception of length among sonorants. According to the sonority scale proposed by Clements (1990), sonorant consonants have different sonority levels: from highest to lowest, glides – liquids – nasals. The perceptual motivation of *RR, together with the sonority scale, suggests that a language permitting a given geminate sonorant should also permit geminate sonorants of lower sonority.
(4) *The presence of geminate gutturals implies the presence of all other geminates*, due to a universal ranking of *GG over the other constraints in the set.

A cross-linguistic survey of geminate inventories in fifty-two languages upholds the generalizations predicted by the proposed constraint set. Thus segmental constraints on geminates account for geminate alternations and also work cross-linguistically to restrict permissible geminate inventories from within the grammar.