

## **Word-final sonorant-obstruent cluster resolutions in loanwords, acquisition and historical change: What \*NC cannot explain.**

This study examines cluster simplification patterns employed in various phonological data. The focus is on the reduction patterns of English word-final sonorant-obstruent clusters when they are adapted into CV and CVC languages as loanwords. Consonant clusters of foreign words are overwhelmingly accommodated through vowel epenthesis in most languages; while in some languages consonant deletion seems to occur in a disciplined way. By comparing cluster reduction patterns in several languages, preference scales for retention of consonants emerged. One of the most robust preference scales found in our data, namely the one for obstruents in the final post-sonorant context (VR\_#) is the following: sibilant fricative (S) > voiceless plosive (T) > voiced plosive (D). For example, the final /t/ of the English word *account* or *elephant* is deleted in Cantonese, Samoan and Marshallese but preserved in Yoruba and Fijian. Sibilants in the same post-nasal position are retained in all of these languages except that Marshallese has variable patterns. /d/ in the same position is deleted in Cantonese, Samoan, Marshallese and Yoruba, but is variably adapted via deletion and epenthesis in Fijian.

The output forms preserving N(asal)T and NS sequences but deleting D from ND contradict the phonetically-motivated \*NC constraint (C denotes here a voiceless consonant) by Pater (1999). The NT vs. ND discrepancy in loanword patterns in CV languages cannot be easily handled by sonority constraints either, since deletion of D leaves more sonorous N in the onset position (see Barlow 2003 for analysis of similar acquisition patterns of word-medial NT/ND clusters). The deletion patterns seem in fact conditioned by the perceptual robustness of certain segments in particular phonetic contexts. Our working hypothesis is that covert knowledge of the perceptibility of sounds in context, the 'P-map' (Steriade 2001ab), underlies loanword adaptation. A perceptual approach to our cases is justified by acoustic facts and auditory functions. Acoustic energy of sibilants is the highest among the consonantal sounds, and release of voiceless plosives is more robust than that of voiced counterparts. In addition, voiceless plosives' longer hold stage can contribute to the perception of their release by the peripheral auditory system where sonorous sounds prevent an immediately following sound from being clearly perceived for a short period of time (i.e. perceptual forward masking). In a formal analysis of cluster reduction, as proposed in previous studies (Steriade 2001ab; Côté 2000), perceptibility scales correspond to Max rankings of segments containing specific features in the OT grammar. Thus, the perceptibility scale (VR\_# : S > T > D) can be translated as (Max-S >> Max-T >> Max-D/VR\_#). By incorporating scaled Max constraints into the general OT grammar of a language, cluster resolution patterns in that particular language obtain.

The results from English loanwords are further compared with cluster simplification patterns in child acquisition data from English and Spanish, French and English creolisations, and French and English dialects. In these comparisons, the perceptual scale appears to be active in both historical and synchronic axes (cf. also Côté 2000 for the role of perceptual constraints in many synchronic processes).

For the topic of the relative roles of grounded markedness in synchronic and diachronic grammars, at least some of the apparent counterexamples to an articulatorily-based markedness, namely \*NC, may be handled by perceptually-based constraints (see Hyman 2001 for other counterexamples and analyses). Hence, opposite resolution patterns may occur within phonetically-grounded grammar itself depending whether they originate from articulatory or perceptual constraints.

## References

- Barlow, Jessica (2003) Asymmetries in the acquisition of consonant clusters in Spanish, *Canadian journal of linguistics* 48 (3/4): 179-210.
- Côté, Marie-Helene (2000) *Consonant cluster phonotactics: a perceptual approach*, Ph.D. Dissertation, MIT.
- Hyman, Larry, M. (2001) The limits of phonetic determination in phonology \*NC revisited, In E. Hume and K. Johnson (eds.) *The role of speech perception in phonology* San Diego: Academic Press, 141-185.
- Pater, Joe (1999) Austronesian nasal substitution and other NC effects. In R. Kager, H. van der Hulst & W. Zonnevelt (Eds.) *The prosody-morphology interface*, Cambridge: Cambridge Univ. Press, 310-343.
- Steriade, Donca (2001a) Directional asymmetries in place assimilation a perceptual account. In E. Hume and K. Johnson (eds.) *The role of speech perception in phonology* San Diego: Academic Press, 219-250.
- (2001b) *The phonology of perceptibility effects: the P-map and its consequences for constraint organisation*, ms. UCLA.