Indexation to stems and words predicts long-distance morphophonological effects

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Phonology is frequently sensitive to properties of the morphemes to which an operation or constraint applies. In Optimality Theory (OT), one way this has been accounted for is by allowing constraints to be *indexed* to certain classes of words, e.g. to roots (McCarthy and Prince 1993), loanwords (Itô and Mester 1995, 2001), nouns (Smith 2001, 2006), specific lexical items (Pater 2000; Becker et al. 2011), or exceptional suffixes (Pater 2007, 2009).

An key observation in this work has been that morphological sensitivity is *local*: the presence of an exceptional affix in a word does not cause all other affixes to behave exceptionally. Pater (2007, 2009) thus explicitly limits the reach of indexed constraints, so that the locus of violation of an indexed constraint must be part of the exceptional morpheme itself.

The locality of indexed constraint evaluation is challenged, however, by the existence of clearly non-local patterns, described in recent work by Jurgec (2014), and Gouskova and Linzen (2015). They describe cases in which an exceptional property of a root is *suppressed* in certain morphological contexts. The profile of such cases can be seen in the Tagalog data in (1): *f* is permitted in bare loanword roots, but not in prefixed or suffixed words, where the segment is nativized to *p*.

(1) Tagalog morphologically derived environment effects: f → p (Zuraw 2006; Jurgec 2014)

BARE ROOT [f]		PREFIXED [p]		SUFFIXED [p]	
filipino	'Filipino'	mag-pilipino	'language'	pilipino-ŋ	'DEF'
fiesta	'feast'	pam-pista	'INSTR'	pista-han	'festival'

We propose that such apparently non-local effects can be captured in terms of local constraint evaluation, but only if we allow constraints to be indexed not only to individual morphemes, but also to complex morphological constituents such as stems and morphological words. We share with many others the view that indexed constraints can be sensitive to both morpheme type (e.g. root, affix) and to arbitrary lexical specification (McCarthy and Prince 1993; Itô and Mester 1995, 2001; Beckman 1998; Pater 2000; Flack 2007; Gouskova 2007; Jurgec 2010).

Our extension is that indexed constraints must further be specified for the morphological domain to which they apply, whether this is a single morpheme or a constituent consisting of a root plus zero or more affixes (i.e. a stem or word). Assuming that morphosyntactic notions of headedness are not visible within the phonological component, however, we propose that if a constraint indexed to stems or words is further restricted to some arbitrary class L, it will apply only if all morphemes in the stem or word are equally specified as L. This extension predicts that marked structures can be preserved in stems or words that contain a single morpheme (i.e. a root belonging to an indexed class), but not in stems or words that are complex (i.e. containing at least one non-exceptional affix). This prediction is borne out in long-distance morphologically derived environment effects found in many languages, including Tagalog, Dutch, and Slovenian.

Beyond the restriction to local evaluation, indexation has also been argued to be possible only for faithfulness constraints (Itô and Mester 1995, 1999; Inkelas and Zoll 2007), preventing markedness constraints from being indexed. While this prediction seems true in the domain of loanword nativization, we suggest that other cases of long-distance morphologically derived environment effects can be accounted for only if we admit indexed markedness constraints, specifically illustrating with a case of variable vowel retention in Russian, discussed in Gouskova and Linzen (2015).

Overall, morphologically derived environment effects constitute an unusual case of non-local interactions arising from the interplay of exceptional phonological patterns and morphological structure of words. These patterns have constituted a serious challenge for theories of locality and exceptionality in phonology, but we show that a simple extension of lexical indexation to refer to morphological domains can successfully account for them.

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