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Editor-in-Chief
MANFRED KRIFKA

Comparative markedness

Target Article by
John J. McCarthy

Comments
Mike Armstrong
Lev Blumenfeld
Megan Crowhurst
Elizabeth Hume
Ania Łubowicz
Joan Mascaró
John J. McCarthy
Jeff Mielke
Marc van Oostendorp
Moira Yip

Comparative markedness and derived environments

JOAN MASCARÓ

McCarthy's paper contains a simple idea with important consequences. The simple idea is that markedness constraints come in two brands, $_{O}$M and $_{N}$M. Whereas a "classic" markedness constraint *M bans the structure M, $_{O}$M does so only if M is present in the input and $_{N}$M only if M is not present in the input. The idea is simple but the array of consequences that it entails is by no means simple. It can be implemented in different ways; some of the implementation problems are discussed by the author, others are left for the future. As for the consequences, some are theoretical (relations to local constraint conjunction, sympathy, stratal OT) others empirical. The latter involve new predictions (grandfather effects) and older empirical domains, like counter-feeding opacity and derived environment effects (DEE). In this reaction to McCarthy's paper I will concentrate on the latter.

DERIVED ENVIRONMENTS. The observation that some processes apply in derived environments but fail to appear in nonderived ones is an old one (Kiparsky 1973). Traditionally, the distinction was made between morphologically derived environments (e.g. halut+i is morphologically derived for t palatalization, which applies before i) and rule derived (in Makassarese, ʔ-insertion after a vowel does not apply after underlying Vs but does apply if this vowel is inserted by rule). Since derived environment effects seem to be somehow inherently derivational, it can be expected that they constitute a challenge to parallel OT. Here I will address some cases of DEE which seem to present serious difficulties for such an analysis.

A potential class of cases that are not treatable under a strict OT analysis are those in which the structure is new, but not distinct from the old one. These are cases of vacuous rule application: in derivational terms it is

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possible to define *derived* under vacuous application. In strict technical derivational terms when [αF]→[βG] applies to X[αF, βG]Y it replaces the feature [βG] with [βG] itself, but the rule *has* applied and the structure is derived. Such an approach is not possible when there is no derivation, since there can be no vacuous application of rules where there are no rules to begin with. In OT a constraint checks structures, and identical structures determine identical violations. Within CM, given an identical structure X in $cand_i$=AXB and in the fully faithful candidate FFC=A'XB', where Loc_C ($cand_i$)=X and Loc_C (FFC)=X, constraint $_N$C fails to apply to the corresponding Xs.

The descriptive hypothesis on which the analysis of such cases has been based in the past is the following:

(1) An environment is rule-derived for the purpose of DEE even under vacuous rule application.

Let me (re)examine such a hypothesis.

VOWEL REDUCTION. Two possibly related processes in Catalan are governed by DEE under vacuous derived environments (Mascaró 1978). One is vowel reduction, illustrated in (2), which shows that vowel reduction applies generally to unstressed vowels, changing o, ɔ→u and a, ɛ, e→ə.

(2)

póp	pupɛ́t
'octopus'	'octopus-dim.'
əkstrém	əkstrəmá
'extreme'	'to make extreme'

Some words (or some vowels in some words) are exceptions to full vowel reduction; two examples with nonreduced [o] and [e] are shown in (3a). But morphemes which are exceptions to vowel reduction cease to be exceptions when they appear in derivatives, as shown in (3b).

(3)

a.	b.
kánon	kənunidzá
'canon'	'canonize'
tótem	tutəmízmə
'totem'	'totemism'

The examples in (3b) are cases of derived environment, so we might be justified in attempting to obtain the generalization through comparative markedness. The *o* in kánon is "old", hence a "new" constraint responsible for vowel reduction which prohibits unstressed *o, e,* etc., $_N$VR, would not be violated by underived *kánon*. An unreduced *o* in **kənonidzá* would also not be "new" and would not violate $_N$VR. Of course, $_N$VR is ranked above identity of vowel quality features, IDENT V. As (4b) shows, the candidate **kənonidzá* is identical to FFC *kánonidzá* in its unreduced *o*. Under CM it is not derived, "new"; **kənonidzá* is therefore incorrectly selected instead of the correct *kənunidzá*.

(4) a. *No reduction if underived* b. *Reduction (fails!) under destressing*

kánon	$_N$VR	IDENT V
(FFC) ☞ kánon		
kánun		*

kánon-idza	$_N$VR	IDENT V
*☞ kənonidzá		
√ kənunidzá		**

Let us consider now the case of reduction under nonvacuous destressing (2), which also seems to present problems but is amenable to a successful analysis. Here the stressed vowel in the base póp has been destressed because the stress falls on the last derivational affix, in this case ét in pop-ét. We therefore need that the candidate *pop-ét count as derived in order to be able to violate $_N$VR. One possibility is to have a (low-ranked) OO-IDENT STRESS constraint requiring faithfulness of the root of the derivative to its base. This ensures that the FFC retains the root stress. Now the FFC is different from the reduction-offending pop-ét, hence this candidate will contain a "new" *o*, and will violate $_N$VR. The FFC, on the other hand, will violate a highly ranked markedness constraint disallowing multiple word stress.

(5) *Successful reduction under destressing*

pop-ét	ONE WORD STRESS	$_N$VR	IDENT V	OO-IDENT STRESS
(FFC) pop-ét	*			
pop-ét		*		*
☞ pup-ét			*	*

But vacuous application cannot be analyzed in a similar way. The derived verb *kanun-idzá* can be related by output to output constraints to the noun *kánon*, but the vowels in correspondence are both unstressed.

[1] The FFC is assumed to show predictable stress, for the same reasons that it shows predictable syllabification. I am assuming here that only unpredictable stress is present underlyingly.

Consider again this case; here the FFC retains its root stress because of OO-IDENT STRESS:

(6) *Reduction (fails!) under destressing*

kánon-idza	ONE WORD STRESS	$_N$VR	IDENT V
(FFC) kánonidzá	*		
*☞ kənonidzá			*
√ kənunidzá			**

MID VOWEL LOWERING. Similar problems arise with another process, which lowers mid vowels (Mascaró 1978). Whenever a prestressing suffix stresses a high mid vowel (*o* or *e*), the vowel turns to ɔ, ɛ, respectively. Some of the examples in (7) derive from the same roots in (3) used to illustrate vowel reduction in derived non-reducing vowels:

(7)

a.		b.	
kánon	kənɔ́nik	krɔ́m	krɔ́m-ik
'canon'	'canonical'	'chromium'	'chromic'
tótem	tutɛ́mik	iβér	iβɛ́r-jə
'totem'	'totemic'	'Iberian'	'Iberia'

Let us consider first the case of shifting stress, (7a). For the sake of brevity, assume that a constraint prohibiting (new) high mid vowels under stress, $_N$*é,ó, is responsible for mid vowel lowering. Lowering of only derived stressed mid vowels is obtained from the ordering $_N$*é,ó ≫ IDENT V. Here, even if we resort to faithfulness OO constraints, the FFC will still contain a corresponding vowel which is identical to the one in the candidate that we don't want to win.

(8) *Lowering (fails!) under restressing*

kánon-ík	ONE WORD STRESS	$_N$*é,ó,	IDENT V
(FFC) kánónik	*		
*☞ kənónik			*
√ kənɔ́nik			**

In the case of vacuously restressed vowels (7b), the problem is still clearer. When the prestressing suffix is attached to an oxytone base, the prestressing suffix reassigns stress and the mid vowel lowers. Here is an extended sample of examples:

(9)

cr[ó]m	cr[ɔ́]m-ic
'chromium'	'chromic'
falc[ó]	falc[ɔ́]n-ids
'falcon'	'Falconidae'
cal[ó]r	cal[ɔ́]r-ic
'heat'	'caloric'
ib[é]r	Ib[ɛ́]r-ia
'Iberian'	'Iberia'
Hom[é]r	hom[ɛ́]r-ic
'Homer'	'Homeric'
refrig[é]ra	refrig[ɛ́]r-i
'it refrigerates'	'refreshment'

In these cases there is no indirect way to treat derivative elements as "new", since the root in the base, e.g. *krɔ́m*, is identical to the root in the derivative krɔ́m-ik, except for vowel height.

REANALYSIS. The conclusion seems to be that these cases of DEE pose a serious problem for CM. A careful analysis of the facts, though, points to a different direction. In the case of exceptions to vowel reduction (*kánon*, **kánun*), there are indications that the derived environment effect does not follow the generalization in Mascaró (1978), i.e. the DEE is not traceable to vacuous destressing of *o*. A first piece of evidence comes from other exceptional nouns, those containing the Spanish fricative *θ*. Whereas Spanish *x* has been accommodated into the Catalan consonant inventory, *θ* appears only in some nouns, and is elsewhere rendered by its most immediate neighbor *s*. Interestingly enough, whenever nouns with exceptional *θ* are derived, *θ* turns into *s*.

(10)

θərəɣóθə	'Zaragoza'	sərəɣusá	*adjectival derivative*
θerβántes[2]	'Cervantes'	sərβəntí	*adjectival derivative*
káθeres	'Cáceres'	kəsərɛ́ɲ	*adjectival derivative*
θəmórə	'Zamora'	səmurá	*adjectival derivative*
kəθáʎə	'cazalla, liquor'	kəsəʎɛ́t	'cazalla-dim.'
θərθwélə	'zarzuela, Spanish operetta'	əsərswəlát	'zarzuela-like'

[2] Notice that this example and the following one show also exceptionality with respect to vowel reduction.

Another indication that the derived character is not linked to restressing comes from a problem in the analysis of Mascaró (1978), noticed by Bonet and Lloret (1998: 58). Recall that *o* and *e* that are exceptions to full vowel reduction are codified lexically as /o/, /e/. Hence whenever such vowels appear in the input they don't turn into [u], [ə]. Now consider cases in which [u], [ə] appear reduced when unstressed, but lowered to [ɔ], [ɛ] by a prestressing suffix (stress is marked even if not present orthographically):

(11)				
	apòst[u]l	'apostle'	apost[ɔ]l-ic	'apostolic'
	xenòf[u]b	'xenophobe'	xenof[ɔ]b-ia	'xenophobic'
	cícl[u]p	'Cyclops'	cicl[ɔ]p-i	'cyclopean'
	adúlt[ə]r	'adulterous'	adult[ɛ]r-i	'adultery'
	cadàv[ə]r	'corpse'	cadav[ɛ]r-ic	'corpselike'
	àng[ə]l	'angel'	ang[ɛ]l-ic	'angelic'

But now base and derivative require conflicting underlying forms. The derivative apost[ɔ]l-ic mandates underlying /o/ (or /ɔ/), given that /u/ would yield *apost[ú]l-ic. On the other hand, the underived noun apòst[u]l requires /u/, since apòst/o/l would surface as * apòst[o]l, as in the case of lexical exceptions. This means that codifying lexical exceptions to vowel reduction only by means of positing the nonreduced vowel underlyingly is not sufficient. An adequate solution must be left for further research, but it seems clear that some other kind of codification of exceptional character is necessary, and that the DEE should also be derived otherwise. A third argument involves denominal verbs. Marked (retracted) stress in nominals is eliminated when a verb is derived by prefixation or zero derivation:

(12)				
	màscara	'mask'	desemmasc[á]ra	'to unmask'
	àrbitre	'referee'	arb[í]tra	'to referee'
	número	'number'	num[é]ra	'to number'
	úlcera	'ulcer'	ulc[é]ra	'to ulcerate'
	cronòmetre	'chronometer'	cronom[ɛ]tra	'to measure with a c.'
	fòsfor	'phosphorous'	fosf[ó]ra	'to phosphorate'
	àncora	'anchor'	anc[ó]ra	'to anchor'
	apòstrof	'apostrophe'	apostr[ɔ]fa	'to apostrophize'

As can be seen from the last six examples in the second column, there is no regular lowering since high and low mid vowels appear freely. It seems fair to assume that whenever the denominal character is justified a

restressing process has taken place. Here again restressing doesn't seem to correlate with lowering. The same argument applies in cases where verbal restressing is vacuous. The following examples show lowering with prestressing suffixes and no lowering in restressing by zero derivation:

(13)	*Non-suffixed*	*Prestressing suffix*	*Stressless suffix*
	carb[ó]	carb[ɔ]n-i	carb[ó]n-i
	'coal'	'carbon'	'carbonate-3pr.subj.'
	abs[é]nt	abs[ɛ]nc-i-a	abs[é]nt-i
	'absent'	'absence'	'absent-3pr.subj.
	introduct[ó]r	introduct[ɔ]r-i	introduct[ó]r-a
	'introductor-masc.'	'introductory'	'introductor-fem.'
	mod[é]st	mod[ɛ]st-i-a	mod[é]st-o-s
	'modest'	'modesty'	'modest-masc.pl.'
	cl[ó]r	cl[ɔ]r-ic	cl[ó]r-a
	'chlorine'	'chloric'	'chlorinate-3pr.subj.'

How are we to treat the instances of mid vowel lowering? In these cases we might have to return to the initial observation by Fabra (1912: 459–460; 1956: 4) that marked stressed words (proparoxytones and paroxytone stems) tend to show low mid vowels. Assume that markedness constraints, here subsumed under $_{O,N}$*o,e ES (no high mid vowels under exceptional stress) are responsible for lowering; all stressed vowels, old and new, lower in marked stress structures:

(14) *Lowering in derived environments*

kánon-ik	$_{O,N}$*o,e ES	IDENT V
(FFC) kánónik		
kənónik	*	*
☞ kənɔ́nik		**

Under this approach the vowel in cases like krɔ́m (9) remain unlowered under the modified constraint, whereas in krɔ́m-ik it lowers not because it is derived, but because it appears in a marked stress structure. Exceptions like *f[ó]rmula* 'formula', or *pr[é]ssec* 'peach', should be treated in the same way as exceptions to vowel reduction.

I now turn to a different, though related case.

SCHWA DISSIMILATION UNDER VOWEL REDUCTION. In this section I will briefly reanalyze a case involving opacity which can be successfully treated

using CM. In Catalan sequences like /ɛa/ or /ea/ are expected to change under vowel reduction to [ə́á] or [əə], depending on stress position. But instead we get the dissimilated sequences [eá] or [eə], respectively. In Mascaró (1978) this was analyzed as dissimilation at an intermediate level, after a first vowel reduction rule and before the second vowel reduction rule, e.g. /ɛa/ (Vowel Reduction 1)→ [ɐa] (Dissimilation)→ [ɛa] (Vowel Reduction 2)→ [ea]. This move was necessary in order to prevent other underlying structures, like /aa/, which under vowel reduction should also become [ə́á] or [əə], from undergoing dissimilation. Here are two relevant examples, *crearà*, 's/he will create' and *saharià* 'Saharian':

(15)

	Dissimilating	*Non-dissimilating*
Input:	krɛara	saarja
Predicted output under reduction:	*krəərá	səərjá
Real output:	kreará	səərjá

The opacity problem stems from the fact that dissimilation is not surface true in cases like səərjá. But notice that in these cases the offending structure appears already in the input, under the minimal assumption that it is generally characterized as the sequence [+back, –round][+back, –round], whereas in *krəərə* it is newly created by vowel reduction. Thus $_{N}$*[+back, –round][+back, –round] will prevent vowel reduction in the appropriate cases.

In the next section I conclude by exploring some consequences of the introduction of the FFC.

THE FULLY FAITHFUL CANDIDATE. CM is based on a fundamental distinction, the difference between candidates that retain an instance of a marked configuration and candidates that introduce a new instance of a marked configuration. This requires a clear definition of 'old' and 'new'. They are defined in terms of the Fully Faithful Candidate (FFC). The FFC is the most harmonic among the candidates that do not violate any faithfulness constraint. A FFC candidate is needed "because inputs may lack fully predictable structure, such as syllabification, or they may have it wrong." (p. 10) In CM a markedness constraint will assign violations depending on the candidate and the FFC. We might wonder whether faithfulness constraints should refer, or might refer to the FFC. Although conclusions might be premature, let us consider a couple of such cases. Notice the

similarities between the FFC and the stage of the derivation at which "non-structure changing lexical rules", like stress and syllabification, have applied in Lexical Phonology (Kiparsky 1985: 92).

Consider syllabification. To use McCarthy's (2002a: §6.2) example consider /habla/, which can have several possible FFCs, notably *hab.la* and *ha.bla*, depending on the ordering between *COMPLEX and NO-CODA. Assume now that a language crucially requires faithfulness to one of these syllabifications. It follows that faithfulness is defined with respect to the FFC and not with respect to the input. Some varieties of Catalan fall pretty close from this situation. After a stressed vowel, *bl* and *gl* present a geminate stop: káb.blə, 'cable', ség.glə 'century.' This can be analyzed as the need to satisfy the syllabification with a complex onset (the one that appears after unstressed vowels, cf. əβlətíw 'ablative', əylá 'acorn') and the preference for heavy stressed syllables:

(16)

$kab_1lə$	FAITH *σ*	*WEIGHT -TO-STRESS	NO-CODA	*COMPLEX
(FFC) ká.b_1lə		*		*
káb$_1$.lə	*			
☞káb$_2$.b_1lə			*	*

Another case of faithfulness to syllabification comes from Cabré and Prieto (2003: §5.1), who analyze glide formation in Catalan. They base their analysis on a constraint, $MAX_{INIT-\mu}$, that "maintains the prosodic status of the word-initial mora from the input form." This accounts for no glide in initial position, as in d[i.ə]dema 'diadem' vs. man[já]tica 'whimsical'. But such an analysis is impossible to implement since the input /diədemə/ is not syllabified and therefore it contains no mora to be faithful to. Again, if faithfulness is defined in terms of the FFC, the problem might be circumvented.

Universitat Autònoma de Barcelona

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Looking through opacity[1]

JEFF MIELKE, MIKE ARMSTRONG, and ELIZABETH HUME

1. Introduction

Comparative Markedness deals with alternations which are problematic for classical Optimality Theory such as counterfeeding opacity. In Sea Dayak, for example, the distribution of nasal and oral vowels is generally predictable: after a nasal consonant, a vowel is typically nasal and after an oral consonant, the vowel is oral. However, an oral vowel also occurs after a nasal consonant just in case the consonant is optionally followed by an oral stop, as in [rambo?] ~ [ramo?] 'a kind of flowering plant'. The orality of the postnasal vowel in such cases is thus opaque (Scott 1957, 1964). Representative forms are shown in (1).

(1) *Sea Dayak* (originally from Scott 1957)

nãŋã?	'straighten'
nãŋga? ~ nãŋa?	'set up a ladder'
rambo? ~ ramo?	'a kind of flowering plant'

Opacity of this type has been brought to the forefront of phonological theory by Optimality Theory, precisely because it is difficult to formalize in a surface-oriented theory. Some accounts have gone so far as to claim that constraint interaction *explains* the occurrence of opacity (see, e.g., Itô and Mester 1999). We offer two arguments against the assumption that OT formalism is required to account for the existence of opacity. First, as we

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