Local conjunction and comparative markedness

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1. Introduction

In classic Optimality Theory (Prince and Smolensky 1993), markedness constraints evaluate output well-formedness, whereas faithfulness constraints evaluate input-output disparity. Thus, markedness constraints have access only to the output while faithfulness constraints view both the input and the output.

Current research in phonology suggests, however, that the boundary between markedness and faithfulness constraints is no longer clear-cut. See, for example, comparative markedness (McCarthy, this volume), local conjunction (Smolensky 1995), preserve contrast (Łubowicz 2003), targeted constraints (Wilson 2001). In what follows, I will seek a parallel between *comparative markedness* and *local conjunction*, both of which propose constraints that infringe on the territory of markedness and faithfulness.

2. The Two Approaches

2.1. *Comparative markedness*

Comparative markedness theory proposes two types of markedness constraints: markedness new and markedness old. Unlike standard markedness, these novel markedness constraints evaluate both the input and the output. Markedness new constraints ($_{N}$M) militate against violations of markedness that are present in the output but are not present in the corresponding input. Markedness old constraints

($_{O}$M) militate against violations of markedness that are present both in the input and the corresponding output. Together, $_{N}$M and $_{O}$M fulfill the role of standard markedness, M. Thus, standard markedness can be seen as a union of $_{N}$M and $_{O}$M, as shown below.

(1) Standard markedness
$_{N}M \cup {}_{O}M = M$

The advantage of splitting standard markedness into $_{N}$M and $_{O}$M is that these two types of constraints can be ranked in different places in the constraint hierarchy and thus lead to different and arguably superior predictions than standard markedness approach. Primarily, they admit cases of counter-feeding and counter-bleeding opacity, as shown in McCarthy (this volume).

2.2. *Local conjunction*

The ability to distinguish between new and old violations of markedness is also a property of locally-conjoined constraints (Smolensky 1995). A locally-conjoined constraint is violated iff both of its conjuncts are violated in a given domain.

As described above, there are two types of comparative markedness constraints: markedness new and markedness old. Markedness new violations are derived violations while markedness old violations are retained from the input. In OT a violation is derived iff it comes about by a violation of some faithfulness constraint. Thus, $_{N}$M can be compared to local conjunction of a markedness constraint with a relevant faithfulness constraint in some local domain (see Łubowicz 2002). This is illustrated in (2).

(2) *Markedness new* as local conjunction
$_{N}M = [M \& F]_{D}$

The locally-conjoined constraint represented in (2) is violated iff markedness violation arises by faithfulness violation. Markedness violation that does not arise by faithfulness violations satisfies the above constraint.

Unlike markedness new, markedness old constraints refer to markedness violations that are already present in the input. To put it differently, markedness old is violated only when faithfulness that would otherwise lead to this markedness violation is not violated.

Research in OT has argued that in addition to faithfulness constraints that demand identity between related forms, there exist anti-faithfulness constraints (Alderete 2001, Horwood 1998). Formally, anti-faithfulness constraints are a negation of faithfulness. Unlike faithfulness, anti-faithfulness constraints are satisfied when identity is violated. Anti-faithfulness constraints have been shown to account for a range of morphological processes: morphological truncation

processes, segmental exchanges in morphologically-related forms, and accentual and tonal processes.

In what follows, I will assume that there exist anti-faithfulness constraints on the input-output dimension, called *F. With this in mind, $_{O}$M constraints of McCarthy (this volume) can be compared to local conjunction of a markedness constraint and a negation of a faithfulness constraint, indicated here as *F.

(3) *Markedness old* as local conjunction
$_{O}M = [M \ \& \ *F]_{D}$

The locally-conjoined constraint shown in (3) is violated iff markedness violations are not accompanied by faithfulness violations. This allows for a parallel treatment of markedness new (see (2)) and markedness old (see (3)) in terms of local conjunction. Comparative markedness constraints are accounted for as conjunctions of standard markedness with faithfulness and anti-faithfulness constraints.

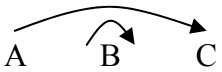
Let us see how the comparative markedness and local conjunction approaches account for counter-bleeding and counter-feeding opacity. I will refer to the two types of opacity, following McCarthy (this volume), as derived environment effect and chain shift. In what follows, I will use a schematic scale of similarity of the form A-B-C.

3. Illustration

3.1. *Counter-bleeding opacity (derived environment effect)*

In a derived environment effect, A becomes C skipping over B but underlying B remains faithful in the same context – it does not map onto C. In other words, B's are avoided iff they are derived. This is illustrated in (4).

(4) Derived environment effect



Some examples of derived environment effect are given in (5).

(5) Examples of derived environment

Polish (Rubach 1984):	g→ž, *ǰ	but	ǰ→ǰ
Campidanian Sardinian (Bolognesi 1998):	p→β, *b	but	b→b
Slovak (Rubach 1993):	e→ie, *ee	but	ee→ee

In each case a derived segment is avoided even though an identical underlying segment maps faithfully. In Polish, for example, underlying postalveolar affricates are accepted (ǰ→ǰ) but derived postalveolar affricates are not allowed (g→ž, *ǰ).

The following is the constraint ranking that accounts for a derived environment effect in terms of comparative markedness:

(6) Comparative markedness ranking

Ranking	Logic
*A >> IDENT (A)	A's are avoided
$_N$*B >> IDENT (B) >> $_O$*B	B's are accepted unless derived

New violations of B are banned due to high-ranking markedness-new constraint, $_N$*B. Old violations of B are accepted since the markedness constraint that refers to them is ranked below conflicting faithfulness, IDENT (B) >> $_O$*B.

Let us now look at local conjunction analysis of derived environment effects. Local conjunction preserves the logic of the argument shown in (6) but instead of markedness new, it uses a locally conjoined constraint of the form $[M \& F]_D$. This is shown in (7).

(7) Local conjunction ranking

Ranking	Logic
*A >> IDENT (A)	A's are avoided
$[*B \& \text{IDENT (A)}]_D$ >> IDENT (B) >> *B	B's are accepted unless derived

Since the locally-conjoined constraint is ranked higher than conflicting faithfulness, derived violations of B are ruled out.

The following tableaux illustrate the local conjunction and comparative markedness analyses. Comparative markedness is shown in (8). Local conjunction is illustrated in (9). In each case, new violations of B are shown first followed by old violations. New violations are the ones where B is derived. Old violations are where B is present in the underlying form.

(8) Comparative markedness

i. New violations of [B]

/A/	$_N$*B	IDENT (B)	$_O$*B
B	*!		
☞C		*	

ii. Old violations of [B]

/B/	$_N$*B	IDENT (B)	$_O$*B
☞B			*
C		*!	

(9) Local conjunction

i. New violations of [B]

/A/	[*B & IDENT (A)]$_D$	IDENT (B)	*B
B	*!		*
☞C		*	

ii. Old violations of [B]

/B/	[*B & IDENT (A)]$_D$	IDENT (B)	*B
☞B			*
C		*!	

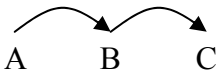
Both approaches accept old violations of B (tableaux 8ii, 9ii). The winning candidate in those tableaux carries B violation over from the input into the output. But both approaches eliminate new violations of B (tableaux 8i, 9i). Here, new violations of B cannot be created. They are ruled out either by $_N$M or by a locally-conjoined constraint.

Let us now move on to counter-feeding opacity also known as a chain shift effect.

3.2. *Counter-feeding opacity (chain shift effect)*

In a chain shift mapping, A becomes B but underlying B maps onto C in the same context. Thus, B's are avoided but only if they are underlying.

(10) Chain shift



Some examples of chain shift mappings are given in (11).

(11) Examples of chain shifts

Finnish (Anttila 1995)	aa → a → o
Toba Batak (Hayes 1986)	np → pp → ʔp
Soutern Paiute (Sapir 1930)	pp → p → v

In each case old violations of a given type are ruled out while new violations are accepted. In Finnish, for example, unrounded vowels are allowed but only if they come about by the process of shortening. If they are underlyingly present, they undergo rounding and turn into [o].

The following is the constraint ranking that accounts for chain shifts using comparative markedness:

(12) Comparative markedness ranking

Ranking	Logic
*A >> IDENT (A)	A's are avoided
$_{O}$*B >> IDENT (B) >> $_{N}$*B	B's are accepted only if derived

In a comparative markedness approach underlying violations of B are ruled out due to high-ranking markedness old constraint, $_{O}$*B. New violations are accepted since the markedness constraint that refers to them, $_{N}$*B, is ranked below conflicting faithfulness.

Again, local conjunction analysis preserves the logic of the argument in (12) but instead of markedness old, it uses a locally-conjoined constraint of the form $[M \& *F]_{D}$.

(13) Local conjunction ranking

Ranking	Logic
*A >> IDENT (A)	A's are avoided
$[*B \& *\text{IDENT}(A)]_{D}$ >> IDENT (B) >> *B	B's are accepted only if derived

The locally-conjoined constraint bans B-type segments that do not arise by faithfulness violation, underlying B's. Due to the high-ranking locally-conjoined constraint underlying B's are ruled out. The locally-conjoined constraint uses a negation of faithfulness to achieve the old-markedness effect. For prior uses of such constraints see the discussion in section 2.2.[1]

The following tableaux illustrate the comparative markedness and local conjunction analyses. As in the previous section, new violations of B are shown first followed by old violations.

[1] The locally-conjoined constraint $[*B \& *\text{IDENT}(A)]_{D}$ is more general than $_{O}$*B. It rules out underlying B's as well as derived B's that arise by faithfulness violation other than IDENT (A).

(14) Comparative markedness

i. New violations of [B]

/A/	$_{O}$*B	IDENT (B)	$_{N}$*B
☞B			*
C		*!	

ii. Old violations of [B]

/B/	$_{O}$*B	IDENT (B)	$_{N}$*B
B	*!		
☞C		*	

(15) Local conjunction

i. New violations of [B]

/A/	[*B & *IDENT (A)]$_{D}$	IDENT (B)	*B
☞B			*
C		*!	

ii. Old violations of [B]

/B/	[*B & *IDENT (A)]$_{D}$	IDENT (B)	*B
B	*!		*
☞C		*	

Both approaches show the same logic: they accept new violations of B (see 14i, 15i) but eliminate old violations of B (see 14ii, 15ii). Old violations are ruled out by markedness- old constraint in the comparative markedness approach (see (14)), and by locally- conjoined constraint in the local conjunction analysis (see (15)).[2]

3.3. Predictions

So far comparative markedness and local conjunction work side by side but there are differences in predictions. This section considers one difference that has to do with the way new markedness violations are evaluated.

Consider a language where $_{N}$M structures can arise in various ways and some of these structures are avoided while others allowed. Assume a language that accepts voiced stops inter-vocalically (16a). Voiceless stops undergo voicing in the same context (16b). This language also has a process of denasalization when

[2] There is an alternative approach to chain shifts in Kirchner (1996). Kirchner uses local conjunction of faithfulness constraints. Łubowicz (2003) accounts for chain shifts using lexical constraint of contrast preservation.

there is another nasal in a word. Interestingly, underlying nasals turn into fricatives in the intervocalic context and do not remain a stop (16c).[3]

(16) Hypothetical language
a. Underlying /d/
d→d /arad-in/→ara**d**in
b. Underlying /t/
t→d /arat-in/→ara**d**in
c. Underlying /n/
n→ð /aran-in/→ara**ð**in Expected: *ara**d**in

This is an example of a derived environment effect. Denasalized stops turn into fricatives (16c) even though stops surface in the same context (16a). Thus, old instances of intervocalic stops are accepted while derived instances are ruled out. However, not all derived stops are ruled out. Voiced stops that come about by intervocalic voicing (16b) do not spirantize. Therefore, we need to distinguish between stops derived by intervocalic voicing and stops derived by denasalization.

Local conjunction distinguishes between different types of the same $_{N}$M violation. In local conjunction, $_{N}$M violations are indicated by conjoining a given markedness constraint with different faithfulness constraints. In the example above, the two instances of derived stops come about by violations of different faithfulness constraints: IDENT(voice) in (16b) versus IDENT(nasal) in (16c). Since locally conjoined constraints are separate constraints they can be ranked in different places in a constraint hierarchy. In the example above, the constraint against intervocalic voiced stops derived by denasalization, [*V-VDSTOP-V & IDENT(nasal)]$_{D}$, is ranked above IDENT(continuant) thus forcing spirantization for underlying nasals.[4]

The following is the constraint ranking using local conjunction:

(17) Local conjunction ranking
[*V-VDSTOP-V & IDENT(nasal)]$_{D}$ >> IDENT(cont) >> *V-VDSTOP-V

Voiced stops are accepted inter-vocalically (IDENT(cont)>>*V-VDSTOP-V) but spirantization takes place when stops come from underlying nasals, [*V-VDSTOP-V & IDENT(nasal)]$_{D}$ >> IDENT(cont).

The following tableaux illustrate the hypothetical case. Underlying voiced stops map faithfully in the intervocalic context (see (18)). Underlying nasals

[3] This is a hypothetical language but the processes discussed occur cross-linguistically, e.g., lenition (Dutch, Spanish, Italian); denasalization as dissimilation (Chukchee).

[4] The other locally-conjoined constraint, [*V-VDSTOP-V & IDENT(voice)]$_{D}$, if it exists, needs to be ranked below IDENT(cont). The assumption is that the mechanism of local conjunction is universal but particular conjunctions are language specific. Thus, not all locally conjoined constraints exist in all languages.

undergo spirantization due to local conjunction (see (19)). Underlying voiceless stops do not spirantize since the locally-conjoined constraint is satisfied (see (20)).

(18) Underlying /d/

/arad+in/	[*V-VDSTOP-V & IDENT(nasal)]$_D$	IDENT(cont)	*V-VDSTOP-V
☞aradin			*
araðin		*!	

(19) Underlying /n/

/aran+in/	[*V-VDSTOP-V & IDENT(nasal)]$_D$	IDENT(cont)	*V-VDSTOP-V
aradin	*!		*
☞araðin		*	

(20) Underlying /t/

/arat+in/	[*V-VDSTOP-V& IDENT(nasal)]$_D$	IDENT(cont)	*V-VDSTOP-V
☞aradin			*
araðin		*!	

Comparative markedness constraints, unlike local conjunction, cannot distinguish between different $_N$M violations since they treat a given $_N$M as a uniform entity. In the example above, there is one constraint against derived stops intervocalically, $_N$*V-VDSTOP-V. When ranked above IDENT(cont), it forces spirantization across the board. When ranked below IDENT(cont), spirantization is blocked. In both cases, *derived voiced stops* are treated the same regardless of whether they come from underlying nasals or underlying voiceless stops. They either both spirantize (see (21a)) or both remain stops (see (21b)).

(21) Conundrum

a. Spirantization across the board

/aran+in/	*V-VDSTOP-V$_N$	IDENT(cont)
aradin	*!	
☞araðin		*
/arat+in/	*V-VDSTOP-V$_N$	IDENT(cont)
aradin	*!	
☞araðin		*

b. No spirantization

/aran+in/	IDENT(cont)	*V-VDSTOP-V_N
☞aradin		*
araðin	*!	

/arat+in/	IDENT(cont)	*V-VDSTOP-V_N
☞aradin		*
araðin	*!	

Thus, to allow for some $_N$M violations in a language while prohibiting other instances of the same $_N$M violations, comparative markedness approach needs some other means than comparative markedness constraints alone.

4. Implications

This review has represented two ways of accounting for derived environment effects and chain shifts using locally conjoined constraints of markedness and faithfulness. The difference between the two types of phenomena is in the use of positive versus negative versions of faithfulness. Positive faithfulness is used to account for derived environment effects whereas the negation of faithfulness is used for chain shift mappings. The relevant rakings are recalled in (22).

(22) LC rankings

i. Derived environment ranking

[*B & IDENT (A)]$_D$ >> IDENT (B) >> *B B's are accepted only if underlying

ii. Chain shift ranking

[*B & *IDENT (A)]$_D$ >> IDENT (B) >> *B B's are accepted only if derived

The local conjunction approach is shown in parallel with the comparative markedness theory of McCarthy (this volume). Comparative markedness, thus, sheds light on our understanding of local conjunction and in this, helps to understand the nature of chain shifts and derived environment mappings.

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