[To appear: Kusumoto, Kiyomi, ed., *Proceedings of the North East Linguistics Society* 27: 17-32. Amherst, MA: GLSA.]

Dissimilation as Local Conjunction*

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1. Introduction

The Obligatory Contour Principle (1) has played an important role in formal phonology. It is used in describing the distribution of phonological units like tone and Place features, and the OCP is also employed in the characterization of phonological processes — both in motivating the application of a process, and restricting its output.

(1) The Obligatory Contour Principle (Leben 1973, Goldsmith 1976, McCarthy 1986)

Adjacent identical autosegments are prohibited.

While the OCP has been an essential tool in explaining these phenomena, a fundamental problem arises when it is applied to the analysis of dissimilation and segmental cooccurrence restrictions. Such phenomena typically rule out more than one *marked* element in some domain. But the OCP, as a bald declarative statement, says nothing about the markedness of the elements involved. To account for the correlation between activity in a dissimilatory process and the markedness of target and trigger, adjunct theories of feature specification are required. These theories, however, have been shown to have many unsatisfactory consequences, essentially because unmarked segments can be active in ways that do not involve the OCP (Mohanan 1991, McCarthy & Taub 1992, Smolensky 1993, Steriade 1995, Itô, Mester & Padgett 1995, =IMP; Goodman 1995).

Consider the well-known case of Lyman's Law in Japanese as an example of the general problem. This cooccurrence restriction rules out more than one voiced obstruent in a stem. Voiced obstruents can occur with voiced sonorants, however, showing that marked voiced obstruents are 'active', while unmarked voiced sonorants are 'inactive'. If sonorants are unspecified for [voice] underlyingly, this accounts for the inactivity of sonorants. But derived voicing in post-nasal obstruents is also active in Lyman's Law, showing that sonorant voicing *is* active in a limited way, and hence must be specified (see

*This paper has greatly benefited from conversations and correspondence with the following scholars: Eric Bakovic, Diamandis Gafos, Roger Higgins, Aditi Lahiri, John McCarthy, Scott Myers, Jaye Padgett, Joe Pater, Alan Prince, Marc van Oostendorp, Lisa Selkirk, Keiichiro Suzuki, Rachel Walker, and Cheryl Zoll. In preparing this paper, recent work by Junko Itô and Armin Mester has come to my attention which independently develops an approach to OCP effects similar to the one taken here; this work forms the basis of their WECOL talk, October 1996. The reader is directed to this work for further discussion of the issues raised here, and also to a published paper, Suzuki 1995, which takes a rather different approach, but was the first to my knowledge to apply the notion of Local Conjunction to the analysis of dissimilatory processes. This research was supported in part by the National Science Foundation under grant SBR-9420424.

IMP for an explicit illustration). This example, and others like it, suggest that alternative approaches to predicting the correlation between phonological activity and markedness are warranted, and this paper will develop one such alternative.

I propose to deal with this problem by developing the following hypothesis.

(2) Dissimilation as Local Conjunction

OCP effects are derived by markedness constraints, doubled in a local context.

The hypothesis is that OCP effects, broadly understood to encompass segmental processes of dissimilation and restrictions on segment cooccurrence, are the result of markedness constraints which are strengthened by the operation of Local Conjunction (see below). Because of the role of the markedness in the proposal, it will be possible to derive the relationship between phonological activity and markedness in a direct way, following a proposal first put forth in Smolensky 1993. This will be clarified as I spell out my theoretical assumptions:

A. *The inventory derived by constraint interaction* (Prince & Smolensky 1993, P&S)
Inventory patterns are derived through the interaction of faithfulness constraints and markedness constraints.

B. *Markedness through constraint satisfaction* (P&S, Smolensky 1993, McCarthy 1993)
If the property P is marked in structural inventories, then there is a constraint in Universal Grammar which marks forms bearing P.

C. *Local Conjunction* (Smolensky 1993, 1995; Suzuki 1995, Kirchner 1996)
Multiple constraint violations in a local context are categorically worse than the same violations in a nonlocal context.

Starting with assumption (A), I follow Prince & Smolensky 1993 in assuming that the inventory of a language is derived by the ranking of faithfulness constraints relative to the markedness constraints. Approximately, if faithfulness for a property P dominates the markedness constraint for P, then P is part of the inventory of the language. Conversely, if markedness for P is high ranking, then P is not part of the inventory. In sum, the inventory of a language is described by ranking the constraints governing phonological markedness relative to the constraints with ensure preservation of underlying structures.

The second crucial assumption, stated in (B) above, is that the marked elements of the inventory are characterized in the constraint system as well. Thus, speaking abstractly again, if the property P is marked in inventories, there is a constraint in UG which marks forms bearing P with a "*". That is, principles of phonological markedness are encoded directly in the grammar as well-formedness constraints, and then ranked on a language particular basis to derive the inventory.

The third assumption, given in (C), has a special application to dissimilation. Following Smolensky 1993 and others, I assume that well-formedness constraints can be strengthened by a process of Local Conjunction. Local Conjunction accounts for cases where multiple constraint violations in a local context are systematically avoided, while the same violations in a nonlocal context are allowed. In this paper, I will only be using Local Conjunction of a constraint with itself, "self-conjunction" in Smolensky's vocabulary. The meaning of the self-conjoined constraint $\mathbb{C}^2{}_L$ is simply this: more than one violation of $\mathbb{C}$, in the local context L, is not allowed.

With this little bit of background, we are in a position to understand how these assumptions can be applied to the analysis of dissimilation. Imagine an input with two segments α and β, as in the OT tableau in (3). These segments are marked because they bear the property P, and P is marked by the markedness constraint $\mathbb{M}$(P). Hence, an output will incur as many violations of $\mathbb{M}$(P) as there are P-bearing units.

(3) Dissimilation as Local Conjunction of $\mathbb{M}$(P)

Input: α β | | P P	$\mathbb{M}(P)^2{}_L$	$\mathbb{F}$(P)	$\mathbb{M}$(P)
☞ [α β]$_L$ | P		*	*
[α β]$_L$ | | P P	*!		**

In a scenario like this, the loss of property P can be described as a response to the locally-conjoined constraint $\mathbb{M}(P)^2{}_L$. If $\mathbb{M}(P)^2{}_L$ is high-ranking in the constraint system, specifically out-ranking faithfulness for P, then outputs will not surface with more than one P-bearing unit, which is true of the optimal candidate above. This is the general approach I will take to dissimilation in this paper, and in doing so, I will argue, we are in a better position to explain the observed correlations between activity in a process and the markedness of the elements involved. This point is made explicitly in my analysis of Lyman's Law, which is the topic of the next section.

The rest of this paper elaborates on the role of markedness in the proposal, and shows how Dissimilation as Local Conjunction resolves two additional problems identified for the standard characterization of the OCP. First, the possibility of dissimilatory effects outside the domain of autosegmental phonology poses a problem for the OCP (see e.g. Yip 1988). As a constraint on features linearized on an autosegmental tier, the OCP fails to generalize to cases of dissimilation which involve prosodic categories, e.g., moraic units, or grid marks. However, if dissimilation is the result of strong markedness constraints, constraints outside the domain of autosegmental phonological can drive dissimilatory patterns. In section 3, I show how this hypothesis can be applied to just such a case, namely length dissimilation in Oromo.

A second problem addressed below involves the viability of the OCP for Place cooccurrence restrictions, especially for the behavior of coronals. As evidenced in many Semitic languages, partially dissimilar coronals may cooccur in a root, but the same is not true for dorsals and labials, showing that the OCP does not apply across the board to all members of a feature class (see especially Yip 1989, Padgett 1991[1995], Selkirk 1991, cf. Pierrehumbert 1993). The theory developed here will give a natural account of the aberrant behavior of coronals in cooccurrence restrictions, also stemming from the role of markedness. In section 4, I will demonstrate how coronal inertness in a pattern of Berber labial dissimilation derives from the equation, marked segments = active in dissimilation, with coronals being the unmarked segments in the inventory, and hence inactive.

2. Dissimilation as Local-Conjunction

In this section the central hypothesis is developed in the context of a concrete example, namely dissimilation of marked obstruent voicing in Japanese.

As is well-known, in the Yamato stock of Japanese, a regular pattern of voicing referred to as Rendaku is suppressed in certain contexts, as illustrated below in (4). Rendaku voicing applies to the second member of a compound, as in the example *ori gami* in (4a). But this morphological pattern is blocked in stems which contain a post-initial voiced obstruent, as in the example *kami kaze* from (4b).

(4) Rendaku blocked by Lyman's Law

a.				b.		
ori kami	→	ori+**g**ami	folding paper	kami+ka**z**e	*kami+gaze	divine wind
oo sumoo	→	oo+**z**umoo	*sumo* tournament	širo+ta**b**i	*širo+dabi	white tabi
yama tera	→	yama+**d**era	mountain temple	mono+ši**z**uka	*mono+ǰizuka	tranquil
mizu hana	→	mizu+**b**ana	running nose	maru+ha**d**aka	*maru+badaka	completely naked

As noted in Itô & Mester 1986, the blocking of Rendaku in these examples is part of a larger pattern, commonly referred to as Lyman's Law. Lyman's Law states that stems may contain at most one voiced obstruent. To state this pattern more generally, voicing is contrastive in obstruents, but this voicing contrast is limited to one obstruent per stem. Rendaku voicing is thus blocked in stems with an underlying voiced obstruent.

The proposal here is that the constraint characterizing Lyman's Law is built up from the constraints involved in deriving the voicing contrast. It is therefore necessary to deal with the voicing contrast first, before accounting for the dissimilatory pattern. The constraints which yield this contrast are given below in (5).

(5) Markedness and Faithfulness for [voice]

a. $*\begin{bmatrix}+\text{voi}\\ -\text{son}\end{bmatrix}$
Avoid voiced obstruents. (Lombardi 1995, cf. Ohala 1983)

b. IDENT[voice] (McCarthy & Prince 1995)
Correspondent segments in input and output agree in [voice] specification.

The first constraint, given in (5a), asserts the markedness of voiced obstruents. This constraint gives a star for each voiced obstruent in a form. The second constraint, IDENT[voice], is the corresponding faithfulness constraint for voicing. It says that segments in the output must be faithful to their input counterparts in that they agree for the feature [voice].

One can see the consequences of the markedness constraint by studying its interaction with IDENT[voice], as is done in (6). With IDENT[voice] high-ranking, the sound inventory will contain both voiced and voiceless obstruents. But if the markedness constraint is top-ranked, as in (6b), obstruents may only be voiceless.

(6) Consequences for obstruent voicing in sound inventories

a. IDENT[voice] >> $*\begin{bmatrix}\text{+voi}\\ \text{−son}\end{bmatrix}$: obstruents may be voiced and voiceless.

b. $*\begin{bmatrix}\text{+voi}\\ \text{−son}\end{bmatrix}$ >> IDENT[voice]: obstruents may only be voiceless.

Therefore, one consequence of this constraint interaction for inventories is that no language will have a voiced obstruent series without a corresponding voiceless one. This is in line with typological studies on laryngeal contrasts in sound inventories (Maddieson 1984).

Let's return now to Lyman's Law, the dissimilatory pattern in which only voiced obstruents are active. Voiced obstruents are active in the sense that the presence of one in a stem excludes the occurrence of another. A direct account of this pattern is given by performing self-conjunction on the obstruent voicing markedness constraint, as in (7), and defining this complex constraint for the domain of the stem.

(7) $*\begin{bmatrix}\text{+voi}\\ \text{−son}\end{bmatrix}2_{\text{Stem}}$: More than one voiced obstruent in a stem is prohibited

The dissimilation constraint above states that no stem can incur two violations of the obstruent voicing markedness constraint. In sum, the constraint accounting for Lyman's Law is built up from an independently necessary markedness constraint, and its application is restricted in the required way.

We can see the role of the dissimilation constraint by considering the constraint rankings in (8). As shown in (8a), faithfulness for [voice] features must outrank the simple markedness constraint to account for the fact that Japanese has voiced obstruents. But the constraint rankings in (8b) will limit this contrast in the correct way. Here, the dissimilation constraint dominates IDENT[voice], with the effect of restricting the voicing contrast to one obstruent per stem.

(8) a. IDENT[voice] >> $*\begin{bmatrix}\text{+voi}\\ \text{−son}\end{bmatrix}$: obstruents may surface specified [+voi].

b. $*\begin{bmatrix}\text{+voi}\\ \text{−son}\end{bmatrix}2_{\text{Stem}}$ >> $\begin{Bmatrix}\text{IDENT[voice]}\\ \text{RENDAKU}\end{Bmatrix}$: 1 obstruent may be specified [+voi] per stem.

The locally-conjoined markedness constraint also dominates RENDAKU, the ensemble of constraints governing the morphological voicing process (see below). Because of this, the dissimilation constraint blocks the regular pattern of Rendaku voicing, as illustrated in (9).

(9) Rendaku blocked by Lyman's Law: /kami+kaze/ → kami+kaze, *kami+gaze

Candidates	$*\begin{bmatrix}\text{+voi}\\ \text{−son}\end{bmatrix}2_{\text{Stem}}$	RENDAKU	$*\begin{bmatrix}\text{+voi}\\ \text{−son}\end{bmatrix}$
☞ kami+ka**z**e		*	*
kami+**g**a**z**e	*!		**

The failed candidate in (9) has two voiced obstruents within the same stem, and so this candidate incurs a fatal violation of the dissimilation constraint. This leaves the first candidate as the optimal one. An important point here is that voiced obstruents are active precisely because they are marked by the constraint which bans voiced obstruents.[1]

We are now in a position to better understand how the dissimilation constraint distinguishes between active and inactive segments in Lyman's Law. Recall that voiced sonorants behave differently than voiced obstruents: voiced obstruents don't block Rendaku. This pattern of inactivity is a direct outcome of the constraint rankings used thus far, as illustrated in the following tableau.

(10) Transparency of sonorant [voice]: /ori+kami/ $\rightarrow$ ori+gami, *ori+kami

Candidates	$*\begin{bmatrix}+\text{voi}\\-\text{son}\end{bmatrix}^2_{\text{Stem}}$	RENDAKU	$*\begin{bmatrix}+\text{voi}\\-\text{son}\end{bmatrix}$
☞ ori+gami			*
ori+kami		*!	

Voiced sonorants are inactive in Lyman's Law because they are not marked by the markedness constraint which specifically bans voiced obstruents. Thus, RENDAKU does not enter into conflict with the dissimilation constraint, and underlying *kami* may be voiced according to the regular pattern.

To summarize the analysis, independently motivated markedness constraints tell us what segments in the inventory are marked. Further, because the dissimilation constraint is simply a self-conjoined markedness constraint, the segments active in dissimilation are precisely those which are marked in the inventory of the language under analysis. In particular, voiced obstruents are marked segments, and just these segments are active in Lyman's Law. Moreover, voiced sonorants are unmarked, and so they do not condition or undergo dissimilation, either in a stem with a marked voiced obstruent or with another voiced sonorant.

This approach may be contrasted with the OCP-based account which relies on underspecification to characterize phonological activity in Lyman's Law. The OCP account to sonorant transparency requires underspecification of unmarked sonorant voicing. This assumption, however, leads to a formal problem for the OCP-based account when the assignment of [voice] is considered in post-nasal contexts (see IMP for discussion). It's a surface-true observation that post-nasal obstruents are always voiced. Also, the assignment of voicing derived in these contexts blocks the application of Rendaku, as exemplified with compounds like *širooto-kaŋgae* 'layman's idea'. With the order of events required on the underspecification account, this fact entails that [voice] is specified in sonorants before the application of Rendaku — because voiced post-nasal obstruents do block Rendaku. But sonorants on their own show that [voice] must be specified after Rendaku, because they fail to block Rendaku. To summarize, the OCP-based account which uses underspecification leads to an ordering paradox.

The theory I've developed here doesn't relate activity in a process with feature specification, and because of this, the problem identified for the OCP-based account does

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[1] The constraint rankings argued for here do not predict which obstruent surfaces as voiceless, i.e., whether the outcome is *kami+kaze* or *kami+gase*. I follow Itô & Mester 1986 in assuming that Rendaku voicing is essentially a morphological process, and that the Rendaku morpheme is an affix whose position in the compound is governed by alignment constraints. With these assumptions in place, the failure to realize the Rendaku affix [voice] feature can be explained by ranking Root Faith over Affix Faith (McCarthy & Prince 1995, Beckman 1996).

not arise. The activity of [voice] in post-nasal contexts is derived on a par with the analysis developed above, with the simple addition of a markedness constraint banning post-nasal voiceless obstruents, *NC (see Hayes and Stivers 1996 and Pater 1996 for the motivation of this constraint). *NC is a phonetically-grounded constraint which requires that post-nasal obstruents be voiced. Because *NC requires voicing in obstruents, they will be active in the process, as illustrated below.

(11) Post-nasal voicing blocks Rendaku: /širooto-kaNKae / → širooto-kaŋgae

Candidates	$*\begin{bmatrix}+\text{voi}\\-\text{son}\end{bmatrix}2_{\text{Stem}}$	*NC	RENDAKU
☞ širooto-kaŋgae			*
širooto-gaŋkae		*!	
širooto-gaŋgae	*!		

Rather than posing a challenge for theory proposed here, this case is handled rather straightforwardly with one additional constraint ranking, namely *NC >> RENDAKU. To summarize the rest of the analysis, the voicing contrast observed in obstruents is derived by ranking the faithfulness constraint for [voice] above the markedness constraint banning obstruent voicing. This contrast is limited to one obstruent per stem by ranking the self-conjoined obstruent voicing markedness constraint above [voice] faithfulness. Also, the pattern of Rendaku voicing is suppressed in stems with a voiced obstruent by ranking the strong markedness constraint above RENDAKU.

(12) Lyman's Law in Japanese: $*\begin{bmatrix}+\text{voi}\\-\text{son}\end{bmatrix}2_{\text{Stem}} \gg \begin{Bmatrix}\text{IDENT[voice]}\\ \text{RENDAKU}\end{Bmatrix} \gg *\begin{bmatrix}+\text{voi}\\-\text{son}\end{bmatrix}$

Finally, this analysis of Lyman's Law was shown to be superior to the OCP-based account, which leads to a formal problem in the specification of [voice].

3. Disharmony outside of autosegmental phonology

To recapitulate what has come before, the proposal developed here is that dissimilation patterns arise from the force of self-conjoined markedness constraints. In the previous section, it was argued that this approach differs from the standard OCP-based account of dissimilation in that it explains the correlation between activity in a process and the markedness of the target and trigger. In this section, a different argument is constructed in favor of dissimilation as Local Conjunction which develops further the role of markedness in the proposal. Because dissimilatory constraints are built up from markedness constraints, and not defined in terms of adjacency on a tier, markedness constraints outside the domain of feature structure can drive dissimilation. In this section, a pattern of prosodic dissimilation is studied which will confirm this prediction.

It is a common observation in languages with vowel length that long vowels dissimilate when in adjacent syllables. Languages of this kind include the Australian language Gidabal (Geytenbeek & Geytenbeek 1971), Slovak (Kenstowicz & Rubach 1987), and the Cushitic language Oromo (Gragg 1976, Lloret-Romanyach 1988, Goodman 1996). The basic observation in these languages is that, given a sequence of two consecutive syllables, only one syllable can have a long vowel. Focusing our attention on length dissimilation in Oromo, this pattern is exemplified with the morphophonemic alternations in (13) and (14). As shown in (13), the allomorphic variation of the plural suffix *-(o)ota* is predictable from the stem it attaches to. Hence, the suffix shortens just when it attaches to a base that ends with a long vowel, as in the example gaal-ota. The allomorphy of the causative suffix shown in (14) also supports this observation, and extends the domain of shortening to sequences of suffixes (14c).

(13) Length alternation in plural marker: *-oota* ~ *-ota*

a.	nama	nam-oota	man, person	b.	gaala	gaal-ota	camel
	harree	harr-oota	donkey		loomi	loom-ota	lemon tree
	k'ottuu	k'ott-oota	farmer		ʔadaadaa	ʔadaad-ota	aunt
	fardda	fardd-oota	horse		adaammi	adaamm-ota	cactus

(14) Causative suffix alternation: *-siis* ~ *-sis*

a.	argisiis-	agarsiis-	√arg- see	b.	adeemsis-	√adeem- go
	gufacciis-		√gufadd'- stumble		teesis	√taa^{y}- sit

c.	fiig-a	fiig-sis-a	fiig-sis-iis-a	drink
	ɪug-a	ɪug-siis-a	ɪug-siis-is-a	run

I assume, following the researchers mentioned above, that these suffixes are underlying long, and that they shorten because of a general ban on adjacent long vowels. These researchers stress that this pattern also holds of lexical forms, showing that length dissimilation is a general pattern in the language which is independent of syllable parity.[2]

The proposal here is that markedness has a role in characterizing this pattern of dissimilation. To understand the proposal, therefore, we need to consider the markedness of vowel length. The relevant faithfulness and markedness constraints are given below.

(15) Markedness and Faithfulness for vowel length

a. NOLONGVOWEL (Rosenthall 1994)
Avoid vowels dominated by more than one mora.

b. WT-IDENT (McCarthy 1996)
If α and β are correspondent segments in input and output,
and α is monomoraic, then β is monomoraic. (No lengthening.)
and α is bimoraic, then β is bimoraic. (No shortening.)

The markedness constraint in (15a) is a context free constraint which bans long vowels. It yields a star for every long vowel in a surface form. The constraint in (15b) is the corresponding faithfulness constraint for vowel length. WT-IDENT says essentially that surface vowels preserve their underlying length, represented here formally as mora.

The length markedness constraint asserts that long vowels are marked in segmental inventories. Furthermore, the observation characterizing length dissimilation in Oromo is that long vowels are active in the process. The conclusion we can draw from this, given the framework of ideas developed here, is the following. Long vowels dissimilate because

[2]There is one important exception to this surface-true constraint, namely that the final two syllables can both contain long vowels, e.g., ʔadaadaa. This looks like a case of classic extrametricality in the sense that the final syllable both fails to undergo shortening and to condition the process for the preceding vowel. I do not know how to account for this fact within my analysis.

of a locally conjoined markedness constraint banning more than one long vowel in a local context, as formalized below.

(16) NOLONGVOWEL$^2_{SA}$
In adjacent syllables, avoid two vowels each dominated by more than one mora.

This constraint is the result of conjoining NOLONGVOWEL with itself; it therefore rules out forms with more than one long vowel. Long vowels must be in adjacent syllables in order to be local for this constraint.[3] Thus NOLONGVOWEL$^2_{SA}$ is violated by a form with two adjacent syllables that both have long vowels, exactly the dispreferred sequence in Oromo.

Returning to the Oromo facts, the effects of the dissimilation constraint can be seen when it assumes high rank in the constraint system, as illustrated in (17) for the allomorphy of the plural suffix.

(17) Length Dissimilation: /gaal-oota/ → gaalota, *gaaloota

Candidates	NOLONGVOWEL$^2_{SA}$	WT-IDENT	NOLONGVOWEL
☞ gaalota		*	*
gaaloota	*!		**

The failed candidate here violates NOLONGVOWEL twice in two adjacent syllables, and so it violates NOLONGVOWEL$^2_{SA}$. The optimal candidate is therefore the one which violates WT-IDENT to achieve the prerequisite length alternation. Therefore, consistent with my general proposal, long vowels are active in dissimilation because they are marked by the length markedness constraint in UG. As shown below, length dissimilation in Oromo falls out from the schematic ranking sketched at the beginning of this paper.

(18) Length dissimilation in Oromo

NOLONGVOWEL$^2_{SA}$ >> WT-IDENT >> NOLONGVOWEL

We are now in a position to make a second argument in favor of the hypothesis. The OCP fails to derive results like this because the marked structures in this case are not autosegments in the correct sense. Timing units such as moras do not figure in the representations worked on by the OCP, and so the OCP cannot generalize to these cases. On the other hand, if dissimilation is generally an effect of locally-conjoined markedness constraints, there is no implication that the active units in dissimilation must be represented in autosegmental phonology. The only requirement is that the target and trigger of the dissimilatory process be marked units, and in this example, long vowels are marked segments by the length markedness constraint.

When one ponders the possibility of dissimilatory patterns outside of autosegmental phonology, extensions of the main idea fleshed out here are not hard to come by. For example, complex segments like prenasalized stops are marked in segmental inventories, and as sketched in (A) below, self-conjunction of the constraint responsible for this observation will directly derive dissimilation of prenasalized stops. A second case, given in (B), involves self-conjunction of syllable structure constraints: a self-conjoined

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[3]The characterization of locality here is akin to the notion of Head Adjacency employed in Archangeli & Pulleyblank 1987 and Syllable Adjacency of Odden 1994. This constraint therefore requires a relational characterization of locality which is an enrichment of the locality conditions proposed in Smolensky 1993 (see Alderete 1996 for motivation and analyses of particular examples).

NOCODA prohibits two neighboring closed syllables, causing degemination of voiceless obstruent geminates in the context of a neighboring closed syllable (see also recent work by Itô & Mester who derive a similar result by employing a self-conjoined NOGEMINATE). A third and final example uses a self-conjoined PARSE-SYLL to characterize the fact that stress systems generally avoid leaving two adjacent syllables unfooted (C).

A. *Dissimilation of complex segments.* The Ganda Law (Meinhof 1932): "When two successive syllables both begin with a nasal plus following voiced plosive, the plosive of the first syllable is lost". General constraints on Luganda syllable structure indicate that the NC compounds are syllabified as complex segments, permitting the following analysis: PRENASAL$^{2}_{SA}$ >> MAX$_{IO}$ >> PRENASAL

B. *Dissimilation of marked syllable structure*. Consonant Gradation in Finnish (Keyser & Kiparsky 1984): geminate voiceless stops degeminate when the second member is the onset of a closed syllable. Assuming voiceless obstruents may only occupy the coda position as the first member of a geminate leads to the following analysis:
NOCODA$^{2}_{SA}$ >> MAX$_{IO}$ >> NOCODA

C. *Disharmony of strict layering violations.* Underparsing in stress systems (Kager 1994, Alderete to appear): in ternary stress systems and stress-epenthesis interaction, these researchers find that two unfooted syllables is categorically worse than two nonadjacent unfooted syllables: PARSE-SYLL$^{2}_{SA}$ >> ALIGN-R, HEAD-DEP >> PARSE-SYLL

The abundance of examples presented above suggests that disharmony phenomena are well-attested outside of the domains operated on by the OCP. I have sketched here how the theory of dissimilation as Local Conjunction generalizes to such cases, which distinguishes this approach from an account employing the standard version of the OCP.

4. Coronal unmarkedness in dissimilation

In the examples examined thus far, markedness was correlated with phonological activity, while the unmarked structures were inactive. In this section, I will derive a similar set of results, but in this case, markedness is defined relative to a harmony scale.

Markedness can be derived by meta-constraints on constraint rankings. For example, P&S have claimed that coronals are unmarked relative to dorsals and labials, as shown with the meta-constraint in (19).[4]

(19) Place markedness subhierarchy (Prince & Smolensky 1993)

*PL/LAB, *PL/DORS >> *PL/COR

This markedness relation explains an array of phenomena in which coronals are ignored in phonological processes, i.e., well-known cases of 'coronal transparency' (see Smolensky 1993 and McCarthy 1993 for discussion). If coronals are unmarked relative to noncoronals, we also expect that they will be inactive in dissimilation. I will argue below that the inactivity of coronals in Tashlhiyt Berber dissimilation follows from this claim.

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[4]The position of the markedness constraint for pharyngeals in this subhierarchy is a matter of current debate (P&S, cf. Lombardi 1996, Alderete et al 1996), and so it is left out of the meta-constraint in (19). This does not affect the overall argument, however, as the data examined here does not involve pharyngeals.

To start with the main cooccurrence restriction, derived stems in Tashlhiyt Berber may have at most one primary labial consonant, i.e., /b, f, m/ (Boukous 1987, Lasri 1991, Elmedlaoui 1992[1995], Selkirk 1993). One reflex of this restriction is that derivational prefixes containing *m* delabialize when they combine with a root that also contains a labial, as exemplified with the data in (20) and (21).

(20) Reflexive prefix alternation: *m ~ n* (C! is an emphatic consonant.)

a.	m-xazar	√xzr scowl	b.	n-fara	√fra disentangle
	m-saggal	√siggl look for		n-ħaʃʃam	√ħʃʃm be shy
	m-!ʃawar	√!ʃawr ask advice		n-xalaf	√xalf place crosswise
	mm-ʒla	√ʒla lose		n-kaddab	√kddb consider a liar

(21) Agentive prefix alternation: *am ~ an*

a.	am-las	√las shear	b.	an-!rmi	√!rmi be tired
	am-krz	√krz plow		an-bur	√bur remain celibate
	am-agur	√agur remain		an-!dfur	√!dfur follow
	am-zug	√sug abscond		an-!azum	√!azum fast

The output of delabialization is a coronal nasal, so I assume, following the authors listed above, that the underlying form for n-fara is /m-fara/, and that the default coronal is the output of the dissimilation process. Note that the *m* prefixes default to a coronal nasal, even if the root also contains a coronal, as supported by the data in (22).

(22) Coronal unmarkedness in Place cooccurrence restrictions

a.	/a-m-bdad/	anbdad	pélier, colonne	b.	/m-fa!sal/	nfa!sal	s'arranger
	/a-m-rzif/	anrzif	l'invité		/m-ʕajab/	nʕajab	s'apprécier
	/a-m-jdam/	anjdam	le contaminé		/m-b!dan/	nb!dan	se séparer
	/a-m-!dalab/	an!dalab	mendiant		/m-xalaf/	nxalaf	se differencier

We can think of delabialization as a dissimilation process for identical Place features. This is sensible because delabialization is part of a larger pattern of Place cooccurrence restrictions in stems, a pattern which extends to dorsal sounds as well (Selkirk 1993). Thinking of the pattern in this way leads to the following question: why do labials and dorsals dissimilate, but not coronals?

I will give an answer to this question, but first we must show what drives dissimilation in the first place. Labial dissimilation is the result of the constraint interaction employed thus far where the labial markedness constraint is strengthened by the operation of Local Conjunction, resulting in the constraint given below.

(23) *PL/LAB$^{2}_{\text{Stem}}$
Ban any stem with two segments with independent Place specifications [labial].

Ranking the complex constraint above the faithfulness constraint for Place features, as in the tableau given below, derives the pattern on a par with the cases examined thus far.

(24) Delabialization as a result of *PL/LAB$^2_{Stem}$

Input: m-kaddab	*PL/LAB$^2_{Stem}$	IDENT[Place]	*PL/LAB
☞ [n-kaddab]$_{Stem}$		*	*
[m-kaddab]$_{Stem}$	*!		**

The failed candidate here incurs two violations of *PL/LAB within the stem, and so it also incurs a fatal violation of *PL/LAB$^2_{Stem}$. The optimal candidate is therefore the one which delabializes to satisfy the labial coccurrence constraint.[5]

Now that we have accounted for what drives labial dissimilation, we are in a position to account for the inactivity of coronals in the pattern. Remember that labial prefixes default to a coronal, even if there is a coronal in the root. In sum, more than one labial or dorsal is out, but more than one coronal is okay. I propose to deal with coronal inertness in the cooccurrence restriction by extending P&S's meta-constraint to the locally-conjoined Place markedness constraints, as shown below.

(25) Meta-constraint on self-conjoined Place markedness constraints

*PL/LAB^2_L, *PL/DORS^2_L >> *PL/COR^2_L

By extending the Place markedness subhierarchy in this way, coronal inactivity can receive a very general explanation, as illustrated in the following tableau. The root *kaddab* contains a Place specification for all three of the relevant Place features, so no matter how the prefix is realized, an OCP violation will result. But given the ordering of the self-conjoined Place markedness constraints above, the form with the coronal prefix best satisfies the constraint hierarchy.

(26) Deriving the coronal default[6]

Input: m-kaddab	*PL/LAB$^2_{Stem}$	*PL/COR$^2_{Stem}$
☞ [n-kaddab]$_{Stem}$		*
[m-kaddab]$_{Stem}$	*!	

The coronal nasal violates the dissimilation constraint for coronals, but that's okay, because it's the best of all possible alternatives.[7]

[5]The prefixal target for delabialization can be analyzed as an effect of McCarthy & Prince's 1995 meta-constraint Root Faith >> Affix Faith: the [labial] specification is preserved in the root because failing to do so would voilate high-ranking IDENT[Place] in roots (Selkirk 1995).

[6]We cannot test the effects of *PL/DOR$^2_{Stem}$ in this case because Tashlhiyt does not have a velar nasal, and so an independent constraint must rule out this rendering of the nasal prefix.

[7]The inactivity of coronals in this case could be accounted for with [coronal] underspecification (see Paradis & Prunet 1991, and references cited therein). An analysis which employs [coronal] underspecification is complicated considerably by the exceptions to delabialization reported in Elmedlaoui 1995 for the Imdlawn variety of Tashlhiyt. Imdlawn Tashlhiyt has delabialization too, but delabialization is blocked when the base begins with a coronal sonorant: if the root begins with a coronal sonorant, the nasal prefix stays labial, e.g., /m-laqqaf/ → mlaqqaf 'attraper en l'air', or it delabializes, and epenthetic *ya* separates the prefix from the coronal sonorant, e.g., /m-lkm/ → nyalkam 'atteindre'. The underspecification approach to coronal inactivity is thus confronted with the problem that coronals *are* active in a specific kind of dissimilation. This problem can be handled straightforwardly in the constraint-based approach advocated here with the assumption that blocking effects are the result of a higher-ranking dissimilation constraint (along the lines of Walsh-Dickey 1996 and Steriade 1995).

This approach to the output of labial dissimilation has some further advantages. Conceiving of the coronal default in terms of relative unmarkedness paves the way for relating this example to coronal defaults elsewhere in phonology. For example, the explanation for the output of delabialization is treated by a markedness subhierarchy related to the one responsible for deriving coronals as a preferred output in epenthesis, and as a default segment in neutralization processes (Smolensky 1993, McCarthy 1993, cf. Lombardi 1995). Furthermore, this approach has clear implications for the behavior of coronals in segmental cooccurrence restrictions generally. The theorem of coronal unmarkedness, given in (27), and proven in (28), fleshes this out in detail.

(27) Theorem of coronal unmarkedness in segmental cooccurrence restrictions

A segmental cooccurrence restriction on [coronal] *sounds entails the same cooccurrence restriction for* [labial] *and* [dorsal] *sounds.*

(28) Reranking of Place faithfulness relative to self-conjoined Place subhierarchy

(i) >> *PL/LAB^2_L, *PL/DOR^2_L >> (ii) >> *PL/COR^2_L >> (iii)
↑ ↑ ↑
IDENT[Place] IDENT[Place] IDENT[Place]

The ranking permutation for Place faithfulness within the self-conjoined Place subhierarchy yields a restricted typology of segmental cooccurrence restrictions: (i) no segmental cooccurrence restrictions within the root; (ii) cooccurrence restrictions for [labial] and [dorsals], but not [coronal]; (iii) cooccurrence restrictions for all Place features, [labial], [dorsal], and [coronal]. The general prediction here is that, all things being equal, a restriction on coronals will never be stronger than the same restriction on noncoronals. This prediction accords nicely with the general tendency for root cooccurrence restrictions on coronals to be weaker than those on noncoronals. For example, in Russian the labial consonants form identity classes for the purposes of root cooccurrence restrictions, while the coronals do not; they are split up into stops, fricatives, and sonorants (Padgett 1991[1995]). Furthermore, examination of the cases presented in Yip 1989, Mester 1986, Pierrehumbert 1993, and Kawasaki 1989 reveals a strong bias towards weaker cooccurrence restrictions on coronals than noncoronals.

To summarize the main features of the analysis, the language-particular rankings needed for Tashlhiyt Berber are given below.

(29) Delabialization in Berber: *PL/PLACE$^2_{\text{Stem}}$ >> IDENT[Place] >> *PL/PLACE

The ranking the universal *PL/PLACE^2 subhierarchy above IDENT[Place] yields the observed delabialization and cooccurrence restrictions within the stem, and the inherent rankings within the *PL/PLACE^2 subhierarchy derive the coronal default in the process.

5. Conclusion

In conclusion, I have developed a proposal in this paper which roots dissimilatory phenomena within the theory of the inventory. In this theory, OCP effects are the result of a richly articulated constraint component governing phonological markedness. From this hypothesis, I derive a number of consequences. First, the proposal provides a direct explanation for the correlation between phonological activity and the markedness of target and trigger. Second, the theory generalizes to cases of dissimilation which are not represented in autosegmental phonology. Lastly, the hypothesis provides an avenue for explaining the output of dissimilation in a way that generalizes to other areas of phonology.

6. References

Alderete, J. To appear. Head Dependence in Stress-Epenthesis Interaction. Proceedings of the Derivational Residue in Phonology, Tilburg University, October, 1995.

—. 1996. A formal theory of dissimilation. Handout to talk presented at Rum J. Clam II. University of Massachusetts, Amherst, May.

Alderete, J., J. Beckman, L. Benua, A. Gnanadesikan, J. McCarthy, & S. Urbanczyk. 1996. Reduplication and Segmental Unmarkedness. Ms., University of Massachusetts, Amherst.

Archangeli, D. and D. Pulleyblank. 1987. Maximal and Minimal Rules: The Effects of Tier Scansion. Proceedings of the North Eastern Linguistic Society 17: 16-35.

Beckman, J. 1996. *Positional Faithfulness*. Doctoral dissertation, University of Massachusetts, Amherst.

Boukous, A. 1987. *Phonotactiques et domaines prosodiques en Berbère* (Parler Tachelhit d'Agadir, Maroc). Thèse d'etat. Université de Paris, VIII, Vincennes à Saint Denis.

El Medlaoui, M. 1992 [1995]. *Aspects des representations phonologiques dans certaines langues chamito-semitiques.* Thèse de doctorat d'état. Université Mohamed V, Rabat.

—. 1995. Géométrie des restrictions de cooccurrence de traits en sémitique et en Berbère: synchronie et diachronie. *Canadian Journal of Linguistics* 40: 39-76.

Geytenbeek, B. & H. Geytenbeek. 1971. *Gidabal Grammar and Dictionary*. Canberra: AIAS.

Goldsmith, J. 1976. *Autosegmental Phonology*. Doctoral dissertation, MIT.

Goodman, B. 1995. *Features in Ponapean Phonology*. Doctoral dissertation, Cornell University.

—. 1996. Phonological weight and phonetic duration in Oromo. Handout to talk presented at University of Eastern Michigan, February.

Gragg, G. 1976. Oromo of Wellegga. In M.L. Bender, ed., *The non-Semitic languages of Ethiopia*. East Lansing: Michigan State University Press.

Hayes, B. & T. Stivers. 1996. The phonetics of postnasal voicing. Ms., UCLA.

Itô, J. & A. Mester. 1986. The Phonology of Voicing in Japanese: Theoretical Consequences for Morphological Accessibility. *Linguistic Inquiry* 17: 49-73.

Itô, J., A. Mester & J. Padgett. 1995. Licensing and Underspecification in Optimality Theory. *Linguistic Inquiry* 26: 571-614.

Kager, R. 1994. Alignment and ternary stress. Ms., Utrecht University.

Kawasaki, N. 1989. Cooccurrence restrictions on consonants in some Polynesian languages. Ms., University of Massachusetts, Amherst.

Kenstowicz, M. & J. Rubach. 1987. The Phonology of Syllabic Nuclei in Slovak. *Language* 63: 463-497.

Keyser, S. & P. Kiparsky. 1984. Syllable Structure in Finnish Phonology. In Aronoff, M. & R. Oehrle, eds., *Language Sound Structure*. Cambridge: The MIT Press.

Kirchner, R. 1996. Synchronic Chain Shifts in Optimality Theory. *Linguistic Inquiry* 27: 341-50.

Lasri, A. 1991. *Aspects de la phonologie non-linéaire du parler Berbère Chleuh de Tidli*. Thèse de Doctorat. Université de la Sorbonne Nouvelle, Paris III.

Leben, W. 1973. *Suprasegmental Phonology*. Doctoral dissertation, MIT.

Lloet-Romanyach, M.R. 1988. *Gemination and Vowel Length in Oromo Morphophonology*. Doctoral dissertation, Indiana University.
Lombardi, L. 1995. Why Place and Voice are Different. Ms., University of Maryland, College Park.
Maddieson, I. 1984. *Patterns of Sounds*. Cambridge: Cambridge University Press.
McCarthy, J. 1986. OCP Effects: Gemination and Antigemination. *Linguistic Inquiry* 17: 207-263.
—. 1993. The parallel advantage: containment, consistency, and alignment. Handout to talk presented at ROW-1, October.
—. 1996. Faithfulness in Prosodic Morphology & Phonology: Rotuman Revisted. Ms., University of Massachusetts, Amherst.
McCarthy, J. & A. Taub. 1992. Review of Paradis & Prunet 1991. *Phonology* 9: 363-70.
McCarthy, J. & A. Prince. 1995. Faithfulness and Reduplicative Identity. *University of Massachusetts Occasional Papers in Linguistics* 18: 249-384.
Meinhof, C. 1932. *Introduction to the phonology of the Bantu languages.* Berlin: Dietrich Reimer.
Mester, A. 1986. *Studies in Tier Structure*. Doctoral dissertation, University of Massachusetts, Amherst.
Mohanan, K. 1991. On the Bases of Radical Underspecification. *Natural Language and Linguistic Theory* 9: 285-325.
Odden, D. 1994. Adjacency Parameters in Phonology. *Language* 70: 289-330.
Ohala, J. 1983. The origin of sound patterns in vocal tract constraints. In MacNeilage, P., ed., *The Production of Speech*. New York: Springer Verlag.
Padgett, J. 1991 [1995]. *Stricture in Feature Geometry*. Doctoral dissertation, University of Massachusetts, Amherst [Chicago: University of Chicago Press].
Paradis, C. & J.-F. Prunet. 1991. Introduction: asymmetry and visibility in consonant articulations. In C. Paradix & J.-F. Prunet, eds., *The Special Status of Coronals: Internal and External Evidence*. San Diego: Academic Press.
Pater, J. 1996. *NC. Proceedings of the North East Linguistics Society 26: 227-239.
Pierrehumbert, J.B. 1993. Dissimilarity in the Arabic Verbal Roots. Proceedings of the North East Linguistic Society 23: 367-381.
Prince, A. & Paul S. 1993. Optimality Theory: Constraint Interaction in Generative Grammar. Ms., Rutgers University and University of Colorado.
Rosenthall, S. 1994. *Vowel/Glide Alternation in a theory of Constraint Interaction.* Doctoral Dissertation, University of Massachusetts, Amherst.
Selkirk, E. 1991. Vowel Height Features: Evidence for Privativity and Dependency. Paper presented at UQAM, Montreal.
—. 1993. Labial relations. Ms., University of Massachusetts, Amherst.
—. 1995. Language-particular violation of a universal constraint: The OCP from the perspective of Optimality Theory. Ms., Marrakech, October.
Steriade, D. 1995. Underspecification and Markedness. In Goldsmith, J., ed., *Handbook of Phonological Theory*. Cambridge: Blackwell.
Smolensky, P. 1993. Harmony, Markedness, and Phonological Activity. Handout to talk presented at the Rutgers Optimality Workshop 1, New Brunswick, N.J.
—. 1995. On the internal structure of the constraint component *Con* of UG. Handout to talk presented at UCLA, April.
Suzuki, K. 1995. NN: Rendaku and licensing paradox. Proceedings of the Sixth Annual Japanese/Korean Conference.
Walsh-Dickey, L. 1996. *The Phonology of Liquids*. Doctoral dissertation, University of Massachusetts, Amherst.
Yip, M. 1988. The obligatory contour principle and phonological rules: a loss of identity. *Linguistic Inquiry* 19: 65-100.
—. 1989. Feature geometry and cooccurrence restrictions. *Phonology* 6: 349-374.