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Licensing and Consonantal Harmony

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1 Introduction

Consonant harmony is an intriguing phenomenon in and of itself, and because any treatment of it will have to involve itself in some of the more detailed aspects of feature specification, it provides a wealth of interesting data for the testing of new approaches to this facet of phonological theory. In this paper we undertake the task of capturing consonant harmony with the use of the constraint-based licensing theory developed in Itô, Mester, and Padgett (1993). By employing a licensing theory of harmony we will be able to provide an account of why consonant harmony arises in certain languages, as it will be shown what sort of constraint ranking prefers words in which consonants of a certain type ‘share’ a particular set of features. At the same time, we will be able to confront the most significant questions about the distribution and nature of consonant harmony as addressed in a recent discussion of this phenomenon, Shaw (1991), with what are argued to be more insightful answers. On a front of broader theoretical interest, many of the questions about specification raised by this treatment of consonant harmony are shown to have repercussions in areas of current discussion, most notably in illuminating the relationship between underlying representations and licensing.

2 Theoretical Background

2.1 Licensing and Constraint Interaction

Itô, Mester, and Padgett (1993) present an account of licensing designed to resolve the apparent specificational contradictions exhibited by redundant feature values that are sometimes active in and sometimes inert for certain phonological processes. Their account, couched in the framework of Optimality Theory (McCarthy and Prince (1993), Prince and Smolensky (1993)), appeals to the ranking of violable and antagonistic constraints to account for the varied behavior of redundant features. Their analysis is intended to account for the following facts of Japanese:

- A voicing process, RENDAKU, voices an initial obstruent in the second member of a compound:

- (1) /ori/ + /kami/ → origami
/oo/ + /sumoo/ → oozumoo

*I have benefitted greatly from discussions of various versions of this paper at various times with Gene Buckley, Bill Reynolds, and Hadass Sheffer.

- In the forms to which RENDAKU applies, there may not be more than one voiced obstruent within a single morpheme. In certain cases, RENDAKU is blocked from applying, in that its application would create a form with more than one voiced obstruent. This generalization, called LYMAN'S LAW, has been analyzed as a consequence of the Obligatory Contour Principle for the feature [voice]; it is illustrated in (2) (offending segments are underlined):

(2) /širo/ + /tabi/ → *široɔabi
 /maru/ + /hadaka/ → *maruɔadaka

- Sonorant consonants do not behave as if they were voiced for the purposes of LYMAN'S LAW; i.e., RENDAKU applies to voice the initial obstruents of morphemes containing sonorants:

(3) /mizu/ + /hana/ → mizubana
 /yama/ + /tera/ → yamadera

- In the same (Yamato) forms in which RENDAKU and LYMAN'S LAW apply, sequences of nasal+obstruent (abbreviated by Itô, Mester, and Padgett (1993) as NC) must be voiced; this is analyzed as the spreading of [voice] from the nasal onto the obstruent:

(4) tombo, *toppo
 unzari, *unsari

The above facts make for an apparent conundrum: for the purposes of RENDAKU and LYMAN'S LAW, sonorants must be treated as not specified for [voice]; for the purposes of NC clusters and spreading, they must be treated as possessing the feature [voice]. Voiced obstruents created by the spreading of [voice] from a preceding nasal trigger LYMAN'S LAW, so it is not possible to order the specification of [voice] on nasals after the application of RENDAKU.

The first component of the solution to this problem involves licensing. It is encapsulated in two principles; first, the *Redundancy Licensing Implication*, which identifies the implications that a Redundancy Condition (i.e. 'rule') has for licensing (the following is (15) in Itô, Mester, and Padgett (1993)):

- (5) Suppose a given grammar contains an R-condition (implication) of the form (i):

(i) [F] → [G] "All [F] are [G]"

Then the following licensing restriction also holds (this is (18) in Itô, Mester, and Padgett (1993)):

(ii) A Root containing [F] does not license [G].

The second principle is stated as the *Feature Licensing Condition*:

- (6) All features in a feature-geometric representation must be licensed.

The mechanics of the solution are to be found within Optimality Theory, familiarity with which will, for reasons of space, be assumed here. Along with (6), it is assumed that the following R-condition holds in Japanese:

(7) [+nasal] → [+voice]

(6) is interpreted as the constraint LICFEAT, and (7) as [NAS]→[VOI]. These constraints are ordered such that LICFEAT \gg [NAS]→[VOI]. The effects of this ranking may be seen with reference to two forms: the *kami* of *origami*, which behaves as if the sonorant is not [+voice], and *tombo*, in which the sonorant seems to be spreading voice.

For the relevant portions of *kami*, there are two representations to consider: one with /m/ linked to [+voice], and one with the /m/ not linked to [voice]. The former fails LICFEAT and satisfies [NAS]→[VOI], while the latter passes LICFEAT and fails [NAS]→[VOI]. As the version with /m/ not linked to [voice] passes the most highly ranked constraint, it emerges as the most optimal form.

In the case of *tombo*, the first two forms to consider are exactly as above, i.e. one form with /m/ linked to [+voice] and one form with no such linking. Once again, the latter form emerges as preferable. There is, however, another form to consider in this case. As obstruents may license [voice] by virtue of the fact that these segments are distinctively and non-redundantly voiced in Japanese, one may posit a representation in which the sonorant is linked to the [+voice] feature licensed by the following obstruent. Such a representation satisfies both LICFEAT and [NAS]→[VOI]. The dual nature of [voice] in sonorants is thus explained as arising from the interaction of ranked constraints and the theory of licensing outlined above.

The importance of the account of Itô, Mester, and Padgett (1993) for our purposes lies in the manner in which it makes explicit the relationship between ‘redundant’ or ‘predictable’ features and the behavior of these features in phonological processes. As discussed in Shaw (1991), what we will be treating as true systems of consonant harmony¹ have been attested only in sets of coronal consonants. Coronal place, as has often been noted, seems to be the ‘default’ or ‘unmarked’ place for consonantal articulation. We will later appeal to the interaction of ranked constraints and the licensing of redundant features in the style of Itô, Mester, and Padgett (1993) to account for the apparent restriction of consonant harmony to coronal systems.

2.2 Feature Organization

We will be assuming in our discussion the hierarchical/geometric arrangement of features as developed in Clements (1985), Sagey (1986), McCarthy (1988), and much subsequent work. It may be said without presentation of an explicit representation of the entire inventory of phonological features that the model of feature geometry to be employed here diverges from some models in the literature in having [lateral] as a dependent of the Root Node, and not a dependent of the coronal node. For the purposes of the examination of consonant harmony to be undertaken here, this choice of geometry represents the fact that, in the systems examined, lateral segments are completely inert for processes of coronal harmony. In this we follow Shaw (1991), who posits [lateral] as a dependent of the Root Node in her account of harmony in Chumash and Tahltan.

3 A Framework for Harmony

3.1 An Overview of Consonant Harmony: Shaw (1991)

The system of consonant harmony to be examined here was presented and analyzed in Shaw (1991), a paper which also contains a survey of consonant harmony systems. Shaw attempts to answer the following three questions:

¹The emphasis here is on *harmonic* or assimilatory as opposed to *disharmonic* or dissimilatory systems (the latter exemplified by the process of LYMAN’S LAW described above, or by Latin lateral dissimilation- see Steriade (1987) for this.)

1. Why is consonant harmony rare?
2. Why is coronal harmony so much more frequent than harmony in other places of articulation?
3. Why do coronal harmony systems involve only a subset of the harmonizing language's coronals?

Shaw's answers to the first two of these questions are taken to follow from her adoption of what she calls the *Integrated Articulators Hypothesis*, the claim that consonants and vowels are both specified in terms of the same articulator nodes. Consonant harmony is found much less frequently than vowel harmony, she argues, because consonant harmony takes place at the level of minimal scansion (in the sense of Archangeli and Pulleyblank (1987)). Potentially harmonizing features do not find themselves adjacent because of the presence of intervening vowels. The answer to the second question lies in the fact that it is only consonants that are distinctively specified by the presence of a coronal node; vowels, which make no use of this node, will not interfere with potentially harmonizing consonants on the coronal tier, thus allowing for adjacency and possibly harmony among coronal consonants.

The answer to the third question, that of the transparency of certain segments for harmony processes, lies in the underlying representation of a language's coronal system. In an approach that follows points made in Avery and Rice (1989) (points which will be discussed in greater detail later), Shaw holds that segments possess a coronal node only when they are distinctive for a feature under that node. In this sense, it is predicted that only those consonants for which a dependent of the coronal node is needed for proper specification will harmonize.

3.2 Constructing a System for Harmony: Chumash

For our first attempt at capturing consonant harmony in licensing theory we will address the often discussed case of Chumash. As shown in the following forms (taken from Shaw 1991), all sibilants agree in the feature [anterior] with the rightmost sibilant in the word:

- | | | |
|------|------------------|---------------------------|
| (8) | k-sunon-us | 'I obey him' |
| | k-šunon-š | 'I am obedient' |
| (9) | ušla | 'with the hand' |
| | usla-siq | 'to press firmly by hand' |
| (10) | uqsti | 'of throwing' |
| | š-uxšti-meš | 'throw over to' |
| (11) | s-iš-tiši-yep-us | 'they two show him' |
| | s-is-tisi-yep-us | (3-DUAL- show-OBJ) |

The entire coronal system is not involved in this process; the coronals /n,t,l/ are transparent to the sibilant harmony (transparent coronals are shown underlined):

- | | | |
|------|---------------------------|--------------------------|
| (12) | š- <u>api</u> -čo-it | 'I have good luck' |
| | s- <u>api</u> -co-us | 'he has good luck' |
| (13) | k-šun <u>on</u> -š | 'I am obedient' |
| | k-sun <u>on</u> -us | 'I obey him' |
| (14) | ha-s-xin <u>ti</u> la | 'his Indian name' |
| | ha-š-hin <u>ti</u> la-waš | 'his former Indian name' |

Within the framework of Contrastive Underspecification, this has been treated as the spreading of [\pm anterior] from the rightmost consonant bearing an anterior feature to other consonants linked to a feature on the anterior tier. In this process, only the consonants with values for [anterior], i.e. only those with [coronal] nodes, are active. One way of stating this generalization within a theory of licensing would be the following:

- (15) Only one coronal node is licensed per word.

(15) captures our intuitions about how harmony might be linked to licensing; we now turn to the mechanics for this.

3.3 Markedness and Constraint Ranking

In our attempt at capturing consonant harmony within a theory of licensing, we will assimilate the fact that [coronal] is the unmarked or default place for consonant articulation with the Redundancy Licensing Implication (given above as (5)). This involves two steps. The first is to say that languages possess a Markedness Condition [M-Condition] stated as follows:

- (16) [Cons] \rightarrow [cor]

The second step involves establishing a licensing implication based on the fact that [coronal] is the default place for consonants. Once again on analogy with the Redundancy Licensing Implication, we may state the following as a Markedness Licensing Implication:

- (17) If a language contains an M-Condition of the form [F] \rightarrow [G], then a Root of type [F] does not license [G].

A point worth mentioning in respect of this formulation concerns underspecification theory in general. Radical Underspecification differs from other (Contrastive and Restricted) theories of specification in regarding as unspecified features predictable on the basis of markedness statements like (16). Directly assimilating Markedness Licensing to Redundancy Licensing would seem to instantiate a non-derivational equivalent of Radical Underspecification, all other things being equal. Later, however, we will make use of the constraint LICFEAT in such a way that the potential effects of this form of radical underspecification will be overridden by requirements on the representation of minimally distinctive segments. Thus while interesting consequences will be seen to come from the reduction of markedness statements to a licensing implication, there is no ‘direct’ instantiation of Radical Underspecification in our system to speak of.

Let us now see how the licensing account sketched above may be extended to Chumash. Before we do this, however, one further point must be made. As noted in the discussion of licensing found in Steriade (1993), it is often the case that there are certain *prominent positions* in which feature values otherwise not available in a language are licensed. In our account of Chumash, we may appeal to this notion to explain why it is that it is the coronal values of the *last* sibilant in the word that are manifested on the other sibilants. The trigger of harmony, on this view, will be the only licensed coronal consonant.²

We may now proceed with an examination of how the ranking of constraints may be used to represent harmony. The relevant constraints for harmony are in this case different from those that resulted in [voice] being assigned to nasals in Itô, Mester, and Padgett (1993);

²Although we will not dwell on the issue of how the statement of this trigger should be made, it should be pointed out that one could capture the fact that the rightmost [coronal] node in a word is licensed by appealing to the EDGEMOST constraint for the place node CORONAL relying on the rightmost edge of the phonological word.

in that paper, it was the interaction of the R-Condition [NAS]→[VOI] and the licensing condition LICFEAT that led to the voicing of nasals in certain configurations (cf. §2.1). In the case of coronal harmony, we will be dealing with segments that are underlyingly specified for [coronal];³ the workings of harmony will thus be explained through the interaction of the constraints LICFEAT and the Association Constraint PARSEFEAT, which militates against the non-parsing of underlying features. The M-Condition CONSCOR, corresponding to the R-Condition [NAS]→[VOI], will not play a significant role in the constraint ranking; its importance lies in the fact that, through its very existence, [coronal] is not licensed. Intuitively, the idea is that the tension created between the constraint that features must be licensed and the constraint that underlying features must be parsed will, with the further assumption that [coronal] is present underlyingly in some segments, result in a situation in which certain constraint rankings will favor coronal node sharing, thus producing harmony.

The following tableau shows the interaction of LICFEAT and PARSEFEAT for a sample form [...š...s...]_w with two sibilants:⁴

(18)

[cor]	...	[cor]	LICFEAT	PARSEFEAT
š		s		
[cor]	...	[cor]	*!	
š		s		
♡		[cor]		*
		/ \		
		s s		
		š ... s		**!

Given the above set of candidates, the constraint ranking LICFEAT \gg PARSEFEAT makes the correct predictions for a system with coronal harmony. However, when we consider as a candidate a form in which the unlicensed coronal node on the first sibilant has simply been delinked, we see that finer distinctions are needed:⁵

³This will be discussed at length in §3.4.

⁴Where possible, detail has been omitted from the trees of the candidate forms in the following tableaux. Where š and s are each shown linked to a coronal node in the first candidate, this is meant to represent each as associated with the coronal node that it possesses underlyingly, so that, e.g. the coronal node of s should be thought of as dominating [+anterior], and that of š as dominating [-anterior]. When a node is shown to be shared (second candidate form), it is assumed to be the node of the final coronal. Finally, constraints related to word-processing necessitate the use of the heart (♡) in the place of the famous Optimality Hand.

⁵The symbol '♠' is here used to indicate forms that are equally desirable from the perspective of the constraints given.

(19)

	[cor]	[cor]	LICFEAT	PARSEFEAT	
	ǰ	...	s		
	ǰ	...	s	*!	
	♠	[cor]	s	s	*
	♠ ǰ	[cor]	s		*
	ǰ ...	s		**!	

The generalization that must be captured is that, in a harmonizing language, coronal consonants that are distinctive for a feature beneath coronal stay coronal, even when their own coronal node is unlicensed. We examine in the next section some suggestions that have been made in the literature concerning this point.

3.4 Underlying Specification, Activation and Transparency

A first refinement necessary for this system involves explaining why the segments that are transparent for and those that are active for harmony behave as they do; the participants in harmony must be distinguished from the coronal consonants that are completely inert for it.⁶ This bears upon the insight that resulted in the statement above that one [coronal] node is licensed per word in Chumash. The relevant node is not one that appears in the representations of /t,n,l/, as these consonants are inert for harmony; rather, it is the [coronal] node of one of the consonants that is distinctive for a feature dominated by [coronal].

In a derivational system, the distinction between active and inert consonants would be accomplished by holding that, at the time of the harmony process (i.e. at the time when values of [anterior] are spread), the transparent consonants, /t,n,l/, are not specified for a value of [anterior], and are thus not targets for spreading. In order to see more clearly how the problems of transparency and targeting may be resolved, let us examine in detail the Chumash consonant system, and how the coronals involved in the harmony process may be specified.

First, the Chumash Consonant Inventory (taken from Shaw 1991):

⁶By *completely inert* it is meant that these segments do not trigger or serve as targets for harmony, nor do they interfere with harmony among other consonants.

p	t	c	č	k	q	
p ^h	t ^h	c ^h	č ^h	k ^h	q ^h	
p'	t'	c'	č'	k'	q'	ʔ
		s	š	x		h
		s ^h	š ^h	(x ^h)		
		s'	(š')	x'		
m	n					
m'	n'					
w	l		y			
w'	l'		y'			

Bearing in mind that that /s,š,c,č/ participate in harmony while /t,n,l/ are completely inert for it, we see upon examination of the above inventory that the consonants that are active in harmony are precisely those that are distinctive from another coronal for a value dominated by the coronal node. In the present system, we will be assuming that input forms are fully specified for feature content. Thus in developing a system of constraints that will capture the facts of Chumash, two goals must be kept in mind: the first will be to ensure that e.g. /s/ and /š/ are distinct from one another, and the second will be to represent these (and the other harmony-active) segments in a way that distinguishes them from the inert (non-harmonizing) coronals.

An initial indication of the sort of representation was mentioned earlier: Shaw holds that coronal nodes are present underlyingly only when there is some phonemic distinction to be made by features that are dependants of [coronal]. The proposal that both /s/ and /š/ have a coronal node in their underlying representations because they are distinctive for a feature dominated by [coronal] was advanced in Avery and Rice (1989) to account for aspects of coronal underspecification similar to those investigated in this paper. Consider the following, which they call the *Node Activation Condition* (their [6]):

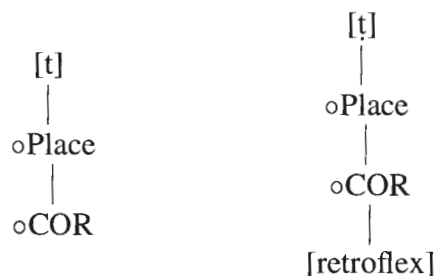
(20) *Node Activation Condition*

If a secondary content node is the sole distinguishing feature between two segments, then the primary feature is activated for the segments distinguished. Active nodes must be present in underlying representations.

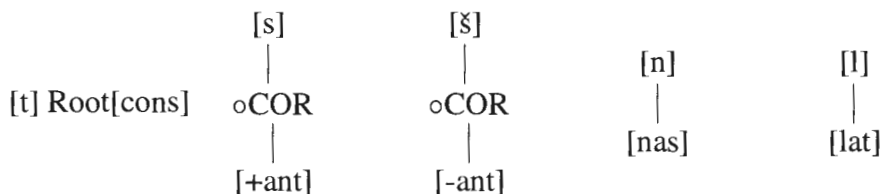
An example in which the Node Activation Condition is seen to apply is the case of retroflex as opposed to non-retroflex consonants in Sanskrit, the coronal inventory of which is as follows (chart is [27] in Avery and Rice):

ṭ	ṭh	ḍ	ḍh	ṇ	r	ṣ
t	th	d	dh	n	l	s
č	čh	j	jh	ñ		š

In this system, retroflex as opposed to non-retroflex /t/ are taken to differ for the value [retroflex], which is a dependent of the coronal node. According to assumptions relating underspecification and markedness made by Avery and Rice, /t/ and /t/ would not normally be said to be specified with a coronal node, because this is the unmarked value for place of consonantal articulation. However, because these two segments are distinguished by a feature that is a dependent of coronal, they must both possess a coronal node. These two segments are thus represented as follows ([8] in Avery and Rice):



From this perspective, the ‘active’ nodes in the relevant Chumash consonants would be those in the following representations:



The effects of the Node Activation Condition are needed within our non-derivational system, and we now address the question of how its insights may be incorporated into our theory.

3.5 The Internal Structure of the Constraint LIC^{FEAT}

An initial way to bring the effects of the Node Activation Condition into the licensing theory of harmony would be to simply state it as a constraint:

Definition 1 (NAC: Constraint Version 1) *If a node is distinctive for a particular segment (i.e. dominates a feature that minimally distinguishes that segment from another), license a node of that type with each of the minimally distinguished segments.*

As stated here, Definition (1) will serve to ensure that active nodes will be represented with the relevant segments. It does not, however, have anything to say about nodes that are inactive for particular segments. The NAC as part of a derivational system need not have any effect on inactive forms, because in such a system assumptions of underlying underspecification will remove inactive nodes from segmental representations. In the system to be examined here, it would be possible to capture these effects by making the constraint NAC work in two directions. In addition to forcing the presence of active nodes, the bidirectional NAC would also have the function of removing inactive nodes from candidate forms. The modified constraint is given as follows:

Definition 2 (NAC[↔]: Two-way Version) *If a node is distinctive for a particular segment (i.e. dominates a feature that minimally distinguishes that segment from another), license a node of that type with each of the minimally distinguished segments. Nodes not distinctive for a particular segment are not licensed for that segment.*

The addition of the NAC[↔] to the system of constraints seems, however, to be unnecessary. In order to see why this is the case, it is necessary that we address the question of how this constraint compares with the constraint LIC^{FEAT}. It is evident from the discussion and the use of the LIC^{FEAT} constraint in Itô, Mester, and Padgett (1993) that it recognizes that features (and presumably nodes) that are distinct for a given segment are licensed in the representation of that segment. It is also clear that LIC^{FEAT} contains a statement to the effect that redundant features are not licensed. From this, the following two points may be concluded:

- (a) The constraint LICFEAT has internal structure.
- (b) The elements comprising LICFEAT could be represented as individual constraints.

Bearing in mind the Markedness Licensing Implication (MLI) above, we may split LICFEAT into the following three constraints:

Definition 3 (LICDIST) *Nodes/features that are distinctive for a segment are licensed for that segment.*

Definition 4 (*NONDIST) *Nodes/features that are not distinctive for a segment are not licensed for that segment.*

Definition 5 (MLI) *Omit unmarked features from feature-geometric representations.*

Definition 6 (RLI) *Omit redundant features from feature-geometric representations.*

The constraints listed immediately above capture all that seems to be subsumed under the constraint LICFEAT. The interesting point to note, and one which will be appealed to in this analysis, is that there may be a certain degree of antagonism between the sub-constraints. This is evident in the case of the constraints LICDIST and MLI. The former constraint will, under certain conditions, require the appearance of an unmarked but nevertheless distinctive feature in the representation of some segments. The constraint MLI, when applied to this kind of segment, will regard the unmarked node/feature as unlicensed.

Returning to the question that prompted the examination of LICFEAT, it is now evident that the role of something like the Node Activation Condition is fulfilled by the constraint LICDIST in a system of licensing. Incorporating the NAC as a constraint would thus be almost entirely redundant. As noted in the preceding paragraph, LICDIST and MLI may be at odds with one another. The natural move, then, and one which will allow us to exploit this antagonism in a way that captures harmony, is to treat these different components of LICFEAT as independent constraints.⁷

Before we apply the split LICFEAT constraints to Chumash coronal harmony, some words are in order concerning the constraint PARSEFEAT. For concreteness, it will be defined as follows:

Definition 7 (PARSEFEAT) *For a segment γ and feature F , parse the value of F that is linked to γ in its underlying representation.*

In the definition of LICDIST, the features or nodes licensed for a particular segment are those that are distinctive for the segment in question. There is nothing in the definition, however, to ensure that the values of the features will be those present in the segments underlying representation. For a feature F distinctive for a particular segment, LICDIST only states that one of the values of F is licensed for the segment, without specifying a particular value. The constraint PARSEFEAT as defined here differs from LICDIST in seeking to ensure that the feature value parsed with a segment is that which is associated with the segment underlyingly. In the typical case, then, the ranking LICDIST \gg PARSEFEAT will result in segments being parsed with their underlying features, as shown in the following tableaux:

⁷Although the constraint LICFEAT will be treated as fully ‘exploded’, i.e. with *NONDIST and LICDIST shown as distinct constraints in the tableaux to come, this move is not absolutely necessary. That is, the crucial point is that MIL must be separated from the other two feature licensing constraints. It would be possible to call *NONDIST and LICDIST together LICFEAT; they have been treated separately here in order to emphasize the dual nature of LICFEAT, and to make clear the contribution made by each of its components.

(21)

[+ant] [cor] s	LICDIST	PARSEFEAT
[+ant] ♡ [cor] s		
[-ant] [cor] s		*!
s	**!	*

The neutrality of LICDIST to the actual feature value given for a particular segment is of crucial importance in understanding how the insights given by the Node Activation Condition are captured in the system being developed here. Intuitively, LICDIST will have the property of requiring that coronal consonants that are distinctive for a feature dominated by [coronal] always be parsed with a [coronal] node, whether it is the one that they possess underlyingly or one that they have through the working of harmony.

Now that we have presented the full array of constraints to be used, we may examine their effects on a sample form [...s...š...]_w with two sibilants:⁸

(22)

[...s...š...] _w	*NONDIST	LICDIST	MLI	PARSEFEAT
[cor] [cor] s š			*!	
♡ [cor] [cor] / \ š š				*
[cor] [cor] s š		*!		*
[cor] [cor] s š		**!		**

It should be pointed out in light of the discussion of a few paragraphs back that the second (and winning) candidate form here does not violate LICDIST. This is a result of the fact that LICDIST is only sensitive to the *classes* of features and nodes being represented, and not to individual instantiations (i.e. values) of a feature. In the second form, both /s/

⁸Once again, the input form is assumed to be fully specified.

and /š/ are represented with a [coronal] node and an [anterior] node, which suffices for the purposes of LICDIST.

It will have been noticed that the constraint *NONDIST does not seem to have any effects in distinguishing among the candidates given above. The value of this constraint becomes clear when forms containing the coronal consonants that are inert for harmony are considered. Take for concreteness the underlying form /hashintilawaš/, in which three coronal consonants intervene between the active /s/ and /š/:⁹

hashintilawaš		*NONDIST	LICDIST	MLI	PARSEFEAT
[cor]	[cor]			*!	
...nt...l...					
s	š				
♡	[cor]				*
	š				
	š				
[cor]		***!			*
s	n				
t	l				
	š				

As desired, the form *hašhintilawaš* emerges as the most optimal.

One important point remains before we proceed to discuss some of the implications of the system presented here. This concerns languages in which there is no consonant harmony. The following tableaux, with the order of MLI and PARSEFEAT reversed, represents the case in question:

[...s...š...] _w		*NONDIST	LICDIST	PARSEFEAT	MLI
♡	[cor] [cor]				*
s	š				
[cor]				*!	
š	š				
s	[cor]		*!	*	
	š				
s ... š		**!	**		

4 Answering Shaw's Questions

The above account, in identifying a particular ranking of constraints as determining when a language will exhibit consonant harmony, is able to offer an explanation as to why consonant harmony takes place in Chumash but does not in e.g. English. Let us at this point address explicitly the three questions that Shaw's account was intended to address, and compare, where it will be insightful, our answers with hers; this will allow us to review the major points of the licensing theory of harmony.

⁹Some of the candidate forms eliminated from consideration in the previous tableaux are not considered here.

The first of Shaw's questions was *Why is consonant harmony so rare?* It is for this question that the licensing account is able to make the weakest assertion. The best that may be said is that the rarity of consonant harmony is the result of an 'odd' ranking of constraints; this, of course, relies completely on a corresponding statement of what a 'normal' ranking of constraints would look like. This in turn relies on the development of more sophisticated constraints, and the application of these to larger sets of languages. Statements concerning the oddness of a particular ranking can therefore only be treated as speculative. While the licensing theory's answer is inconclusive, Shaw's answer to this question, which relies on the previously discussed (§3.1) *Integrated Articulators Hypothesis*, seems dubious given the development of more sophisticated, segregated theories of vowel and consonant features (Clements and Hume (1993), Ní Chiosáin and Padgett (1993).) Even on its own terms, however, her argument is somewhat weak; one would expect to find many more coronal harmony systems than have been attested, given that vowels would never intervene for the propagation of features resulting in such harmony.

Shaw's answer to the second question, *Why is coronal harmony so much more frequent than harmony in other places of articulation?*, relies once again on the *Integrated Articulators Hypothesis*. It is in respect of this question that many of the insights gained by a licensing approach to harmony are the most apparent. The Markedness Licensing Implication, which reflects the fact that [coronal] is the unmarked value for consonantal place of articulation, prevents [coronal] from being licensed. At same time, however, there exist constraints on underlying representations (manifested in the constraint LICDIST) requiring the presence of [coronal] in certain underlying forms. As it was shown earlier, the interaction of this constraint with other constraints results, in certain rankings, in forms which share a coronal node being preferred to those in which the segments involved each have their (underlying) coronal node. The absence of harmony systems for the other possible places of articulation is thus a direct result of the fact that, for these other places, there will be no M-Condition to the effect that all consonants should be e.g. [dorsal]. Since there will be no Markedness Licensing Implications for the non-coronal consonants, their place features will always be licensed, and will thus not be susceptible to the parsimonious feature licensing conditions which result in coronal harmony.

The account developed here shares with Shaw the position that the transparency of certain coronals for harmony is the result of constraints governing the specification of features; this in answer to the third question, *Why do coronal harmony systems involve only a subset of the harmonizing language's coronals?* With the incorporation of the insights gained from Node Activation Condition into the system developed here, our account resembles Shaw's (not to mention Avery and Rice's) very much as far as this question is concerned. Notably, however, our theory assumes full underlying specifications, with 'underspecification' effected by constraint ranking.

5 Conclusions

The purpose of this investigation was to develop an account of consonant harmony within the licensing theory of Itô, Mester, and Padgett (1993), and to compare the account constructed with previous accounts of the phenomenon in question. It has been shown that with the addition of a Markedness Licensing Implication and the separation of the licensing statement for markedness from the other constraints on licensing such a theory can be built, and that it matches up well with an earlier account of consonant harmony.

Questions remaining take two forms. The first type of question concerns the theoretical implications of the extension of licensing implications to markedness statements. As mentioned in Itô, Mester, and Padgett (1993), such an extension might instantiate a non-derivational equivalent of Radical Underspecification. They speculate that [coronal] underspecification might be reducible to a tension between a Markedness Licensing Implication for [coronal] and the constraint FILLPLACE of Prince and Smolensky (1993). Whether

or not such considerations could be applied to the case of consonant harmony is, at this point, unclear. It is clear, however, that in the system developed here the effects typically associated with Radical Underspecification are not found; this because of the manner in which the constraints *NONDIST and LICDIST instantiate a form of Contrastive Underspecification, in conjunction with the separation of the constraint MLI from the other licensing constraints. A second type of question concerns data; it remains to be seen whether or not the system developed here can be directly extended to other languages (e.g. Tahltan and Wiyot) that exhibit coronal harmony. Both types of question make it clear that more may be learned from investigations of the correlation between licensing and consonant harmony, leaving the possibilities for further research intriguing.

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