In Support of a Unified Approach to [labial]

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0. Introduction

Traditional investigations into the feature geometric location of [labial] argued that it is a distinct articulator (along with [coronal], [dorsal], and perhaps [radical]) with the terminal feature [round] as its dependent (Clements 1985, Sagey 1986, McCarthy 1989).

```
                Place
            /     |   \
     [labial][coronal][dorsal]
        |                etc.
     [round]
```

However, several investigations have challenged traditional assumptions concerning [labial]'s location within the feature geometry (Archangeli and Pulleyblank 1986, Selkirk 1989, Clements 1990, Hume 1990, Odden 1991). All challenges to the traditional model draw a distinction between labiality in vowels and labiality in consonants, although the details of how this distinction is to be geometrically characterized varies from model to model.

In this paper I will argue against positing distinct [labial] features for consonants and vowels, supporting instead traditional assumptions regarding this feature's position in the tree. In Section 1 I will briefly present three recent proposals involving [labial] consonant-vowel geometric asymmetries; those of Odden (1991), Clements (1990), and Selkirk (1989). In Section 2 I will present data from two languages indicating that consonant and vowel [labial] specifications crucially interact, requiring no assumptions concerning their supposed tier-distinctness. The first language, Berber, has in fact been invoked as providing evidence *for* C-V [labial] segregation (Selkirk 1988, Clements 1990). The second language, Trique, has not previously been investigated in this fashion.

1. On C-V [labial] Segregation

1.1 Odden (1991)

Odden (1991) argues for an "acoustic-driven" geometry of the following form:

```
                         root

           dorsal    .
           labial      .
           coronal       .
           vowel place     .
                         /   \
                    height    back-round
                  /   |   \       /  \
                low   ATR high   rnd back
```

Note that on the one hand, labial Cs are represented in the more-or-less traditional fashion, that is, as an articulator, sister to [coronal] and [dorsal]. [round] vowels, on the other hand, are not represented in this fashion. Instead, Odden posits a distinct vowel place node with dependents [height] and [back-round]. The terminal feature [round], which distinguishes [labial] vowels, is thus predicted to pattern solely with vowels; the [back-round] node affects [back] and [round] vowels to the exclusion of consonants. As labial Cs are on a distinct tier, no interaction is predicted between labial Cs and labial Vs.

Odden provides many compelling arguments for grouping [back] and [round] together as a constituent, as many spreading processes refer solely to these features to the exclusion of all others, [labial] Cs being both non-triggers and non-undergoers. Articulator theory would not predict this patterning however, as [back] and [round] are dominated by distinct articulators, and thus predicted not to pattern together. I thus assume that some representational dimension encodes the intimate acoustic relationship [back] and [round] share (i.e. their similar influences on F_2). However, I do not concur with Odden's conclusion that labial Cs and labial Vs never interact.

Odden's sole argument against the hypothesis that labial Cs and labial Vs interact is a rather weak one. He cites evidence from Tulu, argued by Sagey (1986) to provide evidence both *for* labial C - labial V interaction, and for the existence of the [labial] articulator node present on both labial Cs and labial Vs. In Tulu, /i/ becomes [u] when following a labial segment (C or V), even if a non-labial consonant intervenes (Bright 1972):

/i/ -> [u] / [lab] (C) ___

Sagey assumes that vowels marked [labial] acquire [round] and [+back] specifications by Redundancy Rule:

```
place          place              place     place
  |              |                  |    /    |
labial         dorsal             labial    dorsal
                 |                /          |  \
               [+high]         [rnd]   [+back][+high]
```

She observes that the process cannot be [place] spread, as intervening non-labial Cs do not inhibit the process. Nor can the process be [round] spread, as the triggering Cs are not round. Instead, the [labial] articulator node must spread.

Odden observes that if Sagey assumes the vowel to have received its labial specification from a leftward consonant, she must assume also that the consequent [round] value acquired by Redundancy Rule rounds all segments to which it is ultimately linked, including the consonant of [labial]'s origin. Odden notes that no mention is made of rounding on the triggering segment. He concludes that the whole matter is questionable, without offering an alternative account.

While there may indeed be no phonetic description of the output in Bright's (1972) presentation, it is well within the realm of possibility that the triggering consonant is indeed rounded, even if not phonologically, then quite likely phonetically through anticipatory coarticulation. But as no information is available concerning this phonetic detail, and as Odden does not offer an alternative account, I conclude that labiality in Tulu should certainly not be invoked as an argument -- indeed the sole argument -- against labial C-V interaction.

In fact Section 2 will discuss data which requires the interaction of labial Cs and labial Vs, showing that Odden's geometry is insufficiently powerful.

1.2 Clements (1990)

Clements (1990) proposes a "C-place - V-place" geometry, that, while still segregating consonantal labiality from vocalic labiality, nonetheless allows their interaction via "cross-tier assimilations" and "cross-tier dissimilations".

```
                    root
                     |
                    C-place
                    /    \
         articulators    vocalic
           /             /     \
     [labial]       V-place   aperture
          etc.      /
                  [labial]
                     etc.
```

In this geometry, Clements allows C-[labial] and V-[labial] to interact in terms of assimilatory and dissimilatory processes despite their being on distinct autosegmental tiers. Cross-tier C-[labial] - V-[labial] dissimilation occurs in Bantu, while C-[labial] - V-[labial] dissimilation is present in Berber.

It is quite transparent that Clements avoids the problems encountered in Odden's geometry by stipulation only. Within Clements' model, the only property common to C-[labial] and V-[labial] is the label [labial]. According to this approach, we might expect interactions between, say, [anterior] and [sonorant], should we rename these features [Frederick] and [Frederica] respectively. Surely, we do not want such rampant arbitrariness to be allowed into the grammar, and yet Clements' approach would seem to be lifting the curtain on just such a scenario.

```
                [Frederick]
                     |
                   C-place
                   /    \
        articulators    vocalic
         /    |         /     \
    [labial][coronal]V-place aperture
               /    /
      [Frederica][round]
```

In this geometry, [Frederick] (aka [sonorant]) and [Frederica] (aka [anterior]) may interact.

1.3 Selkirk (1988)

Selkirk's presents an analysis of C-V [labial] interaction something along the lines of Mester (1986), whereby tier dependencies may be language-specific. Selkirk goes Mester one further, hypothesizing that identical features may display distinct dependent relationships within a single system. She additonally allows cross-tier processes a la Clements (1990). Thus a labialized dorsal and a dorsalized labial may coexist in the same system, along with their plain counterparts, and any and all [labial] specifications may interact:

```
RC                  RC                  RC             RC
|                   |                   |              |
dorsal              labial              dorsal         labial
|                   |
labial              dorsal

labialized dorsal   dorsalized labial   dorsal         labial
```

Selkirk thus combines the unbridled power of a Clementsian approach with the power of a Mesterian approach. As Selkirk's analysis imparts even more power to the grammar than Clements' does, we will not discuss it further.

2. Unified Labiality

We have thus far considered three approaches to labiality which, while possessing certain points in their favor (Odden's [back]-[round] observation), have been claimed to be either not powerful enough (in the case of Odden's "acoustic driven" geometry), or far too powerful (in the case of Clements' "C-place - V-place" geometry,and Selkirk's segment-specific tier dependency model), as the following chart summarizes.

	Odden	Clements	Selkirk	ideally
allows [labial] C-V interactions	no	yes	yes	yes
potentially allows any two tiers to interact	no	yes	yes	no
allows back-round constituency	yes	no	no	yes

In this section I hope to show, contra Odden, that labial consonants and labial vowels do crucially interact, but also, contra Clements and Selkirk, that it serves no purpose to empower the grammar with "cross-tier" capabilities.

2.1 Berber

Berber displays a rather complex constraint involving labiality. I will present the facts as outlined in Selkirk (1988), briefly discuss Clements' approach to the data, then invoke an approach originally due to McCarthy's (1989) analysis of Semitic root constraints. This analysis will not require distinct [labial] values for consonants and vowels.

The Berber facts (from Selkirk (1989):

1. a labiovelar consonant loses its labiality when immediately preceded by a segment with a [labial] component:

a.	g^wra	(glean, pret.)	imgra	(gleaners)
b.	g^w:ra		imgrad	
c.	amda:k^wl		imd:uk:al	

2. prefixal /m/ and /m/ introduced by templatic morphology dissimilate to [n] when followed in the stem by a primary labial consonant, not necessarily adjacent to it:

a.	Gza	(dig)	mGza
b.	siggl	(look for	msaggal
c.	!sawr	(ask for advice)	msawar
d.	zla	(lose)	mmzla
e.	fra	(disentangle)	nfara
f.	hssm	(be shy)	nhassam
g.	xalf	(place crosswise)	nxalaf
h.	9zb	(please)	n9azab

(note that Selkirk assumes labial vowels to possess secondary labiality, not primary labiality, and thus they are non-triggers (cf. (c)))

3. The labiovelar obstruents dissimilate to their non-labial counterparts when /w,u/ and also the labiovelar obstruents follow in the same root:

a.	zdr	(be located below)	azddayru	(the one below)
b.	x^wsn	(be ugly)	axssaynu	
c.	!(g)g^wzd	(chip a corner of)	a!gzzaydu	
d.	(g)g^wzm	(be amputated)	agzzaymu	

4. Labiovelars do not dissimilate when primary Labial follows:

a. (g)g^wzm (be amputated)

Labiality in Berber has been argued in Clements (1990) to be an instance of "cross-tier dissimilation". That is, primary labiality may, for part of the derivation at least, interact with secondary labiality.

Clements relies on the supposed templatic nature of Berber morphology (McCarthy 1979), defining constraints both pre- and post-Plane Conflation. Foregoing a detailed presentation of his analysis, I will instead focus on what I regard to be its major problematic facet. Clements theory requires that the sequence /mk^w/, which is in fact unattested on the surface, has the following representation:

```
            m          C^w
            |          |
            root       root
            |          |
            C-pl       C-pl
           /           |
     [labial]          V-pl
                       |
                       [labial]
```

To quote directly from Clements, "Here we see that the two occurrences of [labial] are not on the same tier, yet they are still ill-formed...This fact requires us to extend our analysis of the OCP so that it can generalize across tiers..."(p.14). As we have already discussed the unattested power such an approach imparts to autosegmental phonology, we will not belabor this point here.

Instead, I suggest that the Berber facts may be readily explained along the lines outlined in McCarthy (1989) in his analysis of articulator co-occurrence restrictions in Arabic roots.

Extracting the essence of McCarthy's presentation, he observes three parameters at work in these co-occurrence restrictions:

place, locality, and stricture.

With respect to place restrictions, McCarthy reports that roots disfavor identical articulators to a statistically significant degree ($p<.01$). Thus two coronals within a root are disfavored:

XYX, XXY, YXX: disfavored

(where X and Y are variables over articulator nodes)

With respect to locality, McCarthy reports that the restriction on articulator identity is eased somewhat for non-adjacent identical articulators. Thus, for example, coronals are very rarely observed in strict root-adjacent position, though somewhat more readily observed in root non-adjacent position.

XYX: disfavored,
XXY: more disfavored

Unlike place, stricture does not appear to be an independent parameter, but instead operates within the domain of the place parameter. That is, there does not seem to be a general root constraint in Semitic limiting particular stricture specifications. However, if a particular articulator is investigated in isolation, statistically significant constraints on stricture co-occurrence is observed. Thus within the class of coronals, strictly adjacent stops and strictly adjacent fricatives are observed less often than strictly adjacent coronals which differ in stricture. Non-adjacent coronals relax the stricture constraint to a certain degree, though the co-occurrence of stricturally distinct non-adjacent coronals is still restricted.

Order from most disfavored to least disfavored:

1.	XXY	2.	XXY	3.	XYX	4.	XYX
	||		||		| |		| |
	AA		AB		A A		A B

(where A and B are distinct stricture values)

Now recall the labiality facts from Berber.

<u>Under strict adjacency</u>

1. a labiovelar which follows a labial loses its labiality:

   [lab]$C^{[lab]}$ -> [lab]C

2. a labiovelar prefix loses labiality if abutting a labial:

$C^{[lab]}$ + [lab] -> C[lab]

<u>Long distance effects</u>

3. a labial prefix to a root containing a labial dissimilates to coronal (but neither labiovelars *nor labial vowels/glides* trigger the rule)

[lab] + ...[lab] -> n...[lab]

4. labiovelars delabialize when /u,w/ or labiovelar consonants follow in a stem

$C^{[lab]}$ + ...u,w,$C^{[lab]}$ -> C...u,w,$C^{[lab]}$

With McCarthy's observations of Semitic in mind, the characterization of Berber becomes rather straightforward.

First, I assume that labiovelars are underlying clusters, and thus possess distinct root, place, and stricture nodes. Due to their feature compatalibilty, these clusters may merge at some point of the derivation (Steriade 1992). Now, just as in Semitic, locality, stricture, and place crucially interact, stricture playing a role solely within the confines of place, and not independently. So, no two [labial] specifications may be string adjacent in Berber, regardless of stricture specifications:

*[lab][lab]

Second, no two labial specifications may cooccur in non-adjacent position, should their stricture specifications agree in consonantality:

*[lab] [lab]
[ácons]...[ácons]

These interrelated constraints would seem to account for all the data presented in Selkirk, without making any seemingly unwarranted assumptions regarding "primary" and "secondary" specifications, or "C-[labial]" - "V-[labial]" asymmetry. Still more in this approach's favor is the fact that it need not consider glides and vowels secondarily labial, as Selkirk's analysis requires, but instead relies solely on their [cons] value, thus explaining their patterning with the labial portion of labio-velars. Below is the Berber data, presented again.

a.	g^wra	(glean, pret.)	imgra	(gleaners)
b.	g^w:ra		imgrad	
c.	amda:k^wl		imd:uk:al	

a.	Gza	(dig)	mGza

b.	siggl	(look for	msaggal	
c.	!sawr	(ask for advice)	msawar	
d.	zla	(lose)	mmzla	
e.	fra	(disentangle)	nfara	
f.	hssm	(be shy)	nhassam	
g.	xalf	(place crosswise)	nxalaf	
h.	9zb	(please)	n9azab	

a.	zdr	(be located below)	azddayru	(the one below)
b.	x^wsn	(be ugly)	axssaynu	
c.	!(g)g^wzd	(chip a corner of)	a!gzzaydu	
d.	(g)g^wzm	(be amputated)	agzzaymu	

2.2 C-V Labiality Constraints in San Juan Copala Trique

Another language which seemingly requires a unified treatment of C and V labiality is the San Juan Copala dialect of Trique.
The Trique segment inventory is listed below (all data from Hollenbach 1977).

p	t			k	i:		u:
b	d			g		e(:)	o(:)
	s	s	s			a(:)	
	z	z	r				
	c	c	c				
m	n						
	l						
		y	w				

?, h

(/p/ and/b/ occur only in loans)

Concerning clustering properties in Trique, a nasal may co-occur with any homorganic stop:

kamba?	(furrowed green squash)	(-ma?, -wa?)
zindi?	(calf of leg)	
nda	(until)	
ngga	(cloud)	

/?/ may co-occur with any sonorant:

a?ma	(to be hot)
a?na?	(to be hurt)
da?lu	(malaria)
la?wa	(toothless)
da?ya	(door)

A velar stop may co-occur with /w/:

nukwah (strong)
dugwah (to twist)

Three-element clusters are limited to the following, and are reportedly rare.

/?nd/
/?ngg/

yuwe zigu?ndu? (eyelash)
(-zigu?nu?, -zigu?lu?, -zigu?yu?)
a?ngga (to be born)

In Trique there is a constraint on labiality that involves both consonants and vowels. I will first present the preliminary generalizations, then further analyze the data in order to extract the most general constraint possible.

Here are the preliminary generalizations regarding labiality patterning in Trique:

1. Only one labial consonant is permitted per word.

```
*[lab]      [lab]
 [+cons]...[+cons]
```

2. no syllable consists of a labial followed by a round vowel.

*mu *mo *wo *wu

(recall that /m/ is the only native labial consonant)

3. labiovelars occur word-medially only if immediately preceded by /u/.

nukwah (strong)
dugwah (to twist)

4. sequences of [uw] are attested, but only to resolve hiatus.

yu.wi (people)
zu.we (dog)
ru.wa (squash seed)

cf. ri.u (whistle)
zeri.o (match)
ri.o (trough)

(where "." indicates syllable boundaries)

5. multiple [labial] specifications on vowels are attested, as no systematic seems in evidence harmony seems in evidence.

```
a.   roko      (custard apple)
     riki      (grasshopper)
     gata      (to carry (potential))
     guku      (Inca dove)

     but
b.   gaki      (nail)
     utah      (to annoint)
     ako       (to sob)
     dako      (foot)

     and
c.   ziko      (groove)
     nike      (poor)
     yuwe      (hidden)
     uce       (to get wet)
```

The data in (a) are harmonic forms. those is (b) are disharmonic involving the low vowel, and those in (c) are disharmonic both in terms of [high] and [round], with no pattern governing direction of feature association.

Regarding generalizations (3) and (4), it is apparent that superficial sequences of labial Vs followed by labial glides may be reducible to a single labial specification. Thus [uwV] sequences involve hiatus resolution in which the labial vowel spreads rightward to provide an onset for the bare V syllable. Similarly, medial labiovelars acquire their labiality from the preceding [labial] vowel, thus requiring solely a single [labial] autosegment.

```
    /ua/ ->   [uwa]              /uka/     ->   [ukwa]

     ó      ó                      ó         ó
     |      |                      |         |
     ì      ì                      ì         ì
     |      |                      |         |
   [lab]  [lab]                  [lab]     [dors]
```

The overall generalizations to be made regarding the patterning of labiality in Trique are as follows:

1. all instances of adjacent labial segments are reducible to a single [labial] autosegment[1]

[1] There are two exceptions in the data. The first, *ru?mi* (charcoal), is in free variation with *ru?wi*, and is thus not a true counterexample. The second, *zume* (barn owl), seemingly does not possess a free variant *zume*, but could cenceivably have its historical

2. labial contoids never co-occur with any other labial segment, either consonant or vowel, i.e., if a labial consonant, then no other labial segment

3. multiple labial specifications in vocoids are allowed, though may not be string-adjacent (cf. *[([lab])w[lab]])

In summation, there are definite constraints on the distribution of [labial] in Trique which crucially involve both consonants and vowels considered together:

```
[lab]     [lab]
[-cons]...[-cons]
```

otherwise:

*[lab](...)[lab]

That is, the only instance in which more than one labial autosegmennt is found within the word is when both labial segments are maximally sonorous and non-adjacent. Otherwise, two [labial] specifications are disallowed.

3. Discussion and Conclusion

Recall the chart presented at the beginning of Section 2, repeated here.

	Odden	Clements	Selkirk	ideally
allows [labial] C-V interactions	no	yes	yes	yes
potentially allows any two tiers to interact	no	yes	yes	no
allows back-round constituency	yes	no	no	yes

The present analysis of the representation of labiality approaches the ideal, in that it allows for [labial] Cs to interact with [labial] Vs, without stipulating the allowability of cross-tier interactions. Reanalyzed constraints in Berber, as well as similar constraints in Trique, favor a unified approach to C-V labiality, eschewing the problems shown to exist for positing their segregation. However, the present approach is still subject to the criticisms launched by Odden (1991), in that it fails to capture the intimate relation shared by [back] and [round].

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origins in this alternate form.

As noted in Section 1, one possible way of incorporating Odden's observation is to hypothesize an additional dimension to feature representation which encodes specific features' distinguishing acoustic qualities, allowing for the formation of additional natural classes.

```
Acoustic geometry:                [back]       [round]
                                       \         /
                                       [back-round]   etc.
                                            \
                                            Place
                                          /    |   \
Articulatory geometry:
[labial][coronal][dorsal]
                                     |                etc.
                                  [round]
```

Determining the conditions under which any given language would allow for such feature organization, and determining if there is a systematicity with respect to the type of rule which may or may not refer to these natural classes, would seem a formidable, though highly worthy, research program.

Among the predictions such a model predicts are the following:

First, if a language displays vowel-to-vowel [labial] spread, and intervening [labial] consonants block this process, then it is predicted that [back] is not involved in the spreading process: since consonants are not subject to the acoustic geometry dimension, such spreading is along the articulatory geometry dimension, where [back] and [round] do not form a constituent. This means that the rule may be targeting either the terminal feature [round], in which case [labial] consonants should be transparent, or the [labial] articulator, in which case labial consonants may be blockers. Exactly this final scenario obtains in Nawuri (Casali, this volume). In Nawuri, a labial vowel transmits labiality to a right adjacent vowel. If a labial consonant intervenes, transmission is (optionally) blocked.

gI + sU	->	gUsU	(ear)
gI + kUlUng	->	gUkUlUng	(one item)
gI + ni	->	gIni	(tooth)
gI + jo	->	gUjo	(yam)

but

gI + mu	->	gImu - gumu	(head)
gI + pula	->	gIpula - gupula	(burial)

As rounding spreads without concomitant backing, either the terminal acoustic feature [round] is spreading, or the terminal articulatory feature [round] is spreading, or the [labial] articulator node is spreading. Since [labial] consonants block the process, the rule apparently targets the [labial] articulatory node. Consequently, it is predicted that [back] not pattern with [labial] spread. This is exactly what obtains in Nawuri.

Second, if [back] and [round] spread together, then the rule is argued to be operating on the acoustic geometry. Consequently, intervening [labial] Cs are predicted to be transparent. Recall that this is exactly what obtains in Tulu.