Aspect in Mafa: An Intriguing Case of Featural Affixation*

Marc Ettlinger
University of California at Berkeley

0. Introduction

This paper analyzes a few of the morphological and phonological issues raised by the imperfective form in Mafa, a Central Chadic language spoken in Cameroon. Four forms of the imperfective are seen in (1):

(1)	a. gudza	'tremble'	gudza**j**	'is trembling'
	b. tsap-	'spackle with clay'	t**ʃe**p-	'is spackling w/ clay'
	c. lubat	'twist'	l**yb**e**t**	'is twisting'
	d. suwdək	'miss'	**ʃ**uwd**i**k	'is missing'

The three main questions these data raise are: i) What is the imperfective morpheme and can the allomorphy of the suffix (1a) versus spreading palatal feature (1b) be reduced to a single underlying form? ii) To what does the morpheme link in the stem in the case that it is realized as a feature (1b, 1c, 1d)? iii) How is agreement amongst the appropriate stem segments (in bold in (1b, 1c, 1d) achieved allowing for transparent segments such as the unpalatalized /u/ in (1d), that are normally contrastive for palatality (1c)?

The theoretical significance is found in the answer to the third question where I propose an alternative to both agreement by strict locality (Gafos 1996) and agreement by correspondence (Rose and Walker 2003, Hannson 2001). As conceived within an Optimality Theory (Prince and Smolensky 1993) framework, the solution posits a constraint that segments be palatal which dominates faithfulness constraints only within the imperfective co-phonology. Ultimately, this amounts to a morpheme that causes targeted segments to be palatal resulting in an epiphenomenal surface agreement between segments.

This paper begins with a brief introduction to the phonology relevant to the formation of the imperfective and perfective forms in Mafa. In the subsequent section, I argue that there is a single underlying morpheme for the formation of the imperfective using violable constraints. Next, I discuss the segment agreement in the imperfective, first by contrasting different approaches to linking the featural

* I am grateful for the help, guidance and aid of Larry Hyman, who introduced me to Mafa, and Sharon Inkelas, who introduced me to morphology. I also owe a debt of thanks to the Berkeley Phonology Forum and Mari.

morpheme to a segment in the stem, then by comparing three possible approaches to the agreement of the remaining segments.

1. Basic Phonology

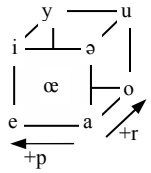
The phonemic inventory (Barreteau and Le Bleis 1990) is shown in table 1 (consonants) and table 2 (vowels):

Table 1: Consonants in Mafa

	Labial	Dental	Alveolar	Palatal	Velar	Rounded velar
Stops	p b	t d			k g	k^w g^w
Pre-nasalised stops	^{m}b	^{n}d	^{n}dz	^{n}dʒ	ŋ	$ŋ^w$
Nasal	m	n				
Fricatives	f v	θ ð	s z	ʃ ʒ	x ɣ	x^w $ɣ^w$
Affricates			ts dz	tʃ dʒ		
Lateral		l				
Approximants		r		j		w

There are eight vowels in Mafa defined by three distinct features: rounding, palatality and height:

Table 2: Mafa Vowel Space



Relevant to the discussion of the imperfective are the palatalization and labialisation of the consonants and vowels. Palatalizing the alveolar consonants results in the palatal consonants in table 1. So /s/ > [ʃ] and /z/→[ʒ], etc. The velar consonants are subject to labialisation becoming rounded velars: /k/→[k^w], /g/→ [g^w], etc.

All vowels are subject to both labialisation and palatalization. The vowel space (table 2) shows that palatalized /ə/ is [i], /u/→[y], /o/→[œ] and /a/→[e]. Labialized /a/ is [o], /e/→[œ], /i/→[y] and /ə/→[u].

A phonotactic constraint important for the analysis of the imperfective is a constraint against velar consonants adjacent to /y/. Normally /u/ is palatalized as [y] as seen in the imperfective and diminutive (2). However, when preceded by a velar, the vowel remains /u/ (3).

(2) Regular palatalization of /u/

a. tud-	‘die’	t**y**d-	‘is dying’
pul-	‘dig’	p**y**l-	‘is digging’
furk^{w}	‘scrunch’	f**y**rk^{w}	‘is scrunching’

(3) Velar blocking palatalization

a. gud-	‘search with anxiety’	g**u**d-	‘is is searching with anxiety’
kurk^{w}-	‘search everywhere’	k**u**rk^{w}-	‘is searching everywhere’
gum-	‘work’	g**u**m-	‘is working’
b. hupat	‘rock’	h**u**pet	‘little rock’
kuðar	‘type of plant’	k**u**ðer	‘tiny plant’

2. The Form of the Imperfective

Verbs appear with one of three aspect markings in Mafa: the imperfective, the perfective and the fundamental. The fundamental represents the “…raw process without any indication of tense or aspect” (Barreteau and Le Bleis 1987, p. 40). In addition to aspect, verbs can be suffixed by other inflectional and derivational suffixes to indicate mode and inchoative, passivization, causative, and transitive. Also, all consonant-final verbs have final vowels, which is open pre-pausally and closed otherwise (4).

(4) a. i panə tə gay
I wash in house
“I wash in the house.”

b. i pana
I wash
“I wash.”

The imperfective is formed in one of two ways depending on the final segment of the root. In the case of vowel-final verbs, /j/ is suffixed to the base as seen in (5). All vowel-final verb stems end in an /a/ and all other suffixes are positioned after the imperfective suffix.

(5) Palatalization of /-a/ final verbs:

a. gudza	‘tremble’	gudza**j**	‘is trembling’
b. bəra	‘insult’	bəra**j**	‘is insulting
c. ^{n}da	‘cut a hole’	^{n}da**j**	‘is cutting a hole’
d. keða	‘divide’	keða**j**	‘is dividing’

The imperfective of verbs ending in a consonant are shown in (6). In (6a-c) a single vowel is palatalized to mark the imperfective aspect; in (6d), a consonant is

palatalized, and in (6e,f), both a vowel and consonant are palatalized. In (6g), vowels and consonants in two syllables are palatalized, including non-adjacent segments. In (6h), there is no surface marking of the imperfective because of the phonotactic constraint on [y] after a velar mentioned previously.

(6) Palatalization of consonant final verbs:

a. pan-	'wash'	p**e**n-	'is washing'
b. təv-	'light (v.)'	t**i**v-	'is lighting'
c. dad-	'add water to'	d**e**d-	'is adding water to'
d. guts-	'squirt'	gutʃ-	'is squirting'
e. tsap-	'spackle'	tʃ**e**p-	'is spackling w/ clay'
f. sur-	'sleep w/ a woman'	ʃ**y**r-	'is sleeping w/ a woman'
g. səban-	'work'	ʃ**i**b**e**n-	'is working'
h. gum-	'carve wood'	g**u**m-	'is carving wood'

3. Underlying Form of the Imperfective Morpheme

The morphophonemic principle (Hyman 1975) dictates that we looks for a single underlying representation for the imperfective allomorphs. In this section, I show that the allomorphy of (5) and (6) can be reduced to an underlying /j/ suffix as the imperfective morpheme.

Separating the morpheme into two components - the segmental representation in the skeletal tier and the featural representation - allows for the creation of two separate constraints: one for realizing the segment of the imperfective morpheme in the skeletal tier and another for realizing the primary feature of the morpheme. Both conditions are violable and the data show the dominance of one, both or neither constraint. The examples in (5) show the instantiation of both: the /j/ suffix has both the segmental manifestation of the morpheme and the feature [+pal] of the morpheme. In (6), a phonological constraint against consonants followed by /j/ prevents the realization of the segment, but the palatal feature is realized on one or more of the segments of the stem. In (6h), two phonotactic constraints – against /Cj/ and /Ky/ (discussed in §1) – dominate the realization of the segment in the skeletal tier or the feature on any of the stem segments. Not found in the grammar is the realization of the segment of the imperfective morpheme absent the feature indicating that the realization of the feature takes priority over the realization of the segment. This is consistent with the data in (6) where the constraint against /Cj/ takes precedence over the realization of the segment, but not the feature.

This can be represented in OT by applying two constraints, defined in (7) and (8), combined with an alignment constraint dictating that the imperfect be aligned with the right edge of the stem:

(7) PARSE-IMP-SEG:
Realize the segment of the imperfective morpheme in the skeletal tier.

(8) PARSE-IMP-FEAT:
Realize the features of the imperfective morpheme.

Tableau 1 shows regular suffixation with /-a/ final verbs:

Tableau 1 – Parse and alignment of the imperfect morpheme.

/bəra, j/	PARSE-IMP-SEG	ALIGN-R-IMP	PARSE-IMP-FEAT
(a)☞bəraj			
(b) bərja		*!	
(c) bəra	*!		*!
(d) bire	*!		

Tableau 2 shows the dominance of PARSE-IMP-SEG by a markedness constraint resulting in just a featural affix. To be realized, the PARSE-IMP-FEAT must dominate the identity constraint that maintains the palatality of each segment in the base:

Tableau 2 – Featural realization of the morpheme.

/pan, C/ | [pal]	PARSE-IMP-FEAT	*CJ	PARSE-IMP-SEG	IDENT-PAL
(a)☞pen | [pal]			*	**
(b) panj		*!		
(c) pan	*!		*	

As shown above (6h), there are cases where no morpheme will be realized on the surface form; this is modeled by having both parse morpheme constraints dominated by other phonotactic constraints as in tableau 3:

Tableau 3

/gum, C/ | [pal]	IDENT-MP	*Ky	*CJ	PARSE-IMP-FEAT	IDENT-PAL
(a) gym | [pal]		*!			*
(b)☞gum				*	
(c) dym	*!				*
(d) gumj			*!		

Also introduced in tableau 3 is the constraint for faithfulness of the major place of articulation, a constraint that eliminates the strategy of changing the velar to another segment to avoid violation of *Ky. The inviolability of this constraint amounts to limiting the strategies for changing segments to palatalization and

labialisation, excluding such strategies as assimilation and dissimilation of anything put palatal features.

This section has shown that the underlying representation of the imperfective morpheme can be /j/, provided there are two constraints, one requiring the segmental realization of the suffix and the other requiring just the realization of the major feature of the morpheme.[1] Within OT, the constraints are ordered as follows:
IDENT-MP, *Ky, *Cj » Parse-Imp-Feat » IDENT-PAL, PARSE-IMP-SEG
Crucial to the next section are the examples where the morpheme is represented exclusively as a feature, and not as a segment.

4. Feature Linking

The above examples obscured how the de-linked palatal feature from the imperfective morpheme affects the segments in the base. In tableau 2, for example, it was simply assumed that the floating [+pal] would palatalize the /a/ into an /e/. The ultimate solution is far more complicated, however, and further investigation reveals that the mechanism by which the feature affects the base has importance for theories of agreement.

The are a number of approaches possible for the linking of the palatal feature to the stem: i) link the feature to a vowel, with consonants affected through agreement, ii) link the feature to a strident, with vowels affected through agreement, or iii) link to any available segment[2].

Ruling out (i) requires examples where there are no vowel to which the feature links, thereby eliminating the possibility of palatalized consonants as a result of spreading **from** palatal vowels. Indeed, there are examples, such as those in (9), where a consonant, /s/, is palatalized despite the lack the palatal vowels.

---

[1] This same effect can be achieved through the use of a [+p] morpheme assuming a featureless C at the end of all /-a/ final verb stems. The difference in behavior would be apparent through the interaction with other morpheme – beyond the scope of this current analysis. Additionally, the CV-syllable is preferred to the CVC-syllable making it less desirable to posit CVC with a featureless C in the /-a/ final verb stems.

[2] "Available" is not clearly defined here, but is more precisely explained later.

(9) Vowels unaffected:

a. wurts	'engrave with fire'	wurtΣ	'is engraving with fire'
b. guts	'squirt'	gutΣ	'is squirting'

Similarly, there are myriad examples where vowels are palatalized without a corresponding palatal consonant (10) ruling out option (ii), the palatalization of vowels through feature-spreading from a consonant.

(10) Consonants unaffected:

a. ∆a∆ay	'light(v.)'	∆e∆ey	'is lighting'
b. təkəd	'grind millet'	tikid	'is grinding millet'
c. kədah	'cook (a fatty sauce)'	kideh	'is cooking (a fatty sauce)'
d. bəla∆	'lift'	bile∆	'is lifting'
e. lubok^{w}	'obey'	lybœk^{w}	'is obeying'
f. lubat	'twist'	lybet	'is twisting'

The remaining option is that the palatal feature targets both stridents and vowels: an unnatural class of segments (Clements and Hume 1996).[3]

5. Agreement: Spreading

With the linking of the feature established, the question of how, once a single segment receives the palatal feature, the feature spreads to other segments, must be answered. There have been two primary approaches to segment agreement: agreement by correspondence (Rose and Walker 2003) and agreement by feature spreading (Gafos 1996, Akinlabi 1996). Neither approach is appropriate for the data in Mafa, so a third option, a non-directional constraint requiring segment to be palatal, is suggested.

Akinlabi presented a way to account for morphologically induced harmony through a featural affix. The idea is that the feature aligns to the left and right of the stem and markedness against gaps in the feature results in spreading to all intermediate segments. The constraint against gaps (Archangeli and Pulleyblank 1994) correlates with the idea of strict locality (Gafos 1996), which suggests that spreading is from segment to adjacent segments only. The apparent transparency of unaffected segments is due to the segment not being contrastive with respect to the particular spreading feature. Thus, the strict-locality autosegmental representation of *Σĭben* from (6g) above, is seen in (11). Because /b/ and /n/ are not contrastive in Mafa for palatality, there is no surface realization of the feature.

---

[3] Two additional options have been suggested:

iv. Link preferentially to a strident, otherwise link to a vowel, then other segments agree.

v. Link preferentially to a vowel, otherwise link to a strident, then other segments agree.

However, these make indistinguishable predictions from each other as well as (iii) above,

(11) /Σiben/
\ \ | / /
[pal]

However, there is evidence of transparent segments (segments that do not block spreading) that are constrastive (normally reflect a particular feature in their surface form) in Mafa which conflicts with the idea of strict locality. In (12), segments near the left and right edges are palatalized – the /s/ >/Σ/ and /ə/ > /i/ in (12a) and the /ts/ > /tΣ/ and /a/ > /e/ in (12b) – but there is an intervening unpalatalized segment – the /u/ – in both. Strict locality would hold that for the spreading palatality of the /i/ (10a) or /e/ (10b) to affect the segments on the left, the feature would also link to intervening segments. These two examples show evidence against strict locality because the /u/ normally contrastively reflects the palatal feature (cf. s**u**r 'sleep with a woman', Σ**y**r 'is sleeping with a woman').

(12) Evidence against strict locality in Mafa:

a. suwdək	'miss'	Σuwdik	'is missing'
b. tsuwah	'cut into pieces'	tΣuweh	'is cutting into pieces'

Indeed, the OT constraints developed by Akinlabi to account for feature spreading through transparent contrastive segments results in a ranking paradox when applied to the Mafa imperfective.

The constraints he suggests, as applied to Mafa, are:

(13) Featural Affix Constraints (Akinlabi 1996):
a. ALIGN-IMP-R – Align the right edge of the imperfective morpheme with the right edge of the stem.
b. ALIGN-IMP-L – Align the left edge of the imperfective morpheme with the left edge of the stem.
c. *GAP – There can be no gapping of a spreading harmonic feature.

Deriving the ranking paradox requires going through a sequence of tableaux:

Tableau 4 – The alignment constraints dominate palatal faithfulness

/tsap, C/ | [pal]	PARSE-IMP-FEAT	ALIGN-IMP-R	ALIGN-IMP-L	IDENT-PAL
(a)☞ tΣep | | [pal]				**
(b) tsep			*!	*
(c) tΣap		*!		*
(d) tsap	*!			

Tableau 5

/tsəbawuΔ, C/ | [pal]	*Ky	PARSE-IMP-FEAT	ALIGN-IMP-R	ALIGN-IMP-L	IDENT-PAL
(a) tΣibewyΔ	*!				****
(b) ☞tΣibewuΔ			*		***
(c) tsibewuΔ			*	*!	**
(d) tsəbawuΔ		*!			

Tableau 4 and 5 show the dominance of the parse constraint (the relevant constraint from the previous section) over the alignment constraints which dominate the identity constraint allowing the surface realization of the palatal feature.

Tableau 6: Necessity of *GAP

/səban, j/	*GAP	PARSE-IMP-FEAT	ALIGN-IMP-R	ALIGN-IMP-L	IDENT-PAL
(a)☞Σiben					***
(b) Σəben \⊨/ [pal]	*!				**
(c) səban		*!			
(d) Σiban			*!		**
(e) siben				*!	**

Tableau 6 shows necessity of the constraint against gapping (Archangeli and Pulleyblank 1994), enforcing palatalization of all intermediary segments. This is accomplished through *GAP dominating the other constraints.

To summarize thus far, the above tableaux result in the following ranking:
*GAP » PARSE-IMP-FEAT » ALIGN-IMP-R, ALIGN-IMP-L » IDENT-PAL

Applying this ranking to an example in (12) predicts the incorrect form:

Tableau 7: Incorrect predication of rankings for transparent segments

/ suwtəh, [+p]/	*wy,*yw	*GAP	PARSE-IMP-FEAT	ALIGN-IMP-R	ALIGN-IMP-L	IDENT-PAL
(a) Σuwtih		*!				***
(b)☞suwtih / [pal]					*!	**
(c) ☞Σuwtəh				*!		
(d) suwtəh			*!			**
(e) Σywtih	*!					**

The ranking required to obtain the correct form is shown in tableau 8, with *GAP ranked lower than the other constraints:

Tableau 8

/suwtəh, [+p]/	*wy, *yw	PARSE-IMP-FEAT	ALIGN-IMP-R	ALIGN-IMP-L	*GAP
(a)☞Σuwtih \ǂ / [pal]					*
(b) suwtih				*!	
(c) Σuwtəh			*!		
(d) suwtəh		*!			
(e) Σywtih	*!				

6. Agreement: Correspondence

Rose and Walker (2003) (also see Hansson 2001) encounter similar problems in an array of languages and propose analyzing segment agreement as correspondence amongst "like" segments when strict locality is violated. "Like" is defined as segments that have a set of shared features and they propose correspondence between coronals in Aari (Hayward 1991), nasals in Kikongo (Ao 1991) and Yaka (Hyman 1995) and dentals in Mayak (Andersen 1999) to obtain agreement. For example, in Aari, the causative suffix /-sis/ is realized as /-ΣiΣ/ when a palatoalveolar segment occurs anywhere in the stem (14). This is conceived of as agreement in palatality between segments that have the same major place of articulation.

(14) Aari causitive

a. gi?-	'hit'	gi?-sis-	'cause to hit'
duuk-	'bury'	duuk-sis-	'cause to bury'
sug-	'push'	sug-zis-	'cause to push'
b. na-Σ-	'like, love'	na-Σ-ΣiΣ-	'cause to like'
tΣ'a-a-q-	'curse, swear an oath'	tΣ'a-a-q-ΣiΣ-	'cause to curse, etc.'
Σaan-	'urinate'	Σaan-ΣiΣ-	'cause to urinate'
Za-a-g-	'sew'	Za-a-g-ZiΣ-	'cause to sew'

In Mafa, vowels (aside from /a/ in certain phonological environments) also agree in palatality in addition to stridents, /s/, /z/, /ts/, /dz/ and /^{n}dz/ as shown in the

examples above (6e-g). Drawing a correspondence between this set of segments – vowels and stridents – would stretch the ideas of similarity well beyond its original scope of "check feature matching in corresponding consonants" (Rose and Walker 2003, p. 1) to one where the insightful generalizations captured by correspondence theory, that dentals, coronals or nasals may tend to agree, are lost.

7. Agreement: Generalized Agreement

What makes Mafa different from previous accounts of agreement is the long-distance agreement of segments that are not similar. To account for this phenomenon I propose that in the imperfective there is the more general requirement that all segments be palatal in the presence of a palatal segment and that the agreement in palatality that results is, in this way, epiphenomenal.

This general requirement that segments be palatal differs from other accounts of agreement in two crucial ways. First, no adjacency is required at any level, in particular at the segment level, at the tier level or amongst corresponding segments. Second, the agreement is asymmetrical in that it does not require that a segment be non-palatal in the presence of other non-palatal segments. This suggests that the palatal feature is privative, wherein a lack of palatality has no affect on other segments or agreement.

This can be modeled in OT through the use of a single constraint:

(15) BE-PAL – If any output segment is palatal, then each targeted segment is palatal.

This constraint is not categorical in that it incurs a violation for each output segment that is not palatal in the presence of one of more palatal segments. Also, to account for the asymmetry discussed above, extra violations are **not** incurred for the presence of additional segments that are palatal in the presence of non-palatal segments.

This constraint, along with the PARSE-IMP-FEAT, which ensure that the palatal feature surfaces on some segment, yields the transparency of un-palatalized segments:

Tableau 9

/səban, j/	*Cj	PARSE-IMP-FEAT	BE-PAL	IDENT-PAL
(a)☞Σiben				***
(b) Σəben			*! (Σ/e,ə)	**
(c) səban		*!		
(d) Σiban			*! (Σ/i,a)	**
(e) siben			*!	**

			(i/e,s)	

Tableau 10

/suwtəh, j/	*Cj	*wy, *yw	PARSE-IMP-FEAT	BE-PAL
(a)☞Σuwtih				* (Σ/i,u)
(b) suwtih				**! (i, u), (i, s)
(c) Σuwtəh				**! (Σ,u). (Σə)
(d) suwtəh			*!	
(e) Σywtih		*!		
(f) suwtəhj	*!			

Unanswered to this point is the question of how the target of palatality can be limited to the appropriate segments without pre-defining them. In other words, why does the form /p^{j}eJ/ not appear as the imperfective on /pan/ 'wash'. The answer: the phonemic inventory of Mafa. If we limit ourselves to segments that appear in the inventory, we can rule out segments like /p^{j}/ and /J/. This can be represented by a series of constraints against segments not in the inventory much as English has a high-ranked constraints against lateral-fricatives, retroflex segments, etc. In OT, the tableau would be as shown:

Tableau 11 – Unpalatalizable segments can't be palatalized.

/pan, j/	*C^{j}	PARSE-IMP-FEAT
(a)☞ pen		
(b) p^{j}an	*!	
(c) pan^{j}	*!	
(d) pan		*!

Thus, to achieve the imperfective forms found in Mafa, the constraints in the imperfective co-phonology must be ranked as follows:

IDENT-MP, *Ky, *Cj, *C^{j} » PARSE-IMP-FEAT » BE-PAL » IDENT-PAL, PARSE-IMP-SEG

8. Conclusion

The aim of this paper is to describe the imperfective morphological processes of Mafa. First, the allomorphy of the /j/ suffix for vowel-final verbs and a palatal feature for consonant-final verbs was accounted for through separating the parse of the imperfective morpheme's feature from the parse of its segment. This allows positing /j/ as the underlying forms of the morpheme. Second, to account for the data where palatal vowels can appear without palatal consonants and vice-versa, the palatalization feature is determined to target both stridents and vowels equally.

This class of segments is determined by the phonological inventory, as unpalatalizable segments lack a palatalized counterpart in the segments of Mafa.

The most theoretically significant conclusion is the answer to how agreement obtains between segments in the imperfective. All segments are transparent, including those that are contrastive for the palatal feature despite being unpalatalized because of local constraints. This violates strict locality and, because of the dissimilarity of agreeing segments, does not fit within the data explained by correspondence. Instead, I suggest that Mafa has a generalized form of agreement that constrains all targeted segments to be palatal in the presence of another palatal segment or feature in the stem. Indeed, the lexical phonology exhibits a similar pattern, adding further credence to the appropriateness of this constraint.

References

Akinlabi, Akinbiyi. 1996. "Featural Affixation." *Journal of Linguistics*. Vol 32, No. 2. 239-289. Cambridge University Press.

Andersen, Torben. 1999. Consonant alternation and verbal morphology in Mayak (Northern Burun). *Afrika und Übersee* 82, 65-97.

Ao, Benjamin. 1991. "Kikongo nasal harmony and context-sensitive underspecification." *LI* 22,193-96.

Archangeli, Dianne and Pulleyblank, D. 1994. *Grounded Phonology*. Cambridge, MA: MIT Press.

Bakovic, Eric. 2000. *Harmony, Dominance and Control*. PhD dissertation, Rutgers University.

Bakovic, Eric & Wilson, Colin. 2000. "Transparency, Strict Locality, and Targeted Constraints." *WCCFL 19 Proceedings*, ed. Billerey and Lillehaugen, pp. 43-56. Somerville, MA: Cascadilla Press.

Barreteau, D. & Le Bleis, Y. 1987. 'Lexemes et themes verbaux en mafa', *Cahiers du LACITO (CNRS-LACITO 2)*, Paris:31-52.

Barreteau, Daniel & Le Bleis, Y. 1990. *Lexique Mafa*. Librairie Orientaliste Paul Geuthner. Paris.

Barreteau, Daniel, Le Blies, Y. & Wandala, D. 1985. *Conte Mafa*. Developpement des Langues Camerounaises. Yaounde'.

Clements, G. N. & Elizabeth V. Hume. 1995. The internal organization of speech sounds. *The Handbook of Phonological Theory,* ed. by John Goldsmith, 245-306. Oxford: Blackwell.

Gafos, Diamandis. 1996. *The Articulatory Basis of Locality in Phonology.* PhD dissertation, Johns Hopkins University. [Published by Garland, New York, 1999.]

Hansson, Gunnar. 2001. *Theoretical and Typological Issues in Consonant Harmony*. PhD dissertation, University of California, Berkeley.

Hayward, Richard. 1990. Notes on the Aari language. *Omotic Language Studies*, ed. by Richard Hayward, 425-93. London: SOAS.

Hyman, Larry M. 1975. *Phonological Theory and Analysis.* New York: Holt, Rinehart and Winston.

———. 1995. "Nasal consonant harmony at a distance: The case of Yaka." *Studies in African Linguistics* 24, 5-30.

Prince, Alan & Smolensky, Paul. 1993. *Optimality Theory: Constraint Interaction in Generative Grammar.* Rutgers University Center for Cognitive Science Technical Report **2**.

Kager, Rene'. 1999. *Optimality Theory*. Cambridge University Press.

Rose, Sharon. 2004. "Long-distance vowel-consonant agreement in Harari." *Journal of African Languages and Linguistics* 25:41-87

Rose, Sharon and Walker, Rachel. 2003. "A Typology of Consonant Agreement as Correspondence." Ms. UCSD

Schuh, Russell. 2003. "Palatalization in West Chadic". Draft. UCLA.