Cyclic Rule Application of Chaha Palatalization*

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Son, Gwangrak. 2004. Cyclic Rule Application of Chaha Palatalization. *The Linguistic Association of Korea Journal, 12*(2), 55-76. McCarthy (1983) claimed that across-the-board (ATB) application of palatalization in Chaha, an Ethiopian Semitic language, can be best explained by placing the palatalization in derivational order before Plane Conflation, a mechanism elaborated by Younes (1983), McCarthy (1983, 1986a,b, 1989) and Cole (1987). Rose (1994), however, challenged this rule order of prior application of palatalization to Plane Conflation. Based on some examples in which front vowels interact with palatalization, she claimed that the interaction could only be accounted for by applying palatalization in a later derivational stage with respect to Plane Conflation, a result directly opposite to McCarthy (1983). This paper reinterprets Rose's (1994) data and analysis from the viewpoint of feature geometrical framework, in particular, the articulator-based model developed by Sagey (1986) and Halle (1996). It will be shown that the vowel interaction in Rose (1994) is not due to a later setting of palatalization as Rose argued, but indeed comes as a consequence of cyclic rule application inside the lexicon.

Key words: Chaha, palatalization. ATB, blocking effects, cyclic rule application, articulator-based model, plane conflation, labialization.

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1. Feature Geometrical Analysis of Chaha Palatalization

Chaha palatalization provides a valuable testing ground for feature geometrical approach, since a 2nd sg. fem. suffix is composed solely of a feature. The traditional concept of a 'morpheme'—a string of segments with constant meaning—does not fit to cover this feature-triggered morphological operation. This paper is an attempt to make a unified analysis on a wide range of data concerning palatalization in Chaha within feature geometrical framework. In particular, the articulator based model developed by Sagey (1986) and Halle (1995), will be adopted with the following three canons well-established in the model. First, palatalization is a process spreading a feature [-back]. Second, the linking lines from trigger to target are those of terminal nodes in the tree (Halle (1995:19)). Third, a spreading process such as palatalization has an access only to contrastive features (Halle (1995:21)).

Prior to advancing to a detailed analysis, let us consider descriptive facts concerning the Chaha palatalization. In this language, a second person singular feminine subject has no overt segmental form of the agreement marker, but is realized by palatalization within the stem verb. The process affects a variety of phones in different positions in the stem. See (1-3) below.[1)]

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1) Phonemic inventory of Chaha

(i) Consonants

Labial	Alveolar	Velar
p p^w	t t^y	k k^y k^w
b b^w	d d^y	g g^y g^w
	T T^y	q q^y q^w
f f^w	s s^y	x x^y x^w
	z z^y	
m m^w	n	
	r	
w	y	

*The superscript, ^{y} and ^{w}: a palatalized and a labialized segment, respectively. T: voiceless alveolar ejective. q: voiceless velar ejective.

(1) Imperative

	2sg. masc.	2sg.fem.	
a.	kift	kift^{y}	'open!'
	zimd	zimd^{y}	'pull'
	nikis	nikis^{y}	'bite'
	girəz	girəz^{y}	'be old'
	difT	difT^{y}	'hit strongly'
b.	dirg	dirg^{y}	'hit'
	firəx	firəx^{y}	'be patient!'
	niTiq	niTiq^{y}	'snatch away'
			(Rose (1997:60))

(2) Imperative

2sg. masc.	2sg.fem.	
nigim	nig^{y}im	'collect'
nikif	nik^{y}if	'instigate quarrel'
nixəb	nix^{y}əb	'find'
gimim	g^{y}imim	'chip the rim'
qibib	q^{y}ibib	'shave'
		(Petros (p.c))

(3) Imperative

2sg. masc.	2sg.fem.	
kitif	kitif	'chop'
tirəf	tiref	'survive'
sirib	sirib	'spin'
Timəm	Timem	'be contrary'
		(Rose (1994:104, 1997:61))

In (1), word-final alveolar (1a) or velar (1b) is palatalized. In (2), velar

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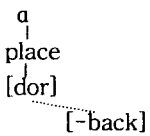
(ii) Vowels

i		ɨ	u
	e	ə	o
		ɛ a	ɔ

is permitted to undergo palatalization even in non-final position as long as no alveolar occurs to the right side of the velar. Vowels may also be subject to palatalization in Chaha. That is, in (3), when a word-final consonant is neither alveolar nor velar and alveolar occurs in non-final position within the word, the rightmost vowel is fronted.

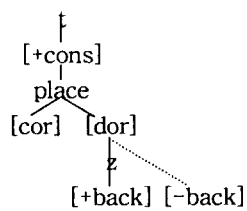
Adopting the articulator based model developed by Sagey (1986) and Halle (1995), let us now characterize Chaha palatalization as a leftward spreading of a [-back] feature, targeting the dorsal node of a compatible segment, as depicted in (4).

(4) Chaha palatalization



In (4), a root final alveolar, a rightmost velar, or a word-final vowel defines α, a compatible target. Under this treatment, α acquires a secondary articulation of [-back], with the concomitant delinking of its own backness feature (if any) under the dorsal node. (5) illustrates its effect on a form like *kift* in (3a):

(5) kift --> kift^{y}



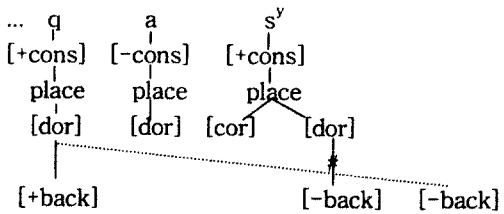
In (7), the plain alveolar *t* acquires [-back] property through the spreading process, while delinking the original [+back]; as a consequence of this process, the plain *t* becomes a palatalized t^{y}.

Given the theory of contrastive feature specification, any intervening

element with [-back] will block the spread by the Line Crossing Constraint (LCC), the ban on crossed association lines (Sagey (1988)). This prediction is borne out, as can be seen in (6).

(6) 2sg.masc. 2sg.fem.

qas^{y} qas^{y} (*q^{y}as^{y}) 'throw away!'



In (6), the line connecting the spreading feature [-back] to the dorsal node of the target, *q*, violates the LCC by the intervening material, *s^{y}*, which is marked with [-back] underlyingly. Thus, the long-distance palatalization of the word-initial velar is blocked.

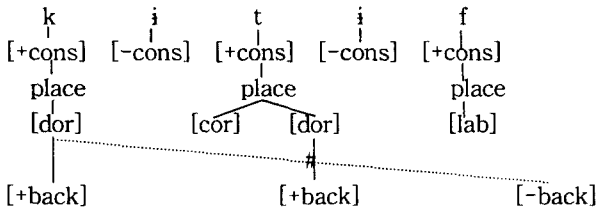
One interesting aspect with regard to the blocking phenomenon is that not only an underlyingly palatalized consonant but also a plain one acts as a blocker. Consider (7), which repeats one of the examples in (3).

(7) 2nd sg.masc. 2ndsg.fem.

kitif kitif 'chop'

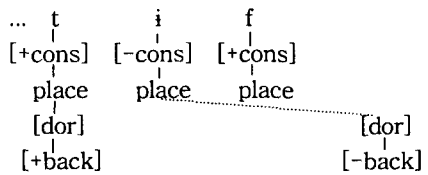
In (7), the word-initial *k*, a potential target of palatalization, is not palatalized. This should not be attributed to the intervening material such as labial *f* or central vowel *i*, since these segments are noncontrastive for the spreading feature [back] and hence are invisible to the rule. The intervening alveolar *t*, however, is contrastive for the feature [back] (note that a plain alveolar and its palatalized counterpart differ only in backness), and hence is visible to the spread. (8) portrays how the leftward spreading is blocked by *t*.

(8) [kɨtif] (*[k^{y}ɨtif])



It is readily seen in (8) that the line associating the triggering feature [-back] with the dorsal node of the word-initial *k* violates the LCC, due to the intervening [+back]. Now that this long-distance velar palatalization is blocked, the only option to realize the feminine suffix within the stem verb is as a vowel fronting. See (9).

(9) [kɨtif] (*[k^{y}ɨtif])



The high central vowel */ɨ /* is epenthetic in Chaha.[2] Accordingly, it has no terminal feature under the place node. Through the spreading process, however, it acquires the feature value [-back], with the creation of a non-terminal dorsal node. Thus, a front vowel *i* results.

To conclude, the articulator based model developed by Sagey (1986) and Halle (1995) attains success with the data in which single elements in a word undergo palatalization. The subsequent section concerns about a case in which palatalization affects all copies of a reduplicated

2) */ɨ/* occurs to break up impermissible consonant clusters. Chaha does not allow CCC clustures anywhere in a word, while it permits syllable final CC clusters (only when a falling contour is involved). Take the root verb *kft* 'open,' for example, the surface form of which is *kɨfit* (2sg.masc.). Epenthesis occurs after the first member of the CCC, leaving the final CC as a cluster.

consonant. The articulator based model continues to be adopted.

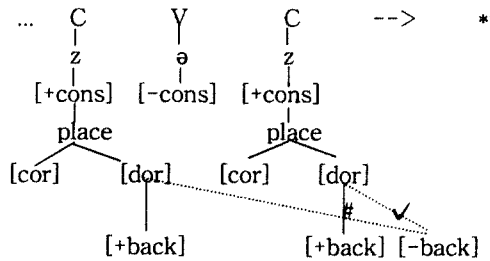
2. Rule Ordering Conflicts; McCarthy (1983) versus Rose (1994)

One of the most interesting aspects of Chaha palatalization is that the palatalization process affects not only single elements in a word but also all copies of a reduplicated consonant, as in (10).

(10)	2nd sg.masc.	2nd sg.fem.	
a.	nɨzəz	niz^{y}əz^{y}	'dream!'
	sɨdɨd	sɨd^{y}ɨd^{y}	'drink coffee'
	sɨkɨk	sɨk^{y}ɨk^{y}	'stick in/up!'
b.	jigəgim	jig^{y}əg^{y}im	'hit again!'

The across-the-board (ATB) application of palatalization in (10) would be an anomaly if the sequences of identical consonants, *z-z* in *niz^{y}əz^{y}*, for example, occupy distinct slots on the root tier, as in (11).

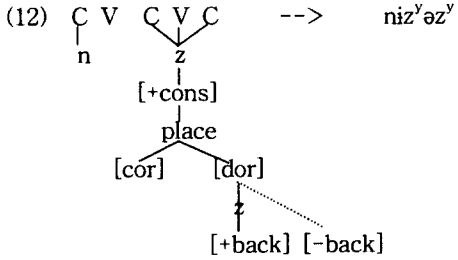
(11) ... C V C --> *nizəz^{y}



Given (11), the intervening [+back] of the last consonant *z* will block the spreading of [-back] to the penultimate *z*. Then, the floating [-back] can dock only on the last half of the identical consonants, yielding an unexpected form **nizəz^{y}*.[3] The double palatalization noted here, rather,

3) In this approach, an iterative application of the spreading process seems to be prohibited due to LCC. See (i) below.

can be captured if we simply adopt the OCP-driven representation like (12), following a suggestion made by McCarthy (1983, 1986a) within the theory of lexical phonology.

(12) 

--> $niz^{y}əz^{y}$

In (12), all surface identical consonants originate in a single element on the root melody, so that palatalization of the medial consonant can be seen as an unavoidable consequence of the application of palatalization to the root final consonant.

The multiple linking representation in (12) crucially relies on one thing to account for the across-the-board effects of palatalization: that is, palatalization must precede Plane Conflation. Were it not so, the double linking of *zz* in *nizəz* , driven by the OCP, would be split off via the process of Plane Conflation. If so, it would result in the rule application only to the root final consonant, as in (11).

However, Rose (1994), with the interesting data as follows, challenges this rule order.

(i)	2sg.masc.	2sg.fem.		
a.	kift	$kift^{y}$	($*k^{y}ift^{y}$)	'open'
b.	nikis	$nikis^{y}$	($*nik^{y}is^{y}$)	'bite'
c.	dimd	$dimd^{y}$	($*d^{y}imd^{y}$)	'unite'

In these forms, the potential target of palatalization, *k* in (a, b) and *d* in (c), remain unaffected, indicating that the rule does not apply in an iterative way.

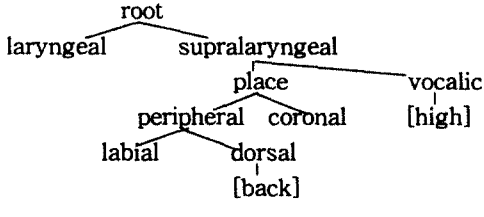
(13)

2sg.masc.	2sg.fem.	
xi	xi (*x^{y}i)	'make a hole'
əqe	əqe (*əq^{y}e)	'crunch'
təqɔ	təq^{y}ɔ (*təq^{y}ɔ)	'drink coffee'

In (13), palatalization has not affected the rightmost palatalizable consonants when they are followed by front vowels, though it has applied when followed by other vowels. If palatalization precedes Plane Conflation and affects the consonant melody directly as claimed by McCarthy (1983), there seems to be no way of explaining the blocking effects that front vowels have displayed toward preceding consonants shown in (13). Rose (1994), taking these as evidence, argued that palatalization in Chaha, in fact, follows Plane Conflation rather than preceding it, contra McCarthy (1983).

Since it is true that vowels interact with the rule not only in blocking but also in vowel fronting, as observed in section 1, Rose's (1994) proposal as to the later rule application of palatalization with respect to Plane Conflation seems correct. With this rule ordering, however, now it becomes a puzzle that in a form like *niz^{y}az^{y}* both instances of an underlying root consonant have undergone palatalization simultaneously without being interrupted by Plane Conflation. To solve this problem, Rose (1994) claimed that central vowels in Chaha are placeless. They may have [height], but the height features were considered to be dependents of vocalic under the supralaryngeal node in the tree Rose (1994) assumed. (14) represents the tree Rose assumed:

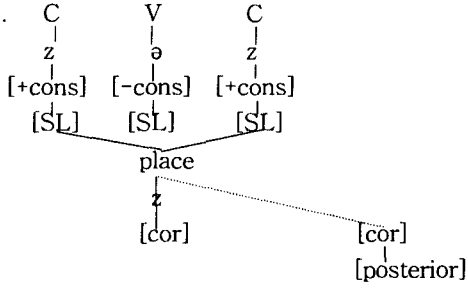
(14)



By segregating [high] from [back] and postulating the [high] under the

vocalic node, Rose (1994) could keep the claim that central vowels are placeless. Based on this claim, Rose (1994) stated that Plane Conflation does not completely split apart the multiple linking of consonants; it separates consonants by the insertion of a vowel between the consonants, but only as far as the node for which the vowel is specified. Since a central vowel in Chaha is marked as low as the supralaryngeal node, and lacks the place node, both the surface identical consonants *z-z* in *niz^{y}əz^{y}* are to remain linked on the place node even after two planes (consonantal and vocalic planes) are conflated. The double palatalization in *niz^{y}əz^{y}* then is derived as a consequence of the double-linking structure, as in (15).

(15)



(SL stands for supralaryngeal node)

For Rose (1994), Chaha palatalization is a process occurring at a later stage than Plane Conflation. The blocking effect displayed by a front vowel in (13) is a result of the later rule application of palatalization with regard to Plane Conflation. The ATB application of palatalization to reduplicated forms as in (10), on the other hand, were explained by postulating a geometric structure in which central vowels could be construed as placeless (from now on, I refer to this analysis of Rose (1994) as a placeless central vowel analysis). As long as the reasoning pursued by Rose (1994) is correct, her claim on the rule order seems preferable to McCarthy's (1983) because the blocking effects that pose problem to McCarthy (1983) were nicely accounted for.

A careful examination, however, reveals that the placeless central

vowel analysis has both empirical and theoretical pitfalls. The next section discusses this issue.

3. Against Rose's (1994) Analysis

In Chaha, a feature [-back] fuses with /ɨ/, /ə/, or /a/ to surface as [i], [e], and [ɛ], respectively. A feature [+round] combines with /ɨ/, /ə/, or /a/ to yield [u], [o], and [ɔ], respectively (see Petros (1997), and Rose (1997) for relevant examples). A fact we note from this fusion is that central vowels change to front or back vowels of the same height. Putting it differently, it is a central vowel that determines the height value of a derived vowel, strongly indicating the underlying feature specifications of the central vowels for height (see Son (2000) for discussion). In Rose (1994), the feature values [height] were analyzed as dependents of the vocalic node, not of the place node, thereby she could keep the claim that central vowels are placeless. This approach, however, is ad hoc in the light of the articulator based feature framework assumed in this paper. First, [high], [low], and [back] are all executed by the same articulator dorsal but are dominated by different nodes in the tree Rose assumed. Second, it has been well attested in many languages that [high], [low], and [back] features function as a constituent in phonological rules (e.g., vowel copy in Ainu (Halle (1995)), but in Rose (1994) [back] was segregated from [high] and [low]).

Additionally, we find that in Rose's (1994) approach a ternary distinction is hidden in some disguise on the feature backness. That is, at surface, three feature values for backness—[-back] for front vowels, [+back] for back vowels, and placeless for central vowels—appear. Note that in Rose (1994), palatalization was characterized in terms of a coronal node spreading, not of a [-back] feature, so the backness does not play any role. However, even under the Clement's style approach she assumed where vowels are expressed as coronal, labial or dorsal, back vowels still could be dorsal possessing backness values (see Clements & Hume (1995) for details). If backness feature somehow

appears, playing a certain role, then her theory would be unavoidable from the criticism of the ternary power. This may present merely a potential problem under Clement's style approach, but it becomes a serious problem once the articulator based model is employed where [backness] is essential, for example, in a rule like palatalization.

These theoretical problems are all fairly suggestive pointing that the placeless central vowel analysis may not be on the right track. However, if the analysis is wrong at all, it would be more desirable to be argued against on the empirical grounds, rather than on theoretical grounds. In what follows, I present two main pieces of empirical evidence against Rose's (1994) analysis.

In Chaha, a 3rdsg.masc.object marker consists of a suffix /-n/ and labialization of the rightmost velar or labial consonant of the stem verb. Some illustrative examples are given in (16).

(16)

	Imperative without object	with object	
a.	tɨ-kətif	tɨ-kətif^{w}-n	'you chop (it)'
	tɨ-dərg	tɨ-dərg^{w}-n	'you hit (it)'
b.	tɨ-kəft	tɨ-kəf^{w}t-n	'you open (it)'
	tɨ-bəq^{y}ɨr	tɨ-wəq^{y}ɨr-n	'you brew (it)'

In (16), the rightmost labial or velar is labialized either word-finally (16a) or non-finally (16b). Labialization thus can be expressed as a leftward spreading of a [+round] feature, aiming at a labilalizable consonant—i.e., velar or labial consonant in Chaha.

Of importance for matters under discussion here is that this rule applies across-the-board exactly the same way palatalization does. The following (17) is adapted from (67) of Rose (1997:186).

(17)

		without object	with object	
a.	Doubling	gɨmɨm	gɨm^{w}ɨm^{w}-ɨn	'chip it!'
b.	Frequentative	kɨfəfɨt	kɨf^{w}əf^{w}ɨt-ɨn	'open it again!'
c.	Total copy	qɨTəqɨT	q^{w}ɨTəq^{w}ɨT	'hammer it!'

In (17), both the doubled consonants, base and reduplicant, were affected by labialization, indicating that they are somehow linked. This overapplication is an expected one given the placeless central vowel analysis. According to the analysis, an intervening central vowel *i* in *gi* m^{w}*i*m^{w}*-in*, for example, is placeless, and hence both the instances of *m* would remain connected on the place node even after consonantal and vocalic planes are conflated. The docking process of [+round] onto the place node connecting both the surface identical consonants then would bring about the overapplication effect in labialization. This account, however, does not apply to the following forms Rose brought in her later work (1997). Consider (18), which is (70-71) of Rose (1997:188) (glossary: 'shave' and 'make it droop' for (a) and (b), respectively).

(18)		no object	with object
a.	Perfective	qəpəb-ə-m	qəpəw-ə-n-im
			(*qəp^{w}əw-ə-n-im)
	Jussive	yi-qbib	yə-qwiw-in
b.	Perfective	an-zirəpəb-ə-m	n-zirəpəw-ə-n-im
			(*an-zirəp^{w}əw-ə-n-im)
	Jussive	y-an- zərbəb	y-an-zərwəw-in

In Chaha, perfective verbs are characterized by a geminate penult, and the geminate undergoes devoicing and degemination (McCarthy (1986a), Petros (1997), Rose (1997)). The jussive form in each of (18a) and (18b) indicates the biliteral and triliteral status of the root *qb* and *zrb*, respectively. The penultimate *b* in each of these forms has undergone devoicing and a subsequent rule of degemination, thus surfacing as [*p*]. The interesting aspect of this rule for matters under discussion here is that in the perfective with object in each of these forms, *qəpəw* (18a) and *zirəpəw* (18b), the final two consonants are treated as separate ones for labialization. That is, only the final one is affected (b > *w*), while the first one being intact (so, [*p*] not [p^{w}]). This poses a significant problem to Rose's (1994) approach where central vowels are treated to be placeless. If /ə/, which intervenes between the final two consonants

in each of these forms, were placeless, as was assumed by Rose (1994), then the final two consonants should remain linked. Labialization is then expected to apply to the multiple linking, yielding wrong forms such as **qəpʷəw-ə-n-im* and **an-zirəpʷəw-ə-n-im*.

Rose's placeless central vowel analysis states that multiple association lines formed at underlying representation persists throughout derivation provided an intervening element does not bear a feature that is spreading. This being the case, long-distance geminates are predicted to pattern together with single elements for some phonological processes even at the post-Plane Conflation stage, as witnessed in palatalization. This prediction, however, does not hold for Chaha geminate devoicing (see McCarthy (1986), Petros (I997), Rose (1997), and Son (2000) for data and discussions). Consider (19).

(19) Perfective

a-zgaggər	>	a-zgakər	'cause to jump'
wigagga	>	wigaka	'stab repeatedly'
a-wzazza	>	a-wzasa	'perspire'
a-dbabbər	>	a-dbəpər	'do an injustice'

In (19), devoicing takes place in perfective forms in the configuration of [...$C_iVC_iC_iV$...]. What we notice here is that only the second half of the long-distance geminate devoices in each of the forms. If the placeless central vowel analysis is correct, this is surprising. Note that according to the analysis an underlying multiple linking would not be broken apart for the node for which an intervening element is not specified. Vowels are unmarked for voicing features, a universal property. Vowels thus can be considered to lack the laryngeal node. If so, the linking line between *g* and *k* (*/gg/* > [*k*]) in *a-zgakər*, for example, would remain linked on the laryngeal node, which entails that all the legs of the underlyingly single segment *g* would behave as a unit. If so, they are predicted to either devoice or not, in an exhaustive fashion. This prediction, however, is not borne out, as is witnessed above

Up to now, we have seen that Rose's analysis not only raises

theoretical problems but also makes wrong predictions on labialization and devoicing in Chaha.

4. Reconsideration of the Blocking Effects

At this point, it is instructive to review the argument that led Rose (1994) to the claim that palatalization follows Plane Conflation, not vice versa. Note that her argument crucially relies on the data such as (13), repeated in (20) below, in which a front vowel exhibits blocking effects toward a preceding velar.

(20)

2sg.masc.	2sg.fem.	
xi	xi (*x^{y}i)	'make a hole'
əqe	əqe (*əq^{y}e)	'crunch'
təqɔ	təq^{y}ɔ (*təq^{y}ɔ)	'drink coffee'

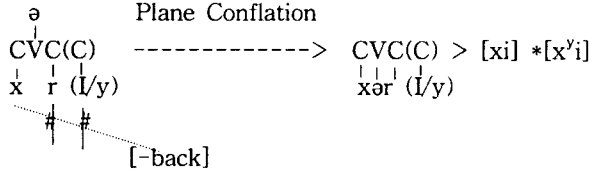
Concerning such forms involving front vowels as in (20), a series of recent works (Prunet (1996), Prunet & Petros (1996), Petros (1997), Rose (1997)) have made a very interesting finding, which sheds light on the issues under discussion here. In Chaha *n* and *r* behave like quasi-allophones. In particular, geminate /rr/ surfaces as [n] (see McCarthy (1986), Petros (1992, 1996, 1997), Rose (1994, 1997) for details). For instance, */xərrə/*, perfective in the configuration of [...CVCCV...], is realized as [*xənə*]. The presence of *n* in perfective forms in (21) below, then, indicates the existence of *r* in the root of each of the following form.

(21) (=(28) of Petros (1997:147))

Jussive	Imperfective	Perfective	
yə-xi	yi-xe	xənə	'dig a hole'
yə-gi	yi-ge	gənə	'cast a spell'
yə-ji	yi-je	jənə	'cripple'
yə-ti	yi-te	tənə	'swear'

The biradical root *Cr*, however, is not sufficient enough to yield a correct jussive or imperfective form in (21), because if, for example, *xr* were a root of [xi], then we would expect *[xər] with an epenthetic vowel *ə*, but not [xi] for jussive. To account for this, Petros (1996, 1997), Prunet & Petros (1996), and Rose (1997) posit a third radical /I/ or /y/, analyzing such forms in (21) as triradicals of the root *CrI* or *Cry*. The jussive [xi] is then derived from /xəry/ (or /xərI/) through a series of phonological change of *xəry* > *xəy* > *xi*. I am not contending in this paper for the third radical that they postulated to get the correct jussive or imperfective form. Nevertheless, supported from the presence of [n] in perfective, it seems true that each of the forms in (21) possesses /r/ in the root. This being correct, Roses (1994) argument for the rule ordering—i.e., a later rule application of palatalization with regard to Plane Conflation-becomes groundless. It is indeed a root segment, /y/, /I/, or /r/ (if there is no third radical like /y/ or /I/), but not a front vowel that blocks a spreading to the word-initial velar in such forms as in (21). /y/, /I/, or /r/, possesses [back] and hence will block palatalization of a velar to its left. (22) illustrates how [xi], a 2nd sg.fem. form, is derived directly from the root *xr(I/y)*.

(22)



In (22), palatalization is seen to apply prior to Plane Conflation. The absence of palatalization in the word-initial *x* is due to the existence of the [back] feature-bearing segment between target and trigger. The later setting of palatalization with regard to Plane Conflation, as was claimed by Rose (1994), is unnecessary for the explanation of the blocking effects. Given this rule ordering of prior application of palatalization to Plane Conflation, the ATB-application of palatalization (e.g., *nizʸəzʸ*) discussed in section 2 is straightforwardly accounted for,

since the rule applies directly to a doubly linked segment *z* on the root plane. There is no need to postulate an otherwise ad hoc geometric structure, coupled with the assumption of placeless central vowels.

Thus far discussions lead us to the conclusion that Chaha palatalization applies directly to the root plane. However, there is a case that appears to be problematic to this proposal. I start the subsequent section by bringing in this seemingly problematic case.

5. Cyclic Rule Application and Its Consequences

Consider the examples in (3), repeated as (23) below, in which a vowel is fronted in the second singular feminine form.

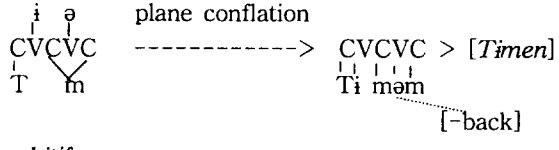
(23) Imperative

2sg. masc.	2sg.fem.	
kitif	kitif	'chop'
tirəf	tiref	'survive'
siriβ	siriβ	'spin'
Timəm	Timem	'be contrary'

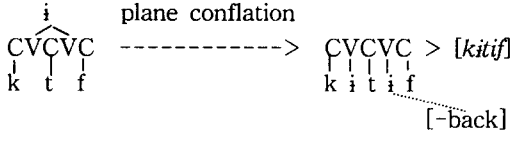
If Chaha palatalization applies solely to the root plane before vowels and consonants are aligned on a single plane, the vowel fronting noted here would be mysterious. To get a better understanding of this phenomenon of vowel fronting, it is worth reconsidering the whole process of palatalization, with the intention to see what procedure the language follows to realize the feminine marker within a stem verb. Palatalization at issue scans a word-final alveolar or velar first. If it encounters a word-final alveolar or velar, it affects the consonant (e.g., *kiftʸ* 'open'). Otherwise, it keeps spreading leftward to anchor at a potential landing site, velar. If the spreading successfully anchors at a velar without being hindered by any intervening material, then the velar is to be palatalized (e.g., *nɨkʸɨf* 'instigate quarrel'). There may be no velar within a word (e.g., *Timem* 'be contrary'), or the spreading may be blocked by

an intervening alveolar (e.g., *kitif* 'chop'). When either of these cases arises, the rule has no way to realize the feminine suffix on the root consonant. Note that the language has no other way to mark the suffix than palatalization. Without palatalization, no distinction could be made possible between 2nd sg.masculine and feminine. Chaha does not seem to favor this sort of a verbal form that is obscure in gender. This seems to be the situation where the second spreading does arise to repair such sort of unwanted verbal forms. This time, a spreading may take place at the stage where vowels and consonants are folded on a single line, so it may fulfill the feminine suffix via vowel fronting. What is noteworthy about this process is that the rule applies twice, one before and the other after Plane Conflation. The derivation (24) illustrates the vowel fronting observed in *Tömem* and *kötif*.

(24) a. *Timem*



b. *kitif*



In *Timem* (24a), the feature [-back] has no way to dock at the pre-Plane Conflation stage because of the lack of a compatible target on the root plane. The floating [-back], however, is to be realized, which requirement is fulfilled at the post-Plane Conflation stage by getting associated with the vowel *ə*, resulting in *e*. A gender distinction is thus made possible within the verb. In *kitif* (24b), a docking process is blocked by the intervening alveolar *t* before Plane Conflation, but is fulfilled by vowel fronting after Plane Conflation.

The cyclic rule application analysis proposed above has an immediate

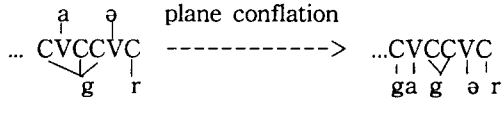
consequence in explaining long-distance velar palatalization in a form like *nɨkʲɨf* 'instigate quarrel.' (see the examples in (2) which are subject to the same analysis). Note in this example that velar palatalization is forced, to the exclusion of vowel fronting. If Chaha palatalization were treated simply as a one time operation of a leftward spreading, as was assumed by Rose (1994), then it would be hard to understand why the spread affects velar, not vowel the leftward spreading meets first. In order to account for this sort of velar palatalization, the grammar of Chaha must make an independent stipulation that the palatalization process suppresses vowel fronting in favor of velar palatalizaion. Admitting such stipulation, a question still arises as to how come a rule does skip an intervening potential target and apply to a next target. This problem, however, does not arise under the current approach. The preference of velar palatalization to vowel fronting simply follows from the derivational order. Palatalization is to apply to the consonantal plane first and then to vowel at the stage where two planes are folded. No independent stipulation is necessary.

Now, let us see if the proposed analysis gains success for a form such as *qəpəw-ə-n-ɨm* (**qəpʷəw-ə-n-ɨm*) 'shave' in (18), which was problematic to Rose (1994). Recall that there is no possible way under the placeless central vowel analysis for the absence of labialization in the penultimate consonant *p* in *qəpəw-ə-n-ɨm*. It was because under the placeless central vowel analysis all surface instances of an underlyingly single element */b/* are not to be broken apart in any level of derivational stage, regardless of the pre- or post-plane conflation stage. This problem arises under the approach proposed in this paper as well, because labialization will apply to the root *b* and its influence will be spread over to any surface consonant linked to the root *b*, yielding an incorrect form *[qəpʷəw]. The current approach, however, has one thing that the placeless central vowel analysis lacks; labialization can apply once again at the post-plane conflation stage. At this point, I adopt the language-specific constraint of *No P^{w} in Chaha that Rose (1997:189) proposed (in an attempt to bar these sort of wrong forms).[4] Rose (1997) being correct in that the language is equipped with the constraint

*No P^w, then the ill-formed *[qəp^{w}əw], an output of the rule application to the root tier, will be ruled out by the very constraint. If the wrong form is ruled out in this way, the rule is to apply once again when the last leg of the long-distance geminate is separated from the first one, correctly producing [qəpəw].

Finally and most importantly, the current analysis is fully consistent with the mechanism of Plane Conflation (Younes (1983), McCarthy (1986a)), the key role of which is to bar any sort of long-distance geminate being connected after Plane Conflation. Recall that the placeless central vowel analysis pursued by Rose (1994) predicts that a long-distance geminate may remain linked at the post-Plane Conflation stage, depending on the feature specification of an intervening element. I have shown in the discussion around (19) that such an analysis fails for geminate devoicing in Chaha for a form like *a-zgakər* (< */a-zgaggər/*) 'cause to jump,' in which only one half of the geminate devoices. By contrast, in view of the cyclic rule application approach, there would be no long-distance geminate that remains linked at surface. Thus, devoicing can apply solely to a half of the underlyingly long-distance geminate. (25) below gives a derivation for such a form as *a-zgakər*.

(25) /a-zgaggər/ > [a-zgakər]



In (25), geminate devoicing is prevented from applying at the pre-Plane Conflation stage due to Hayes (1986) version of geminate inalterability (i.e., exhaustive enumeration of association lines) or due to the failure of the structural description that geminate devoicing must meet (see Son (2000) for the detailed analysis of this sort). Devoicing, however, affects the sequence *gg*, at the post-Plane Conflation stage, leaving the first *g* intact. This is because at the post-Plane Conflation stage the last leg of

4) No P^w unless it is the rightmost labialized consonant.

the long-distance geminate *gg* and the first *g* become separated by virtue of the intervening vowel, and the devoicing has access only to the last leg *gg*.

In conclusion, under the cyclic rule application analysis proposed in this paper, the seemingly paradoxical claims made by McCarthy (1983) and Rose (1994) on the rule application of palatalization with regard to Plane Conflation were incorporated into one unified and principled theory. The ATB-effects (McCarthy (1983)) and the interactions of vowels with palatalization (Rose (1994)) were all naturally and simply accounted for, without invoking the otherwise needed assumptions in McCarthy (1983) and Rose (1994). Besides, the current approach was seen to have several advantages. Long distance velar palatalization to the exclusion of vowel fronting, and partial rule application in labialization and geminate devoicing are all natural consequences of the cyclic rule application, coupled with the mechanism of Plane Conflation. The common properties of palatalization and devoicing as lexical rules were also captured by their employment of cyclicity, a typical characteristic of lexical rules.

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