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THE PERFECT STEM IN CHI-MWI:NI*

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In this paper we examine in some detail the morphophonemic principles underlying the construction of what Bantu scholars generally refer to as the "perfect stem" in Chi-Mwi:ni, a Bantu language spoken in the city of Brava (the indigenous name of which is Mwi:ni) in Somalia. We restrict ourselves to a consideration of perfect stems involving the addition of a suffix; a subsequent paper will examine cases where the perfect stem is constructed by means of a change in the quality and/or quantity of the last vowel of the non-perfect stem. Furthermore, not all instances of suffixed perfect stems are dealt with here. We postpone until later the analysis of (1) the construction of a perfect stem from the so-called "applied" or "prepositional" stem, and (2) the shape of the perfect stem when it is passivized. The analytical problems offered by these two formations are of considerable interest and thus merit separate treatment.

Chi-Mwi:ni has been referred to as a "dialect" of Swahili,[1] forming the northernmost link of a chain of dialects that extends along the East African coast. Whether this label is appropriate is a debatable point, but in any case Chi-Mwi:ni is highly divergent from the more familiar forms of Swahili, and the phonological problems that we will be concerned with have no parallels in standard Swahili. Indeed, a suffixed perfect stem is not currently employed in Swahili. That data presented here is based entirely on the speech of Mohammad Imam Abasheikh, a graduate student in the Department of Linguistics of the University of Illinois, and is the result of a collaborative effort between him and the present writer [C.W.K.] that was initiated in June 1973.

We take the perfect suffix to be underlyingly -i(:)ɬ- (see below for a discussion of the quantity of the suffixal vowel), where ɬ stands for a liquid that is phonemically distinct from both l and r. Preliminary instrumental investigation suggests that in the articulation of ɬ, the tip of the tongue strikes lightly against a small area to the front of the

alveolar ridge without any lateral contact. The area of contact in the case of l, on the other hand, is larger, and there is lateral contact. The duration of l is longer than the duration of ɬ. Although phonemically distinct, the contrast between ɬ and l is merged in favor of l in a number of contexts.

Some examples where the perfect suffix shows up with its basic shape intact phoneticallyare given below in (1):[2]

(1) jib-i:ɬ-e 'he answered' cf. ku-ji:b-a 'to answer'
sif-i:ɬ-e 'he praised' x-si:f-a
ɬum-i:ɬ-e 'he bit' ku-ɬum-a
i-vuy-i:ɬ-e 'it leaked' ku-vu:y-a
taraj-i:ɬ-e 'he hoped' x-taraj-a
had-i:ɬ-e 'he said' ku-had-a

We have separated the final -e in the above forms from the perfect suffix -i(:)ɬ- and consider it to be a separate morphological element. One motivation for doing so is that this final vowel -e is not a constant feature of perfect forms, whereas -i(:)ɬ- is. For example, the -e is replaced by -a in passive forms and by -o in relative forms. Thus if -ji:b- is passivized, its perfect form will be jib-i:l-a (the shift of ɬ to l is a feature of the passive construction, and is not dealt with here); if -ji:b- is functioning as the main verb of a relative clause, it will have the perfect form jib-i:ɬ-o.

The suffix -i(:)ɬ- undergoes various alternations, as well as conditioning alternations in the preceding stem. We will begin our examination of the formation of the perfect stem by considering changes involving the segmental structure of the perfect suffix itself. The quality of the suffixal vowel is subject to a systematic alternation: it is a high vowel just in case the preceding vowel in the word is i, a, or u (long or short), but a mid vowel if the preceding vowel is e or o (long or short). In (1) we gave examples where the verb stem has i, a, or u as the last vowel, thus requiring a high vowel in the perfect suffix. In (2) examples are given of stems whose last vowel is e or o, thus requiring the appearance of e rather than i in the suffix.

(2) tov-e:ɬ-e 'he dipped' cf. x-tov-a 'to dip'
som-e:ɬ-e 'he read' x-so:m-a
gorom-e:ɬ-e 'he roared' ku-goro:m-a
heshm-e:ɬ-e 'he respected' ku-heshm-a
reb-e:ɬ-e 'he stopped' ku-re:b-a
tetem-e:ɬ-e 'he shivered' x-tetem-a

We have assumed that the vowel of the perfect suffix is i underlyingly and becomes e when preceded by e or o by virtue of a rule of Vowel Harmony. The alternative to this analysis would be to consider the vowel of the perfect suffix to be e underlyingly, and have it raised to i when preceded by i, a, or u. We have preferred the former solution on the grounds that it is phonetically more plausible that a high vowel should become mid if preceded by a mid vowel than that a mid vowel should become high if preceded by either a high vowel or a low vowel. The proposed rule of Vowel Harmony operates in additional contexts in Chi-Mwi:ni and is not a feature of the language that is peculiar to the perfect stem. We note its operation here simply because its effects are observable in many of the examples cited below.

The ɬ of the perfect suffix undergoes two separate changes. After a stem ending in l, ɬ, or r, it changes to l. Note the examples in (3):

(3) sul-i:l-e 'he wanted' cf. x-su:l-a 'to want'
komel-e:l-e 'he locked' x-komel-a
owel-e:l-e 'he swam' k-o:wel-a
fadiɬ-i:l-e 'he preferred' x-fadiɬ-a
sajiɬ-i:l-e 'he recorded' x-sajiɬ-a
gulguɬ-i:l-e 'he threatened' ku-gulgu:ɬ-a
gir-i:l-e 'he moved' ku-gu:r-a
jasir-i:l-e 'he dared' ku-ja:sir-a
mer-e:l-e 'he turned about' ku-me:r-a

This change of ɬ to l after liquid-final stems -- call the process Lateralization -- also affects the "applied" suffix -iɬ-, which is the only other suffix containing the consonant ɬ. Lateralization must be restricted to ɬ in suffixes, for a root ɬ is permitted to appear after a liquid. Note the following examples:

ku-ła:ł-a 'to sleep', ku-łe:ł-a 'to be loose', łe:ło 'today', ku-ło:ł-a 'to take a wife', li-łe 'tall', ku-la:ł-a 'to be sick'.

After stems ending in s, z, sh, or ñ, the ł of the perfect suffix changes to z, as the data in (4) show.

(4)	kos-e:z-e 'he made a mistake'	cf.	x-kos-a 'to make a mistake'
	fiłis-i:z-e 'he went bankrupt'		x-fiłis-a
	tokos-e:z-e 'he boiled'		x-tckos-a
	anz-i:z-e 'he began'		k-a:nz-a
	tez-e:z-e 'he played'		x-tez-a
	tunz-i:z-e 'he looked stealthily'		x-tu:nz-a
	rash-i:z-e 'he followed'		ku-ra:sh-a
	ash-i:z-e 'he lit a fire'		k-a:sh-a
	tosh-e:z-e 'he thought'		x-tosh-a
	fañ-i:z-e 'he did'		x-fa:ñ-a
	kakañ-i:z-e 'he changed'		x-kakañ-a
	tatañ-i:z-e 'he created discord'		x-tatañ-a

This particular change is limited to the ł of the perfect suffix; it does not affect the ł of the applied suffix, nor does it affect a ł in a root. Note the following examples of root ł where it is retained after s, z, sh, and ñ: x-so:ł-a 'to crush grain by pounding', ku-za:ł-a 'to bear (children, e.g.)', ku-ña:ł-a 'to collapse', shałabe:ła 'haphazardly'.

The two changes in the consonant of the perfect suffix described above are highly regular: so far in our investigation no exceptions to the change of ł to l after stems ending in a liquid have been found, and just three or four to the change of ł to z after stem-final s, z, sh, and n (bariz-i:ł-e 'he attended a meeting', jasus-i:ł-e 'he spied', asis-i:ł-e 'he founded an organization').

We turn now to changes in the final consonant of stems when they precede the perfect suffix. The consonants of Chi-Mwi:ni may be divided into two categories by virtue of their behavior before the perfect suffix: the Immutable and the Mutable consonants. The members of these two groups are listed below:

(I) The Immutable consonants: (a) nasal consonants
(b) l, r -- but not ɬ
(c) voiced stops if not preceded by a nasal
(d) continuant obstruents
(e) "glides"

(II) The Mutable consonants: (a) voiceless stops
(b) voiced stops if preceded by a nasal
(c) ɬ

As should be clear from our terminology, the Immutable consonants are those which undergo no alternation when they precede -i(:)ɬ-. Immutable consonants are exemplified in full in (5):

(5) Immutables of type (a):

som-e:ɬ-e 'he read'	cf.	x-so:m-a 'to read'
ɬim-i:ɬ-e 'he cultivated'		ku-ɬim-a
amin-i:ɬ-e 'he believed'		k-a:min-a
kun-i:ɬ-e 'he scratched'		x-kun-a
awañ-i:z-e 'he divided'		k-a:wañ-a
fañ-i:z-e 'he did'		x-fa:ñ-a

Immutables of type (b): cf. (3)

Immutables of type (c):

jarib-i:ɬ-e 'he tried'	ku-ja:rib-a 'to try'
dhib-i:ɬ-e 'he bothered'	ku-dhib-a
rud-i:ɬ-e 'he returned'	ku-ru:d-a
dod-e:ɬ-e 'he complained'	ku-do:d-a
taraj-i:ɬ-e 'he hoped'	x-taraj-a
i-jaj-i:ɬ-e 'it itched'	ku-ja:j-a
tig-i:ɬ-e 'he castrated'	x-tig-a
rag-i:ɬ-e 'he was late'	ku-ra:g-a

Immutables of type (d):

gaf-i:ɬ-e 'he made a mistake'	ku-gaf-a 'to make a mistake'
tuf-i:ɬ-e 'he spit'	x-tuf-a
tov-e:ɬ-e 'he dipped'	x-tov-a
kod-e:ɬ-e 'he talked'	x-ko:d-a

kas-i:z-e 'he heard'	x-kas-a
tez-e:z-e 'he played'	x-tez-a
barsh-i:z-e 'he taught'	ku-barsh-a
dhaxax-i:ɬ-e 'he moved'	ku-dhaxa:x-a

Immutables of type (e):

duguw-i:ɬ-e 'he limped'	ku-duguw-a 'to limp'
oɬow-e:ɬ-e 'he got wet'	k-o:ɬow-a
i-vuy-i:ɬ-e 'it trickled'	ku-vu:y-a
tiy-i:ɬ-e 'he feared'	x-tiy-a
sameh-e:ɬ-e 'he forgave'	x-sa:meh-a
xada'-i:ɬ-e 'he cheated s.o.'	xada'-a

The Mutable consonants, on the other hand, are those that undergo a mutation before the perfect suffix -i(:)ɬ-. The result of this mutation is always a coronal continuant obstruent. In the case of the voiceless stops, p, t, and t all change to s, whereas k changes to sh. (It should be pointed out that there are very few stems ending in p, and thus the change of p to s is only marginally attested.) In the case of post-nasal voiced stops, b, d, d,and g all change to z. Similarly, ɬ changes to z. Examples:

(6) Mutable consonants of type (a):[3]

ɬas-iɬ-e 'he swore an oath'	cf.	ku-ɬap-a 'to swear (an oath)'
ɬis-iɬ-e 'he paid'		ku-ɬip-a
gi:s-iɬ-e 'he pulled'		ku-gi:t-a
kus-iɬ-e 'he folded'		x-kut-a
las-iɬ-e 'he let go'		ku-lat-a
ɬo:s-eɬ-e 'he dreamed'		ku-ɬo:t-a
ɬe:s-eɬ-e 'he brought'		ku-ɬe:t-a
pis-iɬ-e 'he passed'		x-pit-a
pish-iɬ-e 'he cooked'		x-pik-a
tesh-eɬe 'he laughed'		x-tek-a
shi:sh-iɬ-e 'he held'		x-shi:k-a

Mutable consonants of type (b):

ɬo:nz-eɬ-e 'he begged'	ku-ɬo:mb-a 'to beg'
tu:nz-iɬ-e 'he made a hole'	x-tu:mb-a
ya:nz-iɬ-e 'he farted'	ku-ya:mb-a

ti:nz-iɬ-e 'he cut'	x-ti:nd-a
pe:nz-eɬ-e 'he liked'	x-pe:nd-a
so:nz-eɬ-e 'he sucked'	x-so:nd-a
po:nz-eɬ-e 'he pounded'	x-po:nd-a
shi:nz-iɬ-e 'he won'	x-shi:nd-a
ka:nz-iɬ-e 'he kneaded'	x-ka:nd-a
fu:nz-iɬ-e 'he closed'	x-fu:ŋg-a
kaɬa:nz-iɬ-e 'he fried'	x-kaɬa:ŋg-a
te:nz-eɬ-e 'he moved away'	x-te:ŋg-a

Mutable consonants of type (c):

mo:z-eɬ-e 'he shaved'	ku-mo:ɬ-a 'to shave'
paz-iɬ-e 'he scraped'	x-paɬ-a
pe:z-eɬ-e 'he swept'	x-pe:ɬ-a
kuz-iɬ-e 'he grew'	x-kuɬ-a

(The reader will recall that examples were given in (3) showing that stem-final ɬ, like l and r, causes a change of the ɬ of the perfect suffix to l -- cf. faɗiɬ-i:l-e 'he preferred'. Stems such as -faɗiɬ- must be considered exceptions to the mutation of stem-final ɬ to z. There are in fact a fair number of such exceptions, all loan-words from Arabic or Somali.)

We will refer to the process whereby stem-final mutable consonants alternate before the perfect suffix as Mutation. The first thing that must be noted about mutation is that the coronal continuant obstruents s, z, and sh which arise from this rule do not condition a change in the ɬ of the perfect suffix, whereas an underlying s, z, sh or ñ causes this ɬ to change to z (cf. (4) above). Within the standard generative approach to phonology, this fact would be accounted for by ordering the rules so that the ɬ-to-z rule is applied prior to Mutation. The derivation of shi:sh-iɬ-e as opposed to rash-i:z-e is given in (7):

(7)

shi:k-i:ɬ-e	ra:sh-i:ɬ-e	
inapplicable	ra:sh-i:z-e	ɬ-to-z
shi:sh-i:ɬ-e	inapplicable	Mutation
shi:sh-iɬ-e	rash-i:z-e	other rules

Notice that Mutation potentially feeds the ɬ-to-z rule since it creates new instances of s, z, and sh, all of which potentially condition the change of ɬ to z in the perfect suffix. In the derivations in (7), however, ɬ-to-z applies before Mutation -- an instance of a "counter-feeding" order of application of rules.

There are, of course, alternatives to the rule ordering description of these data. If the device of global rules is allowed in phonology (for some discussion, see Kenstowicz and Kisseberth (1970) and Kisseberth (1973a, b)), we would simply restrict the ɬ-to-z rule so that it applies only after underlying stem-final s, z, sh, and ñ. The ɬ-to-z rule then will not be able to apply in a case like shi:sh-iɬ-e, since the ɬ of the perfect is not here preceded by a sh that is present in underlying structure. The global rule approach simply places an additional (global) constraint on the ɬ-to-z rule, rather than applying the ɬ-to-z rule in any particular order relative to Mutation. The rule ordering solution and the global rule solution in any case make the same basic claim, which appears to be correct: namely, it is the underlying form of the verb stem that determines the shape of the perfect suffix, not the surface shape.

The reader will have noticed that there is considerable variation in the examples cited with respect to the length of vowels. Chi-Mwi:ni is subject to an extensive set of vowel lengthening and vowel shortening processes, a complete description of which is well beyond the scope of this paper. Goodman (1967) and Kisseberth and Abasheikh (1974) provide a description of some of the main features of these processes. The formation of the perfect stem, however, presents certain problems of vowel length variation that are over and above the general patterns of alternation. In particular, the vowel of the perfect suffix exemplifies a pattern of morphophonemic alternation unattested elsewhere in the language. The remainder of this paper will focus on this unique pattern. (We will not be concerned here with variations in the length of vowels in the verb stem to which the perfect suffix is added -- e.g., x-so:m-a 'to read', but som-e:ɬ-e 'he read' -- since such variations can be predicted in terms of generally motivated rules, provided that the correct length has been assigned to the vowel of the perfect suffix prior to the application of the general rules.)

What determines whether the vowel of -i(:)ɬ- will be long, as in jib-i:ɬ-e, or short, as in shi:sh-iɬ-e (note that the verb roots in both cases have an underlying long vowel: /ji:b/ and /shi:k/)? An examination of the data presented so far reveals a regularity of a fairly obvious sort: in (5), where the verb stem ends in an Immutable consonant underlyingly, the vowel of the perfect suffix is always long, while in (6), where the preceding verb stem ends in a Mutable consonant, the vowel of the perfect suffix is always short. This observation suggests that the length of the vowel of -i(:)ɬ- might be correlated with the nature of the underlying final stem consonant -- in particular, correlated with the mutability of that consonant. For example, if we assumed that the vowel of the perfect suffix is underlyingly long, we would have a rule that said: shorten the i: of the perfect suffix after a Mutable consonant (i.e. voiceless stops, voiced stops if after a nasal, ɬ). Alternatively, if we claimed that the vowel is short underlyingly, we would have a rule that said: lengthen the i of the perfect suffix after Immutable consonants (i.e. voiced stops not preceded by a nasal, continuant obstruents, sonorants, glides). Given either of these analyses, what is being claimed is that the length of the vowel of the perfect suffix is determined by the nature of the final consonant of the preceding stem prior to Mutation. Recall that Mutation has the effect of changing a Mutable consonant into s, z, or sh -- all of which are themselves in the Immutable class. Thus if it were correct that the length of the perfect suffix correlated with whether the preceding stem ends underlyingly in a Mutable consonant or not, then it would be necessary to apply the rule determining the vowel length of -i(:)ɬ- prior to Mutation (or else appeal to global rules).

There is evidence, however, to show that the length of the vowel of the perfect suffix is not in fact correlated with the contrast between Mutable and Immutable consonants, and thus that the determination of the length cannot be made on the basis of the structure prior to Mutation. This evidence is provided by two types of exceptions to Mutation. The first type invovles instances of "negative" exceptions to Mutation -- i.e. cases where the rule should apply, but does not. Exceptions of this type are well-documented in many languages. (8) lists many of the negative

exceptions to Mutation that we have so far discovered. Most of the exceptions are either loanwords or stems ending in a nasal plus a voiced stop (in the latter cases, avoidance of homonyms may be involved in some of the cases of exceptional behavior).

(8) pamb-i:ɬ-e 'he decorated' (The expected form is pa:nz-iɬ-e, which does occur, but only as the perfect form of -pa:nd- 'to climb, go up'.)

imb-i:ɬ-e 'he sang' (The expected form is inz-iɬ-e, which does occur as an alternative to imb-i:ɬ-e.)

ond̲-e:ɬ-e 'he tasted'

goŋg-e:ɬ-e 'he knocked'

soŋg-e:ɬ-e 'he moved close' (The expected form is so:nz-eɬ-e, which does occur, but only as the perfect form of -so:nd̲- 'to suck'.)

te̲ŋg-e:ɬ-e 'he stayed away, avoided' (The expected form te̲:nz-eɬ-e does occur as an alternative form.)

ta̲p-i:ɬ-e 'he tossed around'

xat̲-i:ɬ-e 'he went without (food, e.g.)'

i-θibi̲t̲-i:ɬ-e 'it was certain'

set-e:ɬ-e 'he stamped on'

ishta̲k-i:ɬ-e 'he complained'

ta̲da̲ruk-i:ɬ-e 'he attended to the needs of his guests'

jadiɬ-i:ɬ-e 'he argued pointlessly' (Cf. (3) above for other examples where stem-final ɬ fails to undergo Mutation.)

Observe that in the above examples, a stem ending in a Mutable consonant fails, exceptionally, to actually mutate. Now, if the length of -i(:)ɬ- were in fact dependent on the contrast Mutable vs. Immutable, then the vowel should have the same length in the examples in (8) as it does in (6); in both cases the vowel is preceded by a Mutable consonant. But whereas the suffixal vowel is short in the examples in (6), it is long in the examples in (8). In other words, the vowel is long after a Mutable consonant when that consonant does not actually mutate, but short after a Mutable consonant when that consonant does in fact mutate.

The second type of exception to Mutation involves "positive" exceptions -- i.e. cases where the rule applies, even though the conditions for its application are not fulfilled. Exceptions of this type appear to be much

less frequent than simple negative exceptions, but the examples in (9) appear to be strong candidates for such a treatment:

(9) bish-iɬ-e 'he hit' cf. ku-big-a 'to hit'
t̲a:z-iɬ-e 'he opened it wide' (alternatively: t̲ag-i:ɬ-e) x-t̲a:g-a
laz-iɬ-e 'he went out' ku-law-a
t̲oz-eɬ-e 'he didn't find' x-t̲ow-a

The consonants g and w belong (regularly) to the class of Immutables and do not undergo Mutation before the perfect suffix. The roots -big-, -t̲a:g-, -law-, and -t̲ow- are exceptions in that they do mutate: -big- changes its final consonant to sh, whereas the other three roots change their final consonant to z.

Once again, if it were correct that the length of -i(:)ɬ- is governed by the contrast Mutable vs. Immutable, then the vowel should be long in (9) just as it is long in (5). In both sets of cases the stem ends in an Immutable consonant. But the vowel is short in laz-iɬ-e, etc., not long as in d̲uguw-i:ɬ-e, even though the roots -law- and -d̲uguw- both end in w. In other words, the vowel of the perfect suffix is short after an Immutable consonant that does in fact mutate, but long after those Immutable consonants that (regularly) do not mutate.

The two classes of exceptions discussed above demonstrate that the structure of the stem prior to Mutation does not determine when the vowel of -i(:)ɬ- is short as opposed to when it is long. The contrast Mutable vs. Immutable is not, in fact, the relevant contrast. It would seem rather that the contrast Mutated vs. Unmutated is the crucial one. The vowel of the perfect suffix is long after an Unmutated consonant, but short after a Mutated consonant. The Unmutated consonants are those Immutable consonants that have (regularly) failed to undergo Mutation and also those Mutable consonants that have (exceptionally) failed to undergo Mutation. The Mutated consonants are those Mutable consonants that have (regularly) mutated, as well as those Immutable consonants that have (exceptionally) mutated.

Let us now consider how we can formulate the above observations into a rule. Assume for the moment that the vowel of the perfect suffix is bascially long. We would then want to say: shorten this vowel when it is preceded by a Mutated consonant. How do we identify a "mutated" consonant?

We have already seen that this concept is not equatable with the concept underlying the term Mutable. It would seem rather that it is the structure that results from Mutation that determines the length of the vowel of the perfect suffix. However, if one examines just the output of the rule of Mutation, it is not possible to distinguish (phonetically) a Mutated consonant from an Unmutated consonant. The reason that it is not possible has already been pointed out: the consonants s, z, and sh may be either Mutated consonants (in the event that they derive from underlying stops or ɬ) or Unmutated (in the event that they derive from underlying s, z, or sh). The vowel of the perfect suffix is long in kos-e:z-e 'he made a mistake', but short in pis-iɬ-e 'he passed'; in both cases the stem ends phonetically in s, but in the former case the s is Unmutated (deriving from underlying s) while in the latter case it is Mutated (deriving from underlying t). Thus the post-Mutation structure cannot, by itself, provide sufficient information to distinguish Unmutated from Mutated consonants.

The reader may have noted that kos-e:z-e and pis-iɬ-e differ not just in the length of the vowel of the perfect suffix, but also in the quality of the consonant of that suffix: z in kos-e:z-e, but ɬ in pis-iɬ-e. Could that not have something to do with the length of the preceding vowel? Recall that this difference in the shape of the consonant of the perfect suffix is due to the fact that ɬ-to-z rule does not apply after a stem-final s, z, or sh resulting from Mutation. In kos-e:z-e, the verb stem ends underlyingly in s, and thus the ɬ of the perfect changes to z as required by the ɬ-to-z rule. In pis-iɬ-e, on the other hand, the stem ends in t underlyingly, and the ɬ-to-z rule does not affect the ɬ of the perfect suffix. Given our analysis, then, the fact that in kos-e:z-e the suffix has a long vowel followed by z whereas pis-iɬ-e has a short vowel followed by ɬ is simply the consequence of the fact that both the rule assigning the appropriate vowel length to -i(:)ɬ- and also the ɬ-to-z rule depend crucially on the contrast between Mutated and Unmutated consonants. There is good evidence in support of the contention that there is no direct connection between the length of the vowel and the change of ɬ to z. For one thing, there are many cases where a perfect suffix has ɬ preceded by a long vowel: e.g., som-e:ɬ-e, jib-i:ɬ-e, had-i:ɬ-e, etc. Such examples demonstrate that an ɬ in the perfect suffix does not generally require that

a short vowel precede. Secondly, there is evidence from exceptions again to support the claim that the appearance of ɬ vs. z in the perfect suffix is in no way directly correlated with the length of the preceding vowel. Recall that there are a few exceptions to the ɬ-to-z rule: bariz-i:ɬ-e, jasus-i:ɬ-e, asis-i:ɬ-e. Notice that the fact that ɬ appears in these examples rather than z has no effect whatsoever on the length of the preceding vowel, which is long (just as it would be if the ɬ had undergone the ɬ-to-z rule). The suffixal vowel is long in examples like bariz-i:ɬ-e simply because the preceding stem ends in an Unmutated consonant.

We have now shown that the structure that exists prior to Mutation cannot provide the relevant information to determine the length of -i(:)ɬ-, and that the structure that exists after Mutation cannot provide the necessary information either. Within the standard approach to generative phonology, only one move is left: put Mutation and the assignment of vowel length into one rule -- that is, formulate one transformational rule that simultaneously mutates a final consonant before the perfect suffix and also shortens the following vowel. Given such an analysis, if Mutation applies, then shortening of the following vowel will also occur; if Mutation does not apply, then neither will the shortening of the vowel of the perfect suffix. Thus the connection between a Mutated consonant and a following short vowel would be captured.

It should be noted that this transformational analysis requires that the vowel of -i(:)ɬ- be underlyingly long. If the vowel were bascially short, it would have to be lengthened after Unmutated consonants, but there is no way to link a change in vowel length to the lack of a change in the preceding consonant by means of a transformational rule. Transformational rules simply allow two structural changes to be welded together into one. The transformational anlaysis also requires that there be one Mutation rule to which the vowel length adjustment can be attached. Thus there must be one rule that (a) mutates voiceless stops after both vowels and nasals, (b) mutates voiced stops just when they are after nasals, and (c) mutates ɬ, but not l or r. Furthermore, that same rule must account for the "positive exceptions" in (9), such as toz-eɬ-e from underlying /tow-i:ɬ-e/. If all of these changes in the final consonants of stems before the perfect suffix were not incorporated into one rule, it would be necessary to repeat

the length adjustment as part of each rule that would carry out the various mutations. Thus if the transformational analysis is the correct one, we have strong evidence that what we have been referring to as Mutation should be formalized as a single rule.

There is an alternative to the transformational analysis which would make use of a global rule. The principle would be simply: the vowel of the perfect suffix is short after a Mutated consonant (i.e., a consonant that has been derived by Mutation), and long otherwise. This formulation of the rule assumes that there is one rule of Mutation. If there are in fact two or mroe separate rules of Mutation, then we would have to revise our characterization of "Mutated" consonant to mean a consonant derived by means of any rule that alters a stem-final consonant preceding the perfect suffix. The global rule approach allows a rule to consider the derivational history of a given structure, and thus allows a Mutated consonant to be distinguished from an Unmutated consonant.

Recall that the ɬ-to-z rule likewise must distinguish between Mutated and Unmutated consonants (since the perfect suffix changes its ɬ to z after Unmutated s, z, sh, and ñ). In that case it was possible to make this distinction by ordering the ɬ-to-z rule prior to Mutation. Global rules provided an alternative to this use of ordering. Now we see that the length of the vowel of the perfect suffix is also determined by a contrast between Mutated and Unmutated, but a rule ordering solution to this problem is not available. There is, we believe, a significant parallelism between the two cases: a phonetic feature in the perfect suffix (occurrence of z as opposed to ɬ, occurrence of a long as opposed to a short vowel) is being employed in such a way as to maintain a contrast that would otherwise be neutralized in the perfect stem. That is, the rule of Mutation neutralizes several phonological oppositions: p, t, t and s are all realized as s before the perfect suffix; k and sh are both realized as sh; ɬ and z are both realized as z; and mb, nd, nd, ŋg, and nz are all realized as nz. This neutralization, while very extensive, is partially offset by the fact that the perfect suffix will have a different phonological shape when a preceding s, z, or sh is derived via Mutation rather than being underlying. The interaction between the ɬ-to-z rule and Mutation helps to preserve underlying phonological contrasts, as does the interaction between the

assignment of length to -i(:)ɬ- and Mutation. Given this parallelism between the two cases, we prefer to describe the interactions between ɬ-to-z and Mutation and between length adjustment and Mutation in parallel fashion. Global rules allow a parallel description, rule ordering does not.

We have not shown that a global rule must be used rather than a transformational rule in accounting for the length of the vowel of the perfect suffix. Either approach is possible, since both allow one phonological change to be tied directly to another phonological change. The data in this paper seem to establish clearly that two phonological changes may in fact be inseparably linked so that one of the changes occurs only if the other also occurs. The proper description of such linkages is still uncertain, but the existence of a need for an appropriate descriptive device has been supported.

Footnotes

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[1]Chi-Mwi:ni is so described in the two published descriptions of the language available to us: Whiteley (1965) and Goodman (1967). Neither of these brief studies examines the problems that we will be focusing on in any detail; furthermore, Whiteley's transcription of vowel length is, in certain cases, at variance with ours. It should be pointed out, however, that Whiteley's work on the language was apparently of a very brief duration. It is also relevant to note that there are vowel lengthening and vowel shortening rules that operate over "phrases", and thus the shape that a word has in isolation may differ from its shape in a particular phrasal context. (Cf. Goodman (1967) and Kisseberth and Abasheikh (1974) for some discussion.) The forms of words cited in the present paper are "isolation" forms.

[2]A description of Chi-Mwi:ni phonetics will not be given here, but a few comments on the transcription employed are in order. t̲ and d̲ represent dental stops, as opposed to alveolar t and d. dh stands for a voiced retroflexed sound that has been borrowed from Somali and is limited (almost

universally) to Somali loanwords. (The new Somali orthography employs the symbol "dh" for the sound in question, and we are simply following this orthographic practice.) đ is used for phonetic [ð], ch for [ɣ], and sh for [ʂ].

[3]The mutation of voiceless stops occurs regularly when that stop is preceded by a vowel, as shown by the examples in the text, and also when that stop is preceded by a nasal, as can be seen from examples like nu:nsh-iɬ-e 'he smelled' (ku-nu:ŋk^{h}-a), ku:ns-iɬ-e 'he was in financial difficulty' (x-ku:nt^{h}-a), pepe:ns-eɬ-e 'he separated the husks from grain' (x-pepe:nt^{h}-a). If a non-nasal consonant precedes, however, mutation does not occur. Thus: shart-i:ɬ-e 'he imposed a condition' (x-shart-a), shirk-i:ɬ-e 'he claimed divine qualities' (x-shirk-a), isk-i:ɬ-e 'he shook s.t.' (k-isk-a).

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