THE ROLE OF REDUNDANCY AND DEFAULT RULES IN CHIYAO PHONOLOGY*

Al Mtenje

There have been persuasive arguments in the recent literature for a theory of phonology in which features are viewed as being represented in a hierarchical fashion whereby tiers are allowed to dominate one another. Work by Mohanan[1], Clements[2], Hayes[3], Sagey[4], Mester[5] and others characteristically illustrates this line of thought.

A related development has been the characterization of assimilation as a process which involves feature-spreading rather than feature-copying, (cf Clements[6], Hayes[7], Schein & Steriade[8] and others). An interesting question that has arisen from this conception of assimilation is how spreading in assimilation is to be constrained namely, does feature-spreading occur on several autosegmental nodes or does it only affect single nodes in tree structure? Clements has proposed and defended the strong and more restrictive position that spreading only affects single nodes. Some supporting evidence for the single-node spreading view has already started to emerge. For instance, Mtenje[9] has argued that several assimilation rules of Chiyao (a Bantu language spoken in Malawi and other neighbouring countries) apply in a manner in which Clements' hypothesis is fully supported.

The present study extends the observations and arguments made in Mtenje's work[10] and shows that the theory of default and redundancy when applied to Chiyao assimilation rules provides further evidence for the view that feature-spreading affects single nodes in tree structure.

The organization of the paper is as follows: Section 2.0 presents a brief sketch of Clements' model of phonological feature geometry and how it relates to recent views on assimilation. The next section discusses some Chiyao rules and shows their compatibility with Clements' hypothesis on feature-spreading in assimilation. The final section is a conclusion.

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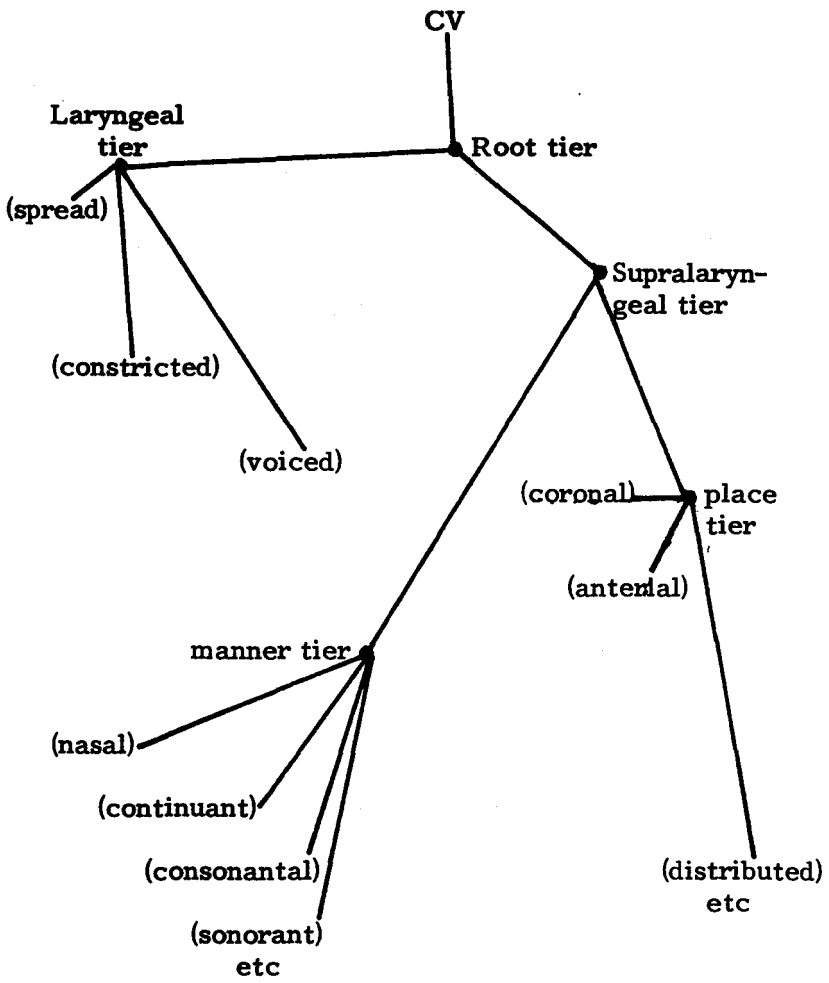
The hierarchical nature of features

Recently, it has been shown in several studies (cf Clements [11], Hayes[12], Sagey[13], Mester[14] etc) that some sets of phonological features consistently function as a unit with respect to certain phonological processes (e.g. assimilation) while other imaginable sets do not function in such a unitary fashion. This observation has been taken as evidence for the need to group such features simultaneously as a unit at some level of phonological organization. Clements proposed a model of feature representation in which the interesting relationship between simultaneous feature grouping and phonological processes like assimilation is said to be more naturally expressed. Clements' model allows for features to be organized under hierarchically superordinate autosegmental nodes which he refers to as CLASS NODES. The class nodes are themselves dominated by the ROOT NODE which is in turn linked to the C-V tier.

The range of class tiers is defined as including the root, laryngeal, supralaryngeal, place and manner tiers. The class nodes dominate one another in the following order: the root tier immediately dominates the laryngeal and supralaryngeal nodes. The former immediately donimates such features as [voiced], [spread] and [constricted], while the latter immediately dominates manner and place features. The manner features include those concerned with the degree and manner of constriction in the oral tract and thus include [consonantal], [sonorant], [continuant], [lateral] and [strident]. On phonological criteria, the feature [nasal] is also assigned to the manner tier. The place features are those features which distinguish place of articulation in consonants and vowels and they include [coronal], [anterial], [distributed], [high] and [rounded].

The hierarchical organization of these tiers is thus as shown in (1).

(1)



According to Clements, each feature in the diagram above characterizes every node that dominates it [with the root and CV nodes being characterized by virtually all the features of the representation]. For example, the manner node is characterized by the feature (nasal), (continuant), (consonantal), and (sonorant). A phonetic segment in this model is thus defined as any element of the CV tier together with all the features characterizing it (i.e. all the features dominated by the C or V slot).

Assimilation and Spreading

As noted above, one of the major motivating factors for the simultaneous grouping of phonological features into separate hierarchical levels of representation as proposed by Clements is the fact that certain common types of phonological and phonetic processes exhibit some kind of phonological (functional) independence in that such processes may affect only one set of features to the exclusion of other logically possible sets. For instance, it has been commonly observed that phonological processes can affect laryngeal features without affecting supralaryngeal features. Rules of voice assimilation and (de)aspiration are typical examples. Conversely, phonological processes can affect supralaryngeal features without affecting laryngeal features. This is common in cases of partial assimilation where only place or manner features of a segment may be involved. One interesting implication of the observations made above is that assimilation processes may be expressed (in some way) within the phonological model proposed by Clements. Before we examine Clements' suggestions on how assimilation ought to be expressed in his model, a brief discussion on recent views on assimilation in autosegmental theory is in order.

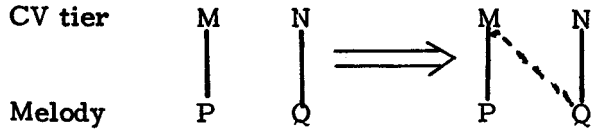
The linear model of phonology presented in Chomsky and Halle [15] views assimilation [both partial and total] as a process whereby one segment is altered in its feature values so as to become more similar to a neighbouring segment. This view essentially considers assimilation as a feature-copying process. In other versions of phonology, assimilation by copying can be achieved by either feature-specifying or feature-changing mechanisms or both depending on certain assumptions about the underlying specification nature of the target segment.

Recent research in CV phonology however, suggests that assimilation is better expressed by feature-spreading rather than feature-copying mechanisms (cf for instance Halle and Vergnaud[16], Goldsmith[17], Steriade[18], Schein and Steriade[19], Clements[20], Hayes[21] among others).

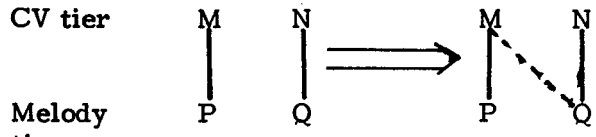
Assimilation as spreading involves expanding the temporal domain of autosegments by adding association lines and often deleting those autosegments which have been displaced as shown in (2).

(2)

(a)



(b)



Here, figure (2a) shows that all the features of (P) are severed and the remaining timing slot (M) is then reassociated with Q yielding a geminate while (2b) simply shows the spreading of the features of Q to the timing slot (M) without any delinking involved.

There are several arguments in favour of assimilation as a spreading process. Since these arguments are readily available in the literature, only a brief summary will be presented here. Firstly, while the view treating assimilation as feature-copying in principle allows for any feature or set of features to undergo assimilation, a spreading account of assimilation constrains assimilation rules more sensibly by predicting that only certain (sets of) features can undergo assimilation. This view thus makes it possible to articulate a more constrained and predictive theory of phonology.

Secondly, the view that assimilation involves spreading accounts for certain behavioral properties of long segments derived by assimilation rules. This cluster of properties can be conveniently described under what Hayes[22] terms "Ambiguity", "Integrity" and "Inalterability". Ambiguity refers to the well-known case where long segments behave like a single segment with respect to quality-sensitive rules and like two segments with respect to quantity-sensitive rules. This property has been observed to extend to segments derived by total assimilation rules.

By assuming that geminates are single segments linked to two timing slots on the CV tier the property of ambiguity is easily accounted for. That is, total assimilation rules

involving spreading yield multiply linked geminates. Rules affecting the melody tier will treat the segment as a single unit while those affecting quantity and applying on the CV tier will have to affect the two slots to which the segmental material is linked.

Integrity is a case where long segments including tautomorphemic geminates derived by assimilation rules cannot be broken up by epenthesis rules (cf Abu-Salim[23], Guerssel[24], Hayes[25], for examples). As pointed out by Schein[26], Kenstowicz[27], Steriade[28], this property can be explained within CV phonology by the assumption that geminates derived by assimilation involving spreading affect multiply linked structures on the CV tier. Inserting a segment [e.g. a vowel] between them would result in the crossing of association lines which is forbidden by the wellformedness condition.

Finally, Inalterability refers to the failure of segments forming halves of a geminate (including tautomorphemic geminates from assimilation) to undergo a rule they would otherwise be expected to undergo (for examples, see Schein[29], Kenstowicz[30], Hayes[31], and others). Hayes[32] and Schein and Steriade[33] have proposed general principles that predict cases of Inalterability automatically for those rules that display it. Hayes' "Linking Constraint" for example proposes that association lines be treated exhaustively for purposes of rule application. That is, a rule whose structural description refers to multiply linked structures cannot apply to segments which are singly linked and, conversely, a rule whose structureal description refers to structures with single linkage cannot affect multiply linked segments. Now, this constraint provides a diagnostic for the mechanisms of assimilation as involving spreading.

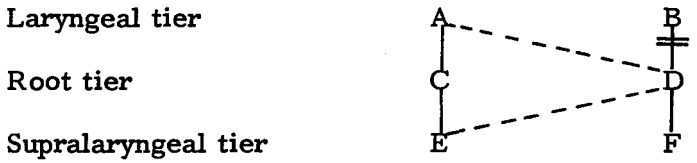
The logic is simple. If a rule of total assimilation is due to spreading, then it must create doubly-linked structures and according to Hayes' constraint, such structures, like all true geminates, will be inalterable by any rule that crucially refers to singly linked structures in its structural description; and this is precisely what happens. Thus we see that Ambiguity, Integrity and Inalterability support the claim that (total) assimilation involves spreading.

Interestingly enough, cases of partial assimilation involving spreading are also supported by principles like the Linking

Constraint. Hayes[34], for instance, presents cases of rules of partial assimilation in Toba Batak, an Austronesian language, which obey Inalterability as predicated by the Linking Constraint. He shows that a number of structures resulting from rules of partial assimilation fail to undergo a rule of glottal formation which is formulated as affecting only singly-linked consonants. Hayes thus concludes that rules involving partial assimilation must be considered as yielding multiplying-linked structures explaining why they fail to undergo glottal formation.

Having briefly reviewed the arguments for treating assimilation as spreading, let us now consider Clements' claims about the characterization of such spreading in the multi-tiered hierarchical representations proposed in his model. Clements has argued that assimilation processes only involve single nodes in tree structures. That is, only those phonological features dominated by a single node can spread to neighbouring nodes to effect the relevant assimilation changes. Clements' hypothesis on spreading predicts that in structures like (3) where spreading occurs from more than one node, (the letters stand for an arbitrary set of features dominated by the relevant nodes) the processes are independent and ought not be represented in a single rule.

(3)



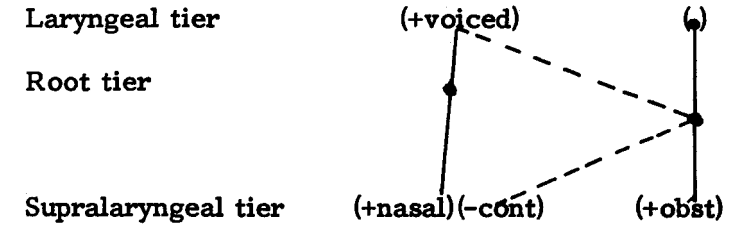
Clements (1985) discusses apparent counter examples to the single-node spreading constraint from Kikuyu, a Bantu language of Kenya and shows how they can be accounted for. In this language, there is a general process which assigns the features (-continuant) and (+voiced) to post-nasal obstruents. The relevant data are presented below:

(4)

Imperative	**1st singular Imperfect**	**Stem (gloss)**
Bur - a	m-bur-eetɛ	"lop off"
tem - a	n-dɛ m-ɛɛtɛ	"cut"
reh - a	n-deh-eetɛ	"pay"
Cin - a	ɲ-jin-eetɛ	"burn"
Kom - a	ŋ-gɔ m-ɛɛtɛ	"sleep"
ɣor - a	ŋ-gor-eetɛ	"buy"

Here, it can be noted that the obstruents following the nasal consonants become voiced non-continuants. Within the framework proposed by Clements, this assimilation process can be accounted for by assuming that the feature (-continuant) and (+voiced) of the preceding nasal spread on to the following obstruent as illustrated below:[35]

(5)



It can be seen here that spreading in (5) involves two independent nodes, the feature (-continuant) belonging to the supralaryngeal tier and the feature (+voiced) belonging to the laryngeal tier. Thus, the way in which post-nasal obstruents become non-continuants appears to involve feature spreading from two nodes instead of one as predicted by the single-node spreading hypothesis.

Clements, however, argues that the Kikuyu data cease to be recalcitrant once other factors of Kikuyu phonology are considered. Particularly, he argues that the feature voiced is redundant in Kikuyu and therefore need not be specified underlyingly. This therefore implies that in a tree structure such as (5) the feature voiced need not be included which means that it cannot spread. The argument that voicing is redundant in Kikuyu is based on the following factors: firstly, all sonorants in Kikuyu are voiced, secondly voicing is also predictable in obstruents: stops are voiced after nasals otherwise they are voiceless; fricatives are also always voiced. This would then seem to suggest that the assimilation rule in (5) only involves the feature (-continuant) and a redundancy rule assigns the feature (+voiced) later to the segments to yield the correct output. The Kikuyu assimilation process therefore would not provide a genuine counterexample to the claim that only single nodes assimilate in tree structure.

Clements goes on to suggest that this interesting intersection between phonological redundancy on the one hand and ssimilation and feature representation on the other may turn out to be a vital clue in explaining some cases

of apparent exceptions to his views on featurespreading in assimilation in the sense that one or more of the features involved may not yet be present in representations, such features being added later by redundancy rules.

In this paper, we demonstrate using Chiyao data that the singlenode spreading hypothesis constrains phonological theory in interesting ways and should be maintained. As originally argued[36], we show that a series of assimilation rules in Chiyao involving the same features as in Kikuyu (i.e. (-continuant) and (+voiced) which appear to require spreading to affect more than one node present further supporting evidence for the view that most of the apparent exceptions to the single-node spreading hypothesis are explained in terms of one or more of the features being redundant. We show that the notions of redundancy and default feature specification provide considerable insight into the nature of feature spreading in multi-tiered representations and assist in our efforts to preserve a more constrained theory of phonology.

Assimilation processes in Chiyao

Chiyao has a class of assimilation processes which are, in many respects, similar to the Kikuyu case. There are several assimilation rules in this language but the rules that will concern us in this paper are the following: post-nasal stop formation I, consonant-voicing and post-nasal stop formation II. We will formulate these rules individually first before collapsing them into one general assimilation rule.

Post-nasal stop formation I

This rule changes /l/ to /d/ when it occurs after a nasal consonant in the perfective tense. Consider the following forms where /ku/ is the infinitive marker and the /a/ at the end of the verb is the final vowel characteristic of Bantu languages. (We omit tone details here and in all subsequent data because they are irrelevant to the present study).

(6)	a)	ku-lapit-a	-	"to lick"
	b)	ku-liŋg-a	-	"to try"
	c)	ku-lokot-a	-	"to pick up"
	d)	ku-lila	-	"to cry"

Among the processes which are triggered by the perfective tense in Chiyao is the change of /l/ to /d/ in post-nasal environments. A characteristic way of expressing this tense is by prefixing a subject marker (SM) to the root and then suffixing either **-e** or **-ile** to the root as the tense marker (TM). The phonological alternations triggered through this process are illustrated in (7) below (the symbol "," represents syllabicity).

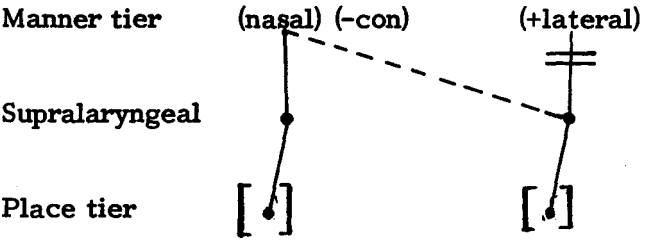
(7)	SM	Root	TM		
a)	n -	lapit -	e	ndapite -	"I have licked"
	m̩ -	lapit -	e	m̩lapite -	"You (singular) have licked"
	a -	lapit -	e	alapite -	"He/she/they have licked"
	tu -	lapit -	e	tulapite -	"We have licked"
b)	n -	liŋg -	ile	ndiŋ̌jile -	"I have tried"
	m̩ -	liŋg -	ile	m̩liŋ̌jile -	"You (singular) have tried"
	a -	liŋg -	ile	aliŋ̌jile -	"He/she/they have tried"
	tu -	liŋg -	ile	tuliŋ̌jile -	"We have tried"
c)	n -	lokot -	e	ndokwete -	"I have picked"
	m̩ -	lokot -	e	m̩lokwete -	"You (singular) have picked"
	tu -	lokot -	e	tulokwete -	"we have picked"
d)	n -	lil -	ile	ndisile -	"I have cried"
	m̩ -	lil -	ile	m̩lisile -	"you (singular) have cried"
	a -	lil -	ile	alisile -	"Have/she/they have cried"

Here, we are mainly interested in the alternation between /l/ and /d/ shown root-initially in the forms ndapite, ndinjile and ndokwete. (For changes which are irrelevant to the present study such as the palatalization of /g/ to /j/ before

/i/ in (7b), the change of **ko** to **kwe** in (7c) and the /l//s/alternation in (7d), see Mtenje[37] for details). Note that /l/ changes to /d/ only when the preceeding nasal is tautosyllabic with it. When that nasal belongs to a different syllable as in the form mlapite, mlokwete, mlinjile and mlisile, the change fails to occur.

Within the framework assumed above where assimilation involves spreading, this process can be accounted for by a rule such as that given in (8) where the feature (-continuant) characterizing the nasal consonant spreads on to the following lateral. (Rule (8) shows the relevant tiers only).

(8) Post-nasal stop formation I



Consonant Voicing

This rule voices a consonant which follows a nasal consonant. Consider the following data:

(9)	a)	ku	-	pel	-	a	- "to be tired"
	b)	ku	-	kat	-	a	- "to cut"
	c)	ku	-	timb	-	a	- "to beat"

Now consider what happens when the verb occurs in the perfective tense as shown in (10)

(10)	SM		ROOT		TM	
a)	n	-	pel	-	ile	mbesile - "I am tired"
b)	n	-	kat	-	ile	ngatile - "I have cut"
c)	n	-	timb	-	ile	ndimbile - "I have beaten"[38]

Here, the post-nasal stops are voiced.[39] It may be worth pointing out that like post-nasal stop formation I in (8), consonant voicing applies only to consonants which are

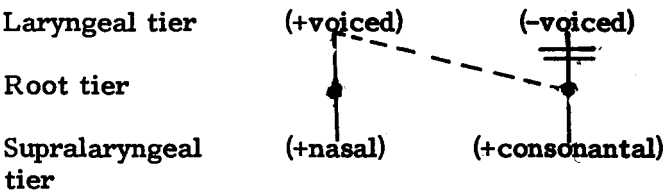
tautosyllabic with the nasal. Note that the syllabic bilabial nasal /m̩/(you, singular) does not trigger this rule as shown in (11).

(11)

m̩	-	pel	-	ile	m̩pesile	-	"You are tired"
m̩	-	kat	-	ile	- m̩katile	-	"You have cut"
m̩	-	timb	-	ile	- m̩timbile	-	"You have beaten"

This voicing process can be accounted for within the spreading framework by assuming that the feature (voiced) from the nasal spreads on to the following consonant as shown below (we assume the tautosyllabicity condition on the relevant segments).

(12) Consonant Voicing



Let us now consider post-nasal stop formation II.

Post-nasal stop formation II

This rule changes the labial glide /w/ into the voiced bilabial stop /b/ in post-nasal environments. This change is shown in (14) where the initial glides in (13) occur in the appropriate post-nasal environments.

(13)

a)	wugul	-	a	-	"open"
b)	walaŋg	-	a	-	"read"
c)	wug	-	a	-	"cook"
d)	wik	-	a	-	"arrive"
e)	weč̌et	-	a	-	"talk"

(14) a) a - n-wugul - ile ambugulile - "You open for me"
you-me-open-for (plural)

b) n - walaŋg - ile mbalasile[40] - "I have read"
I - read - perefective.

c) n - wug - ile mbusile - "I have cooked"
I - cook - perfective

d) n - wik - e mbiče - "I have arrived"
I - arrive - perfective

e) n - weč̣et - e - mbeč̣ete - "I have talked"
I - talk - perfective

Again, like Post-nasal Stop Formation I and Consonant Voicing, this rule also applies to tautosyllabic segments only. This can be observed in the following forms involving the syllabic bilabial nasal where the rule fails to apply.

(14) a) a - m̩ - wugul - ile am̩wugulire - "He/She Open for you (singular)
He/she - You - open - for

b) m̩ - walang - ile m̩walasile - "You (singular) have read"
you - read - perfective

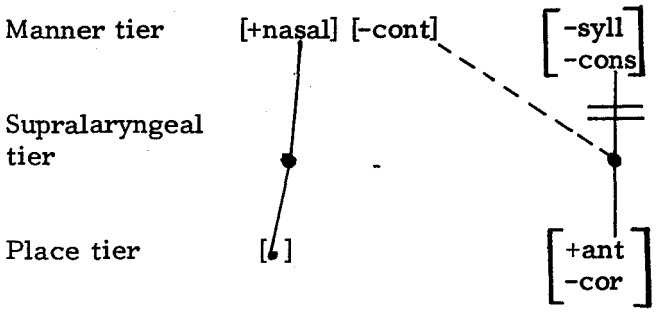
c) m̩ - wug - ile m̩wusile - "You (singular) have cooked"
you - cook - perfective

d) m̩ - weč̣et - e m̩weč̣ete - "You (singular) have talked"
you - talk - perfective

From the point of view of spreading, we can account for this process by assuming that the manner features of the glide are severed and the feature (-continuant) characterizing the nasal spreads to the supralaryngeal node of the glide thus appropriately changing it into a corresponding non-continuant with the same place of articulation as /w/,

namely /b/. The rule achieving this result can be formulated as follows (assuming, again, the tautosyllabicity condition).

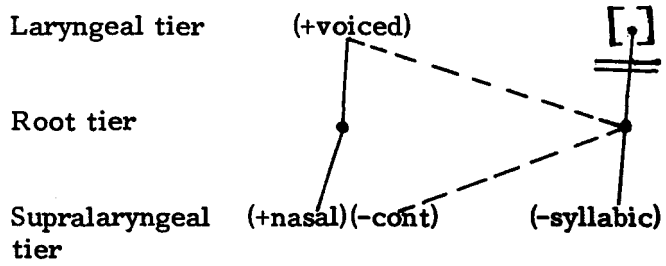
(15) Post-nasal stop formation II



Formulating a General Rule

Now, although rules (8), (12) and (15) are formulated as separate and independent rules, it can easily be noted that they share several elements in common. Firstly, in virtually all cases the segments affected occur in post-nasal environments. Secondly, in two of the rules (12) and (15)), the spreading feature is (-continuant). Finally, in all cases the process involves changing a consonant into a voiced non-continuant obstruent. It is thus obvious that stating these properties in three separate rules repeatedly misses the crucial generalization that all the rules involve the features (voice) and (continuant). One general rule is therefore needed to capture all these generalizations. The general rule, given below in (16), specifies that a post-nasal consonant becomes a voiced non-continuant through the spreading of the features (+voiced) and (-continuant).

(16) Voiced Non-Continuant Formation



At this point, let us review Clement's hypothesis on featurespreading in assimilation processes and assess the

extent to which it is compatible with rule (16) above. It may be recalled that Clements argues that spreading in assimilation involves only single nodes i.e. only a feature or features dominated by a single node can spread. Rule (16) above which is in many respects similar to the Kikuyu assimilation rule given in (5) requires the spreading of at least two features (-continuant) and (+voiced) from two different nodes, namely, the laryngeal and the supralaryngeal nodes.

Now, the crucial question that can be asked in relation to spreading in rule (16) is whether the rule is really incompatible with Clements' hypothesis and **ipso facto** indicates that the hypothesis is too strong and ought to be relaxed to allow spreading to affect more than one node in tree structure. The main claim of this paper is to demonstrate that, on the contrary, the Chiyao data do support Clements' single-node spreading in assimilation. We turn to this issue immediately.

Redundant and Default Features in Chiyao

The notions of redundancy and default in phonological theory have proved to be extremely useful in many recent analyses of phonological phenomena. It has become clear that by extracting redundant features out of underlying representations and maintaining a redundancy - free lexicon, the description of many languages can be fairly simplified.

It is our conviction here that redundancy plays a crucial role in Chiyao phonology and that the formulation and statement of the phonological rules given above gets simplified when the notion of redundancy is considered. We now turn to this issue.

Elsewhere[41], it has been argued that Clements' single-node spreading hypothesis is not violated in Chiyao because the features involved, particularly the feature (continuant) is redundant and is thus not underlyingly available to undergo spreading. The redundancy of this feature in Chiyao was shown to derive from the fact that the language has only one continuant obstruent (s) which can be characterized as (+strident); the other non-continuant obstruents could then be characterized as (-strident) thus rendering the feature (continuant) unnecessary, hence redundant.

In this paper, we argue that the redundancy of the features involved in the spreading rule in (16), namely (continuant) and (voice) can also be derived from other aspects of the theory of redundancy and that, as argued elsewhere[42], the manner in which the spreading rule operates is still consistent with the single-node spreading hypothesis.

There are two ways in which the redundancy of the features (continuant) and (voice) can be characterized. Firstly, it ought to be pointed out that the segment which triggers the assimilation process in rule (16) namely the nasal consonant is inherently a voiced non-continuant. That is, the unmarked (or universal) value for the features (continuant) and (voiced) for the nasal is (-continuant) and (+voiced). This then means that we can motivate the following redundancy rules for these features:

(17) (i) (+Nasal) ——————→ (+voiced)

(ii) (+Nasal) ——————→ (-continuant)

The rules in (17) essentially mean that unless otherwise stated, nasal consonants are usually voiced and non-continuant. But then the fact that these features are predictable (and therefore redundant), means that they are nondistinctive and need not be underlyingly specified. Rule (16) thus does not need those features underlyingly for them to spread. The nasal only bears the feature (+nasal) underlyingly and then at a later stage or stages in the derivation where redundancy rules apply, the redundant features will be specified by rule (17) and they may then spread to the following consonant to derive a voiced non-continuant which is precisely the intended output. Thus by motivating the redundancy rules in (17), we avoid specifying the features (voiced) and (continuant) underlyingly on the nasal and consequently they cannot spread simultaneously from two different nodes in contranvention of the Clements hypothesis. The notion of redundancy thus helps us to constrain spreading processes in multi-tiered tree structures and preserve a restrictive theory of phonology.

There is another way in which the redundancy of the features (voiced) and (continuant) can be expressed. One can assume that the feature (voiced), although redundant for nasals, is still specified in the underlying representation

of the nasal consonant and that it spreads to the following consonant. Once that consonant has been associated with the feature (voice), the redundancy rule for Chiyao given in (18) then marks all voiced obstruents as (-continuant).

(18) $$(+\text{voiced}) \xrightarrow{C} (-\text{continuant})$$

This follows from the fact pointed out above that Chiyao has only one continuant obstruent (s) which means that there are no voiced continuant obstruents. If a consonant is voiced, then it must be a non-continuant. Once the redundancy rule in (18) applies the post-nasal consonant is now marked as (-continuant) and (+voiced) which gives a voiced non-continuant obstruent.

In comparing the two analyses, we find the first one to be better than the second one. The main reason for this choice lies in the fact that the theory of the underspecification of features places more emphasis on the reduction of redundancy in underlying representations. Ideally, such representations are required to be redundancy-free in the sense that only contrastive (non-redundant) features are specified in the lexicon. All redundant features by virtue of being predictable, are supplied later by either languagespecific or universal redundancy rules at the relevant stage in the derivation.

Now, the first solution given above which considers both (voiced) and (continuant) as redundant features and excludes them from the underlying representation stage of the nasal is consistent with the general requirements of underspecification theory stated above. On the other hand, the second solution still includes redundancy in the underlying representation of the nasal segment in as far as it specifies the nasal for the redundant feature [voiced] at that stage. We regard the feature [voiced] redundant for nasals because, as it was pointed out above, nasal consonants are usually voiced (voiceless nasal consonants are rare) which means that the feature is non-contrastive hence predictable.

The implication which the theory of redundancy has for the single-node spreading constraint proposed by Clements is now obvious. By regarding the features [voiced] and (continuant) as redundant for nasals in Chiyao we no longer

need to specify them in a spreading (assimilation) rule like (16). By definition, redundant features are supplied later on in a derivation by appropriate redundancy rules. This then means that these features cannot be represented at the underlying stage where they can spread from two different nodes in violation of the single-node spreading hypothesis. Thus the theory of under-specification of features which allows for redundancy-free underlying representations interestingly confirms Clements' constraint on feature spreading.

The data from Chiyao also supports Clements' claim that the intersection between phonological redundancy and assimilation on the one hand and feature representation on the other provides one of the most reliable clues in explaining cases where, contrary to the single-node spreading hypothesis, spreading appears to affect two different autosegmental nodes. A thorough investigation of the phonology of the language(s) concerned may very likely show one or more of the features involved to be redundant and thus not available for spreading at a time when one of the features assimilates.

Conclusion

This paper has argued that the notion of phonological redundancy provides considerable insight into problems related to feature spreading in assimilation. It has been shown that when thoroughly investigated, feature spreading which appears to contradict Clements' single-node spreading hypothesis could be easily explained in terms of one or more of the features being redundant and thus not being available in tree structure at the time when assimilation occurs.

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35. The voicing quality of the obstruent is irrelevant to the formulation of the rule since there is no evidence that the obstruent must be initially voiceless. The symbol [.] here and in subsequent discussion represents features which need not be specified.

36. Mtenje, **Op.cit.**

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38. There is a general rule in Chiyao (and in Bantu in general) of nasal assimilation which assimilates nasals to their following consonants in place of articulation.

39. This rule is general and is not restricted to any particular tense.

40. There is an independent rule which changes stops into fricatives in the context (+nasal) - (i) in the perfective tense. This rule is responsible for the change of /g/to /s/ in this form.

41. Mtenje, **Loc. cit.**

42. **Ibid.**