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One of the most productive developments in phonology of the last decade has been the emergence of autosegmental phonology. The major insight lying at the base of autosegmental phonology is that the phonological representation is composed not of a single sequence of entities roughly resembling a line of type, but rather that the phonological representation is made up of several parallel sequences of entities, resembling thus more a score for a musical ensemble than a single line of type. This type of representation was, of course, not invented during the last decade. Multi-line phonological represesentations have standardly been used in notating the tonal characteristics of utterances, and in such representations the tones of an utterance have frequently been written on a separate line above the speech sounds that compose the utterance. However, it has usually been thought that much like the neumes used in the notation of the Gregorian chant or of the Massoretic text of the Hebrew bible the tones are diacritic features of the syllables or vowels. What has been novel in autosegmental phonology is that the tones of an utterance are not viewed as diacritics of vowels or syllables; rather the tones are viewed as constituting an autonomous sequence of entities, separate from and equal to the sequence of consonants and vowels that make up what we shall call here the phonemic core of the utterance.

Once the phonological representation is viewed as consisting of several independent sequences (or tiers) of entities -- one sequence composed of tones, another of phonemes -- there immediately arises the question as to how the entities on different tiers are synchronized since ultimately the various tiers are actualized in a single acoustic signal emanating from the speaker's vocal tract. The precise statement of how entities on one tier are linked to those on another tier has, therefore, been an important topic in autosegmental phonology, and the fact of having focused attention on this issue is perhaps one of the most significant contributions to be credited to autosegmental phonology, for it is only when tones and phonemes are viewed as

constituting autonomous sequences that the question of their synchronization can arise.

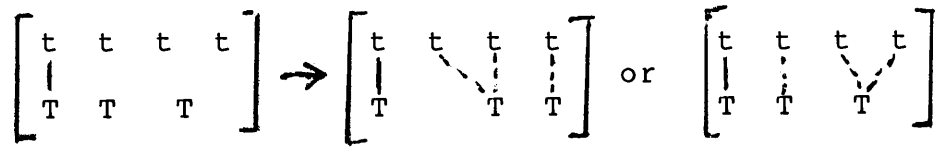
As one examines the different autosegmental studies that have appeared during the last decade there appear two rather different conceptions as to how autosegments on different tiers are to be linked. For reasons that are not altogether clear to us these quite fundamental differences have not previously been brought out in the open and debated, and we believe that this has affected negatively the progress that has been made in this area. We shall, therefore, state what we perceive to be the salient differences between the two approaches and then contrast the two approaches in order to bring out some of their respective advantages and drawbacks.

The most important difference between the two approaches concerns we believe the way in which the links between entities on different tiers are established. In one of the two approaches a critical role in establishing the links is played by the so-called Well Formedness Condition. As is well known, the Well Formedness Condition has been central in the studies of John Goldsmith. We have reproduced in (1) the Well Formedness Condition in the form it is given in Goldsmith's recent paper (February 1981) on Tonga:

1) i. All tones must be associated with (at least) one syllabic element.
ii. All syllabic elements must be associated with (at least) on tone.
iii. Association lines do not cross.

Goldsmith explains that "the Well Formedness Condition functions not to rule out, or eliminate derivations which violate any of its conditions, but rather to add or delete association lines in order to maximally meet its specifications." In addition Goldsmith postulates the existence of a diacritic mark -- the accent -- which serves to synchronize the different autosegmental tiers. Specifically, in their lexical representations morphemes may have any number -- including zero -- of accented tone bearing phonemes (which, unless noted otherwise, will be taken to be vowels). Accented vowels are linked to specific (accented) tones on the tonal tier. Once the accented autosegments are linked, the Well Formedness Condition comes into play adding "association lines in order to maximally meet its specification."

It was pointed out by Clements and Ford (1979) that in certain cases the Well Formedness Condition can be satisfied in several ways as shown in (2)

2) 

Not all of these alternatives are made equal use of in the languages of the world. As remarked by Clements and Ford, it appears rather that in the languages that have been studied to this point the second alternative given in (2) is preferred. To deal with this fact Goldsmith supplements the Well Formedness Condition with a special tone linking rule that has the effect of associating tones and vowels one to one and from left to right.

In the approach that we want to contrast with that of Goldsmith, tone linking is accomplished by a similar left-to-right rule. But here the left to right rule produces the correct output without requiring recourse to the Well Formedness Condition or its equivalent. We find this approach in Williams' (1971) paper, in Haraguchi's (1977) book on Japanese, and in a number of other studies. Williams describes his Tone Mapping Rule, as follows (p. 469):

3) i. It maps from left to right a sequence of tones onto a sequence of syllables.

ii. It assigns one tone per syllable, until it runs out of tones,

iii. then, it assigns the last tone that was specified to the remaining untoned syllables on the right,...

iv. until it encounters the next syllable to the right belonging to a morpheme with specified tone.

It is obvious that the type of linkings established by this rule are rather different from those envisaged by the Well Formedness Condition. In particular, there is no requirement that each tone be linked to at least one vowel. While the last tone is normally linked to several vowels when the number of vowels exceeds the number of tones, the converse is not normally the case when the number of tones exceeds the number of vowels. Williams is quite specific on the fact that the linking of more than one tone to a given syllable is a marked phenomenon for which special provision must be made in the grammar of the language. He writes: "An idiosyncratic fact about the rule in Margi is that if there are two tones and only one syllable then both tones may be assigned to that syllable." To make this explicit we add to the Mapping Rule (3), the provision (3v)

3) v. If the procedure above runs out of vowels (syllabic elements or syllables), more than one tone may be assigned to the last vowel only if the grammar of the language includes a stipulation to that effect.

Having established some differences between the two approaches we now attempt to find evidence which might decide between the two approaches. Consider first the facts in Etung in (4a), which are taken from Goldsmith's dissertation (1976; we reproduce here the 1979 version published by Garland Publishing, Inc.).

4a)

kpá	'first'	kpè	'even'	nâ	'it is'	nǒ	'how
nsé	'father'	ègù	'evening'	óda	'platform'	èkat	'leg'
ékúé	'forest'	èyùrì	'dress'	ákpùgà	'money'	bìsóné	'spoon'

As shown by the monosyllabic words in the first row, Etung is one of those languages which, like Margi, are subject to the special stipulation allowing two tones to be linked to a single vowel. The absence of contour tones in polysyllabic words is then accounted for by the fact that we are running out of vowels only in the case of monosyllabic words. Thus, it would seem that Etung has melodies consisting of at most two tones; consequently, we run out of vowels to assign tones to only in monosyllables. This, however, cannot be the entire story, as shown by the examples in (4b)

4b)

érôp	'spear'	èbǐn	'farm'	ábǒ	'they'	ǹbô	'arm'
ésébè	'sand'	òròbé	'beam'	édìmbá	'pot'	mbùtà	'rain'

The trisyllabic forms in (4b) show that there are three-tone melodies in Etung; specifically HHL, LLH, HLH and LHL and since with such melodies we run out of vowels in the case of bisyllabic words, we find -- as predicted by (3iv) -- contour tones on the second syllable, and we do not find the tone contours in (4c).

4c) âbó ǒbó

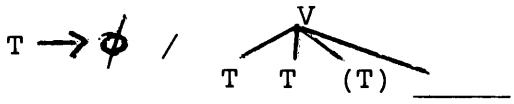
There is still more to this story. We recall that unlike the Well Formedness Condition the Mapping Rule (3) does not require that each tone be linked to a vowel. The question may then be asked what happens to such tones that remain unlinked at the end of the

derivation. The simplest assumption is that in (5).

(5) Only tones linked to segments in the phonemic core are phonetically actualized.

Hence tones remaining unlinked cannot surface and forever remain in a phonetic limbo condemned never to see the bright daylight of phonetic reality. Condition (5) allows us to propose a very simple analysis of the Etung facts presented above. Note that we have encountered eight tone patterns on polysyllabic words; i.e., 2 or precisely the number of all possible sequences of the two tones, High and Low, taken three at a time. Given the stipulation that Etung allows at most two tones to be linked to a single vowels the Mapping Rules (3) and Condition (5) directly account for the tonal contours of the monosyllabic words in (4a).

The situation is less straightforward if the Well Formedness Condition were to be applied here. In that case, the Well Formedness condition would have to be supplemented by a special rule deleting all but the two left most tones linked to a single vowel; i.e., a rule of the form (6)

6) 

Since rule (6) is far from intuitive a solution without such a rule is to be preferred over one requiring this rule. Thus, the facts of Etung provide some evidence favoring the Mapping Rule over the Well Formedness Condition.

The intricate tonology of Tonga, a Bantu language spoken in Zambia has long attracted the attention of scholars, and much fascinating data on Tonga has been published by H. Carter (1962) 1971) (1972), Meeussen (1963) McCawley (1973), and M. Cohen (1974). Goldsmith early recognized the importance of the Tonga facts. He discussed some of them in his dissertation and has recently devoted to them two articles, of which the second, published by the Indiana University Linguistics Club, is to be recommended especially because of the large body of data covered and the clarity of its exposition. Our remarks below are heavily influenced by Goldsmith's study.

Tonga has both accented and unaccented morphemes. There are several kinds of accented morphemes in the language. The simplest kind of accented morpheme illustrated in (6a) has a single accented vowel. The accented vowel always has a Low tone and all preceding

vowels have High tones. We follow Goldsmith in postulating that each accented vowel is supplied with the melody High-Low of which the Low tone is linked to the accented vowel whereas the High tone is unassociated as shown in (7a)

7a) i - bu - si "smoke" i - mu - sune "ox"

H L H L

As illustrated in (7a) unaccented morphemes -- as expected -- have no inherent tone. As a result the H tone of the accented morpheme spreads on to these morphemes.

Tonga also has morphemes with several accented syllables. As illustrated in (7b) these are readily dealt with in the same way as morphemes with a single accented vowel.

7b) tombela "lizard" sikube "vulture" acisya "uncle"

H L H L H L H L H L H L

If we adopt the Mapping Rule (3) nothing further needs to be said since Tonga is one of the many tone languages that does not admit contour tones. Formally this means that in the grammar of Tonga there is no special stipulation allowing us to link more than one tone to a given vowel. In view of this the word initial H tone in (7b) cannot be linked to any vowel and, pursuant to (5) above, does not surface. The solution is not quite as simple if the Well Formedness Condition is employed. We have reproduced in (7c) the passage from Goldsmith's paper (1981, p.7) dealing with the multiple accent words above.

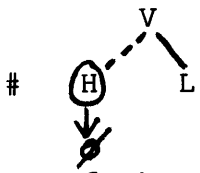
7c)

(15) a ci sya

H L H L

By the Well-Formedness Condition (2), the initial H will be associated with the first vowel of the word, even in a case like (15), thus producing in effect a rising tone. The surface L tone is the effect of the tone-simplification rule (16), which simplifies HL to L (compare with (11b)).

(16)



We note that because of the way the Well Formedness Condition operates, a special tone-simplification rule (rule (16) in the passage quoted in (7c)) is required. No such rule is required if the Tone Mapping Rule (3) is employed.

This brings us to words consisting exclusively of unaccented morphemes which are illustrated in (7d)

7d) i - bu - su 'flour' i - mu - ntu 'person' i - ba - sankwa 'me

The obvious way to deal with such words is to assign to them no tone whatever -- for as we have already seen in (7a), this gives the correct results in the case of unaccented prefixes. The problem with this solution is that we would then have no way of accounting for the fact that accentless words are composed exclusively of Low tones. Since no tones are linked to the vowels in these words it would seem that our theory predicts that such words should be toneless.

Faced with this dilemma we have two options. Our first option is to add some rules to the description of Tonga so as to insure that a Low tone will be linked to all vowels in unaccented words. This is the procedure followed by Goldsmith in the passage reproduced in (7e) which directly follows the material quoted in (7c):

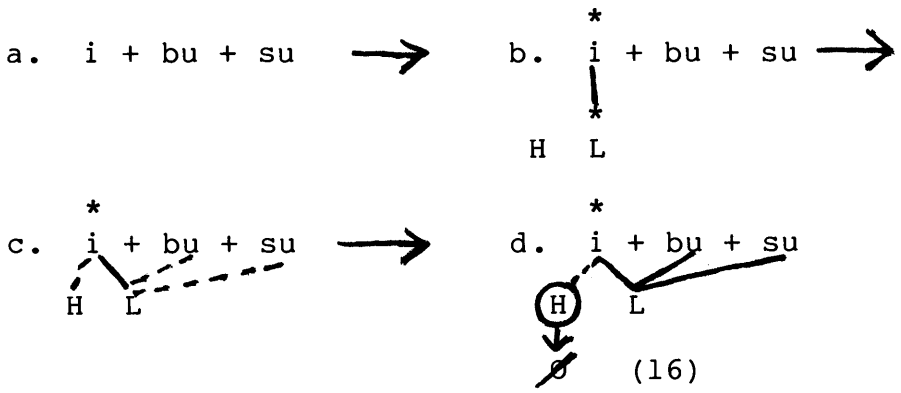
7e)

Rule (16), independently needed, suggests an analysis for Class C, the unaccented class of stems, as Bill Poser has pointed out to me. As has been noted both in Slavic and Japanese accentual systems, a rule of recessive accent placement may place an accent on the initial vowel of an otherwise unaccented words, as in (17).

(17) $V \rightarrow \overset{*}{V}$ / ## C _____ X ## Cond: X $\neq \overset{*}{V}$

This rule will apply to (Class C) unaccented forms, then, as in (18).

(18)



We conclude this survey of the basic nominal types by noting that the basic tone melody is HL; but that all words are accented, either by the accent or accents contributed by their component morphemes (stems, in the cases considered so far), or by the recessive accent rule (17).

While this solution produces the correct output, it is not altogether unproblematic, for it leads to the rather strange conclusion that "all words are accented", even though we know that some words are not accented. There is thus reason to explore another alternative.

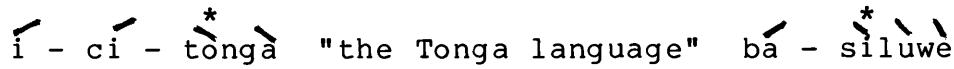
The alternative solution starts out by questioning the implication of the theory as developed to this point that vowels -- or tone bearing phonemes -- which are not linked to an autosegmental tone should surface as toneless. This implication presupposes that if a feature is specified on an autosegmental tier, it may not also be specified in the phonemic core. This proposition is surely the one to be adopted in view of Occam's razor, which enjoins us not to multiply entities without necessity. We note, however, that Occam's razor does not prevent us from multiplying entities when this is made necessary by the facts. In the present instance we believe that we can indeed justify

such a multiplication of entities. We, therefore, postulate condition (8)

8) The fact that a feature is specified on a separate autosegmental tier does not preclude it from also being specified in the phonemic core. Whenever a given phoneme is linked to an autosegment, the autosegmental feature specification supersedes the specification in the core.

We shall assume that in Tonga all vowels are redundantly specified in the phonemic core as being [+Low tone]. At the present time we do not know whether this can be made a universal principle; i.e., whether all vowels in all languages must be redundantly specified as [+Low tone]. If so, then nothing further needs to be said about accentless words in Tonga. If the redundant assignment of Low tone to vowels is not universal, a redundancy rule to this effect will have to be added to the grammar of Tonga.

The preceding has an interesting consequence for the treatment of Tonga words with nonfinal accents. As shown in (9a) in such words the vowels following the last accented vowel have Low tone.

9a) 

We now have two ways of achieving this result. We can either allow the linked Low tone to spread to the right. Alternatively, we can assume that the Low tone on postaccentual vowels is the redundantly specified tone that was discussed above.

We would like to propose that the latter rather than the former is the correct solution, and to implement this proposal formally we suggest that the Tone Mapping Rules (3) are subject to the restriction:

9b) The Tone Mapping Rules (3) apply only to floating (=unlinked) tones.

Given condition (9b) the Low tones on the postaccentual vowels in (9a) can only be redundantly specified since the linked Low tone cannot spread to these vowels.

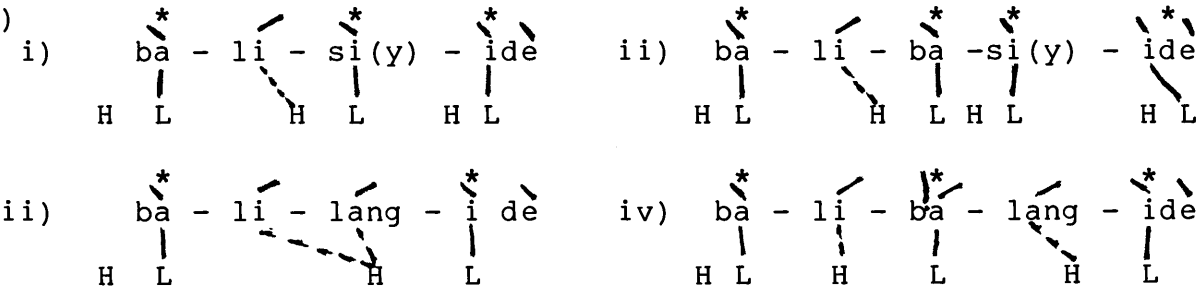
We must now justify this restriction, and Tonga provides crucial evidence. It was observed by Meeussen that all morphemes of the language can be divided into two classes "according to whether ... they are constantly low (or lowered high [i.e. downstepped H]) or

not." He next proposes to mark the former class of elements and leave the latter class unmarked. He then states the rule (9c):

9c) "unmarked" elements are high between "marked" elements (Meeussen (1963), p. 73)

It is important to observe that (9c) is not a rule in our sense; it is rather an observationally correct statement about tonal contours of Tonga words, which falls out as a consequence of the rules and principles that we have developed to this point. To see this consider the forms illustrated in (9d)

9d)



(from Meeussen p. 73).

These forms consist of the verbal stems /siy/ "leave" and /lang/ "look for", the word initial prefix /ba/ "they" the word medial prefixes /ba/ "them" and /li/, which has affirmative meaning, and the suffix /ide/ which signals the perfective aspect. We observe that (with the exception of the last form) once the melodies are assigned to the accented morphemes the tonal contours of the words are derived by the Tone Mapping Rule (3).

Given the rules developed to this point the last form in (9d) should surface with the tone contour LHLHL, whereas its actual contour is LH!HHL. It has been observed by Goldsmith (p. 5) that when a prefix is attached to the stems in (7b) their tone contours are modified as shown in (9e)

9e)

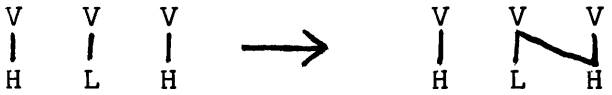
As Goldsmith notes in Tonga, as in many other tone languages, the downstepped High tone is the standard implementation of a High tone immediately preceded by a floating Low tone. There is no difficulty in the present instance to account for the presence of a Low tone in the required position, for the underlying

representations of the forms in (9e) are

9f)

All that we need, as Goldsmith has already shown, is a rule that links the High tone to the left vowel if preceded by two vowels, linked respectively to a High and Low tone as given in (9g)

9g)



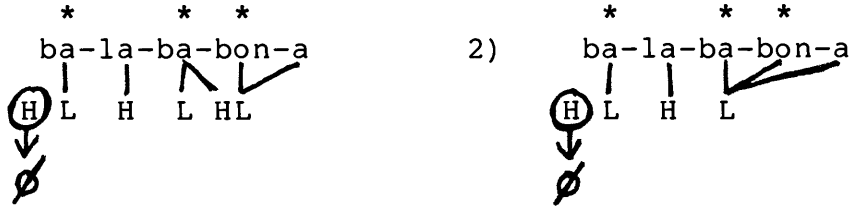
In view of the fact that in Tonga multiple associations of tones with a single vowel are not admitted, we shall assume that an automatic side effect of the rule is to float the Low tone, thereby triggering downstep in the High tone on the right. (We provide further justification for this assumption in the discussion of condition (12d) below.) It is obvious that the Downstep Rule (9g) accounts for the deviant tone contour of the last example in (9d). As noted above, all other facts in (9d) directly follow from the underlying representation, the Mapping Rule (3) and other conventions developed here.

This straightforward and therefore desirable result cannot be obtained by the Well Formedness Condition as simply. To produce it the Condition must be supplemented by additional rules. In discussing forms with consecutive accented morphemes such as the present indicative

9h) ba - la - ba - bon - a "they see them"

which correspond tonally to the example (9d-ii) Goldsmith remarks (p.14) that the string in (9h) would produce the tone contour in (9i-1) with a rising tone on the second /ba/ and that the correct tone contour with Low tone on the /ba/ would require the string in (9i-2):

9i)



In order to obtain the required string Goldsmith postulates that a special rule applies which deletes all but

the first of several accents appearing on consecutive vowels. This rule, which is referred to as Meeussen's rule, is reproduced in 9j)

9j) $\overset{*}{V} \rightarrow \overset{o}{V} \; / \; \overset{*}{VC}\_\_\_\_\_$

Since Meeusen's Rule "must apply before the insertion of the basic tone melodies," the required string (9i-2) is derived from (9h). [It will have been observed that in (9i) the word initial H-tone is deleted. We discuss this deletion directly below, see rule (11c).]

We note that if instead of the Well Formedness Condition the Tone Mapping Rule (3) is applied to the underlying string (9h) the correct tone contour is produced without recourse to any additional rules or principles. We show this in (9k).

9k)
```
      *       *   *
ba - la - ba - bon -a
|    ¦    |    |
H L  H    L  H L
```

We conclude, therefore, that the application of Meeusen's Rule in the derivation of this form is yet another example where the well Formedness Condition generates incorrect outputs which must be fixed up by other rules.

The present instance, however, differs somewhat from the examples of misgeneration discussed above. Whereas in the above example the grammar had to be complicated by the addition of an otherwise unnecessary rule (cf. (6) (7c) and (7e)), Meeusen's Rule (9j) is a fully motivated rule of Tonga phonology. It functions, however, not in all words but only in weak forms of the verb about which a few words need to be said here. Each Tonga verb can appear either in a "strong" form or in a "weak" form. The weak form induces an accent on the first (or only) syllable of an immediately following nominal or particle, with which it stands in a close syntactic relation. Thus, a verb like <u>tola</u> "take" can appear in either of the two forms (10a):

(10a) i) ndà-ká-tóla nyámà "I TOOK meat" (strong)

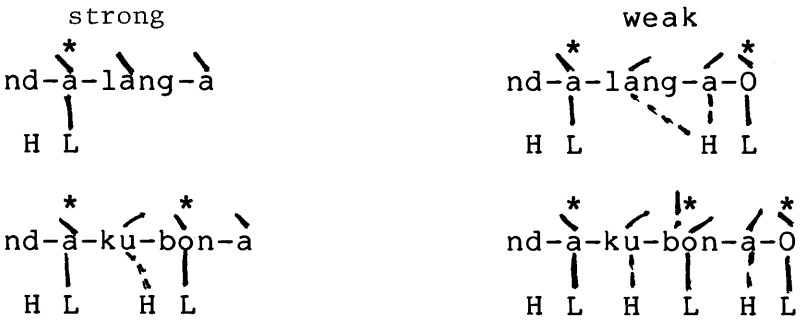
ii) ndà-ká-tóla nyámà "I took MEAT" (weak)

As the translations indicate, the two forms have different interpretations. In (10ai), the focus is on the verb, whereas in (10aii) the focus is on the complement of the verb. Carter notes that "the strong series

require no support and may stand at the end of an utterance; the weak series require the support of a following item, usually nominal or particle." The fact that the weak form cannot be final is implicit in the phonological characterization given above, which places an accent on the following syllable. The formation of a weak form might be viewed as a sort of cliticization.

As shown in (10b) the effect of this process is as predicted by the rules developed to this point. Since each accented vowel is linked to the melody High-Low the High tone, which is floating, is spread to the unlinked vowels at the end of the verbal form which in the strong forms surface with Low tone. We illustrate this in (10b) where the letter O represents the accented syllable of the following word; the word initial prefix represents the 1.sg.subject "I". [The prefix which has the underlying form /ndi/ loses its vowels if followed by a vowel; see (12a) below.]

10b)



(Examples from Meeusen p. 82, 83 - Tenses 15, 16)

It will be noted that in the last form of (10b) a downstepped H tone appears on the stem vowel bon in place of the L tone which is linked to it by the Mapping Rule. This is, of course, to be expected since the string produced by the Tone Mapping Rule undergoes the Downstep Rule (9g). Not all weak forms of the Tonga verb are derived as straight-forwardly. We illustrate some problematical forms in (10c)

10c) i) nd-á-bón-á-O (Tense 16 - Meeusen p. 83)

H L HL HL

ii) nd-á-bá-bón-á-O (Tense 16 - Meeusen p. 83)

H L HL HL H L

iii) nd-á-ká-bá-bón-á-O (Tense 19 - Meeusen p. 83)

H L HL HL H L

As shown above, the Mapping Rule produces incorrect outputs in all these examples. In particular it assigns a Low tone to the stem bon in (10c-i) instead of the attested High tone; and in (10c-ii,iii) it makes incorrect tone assignments both to the stem bon and to the object prefix ba. These incorrect tone assignments will not arise if Meeusen's Rule (9j) is applied to these forms, for then the stem bon will lose its accent in all forms, as will the object prefix ba in (10cii) yielding the representations in (10d)

10d) nd-a-bón-a-O nd-a-ba-bón-a-O nd-a-ka-ba-bón-a-O

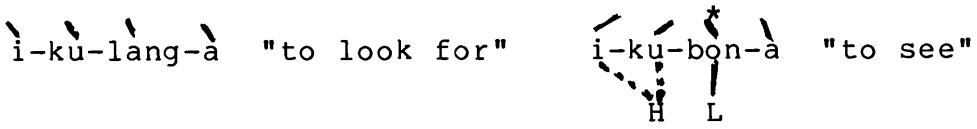
H L H L H L H L H L H H L H L

In the first two examples nothing further needs to be said; in the third example the Downstep rule (9g) will apply yielding the tone contour shown in (10c-iii).

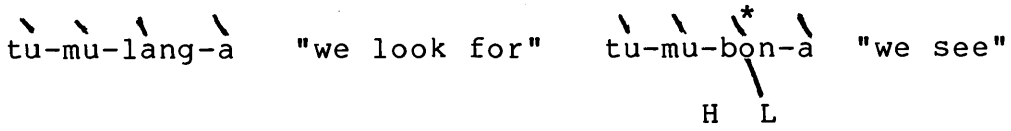
The application of Meeusen's Rule in the weak forms is natural, since accent loss commonly accompanies cliticization of one form onto another. Accordingly, it is to be expected that Meeusen's Rule would not apply to the strong forms. And indeed, as we have seen above, Meeusen's Rule was not needed in the generation of the correct contour of any strong form of the verb.

We now shall attempt to show that when applied to strong forms in the way in which phonological rules are normally applied, Meeusen's Rule produces incorrect results whenever there are more than two consecutive accented vowels. Examples of this kind have led Goldsmith to propose conditions on rule application of a very unorthodox kind. As the facts involved are of some complexity, they require a brief digression into certain other aspects of Tonga tonology.

As we have seen above in (9d), like nominal stems, verbal stems may be accented or unaccented, and this leads to surface contrasts such as those in the infinitive forms in (11a)

11a) 

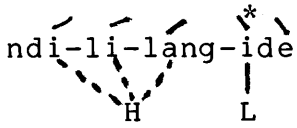
In finite forms of the verb, however, the tonal contrast is neutralized as shown in (11b)

11b) 

To obtain the correct output in such cases we follow Goldsmith in postulating a rule which deletes the first H tonal autosegment in finite verbal forms

11c) $H \rightarrow \emptyset \; / \; [\underset{Vb}{\_\_\_\_\_}$

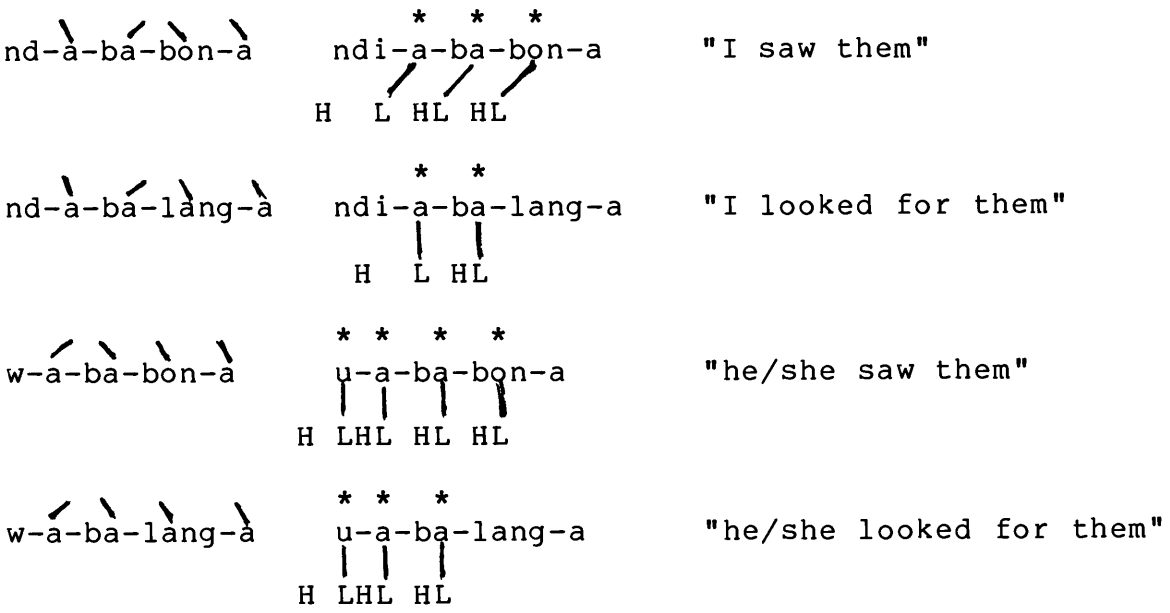
It might be noted here parenthetically that H-Tone Deletion (11c) applies also in the derivations of the forms in (9d), but this has no effect on the output. Moreover, in finite verbal forms with accented suffix, rule (11c) does not apply; e.g., it fails to apply in the 1.sg. pres. perf. ind. aff. forms



which otherwise would have surfaced with a uniformly Low tone contour. Neither of these facts, however, affects anything that is at issue here.

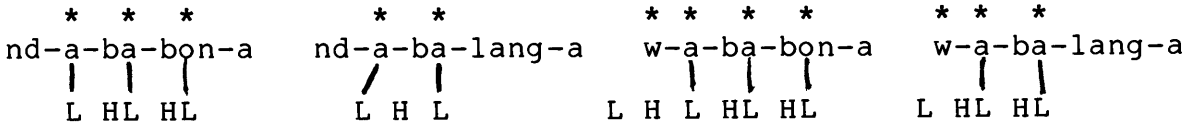
Consider now the strong forms of the recent past of which a few are given in (12a) with the surface representation on the left and the underlying representation on the right.

12a)



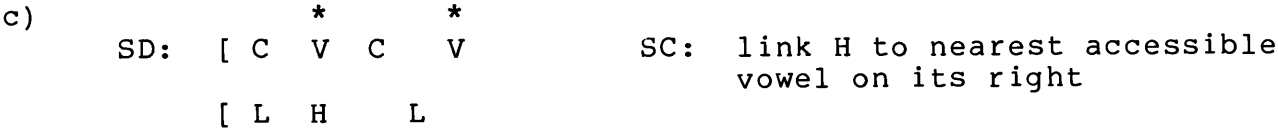
It is immediately obvious that the subject prefixes /ndi/ "I" and /u/ "he/she" undergo phonetic changes in position before the vowel: /ndi/ loses its vowel and /u/ becomes a glide prevocalically. We shall assume that this is the result of two separate rules: Vowel Deletion and Glide Formation. If we now make the plausible assumption that these two rules and H-Tone Deletion (11c) apply to the forms in (11a) we get the representations in (12b)

12b)



It is not difficult to get the correct output from the forms in (12b). All that is required is a rule that links the first H of the melody to the nearest accessible vowel on its right. The rule which is required has the form (12c)

12c)

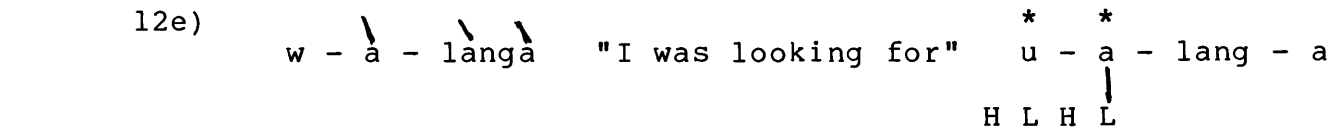


Although (12c) has the form of a transformational rule it can be narrowly constrained so as not to require any of the extra power of transformational rules. We suggest, moreover, that the application of rules is subject to the condition (12d)

12d) If the application of a rule results in a violation of the conditions -- either universal or language-specific -- which must be met by well-formed representations in the language in question, the violation is removed by deleting links between autosegments and core phonemes established by earlier rules or conventions.

Condition (12d) has the effect of deleting the link to the Low tone in vowels to which a High tone is linked by rule (12c). It must be noted that in its structural description rule (12c) requires two consecutive accented vowels. It is this requirements which will correctly prevent rule (12c) from applying to such forms as

12e)



provided, of course, that rule (12c) applies after Glide Formation as was proposed above.

Much more important for the topic under discussion than the preceding is the fact that the account that was just proposed grossly violates the requirement of the Well Formedness Condition that each tone be linked to at least one tone bearing segment. We are thus presented with very clear alternatives: the Well Formedness Condition and the proposed account cannot both be right -- one or the other must be wrong.

Some evidence has been given above which suggests that the Well Formedness Condition should be abandoned. To complete our case we shall examine the solution of the facts in (12a) that is given in Goldsmith's paper of which the Well-Formedness Condition is one of the cornerstones.

Recall that Meeussen's Rule, which must be allowed to apply in the strong forms if the account is to be based on the Well Formedness Condition, deletes all but the first of several accents appearing on consecutive vowels. If Meeussen's Rule were to apply to the forms in (12a) it would produce incorrect results in all cases since it would delete all but the first accent in all words. To handle these problems Goldsmith proposes the rule of Accent Shift given in (13a)

13a) a. $\overset{*}{-}\ a\ -\ \overset{*}{V}\ \overset{*}{V} \rightarrow a\ -\ \overset{*}{V}\ \overset{*}{V}$ or

b. $\overset{*}{a}\ -\ \overset{*}{V} \rightarrow \overset{*}{a}\ V$

This, however, does not resolve the difficulty completely, for in order to obtain the correct results it is necessary that the rule of Accent Shift interact with Meeussen's Rule in a fashion that is quite unprecedented in the literature. Specifically, it is necessary that the two rules apply disjunctively. However, the disjunctivity required is not the traditional one but rather "one according to which the more GENERAL rule can be precluded from applying not only by the ACTUAL application of the more specific rule, but [by] the PRESENCE of the more specific rule -- that is, by its potential application later in the derivation" (p. 24). These are far-reaching modifications in the algorithm for rule application and they are not to be welcomed since they render the rules extremely powerful, for now whether or not a given rule applies to a given string no longer depends purely on the form of the string, but may also depend on what other rules might apply to the input string.

This undesirable increase in the power of the rules is unnecessary in the alternative account, for as we have tried to show above the strong forms of the Tonga verb can be accounted for without recourse to either Meeussen's Rule or Accent Shift, and in that case, there is also no need for the significant increase in the power of the rules. This desirable result, however, can be achieved only if the Well Formedness Condition is replaced by the Tone Mapping Rules (3) and other conventions presented here.

NOTE: The preceding is the revised text of our presentation at the XII NELS Conference. It has been submitted for publication in H. van der Hulst and N. Smith, eds., The Structure of Phonological Representations, Foris Publications, Dordrecht, 1982. The material is to be included in a longer study Three Dimensional Phonology now in preparation. The authors are grateful to J. Goldsmith and P. Kiparsky for help and advice. This work was supported in part by the National Institute of Mental Health Grant #5 PO1 MH13990-15.

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