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Mous, M.P.G.M.

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Vowel Harmony in Tunen

Maarten Mous

Department of African Linguistics, University of Leiden

0. Introduction*

Tunen is spoken in Cameroon around Ndikinimeki (NE of Duala) by approximately 35,000 people. It is a Bantu language, A.44 in Guthrie's classification. Tunen has been claimed by Stewart and Van Leynseele (1979) to have, underlyingly at least, vowel harmony of the cross-height type characteristic of West Africa. There are very few Bantu languages of that type and there is no existing detailed study of the vowel harmony of any of them. My aim in this paper is to give a detailed description of vowel harmony in Tunen and discuss some theoretical problems that arise in describing it. The available data on Tunen are contained in a wordlist (DL) and a grammar by Dugast.

Tunen has eight vowels, /i, e, ɛ, a, ə, ɔ, o, u/, which are classifiable in terms of binary features as follows:

Table 1: Binary features and segment structure conditions for vowels

	i	e	ɛ	a	ə	ɔ	o	u	
high	+	-	-	-	-	-	-	+	NOT: [+high, -ATR] ¹
low	-	-	-	+	+	-	-	-	NOT: [+high, +low]
round	-	-	-	-	-	+	+	+	NOT: [+round, +low]
ATR	+	+	-	-	+	-	+	+	

1. Vowel harmony in roots

1.1. *Non-adjacent vowels in roots*

The data for vowel harmony within roots comprises the disyllabic noun roots in the wordlist. Verb roots are not suitable for this purpose, because they are mostly monosyllabic. With a few exceptions, polysyllabic verb stems include a derivational suffix. The number of disyllabic verb stems that are not derived is too small to permit conclusions on vowel cooccurrences. Nouns are written with their noun prefix in the word list, e.g. bòhota, pl. mà- 'hair' (DL:19).

The shape of the root is always clear (in this example -hòtà). I have disregarded noun stems which are disyllabic by virtue of reduplication. This procedure has resulted in a list of 484 disyllabic noun roots. Possible vowel cooccurrences for non-adjacent vowels have been checked and are presented in table 2.

Table 2: Non-adjacent vowel cooccurrences in disyllabic noun roots

	second v.	i	ɛ	ə	a	o	ɔ	u
first v:	i	x	-	x	-	-	-	-
	ɛ	-	x	-	x	-	-	-
	ə	x	-	x	-	-	-	x
	a	-	x	-	x	x	-	-
	o	x	-	-	x	x	-	-
	ɔ	-	x	-	-	-	x	-
	u	x	-	x	-	-	-	x

Where x means "does occur", and - means "does not occur".

The vowel *e* is rare in roots. My informant has *ɛ* where Dugast notes *e*, or, in some other roots *e* as an optional variant of *ə* which must be captured by a late phonological rule. The non-occurrence of *e* is captured by Well Formedness Condition 1.

WFC 1: NOT: $\begin{bmatrix} +\text{voc} \\ -\text{round} \\ -\text{low} \\ -\text{high} \\ +\text{ATR} \end{bmatrix}$

Apart from roots containing *o*, [+ATR] and [-ATR] vowels do not cooccur in one root. Thus, apart from *o*, non-adjacent vowels in roots agree in their ATR value. This is captured by Well Formedness Condition 2.

WFC 2: NOT: $\begin{matrix} V & C & V \\ \left\{ \begin{bmatrix} +\text{high} \\ +\text{low} \\ -\text{low} \\ -\text{ATR} \end{bmatrix} \right\} & & \left\{ \begin{bmatrix} +\text{high} \\ +\text{low} \\ -\text{low} \\ -\text{ATR} \end{bmatrix} \right\} \\ [\alpha\text{ATR}] & & [-\alpha\text{ATR}] \end{matrix}$

Well Formedness Condition 2 is not sufficient to account for all the vowel cooccurrences and non-cooccurrences in table 2. Other necessary well formedness conditions are:

WFC 3: NOT: $\begin{matrix} V \\ [-\text{round}] \\ [-\text{low}] \end{matrix}$ C $\begin{matrix} V \\ [+ \text{round}] \end{matrix}$

WFC 4: NOT $\begin{matrix} V \\ [+ \text{round}] \\ \alpha \text{high} \\ \beta \text{ATR} \end{matrix}$ C $\begin{matrix} V \\ [+ \text{round}] \\ -\alpha \text{high} \\ -\beta \text{ATR} \end{matrix}$

WFC 5: NOT: $\begin{matrix} V \\ [+ \text{round}] \\ -\text{high} \end{matrix}$ C $\begin{matrix} V \\ [-\text{round}] \\ +\text{ATR} \end{matrix}$

WFC 6: NOT: $\begin{matrix} V \\ [-\text{round}] \\ +\text{ATR} \end{matrix}$ C $\begin{matrix} V \\ [+ \text{round}] \\ -\text{high} \end{matrix}$

Note that the feature [round] is present in all these four conditions and that WFC 6 is exactly the mirror-image of WFC 5. These sequence structure conditions are also valid for noun roots with more than two syllables, for noun roots with a final vowel that is voiceless or deleted in citation form, and for verb roots. The restrictions of well formedness conditions 3, 4, 5, and 6 do not operate across morpheme boundaries.

1.2. *Adjacent vowels in roots*

The vowel cooccurrences for *adjacent* vowels within roots are presented in table 3.

Table 3. Adjacent vowel cooccurrences in roots

	second v:	í	ɛ	ə	a	o	ɔ	u
first v:	í	-	-	x	x	x	x	-
	ɛ	-	-	-	-	-	-	-
	ə	-	-	-	-	-	-	-
	a	-	-	-	-	-	-	-
	o	-	-	-	(x)	-	-	-
	ɔ	(x)	(x)	-	(x)	-	-	-
	u	x	x	x	x	-	-	-

Where (x) means "occurs only in a few cases", which are treated as exceptions. These exceptions are:

- (1)
- | | |
|---------|---------------------------------|
| è òàk | 'germ' |
| è óá yé | 'to, for (prep.)' |
| hòàt | 'to take a propitious position' |
| hòàlèn | 'to stand up' |
| hòanɲ | 'to scratch' |
| hòèl | 'god' |
| hètò ɲ | 'trial by ordeal' |

Instead of hòèl my informant had hwèl, and instead of èlɔ́á yé, èlwá yé. The other words were not familiar to him. Apart from those exceptions one can make the generalization that the first of two adjacent vowels must be high.

Whereas Dugast transcribes the first segment of these VV sequences as a (high) *vowel*, I heard a *glide* generally. Dugast herself writes a glide in a number of cases (e.g. bwà = /bò+à/ 'year, class 14', DL:29). I would therefore prefer to analyse the first of two adjacent vocoid segments as a glide. This has some other advantages. It makes the possible syllable structures simpler, i.e. V, CV, GV, or CGV. And it does away with disharmonic VV sequences. Instrumental phonetic measurements are needed to answer the question whether there is an opposition vowel versus glide in the context C__V. For the moment I shall assume that there is no such opposition and analyse these segments as glides. This means that there are no VV sequences, as is stated in Well Formedness Condition 7.

WFC 7: NOT: V V

Further restrictions are captured by Well Formedness Condition 8 which excludes /ii/ and /iɛ/, and Well Formedness Condition 9 which excludes /uɔ/, /uo/, and /ɔu/.

WFC 8: NOT: $\begin{bmatrix} \text{-cons} \\ \text{-round} \end{bmatrix} \begin{bmatrix} \text{-cons} \\ \text{-round} \\ \text{-low} \end{bmatrix}$

WFC 9: NOT: $\begin{bmatrix} \text{-cons} \\ \text{+round} \end{bmatrix} \begin{bmatrix} \text{-cons} \\ \text{+round} \end{bmatrix}$

2. Vowel harmony in affixes

2.1. Recessive suffixes and the word structure condition

Verbs can have derivational suffixes that are attached to the verb stem. One of those is the applicative suffix /-ɛn/ 'to do for someone'. It has the form after [-ATR] verb roots and ɪn after [+ATR] verb roots. For example:

- | | | | | |
|-----|-------|---------------|---------|----------------------------|
| (2) | fàlàb | 'to build' | fàlàbɛn | 'to build for somebody' |
| | fàɲ | 'to exchange' | fàɲɪn | 'to exchange for somebody' |
| | fòl | 'to borrow' | fòlɛn | 'to borrow for somebody' |
| | húk | 'to blow' | húkɪn | 'to blow for somebody' |

The alternation [ɛ] with [ɪ] in the applicative suffix is straightforward. The underlying form is /ɛn/ which becomes [+ATR] after [+ATR] roots. As a consequence of WFC 1, a [-low, +ATR] vowel must be [+high], the [+ATR] variant of ɛ is ɪ.

This could be handled by a phonological rule along the lines proposed by Anderson (1980).

$$[-ATR] \rightarrow [+ATR] / [+ATR] C \underline{\quad}$$

However, we would have two independent statements for the vowel harmony, a well formedness condition (WFC 2) and a P-rule. Clements objects to this (Clements 1981:125-26). "Within Schachter and Fromkin's framework, it is entirely accidental that the same set of restrictions on vowel cooccurrence should apply internally in roots and externally across morpheme boundaries". This, among other reasons, leads Clements to a non-linear treatment of vowel harmony in Akan, with ATR autosegments on a separate autosegmental tier. Clements' objection can be met without rejecting the linear framework, as Stewart (1983) shows for Akan. Stewart's proposal is to extend the scope of the structure condition from the morpheme to the word. To meet an obvious difficulty which this creates, he introduces automatic rules (A-rules) which state how the structure conditions are met when morphemes are combined to form a word. I will follow this line. Thus we will extend Well Formedness Condition 2 to the word: all vowels in the word, except ɔ, must agree in their value for ATR. However, we have to state explicitly how the well formedness condition is met. In the above examples, changing the root vowels to [-ATR] would be another theoretically possible way to meet the structure condition, and we have to make clear that that does not in fact happen. Therefore we have to add an A-rule to state that vowels become [+ATR] in order to meet the well formedness condition.

$$\begin{array}{lcl} \text{WFC 2: NOT.} & \begin{array}{c} V \\ \left\{ \begin{array}{l} [+high] \\ [+low] \\ [-low] \\ [-ATR] \end{array} \right\} \\ [+ATR] \end{array} & \begin{array}{c} C \\ \left\{ \begin{array}{l} [+high] \\ [+low] \\ [-low] \\ [-ATR] \end{array} \right\} \\ [-\alpha ATR] \end{array} & \text{A 2: } V \rightarrow [+ATR] \end{array}$$

In the same way Well Formedness Condition 1 needs an A-rule. It is theoretically possible to make a vowel round in order not to violate WFC 1, but this is not what happens. A vowel becomes high to meet WFC 1, as we have seen in the applica-

tive suffix.

WFC 1: NOT: V

$$\begin{bmatrix} \text{-round} \\ \text{-low} \\ \text{-high} \\ \text{+ATR} \end{bmatrix}$$

A 1. V → [+high]

The well formedness conditions are a set of unordered conditions that apply simultaneously at every stage in the derivation. They can be viewed as filters. As a consequence the automatic rules that go with them are also unordered. The well formedness conditions 1 and 2 now give the correct results for the examples of the applicative suffix above:

- (3) fàláb+èn WFC 1 and 2 are met: fàlábèn
 fèŋ+èn WFC 2 is not met, A2: fèŋèn, WFC 1 is not met, A1: fèŋìn
 fòl+èn WFC 1 and 2 are met: fòlèn
 húk+èn WFC 2 is not met, A2: húkèn, WFC 1 is not met, A1: húkín

For vowel final verb roots we can follow the same procedure and extend Well Formedness Conditions 7, 8, and 9 to the word with accompanying automatic rules:

A 7a: [+low] → ∅ / ___ V A 7b: [-low] → $\begin{bmatrix} \text{-voc} \\ \text{+high} \end{bmatrix}$ / ___ V
 A 8: [-round] → ∅ / ___ V
 A 9: [+round] → ∅ / ___ V

- (4) fà+èn WFC 7 is not met, A7a: fèn 'to fall'
 hó+èn WFC 7 is not met, A7b: hwèn 'to finish'
 bè+èn WFC 8 is not met, A8: bèn 'to pull down'

The vowel of the suffix has to harmonize. The harmony condition, WFC 2, as it is stated, only applies to non-adjacent vowels. The WFC 2 can easily be extended to adjacent vowels if we replace C by C₀ where C₀ can be series of consonants or the absence of consonants. Well Formedness Conditions 7, 8, and 9 apply simultaneously.

- (5) fìlì+èn WFC 2 is not met, A2: fìlìèn, WFC 1 is not met, A1: fìlìn,
 WFC 8 is not met, A8: fìlìn 'to win'
 bè+èn WFC 2 is not met, A2: bèèn, WFC 1 is not met, A1: bèìn,
 WFC 7 is not met, A7: bìn 'to reward'

2.2. Dominant suffixes and the double nature of o

Verbs like *kòl* 'to create' are marked [-P1], in order not to change to **kùl* with a causative suffix. Note that the applicative suffix *ɛɲ* changes to *ɪɲ* after the verb root *kòl* 'to create'. This instance of vowel harmony is not handled by WFC 2 since *o* is excluded from the harmony condition. We need a phonological rule that changes *ɛ* to *ɪ*. For this aim P1 can be extended.

Similar changes occur with noun prefixes, as we shall see in 2.3, which can be handled with the same P1 because it is a mirror image rule.

$$P1: \left\{ \begin{array}{l} +voc \\ -high \\ \left(\begin{array}{l} [+round] \\ +ATR \end{array} \right) \\ \left(\begin{array}{l} [-round] \\ -low \end{array} \right) \end{array} \right\} \rightarrow [+high] \% _ C [+ATR]$$

Roots like *kòl* 'to create' do not *undergo* P1 (causative is *kòlì*) but can *condition* it (applicative is *kòlìn*). We have to make a distinction between rule undergoer and rule conditioner. Roots that contain a dominant o, like *kòl* 'to create' will be labeled [-P1 undergoer] and [+P1 conditioner]; roots that contain a recessive o, like *kòl* 'to go and buy protective medicine' will be labeled [+P1 undergoer] and [-P1 conditioner]. For example:

- (10) *kòndèn* [+P1 undergoer, -P1 conditioner] + ì → *kùndìn* 'arrive at the top'
bákón [+P1 undergoer, -P1 conditioner] + ì → *b'ákúnì* 'separate'

It seems to be possible to do with just one rule feature and a structure condition: [+P1 undergoer] [-P1 conditioner]. There is, however, some confusion in the language due to the different behaviour of morphemes containing o. Some verb stems containing o are irregular: they take *ɛn* for the applicative ([-P1 conditioner]), but do not change to *u* with a causative suffix ([-P1 undergoer]). See table 4.

Table 4: Irregular causatives after o

stem	meaning	applicative	causative 1	causative 2
<i>óbém</i>	to brood	<i>óbémèn</i>	<i>óbímìwóbémè</i>	
<i>fátón</i>	to open	<i>fátónèn</i>	<i>fátónì</i>	<i>fátónèsì</i>
<i>ónjwàn</i>	to blow	<i>ónjwànen</i>	<i>ónjwàni</i>	<i>ónjwànèsì</i>
<i>álóbòtòn</i>	to answer summons	<i>álóbòtònèn</i>	<i>álóbòtònì</i>	<i>álóbòtònèsì</i>
<i>bótán</i>	to multiply		<i>bóténì</i>	
<i>lòbòn</i>	to weed	<i>lòbònèn</i>	<i>lòbùnì</i>	<i>lòbùnèsì</i>
<i>nótén</i>	to compel	<i>nóténèn</i>	<i>nótínì</i>	
<i>sómbán</i>	to be equal	<i>sómbánèn</i>	<i>sómbw'énì</i>	
<i>yòbè</i>	to do it carelessly	<i>yòbèn</i>	<i>yòbì</i>	<i>yòbèsì</i>
<i>béìlóngóm</i>	to listen carefully	<i>béìlóngómèn</i>	<i>béìlóngómì</i>	
<i>sókóm</i>	to work in vain	<i>sókómìn</i>	<i>súkúmì</i>	<i>súkúmw'èsì</i>

Win Zonneveld has argued that this usage of rule environment features is illegitimate. The rule environment features are part of the *morpheme*, and, by convention, each segment in the morpheme has the feature specification for these rule environment features. In our example, kòndèn [-P1 conditioner, +P1 undergoer] the feature specification [-P1 conditioner] on the n in the stem will block P1 on the preceding o contrary to the feature specification [+P1 undergoer] of this o. Other arguments forwarded by Zonneveld against rule environment features are: The feature [-rule undergoer] will block a rule whether it is part of a lefthand environment or of a righthand environment; it makes no difference with respect to the *direction* of the blocking. Secondly, if an exceptional morpheme contains both the focus and the environment of the rule, it becomes arbitrary to mark it [-rule conditioner] or [-rule undergoer], e.g. a French word like *album*, where the vowel is unexpectedly not nasalized, might be labelled either [-nasalization undergoer] or [-nasalization conditioner]. Zonneveld's proposal is to handle these exceptions with alphabet features. A feature, say [+R], will be added to the lexical representations of certain morphemes, and segments in such a morpheme still undergo rules that have [+R] in their structural description. He further claims the following constraint on overapplication of alphabet features (One Feature Hypothesis). If alphabet features are braced into phonological rules, they may be collapsed with only one feature at a time. (Zonneveld 1978:181-233).

Let us apply this proposal to our analysis. Some cases of o change to u in a [+ATR] environment. These morphemes are marked [+R] (recessive) in the lexicon. And [+R] becomes part of the focus of P1:

$$P1: \begin{bmatrix} +voc \\ -high \\ -low \\ \{[-round] \\ [+R] \} \end{bmatrix} \rightarrow [+high] \% \text{ } C_0 \begin{bmatrix} -R \\ +ATR \end{bmatrix}$$

Prefixes containing e are labelled [+R] too (see 2.3). As a consequence all disharmonic vowels, instances of e and o in a [-ATR] environment, are marked [+R]. Thus WFC 2 can be restated:

$$WFC 2 \quad NOT. \quad \begin{bmatrix} V \\ -R \\ \alpha ATR \end{bmatrix} C_0 \begin{bmatrix} V \\ -R \\ -\alpha ATR \end{bmatrix} \quad A 2. \quad V \rightarrow [+ATR]$$

All morphemes that are not marked [+R] are marked [-R] by convention. Note that the change from *ɛ* to *ɪ* in the applicative suffix which was handled by the automatic rule of WFC 1, is now also covered by P1. We can therefore restrict WFC 1 to non-grammatical morphemes.

2.3. Vowel harmony in noun prefixes

Like all Bantu languages Tunen has a noun class system which assigns paired singular-plural prefixes to all nouns in the language. The noun class prefixes, with their standard Bantu numbers are presented in table 5.

Table 5. Noun class prefixes

singular class				plural class			
prefix before		prefix before		prefix before		prefix before	
-ATR	stem	+ATR	stem	-ATR	stem	+ATR	stem
1	mò	mù		2	bà	bwè	
3	mò	mù		4	mè	mì	
	ò	ù			è	ì	
5	nè	nì		6	mà	mʷè	
7	è	ì		8	bè	bì	
9	mè	mì		4			
	è	ì					
19	hè	hì		13	tò	tù	
14	bò	bù		6			

Note that labial consonants are rounded before *ə*.

The alternation *a* ~ *ə* in prefixes of classes 2 and 6 is straightforward and handled by WFC 2 and its A-rule. The same holds for the prefix of class 13, *hè* ~ *hì*, which is also regular (identical to the alternation in the applicative suffix). The alternation *o* ~ *u* in the prefixes of classes 1, 3, 13, and 14 is similar to the inersive suffix, see (8) above. So the change from *o* to *u* before [+ATR] stems in these prefixes is accounted for by P1; the prefixes are labelled [+R].

The remainder of the noun class prefixes, class 4, 5, 7, 8, and 9, have an *e* in their underlying form. This is not excluded by WFC 1, since we have now restricted WFC 1 to non-grammatical morphemes. The change from *e* to *ɪ* can be handled by P1 because the input of P1 includes *e*, [-round] and [-low]. These prefixes are labelled [+R]. Some sample derivations are:

- (11) mǎ+bàt All WFC's are met, P1 does not apply: mǎbàt 'clothes, cl.6'
 mǎ+kènù WFC 2 is not met, A2: mǎkènù → m^wǎkènù 'bellows, cl.6'
 hè+bòb All WFC's are met, P1 does not apply: hèbòb 'ring, cl.19'
 hè+bìl WFC 2 is not met, A2: hèbìl, P1 applies: hìbìl 'bracelet'
 mò[+R]+nìf WFC 1,2 do not apply. P1 does: mùnìf 'whirlpool, cl.3'
 mè[+R]+nìf WFC 1,2 do not apply. P1 does: mìnìf 'whirlpools, cl.4'
 bò[+R]+hèk WFC 1,2 do not apply, nor P1: bòhèk 'beauty, cl.14'
 è[+R]+bò WFC 1,2 do not apply. P1 does: ìbò 'nine, cl.7' P1 does not
 reapply on o because o is [+ATR, -R].
 e[+R]+bòk[+R] WFC 1,2 do not apply, nor P1 because o is [+R]: èbòk
 'mortar, cl.7'
 mò[+R]+éǎ WFC 1,2 do not apply, WFC 7 does, A7. m^wéǎ 'termite, cl.3'
 mè[+R]+éǎ WFC 1,2 do not apply, WFC 7,8 do, A8. mǎǎ 'termites, cl.4'

There is a tendency in the noun prefixes for e, [+R], to become ε before [-ATR] stems. This tendency is complete in the class 19 prefix hè. In other class prefixes this is an "incidental" assimilation. The assimilation is most frequent before stems with an ε as the first vowel, less frequent before stems which have an ɔ as the first vowel and rare with an a as first stem vowel. This assimilation is parallel to the assimilation of class 14 prefix bò- to bò- before certain stems with a mid [-ATR] vowel as first stem vowel. Similarly mǎ- becomes mò- before some stems in class 6 with ɔ as the first stem vowel and m^wǎ- varies with mò- before a few stems containing a dominant o ([-R]). There is a lot of variation in these assimilation processes and both forms, assimilated or not assimilated, are acceptable in the majority of cases.

2.4 Vowel harmony in pronominal prefixes

Apart from nouns a number of other words have class prefixes. They show agreement in noun class with the governing noun. Demonstratives, possessives, connectives, numerals, question words, and pronouns agree in class by their pronominal prefix with the noun to which they refer. Unlike other Bantu languages, Tunen has no verbal prefix that agrees with the subject. It has subject pronouns that agree in class with the (understood) subject but a noun object can intervene between these pronouns and the verb, so they are separated by a word boundary. There are three different sets of pronominal prefixes which I call type 1, type 2, and type 3. See table 6.

Type 1 is similar in form to the noun prefixes having an initial m in classes 1, 3, 4, and 9. Type 1 is used with emphatic demonstratives and complement pronouns. Prefixes of type 2 are very similar to the proto Bantu numeral prefixes (Meeussen 1967:96-98), and are used with the numerals 'one' ('some' in plural), 'two', and the question word 'how many?' (only in the plural). Prefix type 3 is

similar to the proto Bantu pronominal prefix (Meeussen 1967:96-98). It is used for possessives, non-emphatic demonstratives, connectives, subject pronouns, relative pronouns, and questionwords.

Table 6: Pronominal preixes

	class	type 1	type 2	type 3
1	mó	ó	wò	
2	bá	bá	bá	
3	mú	ó	wú	
4	mí	í	yí	
5	né	né	né	
6	má	má	má	
7	yé	é	yé	
8	bé	bé	bé	
9	mé	é	yé	
19	hí	hí	hí	
13	tú	tó	tú	
14	bó	bó	bó	

The striking point for these pronominals with all three types of prefixes, is the fact that the *prefix* can dominate the root of the pronominal in harmony. The prefixes of classes 3, 4, 19, and 13 are underlying [+ATR]², and all the vowels in the word have to become [+ATR]. This can most clearly be seen with underlying [-ATR] and consonant-initial roots like mòtɛ́ 'one, some', fàndɛ́ 'two', and `táná 'emphatic this'. See table 7.

Table 7: Surface forms of some pronominals

class	class	this	class	one,	two
	prefix		prefix	some	
1	mó	mó:táná	ò	òmòtɛ́	
2	bá	bá:táná	bá	bámòtɛ́	báfàndɛ́
3	mú	mú:ténɛ́	ó	ómòtɛ́	
4	mí	mí:táná	í	ímòtɛ́	ífàndì
5	né	né:táná	né	némòtɛ́	
6	má	má:táná	má	mámòtɛ́	máfàndɛ́
7	é	yé:táná ³	é	émòtɛ́	
8	bé	bé:táná	bé	bémòtɛ́	béfàndɛ́
9	mé	mé:táná	é	émòtɛ́	
19	hí	hí:táná	hí	hímòtɛ́	
13	tú	tú:ténɛ́	tó	tómòtɛ́	tófàndɛ́
14	bó	bó:táná	bó	bómòtɛ́	
underlying:		`táná		mòtɛ́	fàndɛ́

Some derivations:

- (12) bá+m̀t́é WFC 1,2 are met: bá+m̀t́é 'some, cl.2'
 í+m̀t́é WFC 2 is not met, A2: ím̀t́é, WFC 1 is not met, A1 (or P1):
 ím̀t́í 'some, cl.4'
 má+m̀t́é WFC 1,2 are met: má+m̀t́é 'some, cl.6'
 é[+R]+m̀t́é WFC 1,2 do not apply, nor P1: má+m̀t́é 'one, cl.9'
 ó[-R]+m̀t́é[-R] WFC 2 does apply: óm̀t́é, WFC 1 is not met, A1 (or P1):
 óm̀t́í 'one, cl.3'
 bó[+R]+`táná WFC 1,2 do not apply, nor P1: bó`táná 'this (emphatic) cl.14'

Most pronominal roots are vowel initial and all the pronominal prefixes are vowel final. The processes which apply to two abutting vowels are stated in WFC 7, 8 and 9 and are exemplified in (4) and (5) above. The different possible initial vowels for those roots are a e i. For each of those, one example is given in table 8, all with prefix type 3.

Table 8: Some pronominals with vowel initial stem

class	class prefix	1 sing. poss.	1 pl. poss.	that	that (far)
1	wò	wàmè	wəsú	wání	wéyé
2	bá	bámè	bʷəsú	bʷání	báyé
3	wú	wəm̀	wəsú	wəní	wíyí
4	ví	yəm̀	yəsú	vəní	yíyí
5	né	nyámè	nyəsú	níní	néyé
6	mé	mámè	mʷəsú	mʷání	máyé
7	yé	yámè	yəsú	víní	yéyé
8	bé	byámè	byəsú	bíní	béyé
9	vè	yámè	vəsú	víní	yéyé
19	hí	hyəm̀	hyəsú	híní	híyí
13	tú	twəm̀	twəsú	twíní	twíyí
14	bó	bwámè	bwəsú	bwíní	bwéyé
underlying:		ámè	ésú	íní	éyé[+R]

The demonstrative stems *ini* and *eye* behave exceptionally, in that the of the two adjacent vowels drops: A8a: V → ∅ / V __.

- (13) wò[+R]+ámè WFC 7 is not met, A7: wwàmè → wàmè 'my, cl.1'
 bá+ámè WFC 7 is not met, A7: bāmè 'my, cl.2'
 wú+ámè WFC 2 is not met, A2: wúámè, WFC 1 is not met, A1 (or P1):
 wúám̀, WFC 7 is not met, A7: wwəm̀ → wəm̀ 'my, cl.3'
 né+ámè WFC 1,2 are met, WFC 7 is not met, A7: nyámè 'my, cl.5'
 bó[+R]+əsú WFC 2 does not apply, P1 does: búəsú, WFC 7 is not met, A7:
 bwəsú 'our, cl.14'
 má+əsú WFC 2 is not met, A2: mʷəsú, WFC 7 is not met, A7: məsú →
 mʷəsú 'our, cl.6'

- (13) yè[+R]+íní P1. yííní, WFC 7,8 are not met, A8. yííní 'that, cl.9'
 yè[+R]+éyé[+R] P1 does not apply because the environment is not [+ATR, -R], WFC 7,8 are not met, A8. yéyé 'that (far), cl.9'
 tú+éyé[+R] P1. túívé, P1 túíví, WFC 7 is not met, A7 twíví
 'that (far) cl.13'

3. Conclusions

Tunen has the ATR-type of vowel harmony with dominant (+ATR) suffixes and prefixes. The vowel *o* in prefixes and the vowel *e* in a number of morphemes behave as if they are [-ATR, +high], *i* and *u*. They become [+high] in a [+ATR] environment. I have preferred not to analyse them as /i/ and /u/ underlyingly, because this would result in absolute neutralization of /u/ and /o/ in [o]. Kiparsky (1968) has convincingly argued against such abstractness in phonology. As a consequence I am obliged to use a diacritic feature, an alphabet feature, to capture the different behaviour of these *o*'s.

The objection against two different statements about vowel harmony - a condition for harmony within roots, and a rule for harmony in affixes - can be met within the segmental framework by Stewart's (1983) proposal for the word structure condition, see my WFC 2. The extra phonological rule needed, P1, is a consequence of the preference for an alphabet feature over a different underlying phoneme plus absolute neutralization. This rule handles the harmonic behaviour of the segments that would be underlying [-ATR, +high] in an abstract analysis. The rule is somewhat cumbersome in that it says that certain segments become [+high] in a (dominant) [+ATR] environment while the relation between the features high and ATR is a priori unclear. There is a connection in the fact that [+high] vowels are [+ATR] but this cannot be related to it formally.

Notes

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1. See the article by Thilo C. Schadeberg in this volume for preferability of negative conditions. ATR stands for Advanced Tongue Root.
2. In fact the type 2 prefix of class 13 is underlyingly [-ATR].

3. This form has an exceptional initial glide.

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