Against vowel length in Tigrinya

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ABSTRACT

I argue in this paper that vowel length plays no role in the synchronic phonology of Tigrinya: processes affecting vowels should be treated in featural terms only. The evidence in favor of synchronic vowel length is weak, and stronger evidence favors an analysis in which vowel length is phonologically irrelevant. While some researchers have made use of synchronic vowel length to account for ostensible closed-syllable shortening, I show that the relevant alternations are very limited in scope and represent at best the residue of historical vowel length. The evidence presented includes word minimality, vowel coalescence, word-final fronting, guttural lowering, and low dissimilation, with analyses of these phenomena in purely featural terms.

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The analysis of the Tigrinya vowel system raises basic questions of abstractness and productivity. While the inventory, on the surface, consists of seven vowels well distinguished by quality (i.e. features), much recent generative work on Tigrinya phonology and morphology makes use of vowel length in analyzing certain patterns, for example vowel alternations construed as closed-syllable shortening. However, these patterns are quite limited in scope, and the assumption of vowel length in order to account for them leads to serious problems in dealing with numerous more pervasive facts of the language. I argue here that length is absent in the modern language and the system has been reanalyzed strictly in terms of features.

I begin in §1 by outlining a simple moraic approach to Tigrinya syllable structure. In §2 I show how this approach easily explains the nature of minimal word size in the language. In §3 I describe the historical development of the vowels, and outline the alternative approaches in which vowel length plays a synchronic role. In §4 I show that synchronic vowel coalescence — though it is historically responsible for the creation of two of the supposed long vowels — makes no reference to vowel length, and submits to a simpler analysis if no length is present. In §5 I turn to three other purely featural processes which either contradict predictions of a length-based analysis, or which are more simply analyzable without length: these are fronting in word-final position, lowering next to a guttural consonant, and dissimilation of low vowels. In §6 I consider the evidence that has been presented in favor of synchronic closed-syllable shortening, showing that the process is limited to a small set of morphological contexts, and amply contradicted elsewhere. Alternative analyses for all the phenomena discussed are presented. In §7 I briefly discuss the use of length in a previous analysis of the broken plural, and show that it orthogonal to the important insights. A conclusion is given in §8.[*]

1. Tigrinya syllable structure

As with most Ethiopic Semitic languages (cf. Leslau 1966: 595), Tigrinya has a symmetrical seven-vowel inventory.[1]

(1)   i   ɨ   u
        e   ʌ   o
              a

In the traditional view, which I follow here, every Tigrinya syllable consists of a single onset consonant, a vowel in the nucleus, and an optional coda, yielding the two basic types *Cv* and *CvC*.[2] Some illustrative

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[*] This paper is based on a talk presented at the 25th Annual Conference on African Linguistics, Rutgers University, 25-27 March 1994. Data sources are indicated by the following abbreviations (with page numbers for non-dictionary sources): B (Berhane 1991), D (Denais 1990), dB (da Bassano 1918), dL (da Leonessa 1928), L (Leslau 1941), P (Pam 1973), FP (Palmer 1955); unreferenced examples are from consultation with native speakers Tesfai Haile, Medhane Measho, Aida Nigussie, and Abraham Yemane. I would like to thank the editor and an anonymous reviewer for valuable comments.

[1] The vowel [ʌ] is frequently transcribed <ä>; while it often has a fronted quality, it patterns phonologically as a mid central vowel (see below and Buckley 1994; for phonetic discussion of the corresponding Amharic vowel, see Devens 1983). Similarly, [ɨ] is often transcribed <ə> but is a high vowel. In this paper, <c> represents [tʃ], and <j> is [dʒ]. I omit indication of the fact that after a vowel, nongeminate /k, k̓/ surface as [x, x̓] due to a well-studied rule of spirantization (e.g. Leslau 1941: 5, Schein 1981, Kenstowicz 1982).

words, all forms of the verb /brk/ 'bless', are given in (2); the templatic morphology characteristic of Semitic languages is responsible for the variety of vowel and syllable patterns. Periods indicate syllable breaks.

(2) a. ba . rʌ . ku   'they (m.) blessed'
     b. tʌ . ba . ra . ri . ka   'she was blessed several times'
     c. ba . rʌ . kʌt   'she blessed'
     d. ba . rʌk . na   'we blessed'
     e. ba . rik . kum   'you (m.pl.) blessed'

Miscellaneous examples from other parts of speech are given in (3).

(3) a. t'ʌ . ra . p̓e . za   'table'
     b. ʔit . yop̓ . ya   'Ethiopia'
     c. bɨ . rur   'silver'
     d. nɨħ . bi   'bee'
     e. sʌk . ran   'drunk'

I interpret this state of affairs as a syllable structure consisting of one or two moras (cf. Hyman 1985, McCarthy and Prince 1986, Zec 1988, Hayes 1989). The first mora dominates a vowel; the second mora, which is optional, dominates a consonant; and an onset consonant is obligatory.

(4)
```
        σ      σ      σ
        |      |      |\
        μ      μ      μ μ
        |      |      | |
        b a    r ʌ    k ʌ t
```
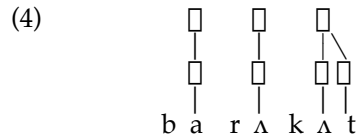
The coda consonant is in many cases the first half of a geminate consonant, the second half of which serves as the onset of the following syllable. Often the gemination marks lexical or morphological categories in verbs such as /bdl/ 'hurt' and /sbr/ 'break (tr.)' (5), though it is distinctive in all word classes (6).

(5) a. bʌd̠ . dʌ . lʌt   'she hurt (tr.)'
     b. nɨ . bɨd̠ . dɨl   'we hurt (tr.)'
     c. nɨb̠ . ba . dʌl   'we hurt each other'
     d. yɨ . sʌb̠ . bɨr   'he breaks (tr.)'
     e. yɨs̠ . sʌ . bʌr   'that it be broken'

(6) a. dɨm̠ . mu   'cat'
     b. sɨn̠ . ni   'tooth'
     c. mʌn . gʌd̠ . di   'road'
     d. nɨs̠ . sa   'she'
     e. s̓ʌl̠ . lim   'black (m.sg.)'

Following standard moraic practice, I interpret these geminates as a single consonant linked to two positions: the coda mora of one syllable and the onset position of the following syllable.

(7)
```
        σ     σ     σ
        |    /\    /\
        μ   μ μ   μ μ
        |   | |   | |
        y ɨ s ʌ b ɨ r
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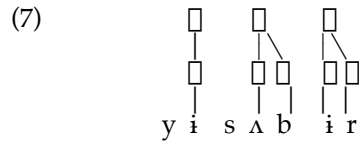
The moraic structure of a syllable containing the first half of a geminate (7) is the same as one containing a simple coda consonant (4), correctly capturing their parallel distributions: geminates occur exactly where clusters of two consonants are found, i.e. between vowels.

The prohibition on syllable-internal consonant clusters is clearly demonstrated by the operation of Epenthesis, which inserts the vowel [ɨ] after any consonant which is unable to syllabify with a vowel already present in the representation. Examples are forms of the verb /sbr/ 'break (tr.)'.

(8)	a.	sbʌr	→	sɨ . bʌr	'break (it)! (m.sg.)'
	b.	ʔay-t-sbʌr	→	ʔay . tɨs . bʌr	'don't break (it)! (m.sg.)'
	c.	y-sbʌr	→	yɨs . bʌr	'that he break (it)'

(9)	a.	t-sʌbr-om	→	tɨ . sʌb . rom	'she breaks them'
	b.	k-t-sʌbr-om	→	kɨt . sʌb . rom	'that she break them'
	c.	n-sʌbr-o	→	nɨ . sʌb . ro	'we break it'
	d.	k-n-sʌbr-o	→	kɨn . sʌb . ro	'that we break it'

Similarly, a word-final cluster is resolved by inserting an epenthetic vowel after the second consonant. Due to an independent rule of Fronting (see §5.1), the vowel appears as [i] in word-final position.

(10)	a.	kʌlb	→	kʌl . bɨ	'dog'
	b.	kʌlb-n	→	kʌl . bɨ . n	'and (a) dog'
	c.	kʌlb-ka	→	kʌl . bɨ . ka	'your (m.sg.) dog'

| (11) | a. | mɨdr | → | mɨd . rɨ | 'earth' |
| | b. | mɨdr-tat | → | mɨd . rɨ . tat | 'earths' |

| (12) | a. | ʕadd | → | ʕad . dɨ | 'country' |
| | b. | ʕadd-tat | → | ʕad . dɨ . tat | 'countries' |

Note that a final geminate (12) induces precisely the same pattern, supporting the parallel syllabic treatment in (7). No Epenthesis occurs when a vowel-initial suffix is present, e.g. *kʌlb-u* 'his dog'.

Just as Epenthesis illustrates restrictions on clusters, so Glottal Stop Insertion shows that every syllable requires an onset. While many glottal stops are present underlyingly, e.g. as part of a consonantal root (see (60c), (61c)), some morpheme-initial glottal stops are not underlying, and do not appear when some other consonant is available to serve as onset to the following vowel.

| (13) | a. | k-bʌlliʕ k-ʌllo | → | kɨbʌlliʕin kʌllo | 'when he was eating' |
| | b. | y-bʌlliʕ ʌllo | → | yɨbʌlliʕ ʔallo | 'he is eating' |

| (14) | a. | z-ʌy-y-bʌlliʕ-n z-ʌllo | → | zʌyyɨbʌlliʕin zʌllo | 'the one who isn't eating' |
| | b. | ʌy-y-bʌlliʕ-n ʌllo | → | ʔayyɨbʌlliʕin ʔallo | 'he isn't eating' |

The (b) examples also show Lowering of /ʌ/ to [a] adjacent to a guttural; see §5.2 for more discussion.[3] The essential point is that these underlyingly vowel-initial words are not permitted to surface as such, and the inserted glottal stop is necessary to give the syllable an onset.

I take the offglide of a diphthong to be equivalent to a consonant, as confirmed by the fact that a syllable cannot contain a diphthong followed by another coda consonant, and either Epenthesis (15) or Vowel Coalescence (16) is necessary to permit syllabification (cf. Ullendorff 1955: 203).

(15) a.   ʕayn   →   ʕay . ni   'eye'
      b.   ħaw-t   →   ħaw . ti   'sister'
      c.   sals-ʌy-t   →   sal . sʌy . ti   'third (f.)'

(16) a.   bʌyt   →   bet   'house'
      b.   ʔʌwm   →   ʔom   'tree'
      c.   ʕʌwf   →   ʕof   'bird'

The basic consequence of this assumption is that the offglide occupies the second mora of the syllable.

(17)
```
         σ      σ
        |\      |
        μ μ     μ
        | |     |
        ʕ a y   n i
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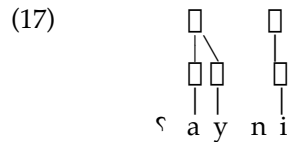
I do not consider there to be any featural distinction between the glides [y, w] and the vowels [i, u]: they are both instances of underlying /i, u/, and the difference follows only from syllable position.[4] A simple illustration of this equivalence comes from consonantal roots containing a glide which surfaces directly as a vowel without need for Epenthesis, found in the accompanying non-glide examples with /sbr/.

(18) a.   y-wsʌd   →   yusʌd   'let him take'
           y-sbʌr   →   yisbʌr   'let him break'
      b.   y-sʌtty   →   yisʌtti   'he drinks'
           y-sʌbbr   →   yisʌbbir   'he breaks'

See also §4, where glides and vowels show equivalent behavior in coalescence. For clarity, I represent vowels functioning as consonants — i.e. those linked to onset or coda position — with the glide symbols <y, w>.

2. Minimality

Important support for the moraic analysis of syllable structure presented in the previous section is its ability to provide a simple explanation of word minimality. The smallest lexical word[5] in Tigrinya has the shape *CvC*. The initial C is due to the requirement for an onset, discussed above. The final C, in turn, can be explained by a requirement for at least two moras per word, as attested in a great many languages

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[3] In the case of the enclitic *-n*, Epenthesis occurs **before** the second of the two final consonants. I do not pursue a formal analysis here, but it could (for example) be attributed to a difference between lexical and phrasal phonology, or to a requirement that verbs not end in epenthetic material (Buckley 1996).

[4] This position is typical in Semitic research, due to frequent alternations of glides and vowels; for example, Brockelmann (1908: 138) identifies the glides as "die konsonantischen Vokale *u̯* und *i̯*". Denais (1990: 156) argues for the equivalent assumption in Tigrinya.

[5] By this term I exclude the prepositional clitics *b(i)-* 'by, with' and *n(i)-* 'to, for' (Leslau 1941: 131).

(e.g. Prince 1980, Broselow 1982, McCarthy and Prince 1986, 1995). Below I give examples of *CvC* words taken from da Bassano (1918), organized by the vowel which heads the syllable.[6]

(19)	ʔid	'hand, arm'		din	'sulphur'
	gif	'bush'		riħ	'bovine disease'
	rim	'feud; land dispute'		lif	'filter'
	ǩim	'vengefulness, rancor'		liǩ	'educated person; scientist'
	lin	'slime, mud'		fit	'front'

(20)	bun	'coffee'		muz	'banana'
	dur	'dense forest'		lul	'pearl'
	sur	'root'		kuk	'peach'
	luħ	'plank of wood'		ruz	'rice'
	ťub	'nipple'		suf	'suit'
	ťuť	'cotton'			

(21)	mes	'honey wine'		geṡ	'gift'
	bet	'house [in compounds]'		ker	'merciful, kind'
	ťel	'goat'		sef	'sword'
	čef	'summit'			

(22)	ǩor	'strength, virtue, power'		dob	'border'
	ṡor	'load, burden'		hob	'heave!'
	sol	'pad for carrying load on head'		ʔom	'tree'

(23)	may	'water'		gar	'wergeld'
	kʷak	'crow'		fas	'axe'
	ǩal	'word'		ʔaf	'mouth'
	gan	'owl'		čaf	'tip, corner'
	mal	'herd (of cattle)'		gaw	'cistern'
	wag	'rust on grain'		gʷal	'girl'
	das	'ceremonial tent'		fal	'prediction, wish'

(24)	šɨg	'torch'		ṡɨn	'pay attention' (with 'say')
	šɨħ	'thousand'		tɨm	'be silent' (with 'say')

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[6] A general areal feature of Ethiopia, quite common in Tigrinya, is the 'compound verb': a word functioning as the object of the verb 'say' (root *bhl*). The verb and 'preverb' form an idiom together; the latter often has no independent existence, and the combined meaning is frequently unrelated to speaking. (Cf. Cohen 1927: 175f, 1939: 287, Waley and Armbruster 1934, Leslau 1941: 124, Ferguson 1976: 71f).

ṡin bʌlʌ	'he paid attention'
dʌw bʌlʌ	'he stopped'
kof bʌlʌ	'he sat down'
ťuf bʌlʌ	'he spat'
ħɨrray bʌlʌ	'he agreed'
ǩʌyǩʌy bʌlʌ	'he was trembling'
kʌrʌwrʌw bʌlʌ	'he rolled head over heels'

These words are subject to the same minimality requirements as the rest of the vocabulary, and so I have included some examples in the text. Another respect in which they resemble normal lexical items is the presence of final-syllable reduplication (e.g. *kʌrʌw-rʌw*) identical to that found in verbs. Finally, some of the words are clearly related to normal nouns or verbs: *dʌs ʔilu-ni* 'I am happy' yields *dʌs-ta* 'happiness'. One way in which they differ from the rest of the lexicon is that Guttural Lowering does not always apply, e.g. *mʌʔ bʌlʌ* '(the goat) bleated'; but this is likely a matter of onomatopoeia.

| šɨm | 'name' | | kɨt | 'die down (of wind)' (with 'say') |
| šɨl | 'imperfect, unexpected' | | wɨs | 'drive away lambs' (with 'say') |

(25)	dʌm	'blood'		mʌn	'who'
	gʌṡ	'face'		ċʌw	'salt'
	sʌb	'person'		dʌw	'stop' (with 'say')
	wʌz	'facial character'		nʌǩ	'shake plant' (with causative 'say')

Another type of minimal word, consisting of the same two moras in size, is words of two open syllables, or *CvCv*. For reasons that will become apparent below, these examples (again from da Bassano 1918) are organized according to the number of the central vowels /ɨ, ʌ/ which are contained in the word: two (26), one (27), or none (28). Word-final /ʌ/ ultimately undergoes Fronting; see §5.1.

(26)	tɨrʌ	'raw'		šɨyʌ	'sp. of grass; handsome youth'
	wʌrʌ	'news'		fɨrʌ	'fruit'
	dɨnʌ	'shade'			

(27)	ħinʌ	'revenge'		ṡaṡʌ	'ant'
	ħadʌ	'one'		šʌka	'verdant pasture'
	sɨga	'meat'		šɨro	'cooked barley porridge'
	gʌza	'house'		šɨbo	'fine metal wire; ring'

(28)	lomi	'today'		suma	'corn cob'
	bota	'place'		laka	'palm frond'
	resa	'corpse'		šabu	'suddenly'
	ruba	'stream'		mosa	'feint'
	šahi	'tea'		ħuṡa	'sand'
	šišo	'army ants'			

Under the minimality analysis, these words are perfectly acceptable, since each syllable provides a mora, just as in *CvC* the coda consonant provides a second mora.

(29)   a.
```
        σ
       |\
       μ μ
       | |
       C V C
```
       b.
```
        σ    σ
        |    |
        μ    μ
        |    |
       C V  C V
```

This parallel status of *CvCv* and *CvC* offers excellent evidence that a coda consonant renders a syllable heavy, yielding the two moras necessary to form a proper word (29a). The alternative means of achieving the same minimum is with two open syllables, each of which provides one mora (29b). Of course, much longer words are possible (as illustrated in §1), but all words must contain at least two moras.

3. The question of vowel length

Conspicuously absent from the set of possible bimoraic word types in (29) is a monosyllable with a long vowel, which by definition bears two moras. Thus if long vowels were present in Tigrinya, we would expect the following third type of minimal word.

(30)
```
            σ
           /\
          μ  μ
           \/
        c    v
```
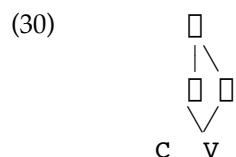
But words such as hypothetical *ʔi, *bu, *me, *ƙo are all excluded from the Tigrinya lexicon. This gap cannot be explained by a requirement that stems end in a consonant — as found in Arabic (cf. McCarthy and Prince 1990a) — since many disyllables are vowel-final, as illustrated in (26) to (28). Another explanation is available, however: words of the shape *Cvv* are absent because long vowels themselves are absent from the language.

My claim in this paper, then, is that while certain vowels may tend to be longer phonetically than others, vowel length plays no role in the phonology of Tigrinya. Recall the seven-vowel inventory, repeated from (1).

(31)   i   ɨ   u
            e   ʌ   o
                      a

In the indigenous terminology for the Ethiopic syllabary, each vowel constitutes an 'order', numbered in the following fashion: first order /ʌ/, second order /u/, third /i/, fourth /a/, fifth /e/, sixth /ɨ/, and seventh /o/. These terms are used in a few quotations cited below.

Historically, this system developed from the Proto-Semitic system of three short and three long vowels, which survives in Classical Arabic (e.g. Bergsträsser 1983: 5).

(32)   i i: u u:
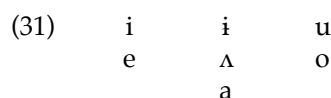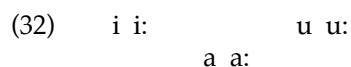   a a:

The three modern Tigrinya peripheral vowels /i, a, u/ correspond to the proto long vowels (33a); the mid vowels /e, o/ are derived by coalescence from the diphthongs *ai, *au (33b); and while mid central /ʌ/ derives uniquely from short *a, high central /ɨ/ represents a merger of short *i and *u (33c).[7]

(33)   a.   *Long vowels*   *i: *u: >   i   u
                                        *a: a

        b.   *Diphthongs*   *ai *au   >   e o

        c.   *Short vowels*   *i   *u   >   ɨ
                                        *a   ʌ
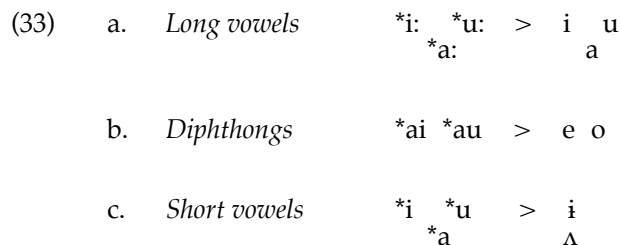
See also Ullendorff (1955: 161), Voigt (1983: 356), and Denais (1990: 60). The question of whether vowel length is phonemic in modern Tigrinya is essentially a question of whether these changes are still active in the language.

The major references in the pre-generative tradition of Tigrinya grammatical analysis generally assume that vowel length is historical only, i.e. that the distinctions in the seven-vowel system of (31) are

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[7] This merger may reflect the consummation of a tendency extending back into Proto-Semitic (and beyond into Afroasiatic): Bergsträsser (1983: 5) notes of the proto-language that "an older stage is still clearly recognizable, in which *i* and *u* were functionally equivalent as varying realizations of a reduced grade, and together were opposed to the vowel *a*, the single full short vowel."

based on quality rather than quantity. Leslau (1941: 8-9) does refer to length in his characterizations of Tigrinya vowels, saying that except for the 'short' vowels /ɨ, ʌ/, all the vowels 'can be long or short'.[8] More specifically, he describes /ʌ/ as having 'une quantité moyenne', while /a/ is 'le plus souvent long'; /ɨ/ is 'une voyelle brève', while /i/ 'peut être long ou bref'; /e/ is 'quelquefois long'. These descriptions are, however, impressionistic in nature and identify phonetic tendencies; crucially, he does not, for example, treat /ʌ/ as a short version of /a/, though this is the historical origin of the contrast.

Confirmation of this interpretation comes from a later source. Leslau (1966: 595), in discussing general properties of Ethiopic Semitic languages, states that "There is no quantitative distinction except in some vowels of Harari, Tigre, Ennemor, and Zway; Geˁez, too, probably had a quantitative distinction." Tigrinya is conspicuously absent from the list. Ullendorff (1955: 159f) is quite emphatic on this point: "The seven Ethiopic vowel-orders all express qualitative distinctions; quantity has no place in this scheme at all." He echoes Leslau's statements when he says that "Each of the seven vowels can be long or short, although some are more frequently long and others more generally short." He continues that "vowel-length is non-phonemic in Ethiopic," and states that "the non-phonemic character of vowel quantity in Ethiopic is, in my view, certainly applicable to Gǝ'ǝz, Tigrinya, Tigre, and Amharic. I cannot pronounce on the position in Gurage and Harari where the existent notation does not appear to me wholly conclusive." Ullendorff singles out "the erroneous assumption that the 1st and 4th orders, on one hand, and the 6th and 5th orders, on the other, stand to each other as the equivalent short and long vowels." The pairs he refers to are /ʌ, a/ and /ɨ, e/. I have encountered no modern work in which /ɨ, e/ are distinguished only by length; Ullendorff may be thinking of orthographies such as Conti Rossini's (1940) use of <ĕ> for /ɨ/. However, as seen below, the pair /ʌ, a/ figures prominently in arguments regarding synchronic vowel length.[9]

Thus while Leslau and Ullendorff disagree regarding Ge'ez (under various spellings) and Tigre, both agree that vowel length is non-distinctive in Tigrinya. Similarly, Tubiana (1956: 82) claims that the Tigrinya vowel system has replaced length with qualitative distinctions.[10] This assumption is found also in the generative approach of Kenstowicz (1982), who links all vowels to a single V-slot, which is the rough equivalent of the mora used above: the only way to mark a vowel as long is by linking it to two V-slots, and the fact that Kenstowicz does not do this for vowels such as /a/ and /e/ shows that he considers them to be short. The same is true for Schein (1981: 37). Schein and Steriade (1986: 709) explicitly state that "Tigrinya does not allow doubly linked [+syllabic] segments (that is, long vowels)." For all these researchers, the distinction among Tigrinya vowels is purely qualitative (or 'featural' in more modern terms). Though there may be secondary differences in phonetic duration, this quantitative property plays no role in the phonology.[11]

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[8] "Toutes les voyelles sauf les brèves *ä* (*ǎ*) et *ǝ* (*ǔ*) peuvent être longues ou brèves; *a* est le plus souvent long."

[9] In his analysis of Amharic vowels, in which the peripheral vowels /i, e, o, u/ are treated as long, Hayward (1986: 324) states that "Many instances of Amharic *a* also must have arisen from an earlier long vowel, but I believe the phonology of the modern language supports the analysis of *a* with *i* and *ä*, rather than with *i, e, o* and *u*." For Tigrinya, my position is that all the historically long vowels, not just /a/, have lost their distinctive length.

[10] Tubiana (1956) and Petráček (1964), working in the structuralist tradition, state that length is absent in Ge'ez. For Tubiana (p. 82), over time "la distinction de timbre est amenée à se généraliser et à se substituer à la distinction de longueur", leading eventually to the system of Ge'ez, "wo der Gegensatz der Quantität phonologisch irrelevant ist" (Petráček, p. 132). Since Ge'ez is roughly the ancestor of Tigrinya, any evidence that length had been lost more than a thousand years ago is also evidence that it has been lost in modern Tigrinya (as Tubiana claims specifically for Tigrinya).

[11] The only phonetic data regarding Tigrinya vowel length that I have found in the literature are in Denais (1990: 61). He cites from Sumner (1957) the following mean vowel durations (in milliseconds) in

On the other hand, we can identify two basic generative approaches which grant a role to vowel length in the synchronic phonology. One is represented by the first generative analysis of Tigrinya phonology, Pam (1973), who claims that underlying distinctions involve quantity as well as quality.[12] Pam (p. 51) gives the following five underlying vowels.

(34)   i: ɨ   u:
              a, a:

This system is identical to the Proto-Semitic system in (32) with one exception: the two short high vowels *i, *u have been collapsed as /ɨ/. For Pam, however, the rule merging these two vowels is still active in the language: when /i:/ and /u:/ are shortened, they become [ɨ]. In this system, all tokens of [e, o] are from coalescence of /ay, aw/. Similarly, [ʌ] is derived from /a/, which in turn is distinguished from /a:/ only by quantity. Since many of Pam's theoretical assumptions have been abandoned in current work, I will not dwell on the details of his quite abstract analysis.

A number of more recent researchers working in the Charm and Government approach (Kaye et al. 1985) accept the seven-vowel inventory in modern Tigrinya and its fundamentally featural distinctions, but also assume redundant length differences (e.g. Angoujard and Denais 1989: 104, Denais 1990: 29, 54, Berhane 1991: 14, Lowenstamm 1991: 962). That is, the historically long vowels are synchronically long as well, yielding the following inventory.[13]

(35)   i: ɨ   u:
          e: ʌ   o:
              a:

A basic difference between this approach and Pam's is that there is no pair of vowels distinguished purely by length: quantity is present in the phonology, but is secondarily determinable based on what features are present.[14] For example, the vowel [i] links to two timing positions (i.e. requires a branching nucleus), while [ɨ] links to just one. Here the timing unit 'x' is (again) roughly equivalent to a mora.

Amharic words, but as pronounced by a native speaker of Tigrinya: [ɨ] = 60; [u] = 70; [ʌ] = 75; [i] = 80; [a] = 100; [e] = 120; [o] = 125. Both languages have the same vowel inventory; and Denais reports that the speaker's articulation of [ʌ] conforms to the more anterior pronunciation of Tigrinya rather than Amharic, suggesting that he used his native vowels. Note in particular that the 'long' vowel [u] is shorter than [ʌ]. While these durations are not inconsistent with a phonological length distinction (assuming appropriate phonetic implementation rules), they do not obviously point to one. For example, Peterson and Lehiste (1960) report that in English the vowel [æ] (=330 ms) is longer than [ɛ] (=200), which in turn is longer than [ɪ] (=180); but all are phonologically short. This reflects the generalization that low vowels are typically longer than high vowels. Further, House (1961: 1177) suggests that the "diminution of duration associated with lax vowels ... might be attributed to a reduction in the vocal effort expended in producing the vowels." Since the 'short' vowels /ɨ, ʌ/ are closest to a neutral tongue position, they should be expected to require less time to articulate. At any rate, the phonological representation of vowels must be based on phonological evidence, and that is the subject of this paper.

[12] In his brief discussion of the location of Tigrinya epenthesis, Noske (1988: 56ff, 1993: 114ff) also adopts Pam's vowel inventory, including length.

[13] Brockelmann (1908) and Bergsträsser (1983) also mark the historically long vowels as long for Ethiopic, but this is likely intended simply to facilitate comparison with related languages; Moscati et al. (1964: 165) explicitly base their use of such notation 'on etymological grounds'.

[14] For Lowenstamm (1991: 962), the distinction between /ʌ/ and /a:/ is based on length and the relative status of the same features within the formal representation, rather than the literal presence or absence of particular features. This approach depends on techniques of the Charm and Government theory not adopted here.

(36) a. *Permitted*   x   x   x

                              \\/ |

                               i   ɨ

    b. *Prohibited*   * x   x   * x

                              \\/ |

                              ɨ   i

This analysis must stipulate the linking properties of the various vowels, or their component elements: essentially, any vowel bearing the feature [–back], [+low], or [+round] must be linked to two timing slots. When, for example, an /i:/ loses a timing slot due to some process (see §6), it must also lose its [–back] feature, thereby becoming /ɨ/. Such a redundancy, while easy to state, should be well motivated to justify its inclusion in the grammar, but we will see evidence that the presence of length at all — whether redundant or distinctive — is itself problematic.

     An obvious first problem is that granting length to all vowels except /ɨ, ʌ/ predicts that those vowels lead to a heavy syllable — and if this is sufficient to meet the minimality condition for *CvC*, then it ought to be sufficient for *Cvv*. However, as noted above, words such as hypothetical **ʔi:* and **bu:* are impossible. Thus the inventory in (35) makes a false prediction regarding a pervasive property of Tigrinya word size; the moraic analysis outlined above captures the facts quite easily, if every vowel is short.[15] What then motivates the quantitative analysis? There are two basic arguments: synchronic correlates of the vowel coalescence shown in (33b), and synchronic correlates of alternations in historical vowel length, e.g. [ʌ]~[a] corresponding to **a~*a:*. I argue in the subsequent sections that both these types of phenomena, while they bear some residue of the historical length distinction, simply cannot be treated with synchronic length in an analysis which takes account of the full range of data in the modern language.

4. Vowel coalesence

4.1. The facts

Recall that Pam (1973) derives the synchronic mid vowels /e, o/ from coalescence of a short vowel with a glide. While I argue that there are underlying mid vowels in the language — an assumption shared even in the quantitative inventory of (35) — it is clear that coalescence is a synchronically active part of Tigrinya phonology. For example, as shown below, when /w/ as part of a consonantal root follows /ʌ/ in the same syllable, the two generally coalesce to produce [o]. (This is parallel to the historical change **aw > o* in (33b).) A related form containing the same root, but with a different template or an affix that places the glide in the onset, is provided first in each case to illustrate the underlying root.

(37) a.   fʌtʌw-a   →   fʌ . tʌ . <u>w</u>a   'they (f.) liked'
           fʌtʌw-ka   →   fʌ . t<u>o</u> . ka   'you (m.sg.) liked'
           y-ftʌw   →   yɨf . t<u>o</u>   'that he like'

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[15] Denais (1990: 65) notes that words with the shape *CʌC* and *CɨC* are uncommon, and often related (synchronically or diachronically) to triliteral roots. For example, the plural of *šɨg* 'torch' is *ʔa-šyag*, indicating the root /šyg/. However, the fact remains that *CvC* words with /ʌ, ɨ/ are permitted, while ostensible *Cvv* words are not. He offers no explanation for this gap. Compare Arabic, where minimality (two moras excluding a final consonant) leads to forms such as colloquial Palestinian *baas*, *bass*, and *basi* from English 'bus' (McCarthy and Prince 1990a: 21, citing Ellen Broselow).

b.	?a-?wam	→	?a? . w̲am		'trees'
	?ʌwm	→	?o̲m		'tree'
c.	kʌwakɨb-t	→	kʌ . w̲a . kɨb . ti		'stars'
	kʌwkʌb	→	ko̲ . kʌb		'star'

The same outcome results from the sequence /uʌ/ — not surprising if [u] and [w] are featurally the same segment, as claimed in §1.

(38)	a.	dɨmmu			'cat'
		dɨmmu-ʌy	→	dɨmmoy	'my cat'
	b.	kuttu			'large bird'
		kuttu-ʌy	→	kuttoy	'my large bird'
	c.	ħamu			'father-in-law'
		ħamu-ʌy	→	ħamoy [16]	'my father-in-law'

Parallel coalescence of tautosyllabic /ʌy/ yields [e], as illustrated below.

(39)	a.	sʌtʌy-u	→	sʌ . tʌ . y̲u	'they (m.) drank'
		sʌtʌy-na	→	sʌ . te̲ . na [17]	'we drank'
		tɨ-stʌy	→	tɨs . te̲	'you (m.sg.) drink'
	b.	?a-byat	→	?ab . y̲at	'houses'
		bʌyt	→	be̲t	'house'
	c.	?a-myas	→	?am . y̲as	'honey wines'
		mʌys	→	me̲s	'honey wine'

The examples in (37) to (39) show that Coalescence is a necessary part of synchronic Tigrinya phonology; but does this mean that we can treat all instances of [e, o] as derived from /ʌy, ʌw/, as Pam does? An important argument against that approach is the idiosyncratic nature of coalescence. For example, in the dialect documented by Leslau (1941), only some words undergo coalescence (40a), while others with the same structure do not, and Epenthesis is necessary instead (40b).[18]

(40)	a.	bʌyt	→	bet	'house'
		ʕʌwf	→	ʕof	'bird'
		?ʌwm	→	?om	'tree'
	b.	sʌyf	→	sʌy . fi	'sword'
		lʌyt	→	lʌy . ti	'night'
		fʌws	→	fʌw . si	'cure'

A widely supported generalization is that rules which apply on a lexically idiosyncratic basis are 'structure preserving', i.e. the output of the rule is of the same phonemic status as the input (e.g. Kiparsky 1982). An example is the English rule which changes a tense (long) vowel to lax (short) before a suffix such as *-ity*: it applies in most pairs (*serēne/serĕnity*) but has exceptions where the vowel remains unchanged (*obēse/obēsity*). Notice that the relevant vowels, /i/ and /ɛ/, are constrastive phonemes in English; the same correlation has been noted for many languages. By this reasoning, given the contrast between *bet* and *sʌyfi*, it would follow that /e/ and /ʌy/ are phonemically contrastive in Tigrinya, as are /o/ and /ʌw/. Morphemes in which /e/ or /o/ occurs without alternation (e.g. *gize* 'time', *lomi*

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[16] The alternative form *ħamu-yʌy* also exists, where the interceding [y] prevents coalescence.

[17] For similar cases, Leslau (1941: 11) gives reduction of /ʌy/ to [ʌ], e.g. *fʌtʌ-ka* 'you (m.sg.) loved' as a variant of *fʌtʌy-ka*, but I have recorded [e]. Berhane (1991: 52) gives forms like Leslau's but also notes coalescence to [e] in Northern Tigrinya dialects, mentioning Hamasen in particular. Also, Denais (1990: 234) cites examples of this coalescence such as /t̊ʌyʌs-/ → [t̊es-] 'smoke'.

[18] Similarly, Denais (1990: 237) gives the variants *mes ~ mʌysi* 'honey wine', *geṡ ~ gʌyṡi* 'jewel'.

'today') will simply have that vowel underlyingly, with no need for application of Coalescence. They contrast with words that have a diphthong underlyingly and which, because they are in non-derived environments (i.e. the vowel and glide are part of the same morpheme), do not undergo the rule.

(41)	a.	bʌyn-u	→	bʌynu	'he alone'
		kinʌw-na	→	kinʌw-na	'farther than us'
	b.	nat-ʌy	→	natʌy	'mine'
		ʔab-ʌy	→	ʔabʌy	'where?'

In cases such as (40) two morphemes are involved: the consonantal root, which provides the glide (e.g. /byt/); and the template, which provides the vowel (e.g. *CʌCC*). The derived environment which results from combining these two morphemes makes Coalescence available for application (though it retains nevertheless some optionality or lexical idiosyncrasy).

Granting that /e/ and /o/ exist underlyingly — as every source agrees, save Pam (1973) — leaves open the question of whether these vowels are short (as I argue) or long (as in (35)). The following examples provide important evidence that these mid vowels are short. All are gerundive forms of verbs (stem template *CʌCiC*) with a medial /y/ in the root.

| (42) | a. | kʌyid-na | → | kʌydna | → | ked . na | 'we went' |
| | b. | kʌyid-u | → | kʌydu | → | kʌy . du | 'he went' |

| (43) | a. | ṡʌyir-na | → | ṡʌyrna | → | ṡer . na | 'we carried' |
| | b. | ṡʌyir-a | → | ṡʌyra | → | ṡʌy . ra | 'she carried' |

(44)	a.	šʌyiṫ-na	→	šʌyṫna	→	šeṫ . na	'we sold'
		šʌyiṫ-ka	→	šʌyṫka	→	šeṫ . ka	'you (m.sg.) sold'
		šʌyiṫ-kin	→	šʌyṫkin	→	šeṫ . kin	'you (f.pl.) sold'
	b.	šʌyiṫ-u	→	šʌyṫu	→	šʌy . ṫu	'he sold'
		šʌyiṫ-a	→	šʌyṫa	→	šʌy . ṫa	'she sold'
		šʌyiṫ-om	→	šʌyṫom	→	šʌy . ṫom	'they (m.pl.) sold'

In all words /yi/ coalesces to [y] as the first step.[19] If Coalescence were a rule which always applied when it is able to, we would expect it to apply in the (b) examples to give e.g. *kedu* While this is a possible output for at least some speakers, it is not obligatory as in the case of *kedna* (*kʌydna*). If, on the other hand, we understand Coalescence as partly constrained to apply when necessary for reasons of syllable structure, and further assume that /e/ is short (monomoraic) while /ʌy/ is bimoraic, then the (a)/(b) contrast is easily explained. That is, the rime [ʌyd] is prohibited because it truly would be tri-moraic, and Coalescence is forced to apply. This shows that [ed] and [ʌy] are equivalent from the standpoint of syllable structure, and therefore that [e] and [ʌ] are also equivalent: they are both short vowels.[20]

Further important evidence regarding length comes from cases where /ʌ/ combines with other vowels. Note first that if the coalescence of a 'short' vowel like /ʌ/ with a glide results in a 'long' vowel, then it would appear that the number of timing slots (whether **x**'s or moras) present in the input is preserved in the output. For example:

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[19] An alternative assumption is that the /y/ of the root is simply absent, so the gerund template is essentially *CʌiC*. The argument in the text regarding the distribution of [ʌy] and [e] is unchanged by this assumption, which would be based on analogy with other verb forms that, for some speakers or dialects, lack the medial glide. Such 'hollow' stems are well known in Semitic; see below for discussion.

[20] Steriade and Schein (1984: 272) and Schein and Steriade (1986: 709ff) also treat Tigrinya coalescence as a purely featural process which results in a short vowel.

(45)
```
     x  x        →        x  x
     |  |                  \ /
     ʌ  y                   e
```

To the extent that all outputs of coalescence are long vowels, then, this phenomenon might be taken as support for the incorporation of length into the analysis. However, we see from the following examples that when /ʌ/ combines with a non-high vowel, the coalescence is vacuous: the output vowel is the same as the adjacent non-high vowel in the input.

(46)	a.	gʌza-ʌy	→	gʌzay	'my house'
	b.	miħe-ʌy	→	miħey	'my rug'
	c.	ʔabbo-ʌy	→	ʔabboy	'my father'
	d.	ħinʌ-ʌy	→	ħinʌy	'my vengeance'

(47)	a.	k̓ʌtʌl-ʌ			'he killed'
	b.	k̓ʌtʌl-ʌ-o	→	k̓ʌtʌlo	'he killed him'
	c.	k̓ʌtʌl-ʌ-a	→	k̓ʌtʌla	'he killed her'
	d.	k̓ʌtʌl-ʌ-om	→	k̓ʌtʌlom	'he killed them (m.)'
	e.	k̓ʌtʌl-ʌ-ʌn	→	k̓ʌtʌlʌn	'he killed them (f.)'

Most importantly, (46d) and (47e) show that the combination /ʌ/ plus /ʌ/ results in just short [ʌ], not a 'long' vowel such as [a]. As noted by McCarthy and Prince (1986: 52), however, vowel coalescence normally results cross-linguistically in uniformly short or uniformly long vowels.

Similar evidence comes from verbs with medial glides, called 'hollow' in traditional Semitics. For example, the perfective of a hollow verb is realized without any glide; the expected short /a/'s on either side of the medial consonant merge to create a single long vowel (cf. Moscati et al. 1964: 165).

(48) *Arabic hollow verbs*

| | a. | qawam-a | → | qāma | 'he rose' |
| | b. | šayam-a | → | šāma | 'he put' |

The most straightforward analysis of such cases involves deletion of the glide, with the two short vowels combining into a single long vowel. (The glide features surface in other contexts, such as the imperatives *qum* and *šim*.) In Tigrinya, the deletion of the glide shows some optionality, or what may be dialect variation;[21] but the important point is that when the glide is absent, the two stem vowels do not result in a long vowel as in Arabic.

(49)	a.	kʌyʌd-ʌ	→	kʌyʌde	'he went'
				kʌde	
	b.	šʌyʌt̓-ʌ	→	šʌyʌt̓e	'he sold'
				šʌt̓e	

Again, coalescence of two /ʌ/'s results not in 'long' [a] but 'short' [ʌ]. This is a particular problem for the approach of Pam (1973), where [a] is precisely the long version of [ʌ]. However, it also casts doubt on the mixed approach in (35): either that approach predicts a long vowel as the general output of Coalescence,

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[21] For example, as the perfective stem of 'sell', Berhane (1989: 284) gives only *šʌt̓-*, while Leslau (1941: 119f) gives regular *šʌyʌt̓-* as an alternative. The medial glide regularly surfaces in other forms, e.g. the passive imperfective *-šiyyʌt̓-* and the frequentative perfective *šʌyayʌt̓-* (Berhane 1991: 56, 286f). Medial /w/ survives as rounding on the vowel, e.g. *mot-* 'die' from /mwt/ (Leslau 1941: 116, Berhane 1991: 56).

in which case it makes a false prediction; or the approach makes no reference to length in Coalescence, in which case there is no motivation for including length in the first place.

4.2. Featural analysis

I show in this section that Tigrinya Coalescence is easily analyzed with reference only to features, and not to length. Let us assume the following radically underspecified features (cf. Archangeli 1984); Combinatorial Specification (Archangeli and Pulleyblank 1994) or a privative theory (e.g. Schane 1984) could provide a comparable matrix (see Buckley 1994 for more discussion).

(50)   *Underspecified Features*

	i	e	ɨ	ʌ	a	o	u
high		–		–			–
low					+		
back	–	–					
round						+	+

Assume further that coalescence is the fusion or unification of feature sets (see discussion in de Haas 1988). Since /ʌ/ is simply [–high], it serves to lower the high vowels /i, u/ but has no effect on /e, o, a/, which are already non-high.

(51)   *Coalescence with high vowels*

	ʌ i → e	ʌ u → o
high	– – –	– – –
low		
back	– –	
round		+ +

(52)   *Coalescence with nonhigh vowels*

	ʌ e → e	ʌ o → o	ʌ a → a
high	– – –	– – –	– –
low			+ +
back	– –		
round		+ +	

In all cases the output features are identical to the underlying radical underspecification of the output vowel as given in (50), except that in (52) the redundant value [–high] is present for /a/. The resulting set of features is linked to one mora, of course, since long vowels are prohibited.

The vowels in the corners of the vowel space (/i, u, a/) cannot combine with each other because each pairing would violate structure preservation, creating ill-formed feature combinations: e.g. /i a/ would yield *[æ], /u a/ *[ɒ], and /i u/ *[ü]; the same is true of the pair /e, o/, which would yield *[ø].

(53)   *Impossible coalescences*

	i	a	→ *æ	i	u	→ *ü	e	o	→ *ø
high				–	–	–	–	–	–
low		+	+						
back	–						–		–
round		–			+	+		+	+

The following examples (most from da Bassano 1918) show the lack of coalescence with /a/.

(54)   ʔa-ʔdaw   'hands'   ʔa-byat   'houses'
       ʔa-ʕṡaw   'wood (pl.)'   ʔa-kyas   'cloth sacks'
       ʔa-ʕwaf   'birds'   gawn-a   'male baboon'
       ʔa-ṡwar   'burdens'   bary-a   'slave'
       ʔa-btay   'nursing calves'   rawy-a   'sp. of vulture'

If /a/ and /ʌ/ are featurally distinct, we automatically predict the failure of coalescence for /a/ but not for /ʌ/. These facts are a problem for Pam (1973), since he treats [ʌ] and [a] as featurally identical. Appeal to length in this context — e.g. ensuring that only a short vowel can coalesce with a glide — is not useful, since a 'long' vowel and glide can coalesce, as when /yi/ yields [y] in the first step of (42). Thus the evidence from coalescence does not favor the quantitative analysis — rather, it favors the qualitative.

A final point in this regard involves glide-vowel alternations (*y~i*, *w~u*). When a glide surfaces as a vowel, the result is always a 'long' vowel [i, u] rather than 'short' [ɨ]. Numerous examples can be found in noun singular–plural pairs.

(55)   SINGULAR   PLURAL
       a.   ʔid   ʔa-ʔyad   'hand'
       b.   ʕayni   ʔa-ʕin-ti   'eye'
       c.   mʌdid   mʌdayɨd   'grindstone'
       d.   bɨħuk   baħawɨk   'leaven'
       e.   ċaċut   ċʌċawɨt-ti   'chick'   f.   diʕul   dʌʕawɨl 'ram'
       g.   ʕuf   ʔa-ʕwaf   'bird'

See also (18) for verb examples. Contrast this situation with what we find in a related language with uncontroversial vowel length, namely Arabic. In Lebanese and other modern dialects (e.g. Haddad 1984, Kenstowicz 1994: 37), alternation between a glide and a vowel is common.

(56)   a.   jadi   'kid'
            jady-ak   'your (m.sg.) kid'
       b.   dalu   'pail'
            dalw-ak   'your (m.sg.) pail'

Notice that it is a short vowel with which the glide alternates. In the quantitative approach, the Tigrinya facts are not only a bit surprising in this regard, but require special treatment, e.g. stipulation of a branching nucleus as in (36). But the outcome in (55) is automatic — and entirely comparable to Arabic — if [i, u] are in fact short; they are the simple result of linking a glide to the nucleus.

5.   Further vowel rules

In this section I show that Tigrinya has three rules changing vowel quantity in particular contexts which are easily analyzed using features alone, and which merely become more complex when length is

included in the phonological representation. These are the fronting of central vowels word-finally (§5.1); the lowering of /ʌ/ next to a guttural consonant in the same syllable (§5.2); and morphologically conditioned dissimilation of /a/ preceding another /a/ (§5.3).

5.1. Fronting

The central vowels /ɨ, ʌ/ are fronted to [i, e] respectively when they occur in word-final position.[22] Some examples of the application of this rule to epenthetic [ɨ], yielding final [i], have already been given in (10) to (12). The same alternation is found with underlying vowels which occur as [i] word-finally but [ɨ] when a suffix or clitic follows; underlying /i/, with Fronting in final position, accounts for this pattern. Each pair below includes a word-final and word-internal example to illustrate the alternation.

(57) a. rʌkʌb-kɨ   →   rʌkʌbki   'you (f.sg.) found'
          rʌkʌb-kɨ-nna   →   rʌkʌbkɨnna   'you (f.sg.) found us'

      b. mʌk̓dɨħɨ   →   mʌk̓dɨħi   'container for drawing water'
          mʌk̓dɨħɨ-tat   →   mʌk̓dɨħɨtat   'containers for drawing water'

      c. y-k̓ʌtlʌ-nnɨ   →   yik̓ʌtlʌnni   'he kills me'
          ʔay-y-k̓ʌtlʌ-nnɨ-n → ʔayyik̓ʌtlʌnnɨn 'he doesn't kill me'

As mentioned, a parallel pattern is found for the mid central and front vowels.[23]

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[22] More precisely, Fronting occurs when the vowel is final within a constituent which includes not only suffixes but also enclitics such as -n 'and' (58a). It is orthogonal to the present discussion whether this constituent should be considered a clitic group (e.g. Nespor and Vogel 1986) or a phrasal correlate of the word (e.g. Inkelas 1989, McCarthy and Prince 1993). Compounds must also be a single constituent for the purposes of Fronting, as in ʔamdirtɨ bet 'floors', literally 'earths (of) house' (Leslau 1941: 36).

[23] The reader who consults Leslau (1941) will see that he always transcribes the effect of Final Fronting for the high vowels, writing <i>, but is not consistent in marking this pattern for mid vowels, writing both plain <ä> (my /ʌ/) and fronted <e>. For example, for the word 'one' the transcriptions <ħadä> and <ħade> are both found many times. I attribute this frequent maintenance of <ä> not to the actual lack of Fronting, but to the influence of the conventional spelling of Tigrinya, which includes a change in character to indicate the fronting of /i/ but not normally to indicate fronting of /ʌ/. For example, the words in (10a-b) are written ከልቢ (kʌ-l-bi) and ከ ልቢን (kʌ-l-bi-n), with distinct 'orders' for the /b/ syllable. In contrast, the words in (58a) are written ሓደ (ħa-dʌ) and ሓደን (ħa-dʌ-n), with no change in the /d/ syllable. This orthographic practice is likely due to two inadequacies in the syllabary. First, the same character (the sixth order) is used for a simple consonant and for a consonant followed by [ɨ]; that is, ብ can indicate either [b] in a coda, or [bɨ] as an onset and nucleus. Second, there is no mark of gemination, the presence of which often requires a final epenthetic vowel. Consequently, if fronting to [i] were ignored in the spelling, there could be no written distinction between words such as [kɨbbi] 'circle' (ክቢ ki-bi) and [kɨb] 'rise' (ክብ ki-b, used with 'say'). Of course, ambiguities remain in non-final position where Fronting is inapplicable (e.g. ምብላዕ represents both mɨblaʕ 'to eat' and mibbilaʕ 'to eat each other'), but marking the application of Fronting serves as a partial remedy. On the other hand, since the first-order character always expresses a vowel (e.g. ደ is uniformly /dʌ/), there is no need to mark the effect of this allophonic rule.
    A second complication explains another quirk of Leslau's transcriptions. While he does often omit Fronting for /ʌ/ after the majority of consonants, he is fully explicit and writes <e> when the /ʌ/ is preceded by a guttural consonant (/h, ʔ, ħ, ʕ/), e.g. <bälʕe> 'he ate' (p. 114). As shown in the next section, /ʌ/ normally lowers to [a] after a guttural. As a result, a first-order guttural character such as ዐ (ʕʌ) can be used as an alternate for the fourth order ዓ (ʕa); for example, da Bassano uses the first order when that is the underlying form in the verb template (ዐለበ ʕʌ-lʌ-bʌ [ʕalʌbe] 'it perched'), and the fourth order in

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(58) a.   ħadʌ   →   ħad<u>e</u>   'one'
           ħadʌ-n   →   ħad<u>ʌ</u>n   'and one'

      b.   dʌmbʌ   →   dʌmb<u>e</u>   'camp, (animal) pen'
           dʌmbʌ-na   →   dʌmb<u>ʌ</u>na   'our camp'

      c.   ħaz-ʌ   →   ħaz<u>e</u>   'he caught'
           ħaz-ʌ-kka   →   ħaz<u>ʌ</u>kka   'he caught you (m.sg.)'

      d.   sʌbir-ʌ   →   sʌbir<u>e</u>   'I broke (something)'
           sʌbir-ʌ-kka   →   sʌbir<u>ʌ</u>kka   'I broke you (m.sg.)'

      e.   barʌk-ʌ   →   barʌk<u>e</u>   'he blessed'
           barʌk-ʌ-nni   →   barʌk<u>ʌ</u>nni   'he blessed me'

Assuming the feature specifications proposed in (50), this rule can be formulated in a very simple manner: it inserts [–back] on any vowel in word-final position.

(59) *Final Fronting*

      V → [–back] / __]$_W$

Feature co-occurrence restrictions prevent application to the vowels /a, o, u/ — which would produce ill-formed *[æ, ø, ü] — just as they prevent the coalescences in (53). Application to /i, e/ is vacuous, correctly leaving /ɨ, ʌ/ as the only vowels that are affected.

   This change is fundamentally featural, and is easily expressed as such; both the position (word-final) and the change (fronting) are well attested.[24] Under an analysis where length is phonological, however, the overall process has to include lengthening: recall that the front vowels /i, e/ are both treated as long in (35), while the vowels which undergo Fronting begin as 'short' /ɨ, ʌ/. Denais (1990: 189f, 229f), for example, requires both final lengthening and introduction of a 'front' element which effects the featural change. A no-length analysis requires only a single component: insertion (by rule or other mechanism) of a front feature. Although the process can be handled by an approach with quantity, vowel length complicates the derivation and is unnecessary to our understanding of it.

5.2. Guttural lowering

By a process widely attested in Semitic (cf. Brockelmann 1908: 194, Hayward and Hayward 1989, McCarthy 1991), in Tigrinya an underlying /ʌ/ lowers to [a] by assimilation to a guttural /h, ʔ, ħ, ʕ/. This assimilation occurs between an onset and following vowel, as well as between a coda and preceding vowel. It has already been illustrated in word-initial position with an inserted glottal stop in (13) and

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cases where the vowel can be treated as underlyingly /a/ (ዓለባ ʕa-lʌ-ba 'cloth'). But since it is Fronting rather than Guttural Lowering that applies across a morpheme boundary (as in 'he ate': /bʌlʕ-ʌ/ → [bʌlʕe]), this practice leads to uncertainty: in final position, should ዐ (ʕʌ) be interpreted as lowered [ʕa] or fronted [ʕe]? To avoid the problem, Fronting is marked explicitly for final /ʌ/ after a guttural, by using the fifth-order character, e.g. in በልዔ (bʌ-l-ʕe). Leslau has apparently imitated this practice in his transcriptions, leading him to use two different symbols (*e* after gutturals, *ẹ* elsewhere) for what is really the same thing, a fronted /ʌ/.

[24] A reasonably close analog of the Tigrinya fronting rule occurred in the history of Latin, where *ŏ (as well as *ĭ) became ĕ in final position (Sommer 1948: 145).

(14). Further illustration is found by comparing the templatic realizations of non-guttural roots, where [ʌ] surfaces (the (a) examples below), with guttural roots in the same inflection, where that vowel has become [a] (the (b-e) examples).

(60) a. sʌbʌr-ku   → sʌ . bʌr . ku   'I broke'
      b. hʌrʌm-ku   → ha̱ . rʌm . ku   'I beat'
      c. ʔʌsʌr-ku   → ʔa̱ . sʌr . ku   'I arrested'
      d. sʌħʌb-ku   → sʌ . ħaḇ . ku   'I pulled'
      e. bʌlʌʕ-ku   → bʌ . la̱ʕ . ku   'I ate'

(61) a. kʌnfʌr   → kʌn . fʌr   'lip'
      b. wʌhyʌw   → wa̱h . yo   'small sack'
      c. mʌlʔʌk   → mʌl . ʔaḵ   'angel'
      d. ħʌrgʌš   → ħa̱r . gʌš   'crocodile'
      e. mʌʕtʌb   → ma̱ʕ . tʌb   'decorative cord'

These alternations are straightforwardly analyzable as spreading of the feature [+low] (or a Pharyngeal node; cf. McCarthy 1989, Selkirk 1991).

(62)   *Guttural Lowering*

$$[_\sigma \quad C \quad \quad V \qquad\qquad \text{(mirror image)}$$
$$\qquad\quad | \quad\; {}_{\diagup\diagup}$$
$$\quad [+\text{low}]$$

For Pam (1973: 50), this lowering effect is actually the blocking of his Centralization rule (whereby short /a/ becomes [ʌ]) in the environment of a guttural; the result is short [a] on the surface. Similarly, Denais (1990: 302) proposes an active rule which results in a short [a] in the lowering context. Since this representation is distinct from that of long underlying /a:/, we would expect a difference in pronunciation. However, no source that I have seen gives a different transcription, and the indigenous spelling is identical. My own perception is that [a] which results from lowering of /ʌ/ is identical to underlying /a/. Leslau (1941: 110) confirms this in describing the lowering that occurs in verbs with an initial guttural in the root (as in (60b)): "La première radicale, étant une laryngale, est prononcée avec la voyelle *a* [...] de sorte qu'au point de vue de la prononciation il n'y a aucune différence entre les types A et C." Type A verbs are the normal triliterals, while Type C verbs have underlying /a/ after the first consonant; this pattern is discussed in the next section. The point to be emphasized here is that inclusion of length in the phonology leads to a dubious prediction for Guttural Lowering, which is a simple process under a purely featural analysis.

5.3. Low dissimilation

Tigrinya has a set of verb roots, traditionally termed Type C, which are characterized by the occurrence of the vowel /a/ between the first and second root consonants in the finite forms, and /ɨ/ in this position in the infinitive (cf. Leslau 1941: 95, 1961).

(63)   *Type C verb stems*

	C_1		C_2		C_3
perfect	C_1	a	C_2	ʌ	C_3
gerund	C_1	a	C_2	i	C_3
imperfect	C_1	a	C_2	ɨ	C_3
infinitive	C_1	ɨ	C_2	a	C_3

By contrast, in the Type A forms the vowel is /ʌ/ in the finite forms, and there is no corresponding vowel in the infinitive. This fact is illustrated below using the Type A verb /grf/ 'whip', alongside Type C /brk/ 'bless' (Berhane 1991: 176f). All finite examples are second-person plural.

(64)

		Type A	Type C
a.	perfect	gʌrʌf-na	barʌk-na
	gerund	gʌrif-na	barik-na
	imperfect	nɨ-gʌrrif	nɨ-barik
b.	infinitive	mɨ-graf	mɨ-bɨrak

A particularly notable fact about Type C is the unusual presence of the vowel [ɨ] in the infinitive stem where it is not required by syllable structure — that is, one normally finds [ɨ] in a stem only when it can be construed as the result of Epenthesis (e.g. Denais 1990: 93ff; see Hayward 1986 for a similar point in Amharic). I argue that it is no coincidence that this vowel occurs in the same position where [a] is found in the finite stems — namely, between the first and second root consonants — and that the [ɨ] is derived from the /a/ which characterizes that position.

Before we turn to the analysis, note a similar alternation between [a] and [ɨ] in the frequentative forms of the verb: here we find [a] before the last syllable of the finite stem, and [ɨ] in the same position in the infinitive. Since this vowel entails an additional syllable, spreading of the second root consonant is in most cases necessary to provide an onset for the penult. This pattern holds for all four basic verb types in the language: those given in (64) plus Type B /bdl/ 'hurt' and quadriliteral /mskr/ 'witness' (Berhane 1991: 179f, 342f).

(65) *Frequentative forms*

		Type A	Type B	Type C	Quadriliteral
a.	perfect	gʌrarʌf-na	bʌdadʌl-na	bararʌk-na	mʌsakʌr-na
	gerund	gʌrarif-na	bʌdadil-na	bararik-na	mʌsakir-na
	imperfect	nɨ-gʌrarif	nɨ-bʌdadil	nɨ-bararik	nɨ-mʌsakir
b.	infinitive	mɨ-giriraf	mɨ-bɨdidal	mɨ-bɨrirak	mɨ-misikikar

Once again we find [ɨ] in the same position as the finite [a], between the reduplicated consonants. There is the additional complication that every frequentative infinitive has [ɨ] in at least two syllables, not just the penult but also the antepenult. This issue is orthogonal to the main interest here, but this vowel could similarly be analyzed as underlying /a/, with left-to-right application of the dissimilation rule discussed below (66). This is the likely explanation at least for Type C, where both /a/'s are independently motivated by the finite forms.[25]

Buckley (1994) argues that both Type C and the frequentative are derived by infixation of /a/ before the final syllable of the stem; as mentioned, the frequentative also involves spreading of a root consonant.[26] In most cases this /a/ surfaces intact as a low vowel, but in the infinitive, when the stem-final

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[25] For example, analogy may operate between the two identical root consonants: the vowel before the rightmost [r] (*migiriraf*) could induce an identical vowel before the preceding [r] (*migiriraf*). See also Leslau (1942: 97) for slightly different forms (with gemination of the first root consonant in the infinitive, e.g. *missibibar* 'to break') which make this extra [ɨ] appear epenthetic, at least in the triliteral verbs.

[26] Similar insertion of /a/ is exploited by Angoujard and Denais (1989) to derive broken plurals of the type shown in (68) below (see §7). However, in the derivation of Type C, different approaches are typical. For example, Berhane (1991: 76) derives the [a] from normal /ʌ/ which lengthens; since [ʌ:] is ill-

syllable contains /a/, a rule of dissimilation applies.[27] With the underspecification shown in (50), deletion of [+low] on the first vowel results in a fully unspecified vowel, which by default surfaces as [ɨ].

(66)   *Low Dissimilation*

$$
\begin{array}{ccc}
\text{V} & \text{C} & \text{V} \\
\not{|} & & | \\
\text{[+low]} & & \text{[+low]}
\end{array}
$$
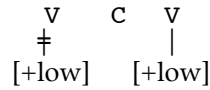
The two /a/'s are separately linked since they come from different morphemes: the first is infixed as the exponent of Type C or the frequentative, while the second belongs to the infinitive template. This rule is similar to others proposed for Kera (Archangeli and Pulleyblank 1989; cf. Ebert 1979: 20), Rwaili Arabic (Parkinson 1993), and Woleaian (Suzuki 1996).

In the purely featural analysis proposed here, loss of the [+low] feature is all that must occur. In the mixed inventory of (35), however, not only must /a/ become a high vowel but it must lose half its length also. As with Fronting (§5.1) and Guttural Lowering (§5.2), the inclusion of vowel length in the phonology serves only to complicate the analysis of these fundamentally featural processes. Together these diverse rules provide strong evidence in favor of omitting length from the phonology of Tigrinya.

6.   Closed-syllable shortening?

Of course, if vowel length were an active part of the phonology, we would expect to find rules which fundamentally affect length. A well known process of this type is closed-syllable shortening, which shortens a long vowel when it occurs in a closed syllable (e.g. Kisseberth 1970: 297, Clements and Keyser 1983: 61, Myers 1987). Shortening of this type occurred in Middle English, and has led to modern alternations as in *keep~kept* (e.g. Luick 1921: 324, Jesperson 1954: 120); subsequently the unstressed final vowel was lost, leading to the modern situation.

(67)   *Middle English closed-syllable shortening*

a.   kēp-e   →   kē . pe
b.   kēp-te   →   kep . te

Such alternations are easily attributed to a limit of two moras per syllable: if the coda consonant requires a mora for itself, then the long vowel must give up one of its moras, thereby becoming short (by definition). If closed-syllable shortening could be motivated for Tigrinya, it would be strong support for the inclusion of vowel length in the phonology. Two basic patterns have been adduced in favor of this

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formed, a featural change is invoked to produce ('long') [a]. Denais (1990: 106f) attributes the [ɨ] in the Type C infinitive to the default filling of an empty vocalic slot between the first two root consonants; the presence of this slot is for him a function of the minimum number of templatic slots that Type C requires. Since Type A requires fewer slots, there is no empty slot to be realized as [ɨ]. In my approach, the slot (i.e. the mora) dominating [ɨ] is a projection of /a/, which in the infinitive does not retain its [+low] feature due to Dissimilation.

[27] Examples such as *bararʌkna* in (65) show that Dissimilation does not occur in finite forms. One account of this fact is to stipulate that the rule is restricted to nonfinite words. A more interesting possibility, which I do not pursue here, is that the infixed /a/'s which mark Type C and the frequentative are a single vowel autosegment, multiply linked to two syllables in words where both occur. If this is the case, the single [+low] feature does not satisfy the conditions for Dissimilation. This assumption is fully compatible with the fact that both of these /a/'s become [ɨ] in the infinitive (65b); as a single multiply linked autosegment, they would necessarily undergo Dissimilation together when infinitival /a/ follows.

claim, in the broken plural and in suffixation. I argue, however, that these processes are extremely limited in nature and should not be treated synchronically as shortening.

6.1. The broken plural

Like other Semitic languages, Tigrinya forms the plurals of some nouns by suffixation — 'sound' plurals as in (11) and (12) — and others by internal changes to the stem, referred to as 'broken' plurals, which may or may not be accompanied by affixes.[28] Two common patterns, quadriliteral *CʌCaCɨC* and triliteral *ʔa-CCaC*, are illustrated below (Leslau 1941: 32f).

(68) | | Singular | Plural | Gloss |
|---|---|---|---|
| | a. | ƙʌrnʌb | ƙʌranɨb | 'eyelash' |
| | | mʌflʌs | mʌfalɨs | 'boar' |
| | b. | gʌmʌl | ʔa-gmal | 'camel' |
| | | bɨrki | ʔa-brak | 'knee' |

Palmer (1955, 1957) gives two forms of the quadriliteral plural pattern in (68a): not only *CʌCaCɨC* but also *CʌCʌCCɨC*, with a geminate consonant and [ʌ] rather than [a] before the geminate.

(69) | Singular | Plural A | Plural B | Gloss |
|---|---|---|---|
| mʌnkʌs | mʌnakɨs | mʌnʌkkɨs | 'chin' |
| kʌnfʌr | kʌnafɨr | kʌnʌffɨr | 'lip' |
| finjal | fʌnajɨl | fʌnʌjjɨl | 'cup' |
| ħarmaz | ħaramɨz | harʌmmɨz | 'elephant' |

If /ʌ/ is a short vowel, /a/ is long, and the first half of the geminate occupies a mora in the preceding syllable (as shown in (7)), then plural B looks like the result of a rule which geminates the penultimate consonant, with subsequent (and automatic) shortening of /a/ in a closed syllable. However, there is good reason to doubt the generality of this process in Tigrinya.

The earliest discussion of this pattern I know of is Palmer's. Leslau's (1941) grammar makes no mention of form B, and in the large dictionary of da Bassano (1918) I found only one such plural listed (*kʌnʌttɨb* 'provincial heads'). Several Tigrinya speakers whom I consulted did not recognize form B as a possible variant, though see also (71) below. More recent citations of these alternations (e.g. Angoujard and Denais 1989: 115, Denais 1990: 252) make no comment on the curious absence of the pattern from many sources. Since the forms they cite are all present in Palmer's work, it is unclear whether they were able to re-elicit the data from other speakers, or simply relied on Palmer.

The geminated form B is, in fact, identical to a basic broken plural template in the closely related language Tigre (Raz 1983: 19f). In Tigre it appears that the two basic forms illustrated in (69) are possible, but only one is chosen for each noun of this type; the transcription is adapted to that used in this paper.

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[28] Though found at least marginally throughout Semitic and even Afro-Asiatic (Brockelmann 1908: 428, Petráček 1960-64, Moscati et al. 1964: 89), broken plurals are particularly common in South Semitic: see McCarthy and Prince (1990b) for a recent formal analysis of Arabic plurals.

(70)   *The Tigre broken plural*

	Singular	Plural	Gloss
a.	kɨrbaj	kʌrʌbbij	'whip'
	ƙilčɨm	ƙʌlʌččim	'wrist'
	šingul	šʌnʌggɨl	'adult'
b.	misƙal	mʌsaƙɨl	'instrument for suspending'
	miwɨƙƙal	mʌwaƙɨl	'high place'
	dingɨl	dʌnagɨl	'virgin'

This similarity, combined with the lack of attestation in many sources, suggests that the form is borrowed from Tigre. Palmer's Tigrinya consultant, who supplied the data in (69), was from the Hamasen region in Eritrea, a part of the Tigrinya-speaking area not far from the Tigre-speaking area.

My consultant MM — also from Hamasen — offered the following plural forms for the words in (69).

(71)

Singular	Plural	Gloss
mʌnkʌs	mʌnakkɨs	'chin'
kʌnfʌr	kʌnʌffɨr	'lip'
finjal	fʌnʌjjɨl	'cup'
ħarmaz	harʌmmɨz	'elephant'

Alternatives such as *kʌnafir* were recognized but not considered proper. Thus this confirms in part Palmer's data. But the plural for 'chin', *mʌnakkɨs*, is striking: it has gemination **and** the vowel /a/. This is precisely what we might expect to find if the choice between /ʌ, a/ and the presence of gemination are, in modern Tigrinya, independent. Further, it presents an obvious difficulty for the length-based approach, given the putative long vowel in the closed syllable.

As illustrated below, the presence of /a/ before the final syllable (of the word or the stem) is a pervasive feature of Tigrinya plurals, even without other vowel changes in the stem.

(72)

Singular	Plural	Gloss
dang-a	danag-u	'calf (of leg)'
kʷatr-a	kʷatar-u	'pigeon'
ƙičč-a	ƙičač-u	'cake'
mʌʕanṭ-a	mʌʕanaṭ-u	'intestine'
sɨrr-e	sirar-u	'trousers'
komor-ot	komorar-u	'(priest or blacksmith's) fee'
karibb-o	karibab-u	'small skin bag'
kursi	kurasi	'chair'
dingɨl	dinagɨl	'virgin'
gʌlid-o	gʌlalid-o	'small knife'
mʌsʌguf	mʌsʌgaguf	'wild sage'

Apparently this /a/ pattern has been imposed on *mʌnakkɨs* (71), but without loss of the gemination. I conjecture that the plural template *CʌCʌCCɨC* was (in some dialects) borrowed wholesale from Tigre. It differs from the basic template in two respects: the medial vowel and gemination. Once borrowed, it is possible for these two properties to be disassociated — but only if what we observe is not actually closed-syllable shortening. In fact, *mʌnakkɨs* reflects a regularization, where one of the borrowed properties — the vowel quality — has reverted to the native norm. This result is not at all surprising if /a/ is short, but the existence of such a form is mysterious if the vowel is long.

6.2. 'Long' vowels in closed syllables

Pam (1973: 54) notes that his abstract vowel inventory incorporating length is based on "what is admittedly, in terms of productive processes, a limited area of Tigrinya morphology." Not only are the relevant data quite restricted in nature, but I argue that wider patterns in the language contradict the predictions of the quantitative approach.

We have seen in the previous section the suggestion that the broken plural alternates in (69) are a matter of template choice, rather than active closed-syllable shortening. Another reason for this conclusion is that there are many cases of the ostensible long vowel /a/ in closed syllables. Numerous examples of the shape *CaC* are given in (23) above; I give below instances in non-final syllables, many with gemination as found in plural type B (data from da Bassano 1918).[29]

(73)	danga	'calf (of leg)'	kʷankʷa	'language'
	barnos	'stink bug'	sagʷgʷa	'nickname'
	barya	'slave'	mantille	'hare'
	bayto	'meeting place'	biranna	'parchment'
	ganta	'team'	sanbuʔ	'lung'
	k̆arma	'gnat'	sagla	'sp. of fruit tree'
	k̆adra	'hard, unplowed soil'	šʌmalya	'convalescent'
	k̆afra	'year-old lamb'	k̆anza	'pain'
	k̆aflay	'merchant, caravan'	lamba	'kerosene'

These data defy references to, for example, 'la non apparition de [a] en syllabe fermée' (Angoujard and Denais 1989: 103; cf. also Lowenstamm and Prunet 1985: 204). The absence of [a] in a closed syllable is indeed predicted by their assumption of vowel length, but this is clearly not borne out.[30]

Similar data can be shown for the other vowels treated as long in the mixed inventory; see also the CVC examples in §2. Application of Fronting (§5.1) to word-final /ʌ/ is not indicated here.[31]

(74)	balik̆k̆a	'cork'	ḥinna	'sp. of plant used for dye'
	fiddo	'short pants'	gindaʕe	'sp. of plant with milky sap'
	bilk̆aṭ	'squat glass jar'	gintir	'sheep pneumonia'
	k̆itta	'short-sleeved shirt'	ʕillu	'young donkey'
	ʔinto	'curse, punishment, ruin'		

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[29] Some of these words are borrowed — e.g. *k̆aflay*, related to *k̆iflʌt* 'caravan', from Arabic *qāfila(t)* (cf. Leslau 1941: 21); *lamba* presumably from a European word 'lamp' — but crucially, the potential substitution of 'short' [ʌ] in a closed syllable has not been made, simply because it is not necessary if [a] is also short.

[30] Palmer (1958: 134f) essentially assumes the mixed inventory in (35), with five long vowels: "The long vowels are, with rare exceptions, found in closed syllables *only* when these are word-final." While such cases as in (74) to (76) are relatively rare, I do not consider them to be exceptions, i.e. violations of the basic phonotactics of the language; rather, the lexicon and morphology inevitably reflect their origin in an earlier state of the language where length was real. Further, as Palmer notes, "the frequent occurrence of an open vowel in non-final closed syllables makes it necessary to place *a* in both the short and the long vowel classes." Thus Palmer has eight vowels, including [a] and [a:]. This complicating move is unnecessary if synchronic vowel length is abandoned.

[31] In (75) and (76), examples of [u] and [o] adjacent to velars may in at least some cases be the result of assimilation to the rounding of a labiovelar (e.g. /kʷɨ/ → [ku]), and could be treated as short vowels which later undergo Coalescence. Under my analysis the output of the rule is no different from underlying /u, o/, since all vowels are short.

(75)	bu̱ltug	'sp. of panic-grass'	gulmus	'strong, burly'
	bu̱rdo	'pure food'	gu̱ndi	'big log'
	bu̱rkuta	'spherical type of bread'	gu̱rsi	'Corsican'
	tutu̱lla	'hunting horn'	du̱gri	'part of plow'
	gulħay	'bovine parasite'	širu̱bbʌ	'braided hairstyle'
	ku̱rsi	'chair'		

(76)	bʌro̱kto	'spotted, black and white'	gon̩ʔo	'natural cistern'
	habo̱bla	'hurricane'	ǩo̱llʌ	'malicious spirit'
	mo̱gdi	'lid for *meguego*'	ǩoro̱nfo	'dried fig'
	bo̱sso	'barley porridge'	ǩon̩ǩor	'smoke hole in *ħidmo*'
	ǩo̱rbabo	'bag'	to̱kla	'wolf'

See (42) above for an example of [e] in a non-final closed syllable; all such examples I have found are from vowel coalescence.

Another source of /a/ before a geminate is verbs of type B, such as /bdl/ 'hurt', whose basic characteristic is gemination of the middle consonant (Leslau 1941: 95, Berhane 1991: 176f).

(77)		Type B
	perfect	bʌddʌl-na
	gerund	bʌddil-na
	imperfect	nɨ-bɨddɨl
	infinitive	mɨ-bɨddal

The frequentative forms reported by Berhane (1991), shown above in (65), do not have gemination; it would seem that the inserted /a/ vowel essentially splits the geminate. Leslau (1941: 97), however, reports alternate forms with and without gemination, and in the alternate there is no change in the preceding /a/ vowel; presumably the alternate is the result of analogy with the true gemination in the basic forms in (77). The sequence /aCC/ stands in conspicuous contrast to the plural template in (69), and is similar to the plural *mʌnakkis* (71).

(78)	ʕaǩaǩʌn-ʌ	'he tested several times'
	ʕa̱ǩa̱ǩǩʌn-ʌ	(same)

(79)	yɨ-bbʌda̱ddʌl	'he offends several times'
	bʌda̱ddil-u	'he offended several times'

Kenstowicz (1982: 116) gives passive forms of the verb in (79) which similarly include gemination after /a/. I have seen no attestation of 'shortened' [ʌ] in the penult of a frequentative verb, as we should expect if 'shortening' in the broken plural is really the result of a difference in templates.

Another pertinent example is the adjectival suffix *-am* (80), forming adjectives from noun stems with the general meaning 'plein de, pourvu de quelque chose en abondance' (Leslau 1941: 20). It has a variant *-amma* (81), which sometimes includes in its meaning 'une note de pitié'.

(80)	ċʌrǩi	'rags'	ċʌrǩ-am	'beggar'
	lʌmṡi	'leprosy'	lʌmṡ-am	'leprous'
	mʌrzi	'poison'	mʌrz-am	'poisonous'

(81)	čʌrǩi	'rags'		čʌrǩ-amma	'poor beggar'
	lʌmṡi	'leprosy'		lʌmṡ-amma	'poor leper, pariah'
	ťʌnǩi	'hatred, misfortune'		ťʌnǩ-amma	'bad, harmful'

The longer variant entails gemination of the /m/ of the basic suffix — just as the Tigre-style variant of the broken plural involves gemination of the penultimate consonant — but in this case there is no change in the proceeding vowel. Similarly and strikingly, Leslau (1941: 19) gives 'intensive' forms of the adjective template *CʌCCaC* which are formed by adding *-a* and geminating the stem-final consonant.

(82)	gʷʌlmass-a	'robust'
	gʷʌlbatt-a	(same)
	lʌflaff-a	'talkative, gossipy'

Again, there is no change in the /a/ of the stem as a result of the consonant gemination, despite essential identity of this phonological context with that in the broken plural data.

These data from gemination in the frequentative, in the suffix *-am(ma)*, and in stems preceding the suffix *-a* all indicate that the supposed closed-syllable shortening found in the broken plural is by no means the general case in Tigrinya, and to treat it as an automatic phonological process is poorly motivated. Rather, the quite limited alternation between *CʌCaCiC* and *CʌCʌCCiC* does not support the inclusion of vowel length in the phonology of Tigrinya, and should be analyzed in a way which captures its ad hoc character — namely, by a simple choice between the two templates, one with /a/ and the other with /ʌ/ (or sometimes /a/) and a geminate consonant. This approach is discussed further in §6.4.

6.3.   The suffix *-t*

Plural type B may be borrowed from Tigre, but an unambiguously native case of proposed closed-syllable shortening comes from the suffix *-t*, which is used primarily to mark feminine gender and plural number. When this suffix is added to a consonant-final stem, the resulting cluster is resolved by insertion of an epenthetic vowel to yield [ti].

(83)	mɨdr-awi	'earthly (m.sg.)'		mɨdr-awi-t	'earthly (f.sg.)'
	kʌfat-i	'(man) who opens'		kʌfat-i-t	'(woman) who opens'
	mʌ-ǩťʌf-i	'scissors (sg.)'		mʌ-ǩťʌf-ti	'scissors (pl.)'

Before the *-t* suffix, the vowel in the stem-final syllable can undergo a change. Most widely attested is that /a/ becomes [ʌ].

(84)	ǩʌťan	'thin (f.sg.)'		ǩʌťʌn-ti	'thin (pl.)'
	rʌǩǩaǩ	'thin (f.sg.)'		rʌǩǩʌǩ-ti	'thin (pl.)'
	ħaddas	'new (f.sg.)'		ħaddʌs-ti	'new (pl.)'
	kʌbbad	'heavy (f.sg.)'		kʌbbʌd-ti	'heavy (pl.)'
(85)	wʌlad-i	'parent'		wʌlʌd-ti [32]	'parents'
	ʔagʌlgal-i	'aide'		ʔagʌlgʌl-ti	'aides'
	ǩʌšaš-i	'deceiver'		ǩʌšʌš-ti	'deceivers'
	ǩʌllab-i	'one who feeds'		ǩʌllʌb-ti	'those who feed'

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[32] By regular rule, /t/ becomes [d] after another /d/, e.g. *wʌlʌd-ti → wʌlʌd-di* (Leslau 1941: 14).

(86)	?amħar-ay	'Amhara man'		?amħar-ʌy-ti	'Amhara woman'
	ħamasen-ay	'man from Hamasen'		ħamasen-ʌy-ti	'woman from Hamasen'
	sals-ay	'third (m.)'		sals-ʌy-ti	'third (f.)'
	taħt-aw-ay	'inferior (m.)'		taħt-aw-ʌy-ti	'inferior (f.)' This change is

phonologically the same as discussed for the broken plural above. A somewhat more limited alternation, since the necessary context is less common, shows /u/ becoming [i].

(87)	nɨgus	'king'		nɨgis-ti	'queen' ħimum 'sick (m.)'
	ħimɨm-ti	'sick (f.)'			
	šɨbbuǩ	'good (m.)'		šɨbbiǩ-ti	'good (f.)'

(88)	mɨrak-ut	'calves'		mɨrak-it-ti	'calves' [alternate]

These alternations, of course, correspond to the historical centralization shown in (33c), applying to the apparent result of closed-syllable shortening. An analysis which accepts modern phonological length can treat this as synchronic shortening as well: in the closed syllable, the vowel shortens and undergoes centralization (Pam 1973: 49f); or any vowel feature which requires a branching nucleus is forced to delink (e.g. Denais 1990: 221f, Lowenstamm 1991: 963). I am not aware, however, of any examples of [i] alternating with [ɨ], though that possibility is certainly predicted by the quantitative approaches.[33]

The suffix -t is the only one which triggers these changes: other suffixes leave a supposed 'long' vowel in the preceding syllable intact (even with the same verbs and clusters illustrated above).

(89)	a.	sʌbir-na	'we broke'
		sʌbir-ka	'you broke (m.sg.)'
		sʌbir-ki	'you broke (f.sg.)'
		sʌbir-kum	'you broke (m.pl.)'
		sʌbir-kɨn	'you broke (f.pl.)'
	b.	mɨ-graf-kum	'your (m.pl.) whipping'
		mɨ-biddal-ki	'your (f.sg.) hurting'
		mɨ-birak-na	'our blessing'

(90)	a.	rʌkib-u-wwa	'he found her'
		rʌkib-u-kka	'he found you (m.sg.)'
		rʌkib-u-nni	'he found me'
	b.	ǩʌtil-na-yyo	'we killed him'
		ǩʌtil-na-kki	'we killed you (f.sg.)'

(91)		nɨgus-ka	'your king'
		sašun-kɨn	'your box (f.pl.)'
		ťel-na	'our goat'
		ťel-ka	'your goat (m.sg.)'
		?ɨd-ki	'your hand (f.sg.)'
		?a-?daw-kum	'your hands (m.pl.)'

(92)		suǩ-ta	'silence'

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[33] For Denais (1990: 297ff), all shortening results in [ɨ], but this can later become [ʌ] by 'propagation' of the [low] feature from an adjacent /a/ or /ʌ/. Thus he actually derives the plurals in (84) from masc.sg. stems such as ǩʌtin. He does not discuss the form ħamasen-ʌy-ti (86), where the preceding vowel is /e/. Pam (1973: 49) treats the vowel alternation in nʌbiy 'prophet' and tɨ-nbɨy-ti 'prophecy' as the result of shortening. I argue in §6.4, however, that this pattern has to be treated as templatic.

Since 'length' is preserved in word-final syllables and in word-internal syllables before other suffixes, it must be some special property of the suffix *-t* that triggers these vowel alternations.

For Pam (1973: 53) and Denais (1990: 220ff, 256f), the special status of *-t* follows from its shape as a single consonant, as opposed to the other suffixes, which all contain a vowel. For Pam, the mechanism is rule ordering. Vowel Shortening (p. 49) refers specifically to a vowel followed by two consonants at the end of the word.

(93) *Vowel Shortening* (Pam 1973: 49)

$$V \rightarrow [-\text{long}] \ / \ \_\_\_CC\#$$

This rule crucially applies before Epenthesis, which removes part of the environment necessary to proper application (since the final vowel means that the consonant cluster is no longer word-final).

(94) | *Suffixation* | nɨgus-t | nɨgus-ka |
|---|---|---|
| *Vowel Shortening* | nɨgɨs-t | — |
| *Epenthesis* | nɨgɨs-tɨ | — |

If Epenthesis applied before Shortening, then intermediate *nigus-ti* ought to behave like *nigus-ka*, with no change in the /u/; but this is incorrect, so the opposite ('counterbleeding') ordering is necessary.

Two objections to this approach come to mind. One is that the environment for Shortening (93) is quite ad hoc: it essentially refers to a 'superheavy' word-final syllable, rather than any closed syllable as in Middle English (67) and other languages with productive closed-syllable shortening. Further, it is a stipulative account of shortening since it does not refer to syllable structure, just to a consonant cluster. (This rule also cannot account for the shortening in the broken plural, but Pam is among the many who do not mention such data.) A less stipulative alternative to explicit reference to a final consonant cluster is that final consonants are extrasyllabic (excluded from syllable structure), so that at the relevant stage of the derivation the actual syllables are as follows (cf. also Lowenstamm and Prunet 1985: 204).

(95) a. nɨ . gu \<s\>
b. nɨ . gus \<t\>   →   nɨ . gɨs \<t\>

This approach to syllable structure is well-motivated in languages like Arabic, where final syllables clearly do pattern differently from other syllables: only in that position are superheavy syllables permitted (i.e. *CvCC* and *CvvC*); a final *CvC* syllable is treated as light, just like *Cv*; and word minimality is not satisfied by *CvC*, only by *CvvC* or *CvCC* (among monosyllables). All of these phenomena can be explained by one assumption, namely that the final C is not part of the syllable (see, for example, McCarthy and Prince 1990a). In Tigrinya, on the other hand, such facts do not hold: syllable types are the same in final and non-final positions (recall the Epenthesis facts from §1), and a final C is crucial in the determination of minimality (§2).[34] And extrasyllabicity is of no help in capturing the contrast between (intermediate) *nigus-t* and *nigus-ka,* since the stem-final /s/ in *nigus-ka* is not word-final, and by the Peripherality Condition (e.g. Hayes 1982, Harris 1983) it cannot be extrasyllabic.

The second objection to Pam's approach is quite simply that the analysis depends on opaque rule ordering: there are many strong arguments against appeal to intermediate stages in the derivation, as

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[34] As Ullendorff (1955: 194) notes, "stress in Tigrinya falls almost invariably on the last syllable." The lack of a clear metrical stress system means that the third property which supports final extrasyllabicity in Arabic cannot be tested for Tigrinya; but certainly, stress placement provides no motivation for it in Tigrinya. See also Leslau (1941: 15).

voiced with particular force by Prince and Smolensky (1993). In the alternative that I develop below in §6.4, there is no crucial reference to unattested intermediate representations.

Denais (1990) takes an approach which resembles Pam's in some respects. The idea is that because it does not contain a vowel, *-t* is prosodically defective, and unable to form a prosodic constituent of its own; it combines in the same prosodic word as the preceding material (the stem). Other suffixes, however, form independent prosodic words, marked here with square brackets.[35]

(96) a.   [nɨgus] [ka]   →   nɨguska
     b.   [nɨgust]   →   nɨgɨst   (→ nɨgɨsti)

If shortening occurs before two-consonant clusters located at the end of a prosodic word, then it applies apply only before *-t,* and not before suffixes such as *-ka.*[36] Like Pam, Denais makes specific reference to a word-final cluster, as well as an intermediate representation (before Epenthesis) at which the /t/ is prosodically incomplete. In addition, he must posit prosodic word constituents which seem to serve no function other than to account for vowel shortening. To my knowledge, other criteria by which one might test the validity of the word boundary — such as the application of velar spirantization (e.g. Leslau 1941: 5, Ullendorff 1955: 56f), obligatory within words as traditionally defined, but optional across word boundaries — do not lend support to the contrasting constituencies in (96).

It should also be noted that Guttural Lowering applies unimpeded in the syllable before the *-t* suffix. This indicates that there is no absolute prohibition on the 'long' vowel [a] appearing in that syllable. The templates here are *CʌC(C)ʌC.*

(97)   mʌ ʕ <u>a</u>l-ti   'day'
         ṡʌħ<u>a</u>f-ti   'writers'
         ʔaṡb<u>a</u>ʕ-ti   'finger'
         mʌ ṡ ħ<u>a</u>f-ti   'books'
         bʌll<u>a</u>ħ-ti   'sharpened (pl.)'
         rʌd<u>a</u>ʕ-ti   'aides'

These facts hold despite the apparent evidence to the contrary in (84) to (86); recall from §5.2 that treating the [a] which results from Lowering as a short vowel makes the disconfirmed prediction that it should be distinct in its realization from underlying /a/. Rather than closed-syllable shortening, what appears to be happening in cases like *nɨgɨsti* is related directly to the features of the vowel in the syllable preceding *-t,* as we see in the next section.

6.4. Alternatives to shortening

If we reject length in Tigrinya, we must still provide an analysis of the vowel alternations before *-t* in (84) to (88). There are two possibilities. One is to stipulate as a property of the suffix *-t* that only the feature

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[35] Denais (1990: 256) states that "la suffixation de /ka/ est celle d'une unité prosodique complète dont on déduit l'autonomie phonologique de deux unités. En revanche, la suffixation de /t/ est celle d'une unité incomplète et de ce fait induit un processus d'ajustement, en l'occurrence de réduction vocalique; /t/ constitue la quatrième consonne d'un seul 'mot' phonologique."

[36] In the Charm and Government terms employed by Denais (1990: 221), vowel shortening is the result of "l'agrammalité de la suite finale de trois creux." Each syllable contains a sonority peak (*sommet*); the second half of a long vowel is a trough (*creux*), as is any consonant. Thus the sequence /u:st/ is a peak plus three troughs, and vowel reduction consists of removing the first trough, creating a short central vowel in [ɨst].

[high] is licensed in the preceding syllable, or (equivalently) that contrasts involving [low], [back], and [round] are prohibited there. With the feature specifications in (50), either restriction will permit only the distinction between [ɨ] and [ʌ] to be marked.[37]

(98)   *[low], *[back], *[round] / [... ___ ...]$_\sigma$ {t}

Such centralization in a closed syllable is a perfectly natural process; parallel cases can, for example, be found in closed-syllable laxing of (high) vowels in Quebecois French (Dumas 1987: 92f) and Javanese (Horne 1974: xi-xii). I do not dwell on the formalization of (98) since I turn now to what I consider to be a preferable analysis.

Whatever the general motivation of closed-syllable centralization might be, it is important to remember that in Tigrinya this is not a general process; rather, it occurs just before *-t.* The only other context for centralization is the dubious example of the broken plural alternate discussed in §6.1, but I have already argued that this should be treated as a different choice of template, as shown in (99).

(99)   *normal plural*   CʌCaCɨC
            variant   CʌCʌCCɨC

Thus the vowel quality /ʌ/ is listed as a property of the template, and synchronically is not attributable to the following geminate. This approach freely accommodates the additional alternate *CʌCaCCɨC*, which differs from the basic plural only in gemination, not in vocalism.

The templatic analysis of the broken plural leads us to an additional possibility for 'shortening' before *-t,* namely that the vowel change has been morphologized as a new template or vocalism which co-occurs with the suffix *-t.* In support of this position is the highly significant fact that all the examples of supposed closed-syllable shortening (including the broken plural) are in a small set of templates: we do not find *-t* added to a non-templatic stem, and therefore no apparent shortening occurs in non-templatic contexts.[38] Surely this restricted morphological distribution is no coincidence. We can therefore treat the marking of the plural and feminine as a difference in suffix **and** template. For example, the pair *wʌlad-i/wʌlʌd-ti* 'parent(s)' in (85) is based on the following template-suffix combinations (shown schematically without the effect of epenthesis).

(100)   *sg. agentive*   CʌCaC-i (-t *fem.*)
            pl. agentive   CʌCʌC-t

Similarly, adjectives such as *kʌt'in/kʌt'an/kʌt'ʌn-ti* 'thin' (84), and the participles *ħimum/ħimim-ti* 'sick' (87), result from the association of root consonants to the following templates.

(101)   a. *m.sg. adjective*   CʌCiC
             f.sg. adjective   CʌCaC
             pl. adjective   CʌCʌC-t

         b. *m.sg. passive participle*   CɨCuC
             f.sg. passive participle   CɨCiC-t

Finally, the only regular occurrence of *-t* not immediately following a template is with the ethnonymic suffix illustrated by *ʔamħar-ay/ʔamħar-ʌy-ti* 'Amhara' (86). Here too the [t] can be reconceptualized as

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[37] A higher-ranking requirement on Guttural Lowering would override this prohibition, thereby permitting the outcomes in (97). See Prince and Smolensky (1993) and Steriade (1995) for related notions.

[38] The only exception I know of is *ħaw-ti* 'sister', derived from *ħaw* 'brother'. No centralization occurs, but this could be attributed to the word-initial guttural.

co-occurring with the appropriate vowel underlyingly. That is, the feminine [ʌyti] is not a concatenation of the masculine /ay/ plus feminine /t/, with resultant centralization/shortening, but rather a single element /ʌyt/. Its status is then parallel to the plural suffix /ot/, e.g. *ʔamħar-ot* 'Amharas', which is unanalyzable into component parts.

(102)   *male ethnonym*   -ay
              female ethnonym   -ʌyt
              plural ethnonym   -ot

In this approach, of course, the quality of the feminine vowel /ʌ/ is not derived from masculine /a/, any more than the quality of plural /o/ is derived. Under such an analysis we correctly predict that apparent shortening is restricted to specific morphological categories, and that no general rule will shorten vowels in closed syllables. The same unitary analysis can be given to the plural suffix *-itti* illustrated in (88), reinforcing its relationship to the plural suffix *-witti* (cf. Leslau 1941: 34f).

     In addition to the broken plural, a more direct analogy for treating the alternating stems before *-t* as different templates is found in the 'abstract noun' template *ti-CCiC-t* (Leslau 1941: 25). While the stem-final syllable of this template has a 'short' vowel, this clearly must be a distinct template (not just affixation and shortening), since the stems to which these nouns are related — shown in the right column — can have a variety of vocalisms and syllabic patterns.[39]

(103)   ti-ʕgis-ti   'patience'   ʕiggus   'patient'
         ti-hrif-ti   'greed, strong desire'   hirfi   'greed, gluttony'
         ti-hki-t   'laziness'   hakkay   'lazy'
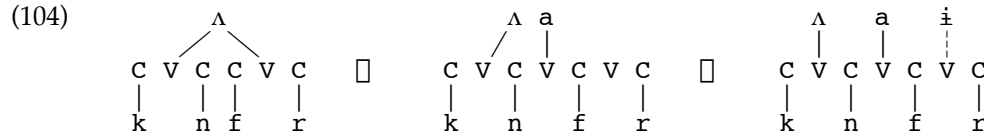   ti-nbi-t   'prophecy'   nʌbiy   'prophet (m.)'

The appropriate description of the relationship between pairs such as ʕiggus and *ti-ʕgis-ti* is not that one is derived from the other by affixation, but rather that both are derived from an abstract consonantal root, /ʕgs/, which associates to a particular template depending on the morphological properties of the intended word: for the adjective the template is unaffixed *CiCCuC*, while for the abstract noun it is *ti-CCiC-t*, with a prefix and suffix. The templates in (100) and (101) are thus formally of the same category as *ti-CCiC-t*: a templatic shape with particular additional properties such as vocalism and co-occurring affixes; cf. also the plural template *ʔa-CCaC* (68b), which always occurs with a prefix. The presence of a central vowel /ʌ/ or /i/ in the template may be a morphologization of the pattern which resulted historically from closed-syllable shortening, but is not attributable to an active phonological process in the modern language.

7. The broken plural revisited

It should be mentioned at this point that Angoujard and Denais (1989: 107ff) refer to phonological vowel length in their analysis of the Tigrinya broken plural. I show here that this reference is not crucial because the difference between /ʌ/ and /a/ is redundantly encoded by a featural contrast, as noted in §3. Specifically, in a word such as singular *kʌnfʌr* 'lip', the plural is derived by infixing the 'long' vowel /a/ before the last syllable. The last vowel in the output *kʌnafir* is explained by the fact that the inserted

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[39] As is typical in Tigrinya, the last two forms, *ti-hki-t* and *ti-nbi-t*, show [i] for expected [iy], and thus require no final epenthesis. This can be treated either as coalescence of /i/ and /i/, or as linking of the 'glide' to an empty syllable nucleus, with realization as [i]. See Buckley (1994) for more discussion. For 'prophecy' da Bassano (1918) gives *ti-nbiy-ti*, without coalescence; this is parallel to the cases illustrated in (40) which fail idiosyncratically to undergo other types of coalescence.

vowel /a/ disrupts the multiple input association of the features for /ʌ/ in the singular. I recast the derivation in terms of the features assumed above, and omit vowel length to show that it is unnecessary.

(104)

```
        ʌ                      ʌ  a                     ʌ   a   ɨ
       /|\                    /|  |                     |   |   |
    C V C C V C    →       C V C V C V C    →        C V C V C V C
    |   | | |             |   | | | |                |   | | | |
    k   n f r             k   n f r                  k   n f r
```
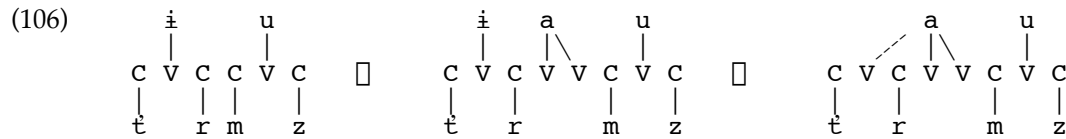
The last vowel of the stem cannot maintain its original association to the /ʌ/ because, once the /a/ has been inserted, that would result in crossed association lines, which are strictly prohibited. The dissociation leaves the last vowel without features, and it will be realized as default [ɨ], just as an epenthetic vowel is. Thus a core insight of Angoujard and Denais' analysis — that the final vowel of the plural template becomes [ɨ] as a direct consequence of the insertion of /a/ — does not depend on vowel length.

A further insight of their approach involves words which have the vowel [ɨ] in the first syllable in the singular, but [ʌ] in that position in the plural (Angoujard and Denais 1989: 107).
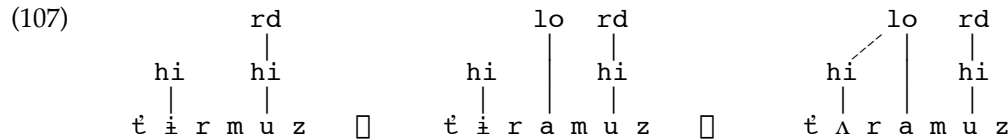
(105)

Singular	Plural	Gloss
ƙinfɨz	ƙʌnafɨz	'boar'
ƙilŝim	ƙʌlaŝim	'forearm'
ṫɨrmuz	ṫʌramuz	'bottle'

Here the role of vowel length at first seems more significant to the analysis. Suppose that /a/ is, in fact, a long vowel, and that [ɨ] and [ʌ] are short. It is then possible to derive the initial [ʌ] essentially by spreading the features of /a/ to the preceding short vowel.

(106)

```
      ɨ      u                 ɨ    a     u                    a      u
      |      |                 |    |\    |                   /|\     |
   C V C C V C    →        C V C V V C V C    →          C V C V V C V C
   |   | | |               |   |   | |                  |   |     | |
   ṫ   r m z               ṫ   r   m z                  ṫ   r     m z
```

This approach fits most easily into the assumptions of Pam, for whom there is no featural difference between /a/ and /ʌ/, simply a length difference. But since Angoujard and Denais (1989: 111) do not share this assumption, they spread only one feature of /a/, and not the entire set of features; as a result, vowel length ceases to play a significant role. Adapting once again from the original notation, we see that an equivalent derivation is possible without reference to length. (Consonant features are omitted for simplicity.)

(107)

```
         rd                    lo  rd                      lo   rd
         |                     |   |                        \   |
    hi      hi              hi      hi                   hi       hi
    |       |               |       |                     |       |
    ṫ ɨ r m u z    →        ṫ ɨ r a m u z    →           ṫ ʌ r a m u z
```

In this approach, the combination of features [hi, lo] is interpreted as mid (cf. Schane 1984, Selkirk 1991, and others). The important point is that since [ʌ] is marked with a height feature that /a/ does not bear (but which it shares with /ɨ/), we do not need length to formalize this insight. In fact, the only crucial role that vowel length plays in Angoujard and Denais (1989) is to derive variants such as *kʌnafir* and *kʌnaffir* in (69); but I have already argued that these examples do not reflect true closed-syllable shortening, and do not support the inclusion of synchronic vowel length in Tigrinya.[40]

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[40] While the issue is largely orthogonal to the question of vowel length, it should also be noted that the two insights of Angoujard and Denais' analysis are not exceptionless. First, there are words in which

8. Conclusion

The most economical and elegant analysis of Tigrinya phonology will choose either features or length as the operative distinction between vowels such as [ʌ] and [a]. As we have seen, features play a crucial role and a radically quantitative approach such as Pam (1973) is untenable. But even a less economical analysis which takes the featural distinctions to be basic, and length to be an additional factor in the phonology (e.g. Denais 1990, Berhane 1991), creates numerous complications which are avoided in an analysis which makes use of features alone. The purely featural approach advocated here accounts readily for the facts of syllable structure, minimality, coalescence, fronting, lowering, and dissimilation. In addition, the proposed reanalysis of 'shortening' has the advantage of treating this empirically marked pattern as formally marked as well, rather than (falsely) as the general situation predicted by the quantitative analysis.

---

the plural preserves /ʌ/ in the final syllable, e.g. *mʌzʌwwʌr → mʌzʌwawʌr* 'wheel, machine' (da Bassano 1918, contra Angoujard and Denais 1989: 116), and *baldʌngʷ-a → baladʌng-u* 'bean' (Pam 1955, contra *balading-a* in da Bassano 1918). Such examples, like those in (72), lend support to the view that /a/-insertion is formally distinct from other aspects of the plural, such as vowel quality and presence of gemination, and therefore the intersection of these properties can vary across words and dialects. Second, the spreading of [low] to the first vowel of the plural is not universal; for example, *dingil* 'virgin' has both *dʌnagil* (da Bassano 1918, Palmer 1955) and *dinagil* (Leslau 1941, Pam 1973) as attested plurals, and for *dimmu* 'cat' Pam (1973) gives *dimamu* while other sources give *dʌmamu*.

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