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*Luganda and the strict layer hypothesis**

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1 Introduction

The ability of a language's syntax to determine the application *vs.* non-application of postlexical phonological rules has by now been firmly established in a number of languages. Such rules, which apply above the word level, have come especially from the prosodic aspects of phonological structure, e.g. effects of syllabification, stress-accent, duration and tone. Much of the interest in this syntax–phonology interaction has centred around two general questions: (i) which specific properties of the syntax are available to affect the application of phonological rules?; (ii) how should these syntactic properties be incorporated into the phonology?

While the answer to the first question logically ranges from one extreme (all syntax) to the other (no syntax), the correct answer most certainly lies somewhere in between. The (ir)relevance of X-bar theory, c-command, traces and labelled brackets has been argued from a number of languages (see especially Selkirk 1984, 1986; Kaisse 1985; Nespor & Vogel 1986; Chen this volume; and the references cited in these works).

Whatever constraints there may be on the syntactic content that is phonologically relevant, one must still address the second question concerning the form in which the syntax is presented. Two logical positions are available, both of which have been taken. The most straightforward approach would be to say that syntactic conditions are incorporated directly into the phonological rule(s) in question. For a phonological rule to apply to the sequence A#B, it may be necessary to add to the phonological structural description of the rule the requirement that A and B belong to the same X^{max} (and perhaps also that B must c-command A within this X^{max}). We shall refer to this view as the DIRECT SYNTAX

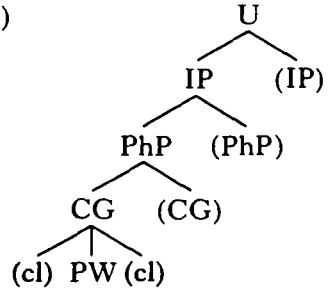
APPROACH (DSA), which has been taken most recently by Kaisse (1985) and Odden (this volume). It is important to note that the only constraints that the DSA can impose on the syntax–phonology interface are those placed on the actual syntactic input itself (cf. our first question).

The opposing view, which we shall refer to as the INDIRECT SYNTAX APPROACH (ISA), proposes a two-step process. First, the same syntactic input assumed by the DSA is used to establish strictly phonological domains. Second, each postlexical rule is encoded for how it interacts with these domains. These P-domains thus mediate between the syntax and the phonology proper.

There appear to be two major advantages to having the mediating P-domains. First, there have been several cases discussed in the literature, e.g. Ewe (Clements 1978) and Chi Mwi:ni (Kisseberth & Abasheikh 1974), where several rules apply within what would be the same P-domain. In the DSA it would appear to be an accident that the same (sometimes cumbersome) syntactic conditions have to be stated in several different rules. The second advantage is that the ISA allows us to place principled constraints on the syntax–phonology interaction that are not statable in the DSA.

To see why this is so we turn to the most constrained ISA, namely Selkirk's (1980a, b, 1984) view that these P-domains are arranged in a prosodic hierarchy, as seen in (1):

(1)



As seen, an utterance is divided into one or more intonational phrases, each of which is further divided into one or more phonological phrases. Finally, each phonological phrase consists of one or more clitic groups (a domain introduced by Hayes 1984), each of which consists of a phonological word with any preceding or following phonological clitics. The structural properties of the prosodic hierarchy have come to be known via the STRICT LAYER HYPOTHESIS (SLH), which Nespor & Vogel (1986: 7) present as in (2):

(2) a. A given nonterminal unit of the prosodic hierarchy, X^p, is composed of one or more units of the immediately lower category, X^{p-1}.

b. A unit of a given level of the hierarchy is exhaustively contained in the superordinate unit of which it is a part.

Given the SLH, a surface string will crucially have a unique parsing into hierarchical domains. Without the SLH the same sequence ABC might be parsed AB–C on the basis of one syntactic property, but A–BC on the basis of another. As stated by Hayes (1984: 8–9): 'a purely syntactic theory of juncture [i.e. the DSA] predicts that a language could have two phonological rules that referred to overlapping domains'. Hayes goes on to say (p. 9): 'If two rules in a language refer to different phrasal domains, then the smaller domains must form subparts of the larger ones. This is a direct consequence of the Strict Layer Hypothesis... If a case of overlapping rule domains exists, it would form a very serious counterexample to the theory, regardless of how the details of the analysis were set up.' The advantage of the ISA is therefore that it actually makes (falsifiable) claims about the syntax–phonology interface, while the DSA does not. Or, as Hayes has further pointed out (personal communication), the ISA is a theory, while the DSA is not.

In the above discussion we have thus given reason to prefer, *a priori*, the ISA. Any potential counterexample to its claims (which, by the way, go beyond the issue of overlapping domains) is thus of considerable theoretical interest. In the following sections we shall demonstrate that the Bantu language Luganda does in fact have overlapping postlexical domains. In §2 we examine the postlexical tone domain (TD) in which the rule of Low (L) Tone Deletion (LTD) applies. In §3 we examine the postlexical quantity domain (QD), at the end of which Final Vowel Shortening (FVS) applies. After demonstrating that the TD and the QD overlap, in §4 we consider and reject alternatives to Selkirk's prosodic domain theory and arrive at the conclusion in §5 that the only way to maintain the SLH is to make P-domains relative to different tiers (tonal *vs.* skeletal in the case of Luganda).

2 The tone domain (TD)

In this section we shall examine the domain within which the rule of L Tone Deletion applies. It is first necessary to introduce the basic tone system of Luganda.

2.1 Tone in Luganda

The tone-bearing unit (TBU) in Luganda is the mora, which may consist of a CV, V or (underlyingly) syllabic consonant. Following Stevick (1969), we consider that each mora is underlyingly tonic or non-tonic. As in Hyman (1982), we mark tonic moras with an underlying linked High (H) tone, while non-tonic moras lack any underlying tone at all. In other words, only H tones occur in underlying representations. On the surface, each mora carries either H or L tone (ignoring downdrift and a marginal downstep phenomenon), though, as we shall see, an HL falling tone may

occur on a final mora. There are no LH rising tones within the same syllable on either one *or* two moras.

Turning to the lexical tone rules that will be relevant for our study, these are most easily detected in the verbal paradigm. Consider, then, the present tense forms in (3):

```
(3) a.  /a–gul–a/  → a–gul–a    'he buys'
    b.  /a–lab–a/  → a–láb–à    'he sees'
            H
    c.  /tu–gul–a/ → tú–gùl–a   'we buy'
          H
    d.  /tu–lab–a/ → tú–làb–a   'we see'
          H   H
```

These forms show all non-tonic moras in (3a), one tonic mora in (3b) and (3c), and two tonic moras in (3d). All tonic moras surface with H tone except for the second mora in (3d). This is because of the operation of what Goldsmith (1984) terms 'Meeussen's Rule', in (4):

```
(4) Meeussen's Rule (MR)
    x       x
    |       |
    H → L / H —
```

MR is, in fact, the only source of L tones in the lexical phonology.

A second rule that is needed will be presented as one of H Tone Doubling. This rule copies an H tone to the right of the last H of a word, if this latter H is preceded by a non-tonic mora:

```
(5) H Tone Doubling (HTD)
       (x)  (x)  x
        |        |
    ø → H  /     H —]w
```

We shall see in §3 that the rule in (5) also introduces a mora (x) if the word-final H happens also to be on the word-final mora. The derivations of (3b) and (3d) are thus given in (6):

```
(6) a.  /a–lab–a/    b.  /tu–lab–a/
            H                H   H      (UR)
                H                       (HTD)
                L                L      (MR)
```

Now consider the verb forms in (7):

```
(7) a.  /tu–li–lab–a/     → tú–lì–làb–a      'we will see' (fut2)
          H  H  H
    b.  /tu–li–ba–lab–a/  → tú–lí–bá–láb–à   'we will see them' (fut2)
          H  H     H
```

As seen in (7a), the fut2 morpheme -*lí*- is clearly tonic. Both it and the tonic verb root -*lab*- have undergone MR (which applies iteratively right to left in such forms). In (7b), however, we observe surface H tones on the first four moras, rather than having H–L pitch drops on both *tu–lí–* and *lab–a*, as would be predicted by HTD and MR. In order to get this H-plateauing effect, a rule of L Tone Deletion is proposed of the form in (8):

(8) *L Tone Deletion* (LTD)

$L_1 \rightarrow \emptyset$ / H—H

Any number of L tones are deleted between H tones. This rule is responsible for the oft-made observation that there can be at most one pitch drop per Luganda word (McCawley 1970; Heny 1971; Heny & Wheeler 1982; Hyman 1982). The derivation of (7b) proceeds then as in (9):

(9) tu–li–ba–lab–a 'we will see them'

H H H		(UR)
	H	(HTD)
L	L	(MR)
ø		(LTD)

All that remains to be said about this form is that the toneless moras found between the two Hs all become H. We refer to this process as H-PLATEAUING (HP) and assume that the output (perhaps driven by the obligatory contour principle)[1] is a single H autosegment linked to all four moras.

The above completes the brief introduction to the lexical tonology of Luganda (for more discussion see Hyman 1982). In presenting examples we shall provide both an autosegmental and a segmental representation. Written beneath the moras, all Hs represent H tones which have survived both MR and LTD. All Ls will represent H tones which have undergone MR (and not undergone LTD), while the symbol ø will stand as a place holder for an H which has undergone first MR and then been deleted by LTD. Thus all three symbols, H, L and ø, have been tonic (H) at some stage in the derivation, while strictly non-tonic moras will lack any indication at all.

The segmental notation will reflect the operation of HP. Thus, we will transcribe (7b) as in (10):

(10) tú–lí–bá–láb–à
H ø H L

It will also reflect the phrase-level operation of the rule of leftward H Tone Spreading (HTS) seen in (11a):

(11) a. tú–làb–á é–bí–kópò 'we count cups'
H L H L

b. a–láb–à e–bi–kópò 'he counts cups'
H L H L

In (11a) the H of *e–bi–kópò* 'cups' spreads leftwards on to all of the non-tonic moras available: the final mora of the verb, as well as the two preceding moras of the noun. In (11b), on the other hand, HTS does not apply. This is because its application requires that the spreading H tone cross a postlexical juncture (Hyman 1982). Since the last mora of the verb *a–láb–à* 'he sees' has a linked L tone, the H of *e–bi–kópò* cannot cross the postlexical juncture. Thus, as observed, HTS fails to apply even to the first two moras of the noun itself.

The rule of HTS is thus sensitive to the difference between a linked L and the absence of a tone. In many cases the non-tonic moras that have not received tone via HP or HTS will instead receive a default L tone. Thus, the non-tonic form *a–gul–a* 'he buys' seen in (3a) is potentially realised as L–L–L on the surface. Nearly all previous studies of Luganda tone have, however, cited forms as they occur with a final H intonational tone (Tucker 1962; Cole 1967; Stevick 1969; etc.). With this final H, (3a) would surface as L–H–H – i.e. exactly the same as it would surface via HTS from a following postlexical unit. In our study, all forms are cited as they would appear prior to submitting them to this H intonational tone.

2.2 Postlexical LTD

As stated above, previous Luganda studies have claimed that the word can have at most one H to L pitch drop. This actually is not quite accurate, since more than one H to L pitch drop may in fact be proscribed in syntactically determined postlexical strings of more than one word. As in single (lexical) words, we attribute this to the rule of LTD. When two words come together within the appropriate tonal domain, each having an H to L pitch drop, the L(s) of the first word are deleted by LTD, since they are, within this domain, surrounded by H tones. In the following sections we shall examine postlexical LTD as it occurs within verb+α sequences within a clause. We shall see that the TD is established only when certain requirements are met both on the verb and on what follows it.

2.2.1 *Nature of the verb.* In this subsection we shall keep constant as the verb complement the proper name *Walúsìimbì*, which, as indicated, has a pitch drop between its second and third moras. The examples in (12) show the TD involving this complement after nine different affirmative verb forms:[2]

(12) a. tú–làb–a / tú–láb–á wálúsìimbì — pres
H L H Ø H LL L — 'we see W.'

b. tú–làb–yè / tú–láb–yé wálúsìimbì — perf
H L LL H Ø ØØ H LL L — 'we have seen W.'

c. tw–áá–láb–yê / tw–áá–láb–yé wálúsìimbì — past1
HØ Ø]HL HØ Ø]HØ H LL L — 'we saw W.'

d. tw–áá–làb–à / tw–áá–láb–á wálúsììmbì — past2
H L L H Ø Ø H LL L — 'we saw W.'

e. tú-náá–láb–à / tú–náá–láb–á wálúsììmbì — futi
H Ø H L / H Ø H Ø H LL L — 'we will see W.'

f. tú–lì–làb–a / tú–lí–láb–á wálúsììmbì — fut2
H L L H Ø Ø H LL L — 'we will see W.'

g. ne tú–làb–à / ne tú–láb–á wálúsììmbì — narr
H L L H Ø Ø H LL L — 'and we saw W.'

h. tu–lab–ê / tu–lab–é wálúsììmbì — hort
HL HØ H LL L — 'let's see W.'

i. tw–áándí–láb–yê / tw–áándí–láb–yé wálúsììmbì — cond
H Ø Ø]HL H Ø Ø]HØ H LL L
'we would have seen W.'

When *Walúsììmbì* (H LL L) follows the affirmative present, perfect, near past, distant past, near future, distant future, narrative, hortative and conditional forms, the H to L pitch drop that would have been realised on the verb in isolation (as shown) has been lost – each verb has undergone LTD.

Not so in the corresponding negative sentences in (13):

(13) a. te–tú–làb–à walúsììmbì — pres
H L L H LL L — 'we don't see W.'

b. te–tú–láb–yê walúsììmbì — perf
H Ø]HL H LL L — 'we haven't seen W.'

c. te–tw–áá–làb–yè walúsììmbì — pasti
H L LL H LL L — 'we didn't see W.'

d. te–tw–áá–làb–à walúsììmbì — past2
H L L H LL L — 'we didn't see W.'

e. te–tú–ú–láb–è walúsììmbì — futi
H H L H LL L — 'we will not see W.'

f. te–tú–lì–làb–á walúsììmbì — fut2
H L L H LL L — 'we will not see W.'

g. ne tú–tà–làb–à walúsììmbì — narr
H L L L H LL L — 'and we didn't see W.'

h. te–tw–áándì–làb–yè walúsììmbì — cond
H H L L L H LL L — 'we wouldn't have seen W.'

In this case the Ls of the verb are preserved. This difference cannot be attributed to any difference there might be in the underlying tonicity of affirmative *vs.* negative verbs (as seen, some tenses maintain the same morphological tones in both forms, while others do not). In (14) we see that a few additional verb forms also resist LTD, whether in the affirmative (as shown) or in the corresponding negative:

(14) a. lab–ír–ìr–à walúsììmbì — imper
H L L H LL L — 'look after W.'

b. tú–kyáá–láb–à walúsììmbì — perst
H Ø H L H LL L — 'we still see W.'

c. tw–aaka–láb–à walúsìì mbì — incept
H L H LL L — 'we have just seen W.'

d. o–ku–láb–à walúsìì mbì — inf
H L H LL L — 'to see W.'

These are the imperative, the perstitive ('still'), inceptive ('to have just/never') and the infinitive (which has both nominal and verbal properties in Luganda).

The statement of what constitutes a TD for the purpose of LTD will thus have to specify first that the verb be in the affirmative and second that it not be one of the morphological classes in (14). As to why these latter forms should pattern together with the negative, see Hyman & Watters (1984).

2.2.2 *Nature of the complement.* The above examples all involved the same proper name functioning as direct object of the verb. In fact, any form within the same clause may join the verb to form a TD, provided that it does not begin with the so-called initial vowel (IV) morpheme. The distribution of the IV is rather complex and has been the subject of considerable study (see Ashton *et al.* 1954; Dewees 1971; Mould 1972). For our purposes we will consider its occurrence on verb complements, especially nouns. The complement *Walúsìì mbì* (H LL L) does not have an IV because it is a proper noun. With few exceptions, all common nouns can take an IV. The sentences in (15) illustrate the present tense with noun objects having an IV:

(15) a. tú–làb–á é–bí–kópò — 'we see cups'
H L H L

b. tú–làb–á ó–mú–kázì — 'we see a woman'
H L HL

c. tú–làb–á á–má–fútà — 'we see oil'
H L H L

Depending on noun class, the IV is either *e-*, *o-* or *a-*, as seen. As also seen, LTD does not affect the verb. When the IV is lacking, however, as seen in (16):

(16) a. tú–láb–á bí–kópò — 'we see *cups*'
H Ø H L

b. tú–láb–á mú–kázì — 'we see a *woman*'
H Ø H L

c. tú–láb–á má–fútà — 'we see *oil*'
H Ø H L

LTD does apply. The semantic difference between (15) and (16) is one of focus: the sentences in (15) have relatively even focus, while those in (16) have focus on the object.

The sentences in (17) show LTD applying when the verb is followed, respectively, by a manner adverb, a temporal adverb, and the (*chômeur*) agent of the passive:

(17) a. tw–áá–géénd–á tútùtu 'we went slowly'
H øø ø H L
b. tw–áá–géénd–á lúlî 'we went the day before yesterday'
H øø ø HL
c. tw–áá–láb–w–á wálúsìì mbì 'we were seen by W.'
H ø ø ø H LL L

The sentences in (18) show LTD applying when the verb is followed by a prepositional phrase (whether the inner noun has an IV or not):

(18) a. tw–áá–gí–sál–á ná ó–bú–sô 'we cut it with knives'
H ø ø ø H HL
b. tw–áá–gí–sál–á ná bú–sô 'we cut it with *knives*'
H ø ø ø HL

In fact, the LTD can in principle apply whenever any [−IV] form follows the verb in the same clause. As seen in (19):

(19) a. tw–áá–mù–làb–à walúsìì mbì 'we saw him, W.'
H L L L H LL L (*-mu-* 'him')
b. *tw–áá–mú–láb–á wálúsìì mbì
H ø ø ø H LL L

when the postverbal form is a right-dislocation, LTD is impossible.

2.2.3 *Formulation of the TD.* Let us refer to negative, imperative, perstitive, inceptive and infinitive verb forms as [+F] and the remaining verb forms as [−F]. We then can formulate the TD as in (20):

(20) Join V and α into a TD if:
a. V is [−F]
b. α is [−IV]
c. α belongs to the same clause as V

To this we need to add that α consists either of a word or a word and its phonological proclitics (e.g. the preposition *na* 'with' in (18)). In cases where, for instance, a complement NP consists of more than one word, it is only the first word that forms a TD with the verb, as seen in (21):

(21) a. tú–láb–á bí–kópò bi–néné 'we see *big cups*'
H ø H L H L
b. tú–láb–á bí–kópò bi–sátù 'we see *three cups*'
H ø H L H L

Here LTD has applied between the verb and the noun *bikópò* (H L) 'cups', but not between the noun and the following adjective or numeral.

While there are many more issues that arise in the exact formulation of the syntactic conditions on the TD, we have faithfully represented the relevant considerations in effect when the left element is a verb. For reasons of space we cannot go into a further justification of the morphological conditions on the TD, demonstrating for example that the morphological

requirement [−IV] cannot be replaced either with a syntactic or semantic one (e.g. relating to focus) or with a phonological one (e.g. relating to the tonal properties of the IV morpheme). Our purpose here is to show that the conditions on TD-formation in (20) intersect those on QD-formation in the following section.

3 The quantity domain (QD)

In this section we examine the QUANTITY DOMAIN (QD) within which contrastive vowel length is preserved. We shall first provide a brief statement on vowel length in Luganda.

3.1 Vowel length in Luganda

There are several sources of vowel length in Luganda, which are carefully documented in several studies (see especially Tucker 1962, Katamba 1974, 1986, and Clements 1986, among others). The first source is from underlying contrastive length appearing intramorphemically. Representative minimal pairs are presented in (22):

(22) a.	o–ku–kool–a	'to weed'	b.	o–ku–kól–à	'to work'
				H L	
	o–ku–saab–a	'to smear'		o–ku–sab–a	'to pray'
	o–ku–liim–a	'to spy'		o–ku–lim–a	'to cultivate'

We see from the infinitive forms in (22) that a verb stem may have a -CVVC- form contrasting with a -CVC- one, where the two VVs in sequence are always identical. Note that these and all long vowels in Luganda count as two moras (x's).

In addition to underlying, intramorphemic length, there also is the surface length that results when two morphemes are concatenated, placing identical short vowels in sequence. Examples are seen in (23):

(23) a.	o–ku–lí–ìs–a	'to feed'	(-li- 'eat', -is- caus)
	H L		H
b.	bá–á–làb–à	'they saw'	(ba- 'they' -a- past2)
	H L L		H

These and other 'derived' long vowels are indistinguishable phonologically or phonetically from the underlying long vowels in (22a).

When two vowels come together that are not identical in quality, one of two things happens. The first vowel either deletes, as in (24a), or it glides, as in (24b). In either case the second vowel, if it is not already long (i.e. double), undergoes compensatory lengthening (see Clements 1986 and references cited therein):

(24) a.	/na + o–mu–kazi/ →	n–óó–mú–kázì	'with a woman'
	H H	H	H L
b.	/o + ku + ol + a/ →	o–kw–ó òl–a	'to carve'
	H	HL	

A final oft-cited rule deriving long vowels is one which lengthens a vowel that is followed by a (non-geminate) NC sequence, e.g.:

(25) o+mu+ntu→o–muu–ntu 'person'

To summarise thus far, we have: (i) underlying vowel length; (ii) length resulting from the juxtaposition of identical vowels; (iii) length resulting from vowel coalescences (either through deletion or gliding of the first vowel); and (iv) length resulting from a vowel followed by a non-geminate NC sequence.

Two additional sources of vowel length need to be mentioned. First, as argued also by Stevick (1969), monosyllabic stems predictably have two underlying moras, e.g. /n–tee/ 'cow' (contrast *n–tee* ki_{H} 'which cow?', where the length is preserved before the enclitic *ki*, with the realisation *n–te* observed without an enclitic). Second, recall the rule of HTD in (5). In cases where the last H of a word is both preceded by a non-tonic mora and is on the final mora of that word, not only will the H be doubled, but an extra mora (x) will be inserted to carry the doubled H, as seen in (26):

(26) tu–gul–e → tu–gul–ee → tu–gul–éè 'let's buy'
H HH HL

First HTD applies, followed by MR. The reason for introducing an additional mora is that within the lexicon there is a constraint in effect that there cannot be more than one tone per TBU. By the rule to be discussed in the next subsection, the output of (26) is modified to *tu–gul–*$\hat{e}_{HL}$, i.e. with a short vowel, unless it is followed by an enclitic.

3.2 Final Vowel Shortening

According to what we have said, there are three reasons why an infinitive form such as /o–ku–li_{H}–a/ 'to eat' should be realised [o–ku–lyáà]: (a) the /li_{H}+a/ sequence should undergo gliding of /i/ with compensatory lengthening of /a/; (b) a monosyllabic stem is present whose vowel should therefore be redundantly double; and (c) the final falling tone should have a second mora inserted via HTD. However, in citation form, as in most environments, /o–ku–li_{H}–a/ is pronounced [o–ku–ly–â], i.e. with a final *short* vowel. The reason for this has been known for some time. Ashton *et al.* (1954), Tucker (1962) and Stevick (1969) all recognise a rule of (word) FINAL VOWEL SHORTENING (FVS) which applies not only to this form but also to the words /n–tee/ 'cow' and /tu–gul–e_{H}/ 'let's buy' discussed in the preceding subsection.

In words such as [o–ku–ly–â], an underlying VV sequence can be unambiguously determined from the surface glide. In cases where there is no CGV sequence to tell us that there is an underlying VV sequence, we are dependent on a group of enclitics which *preserve* the preceding vowel length of their hosts. Phonological enclitics which occur immediately after the verb fall into two categories:

(27) a. locative/partitive enclitics: /wo, ko, mu, yo/
H H H H

b. wh enclitics: /ki/ 'what, which', /wa/ 'where'
H H

In (27a) we find the locative enclitics corresponding to locative noun classes 16, 17, 18 and 23, respectively. They are used both for locative expressions ('in', 'on', 'at', etc.), partitives ('(some) of') and attenuation of the verbal action ('a little'). These two sets of enclitics (marked by =) are illustrated in (28) and (29) after the verb forms *tú–ly–à* (H L) 'we are eating' and *y–a–gw–â* (HL) 'he fell':

(28) a. tú–ly–áá=kô 'we are eating a little'
H ø HL

b. y–a–gw–áá=mû 'he fell in'
HØ HL

(29) a. tú–ly–áá=kí[3] 'what are we eating?'
H ø H

b. y–a–gw–áá=wá[3] 'where did he fall?'
HØ H

The retention of vowel length in forms such as (28) and (29) have led other scholars to assume (a) that there is a rule of word-final vowel shortening, and (b) that these enclitics form part of the same word as their preceding host. There is considerable evidence that this unit is not the word *per se*, but rather the clitic group (CG) recognised as part of the prosodic hierarchy by Hayes (1984) and Nespor & Vogel (1986). Consider first the sentences in (30):

(30) a. y–á–téés–é kú=mú–púùnga mu=li–bya
H ø HØ HL
he–past1–put of = rice in = bowl
'he put some rice in the bowl'

b. y–á–kí–téés–éé=mû ku=mu–púùnga
H ø ø HØ HL HL
he–past1–it–put=in of = rice
'he put some rice in it'

c. y–á–kí–téés–éé = múù=kô 'he put a little in it' '
H ø ø HØ HL HL
he–past1–it–put = in = of

d. y–á–tees–éé=múù=kóò=kí
H ø HØ HL HL H
'what did he put a little of in?'

The full sentence involving two locative class NPs is given in (30a), where *ku=mu–púùnga* (HL) 'some rice' (partitive) and *mu=ki–bya* 'in the bowl' each consist of a locative proclitic (marked by =) followed by a noun. The past1 verb form would have been pronounced *y–á–téés–ê* (H ø HL) 'he put' in

isolation. The final HL falling tone would indicate that it should end in a VV sequence. However, as seen, its final vowel is shortened by the FVS rule. In (30b), on the other hand, where the verb is followed by an enclitic, its final vowel length is in fact preserved. In (30c) we see that when two clitics appear after the verb, the final length of both the verb and the first clitic is preserved. Finally, in (30d), where there are three enclitics following the verb, final length is preserved on the verb as well as on the first and second enclitics. There appears to be a maximum of three enclitics in the verbal CG.

A second piece of evidence for the CG comes from the fact that vowel length is also preserved on phonological proclitics, as seen in (31a):

(31) a. e–bi–kópò by–ee = by–áá–gw–à 'it's cups that fell'
H L H L

b. e–bi–kópó by–áá = wálúsìímbì 'cups of W.'
H Ø H LL L

In the subject focus construction, the length of the focus marker, here class 8 /bi–ee/, is preserved. Since this is the only phonological proclitic in verb forms, (31b) has been provided to show preservation of the length in the genitive marker (here class 8 /bi–aa/), which is proclitic to the second noun. To summarise, we conclude, first, that a CG consists of a host and any occurring phonological proclitics and/or enclitics and, second, that within the CG vowel length is preserved (i.e. not affected by FVS).

4 The problem

In the preceding sections we have established two different phonological domains above the word level: the TD in §2 and the QD (CG) in §3. Both domains have been referred to as word domains in the literature (see Hyman 1982 for the TD, Ashton *et al.* 1954, Tucker 1962 and Stevick 1969 for the QD). The reason for identifying these domains with the word is obvious: both domains obey the properties of the lexical word (maximum of one HL pitch drop, realisation of internal VV). We shall assume that both domains are postlexical. The QD has been already identified with Hayes' (1984) CG level. This raises the question of where the TD fits into the prosodic hierarchy in Luganda.

4.1 Overlapping domains

While we have not explicitly addressed the question of how an enclitic interacts tonally with its host, the examples seen in §3 amply demonstrate that the clitic is considered to be a [−IV] verb complement for the purpose of the TD. Not only does a [−F] verb undergo LTD when followed by an enclitic, but crucially, anything that follows an immediately postverbal enclitic is automatically not part of the TD. This was seen in examples such as (30b–d), where neither a proclitic = noun nor another enclitic

joins the verb = enclitic within the same TD. Thus, in (30d), the sequence *y–á–téés–éé=múù* forms a TD, while both *kóò* and *kí* form separate TDs (since neither *múù* nor *kóò* undergoes LTD). That we do not get one HL contour over the whole sentence in (30) supports our two views (a) that encliticisation is a postlexical process and (b) that the verb = enclitic sequence is not itself restructured as a verb head (which might incorrectly recycle TD formation with what follows the sequence).

Since the TD may be formed between a verb and a non-enclitic, while the QD may not, and since enclitics must precede self-standing words, this suggests that the TD is a larger domain than the QD. With the latter being identified as the CG, this might lead one to identify the TD with the phonological phrase (PhP). However, as already evident in the examples seen in (30), the problem is that the TD and QD are overlapping, exactly as Hayes (1984), cited in § 1, had hoped not to find. The examples in (32), representing all four logical possibilities involving the two domains, summarise the problem:

(32) a. one TD, one QD: tú–ly–áá=kô 'we eat a little'
H ø HL

b. two TDs, two QDs: te–tú–ly–à mu–pú ùnga
H L HL
'we don't eat rice'

c. one TD, two QDs: tú–ly–á mú–pú ùnga 'we eat rice'
H ø HL

d. two TDs, one QD: te–tú–ly–àà=kô 'we don't eat any'
H LL HL

In (32a, c) we have provided an affirmative [−F] verb which forms a TD with what follows *vs.* a negative [+F] verb in (32b, d), which does not. In (32a, d) the verb forms a QD with the following enclitic *vs.* (32b, c), where the verb does not form a QD with the following full word. The two domains line up perfectly in both (32a), where there is one TD and one QD, and in (32b), where there are two TDs and two QDs. We might attempt to account for (32c) by saying that both full words constitute separate CGs (and hence two QDs), and that these two CGs join together to form a single PhP (and hence one TD). The problem with this account is found in (32d). Here we have what would appear to be one CG (since there is one QD), but two TDs (since LTD does not apply). In other words, this analysis would be forced to conclude that there are two PhPs contained within a single CG, thus violating the hierarchy in (1) and the SLH in (2). How can we maintain the desirable contraints of the SLH and still account for Luganda?

4.2 One domain

In this section we shall consider (and reject) three analyses that recognise a single domain and which invoke some means other than the prosodic hierarchy to reflect the observed differences between the TD and the QD.

By 'single domain' we mean one postlexical domain where all of the elements in both the TD and QD are present.

4.2.1 *Boundaries.* Though several researchers have entirely ruled out the use of boundaries or boundary features (see Clements 1978; Selkirk 1980a, b; Hayes 1984; Kaisse 1985) to capture differences in domains, we mention boundaries for two reasons. First, they remain a logical possibility, at least for diacritic purposes. Second, they can account for the data in (32). To see this, simply replace the CG with the boundary feature [CB] (clitic group boundary) and the PhP with the boundary feature [PB] (phonological phrase boundary). With these features the LTD and FVS rules can be formulated as in (33):

(33) a. LTD: $L_1 \rightarrow \emptyset / H — H$
condition: [+PB] does not occur between the Hs

b. FVS: $VV \rightarrow V / — [+CB]$

In (33a) LTD is formulated to apply to any L surrounded by Hs, provided that there isn't any occurrence of a [+PB] feature intervening between the Hs. In (33b) FVS is formulated to apply to any VV sequence which is followed by the [+CB] feature specification. In order for these rules to work, it is necessary to have not only some system assigning the initial values for [PB] and [CB], but also the following two 'readjustment rules':

(34) a. $[+PB] \rightarrow [-PB] / \underset{[-F]}{\text{Verb}} — \underset{[-IV]}{X} \ldots]_S$

b. $[+CB] \rightarrow [-CB] / X —$ clitic (mirror image)

(34a) provides the familiar conditions of the TD. (34b) creates the QD. The X in the environment in (34b) stands either for the host or another clitic (since there can be more than one clitic in sequence, as we have seen).

This approach shares with all boundary approaches that it is too loose to be a serious theory either of prosodic domains or of the syntactic conditions that may enter phonological rules. It becomes more serious when, as proposed by McCawley (1968) and Stanley (1973), boundaries are hierarchised such that a plus value for a higher or stronger boundary implies a plus value for a lower or weaker boundary. This desirable constraint is however violated by (32d), where the = boundary would have to be [+PB] but [−CB]. In other words, any serious boundary theory would have exactly the same problem with (32d) as the SLH. Given this problem and all of the arguments against boundaries in the literature, we reject this approach for Luganda.

4.2.2 *DSA.* Another approach would be to accept that one of the domains, either TD or QD, forms part of the prosodic hierarchy in (1), while the other should be captured instead by direct reference to the syntactic properties that define it. For example, instead of saying that the TD forms part of the hierarchy, the LTD rule could refer to the properties given

earlier in (20). In such an approach the overlap of the two 'domains' might seem non-problematic.

In § 1 we stated that the ISA to the syntax–phonology interface should *a priori* be preferred over the DSA since it makes strong claims about postlexical domains that are absent in the DSA. The two positions outlined were that the syntactically restricted domains of postlexical phonological rules should all be characterised by direct reference to syntax, or they should all be characterised by indirect reference to syntax (e.g. by reference to the prosodic hierarchy). The position considered in the preceding paragraph, on the other hand, is that some such rules might refer directly to the syntax, while other such rules should refer indirectly to the syntax. Since in this view the syntax is still available, any time a claim of the ISA appears to be violated, one will be able to get around the violation by saying that the offending rule in question falls outside the ISA and instead makes direct reference to syntax. Thus, if there are to be any constraints on the interaction of phonological domains, it will be necessary to clarify under what conditions a rule may *vs.* may not make direct reference to syntax.

We conclude, then, that a 'mixed' DSA/ISA approach has at least all of the shortcomings of the DSA. Before leaving this approach, let us consider the following possible constraint: let us assume that the phonological rules cannot directly see syntactic configurations, but that they can see the difference between full (or self-standing) words *vs.* phonological clitics. For Luganda this would mean that LTD could not directly see the syntactic conditions defining the TD, but that FVS could directly see the difference between a phonological clitic and a non-clitic. A viable mixed approach would therefore regard the TD as part of the prosodic hierarchy, but would write the clitic/non-clitic distinction directly into the FVS rule. In a sequence X Y, FVS will apply to X if either (a) Y is null or (b) one of the following situations does not obtain:

(35) a. proclitic — {host, proclitic}
b. {host, enclitic} — enclitic

A proclitic will maintain its final VV if followed either by its host or another proclitic (35a), while an enclitic will preserve a preceding final VV either on its host or on another enclitic (35b). In Luganda, since not every syntactic clitic becomes a phonological clitic for the purposes of FVS, we either have to incorporate the complex and sometimes arbitrary syntactic and morphological conditions that create phonological clitics into our rules or else introduce features such as [procl] and [encl] for this purpose. Here we adopt the latter course and write the rule of FVS as in (36):

(36) $VV \rightarrow V / \left[-\overline{\text{procl}} \right] \{[-\text{encl}], \text{pause}\}$

With these features we can avoid the QD (and tentatively approved CG level): we merely look at the appropriate feature specifications and apply or fail to apply FVS accordingly. In fact, if pause could be shown to be [−encl], it might be eliminated from (36).

What is wrong with this kind of approach is that features such as [procl]

and [encl] allow all kinds of rules to be written that would never be found. For example, it would be quite surprising to find a language having either of the rules in (37):

(37) a. [+encl] → [+G]/— [+procl]
b. [+procl] → [+H]/[+encl] —

The reason for this is that an enclitic should not care whether the following form is proclitic in the next phrase, nor should a proclitic care whether the preceding form is enclitic in its phrase. These rules cannot be written in prosodic domain theory, which thus again turns out to be more constrained and preferred, if it can be saved for Luganda.

4.2.3 *Bracketing*. The last single domain alternative we will consider is bracketing. Since the distinction between clitics and non-clitics is extremely important in Luganda, perhaps we can represent it via differences in bracketing. In (38) we summarise one frequent exploitation of bracketing differences in the literature:

(38)	*configuration*	*lexically*	*postlexically*
a.	[[X] [Y]]	compounding	word merger
b.	[[X] Y]	suffixing	encliticisation
c.	[X [Y]]	prefixing	procliticisation

The configurations and interpretations in (38) are all straightforward except, perhaps, for what we have identified as 'word merger' to refer to cases where two lexical full words come together postlexically.

It is clear that these bracketings will not work for LTD and FVS in Luganda. The latter rule would presumably require a formulation sensitive to a right bracket, as in (39):

(39) VV → V/—]

Looking at the postlexical interpretations only, (38c) would correctly preserve the final VV of proclitics, but (38b) would incorrectly invoke rule (39) in cases of encliticisation. Instead of (38), the brackets that are needed in Luganda are those seen in (40):

(40) a.	[X [Y]]	prefixing (lexically) en/procliticisation (postlexically)
b.	[[X] Y]	compounding/suffixing (lexically) word merger (postlexically)

(40a) remains the same as (38c) for procliticisation. It is however also required for encliticisation in order for rule (39) not to apply to a host + enclitic. What (40a) thus says about such sequences is that the host is actually prefixed onto the enclitic, not the reverse.

Turning to (40b), this bracketing appears acceptable as a way of capturing word merger, and is clearly motivated as a way of representing compounding. In order to see this, consider the compounds in (41):

(41) a. e–n–dy–á # m–éénvû 'banana eater' (cf. m–eenvû)
HØ HL HL

b. e–n–dy–á # má–ǵgwâ 'thorn eater' (cf. ma–ggwâ)
HØ HL HL

The final vowel on *e–n–dy–â*$_{HL}$ 'eater' is short in the compounds in (41), despite the fact that it (a) has an underlying VV sequence (as seen by the surface CGV realisation), (b) has a monosyllabic stem, and (c) receives a falling tone in isolation. The bracketing in (40b) correctly predicts that FVS will apply to the first part of a compound, changing *e–n–dy–áà*$_{HL}$ to *e–n–dy–â*$_{HL}$, as required.

According to (40), the four combinations in (32) would have the bracketings in (42):

(42) a. [tú–ly–áá kô]
H Ø HL

b. [[te–tú–ly–à] [mu–púùnga]]
H L HL

c. [[tú–ly–á] mú–púùnga]
H ·Ø HL

d. [te–tú–ly–àà [kô]]
H LL HL

Encliticisation is represented by the loss of the internal right bracket of the preceding entity, while the TD is created by the loss of the internal left bracket of the noun or clitic to the right of the verb. The result is no internal brackets in (42a) *vs.* all brackets intact in (42b). In (42c) the [−IV] noun complement has no left bracket, but the preceding verb keeps its right bracket. Finally, in (42d), the negative verb fails to condition the loss of the left bracket of its enclitic complement which, however, does condition the loss of the right bracket on the verb.

While the above bracketings appear to work, there are two potential problems with this analysis. First, there is the oddness of the full bracketing of the enclitic in (42d), which will be even more odd in the modification in (44d) below. Second, further information from the tone system suggests that there may be a problem with (42a), the one sequence that, after readjustment, has no internal brackets. Recall the rule of leftward HTS introduced in §2.1. There it was said that this rule will apply only if it crosses a 'postlexical juncture' (cf. Hyman 1982). In (43) we see that an enclitic following an affirmative [−F] verb satisfies this condition on HTS:

(43) a–gúl–ír–ír–á=kô 'he bribes a little'
HL

Here the verb is completely non-tonic, while the clitic has a HL falling tone. As seen, the H of the clitic has spread leftwards via HTS, indicating that the postlexical juncture '=' is visible at the level at which HTS

applies. Since the same lack of internal brackets in (42a) would hold as well in (43), (43) would have nothing in it to tell HTS that there is an internal postlexical juncture. HTS therefore should not apply to this form. Since it does, the way perhaps to modify (42) to include this information would be to increase the brackets as in (44):

(44) a. [tú–ly–áá [kô]]
H ø HL

b. [[te–tú–ly–à] [[mu–pú ùnga]]]
H L HL

c. [[tú–ly–á] [mú–pú ùnga]]
H ø HL

d. [te–tú–ly–à à [[kô]]]
H LL HL

Here we have assumed that a clausemate that does not form a TD with the preceding verb is marked by two left brackets (indicating a new phrase). With the brackets in (44), LTD may apply unless the postverbal element begins with two left brackets. However, if this kind of bracketing is to be adopted instead of the prosodic hierarchy, then we have no explanation as to why the SLH is respected by so many languages (e.g. by the numerous languages cited by Nespor & Vogel 1986). If bracketing is to be adopted in addition to the prosodic hierarchy, then attention must be placed on constraining what these brackets can *vs.* cannot do. While there are doubtless other possibilities of manipulating these brackets in Luganda, its seems extremely odd to have a phrase nested within a CG, as in (44d).

5 Conclusion

In the preceding section we examined three different attempts to account for a serious counterexample to the SLH. In each case we tried to maintain a single domain bolstered by some other device (boundary features, direct reference to syntax, bracketing). While each is capable of giving an observationally adequate account of the Luganda facts, none allows us to keep the important insights of the SLH and prosodic domain theory in general. We shall conclude this study by presenting an analysis with two distinct domains that has a reasonable chance of surviving with the SLH intact. Specifically, we shall hypothesise that domains may overlap only when they are projections from distinct prosodic tiers.

To see the force of this proposal, let us ask whether it is an accident that in Luganda one domain is established on the basis of tone, while the other is established on the basis of vowel length. Similarly, is it an accident that the several rules that establish Clements' (1978) domain for Ewe are all tonal and the several rules that establish Kisseberth & Abasheikh's (1974) domain for Chi Mwi:ni all pertain to vowel length? We do not say that different tiers are never involved in establishing postlexical domains. We merely question whether the prosodic domains must be uniform for all tiers at all times.

The boundary, direct syntax and bracketing solutions all fail to predict that domains may be tier-sensitive. As far as these proposals are concerned, the TD in Luganda might have involved palatalisation and the QD labialisation. Or they might have both had tonal reflexes. Only the tier-based approach says that there will never be overlapping within the same prosodic projection (tone, vowel length, stress, etc.).

We suggest that both the TD and the QD be identified as CGs: the TD is the CG on the tonal tier, while the QD is the CG on the skeletal tier. For the verb and its clausemate, for instance, the tonal CG is established on the basis of the summary in (20), while the skeletal CG is obtained by joining all phonological proclitics and enclitics to their host. Thus, the four domain situations first presented in (32) can now be represented as in (45):

(45) a. $[_{CG}\ [_{W}$ tú–ly–áá$]$ $[_{W}$ kô$]]$
$[_{CG}\ [_{W}$ H ø $]$ $[_{W}$ HL$]]$

b. $[_{CG}\ [_{W}$ te–tú–ly–à$]]$ $[_{CG}\ [_{W}$ mu–púùnga$]]$
$[_{CG}\ [_{W}$ H L$]]$ $[_{CG}\ [_{W}$ HL $]]$

c. $[_{CG}\ [_{W}$ tú–ly–á$]]$ $[_{CG}\ [_{W}$ mú–púùnga$]]$
$[_{CG}\ [_{W}$ H ø$]$ $[_{W}$ HL $]]$

d. $[_{CG}\ [_{W}$ te–tú–ly–àà$]$ $[_{W}$ kô$]]$
$[_{CG}\ [_{W}$ H LL$]]$ $[_{CG}\ [_{W}$ HL$]]$

In the examples in (45) the first line represents the skeletal tier, though for convenience we have merged it with the 'phonemic' or segmental tier. The second line represents the tonal tier. As seen, the word and CG domains line up perfectly in (45a), where there is one CG per tier, and (45b), where there are two CGs per tier. In (45c), on the other hand, there are two CGs on the skeletal tier and only one CG on the tonal tier, while in (45d) there is one CG on the skeletal tier and two CGs on the tonal tier. With the rules of LTD and FVS specified to take place within the CG of their respective tier, as in (46):

(46) a. $L_1 \rightarrow ø / [_{CG} \ldots H — H \ldots]$
b. $V \rightarrow ø / V —]_{CG}$

LTD will apply only in (45a, c), as indicated by the ø, and FVS will apply only in (45b, c). In this way we are able to account for the overlapping of the TD and QD without claiming that (32d) (= (45d)) is a CG containing two PhPs.

This result may or may not be seen as a positive one. On the one hand we have preserved a 'relativised' version of the SLH which now is made tier-sensitive. On the other hand, we have opened up the possibility that each tier may define its own domains. This clearly is undesirable, especially given recent work by Clements (1985), Archangeli & Pulleyblank (1986) and others, proposing elaborate subsegmental nodes and eventually a separate tier for every feature. As stated, our approach seems to allow the possibility of multiple overlapping domains, each for a separate feature.

We suspect, however, that what we are calling 'tier' is really a macro-tier (major class node?) or even a separate plane. It is hoped that overlapping domains can be restricted, say, to the three suprasegmental features of pitch (e.g. tone), duration (e.g. vowel length) and intensity (e.g. stress-accent). The alternative in Luganda which we consider in work in progress is that the SLH and some of the claims of its advocates must be significantly weakened to allow cyclic assignments of postlexical domains as well as the looping of these domains back into the lexicon. With these modifications, the resulting ISA model would be considerably less distinct from the DSA than is current prosodic domain theory. What our present study has shown is that the SLH must be weakened in one way or another in order to account for Luganda. It should be clear that the fate of the ISA will be determined only by close examination of problematic cases such as the one we have just encountered.

NOTES

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[1] Or it may be related to the phrase level rule of leftward H tone spreading illustrated below in (11a).

[2] In these underlying verb forms, the ending *-ye* is derived from the two moras *-ie* and $]_H$ stands for an H that is realised on the final vowel of verb forms involving a tonic verb root (cf. Stevick 1969).

[3] We assume that the two interrogative enclitics have an underlying H, but lack a fall to L for intonational reasons.

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