Affixation by Place of Articulation: Rare AND Mysterious

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1. Introduction

As is well known, certain phonological, morphological and syntactic properties occur with great frequency in the world’s languages, while others are quite rare. To account for this difference, linguists have generally assumed that properties will be frequent if they have a “natural” motivation in terms of production, processing, communication etc., whereas properties which lack such a functional basis are “unnatural” and hence expected to be rare. Qualitative differences between frequent vs. rare properties may be attributed to diachrony: Widely attested synchronic properties tend to resemble each other in terms of substance, as they often arise transparently from universal processes of phonologization and grammaticalization. More restricted properties, on the other hand, often have an unmotivated or arbitrary character requiring a history involving multiple such processes and/or restructuring (cf. Bach & Harms’ 1968 notion of “crazy rules”). What would be striking is a property which appears to be motivated, but still is rare.

In this paper I consider one such case from the verb morphology of Tiene, a Bantu language of the Teke subgroup spoken in the Democratic Republic of the Congo, which is not only rare, but as we shall also see, mysterious. In order, first, to appreciate how unique the Tiene facts to be presented are within Bantu, consider in (1) the derived verb forms from Ikalanga, a Southern Bantu language spoken in Botswana:

(1) Derivational suffixes (“verb extensions”) in Ikalanga (Mathangwane 2001)

a. Productive extensions (cf. dabíl-a ‘answer’)
   i. Causative:     dabíl-ís-a    ‘cause to answer’     < PB *-tc-
   ii. Applicative:  dabíl-íl-a    ‘answer for/at’       < PB *-td-
   iii. Reciprocal:  dabíl-án-a    ‘answer each other’  < PB *-rn-
   iv. Stative/Neuter: dabíl-ík-a    ‘be answerable’   < PB *-tk-
   v. Passive:      dabíl-w-a    ‘be answered’  (→ [dabig-w-]) < PB *-u-

b. Non-productive extensions (*amb-, *fum- are bound roots)
   i. Extensive:     amb-al-a    ‘dress, put on (clothes)’ < PB *-ad-
   ii. Reversive tr.:  amb-ul-a    ‘take off (clothes)’  < PB *-ud-
   iii. Reversive intr.: amb-uk-a    ‘come off (clothes)’  < PB *-uk-
   iv. Impositive:   fum-ik-a    ‘cover up (sth.)’  < PB *-ik-

c. Multiple extensions:  dabíl-is-an-il-a    ‘cause to answer each other for/at’

The productive derivational suffixes or “verb extensions” are illustrated in (1a), where the verb base is /dábil-/ ‘answer’ and -a is a final vowel (FV) inflectional morpheme. With the exception
of the passive (which is not attested in Tiene), these extensions all have the shape -VC-, corresponding with the Proto-Bantu (PB) reconstructions given to the right (Meeussen 1967, Schadeberg 2003). The data in (1b) illustrate some typically non-productive suffixes which also have analogues in Tiene. Although there are constraints, the form in (1c) shows that extensions typically can be combined with each other to form quite long derived verb stems, here six syllables.

If we now compare the Tiene data in (2), we see a quite striking difference (the corresponding Ikalanga suffixes are shown in parentheses to the right):

(2) Verb infixes in Tiene (Ellington 1977)
   a. i. Causative: lók-a ‘vomit’ → lósek-e ‘cause to vomit’ (cf. -is)
      ii. Applicative: yók-a ‘hear’ → yólek-e ‘listen to’ (cf. -il-)
   b. i. Extensive: kab-a ‘divide’ → kalab-a ‘be divided’ (cf. -al-)
      ii. Reversive tr.: sook-e ‘put in’ → solek-e ‘take out’ (cf. -ul-)

As in Ikalanga, the causative and applicative suffixes are productive in Tiene, while the extensive and reversive are not. While Ikalanga (and Bantu in general) has -VC- verb suffixes, the (underlined) consonant of the corresponding suffix appears to be infixed in Tiene. (Other differences, e.g. in the vowels, will be addressed below.) The question is why? What has caused Tiene to change the pan-Bantu suffixes into infixes?

Such questions are addressed in the following sections. In order to answer the above questions I first take a fuller look at Tiene verb morphology in §2. As we shall see, the exact realization of the above and other verb extensions depend on the phonological properties of the verb base. In §3 I show that these properties follow from restrictions on the “prosodic stem” in Tiene, which is then compared with other Bantu languages in §4. §5 seeks diachronic and external evidence for the unusual Tiene properties, which are shown to have parallels in other Teke languages (§6) and a Nigerian Plateau language, Izere (§7). A speculative account of the rare and mysterious distributions and affixation by place of articulation is presented in §8 followed by a brief summary in §9.

2. Tiene verb extensions

In this section we shall examine the realization of the verb extensions in Tiene. Except where indicated, all of the data are taken from Ellington (1977) to whom I owe an additional debt for personal communications.

In (3) we begin by considering the two ways in which the language forms a causative:

(3) Causative formation (PB *-ic-i- > -es-)
   a. C_2 = coronal (alveolar or palatal)
      mat-a ‘go away’ maas-a ‘cause to go away’
      bót-a ‘give birth’ bóos-e ‘deliver (child)’
      tiit-a ‘grow’ tiis-e ‘cause to grow’
      kóli-a ‘become tired’ kóos-e ‘tire (tr.)’
      pal-a ‘arrive’ paas-a ‘cause to arrive’
As seen in (3a,b), most roots in Tiene, as in Bantu in general, consist of a C₁V(V)C₂- structure, where VV = a long vowel. As can now also be seen, the realization of the causative depends on the place of articulation of the root C₂. In (3a), where C₂ = coronal, the /s/ of the causative suffix replaces the C₂, and the vowel lengthens, if it is not already long. (In these and other forms, the FV of a derived verb stem is /-ɛ/, which assimilates to a preceding /ɔ/ or /a/.) In (3b.i.), where C₂ = non-coronal, the /s/ of the causative is infixed, with the root C₂ now being realized as C₃. The same is observed in (3b.ii), with the addition that root C₂ /m/ is denasalized to [b]. The two verbs in (3c) show that when there is no root C₂, the causative suffix takes the expected -Vs- shape.

Turning to the applicative suffix, the data in (4) show the same skewing on the basis of the place of articulation of the root C₂:

(4) Applicative formation (PB *-id- > -el-)

a. C₂ = coronal (alveolar or palatal)

<table>
<thead>
<tr>
<th>root</th>
<th>sense</th>
<th>causative</th>
</tr>
</thead>
<tbody>
<tr>
<td>bóta</td>
<td>‘give birth’</td>
<td>bóoet-ɛ</td>
</tr>
<tr>
<td>bel-a</td>
<td>‘speak’</td>
<td>beel-ɛ</td>
</tr>
<tr>
<td>sal-a</td>
<td>‘work’</td>
<td>saal-a</td>
</tr>
<tr>
<td>yal-a</td>
<td>‘spread’</td>
<td>yaal-a</td>
</tr>
<tr>
<td>kas-a</td>
<td>‘fight for’</td>
<td>kaas-a</td>
</tr>
<tr>
<td>kon-a</td>
<td>‘plant’</td>
<td>koon-a</td>
</tr>
<tr>
<td>son-ə</td>
<td>‘write’</td>
<td>səon-ə</td>
</tr>
<tr>
<td>kony-a</td>
<td>‘nibble’</td>
<td>koony-ɛ</td>
</tr>
</tbody>
</table>

b. C₂ = non-coronal (labial or velar)

i. lab-a | ‘walk’ | lasab-a | ‘cause to walk’ |
| lók-a | ‘vomit’ | lósek-ɛ | ‘cause to vomit’ |
| bik-a | ‘become cured’ | bisek-ɛ | ‘cure’ (< Guthrie 1953) |
| kuk-a | ‘be sufficient’ | kusik-ɛ | ‘make sufficient’ (< Guthrie 1960) |

ii. dím-a | ‘become extinguished’ | díseb-ɛ | ‘extinguish  (tr.)’ |
| yóm-a | ‘become dry’ | yóseb-ɛ | ‘make dry’ |
| tóm-a | ‘send’ | tóseb-ɛ | ‘cause to send’ |
| səm-ə | ‘borrow’ | səsb-ə | ‘lend’ |

c. C₂ = Ø

le | ‘eat’ | lees-ɛ | ‘feed’ |
vu | ‘fall’ | vuus-ɛ | ‘cause to fall’ |
b. \( C_2 = \text{non-coronal (labial or velar)} \)
   
   i. \( \text{yɔ̀b-ɔ́} \) ‘bathe’ \( \text{yɔ̀b-ɔ́} \) ‘bathe for’
   \( \text{bák-ɔ́} \) ‘reach’ \( \text{bálak-ɔ́} \) ‘reach for’
   \( \text{yòk-ɔ́} \) ‘hear’ \( \text{yólek-ɛ́} \) ‘listen to’
   
   ii. \( \text{dum-a} \) ‘run fast’ \( \text{dunem-ɛ́} \) ‘run fast for’ \( \text{NB: l} \rightarrow [n] \)
   \( \text{súm-ɔ́} \) ‘buy’ \( \text{sónem-ɛ́} \) ‘buy for’
   \( \text{tim-a} \) ‘dig’ \( \text{tinem-ɛ́} \) ‘dig for’ \(< \text{Guthrie} 1953 \)
   \( \text{lɔ́n-ɔ́} \) ‘load’ \( \text{lɔ́nɔ́n-ɛ́} \) ‘load for’

   c. \( C_2 = \emptyset \)
      
      \( \text{tá} \) ‘throw, strike’ \( \text{téel-ɛ́} \) ‘throw to/for’
      \( \text{díə} \) ‘wrap’ \( \text{díil-ɛ́} \) ‘wrap for’
      \( \text{síɛ́} \) ‘whittle’ \( \text{síil-ɛ́} \) ‘whittle for’

In (4a), where the root \( C_2 \) is coronal, the /l/ of the applicative suffix /-el-/ is lost, the only reflex of the applicative being the observed vowel lengthening.\(^1\) In (4b.i.), the /l/ is infixed exactly like the /s/ of the causative in (3b.i.). The same infixation is observed in (3.b.ii), but since the root \( C_2 \) is nasal, the /l/ is nasalized to [n]. The three verbs in (4c) which lack a \( C_2 \) form their applicative by suffixing -Vl-.

   Tiene stative formation is shown in (5).

(5) Stative formation (PB *-ık- > -ek-)

a. \( C_2 = \text{coronal (alveolar or palatal)} \)
   
   i. \( \text{yaat-a} \) ‘split’ \( \text{yatak-a} \) ‘be split’
   \( \text{ból-a} \) ‘break’ \( \text{bόlek-ɛ́} \) ‘be broken’
   \( \text{faas-a} \) ‘drive through’ \( \text{fasak-a} \) ‘be driven through’
   
   ii. \( \text{són-ɔ́} \) ‘write’ \( \text{sόnɔ́n-ɛ́} \) ‘be written’
   \( \text{vwuny-a} \) ‘mix’ \( \text{vwunye} \) ‘be mixed’

b. \( C_2 = \text{non-coronal (labial or velar)} \) (? < PB *-ad- > -al-)
   
   i. \( \text{kab-ə́} \) ‘divide’ \( \text{kalab-a} \) ‘be divided’
   \( \text{nyak-ə́} \) ‘tear’ \( \text{nyalak-a} \) ‘be torn’
   
   ii. \( \text{kam-ə́} \) ‘twist’ \( \text{kanam-ə́} \) ‘be turned over’

c. \( C_2 = \emptyset \)
   
   \( \text{kaa} \) ‘fasten’ \( \text{kaal-a} \) ‘be fastened’

The forms in (5a.i.) show that when the root \( C_2 \) is coronal the stative is derived by the historical -Vk- suffix, which becomes -Vŋ- in (5a.ii.), where the root \( C_2 \) is nasal. However, when the root \( C_2 \) is non-coronal, as in (5b.i.), an -l- is infixed, which again becomes -n- when the root \( C_2 \) is nasal, as in (5.b.ii). In this case it appears necessary to recognize two allomorphs: a suffix -Vk- which occurs after coronals vs. an infix with -l- which occurs before non-coronals (and is,

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\(^1\) This process of fusion is reminiscent of a widespread process of root-suffix fusion in Bantu known as “imbrication”, most frequently involving the PB *id-ɛ́* perfective ending (Bastin 1983). Since imbrication sometimes extends to applicatives and causatives, it could be that the Tiene forms derive from this process.
therefore, identical to the applicative). The one example Ellington cites without a root C₂ takes the -l- allomorph, as seen in (5c).

There are fewer examples of reversives in the materials, all of which are reproduced in (6).

(6) Reversive formation in Tiene (PB ‘reversive’ *-uk-, *-ud- > -ok-, -ol-)

a. C₂ = coronal (alveolar or palatal) (PB ‘reversive transitive’ *-ud- > -ol-)

kót-a ‘tie’

yal-a ‘spread’
kót-é ‘untie’
yaal-a ‘roll up’

b. C₂ = non-coronal (labial or velar) (PB ‘reversive transitive’ *-ud- > -ol-)

sook-é ‘put in’

sum-a ‘stick in ground’

solek-é ‘take out’
sunem-é ‘pull out of ground’

c. C₂ = coronal (alveolar or palatal) (PB ‘reversive intransitive’ *-ok- > -ok-)

kót-a ‘tie’
kótek-é ‘be untied’

d. Coronal/non-coronal alternation

vuol-a ‘open’

vuok-a ‘close’ (< impositive *-ik- ?)

(6a,b) show the same realizations as the applicative: vowel lengthening if the root C₂ is coronal vs. -l- infixation if it is non-coronal. The one form in (6c) shows a -Vk- suffix being added to a coronal root C₂ (as in the stative), while (6d) shows an alternation between /l/ and /k/, where the latter is perhaps related to the PB impositive suffix *-ik- illustrated in Ikalanga in (1.b.iv).

While we shall be primarily interested in why affixal -s- or -l- appears before non-coronal root C₂, let us first note the types of phonological analyses one might consider to account for the above alternations. Working within the framework of Chomsky & Halle (1968), Ellington (1977) proposes a solution involving metathesis:

(7) Metathesis: : CVPVT, CVKVT → CVTVP, CVTVK

(a) (b) (c) (d)

/lók-es-/ /yók-el-/ /kab-el-/ /sook-el-/ Underlying representations

lós-ek- yól-ek- kal-eb- sol-ek- Vowel shortening

Whenever there is an input where root C₂ = labial or velar and suffixal C₃ = coronal, the two consonants are metathesized. In addition, (7d) shows that a long root vowel must be shortened.

Had Ellington been working a few years later, Tiene metathesis or infixation could have been neatly represented in the non-linear framework of McCarthy (1981). With the CV template in (8a), the effect of metathesis could be achieved by having the suffixal /s/ of the causative associate to the second C just in case the root ends in a non-coronal:
Multiple tier analysis with CV templates à la McCarthy (1981)

a. /lók-/ + /-es-/ → lósek-
b. /bót + es/ → bóos-
c. /bót+el/ → bóot-

When the root $C_2$ is coronal, as in (8b), it is overriden by suffixal /s/, which links to the second C, while the coronal root $C_2$ overrides suffixal /l/ in (8c).

Finally, as summarized in (9), a constraint-based analysis within the framework of McCarthy & Prince (1999) is also possible (cf. Hyman & Inkelas 1997):

Metathesis/fusion can also be driven by OT-style output constraints

a. $T \supset P, K$
b. $\text{MAX}(s) \gg \text{MAX(Root)} \gg \text{MAX(l)}$

(9a) directly encodes that coronals should precede non-coronals, while the ranked constraints in (9b) say that input /s/ should be preserved over other consonants of the root, which in turn should be preserved over affixal /l/.

The three approaches in (7)-(9) of course assume that the realization of affixal /s/ and /l/ as the $C_2$ of CVCVC-V verb stems should be accounted for in phonological terms. The alternative would be to set up allomorphs (as is required for the stative, in any case): The causative and applicative would have the infixal allomorphs /-se-/ and /-le-/ when the root $C_2$ is non-coronal, otherwise the allomorphs would be suffixal /-es-/ and /-el-, which fuse with a coronal $C_2$ but are transparently suffixed to a CV- root (see §3 concerning the realization of the underlying vowel /e/).

Considering the above (and perhaps other) solutions, we can conclude that the Tiene data are easy to describe, but raise a number of questions: Why doesn’t Tiene have only derivational suffixes as elsewhere in Bantu? Why does the derivational morphology show such sensitivity to place of articulation (“fusion” vs. “infixation”; -Vk- vs. -IV- allomorphy)? Why do affixal -l- and -k- nasalize to [n] and [ŋ], respectively, and the root $C_2$ /m/ denasalize to [b] (e.g. tóm-a ‘send’ → tôseb-e ‘cause to send’)? Why does the vowel of a CVVC- root shorten when appearing in a trisyllabic verb stem (e.g. yaata ‘split’ → yataka ‘be split’)? As discussed in §3, all of these properties are the result of phonological restrictions on the “prosodic stem” in Tiene.

3. The prosodic stem in Tiene

As summarized in (10), there are severe restrictions on the size and distribution of consonants and vowels within the stem in Tiene:

The “prosodic stem” in Tiene

a. Five shapes: CV, CVV, CVCV, CVVCV, CVCVCV
b. In case of \(C_1VC_2V_2C_3V_3\):
   i. \(C_2\) must be coronal
   ii. \(C_3\) must be non-coronal
   iii. \(C_2\) and \(C_3\) must agree in nasality
   iv. \(V_2\) is predictable (with few exceptions)

As seen in (10a), in Tiene stems can be monosyllabic, bisyllabic or trisyllabic, with vowel length being limited to monosyllables and the first syllable of bisyllabic stems. In addition, trisyllabic stems are subject to the conditions indicated in (10b). We have mostly focused on the first two, which have to do with place of articulation. In addition, \(C_2\) and \(C_3\) must agree in nasality: This causes infixal \(-l-\) and suffixal \(-k-\) to nasalize to [n] and [ŋ] when the root \(C_2\) is nasal. When the infix is \(-s-\), root \(C_2\) /m/ denasalizes (since it is difficult, perhaps impossible to nasalize an [s]).\(^2\) With few exceptions, the \(V_2\) is limited to /e/, which is realized [e] after /i, u, e, o/, but is identical to a preceding /e, œ, a/.\(^3\) These phonological conditions define what may be referred to as the “prosodic stem” in Tiene.

Further evidence that the prosodic stem is subject to a maximum of three syllables is seen from the definitive aspect forms in (11).

(11) Definitive aspect formation (cf. PB *-idid-> -elel- ‘completive’)

<table>
<thead>
<tr>
<th>(a)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>kaa</td>
<td>‘fasten’</td>
<td>kalal-a</td>
</tr>
<tr>
<td>nɔɔ</td>
<td>‘look at’</td>
<td>nɔlɔl-ɔ</td>
</tr>
<tr>
<td>bɛɛ</td>
<td>‘become ripe’</td>
<td>bɛlel-ɛ</td>
</tr>
<tr>
<td>sɪa</td>
<td>‘hate’</td>
<td>sɪlel-ɛ</td>
</tr>
<tr>
<td>tɔɔ</td>
<td>‘crush’</td>
<td>tulel-ɛ</td>
</tr>
<tr>
<td>fɛɛ</td>
<td>‘become violent’</td>
<td>fulel-ɛ</td>
</tr>
<tr>
<td>sʊʊ</td>
<td>‘show’</td>
<td>sʊlɔl-ʊ</td>
</tr>
<tr>
<td>(b)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>yɔɔb-ɔ</td>
<td>‘bathe’</td>
<td>yɔɔbɔ-ɔ</td>
</tr>
<tr>
<td>mat-a</td>
<td>‘go away’</td>
<td>matat-a</td>
</tr>
<tr>
<td>yak-a</td>
<td>‘believe’</td>
<td>yakak-a</td>
</tr>
<tr>
<td>kɛɛ</td>
<td>‘dance’</td>
<td>kɛnɛn-a</td>
</tr>
<tr>
<td>lɔɔ-ɛ</td>
<td>‘load’</td>
<td>lɔnore-ɛ</td>
</tr>
<tr>
<td>(c)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>kɔɔm-ɔ</td>
<td>‘sweep’</td>
<td>kɔɔmɔm-ɔ</td>
</tr>
<tr>
<td>maas-a</td>
<td>‘cause to go away’</td>
<td>masas-a</td>
</tr>
</tbody>
</table>

The forms on the right show that the definitive aspect is characterized by a \(C_1VC_2VC_3-V\) template, where \(C_2 = C_3\). If a verb root lacks a \(C_2\), as in (11a), the \(C_2\) and \(C_3\) of the template are filled with a \(-lel-\) sequence, whose /e/ assimilates to the root vowel as expected. As seen in (11b), if the root has a \(C_2\), the definitive is formed by adding /e/ + a copy of the \(C_2\). (11c) shows that if the root vowel is long, it must shorten, as expected. Since the \(C_2\) and \(C_3\) are identical, these

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\(^2\) Note that \(C_2 /ŋ/\) is extremely rare, occurring mostly (only?) in borrowings, e.g. \(lɔŋ-ɔ\) ‘load’, \(lɔŋɔŋ-ɔ\) ‘load for’. While it does not occur in Ellington’s materials, the expected causative form would be \(lɔŋɔk-ɔ\), with denasalization of /ŋ/.

\(^3\) Compare the FV morpheme which is /-ɛ/ after “extended” verbs, otherwise /-al, /-ɛ/ assimilates to a preceding /ɛ/ or [œ], while /-al/ assimilates to a preceding /ɛ/ or [œ].
forms are obviously exceptions to the distribution of coronal + non-coronal indicated in (10b).
The requirement of the definitive that C₂ = C₃ thus overrides the otherwise general place
restrictions on the two consonant positions. Now consider what happens if the verb base already
has a C₃: “...verbs having the canonical shape -CVCVC- (including extended radicals)... do not
accept the Definitive Aspect Morpheme. For such verbs, this aspect must be rendered by adding
the expression nkó mőte to the conjugated verb in the Neutral Aspect” (Ellington 1977:93). The
morphological definitive is blocked just in case the condition C₂ = C₃ cannot be met without
either truncating part of the base or exceeding the maximum trisyllabic size constraint on stems.

Further evidence for a trisyllabic maximum is seen from the vestiges of the reciprocal
extension in (12).

(12) Reciprocal “vestiges” (PB */-a(n)g-an- > -ŋena > -neŋa)

a. lë ‘eat’
   nwa ‘drink’
   pa ‘give’
   ta ‘throw, strike’

b. lë-neŋa ‘eat with each other
   nũ-neŋa ‘drink each other’
   pé-neŋa ‘give each other’
   té-neŋa ‘injure each other’

As seen, the above four C(V)- roots occur with traces of the reciprocal extension -neŋ- inherited
from the Proto-Bantu plural+reciprocal sequence */-a(n)g-an- found in a number of daughter
languages (cf. Haya -angan-, Luganda -agan-). In the Tiene reflex, the velar+coronal sequence is
metathesized to coronal+velar, in conformity with the place restrictions on prosodic stems.
Significantly, there are no vestiges of the reciprocal with CVC- or CVCVC- verb bases, precisely
because -neŋ- would require a fourth syllable. It is again clear that derived stems are maximally
trisyllabic in Tiene.

The same is true of the non-derived verb stems I have been able to extract from Ellington
(1977). As seen in (13a), verbs consisting of a synchronically non-derived CVCVC- base + FV
observe all of the constraints in (10):⁴

(13) “Non-derived” CV(C)V stems in Ellington (1977)

a. kótob-a ‘chase’
   kótok-a ‘gnaw’
   vūtek-e ‘come back’
   pālab-a ‘sprout’
   peleb-e ‘fly’
   tōleb-e ‘pierce’
   sēlek-e ‘tease’
   sōlok-ô ‘go out’
   binem-a ‘sleep’
   dinem-a ‘get lost’
   kanam-a ‘turn over (sth.)’

b. C-t-b
   C-t-k-
   C-t-k-
   C-l-b-
   C-l-b-
   C-l-b-
   C-l-k-
   C-l-k-
   C-n-m-
   C-n-m-
   GCB *kókot-
   GCB *bútok-
   GCB *tóbod-
   GCB *cēk-ed- ‘laugh’ (+app)
   GCB *cokod- ‘pull out’
   GCB *dímed-
   GCB *kámod- ‘wring’

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⁴ Ellington does not report a corresponding root for any of the CVCVC- verbs in (13a). However, because their FV
is -e rather than -a, (cf. note 2) the forms vūtek-e ‘come back’ and tōleb-e ‘pierce’ suggest that they may have been
morphologically complex at one time.
The schemas given to the right these forms show that \( C_2 = \) coronal and \( C_3 = \) non-coronal, as expected. Several of these are reflexes of reconstructed PB forms. Ellington cites from Guthrie’s (1967-1971) Common Bantu, which I abbreviate as GCB. As seen, all but \(*\text{-}b\text{útoko}\text{-} ‘\text{comeback}’\) require the metathesis of the GCB \( C_2 \) and \( C_3 \) consonants. Most interesting is \(*\text{k}\text{ókot}\text{-} ‘\text{gnaw}’\), which, although possibly an archaic reduplication \(*\text{kó-kot}\text{-}\), becomes \text{kótók-a} in Tiene. Since such forms cannot be interpreted as infixation, it is clear that metathesis occurred as historical process in the language.

Except for the first form, the trisyllabic noun stems in (13b) all violate one or another of the conditions in (10). It looks, however, like four are reduplications, one a borrowing, and one a possible compound. (The number(s) following each gloss indicates the Bantu noun sg./pl. noun class.) It is safe to say that there are very few trisyllabic noun stems.

Up to this point nothing has been said about possible constraints on the \( C_2 \) of bisyllabic verb stems. As seen in (14), both coronals and non-coronals appear in this position:

(14) Underlying consonants found in \( C_1 \) position and in \( C_2 \) position of \( C_1V(V)C_2V \) stems

<table>
<thead>
<tr>
<th>Labials</th>
<th>Alveolars</th>
<th>Proto-Palatals</th>
<th>Velars</th>
</tr>
</thead>
<tbody>
<tr>
<td>( C_1 = 13: )</td>
<td>p b m t l n s z ( \ddot{\text{n}} ) k g ( \ddot{\text{n}} )</td>
<td>(PB (*c, *j &gt; s, z))</td>
<td></td>
</tr>
<tr>
<td>( C_2 = 10: )</td>
<td>b m t l n s ( \ddot{\text{n}} ) k ( \ddot{\text{n}} )</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The main restriction is the merger of /p, b/, /s, z/ and /k, g/ in \( C_2 \) position. In addition, there are exactly two constraints on \( C_1 + C_2 \) combinations: First, after \( C_1 /p/ \), we find [p] instead of [b], e.g. \( \text{ka-b-a} ‘\text{divide}’, l3b-\( \ddot{\text{a}} \) ‘\text{fish with a line}’ vs. \( \text{p}\text{í-p-a} ‘\text{suck}’, m\text{-p}\text{e-pepe} ‘\text{wind}’. Second, when \( C_1 \) is a nasal consonant, \( C_2 \) cannot be [b] or [l]. There is one interesting exception to this generalization: \( \text{nyalak-a} ‘\text{be torn}’. \) Deriving from earlier \(*\text{nyakal-a}\), the [l] escapes nasalization because it originates in \( C_3 \) position separated from the [+nasal] \( C_1 \) by a full syllable; cf. \( \text{nyak-a} ‘\text{tear}’. \) This form not only provides further evidence for metathesis, but also reveals that if we start with the pre-metathesis order, nasal agreement is both left-to-right and strictly local. Differing from nasal agreement between \( C_2 \) and \( C_3 \), a \( C_2 [k] \) may follow a \( C_1 \) nasal, e.g. \( n\ddot{\text{o}}k-\ddot{\text{a}} ‘\text{to rain}’. On the other hand, just as we saw that a (metathesized) \( C_2 [s] \) may not co-occur with a \( C_3 \) nasal, Ellington cites no forms where [s] follows a \( C_1 \) nasal.

4. Comparison with the prosodic stem in other Bantu languages

The Tiene facts presented in the preceding sections raise a number of questions: Why does Tiene have such a restrictive prosodic stem template? How did the prosodic stem template arise? Is
Tiene unique, or can we relate these facts to what happens in other languages? In this section we compare Tiene with other Northwest (NW) Bantu languages spoken in the same vicinity.

The properties of the Tiene prosodic stem template can be subdivided as in (15a,b).

(15) The properties of the Tiene prosodic stem template can be subdivided into those which are
a. not so unusual
   i. prosodic maximality
   ii. decreasing # of oppositions from \( C_1 \) to \( C_2 \) to \( C_3 \)
   iii. stronger realization of consonants in \( C_1 \) vs. \( C_2 \) and \( C_3 \) positions
b. very unusual
   i. coronal-noncoronal limitation on \( C_2-C_3 \) sequences
   ii. regular, nonlocal metathesis based on place of articulation

The properties in (15a) are duplicated in neighboring languages. As seen in (16), whereas “canonical” Central, Eastern, and Southern Bantu languages do not place an upper limit on how many syllables can appear within the stem (recall Ikalanga from (1c)), stem-maximality conditions are very common in NW Bantu, as indicated in (16).

(16) Maximal size limitations on the stem in certain NW Bantu languages and further West
a. four (~five) syllable maximum Yaka (Hyman 1998), Bobangi (Whitehead 1899)
   Punu (Fontaney 1980, Blanchon 1995)
b. three (~four) syllable maximum Koyo (Hyman 2004)
c. three-syllable maximum Tiene (Ellington 1977), Basaa (Lemb & Degastines)
   1973, Hyman 2003), Kukuya (Paulian 1975)
d. two (~three) syllable maximum Mankon [Grassfields Bantu] (Leroy 1982)
e. one (~two) syllable maximum Ewe [Kwa] (Westermann 1930)

Some of the languages are transitional, with the additional syllable (indicated in parentheses) typically being restricted to a single morpheme or construction.

As an illustration, consider in (17) the possible stem shapes in Koyo, a NW Bantu language spoken in nearby Congo (Hyman 2004):

(17) Possible stem shapes in Koyo (Congo-Brazzaville) (Hyman 2004)

<table>
<thead>
<tr>
<th>Type</th>
<th>Example</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>CV</td>
<td>dz-a</td>
<td>‘be, exist’</td>
</tr>
<tr>
<td>CVV</td>
<td>dzá-a</td>
<td>‘eat’</td>
</tr>
<tr>
<td>CVCV</td>
<td>kór-a</td>
<td>‘attach’</td>
</tr>
<tr>
<td>CVCVCV</td>
<td>sélum-a</td>
<td>‘slip’</td>
</tr>
<tr>
<td>CVCVCVgV</td>
<td>sélum-ag-a</td>
<td>‘slip + DUR’</td>
</tr>
</tbody>
</table>

In this language stems are maximally trisyllabic, although a fourth syllable is made possible only by the durative -Vg- suffix. That such a maximality condition is in effect is seen in (18).
(18) Maximum trisyllabic stem: verb extensions can be added only if there is room!

a. kór-a ‘to tie’ bar-a ‘to bite’
   kór-is-a ‘to cause to tie’ bar-is-a ‘to cause to bite’
   kór-in-a ‘to tie each other’ bar-in-a ‘to bite each other’

b. *kór-is-in-a ‘to cause each other to tie’ *bar-is-in-a ‘to cause each other to bite’
   *kór-in-is-a ‘to cause to tie each other’ *bar-in-is-a ‘to cause to bit each other’

c. dzá-a ‘to eat’ /dzé-a/ tá-a ‘to see’
   dzé-s-a ‘to cause to eat, feed’ tá-s-a ‘to cause to see, show’
   dzé-n-a ‘to eat each other’ tá-n-a ‘to see each other’
   dzé-s-in-a ‘to feed each other’ tá-s-an-a ‘to show each other’

d. yigin-a ‘to get accustomed to’ súndzin-a ‘to decrease, shorten’
   yig-is-a ‘to cause to be accustomed’ súndz-is-a ‘to cause to decrease’

Causative -is- and reciprocal -in- are illustrated in (18a). As seen in (18b), they cannot both be present after a CVC-root, because that would result in four syllables. The do co-occur in the order causative+reciprocal after a CV-root in (18c), where they can be fit into the trisyllabic maximal template. The examples in (18d) show exceptional cases where the causative replaces the [in] of a monomorphemic CVCin- verb.

Another property of NW Bantu accompanying stem maximality is the decrease in the number of consonant oppositions as one goes from left-to-right. In (19) we see that the drop is precipitous in Koyo:

(19) Decrease in the number of consonant oppositions in each of the four stem syllables

<table>
<thead>
<tr>
<th></th>
<th>Labials</th>
<th>Alveolars</th>
<th>Proto-Palatals</th>
<th>Velars</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1 = 18:</td>
<td>p b w m mb</td>
<td>t l s n nd</td>
<td>ts dz y n ndz</td>
<td>k h n</td>
</tr>
<tr>
<td>C2 = 12:</td>
<td>b m mb</td>
<td>r l s n nd</td>
<td>y n ndz</td>
<td>g</td>
</tr>
<tr>
<td>C3 = 6:</td>
<td>m</td>
<td>r l s n</td>
<td></td>
<td>g</td>
</tr>
<tr>
<td>C4 = 1:</td>
<td></td>
<td></td>
<td></td>
<td>g</td>
</tr>
</tbody>
</table>

This contrasts with Proto-Bantu and present-day canonical Bantu languages, where there is a near-free distribution of consonants in the different stem positions (cf. Hyman 2004, Teil-D’Autrey 2002, to appear). (Concerning vowels, /i, e, e, u, o, o, a/ contrast in V1 position, while only /i, u, a/ contrast as V2, V3 and V4 in Koyo.)

In addition to the decrease in contrasts by position, (25) also shows that a stem-internal stop must be voiced. As a result, /p/ contrasts with /b/ only in C1 position (as in Tiene). The examples in (20) show that /t/ and /k/ are realized \[\text{t, k}\] in C1 position vs. \[\text{r, g}\] in C2, C3 and C4 positions:

(20) Realization of /t/ and /k/ in Koyo

<table>
<thead>
<tr>
<th></th>
<th>/tón-a/</th>
<th>/kúl-a/</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>C1:</td>
<td>[tóna] ‘refuse’</td>
<td>[kúla] ‘abandon’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C2:</td>
<td>/bát-a/</td>
<td>/mék-a/</td>
<td>[méga] ‘dare’</td>
<td></td>
</tr>
<tr>
<td>C3:</td>
<td>/tsikit-a/</td>
<td>/pítak-a/</td>
<td>[píraga] ‘smear’</td>
<td></td>
</tr>
<tr>
<td>C4:</td>
<td></td>
<td>/pítak-Vk-a/</td>
<td>[píragaga] (DUR)</td>
<td></td>
</tr>
</tbody>
</table>
As seen, however, there are no significant place restrictions in Koyo, aside from the restriction of the historical palatals /ts/ and /dz/ to C₁ position. In fact, place restrictions seem to be found only in the Teke subgroup to which Tiene belongs (see §6).

The question is whether the place restrictions in Tiene are synchronically grounded, i.e. due to a linguistic tendency of some sort, or are synchronically accidental, i.e. attributable to specific historical factors which gave rise to it? Addressing this latter possibility first, it is easy to show that T ⊆ P, K is not inherited from PB, nor is it typical of Bantu languages in general, where non-coronals statistically PRECEDE coronals.

Consider in this context the PB extension system, which is impressively uniform throughout most of Bantu:5

(21) PB verb extensions (Meeussen 1967, Schadeberg 2003)

   a. frozen, mostly unidentifiable -VC- “expansions” (9/11 = non-coronal)
      i. *-im-, *-un-, *-ing-
      ii. *-ang-, *-ab-, *-ag-, *-ak-
      iii. *-im-, *-om-, *-ong- (only after CV-)
   b. unproductive extensions often restricted to post-radical position (4/7 = non-coronal)
      i. *-ik- ‘impositive’
      ii. *-am- ‘positional’
      iii. *a(n)g- ‘repetitive’
      iv. *-ut-
      v. *-at- ‘tentive’ (contactive)
      vi. *-ud-/*uk- ‘reversive/separative’ (tr/intr)
   c. productive extensions (3/4 clear cases = coronal)
      i. *-i- ‘causative’
      ii. *-i-c- ‘causative’
      iii. *-id- ‘applicative’
      iv. *-ak- ‘neuter/stative’
      v. *-an- ‘reciprocal/associative’
      vi. *(iC)-u- ‘passive’

In (21) the reconstructions are presented in the order in which they are expected to occur: frozen “expansions”, unproductive extensions, productive extensions. As seen, as one moves out from the verb root the suffixal consonants become more coronal. The preponderance of (productive) coronal suffixes appears to be characteristic of Niger-Congo in general, and is particularly striking in the Atlantic subgroup (cf. the table in Becher 2000:31). Although less impressive in this respect, for completeness, the PB inflectional endings are given in (22).

(22) PB final inflectional endings (Meeussen 1967; see also Grégoire 1979, Bastin 1983)

   a. *-i (past) c. *-id-e (perfective) e. *-a (“default”)
   b. *-e (subjunctive) d. *-ag-a (imperfective)

Since PB did not provide the source, the Tiene place restrictions must be an innovation. We might therefore expect nearby NW Bantu languages to show at least a statistical tendency for coronals to come earlier among post-root consonants. In (23) we see that both Koyo and Bobangi instead show a preponderance of coronals in later verb stem positions:

---
5 The following discussion is restricted to verbs, since noun stems are typically limited to two syllables unless they are derived (e.g. from verbs), reduplicated, or borrowed.
(23) Distribution of consonants by place in two nearby NW Bantu languages

a. Koyo (Hyman 1996): Max = CVCVCV (fourth CV must be durative -gV)

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>P</th>
<th>K</th>
<th>T</th>
<th>Y</th>
<th>h</th>
<th>{T, Y} %</th>
<th>CVC_1-V</th>
<th>CVC_2VC-V</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>1536</td>
<td>419</td>
<td>316</td>
<td>613</td>
<td>118</td>
<td>70</td>
<td>47.6%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C2</td>
<td>1308</td>
<td>324</td>
<td>409</td>
<td>549</td>
<td>24</td>
<td>2</td>
<td>43.8%</td>
<td>47.4%</td>
<td>38.5%</td>
</tr>
<tr>
<td>C3</td>
<td>192</td>
<td>11</td>
<td>31</td>
<td>148</td>
<td>1</td>
<td>1</td>
<td>77.6%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b. Bobangi (Whitehead 1899) : Max = CVCVCVCV; 3/3,324 verbs have fifth CV

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>P</th>
<th>K</th>
<th>T</th>
<th>Y</th>
<th>h</th>
<th>{T, Y} %</th>
<th>CVCVC_1-V</th>
<th>CVCVC_2VC-V</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>7619</td>
<td>2055</td>
<td>1502</td>
<td>3048</td>
<td>1012</td>
<td>55.3%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C2</td>
<td>7246</td>
<td>1508</td>
<td>2289</td>
<td>3257</td>
<td>192</td>
<td>47.6%</td>
<td>81.5%</td>
<td>43.6%</td>
<td></td>
</tr>
<tr>
<td>C3</td>
<td>2930</td>
<td>395</td>
<td>470</td>
<td>1955</td>
<td>110</td>
<td>70.5%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C4</td>
<td>852</td>
<td>65</td>
<td>112</td>
<td>634</td>
<td>41</td>
<td>79.2%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In both Koyo and Bobangi coronals range from 43.8% to 55.3% in the two root positions, C1 and C2. The percentage rises dramatically to 70.5-79.2% in C3 and C4 positions. The last two columns show that the C2 in Koyo and the C3 in Bobangi are even more likely to be coronal if they are the last consonant of the verb stem. Since coronals cannot occur in C3 position, Tiene appears to have exactly the opposite distribution from its neighbors outside the Teke group.

5. In search of an explanation

Having eliminated the possibility that Tiene inherited a skewed distribution of consonants by place, we must now seek an account of how and why Tiene innovated as it did. There are two aspects of the Tiene situation which require an explanation. First, why can’t C2 = C3 in place of articulation? Second, why can’t C2-C3 = non-coronal + coronal?

The first question seems appropriately answered by relating Tiene to the avoidance of sequences of homorganic consonants in lexical items, well-known from the study of Arabic roots (cf. Frisch et al 2004). Pozdniakov & Segerer (to appear) have recently shown that there is, universally, an avoidance of successive homorganic consonants within words, even when such consonants are separated by a vowel. They calculate the expected vs. attested number of consonant combinations by place of articulation. Some of their results are reproduced in (24).

(24) Similar Place Avoidance (SPA) (Pozdniakov & Segerer, to appear)

<table>
<thead>
<tr>
<th>Fula (n=672)</th>
<th>Malagasy (n=1944)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P  K  T  Y</td>
<td>P  K  T  Y</td>
</tr>
<tr>
<td>P  -- -- +  +</td>
<td>P  -- --  +</td>
</tr>
<tr>
<td>K  -- --  ++</td>
<td>K  -- --  +</td>
</tr>
<tr>
<td>T  ++ ++  --</td>
<td>T  ++ --  --</td>
</tr>
<tr>
<td>C  ++ ++  --</td>
<td>C  ++ --  --</td>
</tr>
</tbody>
</table>

36
In the above tables P = labial, K = velar, T = dental-alveolar, and Y = palatal. A single + or - indicates that the attested number of lexical entries is 15-30% off from the number that would be expected if there were no co-occurrence restrictions. A double ++ or -- means that the discrepancy is over 30%. As seen, the bulk of minutes occurs along the descending grey diagonal, i.e. where the consonant combinations involve an identical place of articulation. Besides the underrepresentation of consonants of identical place, the upper left and lower right quadrants of the above tables show a statistical avoidance of successive consonants from the same superclass: P+K (= peripheral/grave) and T+Y (= medial/acute).

Pozdiakov & Segerer show that their statistical universal is also in force within Bantu. While we expect the productive suffixes to combine freely with bases ending in all places of articulation, I have found that unproductive suffixes avoid homorganic bases, at least in Chichewa:  

(25) Distribution of unproductive suffixes *-am-, *-uk-, *-Vt- and *-ud- in Chichewa

<table>
<thead>
<tr>
<th></th>
<th>P</th>
<th>K</th>
<th>T</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>C2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>-77%</td>
<td>23%</td>
<td>+12%</td>
<td>+52%</td>
</tr>
<tr>
<td>K</td>
<td>-25%</td>
<td>-78%</td>
<td>+150%</td>
<td>+17%</td>
</tr>
<tr>
<td>T</td>
<td>+43%</td>
<td>17%</td>
<td>-11%</td>
<td>-77%</td>
</tr>
<tr>
<td>C</td>
<td>-7%</td>
<td>-1%</td>
<td>-11%</td>
<td>-3%</td>
</tr>
</tbody>
</table>

The calculations in (22) are based on 1,412 trisyllabic or longer verbs extracted from Sanderson (1954) as adapted by Al Mtenje for the Comparative Bantu On-Line Dictionary project.
I will therefore assume that the statistical universal of Similar Place Avoidance (SPA) is responsible for the categorical prohibition of the coronal/non-coronal superclasses in Tiene.

Having provided a possible motivation for why C2-C3 consonants cannot be [αcoronal], the remaining question we must address is why they cannot occur in the order non-coronal + coronal (*P-T, *K-T). As indicated in (26), there are three logical possibilities for ruling out such sequences (henceforth, T stands for all coronals):

(26) Three logical possibilities for ruling out non-coronal C2 + coronal C3
   a. a restriction on non-coronals: *P, *K in C2 position
   b. a restriction on coronals: *T in C3 position
   c. a restriction on sequences: *P-T, *K-T in C2-C3 positions

Having limited stems to a maximum of three syllables, the innovative prohibition may have been against medial non-coronals, final coronals, or non-coronal + coronal sequences (cf. Hyman & Inkelas 1997). The Tiene data thus do not point to a clear interpretation.

One possibility is that the coronal + non-coronal order is related to the special “unmarked” status of coronals in inventories, processes, language acquisition, and performance. It is often pointed out that coronals have greater frequency, assimilability, transparency, and distribution (Paradis & Prunet 1991a,b). But why should unmarked T precede marked P and K? Perhaps there is a phonetic motivation: If it could be shown that coronals tend to be shorter in duration than coronals, perhaps Tiene phonologized “fast before slow”? As reported by Maddieson (1997:630), however, available data are not consistent on this point:

(27) Two studies of English stop consonant closure duration (in ms) by place of articulation

<table>
<thead>
<tr>
<th></th>
<th>P &gt; T &gt; K (Strathopoulos &amp; Weismer 1983)</th>
<th>P &gt; K &gt; T (Byrd 1993)</th>
</tr>
</thead>
<tbody>
<tr>
<td>p</td>
<td>96</td>
<td>69</td>
</tr>
<tr>
<td>b</td>
<td>92</td>
<td>64</td>
</tr>
<tr>
<td>t</td>
<td>82</td>
<td>53</td>
</tr>
<tr>
<td>d</td>
<td>76</td>
<td>52</td>
</tr>
<tr>
<td>k</td>
<td>72</td>
<td>60</td>
</tr>
<tr>
<td>g</td>
<td>68</td>
<td>54</td>
</tr>
</tbody>
</table>

While these studies measured stop closure, we would also want to know how the durations compare between nasals, but of oral sonorants, affricates and fricatives. It seems unlikely that Tiene intervocalic [s] and [l] are shorter in duration than [b] and [k] or were so at the time of phonologization.

In §3 it was demonstrated that the historical process in developing the place constraints was one of metathesis: {P, K} \(\triangleright\) T \(\triangleright\) V \{P, K\}. However, this metathesis goes against claims which have been made concerning the direction of historical metathesis or speech errors. As an example of long distance metathesis, Grammont (1933:348) cites the example beaucoup \(\triangleright\) copou as producing a sequence reflecting the “expiratory order”: K \(\supset\) T \(\supset\) P. Concerning contiguous CC metathesis, Blevins & Garrett’s (2004) generalizations in (28), taken together, produce the favored linear ordering: K \(\supset\) P \(\supset\) T.

(28) Generalizations of Blevins & Garrett (2004) concerning CC metathesis as sound changes

   a. PK > KP not: *KP > PK
Data from child language phonology also seems to be of little help in understanding Tiene (Macken 1996, Pater & Werle 2001, Fikkert & Levelt 2006, etc.) First, there is the well-known fact that “consonant harmony predominates”, e.g. *duck* → [gʌk], [dʌt] (Rose 2001). Second, as the examples in (29) show, metatheses often result in coronals being realized later:

(29) Non-coronal + coronal metatheses in child language (examples from Smith 1971)

a. [rikt] ‘risk’
   [ɛplin] ‘helping’

b. [mizbørəl] ‘miserable’
   [gæpəlin] ‘galloping’

The examples in (29a) are cases of local CC metathesis, whereas those in (29b) involve consonant metathesis across a vowel. Concerning these latter, the generalization seems to go against Tiene: “[cor] Cs metathesize to C₂ position in *[CV.CV]* and [CVC] words and to C₃ position in *[CVCV]*, and to the right of string-adjacent [-cor]” (Macken 1996:166). What Tiene does have in common with child language phonology is that the latter is often templatic (Macken 1992, 1996; Vihman 2002). Macken distinguishes two kinds of learners (harmonic vs. templatic) who are both sensitive to coronality: “…in the harmony systems... coronals undergo harmony, particularly when they precede non-coronals; in melody templates, coronals are sequenced to the right of non-coronals” (Macken 1992:350). Macken considers non-coronals dominant and coronals non-dominant and adds: “Nondominant features occur in prosodically nondominant positions, such as in codas or foot-internally, or in positions of neutralization; dominant features occur in prosodically dominant positions, such as foot initial and onsets generally” (Macken 1996:166).

There is reason to think that this property of child language phonology extends to adult phonology as well. As the first of two examples, consider the realization of pluractional -ta in Kashaya:

(30) Pluractional -ta- in Kashaya (Buckley 2000:16)

a. suffixation after T
   i. dahqotol- → dahqotol-**ta**- ‘fail (to do)’
   ii. diṭ’an- → diṭ’an-**ta**- ‘bruise by dropping’

b. infixation before P, K
   i. bilaq’am- → bilaq’am-**ta**- ‘feed’ *bi.la.q’am.ta
   ii. sima:q → sima-**ta**-q- ‘go to sleep’ *si.ma:.q.ta

Whereas -ta is suffixed after a base which ends in a coronal in (30a), it is infixed in (30b), where the base ends in a non-coronal consonant. Buckley explains that -ta is infixed in order to avoid non-coronal codas (as suffixation would produce in the starred forms to the right in (30b)). Following Macken, Kashaya -ta affixation avoids producing dominant {P, K} in a non-dominant (i.e. coda) position.

The second example concerns the distribution of root-internal consonants in Mathimathi. As seen from the lexical counts made by Gahl (1996) in (31a), both consonants of CVC roots can be coronal or non-coronal:
In (31b), however, we see that there are no non-coronal consonants in the C2 position of CVCVC roots. This is indeed very reminiscent of Tiene. Using the term “weak” in place of Macken’s “non-dominant”, the facts seen thus far can be united as in (32).

(32) Tendency to align coronals with weak prosodic positions
   a. Kashaya: coda vs. onset
   b. Bantu in general: late vs. early (roughly, root vs. post-root)
   c. Tiene and Mathimathi: medial vs. peripheral

As was seen in §4, Koyo, Bobangi, and most Bantu show more coronality in later consonant positions within the stem, especially those following the initial CV(V)C- root. The prosodic structure of such languages is therefore strong (root) vs. weak (post-root). In Tiene (and apparently Mathimathi), there is instead a weak medial CV or “nadir” (Hyman & Inkelas 1997). As schematized in (33), the PROSODIC TROUGH (τ), introduced for Yaka (Hyman 1998), consists of the middle C2V2 sequence of a CVCVCV stem in Tiene, where C2 = T and V2 is predictable from V1:

(33) The prosodic trough in Tiene

If we are correct in extending Macken’s observations on child language phonology in this way, we can summarize the account reached for Tiene consonant place restrictions as follows: (i) [αcoronal] C2-C3 sequences are prohibited by a categorical version of the statistical universal of SPA (Pozdniakov & Segerer, to appear). (ii) Non-coronals are restricted from the prosodic trough. Taken together, this account perhaps represents a bit of an overkill in the sense that a non-coronal C2-C3 sequence would be ruled out by either constraint. It also may not be as fine-tuned as needed, since it lumps together all coronals vs. all non-coronals. In order to get more perspective on both of these issues, the next sections briefly describes three other languages that have Tiene-like properties.

6. Other Teke

In the preceding sections reference has been made to the Teke subgroup of Bantu to which Tiene has sometimes been claimed to belong. It should not be surprising that other languages of this subgroup have at least some of the same properties found in Tiene. In this section I will briefly
describe two Teke languages for which we have data and then turn in §7 to a quite distant language, Izere, spoken in Nigeria.

The prosodic stem has been described in great detail for Kukuya by Paulian (1975). The relevant properties of Kukuya prosodic stem are summarized in (34).

(34) The prosodic stem in Kukuya (Paulian 1975; cf. Hyman 1987)
   a. Five syllable shapes: CV, CV.V, CV.CV, CVV.CV, CV.CV.CV
   b. Six C₂ or C₃ consonants: /p, t, k, l, m, n/ (vs. large inventory of C₁ consonants)
   c. Six C₂-C₃ combinations: C-n-m, C-t-k, C-l-k, C-l-p, C-t-p, C-k-p
   d. Weak C₂, C₃ realizations: /p, t, k/ are realized [b ~ β], [r] and [k ~ g ~ γ], respectively.
   e. V₂ of CVCVCV is almost totally predictable and is subject to reduction or deletion
   f. Five tonal “melodies”: L, H, LH, HL, LHL

As seen, Kukuya stems are limited to the same five shapes as in Tiene, with a maximum of three syllables. In terms of consonant distribution it has gone beyond Tiene in two ways. First, only six consonants appear as C₂ or C₃, even in CV(V)CV stems. (We saw in (14) that Tiene allows 10 out of its 13 consonants in this position.) Second, there are only six combinations of C₂-C₃ in trisyllabic stems, exemplified in (35).

(35) Among CVCVCV stems, “ne sont attestées que” (C₂-C₃): (Paulian 1975)
   a. C - n - m : / (kì-) .púnumà/ ‘accidentally knock over’ 34.57%
      C - t - k : / (kì-) .bítikà / ‘be numerous’ 26.33%
      C - l - k : / (kì-) .bólokò/ ‘break’ 19.15%
      C - l - p : / (kì-) .lèlèpè/ ‘slow down’ 9.84%
      C - t - p : / (kì-) nàtàpà / ‘be fixed, stuck’ 3.19%
   b. C - k - p : / (kì-) .pákapà/ ‘crack, be torn (intr.)’ 6.92%

The six combinations agree in nasality and respect the prohibition against [α coronal]. Those in (45a) mirror the coronal + non-coronal sequencing found in Tiene. Unlike Tiene, however, the velar+labial combination is allowed in (35b) is allowed. On the other hand, Kukuya has gotten labials out of C₂, possibly by metathesis: PB *papok-a ‘become torn’ > pákapà ‘crack, be torn’, PB *tombok-a ‘burst open’ > ókopò ‘burst open’ (abcess). Verb extensions are not productive in the language (Christiane Paulian, personal communication).

The second language is a variant of Teke spoken in Gabon whose properties in (46) are drawn from a lexicon of 1466 items (Hombert 1993):

(36) The prosodic stem in Teke-Gabon
   a. Five syllable shapes: CV, CV.V, CV.CV, CVV.CV, CV.CV.CV
   b. Seven C₂ + C₃ consonants: b, r, g, l, m, n, η (vs. large inventory of C₁ consonants)
   c. Five C₂-C₃ combinations: C-b-g C-m-η, C-l-g C-r-g, C-n-η

Again we see the same five stem shapes and a maximum of three syllables in (36a). While Teke-Gabon allows a wide array of C₂ consonants in CV(V)CV stems (including prenasalized /mb, nd, nj, ηg/), the seven consonants in (36b) form the five C₂-C₃ combinations in (36c). As seen,
velars are excluded from $C_2$, while only velars can occur in $C_3$ (cf. Koyo’s $C_4$ in (19)). Again, $C_2$ and $C_3$ must agree in nasality. Given the seven consonants in (36b), which may be derived from /p, t, k, l, m, n, ŋ/, and the bidirectional constraint “if $C_3$, then velar; if velar, then $C_3$”, exactly the five combinations in (36d) will be well-formed.

The facts from Tiene, Kukuya and Teke-Gabon suffice to show that the languages of this area exhibit variations on a theme, as summarized in (37).

(37) Heterorganic $C_2$-$C_3$ combinations ranked in terms of most to least prohibitions

<table>
<thead>
<tr>
<th></th>
<th>$C_3 = T$</th>
<th>$C_2$ &amp; $C_3 = P, K$</th>
<th>$C_2 = T, C_3 = P, K$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tiene</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Kukuya</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Teke-Gabon</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Izere</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

In (37) I have added Izere, which will be discussed next. As seen, all four languages prohibit non-coronal + non-coronal $C_2$-$C_3$. They also all allow CVTVK. Beyond this they differ: Kukuya allows CVKVP (but not CVPVK), while Teke-Gabon and Izere allow CVPVK (but not CVKVP). Finally, Teke-Gabon alone disallows CVTVP, since $C_3$ must be velar.

What this means is that slightly different constraints have been imposed in the languages for which we have information. It is tempting to say that the initial trigger of the above variations was getting coronals out of $C_3$. However, this does not quite work for Izere, as we shall now see.

7. **Izere**

Izere (a.k.a. Afuzare and Zarek) is a Northern Nigerian language belonging to the Plateau subbranch of Niger-Congo whose relevant phonological and morphological properties have been studied by Wolff & Meyer-Bahlburg (1979), Gerhardt (1984), and Blench (2001). Although distantly related to Bantu, Izere is geographically quite far from Tiene and its close relatives. Still, as seen in (38), based on 2,178 entries from Blench & Kaze (2000), the maximum CVCVC stem shows remarkable similarities with the Teke languages:

(38) Maximum stem = CVCVC

<table>
<thead>
<tr>
<th>$C_2/C_3$</th>
<th>$P$</th>
<th>$K$</th>
<th>$T$</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>*</td>
<td>CVbṾk</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CVmṾg</td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>CVrVp</td>
<td>CVrṾk</td>
<td>CVrVs</td>
</tr>
<tr>
<td></td>
<td>CVrVm</td>
<td>CVrṾf</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CVSVP</td>
<td>CVSVk</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CVSVm</td>
<td>CVSṾf</td>
<td></td>
</tr>
</tbody>
</table>

Izere is like Tiene except for the two bolded cells: Like Teke-Gabon, it allows $C_2$-$C_3$ to be CVPVK. Unlike any of the Teke languages, however, it allows one CVTVT shape, CVrVs,
occurring only in pluractional forms (see below). In addition, nasal agreement is unidirectional in Izere: If C2 = nasal, then C3 = nasal, but if C3 = nasal, C2 may or may not be. All 12 acceptable sequences are illustrated in the verbs in (39), where it should also be noted that Izere does not require an inflectional FV:

(39) CVCVC verb stems

<table>
<thead>
<tr>
<th>CVCVC</th>
<th>CVCVC</th>
<th>CVCVC</th>
<th>CVCVC</th>
</tr>
</thead>
<tbody>
<tr>
<td>tíríp</td>
<td>‘rub’</td>
<td>burúk</td>
<td>‘stir’</td>
</tr>
<tr>
<td>kurúm</td>
<td>‘coax’</td>
<td>káránj</td>
<td>‘pay’</td>
</tr>
<tr>
<td>gesèp</td>
<td>‘stammer’</td>
<td>kánánj</td>
<td>‘fry’</td>
</tr>
<tr>
<td>kósöm</td>
<td>‘cough’</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

While Izere contrasts approximately 25 consonants in C1 position, (40) shows severely restricted inventories in C2 and C3 positions:

(40) C2 & C3 consonants (no verbs are CVVp; two verbs are CVVk)

<table>
<thead>
<tr>
<th>CVC</th>
<th>CVCVC</th>
<th>CVCVC</th>
<th>CVCVC</th>
</tr>
</thead>
<tbody>
<tr>
<td>p</td>
<td>b</td>
<td>p</td>
<td>(p)</td>
</tr>
<tr>
<td>r</td>
<td>r</td>
<td>k</td>
<td>r</td>
</tr>
<tr>
<td>k</td>
<td>m</td>
<td>m</td>
<td>m</td>
</tr>
<tr>
<td>n</td>
<td>n</td>
<td>η</td>
<td>n</td>
</tr>
<tr>
<td>η</td>
<td>s</td>
<td>s</td>
<td>s</td>
</tr>
</tbody>
</table>

Again, coronals are missing from C3 position, except for /s/, which must be preceded by [r]. Besides the striking distributional similarities, Izere has in common with Tiene that verb pluractional (~ habitual) formation may involve either suffixation or infixation:

(41) Suffix vs. infix -s-(~ -r-) in pluractional formation

a. CV → CVs (12)
   bó → bós  ‘fetch’
   kpà → kpás  ‘fall’
   df → dís  ‘see’
   se → ses  ‘locate, find’

b. CVP, CVK → CVVs (14)
   rép → réés  ‘sell’
   káp → káás  ‘farm’
   tóm → tôós  ‘send’
   nyim → nyíís  ‘meet’
   nák → n nó s  ‘build’
   fók → fóós  ‘hear’
   gaŋ → gáás  ‘finish’
   tseŋ → tséés  ‘walk, go’

d. CVn → CVrVŋ (9), CVsVŋ (4)
   men → méréŋ  ‘lie down’
   kon → koroŋ  ‘rub’
   tún → türüŋ  ‘remove’
   bún → búsűŋ  ‘break (wood, bones)’
   tén → tésěŋ  ‘cut’
   shán → shášhŋ  ‘buy’ (+ sibilant harmony)

e. CVr → CVsVk (10)
   gor → gósók  ‘pass’
   nár → násák  ‘surpass’
   tár → tášák  ‘shout, yell’
   tsér → tsésěk  ‘look for, want’
Within the data base there are 539 verbs of which 181 (or 34%) have a derived pluractional form. (The number of examples of each pattern is given in parentheses.) In (41a) we see that CV verbs take an -s suffix. The same appears to be true in (41b) when a CVC verb ends in a non-coronal. As seen, the labial or velar consonant drops out. Thus compare Izere nɔk → nɔsɔ ‘build+PL’ with its analogue in nearby Berom: lɔk → lɔgɔs ‘build+PL’ (Blench 2005). The forms in (41c) show infixation of either -r- or -s-. In addition, the /n/ of the root becomes [ŋ] in accordance with the requirement that C₃ be non-coronal. The same interpretation is possible in (41d), if we assume that Cᵢ [r], which reconstructs as *t (Wolff & Meyer-Bahlburg 1979, Gerhardt 1984) is underlyingly /t/ (cf. Izere nɔɔk, Berom nɔt ‘give’). Starting with /got/ ‘pass’, we first derive gɔsɔt, which then becomes gɔsɔk ‘pass+PL’ since C₃ must be non-coronal.

That infixation is required is clearly seen in the following derivations:

(42) CVPVK → CVsVP unambiguously requires infixation (and loss of velar C₃)

a. CVbVk → CVsVp (7), CVsVm (1)
   fúbük → fúsùp ‘sip’  
   túbük → tüsùp ‘stab’  
   kábák → kasàp ‘share out’

b. CVmVŋ → CVsVp (3), CVsVm (1)
   rímíŋ → rísíp ‘kick’  
   shímíŋ → shíship ‘wake up, rise’

When the verb has the shape CVPVK, the plural form is derived by infixing -s- into the C₂ position. In (42a) the labial C₂ of the singular form appears as C₃, where it is devoiced, and the C₃ velar of the singular is deleted. Also reminiscent of Tiene, three of the four plurational forms in (42b) involve denasalization of /m/ as C₃. The last example of each set shows that there is some irregularity concerning nasality.

As seen in the table in (43), when the base verb has the shape CVTVK, the corresponding plurational forms show considerable variation:

---

7 There are four exceptions: rómíŋ → rós ‘bite-PL’, tsíbük → tsíp ‘twist-PL’, téméŋ → tém ‘cut-PL, chop down-PL’, zímíŋ → zim ‘fling-PL, swing-PL’. Forms like the first three motivate Wolff & Meyer-Bahlburg (1979) and Gerhardt (1984) to propose a singular suffix -k (~ -ŋ) which is missing in the plural. Blench’s (2005) reconstruction of singulative *-tV in Berom suggests that this -k may have originally been *-t in Izere as well.
(43) CVTVK \rightarrow \text{multiple forms in the plural}

<table>
<thead>
<tr>
<th></th>
<th># sg.</th>
<th># pl.</th>
<th>CVrVs</th>
<th>CVrVk</th>
<th>CVsVk</th>
<th>CVsVŋ</th>
<th>CVs</th>
<th>CVr</th>
<th>CVk</th>
<th>CV</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVrVk</td>
<td>40</td>
<td>26</td>
<td>13</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>CVrVŋ</td>
<td>20</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CVnVŋ</td>
<td>24</td>
<td>12</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CVsVk</td>
<td>12</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CVsVŋ</td>
<td>9</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

First note that the three shapes whose C₂ and C₃ agree in nasality (CVrVk, CVnVŋ, CVsVk) have the highest percentage of pluractional forms (cf. only one out of 20 CVrVŋ verbs). Examples of some of the patterns are given in (44).

(44) Different patterns when singular = CVTVK

a. CVrVk \rightarrow CVrVs (13)
   kárák \rightarrow káràs ‘open’
   wórók \rightarrow wòros ‘throw, fling’
   kórók \rightarrow kóròs ‘pour’
   yírík \rightarrow yíríś ‘destroy, demolish’

b. CVrVk \rightarrow CVrVk (with tone change) (5)
   burúk \rightarrow burùk ‘stir’
   shirík \rightarrow shirík ‘frighten, scare’
   berék \rightarrow bèrek ‘support’
   bírik \rightarrow bírík ‘cancel, erase’

c. CVsVk \rightarrow CVs (all 6)
   basák \rightarrow bás ‘seal, paste’
   bísík \rightarrow bís ‘untie, unfold’
   fósók \rightarrow fós ‘peel’ (tree bark)
   kpísík \rightarrow kpís ‘split chuck off larger part’
   tásák \rightarrow tás ‘pierce, winnow’
   mísík \rightarrow mís ‘sprinkle, pour away’

d. CVrVk, CVnVŋ \rightarrow CVrVs \sim CVrVk, CVsVŋ
   bárák \rightarrow bárás \sim barák ‘throw’
   fíríŋŋ \rightarrow fíríś \sim fírík ‘sun-dry’
   dorók \rightarrow dóròs \sim dorok ‘leave’
   tónòŋŋ \rightarrow tóròs \sim túsòŋŋ ‘show’
   fúrúk \rightarrow fúrùs \sim furuk ‘jump’
   tárák \rightarrow táràs \sim táràk ‘spread out’

Most significantly, all 16 CVrVs verbs derive from CVTVK, either from CVrVk (13), CVrVŋ (1) or CVnVŋ (2), suggesting that in just this one case it was hard to avoid a CVTVT output. Still, as seen in (44d), six of the 16 CVrVs pluractionals have a variant of the shape CVTVK. It is hard to determine whether one variant is older than the other.

The following summarizes the aspects of Izere which resemble the Teke languages:
(45) Special properties of Izere verb stems
   a. five stem shapes: CV (100), CVC (165), CVVC (72), CVCV (9), CVCVC (183)\(^8\)
   b. limited inventory of C\(_2\) and C\(_3\) consonants in (40) (cf. especially Kukuya in (34b))
   c. C\(_2\)-C\(_3\) is limited to CVTVP (27), CVTVK (109), CVPVK (36) and CV\(_r\)Vs (16PL)
   d. V\(_1\) = V\(_2\) in 167/183 or 91% of CVCVC stems
   e. -s suffix overrides root non-coronal C\(_3\) (vs. coronal C\(_2\) in Tiene);
   f. -s- and -r- infixes precede non-coronal C\(_3\) (cf. -s- in Tiene)

Recall that we have had some difficulty finding support for restricting coronals to internal position. It also is rare for a suffix to be infixed because of its place of articulation. Given that such a distant language has so much in common with the Teke languages, we confidently conclude that they must share a common motivation.

8. Towards an account

I suggest that the precondition that allowed for these languages to progress as they did was the limitation of the prosodic stem (root + suffixes) to a maximal triconsonantal structure: CVCVC-V in Tiene, CVCVC in Izere. With this established it meant that there are exactly three positions: initial, medial and final. Since these same languages show stem-initial prominence (e.g. more oppositions in the first CV of the stem), only the C\(_2\) and C\(_3\) were available to be identified with specific places of articulation. Languages which impose a greater maximum or no maximum are not likely to reorganize the system by place of articulation.

With prosodic maximality as a backdrop, I speculate that the Teke and Izere facts were initially triggered by the codification of SPA, followed by different restructurings. Using T to stand for all coronals, *CVPVP-, *CVTVT- and *CVKVK- became prohibited in various stages. It is known that the fusion or “imbrication” of perfective *-id-, applicative *-id- and causative *-ic-i- suffixes which is widely attested in Bantu (Bastin 1983) first applied to bases which ended in coronals. The prohibition against *CVTVT- may therefore have predated the others in Teke. It certainly predated the develop of the non-coronal constraints *CVPVK-, *CVKVP-, which are differentially observed within the Teke languages (and Izere).

Given the relative non-productivity of non-coronal suffixes in Bantu seen in (21), the effect of these prohibitions may have been to marginalize or lose P and K suffixes. Since coronal suffixes were more productive, some kind of accommodation would have had to be made for *CVT-VT-. As we saw in (3a) and (4a), causative -Vs- and applicative -Vl- avoid *CVTVT- by fusing with a CV(V)T- root. Izere relies on the dissimilation of C\(_3\) T to K and metathesis. This produces the derivations in (46).

(46) Infixation and velarization in Izere
   a. *got [gor] ‘pass’  *got-Vs > gotos > gosot > gosok ‘pass+PL’
   b. *tēn [tēn] ‘cut’  *tēn+Vs > tēnés > tēsén > tēsēŋ ‘cut+PL’
   c. *kon [kon] ‘rub’  *kon+Vt > konot > koton > koro ‘rub+PL’

\(^8\) The numbers do not add up to 539 because of exceptional verbs. For example, two verbs have the shape CVCVVC with exceptional C\(_2\)-C\(_3\) sequences: kutādīm ‘lose direction’, tēmādīr ‘throw (piece of food) into mouth at once’.
In (46a,b) the pluractional suffix is -Vs-, while in (46c) it is -Vt-. In each case the suffixal consonant metathesizes with the coronal C2 of the root. *t is realized [r] as C2, but [k] as C3. The metathesis in (46a,b) appears to be motivated by the fact that velarization of C3 *s would have produced [x], which does not otherwise exist in the language. This, however, cannot explain why metathesis is required in (46c). There we note that a non-metathesized output *[konok] would violate the Izere constraint that if C2 is nasal, then C3 must also be. One might try to fix this up by producing *[konon], which may be avoided for morphological reasons: Of the 84 CVCVC plurational verbs in Blench & Kaze (2000), only two irregular verbs have nasal C2 and C3: mas → manaŋ ‘laugh+PL’, tsé̬m → tsé̬mę́ŋ ‘sift+PL’. Given that pluractionality is marked by [s] and [r] (< *t), *[konon] may just sound too singular.9

The suggestion made here is that once a language both limits its maximal prosodic stem to CVCVC- and introduces severe constraints on C2-C3 homorganicity, it invites other restructurings. For example, Tiene speakers would be justified in interpreting CVT-Vs- > CVVs- as a coronal C3 becoming C2. If this can serve as the basis of analogy, it might be extended to shift other coronals to C2, i.e. CVP-Vs-, CVK-Vs- > CVsVP-, CVsVK-. On the other hand, from the other end of the stem, the C3 velar of the once productive durative/imperfective suffix *-a(n)g- may have served as the model for the requirement that C3 = velar in Teke-Gabon.

There are, however, at least two problems in applying this account to Izere: (i) If CVPVT, CVKVT > CVVT by intervocalic P-/K-deletion, how or why do labials survive in CVPVK? (ii) If CVVT is prohibited, how does (plurational) CVrVs survive? Concerning the first question, considerably less is known about pre-Izere than pre-Tiene, which derives from PB. It is possible that we should reconstruct *CVCs and perhaps other clusters in pre-Izere. In this case *CVPs and *CVKs would become CVVs by cluster simplification. *CVPK, on the other hand might have escaped cluster simplification because the second consonant is not coronal or because an epenthetic vowel was inserted to produce CVPVK. Similarly, it is possible that *CVrs escaped cluster simplification and only later became CVrVs. Perhaps there was a contrast in pre-Izere between CVCC and CVCVC. Since I have argued that C3 *T > K, there also are possible complications deriving from the neutralization of C3 *T and *K. Finally, it should be noted that some of the C3 consonants may have been suffixes even on singulars, and that there may even have been a possibility of multiple suffixation (Wolff & Meyer-Bahlburg 1979, Gerhardt 1984).

While the above account is admittedly speculative, and leaves open a number of questions, one can feel at least confident about SPA as a trigger in paring down the number of consonant combinations in a CVCVC- stem. Compare in (47) the possible CVCVC verb stems shapes in Izere vs. nearby Berom (based on Blench et al 2006):

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9 A few verbs form their pluractional by denasalization, or by -s- affixation + denasalization, e.g. fınıŋ → fırık ~ fırıs ‘sun dry-PL’.
Comparison of CVCVC in Izere vs. Berom verbs

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While 9 out of 12 Izere CVCVC forms have coronal + non-coronal C2-C3, only 12 out of 30 Berom conform to this template. In fact, even though C3 may not be /n/, this still allows 16 different CVTVT shapes. What we see from Berom, however, is that the constraints are severest on combinations of non-coronals: there are no CVPVP or CVKVK forms and only one each of CVKVP and CVVPK, the ordering being predictable based on the nasality of the velar.

Pozdniakov & Segerer (to appear) not only point out that labials and velars work together as a non-coronal superclass, but also that they show greater SPA effects than the coronal superclass (dental-alveolars and palatals). Whether Berom will develop further in the direction of Izere is not clear. What we can say about the above distributions in Berom is that with two exceptions, a CVCVC stem must contain at least one coronal.\

9. Summary

In the preceding sections we have seen that two separate groups of Niger-Congo languages have independently introduced place of articulation constraints on consonant positions within the prosodic stem, which in turn determine whether derivations will involve suffixation or affixation. Although many languages and most of the external evidence from language acquisition and language change suggest that coronals should be realized after non-coronals, these languages have a preference for placing coronals before non-coronals, i.e. CVTVP and CVTVK. Historically, these systems result from the interaction of a number of changes, including

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10 Space limitations preclude a full discussion of plurational marking in Berom, studied by Bouquiaux (1970) and Blench (2005). Suffice it to say that Berom has both -s- suffixation and infixation, e.g. yi → yis ‘come from-PL’, wül → wülus ‘arrive-PL’, sila → silsa ‘fill-PL’, rapal → rapsal ‘ask-PL’. As the last two examples show, Berom differs from the other languages in allowing CVCCVC(C) plurational stems.
metathesis of the C$_2$ and C$_3$ of inherited CVPVT and CVKVT sequences. The fact that this happens independently in the Teke Bantu region and on the Jos Plateau of Nigeria suggests that such sequencing is not isolated or accidental. Based on additional evidence from Kashaya and Mathimathi, it was suggested that the most likely synchronic motivation is that coronals gravitate to “weak” positions. While it appears more common that a language will define strong vs. weak in terms of early vs. late positions within a prosodic domain, in these languages, the weakest position is the medial prosodic trough. Tiene speakers appear to have given an [s-w-s] interpretation to the maximal CVCVC-V stem vs. the more usual [s-w-w] interpretation of Koyo speakers in (19). Interestingly, C$_2$-C$_3$ [w-s] appears to be particularly sensitive to place of articulation while C$_2$-C$_3$ [w-w] shows a gradual weakening along the traditional strength hierarchies (voiceless $\rightarrow$ voiced; non-continuant $\rightarrow$ continuant) (cf. Williamson 1979). In other words, it is [s-w-s] structure that accounts for the relative rarity of Tiene and Izere affixation by place of articulation. That being the case, we would learn a lot more if the rare and (perhaps) mysterious variations in the Teke and Plateau areas were studied in greater comparative detail.

References


Teil-D’Autrey, Gisèle. To appear. Et si le Proto-Bantou était aussi une langue... avec ses contraintes et ses déséquilibres. *Diachronica*.