THE SYLLABLE TEMPLATE IN TANO

1 Introduction

This paper investigates the synchronic syllable structure of Tano languages while focussing on Baule. Tano languages of the Ivory Coast are a subgroup of the Nyo family (Stewart 1989, 1995). These languages include Agni, Baule and Nzema, generally known as Tano languages after the Tano River at the border between Ghana and Ivory Coast.

Previous groundwork on Baule (Creissels and Kouadio 1977) and Ahoua (1997) have mentioned that Baule has open syllables, and pointed to the necessity of more detailed research of the syllable structure. Creissels and Kouadio base their conclusions on comparative data from Anyi. The present work attempts to cover the range of synchronic evidence including word games.

The paper purports to establish the phonological stability of the optimal CV syllable structure in the face of changes that modify this structure phonetically. The phonological evidence we examine here provides motivation for analyzing all of the syllable types in these languages, including phonetically complex ones, as instances of a simple canonical CV or V structure. The analysis is strengthened by a convergence of evidence from tonal patterns, segmental rules, reduplications and a word game.

2 The surface syllable structures of Baule

Monosyllabic words in Baule have surface syllable structures that may be represented phonetically as in (1):

(1) V, VV, CV, CCV, CVV

Vowels in (1) can occur as nasalized vowels, except if it is the mid tense vowel [e]. Since Baule contrast nasal and oral vowels, we follow Stewart (1989), in accordance with other Tano languages, that Baule has underlying nasal vowels. Nasal vowels are not derived by regressive assimilation from right-standing nasal consonants that cannot be recovered. Baule has the vowels [ɛ, ɛ̃, ɛ̋, ɛ̈] and has lost the contrast between advanced and unadvanced vowels as still occurs in Anyi and Nzema.

Disyllabic words have the surface syllable structures given in (2).

(2) CVCV, VCV, CVNCV, CVnCV

Again as in (1), the vowels in (2) can be nasal vowels. In general polysyllabic words combine the patterns of (1) and (2) in a wide variety of ways. One important constraint, however, is that Baule has no complex syllable coda of the type CVCC. The most challenging issue that arises is how to analyze structures that might be represented phonetically as CCV, CVV, CVNCV, CVnCV. The contrast between CVNCV and CVnCV, in which respectively

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1We gratefully acknowledge the assistance of the linguistics graduate students in our project on Comparative Phonology of Ivoirian Languages at Université de Cocody, Côte d'Ivoire. We also thank our informant Kouakou N’guessan, a speaker of the Ahitou dialect, who has generously provided the data on reduplications. Baule is his primary language and he has never been to school. We have benefited from comments by Rod Casali, Jonathan Burmeister, Dafydd Gibbon and the audience of the West African Linguistics Society in July 1998. We are alone responsible for any shortcoming. The project and part of the work for this paper has been supported by a grant from the National Science Foundation, SBR-9514718. The first author would like to acknowledge the support of the Alexander von Humboldt foundation in the formulation of the final version of this paper.
the medial nasal is a syllabic nasal or a prenasal may be hard to find. However, Baule shows a possible contrast between pairs like [sæ̞-n-dæ̞] ‘because of the pot’ versus [se̞-de] ‘to hang’. In the first case, the ‘n’ is syllabic while in the second case it is not. While it might seem useful to distinguish between the two nasals, Stewart (p.c) has suggested to me that a general rule may exist that makes all medial syllabic nasals non syllabic. Again, this raises the question of the distinction between underlying and surface representation. For instance, in the following words, we need to determine the proper phonetic and phonological representations for sounds that are often transcribed as postconsonantal glides:

(3) \text{CCV (CjV, C jV, C ʷV, CWV)}

\begin{tabular}{ccc}
\text{[s+a]} & \text{[sua]} & \text{[s+]} \\
\text{[kl+a]} & \text{[klua]} & \text{[klwa]} \\
\end{tabular}

\begin{tabular}{c}
\text{‘house’} \\
\text{‘sheep’} \\
\text{‘keep’} \\
\text{‘vomit’} \\
\text{‘be able to’} \\
\end{tabular}

The sequences in (3) may refer to a palatalized or labialized consonant or to a consonant followed by a glide. In the list below (3), the labialized consonants of words like [klwa] ‘can’, [swa] ‘house’, could be in theory be further represented phonetically in such a way that the glide is not a vowel but a short vowel. The raised symbol [ʰ] represents an extra-short vowel analogous to the one that can appear in the examples given in (4) below.

(4) \begin{tabular}{ccc}
\text{[s+a]} & \text{[sua]} & \text{[s+]} \\
\text{[kl+a]} & \text{[klua]} & \text{[klwa]} \\
\end{tabular}

\begin{tabular}{c}
\text{[kluwa]} \\
\text{[klwa]} \\
\end{tabular}

\begin{tabular}{c}
\text{‘can’} \\
\text{‘house’} \\
\text{‘be able to’} \\
\end{tabular}

As far as we know, most of the differences in either line in (4) do not correspond to a contrast in Baule, while some genetically related languages such as Akan do have some of the contrasts in (4), according to Stewart (p.c.). Apparently, we need to establish principles for selecting one of these possibilities. According to Stewart (1976), Akan distinguishes between [s+a] and [s+].

We must also make an analogous decision for the following examples in (5), transcribed orthographically with a CC sequence, which is not correct either phonetically or phonologically. Phonetically, the consonant sequence is interrupted by a vowel that is normally extra-short but that sometimes vanishes entirely. Phonologically, the consonant sequence is broken up by a vowel, as we will motivate shortly.

(5) \text{CCV (CLV, CRV)}

\begin{tabular}{ccc}
\text{[tobacco]} & \text{[formerly]} & \text{[quiet]} \\
\text{[toad]} & \text{[fear]} & \text{[stand up’]} \\
\end{tabular}

\begin{tabular}{c}
\text{‘collect’} \\
\text{‘show’} \\
\text{‘lie’} \\
\text{‘paste’} \\
\end{tabular}

\begin{tabular}{c}
\text{‘pass’} \\
\text{‘span’} \\
\text{‘go down’} \\
\end{tabular}

Finally, we also need to take into account the vowels in the following examples in (6). Phonetically and phonologically, are these cases disyllabic or monosyllabic?

(6) \begin{tabular}{ccc}
\text{[tobacco]} & \text{[formerly]} & \text{[quiet]} \\
\text{[toad]} & \text{[fear]} & \text{[stand up’]} \\
\end{tabular}

\begin{tabular}{c}
\text{‘important’} \\
\text{‘pale’} \\
\end{tabular}

\begin{tabular}{c}
\text{‘important’} \\
\text{‘fishy’} \\
\end{tabular}
All the structures (3), (5), (6) look like violations of the CV canonical pattern. One hint that may guide the analysis is the suggested implicational universal of Kaye (1985), and Kaye and Lowenstamm (1979), according to which no language may have branching onsets unless it also has branching rimes. Although this hypothesis has been questioned by Blevins (1995), it captures a widespread generalization about syllable structure in African languages.

The evidence discussed in the remainder of the paper shows unambiguously that none of the cases in (3), (5), and (6) violates the CV canonical pattern phonologically. For our present purposes, (3), (5), (6) will be assumed correct phonetically. For arguments that even the phonetic representations of (4) and (5) observe the CV syllable pattern, see Leben (1999). In the next section we focus on tonal facts that bear on this issue.

3 The tonal patterns of verbs

Baule has two tonal patterns for verbs: level High, on monosyllabic words, and Low followed by High, on words of more than one syllable. As the third column in (7) shows, CCV verbs behave like disyllabic verbs, that is, they have Low - High sequences.

3 The tonal patterns of verbs

<table>
<thead>
<tr>
<th>(7)</th>
<th>Low-High</th>
<th>Low-High</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CCV</td>
<td>CCV</td>
</tr>
<tr>
<td>High CVV</td>
<td>'take'</td>
<td>'walk'</td>
</tr>
<tr>
<td>'go'</td>
<td>'lighten'</td>
<td>'undo'</td>
</tr>
<tr>
<td>'burst'</td>
<td>'be scared'</td>
<td>'cover'</td>
</tr>
<tr>
<td>'bite'</td>
<td>'forgive'</td>
<td>'catch'</td>
</tr>
<tr>
<td>'collect'</td>
<td>'near'</td>
<td>'bear'</td>
</tr>
<tr>
<td>'cry'</td>
<td>'roll'</td>
<td>'hide'</td>
</tr>
<tr>
<td>'pass by'</td>
<td>'search'</td>
<td>'chase'</td>
</tr>
</tbody>
</table>

These data show that the CCV verbs on the right behave like the disyllabic verbs in the middle rather than like the monosyllabic verbs on the left. This is the first bit of evidence for their phonological analysis as /CVCV/. Though not apparently related, but Stewart has mentioned in some other Tano languages that similar structures contrast with tones. Christaller, quoted by Stewart (1976), was the first to point out the efficiency of the tonal and reduplication criteria for distinguishing between disyllabic versus monosyllabic words. The tonal evidence is pursued in the section 4.

4 CVV verbs: Tonal evidence

It is useful to consider now how the tonal evidence of CVV verbs works just as for CCV verbs. First of all, it is important to keep in mind that we are assuming that all phonetic long vowels in Baule are sequences of vowels. For instance, Stewart (1956:354) correctly notices that a verb with a long vowel such as [kː] 'fry' behaves as bisyllabic verbs:

> [kː] 'fry', the only verbal radical which has been found to have a long vowel sound behaves tonally in the same way as radicals which have two short vowels separated by a consonant sound, such as [ʃiːkː] 'split', and differently from any radical with only one short vowel sound. (Stewart 1956:354)

Though it is true that the word for 'fry' is apparently the only one that has a long vowel, there are verbs like [wua] 'steal' that contain two vowels which tonally pattern with disyllabic verbs, that is, with Low-High tones.
These observations suggest the analysis that [CVV] are phonologically /CVCV/ as argued above. Sometimes the reduction of disyllabic items can pervade through apparent monosyllabic verbs such [ra] that behaves tonally as CCV [tra] 'sit down'. Stewart (1956) also notices that generally trills or nasal laterals (to our view, nasalised laterals), a preceded by a consonant.

‘Even in the exceptional cases in which a trill or nasal lateral is not preceded by a consonant sound, the following vowel sound behaves tonally in the same way as it would after a trill or lateral which was preceded by a consonant sound, and not as it would after a consonant sound other than a trill or lateral’ (Stewart 1956:355)

The case reported by Stewart is [jra]. Even if the initial consonant is deleted, the tone is maintained. cf also wua [wa], wie [ye]

One further reason is that the long vowels can be easily reconstructed as two morphemes as occur in... 

This behavior of Baule CCV syllables is mirrored in other Kwa languages, including Akan and Ga. In Akan the postconsonantal liquids of CCV verbs bear a Low tone, as do the first vowels of VV sequences, and the tonal patterns of such verbs are those of disyllabic verbs rather than of monosyllabic ones:

\[(9)\]

<table>
<thead>
<tr>
<th>Tone</th>
<th>Low Tone</th>
<th>Low Tone-CCV</th>
</tr>
</thead>
<tbody>
<tr>
<td>CV</td>
<td>‘go’</td>
<td>‘speak’</td>
</tr>
<tr>
<td></td>
<td>‘take’</td>
<td>‘be shy’</td>
</tr>
<tr>
<td></td>
<td>‘break’</td>
<td>‘agree’</td>
</tr>
<tr>
<td></td>
<td>‘be small’</td>
<td>‘stand’</td>
</tr>
<tr>
<td></td>
<td>‘say’</td>
<td>‘send’</td>
</tr>
</tbody>
</table>

In Ga the suffix m occurs with the imperative CCV verb forms just as with CCVCV verbs, whereas in monosyllabic words this suffix is not used:

\[(11)\]

<table>
<thead>
<tr>
<th>CV</th>
<th>CCVCV</th>
<th>CCV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>‘take’</td>
<td>‘pick up’</td>
</tr>
<tr>
<td></td>
<td>‘sing’</td>
<td>‘shout’</td>
</tr>
<tr>
<td></td>
<td>‘strike’</td>
<td>‘pull’</td>
</tr>
</tbody>
</table>

5 Other CVV words

Data from tone patterns have motivated a /CVVCV/ analysis for surface [CCV] syllables. We now consider other CVV structures. Our hypothesis is that they too reflect an underlying pattern /CVVCV/. The evidence comes from the following data:

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2 Thanks to Florence Dolphyne and Emmanuel Mensah for providing the data.
In these examples we would have expected the sequence of two vowels to be both nasalized. However, only the last vowel bears the nasal feature. This state of affairs is much more likely if we regard the two vowels in the sequence as heterosyllabic. In Twi (Stewart, p.c.) this type of situation exists that allows the contrast between the first vowel of a sequences versus the second vowel of a sequence of two vowels.

Further compelling evidence comes from the phonological contrast between sequences of vowels as in the following examples:

Any attempt to labialize the rounded back vowels will neutralize the contrast, which is disallowed. In the following sections we present independence evidence of processes that produce new [CVV] surface forms by deleting a medial consonant. They will also reveal how structures like [CwV] and [CjV] derive from /CVCV/ structures.

### 6 Reduplicative verbs

A further piece of evidence comes from the reduplication of verbs as in (14). The meanings of these examples tend to be an action repeated many times or shared by many actors.

In the examples in (15), we have the reduplicated form of surface CCV verbs.
They fell down many times

‘they fell down’

‘they made fire’

‘they made fire many times’

The proposed underlying representation /CVCV/ for the verb forms on the left correctly predicts that in the reduplicative forms on the right a copy of the underlying vowel will appear in second position. Similarly for examples like those below.

(17)

‘they kept things’

‘they kept many things’

‘they bore things’

‘they bore many things’

In principle, the second segment of the verbs on the left could be treated as either as a phonological vowel or as a phonological glide. Taking the base forms to be /sie/ and /sua/ immediately explains the reduplicative forms on the right. If instead we regarded them as /sje/ and /swa/, we would need to amend the reduplication rule accordingly. And at the same time, as argued in section 3, we would lose the explanation for why these forms have the tone pattern LH, unlike the other monosyllabic verbs of the language.

The ideal supporting evidence for this argument would come from verbs whose disyllabic status is not in question. But in fact Baule does not permit these verbs to undergo the reduplication process in (14) to (16). We do not have a good explanation for this restriction, but we suspect that since Baule has no three-syllable verbs, there is maximum length constraint that would be violated by adding a CV reduplicated element to a CVCV verb. Because the surface syllabic status of the reduplicated forms in (15) and (16) is ambiguously di- or tri-syllabic, these may escape the strictures of the maximum length constraint. In the next section we show that the syllable structure demonstrated for verbs is also paralleled in nouns.

7 The tonal patterns of noun

7.1 Downstepped High tones in nouns

Disyllabic nouns appear with all possible combinations of High and Low, with only one phonological tone per syllable, as illustrated in the first column of forms below. The corresponding surface forms are given in the column immediately to the right of these. In (18a), the tone of the final syllable is marked as H” to show that it is Super-High after High. In (18b), the tone of the final syllable is marked as L” to show that it is extra-Low after Low. The Super-High realization is described in detail in section 4.2. The process that makes a final Low tone into extra-Low (typically a fall from Low to extra-Low) has been widely described, e.g. by LaVelle (1975) for Yoruba. The surface forms in (18c,d) result from spreading the tone of the first syllable to the second, while retaining the original tone of the second. High is downdrifted after Low, but this is not marked in the transcription.

3Baule has another reduplication process that reduplicates words rather than syllables, and this applies to all verbs without restriction:

swa / swa swa

sje / sje sje

flo / flo flo

sri / sri sri

kata ‘hide’ / kata kata

mantan ‘stick’ / mantan mantan

nanti ‘walk’/ nanti nanti.

These have a very different meaning and distribution, however.

[FIRMIN: Poutrais-tu amplifier?]
Phonologically possible disyllabic nouns

(18)

<table>
<thead>
<tr>
<th>Underlying</th>
<th>Surface</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. H-H</td>
<td>H-H”</td>
<td>‘bag’</td>
</tr>
<tr>
<td>b. L-L</td>
<td>L-L”</td>
<td>‘panier’</td>
</tr>
<tr>
<td>c. H-L</td>
<td>H–HL</td>
<td>‘cloth’</td>
</tr>
<tr>
<td>d. L-H</td>
<td>L-LH</td>
<td>‘cow’</td>
</tr>
</tbody>
</table>

Monosyllables exhibit a similar range of tone patterns, with the following differences. Monosyllables do not exhibit Super-High or Super-Low tones, since these require a preceding High or Low. Similarly, downdrifted High does not appear on monosyllables of the type CV, since this requires a preceding Low.4

(19)

<table>
<thead>
<tr>
<th>Surface</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. L-L!H</td>
<td>‘cow’!H</td>
</tr>
<tr>
<td>b. L-L!H</td>
<td>‘Kofi’!H</td>
</tr>
</tbody>
</table>

Since only polysyllabic items bear phonetic mid tones and CCV nouns behave the same way, this is good evidence that they can be analyzed as /CVCV/ structures. Another argument comes from the behavior of Super-High tone.

7.2 Super-High tones in nouns

As described in Ahoua (1996) and in Leben & Ahoua (1997), sequences of High tones yield a gradual rising contour that ends with a Super-High tone. Ahoua (1996) referred to this phenomenon as upsweep. As argued in Leben & Ahoua (1997), the Super-High tone at the right edge delimits a phonological word or another prosodic domain. In lexical items, i.e. nouns, the last High tone of a sequence is realized higher than all the preceding ones. As can be seen in (12) CCV items can bear Super-High tones, but monosyllabic nouns with CV structures (as opposed to CCV) realized alone do not.

(20)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. H–H</td>
<td>‘cow’</td>
<td>SH</td>
</tr>
</tbody>
</table>

These examples suggest the analysis that the CCV structure may be derived from /CVCV/ structures. The derivation is as follows:

(21)

\[
/\text{Vru}/ > \quad /\text{s.ru}/ > \quad [s \text{ ru}]
\]

H  SH  H  SH  SH

The only word-initial Mid-toned CV syllable we know of is in [森林] ‘forest’. Historically, a Low-toned prefix has been deleted, leaving a floating low tone that downsteps the high tone of [森] ‘forest’ in the Sunwi  dialect of the closely related languageAnyi.
8 Medial consonant deletion, palatization and labialization

8.1 Medial consonant deletion

In certain cases, Baule intervocalic consonants are productively, optionally deleted, leading to surface [CVV] syllable structures. Consider the following examples:

(22)
1. a[ŋ]a (‘tomorrow’) → [a[i]u ]
2. [ŋ][ŋ][ŋ] (Aubergine’) → [ŋ][ŋ][ŋ]
3. koteb (‘biche’) → [kote]
4. mmo aja (‘Mrs Aya’ ) → [mma]
5. ajë ma (Palm corn’) → [aema]
6. [ŋ][ŋ][ŋ][ŋ][ŋ] (‘25 francs’) → [ŋ][ŋ][ŋ][ŋ][ŋ]
7. a aufue (‘Mr. the stranger’) → [ŋ][ŋ][ŋ][ŋ][ŋ]

Here we observe that [CVV] structures are produced by active synchronic rules. These cases provide a precedence for the sorts of process and outputs required by our analysis of the cases described earlier, in which /CVCV/ becomes [CVV].

8.2 Palatal and Labial Glide Formation

Baule lexical correspondences help to motivate a /CVCV/ origin for some words with surface syllables [CjV], [CwV] and [CyV], as seen in (19) and (20).

(23)

<table>
<thead>
<tr>
<th>si</th>
<th>‘father’</th>
<th>së</th>
<th>‘fatherhood’</th>
</tr>
</thead>
<tbody>
<tr>
<td>wë</td>
<td>‘listen’ (verb)</td>
<td>wë</td>
<td>‘listen’</td>
</tr>
<tr>
<td>wë</td>
<td>‘white’</td>
<td>wë</td>
<td>‘clean’</td>
</tr>
</tbody>
</table>

(24)

| u | ‘belly’ | wë | ‘pregnancy’ |
| u | ‘why’ | wë | ‘why?’ |
| wë | ‘elephant’ | wë | ‘elephant’ |

These lexical correspondences are also attested in the ways names of days are realized in personal names. Many names are based on the day of the week that a person is born on. For example, [kisje] ‘Monday’ surface in the proper name [akisi]. Conversely, the proper name [a[ŋ]a] surfaces in [ŋ][ŋ][ŋ] ‘Tuesday’. Notice that the last syllable of [akisi] is realized with an [i] and not with a glide [j]. Such facts strengthen the case for representing words like [si] as [si] as proposed in (16).

9 Prenasals or nasal segments

Prenasalized segments could in principle constitute a formidable challenge to our thesis that all underlying syllables are of the form (C)V, since these could conceivably call for a representation /CC/. A typical constraint that may seem problematic is raised by Creissels (1979) with the examples:

[ŋ][ŋ][ŋ][ŋ][ŋ][ŋ] (‘look badly’) kal[ŋ]ale (‘panther’)
However, in most cases where we encounter word initial prenasals, as for examples as geminated consonants in [nn], [mm], we have to deal with different morphemes. This is pointed out by Stewart (1956:354):

‘[m,n] are sometimes geminated, but such cases are always to be interpreted as sequences of two sounds; e.g. [m] ‘I drink’; cf. [m] ‘he drinks.’ (Stewart 1956:354)

All prenasals that are word initial or phrase initial can all be found to be monosyllabic nasal prefixes. This can be demonstrated by a simple morphemic analysis or by varying the distribution as mentioned by Stewart (1956), because the root word on the prenasals in encliticized can generally occur in isolation. Another test that we now suggest is to apply reduplication as in numerals. Here the reduplication adds a distributive meaning.

(25)

\[
\begin{array}{c}
\text{[e]} \text{[a]} \text{[e]} \text{[a]} & \text{‘three for each'} \\
\text{[e]} \text{[a]} & \text{‘seven for each'} \\
\text{[e]} \text{[a]} \text{[e]} \text{[a]} & \text{‘eight for each'}
\end{array}
\]

However, the only cases that appear difficult to analyze are intramorphemic prenasals.

(26)

\[
\begin{array}{l}
s\text{e}\text{[l]}\text{e} & \text{‘hang’} \\
k\text{o}\text{[d]}\text{o} & \text{‘roll’} \\
k\text{p}\text{o}\text{[s]}\text{e} & \text{‘to be loose’} \\
k\text{u}\text{[f]}\text{[t]}\text{E} & \text{‘to look for’} \\
k\text{p}\text{l}\text{[n]}\text{[l]} & \text{‘to feel’}
\end{array}
\]

We also encounter nouns with variable pronunciation that are, of course, also applicable to the patterns in (20):

(27)

\[
\begin{array}{l}
k\text{p}\text{[i]}\text{[p]}\text{[s]} & \text{‘wild animal’} \\
\text{[s]}\text{[o]}\text{[A]} & \text{‘soldier’}
\end{array}
\]

Yet Baule offers evidence that suggests that prenasalized consonants, even intramorphemically are merely surface phenomena, though the fact that the restricted distribution (intramorphemic occurrence as opposed to word initial distribution) could be a further argument for not taking as granting prenasals as underlying.

We would like to suggest two somewhat competing constraints that explain their occurrence.

Constraint I: any syllabic nasal occurring between a nasal vowel and an oral consonant loses its syllabicity. The evidence that we provide is again tonal. the delinked tone is assigned to the left standing vowel.

Constraint II: a prenasal consonant is created if two nasalized morphemes are closely adjacent.

The constraint II is independently motivated in a Kwa ivorian language such as Abidji where it is still highly productive. The constraint I has been yet provided elsewhere to our knowledge but will be quite amply demonstrated just as constraint II in the following sections. For example, in verbs where we find intramorphemic prenasals, we suggest to analyze them as syllabic nasals that have lost their syllabicity. Though no synchronic evidence, apart from the tonal one, is available we would like to recur to comparative evidence from closely related languages in which the syllabic nasals existed, however, without the following syllable that yield the disyllables in Baule. That suffixes have largely been lost among the whole kwa family is extensively discussed by Stewart (1976) ‘the final light syllables of Akan (Twi-Fante) and their significance for Volta-Conoe Reconstruction’. We illustrate all these cases, even though the case in (a) may appear circular.

9.1 Prenasals in adjectives, numerals and single verbs
Words that are also attested with prenasalized segments are adjectives. They provide the first bit of evidence for our analysis, since the source of first example is the noun ‘the old’ that generally occurs in expressions like: 'older brother'. The voiced obstruent in the middle of the word derives from the voiceless one by the following process of nasal epenthesis:

\[
\begin{align*}
0 & \rightarrow [\text{nasal}] / [\text{+syllabic}, \text{+nasal}] \end{align*}
\]

The reason why we mention adjectives is that their meaning is clearly contained in their monosyllabic forms.

\[
\begin{align*}
\text{reduplication} & \quad /\text{kp} \text{i} \text{b}/ & & /\text{kp} \text{i} \text{i} \text{b}/ & \quad \text{‘old’} \\
/\text{ka} \text{a}/ & & /\text{ka} \text{a} \text{a}/ & \quad \text{‘small’} \\
/\text{ka} \text{a}/ & & /\text{ka} \text{a} \text{a}/ & \quad \text{‘many’} \\
/\text{ka} \text{a}/ & & /\text{ka} \text{a} \text{a}/ & \quad \text{‘shadowy’} \\
/\text{ka} \text{a}/ & & /\text{ka} \text{a} \text{a}/ & \quad \text{‘one after the other’}
\end{align*}
\]

An additional argument for this analysis is that it explains why prenasalized consonants are only medial, never initial. Since only a preceding nasalized vowel can create a prenasalized consonant, the prenasalized consonant will never be initial.

As for adjectives, we can find verbs, in which the root is still available, that seem to pattern in similar way in:

\[
\begin{align*}
/\text{ku} \text{n}/ & & /\text{ku} \text{l}/ & \quad \text{‘to walk with the knees’} \\
/\text{ka} \text{n}/ & & /\text{ka} \text{l}/ & \quad \text{‘to read’}
\end{align*}
\]

The first example can be reconstructed as [ku\text{a}nu\text{a}] ‘one step after the other’, literally ‘one-one’. There are also cases where the deletion of a vowel creates a condition for a prenasal:

\[
\begin{align*}
/\text{tra} \text{a} \text{se}/ & \quad /\text{tra} \text{a} \text{e}/ & \quad \text{‘to sit down’}
\end{align*}
\]

This sequence of words is lexicalized in Nzema as [\text{tra} \text{n}]

\[9.2 \quad \textbf{Prenasals as syllabic nasals that lost their syllabicity}\]

The constraint that we have suggested to apply in verbs, applies when two words are concatenated as in (23). Some speakers omit to pronounce the prenasal.

\[
\begin{align*}
/\text{wu} \text{n}\text{e}/ & & /\text{wun}\text{n}\text{e}/ & \quad \text{‘skin’} \\
/\text{bue n}\text{zue}/ & & /\text{bue}\text{n}\text{zue}/ & \quad \text{‘morse’} \\
/\text{n}\text{d}\text{re}/ & & /\text{n}\text{d}\text{re}/ & \quad \text{‘cuir chevelu’} \\
/\text{n}\text{u}\text{zue}/ & & /\text{n}\text{u}\text{zue}/ & \quad \text{‘crachat’} \\
/\text{su}\text{a}\text{n}\text{ti}/ & & /\text{su}\text{a}\text{n}\text{ti}/ & \quad \text{‘because of the house’}
\end{align*}
\]

To summarize, since apparent true prenasals that cannot be reconstructed offhand appear only between morphemes and never word initially, there is little evidence that prenasals should be viewed as part of the phonemic system of

\[5 \quad \text{The cases where we have prenasals can be traced back to residues of prefixes. So words like: mma /N+ba/ ‘children’ mnaa /N+lali/ ‘couch’ are realized in the singular form as ba ‘child’, or as a verb ‘la’ sleep. Further evidence is provided by reduplications in numerals where the prefixes are dropped. Nsan ‘three’, nsansan ‘three for each’, nglwan ‘nine’, nglwanglwan ‘nine for each’ versus mocue ‘eight, mocue mocue ‘eight for each’.} \]
Baule. Despite the fact that the reconstruction is not apparent, we have presented many independent evidence that show that the internal structure of the intermorphemic prenasals can be attributed to the status of underlying syllabic nasals that are either derived or that existed underlingly as syllabic nasals that lost their syllabicity.

9.3 Comparative data: Nasal epenthesis, stop epenthesis, simultaneous epenthesis as nasal split.

Comparative data on the prenasals in verbs and nouns in medial position reveals the prenasals are cognates of a syllabic unit in other Tano languages. A typical example is given in the following example:

<table>
<thead>
<tr>
<th>stop epenthesis</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Baule</td>
<td></td>
</tr>
<tr>
<td>Agni</td>
<td></td>
</tr>
<tr>
<td>Nzema</td>
<td></td>
</tr>
</tbody>
</table>

Baule

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Agni

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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<td></td>
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</table>

Nzema

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In section 9.1 above we have provided evidence that nasal epenthesis has emerged from the development of nasal vowel in the context of a voiced obstruent. This phenomenon is quite common as reported by Ohala and Ohala (1993) and Ohala. 1994. *speech perception is hearing sounds, not tongues*. unp. paper. Indeed Ohala and Ohala (1993) and Ohala (1994) suggest that nasal epenthesis before voiced stops is attested from the development of Old Hindi to Modern Hindi. Ohala (1994:8) suggests the following natural acoustic explanation for this phenomenon drawn on previous work by Ohala and Ohala 1991, according to which sound change may be caused by perception rather than by articulatory reasons:

‘Among the auditory cues for a voiced stop there must be a spectral and amplitude discontinuity with respect to neighboring sonorants (if any), low amplitude voicing during its closure, and termination in a burst; these requirements are still met even with velic leakage during the first part of the stop as long as the velic valve is close just before the release and pressure is allowed to build up behind the closure. However, voiceless stops have less tolerance for such leakage because any nasal sound – voiced or voiceless – would undercut either their stop or their voiceless character.’ Ohala, J and Ohala M 19916.

Although, another competitive sound law (suggested in different papers by Stewart) may be adduced to explain the sequences nasal vowel-nasal consonant and voiced obstruent, - in which case it is the nasal segment that splits as two segments: a nasal segment and a voiced segment -, we have found no reason to consider that hypothesis to be wrong. We have found cases where either sound change has applied, while the nasal epenthesis seems to be a more productive process.

The emergence of prenasals among the Anyi dialects

A comparative study of Anyi dialects shows that disyllabic verbs, the first syllable of which is nasalized tend to favor a prenasal consonant on the second syllable. In the Indenie and Sanwi dialects the prenasal segment is very weak and is still audible as part of the vowel. In Asrin, the situation is unambiguous, the prenasal is clearly existent. An observation of the duration of the overall length of the vowel before the onset of the consonant, here [d] shows a significant and systematic difference. Asrin has a longer vocalic segment. The segmentation has been processed by listening from the loudspeakers the part chosen with the cursors on the CECIL program. 

We conclude that the prenasals in disyllabic verbs are not true prenasals but must be analysed as a phonologic or phonetic effect that operates in the phonological word. This conclusion is supported by whistling from native speakers who realize verbs with internal prenasals only as two units, instead of three. We agree that one might alternatively conclude that the prenasals are thus part of the onset. But, the anyi comparative data favors the phonological analysis that prenasals have emerged from the nasalized vowels and have no inherent phonological existence.

Evidence from the word game [a-sabesin]  

The CVCV structures we postulate are supported by asabesin, a word game involving syllable insertion that is popular among Baule young people. Etymologically, the word asabesin is /a+ sa be sin/ ‘nominal prefix-you-return’. As seen below, a syllable TV is inserted after each syllable, where the vowel is a copy of the preceding vowel, given the underlying analysis we have proposed. In the underlying forms in the second column and in the outputs in the third column, a dot represents a syllable break.

a.  

b.  

c.  

d.  

7 Special thanks to Bohoussou Amani, Djougba Dolores, Kouamé Emmanuel, and Konan Raimond for their help in describing and interpreting this game.
As the examples in (23a,b,c) show, the game consists in placing a syllable of the form [tV] after each syllable of the original word, where V represents a copy of the vowel of the preceding syllable. The cases from (23d) on behave just the same as the earlier ones, as long as the game is regarded as operating on phonological syllables (as they appear in the second column) and as long as the structure of these syllables is truly CV or V as we have proposed. For example, phonetic CCVi input words (23d,e,f,g,h,i) are analyzed phonologically as /CVi.CVi/ and so in asabesin would be mapped onto the structure in (24):

CVi.tVi.Ci.Vi.tVi

The asabesin forms thus provide evidence for the status of the initial glides in (23a,b) as true consonants while showing the postconsonantal glides in (23d,e,f,g) to represent phonological vowels. In the latter four cases, the second syllable consists of a lone vowel with no onset. In the asabesin forms of (23d,e,f,g), the third syllable thus begins without an onset. Our asabesin transcription, being phonological, does not represent the fact that this onsetless vowel can combine with the vowel of the second syllable to produce what could be transcribed phonetically as a glide-vowel sequence. Still, that is a reasonable description of how this sequence sounds. If we follow the same conventions as in the first column of (24), the phonetic transcriptions for the asabesin forms in (23d,e,f,g) would thus be sutwata, lutwata, sitjata, bitjata.

The game consists in cutting the word in its internal phonological structure and mapping the consonants and vowels in a certain order and infixing the /t/ consonant. Here is the structure for CCV input words:

/C1, V1, + tV1, (C2 )V2, tV2/

C1 and V1 represent respectively the first consonant and the first vowel of the input word that must be identical with the output. C2 and V2 must be identical with the second vowel of the input. The dot represents a syllabic break. The syllabic break is motivated by the fact that monosyllabic words like [wu] 'husband' stop their mapping precisely at that syllabic break.

Now the conclusion is straightforward. [CCV] nouns also can be interpreted as /CVCV/ just as verbs and adjectives. To summarize, the arguments adduced in the preceding sections lead to the following conclusions. We favor /CVi.CVi/ over /CViCVi/ simply because Baule gives no signs of resisting vowel sequences in underlying representations. For example, the language has examples of adjacent vowels that differ in nasality and that are not separated by glides. This is true at the phonetic level: [kuju] 'quiet', [kuju] 'important', and we know of no reason for believing that it is not true as well at the underlying level.

Another factor favoring the choice of /CVi.CVi/ over /CViCVi/ is that the distribution of glides becomes easier to state. Choosing the first underlying representation over the second requires explaining the absence of intervocalic glides from representations like /CViCVi/ which would have to be regarded as non-occurring. A plausible guess is that Baule does not permit vowels to be followed by homorganic glides in monomorphemic words. (One should notice that glides occur in Baule only as the onset or part of the onset of a syllable.)

8 At this point, we would also predict that the output for words like [swa] 'house', underlyingly /su.a/ and [suwa] /su.ua/ 'the fact of carrying' should be respectively [su tu wata] versus [ su tu wu tu ata] or [su tu wu tu wata]. This turns to be true.
This is true on the surface as well, and so one might well regard this as a constraint applying generally to Baule phonology, both to underlying and surface forms.

The alternative of choosing \(/\text{t}\text{t}\text{t}\text{t}/\) over \(/\text{t}\text{t}\text{t}\text{t}/\) is not as attractive. The constraint needed to rule out the latter underlying representation would not be nearly as applicable as the one against homorganic glides, since surface forms that juxtapose \(/\text{t}\text{t}\text{t}\text{t}/\) and similar sequences are extremely common in Baule. One may refer to the above examples in (20) and (21). Further examples are given in (30):

```
au  'Ahou'(proper name)
ai  'exclamation of suprise'
yao 'Yao'(proper name)
```

Or in verbal sequences:

```
be fa e   'they take us'
be fa e boli 'they take our goat'
be fa e ae 'they take our palm nuts'
be fa e owie 'they take our bones'
```

For the same reasons, we conclude that klwa ‘be able’ is analyzed as \(/\text{t}\text{t}\text{t}\text{t}\text{t}/\). The underlying vowel sequence \(/\text{t}\text{t}\text{t}\text{t}/\) avoids the choice of which consonant or consonants to represent as underlyingly labialized (the possibilities being \(/\text{t}\text{t}\text{t}/\), \(/\text{t}\text{t}\text{t}/\), \(/\text{t}\text{t}\text{t}/\)). It equally well avoids the needlessly complex representation \(/\text{t}\text{t}\text{t}\text{t}/\) that would have been consistent with the hypothetical choice \(/\text{t}\text{t}\text{t}/\) above. This solution avoids the impossible cluster \(/\text{t}\text{t}/\) as well.

### 12 Comparative evidence of /CVCV/ structures in Tano

In the present section, we wish to adduce further empirical evidence from Anyi, a language closely related to Baule. Roughly, the issue is that in general whenever we encounter CCV surface structures in Baule, they phonetically surface in Anyi as [CVCV] syllables. The data have been obtained from Retord (1972) that provides an extensive phonetic and phonemic study of Anyi Sanwi as well as a word list.

<table>
<thead>
<tr>
<th>Baule</th>
<th>Anyi</th>
<th>gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>______</td>
<td>_______</td>
<td>----------------</td>
</tr>
<tr>
<td>______</td>
<td>_______</td>
<td>'house'</td>
</tr>
<tr>
<td>______</td>
<td>_______</td>
<td>'carry'</td>
</tr>
<tr>
<td>______</td>
<td>_______</td>
<td>'karity butter'</td>
</tr>
<tr>
<td>______</td>
<td>_______</td>
<td>'can'</td>
</tr>
<tr>
<td>______</td>
<td>_______</td>
<td>'village'</td>
</tr>
<tr>
<td>______</td>
<td>_______</td>
<td>'love'</td>
</tr>
<tr>
<td>______</td>
<td>_______</td>
<td>'forest'</td>
</tr>
<tr>
<td>______</td>
<td>_______</td>
<td>'mouth'</td>
</tr>
<tr>
<td>______</td>
<td>_______</td>
<td>'person'</td>
</tr>
<tr>
<td>______</td>
<td>_______</td>
<td>'take'</td>
</tr>
<tr>
<td>______</td>
<td>_______</td>
<td>'law'</td>
</tr>
<tr>
<td>______</td>
<td>_______</td>
<td>'beg'</td>
</tr>
<tr>
<td>______</td>
<td>_______</td>
<td>'call'</td>
</tr>
<tr>
<td>______</td>
<td>_______</td>
<td>'show'</td>
</tr>
<tr>
<td>______</td>
<td>_______</td>
<td>'maize'</td>
</tr>
</tbody>
</table>
Questions that naturally emerge from these data are: 1) what are the features of the vowels that are deleted in the /CVCV/ structures? 2) What are the principles that delete those vowels (OCP? Underspecification?). As documented in Ahoua (1995), identical vowels in many words are prohibited in the same lexical item if they are separated by a sonorant segment in the same monomorphemic word. Indeed, if we suffix nouns with /l/ the suffix nominalizer, this process does not take place. It has often been argued that sonorant (coronal segments) are transparent and unmarked segments. They generally delete and create most of the CVV structures that we encounter in Baule. The other class of consonants that are generally deleted are all labial consonants and glides when they occur in intervocalic position. The examples in (33) show that unlike vowels are not subject to a possible deletion rule.

But the conditions that we have just discussed seem insufficient, since high vowels generally delete, whatever vowel follows in the next syllable. Since native speakers vary as to the exact nature of that vowel, we speculate that high vowels are unspecified for height, but not for roundness or backness that are the marked features of that vowel. Another kind of argument that supports the type of analysis of underlying syllable structures suggested above is found in Krobou, another Tano language. There we note that Krobou has a rule of Nasal Incorporation:

\[
V + N \rightarrow V
\]

in certain contexts

a. ‘foot’ / ‘nail’ \(\rightarrow\) ‘toenail’

b. ‘goat’ / ‘bone’ \(\rightarrow\) ‘goat bone’

One of the conditions of application is that nasalization incorporates only onto the vowel of monosyllabic words. Thus, (37a) does not undergo incorporation. As we see, the process is also blocked in (37b).

a. ‘damas’ / ‘bone’ \(\rightarrow\) (*‘bone of damas’

b. ‘centipede’ / ‘nose’ \(\rightarrow\) (*‘centipede nose’

Since \(\) satisfies all other known conditions of this rule, this argues that \(\) is disyllabic, like \(\) in (37a).

Another interesting facet of syllable structure that we have encountered is the difference in Adiukru between syllables closed by liquids and glides and those closed by nasals. There it has been observed that in a reduplicative construction liquids and glides are not reduplicated with the rest of the syllable, while nasals in this position are reduplicated. This indicates that nasals are more tightly bound to the nucleus. As in some other languages of this group, surface nasal codas may originate in Adiukru as nasalization on the vowel.

Adiukru

<table>
<thead>
<tr>
<th>‘black’</th>
<th>‘tongue’</th>
<th>‘face’</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>‘a little bit’</th>
<th>‘large’</th>
<th>‘short’</th>
</tr>
</thead>
</table>
The situation is, however, not always as clear, as we may see in Nzema, a Tano language related to the above discussed dialects.

13 *A paradox within the syllable structure of Nzema*

Nzema seems to follow the representation of the syllable structure in Baule/Anyi in that all verbs and some nouns that are cvcv may be optionally realised as ccv.

(39)

<table>
<thead>
<tr>
<th>Verb</th>
<th>Syllable Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>to burn</td>
<td>כו</td>
</tr>
<tr>
<td>to buy at credit</td>
<td>כו</td>
</tr>
<tr>
<td>to love</td>
<td>כו</td>
</tr>
<tr>
<td>to clean</td>
<td>כו</td>
</tr>
<tr>
<td>cold</td>
<td>כו</td>
</tr>
</tbody>
</table>

The rule is however inapplicable in most nouns and some verbs as the following examples display:

(40)

<table>
<thead>
<tr>
<th>Verb</th>
<th>Syllable Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>to spoil</td>
<td>כו</td>
</tr>
<tr>
<td>to bless</td>
<td>כו</td>
</tr>
<tr>
<td>purging ball</td>
<td>כו</td>
</tr>
<tr>
<td>eyes</td>
<td>כו</td>
</tr>
<tr>
<td>cockroach</td>
<td>כו</td>
</tr>
<tr>
<td>dew</td>
<td>כו</td>
</tr>
</tbody>
</table>

In Nzema there are even minimal pairs that confirm the distinctive nature of the syllable structure. An outstanding example is: כו | כו fish’ contrasts with כו | כו papaya (sp.)

14 Conclusion

The present analysis shows that a simple canonical syllable structure can be independently motivated on the basis of some segmental and tonological rules. The consequences for the phonological inventory of the language are that labialized and palatalized segments, on one side, and prenasals on the other side have no phonemic status in the language. Prenasals are syllabic units that are derived either from a syllabic morpheme, VN or N (that expresses plurality or negation, as this still happens in Anyi) or from the spreading of nasality onto the closest segment on the right. This analysis also shows the close phonological unity between Anyi and Baule, and very probably among the Western Tano languages, though some complex and specific properties exist that need to be considered.

References


LaVelle in Fromkin: Tone, a linguistic survey.


