

# YAWA PHONOLOGY

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## 1. INTRODUCTION

This paper presents a brief description<sup>1</sup> of the phonology of the non-Austronesian language spoken on Yapen Island, Irian Jaya, Indonesia. The analysis represents the dialect I call here Yawa, spoken on the south coast of Yapen Island, and, in particular, the Yawa dialect as spoken in the village of Sarawandori, located just west of Serui.<sup>2</sup> There are about 300 speakers of Yawa in this village.

The paper gives a basic phonemic analysis of the various levels of the phonological hierarchy as described in the theoretical model of Kenneth L. Pike (1947, 1971), and further elaborated by Eunice Pike (1974). The phonological levels to be described for Yawa are, from lowest to highest: phoneme, syllable, phonological word, phonological phrase, and pause group. Slight attention to morphophonemics is given. Included as well is a treatment of loan words.

Hitherto there has been only one very brief published description<sup>3</sup> of this non-Austronesian language. This description consisted of four pages of notes, mostly an evaluation of the dialect situation, in Anceaux's 1961 survey report of the languages<sup>4</sup> spoken on Yapen and adjacent areas.

## 2. SYLLABLES

### 2.1 Syllable types

In natural speech all words in Yawa end in a vowel.<sup>5</sup> Since morphemes may end in a consonant (thus far noted are most of the consonants excepting the semivowels), citation forms may occasionally consist of a single morpheme and be pronounced with a final consonant. However, such morphemes would not appear in natural speech without a final vowel. Often, one or more morphemes are suffixed that will result in the word ending in a vowel. Otherwise, generally the phone /e/ is added in the case of nouns and /a/ in the case of verbs. Leaving aside, then, morpheme structure conditions, and focusing only on the phonology, we conclude that all emic syllables in Yawa are open syllables, i.e., they must end in a vowel.

An alternate analysis might allow both open and closed syllables, but say that there is limited distribution of closed syllables in that they may not occur finally in the phonological word. This analysis is favoured by the fact that

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there are consonant-final citation forms and by the fact that phonetically closed syllables do frequently occur, because words containing non-initial consonant clusters are pronounced with the first consonant of the cluster as the coda of one syllable, while the second consonant of the cluster is pronounced as the onset of the next. For example, *mondo fast* is phonetically [mon.do].

However, we believe that the emic analysis still favours exclusively open syllables, since all naturally occurring words end in vowels and they may be evenly divided into open syllables using only a few syllable division rules to be described below. To allow closed syllables would require much more complex syllable division rules and would also result in numerous ambiguous situations. Our analysis, then, posits only phonemic open syllables, which may be at variance with the phonetic syllables that result in natural speech. Thus, *mondo fast* has a closed syllable phonetically, but is analysed as having two open syllables phonemically: /mo.ndo/.

There are two basic types of open syllables: those with an initial consonant slot (CV) and those without an initial consonant (V). The initial consonant slot may be occupied by a single consonant or by a cluster of two consonants. Likewise, the V slot of either basic syllable type may be occupied by a single vowel or by a complex cluster consisting of a nuclear vowel plus an off-glide vowel.<sup>6</sup> The resultant syllable types, with examples, are as follows. (Period indicates syllable break. Ligature joining two vowels indicates a close-knit cluster.)

CV	C <sub>1</sub> V <sub>1</sub>	/bo/	<i>paddle</i>
	C <sub>2</sub> C <sub>3</sub> V <sub>1</sub>	/mbi/	<i>collapse</i>
	C <sub>1</sub> V <sub>2</sub> V <sub>3</sub>	/pae/	<i>bone</i>
	C <sub>2</sub> C <sub>3</sub> V <sub>2</sub> V <sub>3</sub>	/ntai/	<i>full</i>
V	V <sub>1</sub>	/a.jo/	<i>foot and leg</i>
	V <sub>2</sub> V <sub>3</sub>	/ai.rai/	<i>squash</i>

## 2.2 Distribution

There are certain distributional restrictions on the occurrence of various phonemes in the different slots of the syllable. C<sub>1</sub> may be any of the 14 consonant phonemes that occur in Yawa. V<sub>1</sub> may be any of the five vowel phonemes. C<sub>3</sub> may be any stop or fricative; it may not be a nasal, flap /r/, or semivowel. C<sub>2</sub> is always a homorganic nasal defined in the following way: if C<sub>3</sub> is a bilabial (/p/ or /b/), then C<sub>2</sub> is also bilabial (/m/); if C<sub>3</sub> is any other of the permitted consonants (/t, d, k, j, s, ʃ/), then C<sub>2</sub> is the alveolar (/n/). Note that a nasal plus a palatal or velar does not assimilate phonetically, e.g. /nk/ is phonetically [nk], not [ŋk]. In passing, we note that a cluster of flap /r/ plus a voiceless stop may occur in fast speech, but in slow speech such clusters resolve into flap + vowel + voiceless stop.

There are no restrictions on V<sub>1</sub>, but there are on V<sub>2</sub> and V<sub>3</sub>. The only close-knit V<sub>2</sub>V<sub>3</sub> clusters recorded thus far are: /a<sub>i</sub>, a<sub>e</sub>, a<sub>o</sub>, a<sub>u</sub>, o<sub>i</sub>, u<sub>i</sub>/. Close-knit clusters always involve /a/ as the first vowel, or one of the two back vowels plus /i/. Since the list seems well-patterned, we do not expect to

find additional such clusters. As will be seen later, many other vowel combinations occur in Yawa, but they involve two or more syllables in sequence. The list here are just those vowel clusters that may occupy the same emic syllable. The primary difference is a matter of timing, which can be determined by comparing words containing vowel combinations with words consisting only of simple CV syllables. For example, [au] is one mora of timing in the word /tau.me/ *sago flour*, but it is two moras of timing in /ra.u.na/ *cooks*. The difference in timing is heard in comparing these two words with /ta.mi/ *name* and /ra.ne/ *burns*.

There is another difference between vowel combinations that comprise one syllable versus those that constitute two. With one exception, the former have prominence on the first of the two vowels; that is, the first vowel is the syllabic peak of the syllable: VV. When the second vowel has more prominence than the first, VV̄, or when the vowels are of equal prominence, V̄V̄, then the two vowels are in different syllables. The one exception (see end note 6) is that the sequence [u<sup>i</sup>] is regarded as belonging to the same syllable since it is pronounced with unit timing that results in a phonetic semivowel, e.g. [wi].

### 2.3 Syllable division rules

We are now in a position to suggest syllable division rules. The first rule is to divide into as many CV syllables as possible. This is based on the fact that CV is the only universal syllable type and also the first type acquired by young children (e.g. Greenberg 1963). Examples are: /ka.ko.pa/ *land, soil* and /na.ma.ne/ *night*. Second, if there are consonant clusters, divide into CCV syllables: /nta.bo/ *one* and /pa.nsa.na.na/ *he runs*.

Third, if there are single vowels left over after dividing into CV and CCV syllables, treat as V syllables: /a.ja.mbe.re/ *pineapple* and /a.na.o.be/ *funny*. There is a corollary to this latter rule that deals with vowel combinations: when there is a sequence of two vowels, if the second vowel has more prominence than the first OR if it is equally prominent, then divide between the two vowels, UNLESS the sequence is ui, in which case do not divide. Examples are: [ra<sup>ba</sup>u] /ra.ba.u/ *split* and [sa<sup>e</sup>ke] /sa.e.ke/ *lightweight*, BUT [wa<sup>na</sup>mp<sup>wi</sup>] /wa.na.mpu<sup>i</sup>/ *west*. However, when there is a sequence of two vowels, if the first vowel has more prominence than the second, then syllable division is not predictable. The vowels may belong to the same or different syllables. Examples are: [ta<sup>u</sup>me] /tau.me/ *sago flour* and [ra<sup>u</sup>na] /ra.u.na/ *cooks*, cited in the previous section. Further examples include [ya<sup>i</sup>te] /yai.te/ *comb* and [ka<sup>i</sup>be] /ka.i.we/ *valley*.

In the case of sequences of three vowels (there are never more than three vowels in sequence in Yawa), apply the rules dealing with vowel combinations pair-wise twice. For example, [ane<sup>ae</sup>] /a.ne.ae/ *wave*. I believe that all Yawa data can be handled by the syllable division rules just posited.

### 3. PHONEMES

There are 19 phonemes in Yawa: 14 consonants /b, d, j, k, m, n, ñ, p, r, s, ʒ, t, w, y/ and five vowels /a, e, i, o, u/. They are listed in chart form below. The parameters of the chart designate all the relevant feature specifications for each phoneme.

CHART OF CONSONANTS				
	Bilabial	Alveolar	Palatal	Back
Stop vl.	p	t		k
vd.	b	d		j
Fricative		s	ʃ	
Nasal	m	n	ɲ	
Flap		r		
Semivowel	w		y	

CHART OF VOWELS			
	Front	Central	Back
High	i		u
Mid	e		o
Low		a	

The normal phonetic quality of the phonemes are as follows. /p, t, k/ are voiceless oral stops at the bilabial, alveolar, and velar points of articulation. /b, d, j/ are voiced oral stops at the bilabial, alveolar, and alveopalatal points of articulation. The stops are all unaspirated. The term *back consonant*<sup>7</sup> is used to group together /k, j/. Although they are not pronounced at the same point of articulation, they occupy the same slot in the overall consonant system. They share the feature [-anterior] in contrast with the other stops. Actually, /j/ has a velar stop [g] as an allophone, but since the alveopalatal [j] is the unmarked allophone (occurring in the 'elsewhere' environments), we have chosen to label the phoneme as /j/. Furthermore, a rough frequency count shows that the allophone [j] occurs about 1.5 times as often as the allophone [g].

The fricatives are both voiceless spirants. /s/ is an alveolar groove spirant, while /ʃ/ is a lamino-alveolar split spirant best symbolised phonetically as [sʏ] (and hence labelled 'palatal' in the chart). /m, n, ɲ/ are voiced nasal stops at the bilabial, alveolar, and alveopalatal points of articulation. /r/ is an alveolar flap. /w/ is a voiced glide from the position of the vowel /u/, with lip rounding (hence it is labiovelar), with a common voiced bilabial fricative allophone [ɸ]. /y/ is a voiced glide from the position of the vowel /i/ (hence it is palatal).

The vowels are: /i/ high front unrounded; /e/ mid front unrounded; /a/ low central unrounded; /o/ mid back rounded; and /u/ high back rounded.

### 3.1 Allophones

Yawa has the common five-vowel system /a, e, i, o, u/, and like most such systems, the degree of deviation from the typical vowel positions is small (Crothers 1978). Except occasionally in fast speech, the vowels hold the same quality in all occurrences. Thus, each vowel has only the one allophone, itself.

The most important allophonic rule affecting consonants is a Rounding Rule. Of the 14 consonants, all but four /t, ʃ, ñ, ɣ/ have been observed to be sensitive to the Rounding Rule. Since /ʃ, ñ, ɣ/ are the only members of the class of palatal consonants, we can say that the rule does not affect this class. But it is unclear why /t/ should not be sensitive to the rule. It does not seem probable that it is merely a gap in the pattern that would be corrected with more data, in that there are words (five so far) with the correct environment for the rule to operate if /t/ were indeed sensitive to it, e.g. /tutara/ *shiver*. But none of these words have ever been observed with rounded /t/. For the present, then, there is asymmetry in the statement of the rule.

- (1) Rounding Rule: A non-palatal consonant may be rounded when preceded by /u/ and followed by another vowel.  
However, /t/ is not rounded.

opt.

C            +    C<sup>w</sup> / u(C) \_\_v  
[-pal]  
[-/t/]

Note that the rule permits rounding even across an intervening consonant. In the case of a consonant cluster after /u/, it is always the second consonant that is affected by the rounding. The rule is marked 'optional' in that it is not much used by the younger generation of speakers, and even among older speakers, rounding does not always occur in the appropriate environments.

The following examples illustrate rounding as it affects each of the ten consonants to which the rule may apply:

/p/	/aitatupe/	[a <sup>i</sup> tatup <sup>w</sup> e]	<i>fish poison, of taro and crab</i>
/k/	/unkame/	[unk <sup>w</sup> ame]	<i>milk, breast</i>
/b/	/raubai/	[ra <sup>u</sup> b <sup>w</sup> ai]	<i>kill</i>
/d/	/ramaude/	[rama <sup>u</sup> d <sup>w</sup> e]	<i>throw toward speaker</i>
/j/	/anuja/	[anug <sup>w</sup> a]	<i>insides</i>
/s/	/unsumaje/	[uns <sup>w</sup> umaje]	<i>grass</i>
/m/	/kaume/	[ka <sup>u</sup> m <sup>w</sup> e]	<i>cucumber</i>
/n/	/kaunane/	[ka <sup>u</sup> n <sup>w</sup> ane]	<i>rodent's nest</i>
/r/	/raura/	[ra <sup>u</sup> r <sup>w</sup> a]	<i>speak</i>
/w/	/puyuwa/	[puyub <sup>w</sup> a]	<i>whistle</i>

The rule operates across morpheme, but not word, boundaries, as can be seen by /ramaude/ *throw toward speaker*, which is composed of two morphemes /ramau/ *throw* plus /de/ *come*. The rule is progressive – only a preceding /u/, but not a following /u/ can trigger the rule. The word /raopupae/ *wipe*, for instance, has only been observed with the second /p/ rounded, but not the first: [raopup<sup>w</sup>ae]. This word also illustrates that only /u/ and not back vowels in general can cause consonantal rounding. This fact often proves useful for non-native ears to distinguish the sequence /au/ from /ao/, as well as, of course, /u/ from /o/. Compare /unkame/ [unk<sup>w</sup>ame] *milk, breast* with /onkame/ [

Besides the Rounding Rule which is responsible for numerous allophones, there are several other allophonic rules to mention. One minor one is that in citation forms, in the occasional case where a morpheme without suffixes is given, if the morpheme ends in a voiceless stop, it will be uttered unreleased.

- (2) Unreleasing Rule: A voiceless stop is unreleased word finally (citation forms).

C            →    C' / \_\_ ##  
 [+stop]  
 [-voice]

Examples are /rankusyap/ [rankusyap'] *to mix* and /iwak/ [ibak'] *lightning*.

The bilabial semivowel /w/ fluctuates between two variants, a plain bilabial semivowel [w] and a bilabial voiced fricative [b]. There is no phonological conditioning.

- (3) Semivowel w Rule: The phoneme /w/ fluctuates between [w] and [b].

C            →    w ~ b  
 [+semi]  
 [+bilab]

Individual speakers prefer one variant or the other for many specific words, but there are plenty of cases where the same speaker pronounces a word sometimes with [w] and sometimes with [b]. For example, one man whose speech has been often observed always pronounces /rakawi/ *bite* with [w] and /rawe/ *use, do* with [b], but alternates the pronunciation of /rawawi/ *draw water* between [rawawi], [rababi], and [rawabi].

Another allophonic rule involves the back phoneme /j/. The rule is that immediately following the high back vowel, /j/ is manifested as [g] (or usually [g<sup>w</sup>] because of subsequent application of the Rounding Rule). In all other environments, it is realised as voiced alveopalatal affricate [j]. In the rule, the feature 'back' is as defined earlier to refer to the class /k, j/.

- (4) Voiced Back Consonant Rule: The phoneme /j/ is realised as [g] following /u/.

C            →    g / u \_\_  
 [+back]  
 [+voice]

The following words illustrate the phonetic shape of /j/ in all its possible environments – word initial, following each of the five vowels, and following /n/.

Initial	/janiwa/	[janiba]	<i>afraid</i>
	/joena/	[joena]	<i>no, not</i>
After /n/	/njaja/	[njaja]	<i>father</i>
After /i/	/nija/	[nija]	<i>red</i>
	/e/	/anodeja/	[anodeja] <i>he likes</i>
	/a/	/ajama/	[ajama] <i>mother-in-law; sister-in-law</i>
	/o/	/andoja/	[andoja] <i>older sibling of the same sex</i>
	/u/	/kuja/	[kugwa] <i>head</i>

Besides the clear phonological evidence, there is morphophonemic support for uniting [j] and [g] into one phoneme. First, consider the clitic /-ema/ which is frequently added to nouns in simple naming expressions. It might be glossed as *it is*. Nouns ending in /a/ and /e/ drop the /e/ of the clitic /-ema/. The following are examples (the plus sign has no phonetic value; it merely separates the clitic from the stem): [kugwa+ma] *it's (his) head*, [pawa+ma] *it's rice*, [anane+ma] *it's sago*, [make+ma] *it's a dog*. Nouns ending in /o/ simply add the clitic as is: [siro+ema] *it's cloth* and [bo+ema] *it's a paddle*. However, nouns ending in /i/ add a transitional consonant [j] before the clitic: [andani+j+ema] *it's a mango* and [miki+j+ema] *it's a cat*. (Compare these i-final nouns with phonetically similar e-final nouns above.) Nouns ending in /u/ add a transitional consonant [g] or [g<sup>w</sup>] before the clitic: [timburu+g<sup>w</sup>+ema] *it's cassava* and [mabu+g+ema] *it's blood*. (Compare these u-final nouns with the phonetically similar o-final nouns above.) If [j] and [g] are regarded as allophones of the same phoneme /j/ according to the rule in 4 above, then the morphophonemic facts regarding u-final and i-final nouns can be united into one simple statement: nouns ending in a high vowel add a transitional /j/ before clitics (or suffixes) beginning with /e/. It appears that the rule is motivated by the need to avoid unpermitted vowel sequences \*/ie/ and \*/ue/.

There are very similar morphophonemic facts regarding adjectives and verbs when the imperfective suffix /-a/ is added. Adjectives and verbs ending in /e/ or /o/ simply add the imperfective suffix /-a/: [kokobe+a] *crow (rooster)* and [bo+a] *row (a canoe)*. Adjectives and verbs ending in /i/ or /u/ insert a transitional consonant /j/ (manifested as [j] after /i/ and as [g] or [g<sup>w</sup>] after /u/) before adding the suffix /-a/: [kakai+j+a] /kakai+j+a/ *it is/was bad* and [bau+g<sup>w</sup>+a] /bau+j+a/ *it is/was broken*. Again the motivation appears to be to avoid unpermitted vowel sequences \*/ia/ and \*/ua/. These morphophonemic facts lend further support to analysing [j] and [g] as one phoneme.

The final allophonic rule deals with some peculiarities involving word-initial rounded consonants. In the dialect under study, there is no [u] pronounced preceding these initial rounded consonants. However, some of the same words in other dialects are pronounced with a preceding [u]. This suggests the following rule<sup>8</sup> is responsible for the forms occurring in this dialect.

- (5) Initial Unstressed u Deletion Rule: Word-initial unstressed /u/ is deleted preceding a consonant (but not consonant cluster).

v → ∅ /##\_\_CV  
 [+high]  
 [+back]  
 [-stress]

There is considerable evidence for this rule. First, there are a number of words with initial rounded consonants, such as [r<sup>w</sup>], [g<sup>w</sup>], [s<sup>w</sup>], and others, where the rounding is otherwise unexplained. The form [g<sup>w</sup>] is particularly problematical in this regard because aside from some initial occurrences, all other instances of [g<sup>w</sup>] are found after the high back vowel /u/, indicating that it is an allophone of /j/. The Initial Unstressed u Deletion Rule accounts for the problem words with initial rounded consonant by positing a preceding /u/ which is deleted. For example, [r<sup>w</sup>ame] *rib* is phonemically /urame/, [g<sup>w</sup>e] *pig* is /uje/, and [g<sup>w</sup>anena] *sick* is /ujanena/.

Second, there is some important morphophonemic evidence. The person and number markers for consonant-initial intransitive verbs are generally prefixes, e.g. i- '1 sg', m- or n- '3 sg fem', and wa- '2 pl'. However, in the case of third person plural forms there is no prefix but instead the initial consonant is rounded. This suggests that there is an underlying initial /u/ which induces the rounding on the following consonant, according to the Rounding Rule, but then is subsequently deleted. This explanation would account for the following data, which is a small sample of the verbs that behave this way.

	<i>sing</i>		<i>dance</i>		<i>urinate</i>
1 sg	[iken <sup>y</sup> a] /ikeña/	[isare]	/isare/	[ipaobea]	/ipaobea/
3 sg fem	[nken <sup>y</sup> a] /nkeña/	[nsare]	/nsare/	[mpaobea]	/mpaobea/
3 pl	[k <sup>w</sup> en <sup>y</sup> a] /ukeña/	[s <sup>w</sup> are]	/usare/	[p <sup>w</sup> aobea]	/upaobea/

### 3.2 Contrasts between full phonemes

Having discussed all the significant allophonic variation of Yawa phonemes, we backtrack in a sense to present some of the evidence<sup>9</sup> for the phonemes themselves by showing contrast among the suspicious sets of phones. We begin by showing contrast between voiceless and voiced stops at the same point of articulation, proceed through other contrasts between consonants, and, lastly, illustrate the vowels in contrast. (WI = Word initial, WM = Word medial, and WF = Word final.)

#### 3.2.1 Voiceless versus voiced stops

The stop series in Yawa includes both voiceless and voiced stops at bilabial, alveolar, and back points of articulation.

/p/ vs /b/	WI	/po/	[po]	3 sg masc subject
		/bo/	[bo]	<i>paddle</i>
		/pawa/	[pawa]	<i>rice</i>
		/bawati/	[bawati]	<i>feel cold</i>
			~ [babati]	
	WM	/tipu/	[tipu]	<i>blows</i>
		/tibu/	[tibu]	<i>deep</i>
		/ropone/	[ropone]	<i>front</i>
		/anobone/	[anobone]	<i>belly</i>
/t/ vs /d/	WI	/de/	[de]	<i>come</i>
		/tena/	[tena]	<i>alive; 20</i>
		/toede/	[toede]	<i>go back and forth</i>
		/doije/	[doije]	<i>money</i>
	WM	/ratawu/	[ratabu]	<i>to cover</i>
		/radawu/	[radabu]	<i>to snap</i>
		/anamote/	[anamote]	<i>voice</i>
		/anode/	[anode]	<i>like; happy</i>
/k/ vs /j/	WI	/kiri/	[kiri]	<i>bait</i>
		/jiru/	[jiru]	<i>two</i>
		/korokoroi/	[korokoroi]	<i>frog</i>
		/jora/	[jora]	<i>hurts</i>
	WM	/rako/	[rako]	<i>take, get</i>
		/rajo/	[rajo]	<i>her leg and foot</i>
		/ratuka/	[ratuka]	<i>stab, smash, spear</i>
		/ratuja/	[ratugwa]	<i>push</i>

### 3.2.2 Miscellaneous contrasts involving stops

The following are illustrations of contrasts between certain stops and other phonemes.

/d/ vs /j/	WI	/dawuta/	[dabuta]	<i>snapped, broken off</i>
		/janiwa/	[janiba]	<i>afraid</i>
		/doije/	[doije]	<i>money</i>
		/joena/	[joena]	<i>no, not</i>
	WM	/radani/	[radani]	<i>five</i>
		/ajama/	[ajama]	<i>mother- or sister-in-law</i>
		/tutudi/	[tutudi]	<i>all</i>

			/maruje/	[marug <sup>w</sup> e]	<i>rain</i>
/j/ vs /y/	WI		/jani/	[jani]	<i>afraid</i>
			/yane/	[yane]	<i>fence</i>
			/jora/	[jora]	<i>hurts</i>
			/yo/	[yo]	2 dual subject
			/ajare/	[ajare]	<i>ironwood</i>
			/ayaere/	[ayaere]	<i>kind of poisonous grass</i>
			/puje/	[puje]	<i>he gets down</i>
			/puyu/	[puyu]	<i>he whistles</i>
/j/ vs /š/	WI		/jiru/	[jiru]	<i>two</i>
			/šišo/	[s <sup>y</sup> i s <sup>y</sup> o]	<i>enter</i>
			/jora/	[jora]	<i>hurts</i>
			/šo/	[s <sup>y</sup> o]	1 sg subject
	WM		/raija/	[ra <sup>i</sup> ja]	<i>hold, catch</i>
			/raiša/	[ra <sup>i</sup> s <sup>y</sup> a]	<i>eat</i>
			/majo/	[majo]	<i>their legs and feet</i>
			/mašo/	[mas <sup>y</sup> o]	<i>she descends</i>
/b/ vs /w/	WI		/bikikibe/	[bikikibe]	<i>lust</i>
			/wirati/	[wirati]	<i>so, as a result</i>
			/bo/	[bo]	<i>paddle</i>
			/wo/	[wo]	3 pl subject
	WM		/ababa/	[ababa]	<i>bride price bowl</i>
			/awa/	[awa]	<i>mouth</i>
			/kubakube/	[kubakub <sup>w</sup> e]	<i>round</i>
			/uwe/	[ub <sup>w</sup> e]	<i>blossom</i>

The contrast between /b/ and /w/ has strong phonological support. However, we wish to mention that there is some morphophonemic alternation between these two phonemes. The alternation cannot be explained by phonological conditioning. The stative suffix, for example, has two forms /be/ and /we/. Compare [awa+be+a] *yawns* and [kara+be+a] *defecates*; also [koko+be+a] *crows (rooster)* and [babinsanai+be+a] *pregnant*.

### 3.2.3 Sibilant fricatives

There are two fricative phonemes in Yawa, sibilants at the alveolar and palatal points of articulation: /s/ and /š/.<sup>10</sup>

/s/ vs /š/	WI	/sasora/	[sasora]	<i>burned (skin)</i>
vs /y/		/šaše/	[s <sup>y</sup> as <sup>y</sup> e]	<i>different</i>
		/yaši/	[yas <sup>y</sup> i]	<i>middle, centre</i>

	/sopa/	[sopa]	<i>jump</i>
	/šo/	[sʏo]	1 sg subject
	/yo/	[yo]	3 dual subject
WM	/raiseo/	[raiseo]	<i>climb</i>
	/raiše/	[raisʏe]	<i>whittle</i>
	/rayana/	[rayana]	<i>enclose, put a fence around</i>
	/rasakina/	[rasakina]	<i>reverse, flip</i>
	/kašambe/	[kasʏambe]	<i>corn</i>
	/kamayo/	[kamayo]	<i>fog, mist</i>

### 3.2.4 Nasals

There are three nasals in Yawa: /m/, /n/, and /ñ/. The phonetically complex combinations [NC] (nasal plus consonant) are interpreted as a sequence of two phonemes, except in the case of [ny]. This interpretation will be discussed more fully in Section 5. Here we simply illustrate the contrasts involved.

/m/ vs /n/	WI	/miki/	[miki]	<i>cat</i>
		/niki/	[niki]	<i>sleep</i>
		/mana/	[mana]	<i>water</i>
	WM	/nanawa/	[nanawa]	human classifier
		/timure/	[timure]	<i>afterbirth</i>
		/sinu/	[sinu]	<i>steer a canoe</i>
/n/ vs /ñ/	WI	/uma/	[uma]	<i>sun</i>
		/unae/	[unae]	<i>fish scales</i>
		/naume/	[na <sup>h</sup> mwe]	<i>sky</i> <sup>11</sup>
	WM	/naume/	[nʏa <sup>h</sup> nwe]	<i>honey</i>
		/no/	[no]	2 sg subject
		/ño/	[nʏo]	<i>tree; wood</i>
		/mana/	[mana]	<i>water</i>
		/waña/	[wanʏa]	<i>woman</i>
		/maninimbe/	[maninimbe]	<i>quietly</i>
		/mañiñim/	[manʏinʏim]	<i>fishy smell</i>
/N/ vs /NC/ vs /C/	WI	/no/	[no]	2 sg subject
		/ndo/	[ <sup>n</sup> do]	<i>be at a location</i>
		/doije/	[doije]	<i>money</i>
		/nanawa/	[nanawa]	human classifier
		/njano/	[ <sup>n</sup> jano]	<i>firewood</i>
		/jani/	[jani]	<i>afraid</i>

WM	/anane/	[anane]	sago
	/andani/	[andani]	mango
	/radani/	[radani]	five
	/wamo/	[wamo]	1 pl subject (incl)
	/kambore/	[kambore]	taro
	/ntabo/	[ <sup>n</sup> tabo]	one

### 3.2.5 Flap

There is some morphophonemic alternation between the voiced stop [d] and the voiced flap [r] in Yawa. For instance, the intensifier morpheme 'very' varies between [dabe] and [rabe]. At least some of the alternation must be morphologically conditioned, in that it occurs in identical environments. Compare the following pairs: [mamai+dabe] *exactly the same* and [<sup>n</sup>tai+rabe] *very full*; also [sere+dabe] *very naughty* and [manke+rabe] *very heavy*. A test of six Yawa speakers revealed that only these pronunciations occurred — certain words always used [d] for the intensifier; others always used [r]. Within the same word, there was no free fluctuation between them.

Further facts cast suspicion on these two phones. First, [d], but not [r], may follow a nasal. Furthermore, while [r] is extremely common word initial, [d] is rare in this position. These facts may lead one to suppose that these are actually allophones of a single phoneme. However, this supposition cannot be sustained, because there are too many clear contrasts between the two phones, and further, no rule can be found that would predict their occurrences. Consider the following sample of contrasts, showing that /d/ and /r/ must be regarded as distinct phonemes.

/d/ vs /r/	WI	/de/	[de]	come
		/rene/	[rene]	sugarcane
		/dawuta/	[dabuta]	snapped, broken off
		/rawaki/	[rabaki]	carry on one's back
		/duduku/	[duduku]	bridge
		/rubasae/	[rubWasae]	nice, kind
WM		/radani/	[radani]	five
		/rarabita/	[rarabita]	fish with hook and line
		/anode/	[anode]	like, happy
		/kambore/	[kambore]	taro
		/aridu/	[aridu]	coconut oil
		/iru/	[iru]	sago stirring-spoon

## 3.2.6 Vowels

Yawa has a standard five-vowel system: /i, e, a, o, u/. They contrast in all positions in the word – initially, medially, and finally.

WI	/iwak/	[ibak]	<i>lightning</i>
	/ewe/	[ebe]	<i>rainbow</i>
	/awa/	[awa]	<i>mouth</i>
	/owa/	[oba]	<i>wave</i>
	/uwe/	[ubwe]	<i>blossom</i>
WM	/tumbina/	[tumbina]	<i>name of a constellation</i>
	/bambene/	[bambene]	<i>ceiling space and boards</i>
	/bambana/	[bambana]	<i>swollen</i>
	/bamboni/	[bamboni]	<i>strong</i>
	/timburu/	[timburu]	<i>cassava</i>
WF	/rakari/	[rakari]	<i>pick leaves</i>
	/rakokare/	[rakokare]	<i>return something to speaker</i>
	/rakera/	[rakera]	<i>paint, decorate</i>
	/rakaro/	[rakaro]	<i>pound sago</i>
	/raru/	[raru]	<i>pick fruit</i>

Minimal or near-minimal pairs exist for all suspicious vowel pairs.

/i/ vs /e/	WI	/iwak/	[ibak]	<i>lightning</i>
		/ewe/	[ebe]	<i>rainbow</i>
	WM	/kiri/	[kiri]	<i>bait</i>
		/keri/	[keri]	<i>behind</i>
	WF	/mani/	[mani]	<i>quiet</i>
		/mane/	[mane]	<i>fruit</i>
/e/ vs /a/	WI	/ename/	[ename]	<i>fishing net</i>
		/aneme/	[aneme]	<i>arm and hand</i>
	WM	/rene/	[rene]	<i>sugarcane</i>
		/rane/	[rane]	<i>burn something</i>
	WF	/kare/	[kare]	<i>banana</i>
		/kara/	[kara]	<i>faeces</i>
/a/ vs /o/	WI	/awa/	[awa]	<i>mouth</i>
		/owa/	[oba]	<i>wind</i>
	WM	/ratatae/	[ratatae]	<i>sow, scatter seeds</i>
		/ratota/	[ratota]	<i>cut</i>
	WF	/kata/	[kata]	<i>again</i>
		/kato/	[kato]	<i>arrow</i>

/o/ vs /u/	WI	/omo/	[omo]	<i>but</i>
		/uma/	[uma]	<i>sun</i>
	WM	/ponaya/	[ponaya]	<i>he doesn't want</i>
		/punae/	[punae]	<i>year</i>
	WF	/iro/	[iro]	<i>baking dish</i>
		/iru/	[iru]	<i>sago stirring-spoon</i>

Furthermore, the morphophonemic evidence cited in the discussion after the Voiced Back Consonant Rule in 4 above provides further strong support for the contrasts between /i/ and /e/, and between /u/ and /o/. Recall that in the case of nouns, verbs, and adjectives ending in a high vowel, a transitional consonant /j/ must be inserted before suffixes or clitics beginning with /-e/ or /-a/ may be added. The transitional /j/, however, does not appear when the morphemes end in other vowels.

### 3.3 Distribution

There are few significant distributional restrictions pertaining to Yawa phonemes. All phonemes, both consonants and vowels, may occur word initially and word medially. As noted earlier, however, only vowels may occur word finally except in the unusual situation of citation. Perhaps the most significant distributional restriction pertains to the palatals /š/ and /ñ/. Only the high vowels /i/ and /u/ and the low vowel /a/ are found preceding these two palatals; the mid vowels /e/ and /o/ do not occur. It would appear that the contrast between the two front vowels /i/ and /e/ and between the two back vowels /o/ and /u/ is neutralised preceding the palatals /š/ and /ñ/ (essentially in the environment C[+pal][-semi]). Since the resulting phonetic shape is always a high vowel, a Raising Rule might be called for that would have the effect of raising underlying mid vowels to high vowels in this environment. We do not posit such a rule here, though, since it would be impossible in the case of most words to decide whether the true phonemic form ought to involve a mid or a high vowel. To a limited extent, the same distribution patterns are observed preceding /y/ and /j/. However, with these two consonants, mid vowels on occasion do occur preceding them, e.g. /poyowa/ *he cries* and /andoja/ *older sibling of the same sex*.

There are of course differences in the phonemes regarding their frequency of occurrence. Voiceless stops /t/ and /k/, flap /r/, nasals, and the semivowel /w/ all have especially high frequency counts among the consonants. The vowel /a/ occurs three times more often than any other vowel, and seven times more often than the vowel /u/.

## 4. CLUSTERS

A careful study of the permissible consonant clusters and vowel clusters facilitates the interpretation of ambiguous segments [w] and [u], [y] and [i], as well as [nʏ] and [sʏ]. Interpretation of these segments will be discussed in Section 5.

#### 4.1 Consonant clusters

In describing the syllable in Section 2, we stated the constraints on consonant clusters in Yawa. We briefly repeat them here. Within a phonological word, only clusters of two consonants may occur, even across morpheme boundaries. The first consonant must be a nasal and the second must be either a stop or a fricative. Furthermore, there is a constraint that the nasal must be homorganic with the following consonant, where 'homorganic' means that the nasal must be bilabial if the following consonant is bilabial and otherwise must be the alveolar nasal. All the possible combinations occur both word initially and word medially, except that /mp/ has not yet been recorded initially and /nj/ has been recorded medially only in a loan word. Examples follow, first showing word-initial contrasts, then word-medial contrasts.

##### WORD-INITIAL CONTRASTS OF CONSONANT CLUSTERS

/mp/	-		
/mb/	/mbi/	[ <sup>m</sup> bi]	<i>collapse</i>
/nt/	/ntabo/	[ <sup>n</sup> tabo]	<i>one</i>
/nd/	/ndamu/	[ <sup>n</sup> damu]	<i>so that (purpose)</i>
/nk/	/nkoa/	[ <sup>n</sup> koa]	<i>mother</i>
/nj/	/njaja/	[ <sup>n</sup> jaja]	<i>father</i>
/ns/	/nsansimu/	[ <sup>n</sup> sansimu]	<i>cold (3 sg fem)</i>
/nš/	/nšaše/	[ <sup>n</sup> s <sup>ʸ</sup> as <sup>ʸ</sup> e]	<i>different (3 sg fem)</i>

##### WORD-MEDIAL CONTRASTS OF CONSONANT CLUSTERS

/mp/	/ampapire/	[ampapire]	<i>large lizard</i>
/mb/	/ambororomi/	[ambororomi]	<i>house lizard</i>
/nt/	/antakawi/	[antakawi]	<i>octopus</i>
/nd/	/andani/	[andani]	<i>mango</i>
/nk/	/ankai/	[anka <sup>i</sup> ]	<i>sago chopsticks; coconut</i>
/nj/	-		
/ns/	/ansawai/	[ansawa <sup>i</sup> ]	<i>papaya</i>
/nš/	/manšane/	[mans <sup>ʸ</sup> ane]	<i>widower</i>

#### 4.2 Vowel clusters

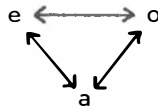
Clusters of two and even, rarely, three vowels in sequence may occur in Yawa. Within the same morpheme, two identical vowels in sequence are very rare; combinations almost always involve heterogeneous vowels. The total inventory of two-vowel combinations thus far recorded as occurring within a single morpheme is as follows:

VOWEL CLUSTERS						
	Second member					
	i	e	a	o	u	
First member	i	ii	-	ia	-	iu
	e	-	-	ea	eo	-
	a	ai	ae	aa	ao	au
	o	oi	oe	oa	-	-
	u	ui	-	-	-	-

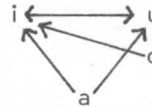
Most gaps in the inventory would be filled if semivowels were included, based on their phonetic quality being that of a high vowel. Thus, one may say that *phonetically* virtually all combinations of two heterogeneous vocoids may occur.<sup>12</sup> However, *phonemically* only the combinations listed above occur. Where a vocoid has been interpreted as phonemically a semivowel (see Section 5.2), combinations involving it have not been counted as a vowel cluster. (Otherwise, clusters of up to six vowels would occur in Yawa, a conclusion not supported by other facts.)

Thus, the inventory of vowel clusters above includes only combinations of two phonemic vowels. Certain observations may be stated about the permitted vowel clusters. First, all combinations of two heterogeneous non-high vowels /ea, eo, ae, ao, oe, and oa/ occur and most are in fact common. However, only a few of the theoretically possible heterogenous combinations involving at least one high vowel occur. Those that do occur phonemically are /iu, au, ai, oi, and ui/. These patterns may be represented as follows:

INVOLVING NON-HIGH VOWELS ONLY



INVOLVING HIGH VOWELS



The following chart gives one example of each of the two-vowel combinations that occur.<sup>13</sup> The examples are written phonemically.

EXAMPLES OF VOWEL CLUSTERS WHICH OCCUR IN YAWA

	/vi/	/Ve/	/Va/	/Vo/	/Vu/
/iv/	piipi <i>taut</i>	--	jiane <i>fish</i>	--	siu <i>pointed</i>
/eV/	--	--	kea <i>skin</i>	seo <i>get up</i>	--
/aV/	ankai <i>sago chopsticks</i>	kae <i>jungle rat</i>	kugaawe <i>yellow, orange</i>	baona <i>plays</i>	rauna <i>cooks</i>
/oV/	nandoi <i>road</i>	ratoe <i>write</i>	boana <i>light colour</i>	--	--
/uV/	suija <i>swims</i>	--	--	--	--

Thus far, there are only two clear instances in the data of three vowels in sequence: /raeana/ *beat a drum* and /aneae/ *wave*.

A sequence of two vowels may belong to one or two syllables, as discussed in Section 2 on the syllable. If the two vowels belong to the same syllable, then they constitute a complex nucleus of two close-knit vowels. Such a complex of close-knit vowels always consists of one syllabic vowel and a second vowel which either on-glides to or off-glides from the syllabic vowel. There is pronounced asymmetry in the on-glide and off-glide patterns. There is only one close-knit vowel nucleus with an on-glide: /uj/. An example is [sab<sup>w</sup>i] /sa.buj/ *ten*. All other close-knit vowel nuclei consist of a syllabic vowel plus an off-glide. The combinations which occur are /qi/, /uj/, and all combinations of /a/ plus a dissimilar vowel - /aj, ae, əo, au/. One of the close-knit vowel nuclei is unique because it involves both an on-glide and an off-glide pattern. This is the sequence /ui/, which may be either [u<sup>i</sup>] (e.g. the word for *ten* just cited) or [u<sup>i</sup>] (example is [mu<sup>i</sup>ndabe] /muindawe/ *generous*). (There is another theoretical possibility for the sequence /ui/, which is that both vowels are equally syllabic, and this also occurs in the data, but of course two syllables are then involved, e.g. [ru<sup>i</sup>nta] /ruinta/ *which one*.)

The same vowels that occur in combination in a close-knit nucleus of a single syllable may also occur in a sequence of two syllables. In addition, all the other combinations in the inventory listed above may occur in a sequence of two syllables.

Contrasts between suspicious pairs of close-knit vowel clusters are illustrated below. Contrasts involving vowel clusters belonging to two syllables are not illustrated, as the contrasts do not seem suspect.

/oi/ vs /ui/	/doije/	[doije]	<i>money</i>
	/nuiše/	[nuiše]	<i>sand</i>
/ai/ vs /ae/	/rai/	[rai]	<i>have</i>
	/rae/	[rae]	<i>see, weave</i>
/ao/ vs /au/	/rao/	[rao]	<i>build a fire</i>
	/rau/	[rau]	<i>cook</i>

## 5. INTERPRETATION OF AMBIGUOUS SEGMENTS AND SEQUENCES

Phonemic representations of the data in previous sections have made implicit assumptions regarding the interpretation of ambiguous segments and sequences. This section will spell out some of the arguments for these interpretations. The segments that are suspicious are [y] and [i], [w] and [u]. The suspicious sequences are [nʏ] and [sʏ].

### 5.1 Ambiguous sequences

The sequence [sʏ] has been interpreted as a unit phoneme /š/ since there are no consonant clusters in Yawa that would be parallel to a /sy/ cluster.<sup>14</sup> All non-suspicious consonant clusters have a nasal as the first member. There is another reason to avoid a consonant-cluster interpretation. All the

non-suspicious consonants which begin the ergative pronoun series are single consonants, e.g., no '2 sg', po '3 sg masc', mo '3 sg fem'. The first singular ergative pronoun is phonetically [sʏo], which would nicely fit the simple CV pattern of the other singular pronouns if it were phonemically /ʃo/.

Interpreting the [sʏ] sequence instead as /si/ is disfavoured because it would allow certain vowel sequences such as ie which would then only occur after /s/, but never after any other consonant. It would also result in a number of ii sequences, when otherwise this sequence is very rare. For example, [rausʏi] *slice* would be /rausii/.

One might argue very similarly for the sequence [nʏ]. In particular, the same arguments would hold against an /ni/ interpretation. However, the interpretation as a sequence of two consonants /ny/ cannot be dismissed as easily, in view of the parallel with the favoured consonant cluster type in Yawa – nasal plus consonant. This parallel argues for an interpretation of [nʏ] as a consonant cluster. However, there is no evidence for a consonant cluster involving the other semivowel, i.e., \*/mw/ does not occur. It would be systematically asymmetrical to allow the sequence /ny/ but not the sequence \*/mw/; in other words, to allow nasal clusters with only one of the two semivowels. However, it is not asymmetrical to exclude semivowels as a class from occurring in nasal clusters. Furthermore, since it seems necessary to posit a sibilant phoneme at the palatal point of articulation, it would be natural to posit a nasal phoneme there as well. Consequently, we assume the best interpretation is to regard [nʏ] as emically a unit phoneme /ñ/.

There is one final argument for interpreting both these palatals as unit phonemes instead of as sequences of an alveolar plus /y/. The phonetic sequences [ʏi], [ʏe], and [ʏu] only occur following [s] and [n], which would seem a peculiar distributional restriction. However, assuming /ʃ/ and /ñ/ as unit phonemes, the analysis would be /ʃi, ʃe, ʃu, ñi, ñe, and ñu/.

## 5.2 Ambiguous segments

The grey area in many a phonological analysis concerns the interpretation of the two high vocoids. Are they always vowel phonemes or are they sometimes consonant phonemes? As will be seen, we argue for a split analysis where these vocoids are in certain positions interpreted as vowels /i, u/ and in others as consonants /y, w/.

There are two arguments for considering these segments as everywhere vowels. One is that such an interpretation would fill out the system of two-vowel combinations such that almost all the theoretical possibilities would occur. Since it is uncommon for languages to be totally symmetrical in their permitted vowel combinations, this is not in itself a powerful argument. The second argument is that such an analysis would make the morphophonemic description easier. For instance, some morphemes could be written identically even though their phonetic shape differed slightly in different grammatical slots. As an example, the word for *big* is phonetically [manakoya] when it is a predicate adjective, but is [manakwe] as a modifier to a noun. A morphophonemic transcription /manakoe/ could yield just one spelling. However, literacy workers (e.g. Shaw and Shaw 1977) have found that morphophonemic spellings are often more difficult to teach than phonemic ones. Hence, this is not a powerful argument either.

On the other hand, the arguments against analysing the high vocoids as everywhere vowel phonemes are considerable. First, there is the fact that the longest sequence of non-suspicious vowels is three in a row (of which there are only two examples in the data). But an exclusively-vowels analysis of [i] and [u] would result in sequences of up to six vowels, and there would be many words with four and five-vowel sequences: [aiao] *speak*, [kaie] *valley*, [poioua] *cry*, [puiua] *whistle*, and [ujaiuaain] *far*. Second, only a very few two-vowel combinations (ai and ae) and no three-vowel combinations, occur word initially. But an exclusively-vowels analysis of [i] and [u] would permit many more word-initial vowel combinations, and some would be five vowels long, e.g. [auaia] *to pay him*, [iauaire] *house*, and [uauone] *beach*.

The first candidates to suggest themselves for interpretation as consonants are the word-initial non-syllabic vocoids [i] and [u]. For instance, *house* and *beach*, just cited, would begin with /y/ and /w/, respectively. This is the most sensible interpretation since these segments are always highly non-syllabic in such environments, even in slow speech. Furthermore, this interpretation fits the CV pattern of a number of monosyllabic words, e.g., /wa/ *canoe* parallels /bo/ *paddle*. This parallel is even more explicit if we re-examine the ergative pronoun series. /yo/ '3 dual' and /wo/ '3 plural' would parallel the many other CV pronouns: /šo/ '1 sg', /no/ '2 sg', /po/ '3 sg mas', /mo/ '3 sg fem'. None of the ergative pronouns begins with a non-suspect VV.

Granting, then, /y/ and /w/ word initially, we must expect them word medially. We suggest that all non-syllabic vocoids [i] and [u] be interpreted as consonants when they occur intervocalically, e.g., [v<sup>i</sup>v] is /vyv/ and [v<sup>u</sup>v] is /vwv/. This results in many more CV syllables, which fits the prevalence of this syllable type in Yawa and indeed its universal prevalence in languages. This also eliminates most /ii/ and /uu/ sequences, which fits the observation that other same-vowel sequences are very rare. Finally, this analysis is more consistent with the consonant-like quality of the non-syllabic [u] as evidenced by its common alternant [b]. The fricative nature of [b] seems more consistent with a consonant, rather than vowel, interpretation.

Since the only non-suspicious consonants word finally occur in citation forms, we posit no syllable-final /y/ or /w/. Instead, in these positions non-syllabic high vocoids are analysed as vowel phonemes /i/ and /u/. This fits nicely with the syllable and timing parallels between such sequences as [aɛ] and [aj], along with [aɔ] and [au]. For example, [kapɛ] *bow* and [kakai] *bad* have an identical timing pattern which suggests an identical syllable pattern. The same is true for [kaɔ] *child* and [rau] *cook*. Analysing the segments syllable finally as /i/ and /u/ also accords with the observation that all other two-vowel combinations which are permitted in Yawa may occur word finally.

In summary, then, we analyse the non-syllabic high vocoids differently in different syllable slots. In the onset of the syllable, they are emically consonants /y/ and /w/. In the coda, they are emically vowels /i/ and /u/.<sup>15,16</sup> Such an analysis does not necessitate positing new syllable types as would be the case with either interpreting both onset and coda as consonants (CVC, CCVC, and VC) or interpreting both as vowels (VVV and CVVV). It also permits unambiguous division into syllables by the rules suggested in Section 2.

The careful reader may have noticed a two-way interpretation of the sequence [C<sup>W</sup>]: (1) it is simply /C/ when it follows a /u/ according to the conditions of the Rounding Rule; (2) it is /Cu/ elsewhere. (This latter case amounts to saying it is /Cu/ preceding a syllabic /i/ since that is the only possibility left.)<sup>17</sup>

In each case, the environment determines the phonemic interpretation unambiguously, if one assumes that the interpretation of most universal application applies first, while the interpretation of the most narrow application applies only if the other has not. In the interpretation of [C<sup>W</sup>], the environment becomes part of the contrastive features by which phonemes are distinguished. Technically, this phenomenon is known as *partial overlap*, a situation in which 'a phoneme is manifested by an allophone in one environment which is homophonous with an allophone of a different phoneme occurring in a different environment' (E. Pike 1974:25). Here the non-syllabic [u] is an allophone of two different phonemes, but the potential ambiguity is resolved by the distinctive environments in which it occurs.

## 6. PHONOLOGICAL WORDS

### 6.1 Stress

The phonological word in Yawa is defined as a unit of one and only one primary stress. Long words may have secondary stress(es), but not necessarily. The longest word recorded thus far, with eight syllables, is /a.te.ka.ra.ra.re.nto.a/ *he snores* with only a primary stress on the antepenultimate syllable. The predominant features of stress are intensity and high pitch. Length is not associated at all with stress, but has a function on a higher phonological level. Stress is contrastive in Yawa in that the syllable on which it occurs is not predictable. Compare the following three nouns, where the stress (indicated by an accent) is on the first, second, and third syllables respectively: *ánauja* ma *it's a garden*, *anáne* ma *it's sago*, and *anománe* ma *it's a pan*. Despite the fact that stress is contrastive, like in most other Papuan languages, it does not carry a heavy functional load. There are no words that contrast solely by stress placement.

Furthermore, as is also the case with many Papuan languages, stress is not assigned to a particular syllable of the word, but may perturb according to the different grammatical functions of the word. Notice the stress on the nouns (each three syllables long) in the following sentences. Stress perturbs in different grammatical slots on the noun *garden* but not on *fire*.

- |     |   |     |   |
|-----|---|-----|---|
| (a) | táname ma<br>fire it is<br>it's a fire                    | (b) | ánauja ma<br>garden it is<br>it's a garden          |
|     | táname mbáru<br>fire flames up<br>the fire burns          |     | anaujáo manakóya<br>garden big<br>the garden is big |
|     | šo táname rápamo<br>I fire put out<br>I put out the fire. |     | šo anujá ráwe<br>I garden make<br>I made a garden.  |

Not only nouns are affected by stress perturbation. Compare the adjective *big* in the second (b) sentence above with *big* in the following.

Anománo manakoé ráujande rínai.  
*pan big give to me*  
*Give me the big pan.*

Verb roots may also be affected by stress perturbation. Compare *put out* in the third (a) sentence above with the following.

táname mpámoa  
*fire put out*  
*the fire is dead*

At the present stage of analysis, no rules have been formulated for stress perturbation. Since words with identical stress placements in certain grammatical functions (e.g. *fire* and *garden* in the first sentences of (a) and (b)) do not show identical stress placements in other grammatical functions (e.g. the second and third sentences of (a) and (b)), it is clear that there is not a straightforward phonological rule. Many words undergo stress perturbation, while many other phonologically similar ones do not. It appears that morphological classes need to be compiled for words that undergo identical stress perturbations. This is a task yet to be done. Probably such morphological classes of stress do not cut across grammatical classes; that is, preliminary study indicates that stress perturbation patterns are different for noun roots, adjective roots, and verb roots.

## 6.2 Distribution

There are certain distributional constraints that operate on the phonological word level. While all single consonants and vowels, and all consonant clusters may occur word initially, only two of the many possible vowel clusters appear word initially (ai, ae). Any syllable type may occur word initially, but there is a constraint that a word may have no more than one V or VV syllable word initially. Only vowels or vowel clusters may appear finally, as discussed previously. In addition to these constraints on the distribution of syllables within the word, there is a further constraint that combinations of syllables that will result in more than two vowels in sequence are not permitted.

## 7. PHONOLOGICAL PHRASES

The phonological phrase is the next level higher than the phonological word in Yawa. It is the basic unit of intonation contours. An utterance may be composed of one to several phonological phrases (intonation contours).


There is some evidence that in natural Yawa speech, phonological phrases have phrase timing, that is, all receive approximately the same amount of time. Thus, when there are a number of words in a phrase, these are pronounced more rapidly, while if there is only one word, it is spoken slowly and drawn out. To illustrate, compare the following two sentences, each with two phonological phrases, but with different numbers of words in them. All four phrases take approximately the same time to pronounce, with the result that the words in the last phrase, with many more syllables, are pronounced more rapidly. (Juncture between the phrases is indicated by a slash. All examples are written phonemically.)

Ájambere mí / káre rátabo.  
*pineapple TOPIC banana also*  
*It's a pineapple / and a banana.*


Káre mí / mánkoije kámije rátabo.  
*banana TOPIC chicken egg also*  
*It's a banana / and a chicken's egg.*

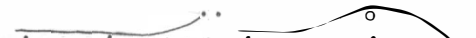
An exhaustive study of intonation contours, both phrase and pause group levels, has not been undertaken. The discussion here is therefore sketchy and possibly incomplete. The following six basic phrase group contours have been identified thus far. They have been named according to their most usual grammatical function. Numbers are from 1 (highest pitch) to 4 (lowest).

The *level dependence* phrase group holds to a relatively constant pitch 2 or more usually pitch 3 throughout. It is used for dependent grammatical units (words, phrases, or clauses). It frequently ends with extra length on the last syllable. In the example below, the first phonological phrase *nkoa mare* is level dependent. (Length is indicated by double dots on the contour line; phrase juncture by a slash; pause group juncture by double slash; word stress by an accent; pause group stress by a small circle above the syllable. The more slight pitch changes caused by word stress are not shown.)

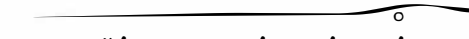
  
 Nkoá maré / šo ánkaije rákaka.//  
*mother say I coconut grate*  
*Mother told me to grate the coconut.*

The *rising dependence* contour has a smooth rise in pitch at the end of the phrase. The final syllable is also frequently lengthened. It is used for dependent grammatical units, for vocatives, for non-final sequences (first of the following two examples), and for the protasis of a conditional sentence (second example below).

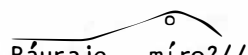
  
 Šo táname ráondi / níndi / mbáruru / mba šo páwa ráuna káta.//  
*I fire light burn flame up then I rice cook also*  
*I lit the fire, it caught and flamed up, then I cooked the rice.*

  
 Núje nórdawe / sánsune rápapi.//  
*earth dry clothes wash*  
*If it's hot, I'll wash the clothes.*

A *yes-no question* contour has elevated pitch throughout that rises to pitch 1 at the end of the contour. At the very end there is a slight dip to pitch 2, then it rises to 1 again. It is used for all yes-no questions. For example:


  
 No kašámbere ntá ráko ée?//  
*you corn some get QUES*  
*Did you get any corn?*

The *wh-question* contour has a smooth rise to a final pitch 1 on the last stressed syllable, followed usually by a pitch fall (to about 2). Most information questions use this contour, although at times the falling declarative contour described later is used instead. An example of a rising *wh-question* is given.




Páuraje míro?//  
dishes where  
Where are the dishes?

The hortatory sharp-fall contour has a sharp rise to pitch 1 on the last stressed syllable, followed immediately by a sharp fall (to 2, 3, or 4). It is used for exhortations and commands. For example:



Idé / wanké.//  
you (DUAL) come we (INCL) sing  
Hey, you two, come sing.

The last contrastive phonological phrase type is the falling declarative contour. The contrastive feature of this contour is that the pitch falls smoothly from the pause group stressed syllable to the end. If the pause group stressed syllable occurs early, then the fall is continuous throughout. More commonly one of the last words is stressed (usually the verb; Yawa is SOV), and the pitch rises steadily to this most stressed syllable, then drops to 4 over the last syllables of the contour. Both types are illustrated below.



Nandínawe po ansawaijé rāmawu.//  
a few days ago he papaya buy  
He bought the papaya a few days ago.



Yawaré mbíto pápabe.//  
house collapsed suddenly  
The house collapsed suddenly.


The falling declarative contour is used for declarative sentences, and sometimes for *wh*-questions.

## 8. PAUSE GROUPS

The pause group is the highest phonological level that we will describe for Yawa in this paper. Eunice Pike (1974) describes this level as follows: 'The chief characteristic of the pause-group level is that it is a rhythm wave (composed of lesser rhythm waves) which occurs between pauses.' In other words, normally a sentence will be pronounced as a single pause group. If it is a simple sentence, it will be comprised of just one phonological phrase, but if it is complex, it may have one or more phonological phrases. Pause group stress occurs on the stressed syllable of one of the words of the pause group. It is the intonation peak of the entire pause group and is realised by extra intensity and generally the highest pitch level. Rarely, there are two peaks (cf. the second example below). (In the examples, pause group stress is indicated by a small circle above the stressed syllable.)

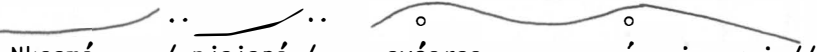
There are only two contrastive pause groups in most languages, including Yawa – *final pause groups* and *non-final pause groups*. The latter occur when a speaker pauses in the middle of a sentence, perhaps to collect his thoughts or for effect. Final pause groups usually coincide with the end of a sentence,

and are characterised by voice relaxation. The last phonological phrase in a final pause group may not be either of the two dependence contours, but may be either of the question contours, the sharp-fall hortatory contour, or the falling declarative contour. The non-final pause group, on the other hand, always consists of one of the two dependence contours. In other words, it never has falling pitch, but only level or most commonly, rising pitch. The following example illustrates both the types of pause groups. It is grammatically just one sentence, but was uttered in a text as two pause groups, first a non-final one, followed by a final pause group. (Note that the first pause group, the non-final one, is composed of two phonological phrases — both rising dependence contours. Phrase juncture is indicated by a single slash; pause group juncture by a double slash.)


  
 Namanáwe / Ñorá ntuná // arikáiñe wáña rai.//

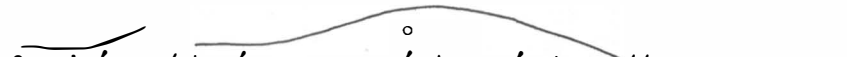
*yesterday Nyora give birth child female have*  
*Yesterday Nyora gave birth to a baby girl.*

A simple pause group is coterminous with a single phonological phrase. Hence, most of the last five examples in Section 7 (from the yes-no questions contour on) are examples also of simple pause groups. A complex pause group consists of two or more phonological phrases. Some combinations of phonological phrases are associated with particular complex grammatical constructions. For example, conditional constructions consist of a rising dependence contour on the protasis (*if*-clause), and a falling declarative contour on the apodosis (*then*-clause). There is an example in Section 7 under the description of the rising dependence contour. Coordination constructions (coordinated either with *or* or with *and*) consist of two or more rising dependence contours generally followed by a falling declarative contour. For example:



  
 Nkoamé / njajapé / ayáorao ánauja rai.//

*mother and father and those 2 possess garden have*  
*Mother and father have a garden.*

Another type of complex pause group is associated with comparatives. Comparative constructions are composed grammatically of two independent clauses that are compared by simple juxtaposition. Each clause is pronounced as a final pause group comprised of two phonological phrases, first a rising dependence contour, followed by a falling declarative contour. Here is an illustration:


  
 Sansimá / batáne woretawéndo ánakomu.//

*in the day people they (PL) go to the sago swamps*


  
 Namá / batáne wo jiané rákani.//

*at night people 3 PL SUBJ fish look for*  
*During the day people go to the sago swamps; at night people go fishing.*

## 9. LOAN WORDS

Yawa has borrowed vocabulary freely from other languages. Here we will focus on borrowings from the national language, Indonesian, particularly the form that is spoken by the indigenous people of Irian Jaya, namely, Malay. Most loan words have been incorporated fully into the phonological system of Yawa. For example, there is a strong tendency in Yawa to add an extra syllable /je/ at the end of all nouns ending in a high vowel. This same tendency operates on nouns borrowed from Malay. For example, Malay *sapu broom* becomes /sapuje/ in Yawa, while Malay *roti bread* becomes /rotije/. Furthermore, because there are no final consonants in Yawa, loan words ending in a consonant generally add an /i/ to make them fit the permissible syllable patterns, but then, because of the strong tendency to add the syllable /je/ after a high vowel, this syllable is tacked on as well. Thus, consonant-final loan nouns assimilate to Yawa by adding /ije/, e.g., Malay *ember bucket* becomes /emberije/ in Yawa.

There are certain regular sound changes as well. Since Yawa has no /l/, the phoneme /r/ is always substituted, e.g., Malay *botol bottle* becomes /botorije/<sup>18</sup> in Yawa. Likewise there is no voiceless alveopalatal affricate /č/ as in Malay, so this is changed regularly to /š/ in Yawa, e.g., Malay *čičin ring* becomes /šinšinije/ in Yawa.

The assimilation of the Malay phoneme /g/ is an interesting matter. Yawa does not have this phoneme per se, although the phoneme /j/ functions somewhat similarly in that it is the voiced opposition to /k/ in the sound system, and furthermore it has [g] as an allophone. Thus, it might be expected that Malay [g] would be changed to [j] in Yawa, except in the environment where the allophone [g] would occur. However, Malay *gereja church* becomes [gerajawe] in Yawa, Malay *gambar picture* becomes [gambarije], Malay *gelas glass* becomes [gerasije], and Malay *negara country* is the same. These are all environments that should produce [j] if indeed Yawa /j/ is the counterpart to Malay /g/. Since the predicted sound change does not occur, an explanation is needed. Perhaps the explanation is as follows. Malay has a two-way distinction among voiced back stops - /j/ versus /g/. Yawa has only one back stop - /j/. However, the Yawa /j/ does have [g] as an allophone; in other words, Yawa speakers regularly pronounce the sound [g] (whereas, for instance, they do not pronounce [l] or [č] because they are not even allophones in Yawa). Hence, we suggest that Yawa speakers are able to absorb the Malay two-way distinction among back stops, not because they make it themselves but because both sounds exist allophonically in Yawa. In absorbing Malay words with /g/, Yawa speakers simply ignore the conflict with the phonetic environment and do not change it to [j].

If the matter of absorbing Malay /g/ was unique, this might be regarded as a serious problem. However, there are many Malay words that are assimilated only partially. As has been mentioned, Malay /l/ invariably changes to Yawa /r/, and almost always, words ending in a consonant add a vowel or a couple of syllables ending in a vowel, e.g. the favoured sequence /ije/ mentioned above. But assimilation is not always complete. Besides the retention of Malay /g/, non-Yawa consonant clusters are often tolerated and sometimes non-Yawa sounds are retained. As examples, note that Malay *April* becomes /apririje/ in Yawa; Malay *Oktober* is borrowed without change; and Malay *Nofember* simply has the /f/ changed to a voiceless bilabial fricative. Other examples are: Malay *berkat to bless* becomes Yawa /berkatiwe/, Malay *kerja to work* becomes /kerjawe/, Malay *kursi chair* becomes /kursije/, and Malay *Roh Kudus Holy Spirit* becomes /rok dusija/. To a certain extent, then, there are 'coexistent

phonemic systems' in Yawa (term from Pike and Fries 1949). That is, there is one phonemic system to describe about 95% of Yawa words, and another system with certain modifications to allow for loans and other residues.

#### 10. A PROPOSED ORTHOGRAPHY

In conclusion, we propose a practical orthography for writing Yawa. Until now, the language has had no standard alphabet. Because most speakers under 40, and some over this age, have had some education in the national language, Indonesian, our proposed alphabet for representing Yawa phonemes corresponds as closely as possible to the equivalent phonemes in Indonesian.

YAWA PHONEME	PROPOSED SPELLING	INDONESIAN SPELLING
/p/	p	p
/b/	b	b
/t/	t	t
/d/	d	d
/k/	k	k
/j/	j, g	j, g
/s/	s	s
/š/	sy	sy
/m/	m	m
/n/	n	n
/ñ/	ny	ny
/r/	r	r
/w/	w	w
/y/	y	y
/i/	i	i
/e/	e	e
/a/	a	a
/o/	o	o
/u/	u	u

The proposed spellings for the vowels and semivowels assumes the phonemic interpretation discussed in this paper, namely, that non-syllabic high vocoids in the onset of a syllable are semivowels, but in the coda of a syllable are vowels. The one exception noted was the unique vowel sequence which had an on-glide to a syllabic vowel, namely /ui/. This has been interpreted as a sequence of two vowels, and will be spelled accordingly as ui.

The only other proposed spelling needing explanation is that of the phoneme /j/. It is proposed that it be represented by the letters j and g, spelling with g when the phonetic quality is [g] and spelling with j otherwise. Essentially, this is representing the phoneme by its two allophones.

Preliminary literacy testing indicated that this will be necessary, probably because Indonesian has a distinction between *j* and *g*, both orthographically and phonemically. Since most Yawas are at least somewhat literate in Indonesian, it seems best to adapt their orthography in this way to Indonesian.

Preliminary literacy testing also indicated that it may be necessary to use semivowels inserted between certain vowels that occur as clusters in Yawa but do not occur in Indonesian. This will need further testing. Our preference would be to not insert semivowels in such cases since they are not phonemic.

It is further proposed that the loan words that have not been phonologically assimilated into Yawa be spelled exactly as they are spelled in Indonesian. Words that have been assimilated or partly assimilated, however, should be spelled according to the proposed orthography.

There is no need to mark word stress since stress plays no role in distinguishing words.

#### NOTES

<sup>1</sup>The description is based on data collected by myself and my linguist husband, Larry B. Jones, during six months' residence in Sarawandori, between July 1983 and April 1984. Research for this paper was conducted with the Cooperative Program of Cenderawasih University and the Summer Institute of Linguistics. I thank the following people for their comments and suggestions on an earlier draft of this paper: Eunice Pike, Peter Silzer, Helen Miehle, and Wietze Baron. I am grateful for the phonetic accuracy of my husband and for his insights into Yawa phonological structure. We both acknowledge with gratitude the kind assistance of the following Yawa speakers in learning to speak their language: Yulianos Warmetan, Karolina Aninam, Elli Karubaba, Stepan and Adomina Karubaba, Dafid, Hans, Manuel, and Manasi Yapanani, and most especially, Abiathar Karubaba. These people provided the data analysed here. The corpus consists of over 1500 words, over 1000 sentences, and a number of full texts.

<sup>2</sup>Sarawandori is in Kecamatan Yapen-Selatan, Kabupaten Yapen-Waropen.

<sup>3</sup>To our knowledge no other published, or even informal, unpublished accounts of this language exist. However, it is possible that some account exists in Dutch materials that we are not aware of. Considering the fact that there has been considerable contact with Western civilisation for most of this century, it is indeed surprising that hitherto no one has undertaken a systematic study of this language.

<sup>4</sup>Anceaux notes that the single non-Austronesian language on Yapen Island is referred to variously as Yava, Yapanani, and Mora. The latter two names, in fact, refer to the dialects spoken by two large clans located on the south coast (Yapanani) and in the interior (Mora). There is no one name that all the speakers will agree upon for the name of their language, most speakers preferring a name that is suitable only for their particular dialect, since it is the name of their ancestor. Others use an expression meaning 'the land language', referring to the non-Austronesians as a group ('the land people') distinct from the Austronesians ('the sea people'). While there are a number of dialects, it is nonetheless clear that they comprise a single language. Larry Jones uses the term Yawa in his paper 'The dialects of Yawa' (in this volume) to refer to the entire language group. However, in this paper I use the

term Yawa more restrictively, to refer to the dialect spoken in the villages of Sarawandori, Tatui, Mantembu, and Aromarea.

All the neighbouring languages to this language are Austronesian, and there have been numerous words borrowed back and forth.

- <sup>5</sup>In other dialects than the one being described here, words may end in consonants. Such dialects, of course, would require a different description of syllables than the one given here, as closed syllables would be necessary. Perhaps it might be better to describe Yawa as also having closed syllables, to bring this dialect in line with the others. But which dialect represents the historical, more conservative, situation is not at all clear, and from a strictly synchronic perspective, the Sarawandori (Yawa) dialect, at least, is most elegantly analysed with no final consonants.
- <sup>6</sup>In the case of one sequence, it is sometimes an on-glide plus nuclear vowel. This is the sequence /uj/ which has two phonetic realisations: [u<sup>i</sup>] and [u<sup>i</sup>]. The former situation occurs infrequently and is the only one involving an on-glide vowel complex.
- <sup>7</sup>Note that the term 'back' is used here quite differently from Chomsky and Halle's (1968) technical use in distinctive feature theory, where 'back' includes velar, uvular, and pharyngeal consonants as well as back vowels. Their term is intended to be a phonetic one of universal application. Ours is a phonemic one to describe a class of sounds occurring in Yawa.
- <sup>8</sup>In a generative analysis, this rule would need to be ordered after the rule in 4. We prefer, however, to view the two rules as operating simultaneously.
- <sup>9</sup>The most common pronunciation is represented in the examples. The careful reader will note that in these lists, not all words have rounded consonants where they might be expected. Recall, however, that this is an optional rule — certain words invariably undergo rounding, others don't, and still others fluctuate.
- <sup>10</sup>There is some evidence that /ʒ/ was, perhaps in the not too distant past, an allophone of /s/ rather than being a distinct phoneme. Most occurrences of [sʏ] could conceivably be accounted for by a rule that /s/ palatalises following /i/. Evidence from other dialects would lead to this conclusion, because a number of words that are pronounced with the alveopalatal [sʏ] in the dialect being described in this paper have the non-palatalised sequence [is] in other dialects. Further evidence stems from the limited distribution of vowels that may occur before [sʏ] in this dialect. Only the sequences [isʏ], [asʏ], and [usʏ] occur; there are no mid vowels preceding [sʏ]. Conceivably, it could be argued that the best analysis of [asʏ] and [usʏ] is as /ais/ and /uis/, respectively, where the high front vowel conditions the occurrence of [sʏ], and then the /i/ is dropped when it occurs as the unstressed second member of such vowel clusters.

However, there are a number of reasons we have rejected this analysis. First, there are already some two-member vowel combinations that occur preceding [sʏ], and in these, neither vowel is deleted. Such combinations are [ai] and [au], e.g. [raisʏa] *eat* and [rausʏa] *open*. Since three-vowel combinations are very rare in Yawa, it is not likely that such words derive from /aii/ or /aui/ sequences. Furthermore, there are a few words in which the pronunciation [is] occurs. If [sʏ] were an allophone of /s/ in the environment following /i/, then the phonetic shape should instead be [isʏ] in these words. This suggests that there is a phonemic contrast between

[s] and [sʏ]. For example, the following pairs contrast in the environment of a preceding high front vowel: [namiso] *here it is* versus [isʏo] *stick*; [raiseo] *climb* versus [raisʏe] *whittle*; and [naiso] *here* versus [raisʏa] *eat*. (Stress is identical in the last two pairs.) Unfortunately, there are only three words with an alveolar instead of alveopalatal sibilant following the high front vowel. But since these three words are all common and well-attested, and further, since there is little solid evidence for analysing [asʏ] and [usʏ] sequences as /ais/ and /uis/, respectively, we conclude that it is best to assume a phonemic contrast of /s/ and /sʏ/ in present-day Yawa.

- <sup>1</sup>This word is often pronounced [namʷe], suggesting that the Initial Unstressed u Deletion Rule in 5 may not be restricted just to initial positions. In non-initial positions, the presence of a phonemic /u/ is attested by the rounding it induces on the following consonant. Another example is [rabʷai] *to kill* which is interpreted as phonemically /raubai/.
- <sup>2</sup>Thus far, one combination has not yet been attested: [ie]. This appears to be an impossible sequence in Yawa, since when there are morpheme combinations that should produce [ie] (first morpheme ending in i and the second one beginning with e), an epenthetic consonant [j] is inserted, resulting in [ije].
- <sup>3</sup>The same-vowel sequences /ii/ and /aa/ occur only once each. Also, the sequence /ia/ has been observed in one place name /maniaje/ and in one very common loan word /jiane/ *fish*. The sequence /iu/ thus far only occurs in one morpheme /siu/ *pointed*. It does, however, also occur across morpheme boundaries as in /nai+umu/ *over there*.
- <sup>4</sup>For the evidence that /sʏ/ is a phoneme instead of an allophone of /s/, see note 10.
- <sup>5</sup>Our interpretation of the non-syllabic high vocoids resembles McElhanon's (1970) for Selepet of Papua New Guinea, also a non-Austronesian language.
- <sup>6</sup>Actually, this analysis is supported by some work in the theory of natural generative phonology that hypothesises that phonemes have different strengths in different syllable positions (Hooper 1976). According to this theory, the end of a syllable is its weakest position, while the onset is the strongest position. The more vowel-like a phoneme is, the more weak it is, according to this thinking. Thus, it is reasonable to expect that a semivowel, which is more consonant-like and thus stronger, would occur in the syllable onset, while a vowel, which is weaker, would occur in the coda.
- <sup>7</sup>This seems the best interpretation for this special situation, since otherwise if the [w] here were regarded as consonantal, it would allow a cluster of three consonants in certain words, e.g., [wanampʷi] *west* would then be /wanampwi/ rather than /wanampui/. But such clusters are never attested in non-suspicious cases.
- <sup>8</sup>Some of the words in this section may appear as if they've been borrowed directly from English or some other European language. This is highly unlikely based on the history of the Yawa people. In general, such words probably first came from Portuguese into Malay centuries ago, or from Dutch into Malay in the last century or two. Subsequently, these words were borrowed from Malay into Yawa.

BIBLIOGRAPHY

ANCEAUX, J.C.

- 1961 *The linguistic situation in the islands of Yapen, Kurudu, Nau and Miosnum, New Guinea.* The Hague: Martinus Nijhoff.

CHOMSKY, Noam and Morris HALLE

- 1968 *The sound pattern of English.* New York: Harper and Row.

CROTHERS, John

- 1978 Typology and universals of vowel systems. In Joseph H. Greenberg, ed. *Universals of human language*, vol.2:93-152.

GREENBERG, Joseph H., ed.

- 1968 *Universals of language.* 2nd edn. Cambridge, Mass.: The M.I.T. Press.

HOOOPER, Joan B.

- 1976 *An introduction to natural generative phonology.* New York: Academic Press.

JONES, Larry B.

- 1986 The dialects of Yawa. In this volume, pp.31-68.

McELHANON, K.A.

- 1970 *Selepet phonology.* PL, B-14.

PIKE, Eunice V.

- 1974 Tagmemic phonology. MS. Dallas, Texas: Summer Institute of Linguistics.

PIKE, Kenneth L.

- 1947 *Phonemics.* Ann Arbor: The University of Michigan Press.  
1971 *Language in relation to a unified theory of the structure of human behavior.* The Hague: Mouton.

PIKE, Kenneth L. and Charles C. FRIES

- 1949 Coexistent phonemic systems. *Language* 25:29-50.

SHAW, R. Daniel and Karen A. SHAW

- 1977 Samo phonemes: description, interpretation and resulting orthography. In Richard Loving, ed. *Phonologies of five Papua New Guinea languages*, 97-135. Ukarumpa: Summer Institute of Linguistics.