

CHUAVE PHONOLOGICAL HIERARCHY¹

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0. Introduction.
1. Phonemes.
2. Syllables.
3. Phonological Words.
4. Pause Groups.
5. Morphophonemics.

0. INTRODUCTION

The purpose of this paper is to present a description of the Chuave² phonological hierarchy: phonemes (segmental phenomena), syllables, phonological words (including supra-segmental phenomena) and pause groups (including subsegmental phenomena). Each of these levels may be defined as a rhythm wave of the hierarchy.³ A rhythm wave in Chuave is a rhythm group which has absence or presence of nucleus or nuclei (peak or crest); it has initial and final margins; and it has prenuclear ascending and postnuclear descending slopes.⁴ A phone is a wave in a syllable, a syllable a wave in a *P*-word, a *P*-word is a wave in a pause group and a pause group is a wave in a phonological paragraph.

Analysis of Chuave phonology on the basis of contrast, variation and distribution has revealed what is pertinent at each level and how each level relates to subsequent levels.

Analysis on the pause group level is not exhaustive. Further research will undoubtedly reveal new types.

1. PHONEMES

1.1. Contrast. The nucleus of a phoneme is contrastive as to point and type of articulation. Employing three articulatory zones, consonants are shown in Chart A. Ranging from front, to central, to back, vowels are shown in Chart B.

Chart A

CONSONANTS

	<i>Bilabial</i>	<i>Alveolar</i>	<i>Velar</i>
Stops		t	k
	b	d	g
Fricatives	f	s	
Nasals	m	n	
Vibrant		r	
Semi-Vowels	w	y	

Chart B

VOWELS

	<i>Front</i>	<i>Central</i>	<i>Back</i>
High	i		u
Low	e	a	o

Consonant phonemes contrast in identical and analogous environment.⁵

/w/ v. /b/	/ewiúm/	'his saliva'	/ebiúm/	'his soap'
/w/ v. /f/	/wíro/	'you (2) come'	/fíro/	'you (2) go'
/f/ v. /b/	/féo/	'you fold'	/béo/	'you work'
/m/ v. /b/	/kamá/	'black'	/kabá/	'moon'
/n/ v. /d/	/néem/	'father of'	/déem/	'feces'
/t/ v. /d/	/táwa/	'here'	/dáwa/	'tree type'
/t/ v. /r/	/ditóo/	'you tell'	/díro/	'you (2) speak'
/t/ v. /s/	/tán/	'to lean'	/sán/	'digging stick'
/r/ v. /d/	/furó/	'I went'	/fudó/	'you break'
/m/ v. /n/	/gáam/	'skin'	/gáán/	'child'
/y/ v. /s/	/yúwa/	'name'	/súwa/	'place'

Vowel phonemes contrast in identical and analogous environments.

/e/ v. /i/	/enayé/	'I give'	/ináye/	'I put'
/e/ v. /a/	/kowiýé/	'stump'	/kowiýá/	'tongs'
/o/ v. /u/	/kóba/	'dish'	/kúba/	'stick'
/o/ v. /a/	/sumó/	'He hit?'	/sumá/	'He hit!'

1.2. **Variants.** All stops have a fortis variant P-word

initial and when they occur as second member of a consonant cluster. The *P*-word initial fortis variant of voiceless stops is aspirated. Intervocally, a lenis variant for each occurs, which for voiced stops, fluctuates in rapid speech with a voiced fricative. Each alveolar stop has a fronted variant *P*-word initial which fluctuates with the phonemic norm.

Examples:⁶ /b/ /bé/ [b_hé] 'to work', /dúmba/ [d_húmba] 'it is', /kabugá/ [k_habugá] [k_habugá] 'bird'; /t/ /táwa/ [t_háwa] [t_háwa] 'here', /kamúntagóme/ [k_hamúntagóme] [k_hamúntagóme] 'daytime'; /ewaitome/ [ewaitome] 'strong'; /d/ /dáwa/ [d_háwa] [d_háwa] 'tree type'; /ibíndome/ [ibíndome] [ibíndome] 'heavy'; /dumédo/ [d_humédo] [d_humédo] 'he talks'; /k/ /kabá/ [k_habá] [k_habá] 'moon'; /dénkábu/ [d_hénkábu] [d_hénkábu] 'mosquito'; /díkéme/ [díkéme] 'it's finished'; /g/ /goúme/ [goúme] 'it's gone'; /degobá/ [degobá] [degobá] 'sweet potato type'; /nígi/ [nígi] [nígi] 'dew'.

The voiceless bilabial fricative /f/ has one allophone [f]: /fí/ 'belt', /kamúnfége/ 'cloud', /wífaimé/ 'he sleeps'.

The voiceless alveolar fricative /s/ has [s] only: /súna/ 'middle', /mwiýúmsume/ 'it is hot', /ásúri/ 'sneeze'.

The bilabial nasal /m/ has one allophone: /mán_hsinóm/ 'ground', /konmori/ 'road', /káma/ 'black'.

The alveolar nasal /n/ has three allophones: [n_h] fronted occurs syllable initial: /manóm/ [manóm] 'his mother', /néfínó/ [néfínó] 'Do you understand?'; [n] occurs syllable final: /erán/ [erán] 'grass type', /sinbói/ [sinbói] 'to push'; [ŋ] occurs preceding vocoid velars: /ními súngwa/ [ními súngwa] 'it rained', /dungeró/ [dungeró] 'It stopped and ...'.

Consonants /m/ and /n/ have lengthened lenis variants when they occur *P*-word final.

The alveolar flap /r/ has one allophone [ř] only:⁷ /irirí/ 'bridge', /aró/ 'sun'.

Semi-vowels /w/ and /y/ have one allophone each: [w] /wéom/ 'tail', /áwom/ 'his father'; [y] /yai/ 'man', /té moyó/ 'thou stay'.

Each vowel has a lengthened variant when it occurs as the nucleus of a stressed syllable, and a lenis lengthened variant when it occurs *P*-word final: /komári/ [komá.ři.] 'before', /gémábo/ [gé.má.bo.] 'spider'.

Vowels are sometimes nasalized *P*-word final following a nasal consonant: /bwimé/ [bwimé] [bwimé] 'rotten'; /néfínó/ [nefínó] [néfínó] 'Do you understand?'.
 Vowel phonemes /i/, /u/ and /o/ each have a lower variant and /a/ has a higher variant [ʌ] which occurs preceding /n/ in a closed syllable. The phonemic norm occurs elsewhere: /ibíndome/ [ibíndome] 'heavy', /ararí/ [ařarí] 'long'; /sán/ [sán] 'digging stick', /kabá/ [kabá] 'moon'; /kamún/ [kamún] 'sky', /búna/ [búna] 'short'; /konmori/ [konmoří] 'path', /kóba/ [kóba] 'dish'. The mid front vowel /e/ has only one allophone [e] /fumé/ 'he is gone', /bebiye/ 'they (2) work'.

1.3. Distribution. The distribution of the phoneme may be described in terms of the syllable. A syllable is a rhythm wave consisting of a simple vowel nucleus with optional pre-*N* (C, Cw), and post-*N* (C), margins and is a point of potential stress placement.

There are five syllable types: CV, V, VC, CVC, and CwV (w represents labialization). Any consonant may occur in the pre-*N* C slot position in CV and CVC; only /b/, /m/, /k/, /g/ and /f/ occur in the C slot of CwV; only consonants /m/ and /n/ occur in the post-*N* slot in CVC and VC.

A single phoneme may occur as the highest level of the hierarchy. The phoneme /o/ 'yes', as spoken in isolation is simultaneously a phoneme, syllable, word and pause group.

Any vowel may occur as a syllable nucleus in any syllable type with the only restriction being the non-occurrence of /u/ in the CwV type. There are no limitations of two vowel sequences which may occur across syllable boundaries within the *P*-word. The following three vowel sequences have been recorded: nóai 'cough', kóiom 'wing', bíai 'old', yogamaíí 'them', kamdiaú 'blue sky', bóie 'to cut'.

In some of the vowel sequences across syllable boundaries, an intervening /w/ or /y/ contrasts with its absence: ké.a 'bamboo type', ke.wá 'lamp'; fe.ó 'you fold', fe.í.yó 'you (two) fold'; kó.i.om 'wing', ko.i.yóm 'navel'.

Across syllable boundaries, consonant clusters which may occur consist of /m/ or /n/ plus any other consonant except the following combinations: /nw/, /nt/, /nn/, /nr/, /ny/, /mm/, /mr/, /mn/, and /my/. /mt/ kámtagóme 'daytime', /mk/ eraromgámkwoingwa 'green', /mb/ dúmba 'it is', /md/ kurákáamdume 'he is angry', /mg/ kurákáamgoúme 'he is not angry', /mf/ káamfi 'to be sorry', /ms/ mwiýumsúme 'it is hot', /mw/ ninumwí 'ice'; /nk/ wánkan 'to walk and look', /nb/ sínbói 'to push', /nd/ kaándo 'look and...', /ng/

dungeró 'it is and...', /nf/ kamúnfége 'white sky', /ns/ mansinóm 'earth', /nm/ kánmoiyé 'to look and stay'.

2. SYLLABLES

2.1. Contrast. The five Chuave syllable types contrast as to relationship of nucleus to pre-N and post-N margins.

(1) V consists of a simple vowel nucleus: imé 'he put', óri 'large', í 'this'.

(2) VC has a simple vowel nucleus with optional pre-N and post-N margins: oóngo 'tomorrow', bián 'twine type', wiúmbiai 'husband'.

(3) CV has a simple vowel nucleus with an obligatory pre-N margin. This pattern is the most frequent: bó 'sugar', kabá 'moon', énugú 'smoke'.

(4) CVC consists of a simple vowel nucleus with obligatory pre- and post-N margins: kán 'string', munmaní 'many', kibám 'his shoulder'.

(5) CwV has a simple nucleus with an obligatory labialized pre-N margin: fwi 'salt', édongwá 'fire', súngwamé 'he has fought'.

2.2. Variants. Syllables that occur in *P*-word nuclear position are characterized by stress, high pitch, slight intensity and lenis length. Non-nuclear syllables are stressless, are neutral in pitch which ranges from low to mid and are relaxed and non-lengthened. A non-nuclear syllable has lenis length when it occurs *P*-word final. An extra-high pitch variant occurs with a double stressed geminate vowel cluster across syllable boundaries. A syllable has lengthened variants depending upon how many syllables compose a *P*-word. A one syllable word may be as long or nearly as long as a polysyllabic word at substitution points within a pause group.

2.3. Distribution. The distribution of the syllable may be described in terms of the *P*-word. A *P*-word is a rhythm wave with an obligatory simple or complex nucleus determined by the stressed syllable or syllables. The optional pre-N slope is slightly accelerated with crescendo⁸ and has a slight rise in pitch and the obligatory post-N slope has decrescendo and a gradual decline in speed, intensity and pitch with the final margin characterized by lenis length of final syllable. A *P*-word may be comprised of from one to eight syllables. All syllable types have been observed in

one syllable words and in all positions in two, three and four syllable words.

3. PHONOLOGICAL WORDS

3.1. Contrast. *P*-words contrast in Chuave as to stress placement. (See Section 2.2. for features defining stress.) There are as many potential stress placements in a *P*-word as there are syllables. Every *P*-word must contain at least one stressed syllable. In describing stress patterns, *v*. is used to represent a syllable.

All one syllable *P*-words are stressed when pronounced in isolation.

Two syllable *P*-words have the following patterns: (1) *v.v.* *kúba* 'stick'; *báre* 'to kick'. (2) *v.v.* *kubá* 'bamboo type'; *toró* 'to cut'. (3) *v.v.* *dúdí* 'insane'.

Three syllable *P*-words may have the following patterns: (1) *v.v.v.* *nímbigá* 'leak'; *gíngódí* 'to snore'. (2) *v.v.v.* *yágóri* 'eagle'; *ágúre* 'to hold'. (3) *v.v.v.* *áurom* 'mole'; *wánmoi* 'to live'. (4) *v.v.v.* *noníki* 'year'; *ewísi* 'to spit'. (5) *v.v.v.* *amámó* 'yam type'; *tabásí* 'to clap'. (6) *v.v.v.* *kiarí* 'fence'; *kuneí* 'to steal'. (7) *v.v.v.* *énugú* 'smoke'; *tóyadi* 'to pour'.

Four syllable words may have the following patterns: (1) *v.v.v.v.* *kábúóri* 'flute'. (2) *v.v.v.v.* *kúriabá* 'bird type'. (3) *v.v.v.v.* *ónosúná* 'night'; *géogéó* 'to knock'. (4) *v.v.v.v.* *kámabanóm* 'talk'; *ágomai* 'to hold'. (5) *v.v.v.v.* *kobónbumbé* 'butterfly type'; *amiagé* 'to yawn'. (6) *v.v.v.v.* *binówíom* 'his hair'; *beifuró* 'to work and go'. (7) *v.v.v.v.* *kamúnfége* 'white sky'; *moitéfo* 'to stop and go'. (8) *v.v.v.v.* *kobónbea* 'kangaroo type'; *kegóboi* 'to whistle'. (9) *v.v.v.v.* *tobaróbá* 'butterfly type'; *koiyósí* 'to tie'. (10) *v.v.v.v.* *korowaré* 'chicken'; *megubaú* 'to retch'.

3.2. Variants. Pitch on-glide and off-glide slopes toward the nucleus of the *P*-word are often lost on the pause group level, particularly in unstressed to stressed sequences: *gaán* [gán] 'child', *oóngo* [óngol] 'tomorrow'.

A *P*-word has lengthened variants which depend upon how many *P*-words compose the pause group. *P*-words in a long pause group are shorter and are longer in a short pause group.

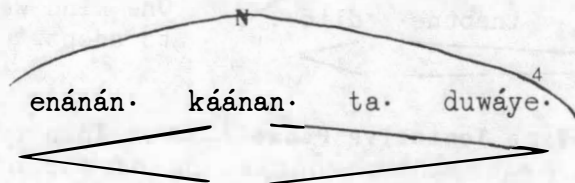
Polysyllabic *P*-words with the same number of syllables have a timing variant according to sequence of syllable type. A *v.v.* sequence is shorter in timing than a *CV.CV.* *goiyóm* (*CV.V.CVC.*) 'old'; *onobá* (*V.CV.CV.*) 'snake'.

3.3. Distribution. The distribution of the *P*-word may be described in terms of the pause group. A pause group is a rhythm wave with absence or presence of a nucleus which is an over-riding stress on one of the lexical stresses as a point of emphasis. In some pause groups the nucleus is indeterminate. The margins of pause groups are well-defined and produce contrastive types of pause groups. *P*-words occur in all positions in a pause group.

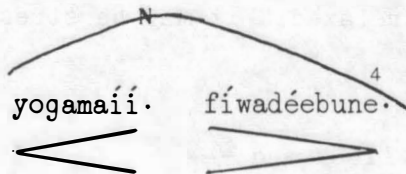
4. PAUSE GROUPS

4.1. Contrast. Pause groups contrast as to final and three types of tentative pause. They are: (1) Final Pause; (2) Narrative-Continuation-Type Tentative Pause; (3) Anticipation-Type Tentative Pause; (4) Hesitation-Type Tentative Pause. The optional pre-N slope of each of the pause group types is characterized by a crescendo, a rise in register and an acceleration over a series of words. The presence of a nucleus is characterized by a peak which is the longest, loudest, and highest syllable in the pause group. Absence of nucleus is a smooth transition from the pre-N slope crescendo to the post-N slope decrescendo. The pause groups are identified by contrastive post-N slopes.

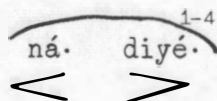
4.1.1. Final Pause /·/. The post-N slope of the final pause is a decrescendo wave over a series of words ending with a word final non-stressed syllable with low pitch⁹ or a stressed syllable with high and falling pitch. There is deceleration with a gradual decline in speed and intensity with length and relaxation. A nucleus is indicated by N.



'All right, I
would like to
give a talk.'

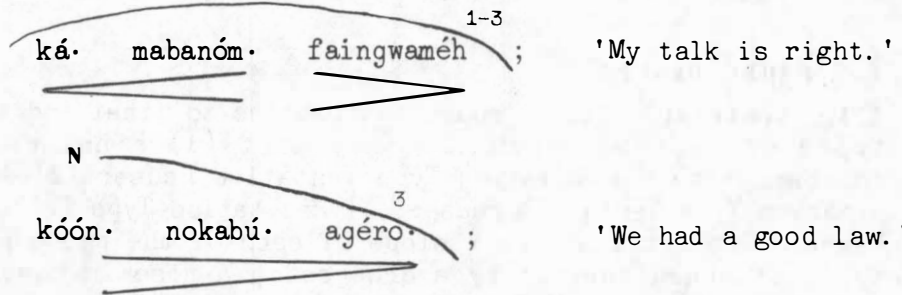


'We were happy
when they came.'

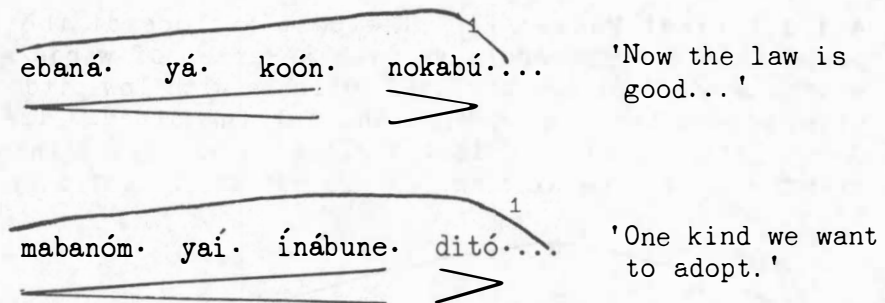


'I talk.'

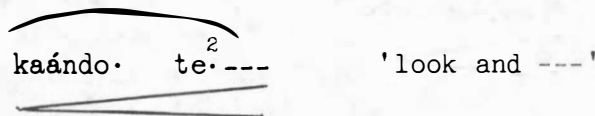
4.1.2. Narrative-Continuation-Type Tentative Pause /;/. The post-N slope of this tentative pause type is a ballistic decrescendo (fast fade or decline) usually over a shorter series of words with non-relaxation in contrast to decrescendo of final pause with relaxation. There is devoicing and a slight downglide on the final syllable when stressed. Non-stressed syllable final is neutral in pitch.

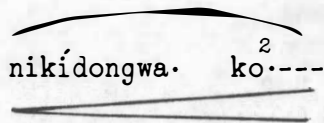


4.1.3. Anticipation-Type Tentative Pause /.../. This type of tentative pause group has the same ballistic decrescendo in the post-N slope as described in the preceding pause group but syllable final is always stressed with accompanying high pitch and slight length but is non-relaxed.



4.1.4. Hesitation-Type Tentative Pause /---/. This type is usually a minimal pause group consisting of one or two words. The post-N slope is a lengthened final syllable without decrescendo and non-relaxed. It may be stressed or non-stressed.




 níkídongwa. ko²---- 'half was bad ----'

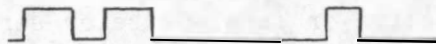

 kogonán¹---- 'work ----'

4.2. Variants

4.2.1. Voice Quality Variants.¹⁰ Within the contrastive pause group types there are variants due to voice quality and register depending upon the attitude of the speaker. This sub-segmental analysis has further substantiated the multiple stress hypothesis for Chuave since characteristic contrastive pitch patterns may be lost but stress is maintained on the basis of intensity and length. Lines below the word indicate low pitch register; above the word, high pitch register; on the word, mid or normal pitch register; extra high above the word, extra-high pitch.

(1) Disapproval or disdain - a very low pitch register with near laryngealization:

koón níkídongwa ko agéro te



'We still held our bad way of life.'

(2) Excitement, approval, elation - the pause group rises to a high pitch register.

yogamáí yuropín yogamáíí béimoibúne díre

'We gathered and talked and ...'

(3) Narrative - the pitch register is normal - mid.

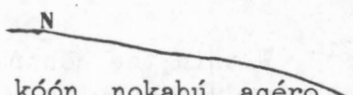
ebehá kabá namba tú muni nonígi káam 62

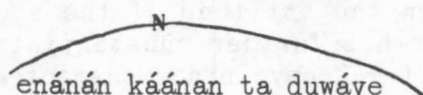
'It is now February, 1962.'

(4) Extreme anger or panic (usually found in conversation) approaches a falsetto with loss of pitch contrast.

noón éa kwingwá ú súna umé
'Whose pig came to my garden!!!!!!'

4.2.2. Pre- and post-N Slope Variants. There are lengthened variants of pre- and post-N slopes depending upon the position of a nucleus in a pause group. There is a nucleus in each of the following pause groups signalled by a double stressed geminate vowel cluster.

N

 kóón nokabú agéro 'We had a good law.'

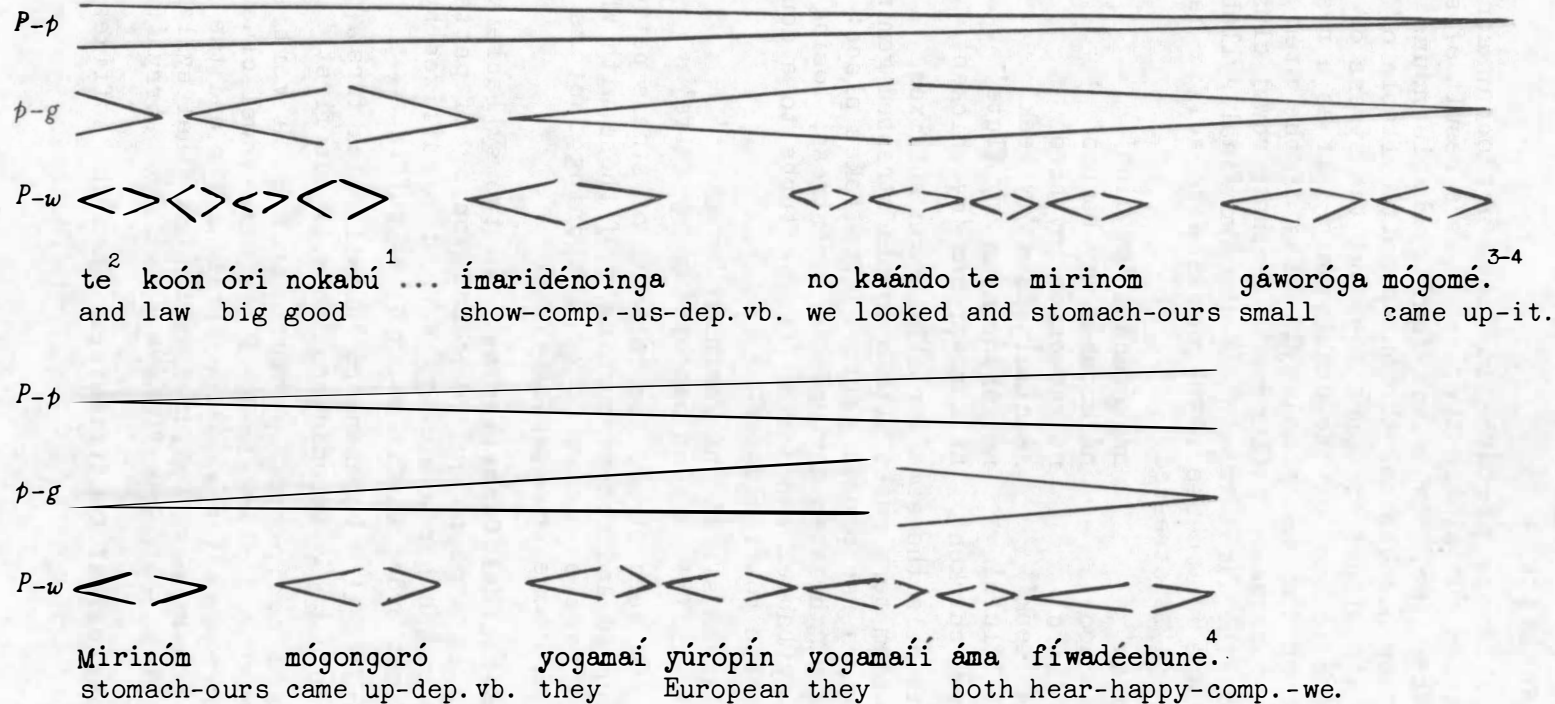
N

 enánán káánan ta duwáye 'All right, I would like
to give a talk.'

N

 té ebená yáá '... and now ...'

4.3. Distribution. The distribution of the pause group may be described in terms of the phonological paragraph. A *P*-paragraph is the largest wave within the phonological hierarchy of Chuave. A nucleus is indeterminate. The pre-N slope may be either a tentative or final pause or series of pauses but a *P*-paragraph closes only with a final pause group. Features marking the pre- and post-N slopes of the *P*-paragraph are exaggerated features of the slopes of the final pause group. There is a decrescendo over the terminal pause group with pitch lower than any other point in the *P*-paragraph with length, relaxation and exaggerated pause. A subsequent *P*-paragraph is indicated by crescendo, a marked rise in register and acceleration over the initial pause group.

Text: (*P*-paragraph, pause group, and *P*-word are abbreviated as *P-p*, *p-g*, and *P-w* respectively.)



Translation:

... of a good law the Europeans told us; we listened and were pleased.

We all were happy as we heard.

5. MORPHOPHONEMICS

5.1. Nouns. Stress perturbation does not occur across *P*-word boundaries but within the *P*-word as a result of suffixation. When two, three and four syllable nouns are suffixed to show possession, the antepenult syllable of the stem retains its stress or non-stress but the stress of the ultima perturbs to that of the penultimate. If as a result of perturbation the two final syllables of the stem are stressed, the possessive suffix has a geminate vowel cluster with stress on the first vowel. If the two final syllables of the stem are unstressed, the possessive suffix has a single vowel and is stressed:

kóba 'dish'	ná kóbánám 'my dish'
kubá 'bamboo'	ná kubanám 'my bamboo'
kabuǵá 'bird'	ná kabuganám 'my bird'
nímbigá 'leak'	ná nímbigánám 'my leak'
kábúóri 'flute'	ná kábúórínám 'my flute'
korowaré 'chicken'	ná korowarenám 'my chicken'.

The perturbation is the same for all person suffixes.

If a noun stem terminates with a double stressed geminate vowel cluster, a reciprocal perturbation takes place: the double stress of the stem perturbs to non-stress, losing the final vowel syllable, and the suffix perturbs to a double stressed geminate vowel cluster:

kawíí 'grass skirt'	ná kawináám 'my skirt'
sanobíí 'knife'	ná sanobináám 'my knife'.

5.2. Verbs. On verb stems, the majority of stress patterns are non-perturbed and non-perturbing. Of those with which perturbation does occur, some conditioning factors are phonological and some are morphological.

5.2.1. Phonological Conditioning. In two syllable verb stems, there is a phonological conditioning of patterns *V.V.* and *V.V.* each perturbing to *V.V.* when suffixed by an unstressed first order suffix among other suffixes:

báre 'to kick'	barenangeró 'He will kick first.'
toró 'to cut'	toronangeró 'He will cut first.'

There is a reciprocal perturbation if a verb stem terminates with a double stressed geminate vowel cluster: the double stress perturbs to the first suffix and the stem perturbs to non-stress, losing a verb stem final syllable: *káamfíí* 'to be sorry', *káamfinááye* 'I will be sorry'.

5.2.2. Morphological Conditioning. When the suffixes *-yé*

(stative aspect), -*nó* (interrogative mode), and -*ró* (dependent verb indicator) occur contiguous to a verb stem with the patterns of *V.V.* or *V.V.V.* the stem perturbs to *V.V.* and *V.V.V.* respectively.

	- <i>yé</i> <i>stative</i>	- <i>nó</i> <i>interrog.</i>	- <i>ró</i> <i>dep. vb. ind.</i>
Class			
báre	baré- <i>yé</i>	baré- <i>nó</i>	baré- <i>ró</i>
'to kick'	'I kick'	'Do you kick?'	'I kick and...'
tóyadi	tóyadi- <i>yé</i>	tóyadi- <i>nó</i>	tóyadi- <i>ró</i>
'to pour'	'I pour'	'Do you pour...?'	'I pour and...'

If another suffix occurs between the stem and any of these suffixes, the perturbation does not take place.

tóyadi 'to pour' tóyadi-*nó* 'Do you pour?'
tóyadi-*ké-dé-nó* 'Did you not pour?'

NOTES

1. This paper supercedes *Chuave Phonology*, 1962, Wolfenden and Swick, unpublished.

2. Chuave is spoken by some 19,000 persons living in the Eastern Highlands District of Australian New Guinea. The analysis here presented is based on the dialect spoken at Gomia No.1, a village near the Chuave Patrol Station, forty-four miles southwest of Goroka. Wurm (1961) classifies the language as a member of the Hagen-Wahgi-Jimi-Chimbu language family, and the Chimbu-Chuave sub-family. It is bordered by related languages Sinasina, Dom and Nomane, as well as unrelated languages Gimi and Siane.

This paper was prepared following eighteen months field work under the auspices of the Summer Institute of Linguistics between July 1960 and October 1962. The main informant was Waiwo, a youth about eighteen years old.

For helpful criticism and suggestions regarding the stress analysis, I am indebted to K.L. Pike, University of Michigan and E. Pike, Summer Institute of Linguistics. I am also indebted to my husband, Ronald Swick, for grammatical analysis and editorial suggestions. Appreciation is also expressed to SIL colleagues E. Wolfenden (Philippine Branch), A. Pence, and D. James for their assistance.

3. "Practical Phonetics of Rhythm Waves", Pike, 1962, has been particularly helpful in the analysis of Chuave high level phonology.

4. Pre-nuclear and post-nuclear are hereafter referred to as pre-N and post-N. Phonological word and phonological paragraph are *P*-word and *P*-paragraph.

5. It is not possible at this point to predict in detail the influence that loan words from Neo-Melanesian may have upon the Chuave phonemic system. Loan words are used frequently by many speakers, simultaneously with the vernacular equivalent, but the majority of the speakers fully accommodate these words to the system described in this paper.

Possible introductions are: (1) phoneme /p/, filling an obvious gap in the system - /pepa/ 'paper', /kap/ 'cup';

(2) phoneme /l/, /luluai/ (řuřuai) 'village leader';
 (3) /t/, /k/, /f/, /s/ and /r/ as syllable codas.

6. Some of the symbols used throughout this paper are: /·/ syllable division occurring between phonemes; /' / acute accent over the vowel indicates a stressed, nuclear syllable; C̣ fortis consonant; C̣ lenis consonant; C̣ fronted consonant; C^h aspirated consonant; Ṿ nasalized vowel; V· and C· lengthened vowel or consonant.

7. The occurrence of a lateral flap (ľ) has been noted in four instances contrasting in analogous environment with vibrant (ř). Because of its infrequency, we are not treating the lateral flap as an additional phoneme. With some speakers, fluctuation has been noted in these four instances with vibrant.

8. Crescendo, symbolized by < , is an increase in intensity of voicing. Decrescendo, symbolized by > , is fade or decay of voicing.

9. Relative pitch is marked over the syllable: 1 high, 2 mid, 3 low, and 4 extra low.

10. Pike (1959, p.45) defines voice quality as a sub-segmental item which is internally structured.

BIBLIOGRAPHY

Pike, K. L.

- 1959 "Mode-Like Emic Units and Systems". *Language* III, Chapter 13.
- 1962 "Practical Phonetics of Rhythm Waves". *Phonetica* 8:9-30.

Wurm, S. A.

- 1962 "The Languages of the Eastern, Western, and Southern Highlands, Territory of Papua and New Guinea", published in A. Capell, *A Linguistic Survey of the Southwestern Pacific*. New and revised edition. Noumea: South Pacific Commission.