PAPERS IN NEW GUINEA LINGUISTICS No. 4

by

Darlene Bee
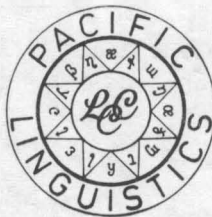
PACIFIC LINGUISTICS

The Australian National University

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COMPARATIVE AND HISTORICAL PROBLEMS IN
EAST NEW GUINEA HIGHLAND LANGUAGES

DARLENE BEE

0. Introduction

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0.0 The linguistic terrain of New Guinea is covered with virgin forests of untouched problems of synchronic and diachronic analysis, description and comparison. Almost any area chosen will reward its investigator with opportunities for pioneer work in one area of linguistic research or another. The Eastern Highlands of the Territory of New Guinea is no exception. Although some areas of research in the Eastern Highlands are rapidly becoming familiar ground there are many areas which have hardly been touched. One such area is that of historical reconstruction and comparative analysis. McKaughan has taken a step in that direction in his 1964 "Divergence in Four New Guinea Languages" where he suggests a reconstructed phonemic system for the Eastern Family. The purpose of this present paper is to take a few more steps into the frontier of comparative and historical research in New Guinea.[1] For this study the seven languages of the Eastern Family will be used and levels below and beyond the phoneme will be investigated. An attempt will be made to reconstruct some actual linguistic forms and problems awaiting solution will be pointed out. Material for this study has been drawn from the author's personal field notes, published and unpublished papers of colleagues from the New Guinea Branch of the Summer Institute of Linguistics and from extensive word lists collected by Dr Howard McKaughan presently of the University of Hawaii.

0.1 Tairora, Binumarien, Gadsup, Agarabe, Usarufa, Auyana, and Awa will form the basis of the discussion presented here. Wurm's classification and sub-classification of these speech communities rather than McKaughan's has been adopted. The basic difference between the two classifications is one of status rather than grouping. Wurm classifies the seven speech communities together as the Eastern Family with four Sub-families: Gadsup, Auyana, Awa and Tairora which are

respectively composed of the following languages: Gadsup and Agarabe; Auyana and Usarufa; Tairora and Binumarien; and Awa. McKaughan does not recognize the Sub-family division but classifies Wurm's Sub-family groups as languages each of which have several dialects. Agarabe and Usarufa are regarded by McKaughan as merely the most divergent dialects of Gadsup and Auyana respectively. His conclusions are based on statistical evidence which although extensive are subject to interpretational differences of opinion. The general groupings of the two classifications are however in agreement. The status ranking of the speech groups whether language versus dialect or family versus sub-family is at the present stage of analysis relatively unimportant. In any case statistical information is only one type of information needed for the assignment of status labels. [2]

1.0 Not only is the comparative and historical analysis of New Guinea Highland languages in its infancy but these languages have characteristics which make such analysis particularly difficult. The present discussion is primarily concerned with the Eastern Family but many of the points which will be made are true throughout the Highland area. With reference to the Eastern Family at least four factors need to be given careful consideration: (1) The polymorphemic shape of linguistic forms, (2) Extensive and complex morphophonemic systems, (3) Interpretation and distribution of contoid clusters, and (4) Borrowing. The extent and nature of the influences of these four factors cannot be specified until the comparative studies anticipated here have been completed. However, it is important that one should be prepared for confusions on several levels as the result of these factors so that if possible one might avoid travelling too far up blind alleys created by combinations of them. The brief general description of the nature of the problems which arise even at an early stage of analysis is intended as a warning not an answer.

1.1 In the beginning stages of the search for sets of sound correspondences one hopes to find a nucleus of monomorphemic forms upon which to base initial hypotheses. Such a nucleus is almost impossible to find in Highland languages. Polymorphemic forms are the rule rather than the exception. In Usarufa for example monomorphemic words do not occur in isolation so that at least two morphemes must be taken into account. Some categories of words which are especially fruitful in their yield of cognates, for example kinship terms and body parts, are in most of the languages of the Eastern Family always polymorphemic. Heavy verbal inflection in all of the languages not only makes it difficult to establish equivalent sets of forms but almost excludes this class of words from the search for monomorphemic forms. One may however still be rewarded with a form in a given language

which synchronically seems to be monomorphemic. But such rewards are hard come by and often prove to be polymorphemic on the diachronic level. Therefore the necessity of familiarity with the morphemic structure of each language can hardly be over stressed. The accuracy of the reconstructions which are postulated will be increased in proportion to one's familiarity with the morphemic structures involved. The author's familiarity with the structure of Usarufa has proven of great value and one could wish for a similar competency in each of the other languages.

1.2 The Highland languages are characterized by systems of morphophonemic change which tend to mask the true nature of historical change and which make the recognition of cognates difficult. A thorough study of the morphophonemics of each language should be undertaken as part of the comparative and historical analysis of each family of languages. Materials for such a study are not yet available for the Eastern Family but information on the morphophonemics of some of the languages has been gleaned from various papers and has proven helpful.[3] Although no information of a direct nature has been available for Tairora, Binumarien or Agarabe comparative studies show that there is evidence of some similar active or fossilized morphophonemic processes to that which has been recorded for the other languages of the family. Morphophonemic information from Fore of the East Central Family seems to indicate that a remarkably similar system of change is operative there. It looks as though it may be possible to reconstruct a proto-morphophonemic system and that this will provide insight into the development of the phonemic and morphemic systems of Highland languages. A summary of the information in hand about the various morphophonemic systems follows.

All of the languages for which morphophonemic information is available have a system of morphophonemic classification which includes all or most of the morphemes of the language and other co-systems of morphophonemic change which are restricted to particular morphemes or morpheme classes. The former seems to be an inherited system while the latter seem to be developments within individual languages. Although there are differences in the extent of the circumstances for application of the more pervasive type, depending upon the particular language, the similarities are striking. The general principle of the system is that the phonemic shape of a given morpheme is determined by the morphophonemic class of the morpheme which precedes it. Usarufa, Awa and Auyana as well as Fore have three such morphophonemic classes and Gadsup has five. Cognate morphemes within the Eastern Family belong to corresponding morphophonemic classes.[4] The regularity of this class correspondence is very significant and may provide evidence for determining whether two forms are cognate or not. It also may give some clues as to the analysis of polymorphemic forms. The

specific nature of the changes which occur may be seen on the following chart. The information from Fore has been included for comparison even though it does not directly pertain to this present study. Morpheme initial phonemes which appear along the horizontal axis are changed when preceded by morphemes belonging to the morphophonemic classes indicated along the vertical axis as specified by the cells formed by the intersection of the two axes.

Class		p	t	k	b/w	d/r	y	m	n	Vowel (v)
V	Ga.	p	t	k	b	d	y	m/n	n	V + v
	Us.	[b]	t	[g]	w/[g]	r	y	m	n	V + v
	Au.	p	s	g	gw	k	y/t	m	n	w/y + v
	Aw.	[b]	[r]	[g]		-	y	w	n	V + v
	Fo.	b	[r]	g	w	-	y	m	n	(V + v)/V
N	Ga.	mp	nt	nk	mb	nd	ny	m	n	n + v
	Us.	qp	qt	qk	qk	qk	qt	m:	n:	n + v
	Au.	mp	nt	nk	nkw	nk	nt	mb	nd	n + v
	Aw.	p	t	nk		-	ns	m	n	n + v
	Fo.	p:	t	k·	nkw	-	nt	mp	nt	nk + v
Q	Ga.	qp	qt	qk	qb	qd	qy	qm	qn	k/q + v
	Us.	qp	qt	qk	qw/qk	qk	qy	qm/q	qn	r + v
	Au.	p	t	k	kw	k	t	qm	qn	r + v
	Aw.	p	t	k		-	s	qm	qn	[r] + v
	Fo.	p	t:	k·	qw	-	qy	qm	qn	q + v
Y	Ga.	t	t	t	y	y	y	n	n	y + v
D	Ga.	nt	nt	nt	nd	nd	nd	n	n	d + v

A blank cell indicates that the information concerning that particular sequence is lacking. A dash (-) indicates that the language in question does not have that particular phoneme. In some cases as indicated by phonetic brackets allophones are given. The chart is to be read as follows: following a morpheme of class N (second row

division) the phoneme **p** becomes **mp** in Gadsup and Auyana; **qp** in Usarufa; **p** in Awa and **p**: in Fore. It should be stressed that these are synchronic changes active within each language but which are diachronically corresponding. Tairora and Binumarien have regular correspondences to some of these sequences but evidence thus far seems to indicate that these may be fossilized forms and not synchronically productive. Nevertheless it is important to recognize these correspondences. The sequence **N + m** regularly corresponds in Tairora to **b** and in Binumarien to **m**.[5] The sequences **V/N/Q** + vowel **(v)** correspond as follows:

	Tairora	*Binumarien*
V + v	**r + v**	**r + v**
N + v	**r + v**	**n + v**
Q + v	**q + v**	**k + v**

It is important to realize the implications of these morphophonemic processes. Each polymorphemic form whether a compound of more than one stem or a stem plus inflectional affixes will reflect both morphophonemic and historical change. The specification of the relationship between the two is a task that the comparative linguist in New Guinea can hardly avoid.

1.3 In the phonemicization of the languages of the Eastern Family prenasalization, preglottalization and consonant length have been interpreted either as clusters of consonant phonemes or as single complex unit phonemes depending on the language and the analyst.[6] For comparative work, however, it is important to consider these sequences as units corresponding as units to other units. These need not be single phoneme units but may, if desired, be considered higher level units and treated on the phoneme level as clusters. The result of further historical study may furnish clues as to which synchronic interpretation is more likely but it need not necessarily dictate the choice of interpretation for any given language.

Complex sequences as indicated above occur only between vowels in all of the languages of the Eastern Family except Tairora. They also are often clearly the result of morphophonemic processes. (See chart section **1.2**.) However this restriction in the distribution and occurrence of sequences of contoids is parallel to the complementary distribution of allophones of single phonemes in some languages and to restrictions on non-complex phonemes in others. Rather than being a determinant for choice of interpretation these restrictions tend to emphasize the necessity of keeping initial and non-initial correspondence sets separate.

1.4 The seven languages considered here are spoken by populations

living in an area approximately one hundred miles long and fifty miles
wide. Such geographic proximity promotes multi-lingualism and lin-
guistic borrowing. The evidences of the former are legion and although
less easy to recognize the latter has surely played a significant role
in the development of Highland languages. In languages without a
written tradition borrowing is not only difficult to recognize but
often almost impossible to prove. The regularity of the incorporating
processes of the language in question is hard to distinguish from the
processes of historic change. However it is important to be alert to
the evidences and influences of linguistic borrowings when the con-
ditions for such borrowing are so manifestly present.[7]

2.0 The reconstructions which follow are based on an examination and
analysis of one hundred and eighty cognate sets of forms. The SIL
Survey List (Bee and Pence, 1962) was used as a starting point but
lists of more than one thousand forms were examined for each of the
languages except Binumarien and Agarabe where only the SIL list was
available. The least complicated and most transparent sets of cognates
have been chosen for presentation here. To keep the influences of the
various factors described in section 1 to a minimum complex sequences
of contoids have been avoided as much as possible and the least mor-
phemically complex forms have been chosen. Only two verbal forms have
been included. Except for the indication of morphophonemic class (**N**,
V, or **Q**) which has been reconstructed in the cases where there is
fairly clear evidence to do so, no attempt has been made to recon-
struct anything more than stem morphemes. Where morphophonemic class
has been reconstructed the reflexes in the various languages are mor-
phemes (active or fossilized) not phonemes as such.

These reconstructions are only tentative and are intended to serve
as stepping stones to more precise analyses. Vowel reflexes and re-
flexes of complex contoid sequences in particular need more detailed
study and may alter some of the present reconstructions. The comments
following each reconstruction usually indicate specific problem areas.

No attempt has been made to standardize the orthographies for the
different languages. The orthography used for each language is that
used by the linguist who prepared the lexical list from which the
forms have been taken. In some cases these lists were made after pre-
liminary phonemic analysis and are only partly phonemic. The follow-
ing summary of orthographic devices which have been used may prove
helpful:

:	*Bi.* length
.	*Ga.* and *Au.* length
'	stress

´	high tone
`	low tone
^	falling tone
q	glottal stop
ë	*Ta.* mid central vowel; *Aw.* front low vowel
ä	*Aw.* mid central vowel

In addition from individual languages are the following representations of phonemes:

GADSUP

t/s	the t phoneme	a	the ä phoneme
w/b	the w/b phoneme	a.	the a phoneme
r/d	the r/d phoneme		

USARUFA

p-/-b-	the p phoneme	-k-	the qk complex
k-/-g-	the k phoneme	mm	the m: complex
-p-	the qp complex	nn	the n: complex

AWA

p-/-b-	the p phoneme
t-/-r-	the t phoneme
k-/-g-	the k phoneme

AGARABE

h	the h/q phoneme
a	the ä phoneme
aa	the a phoneme

In the reconstructions hyphens (-) indicate morpheme boundaries and a plus preceding a reconstructed form indicates that the prefix which is postulated has become fossilized in those languages which retain an overt reflex of it.

2.1   **RECONSTRUCTIONS**

1. armpit   *apë-N   Ta.   'akë
                                                Ga.   àppè.mì
                                                Us.   áábêmma
                                                Au.   á.'bémbà
                                                Aw.   äbé

   Comment: The reflexes of *N should be noted. *Ga.*, *Us.*, *Au.* and
   Aw. regularly show **mi, mma, mba** and loss respectively. The loss
   in *Ta.* while not uncommon is but one of several reflexes of *N.

2. arrow   *paro-V/kwe-   Ta.   'bebë
                                                Bi.   pè᷄pà
                                                Ga.   pàkò.nì
                                                Ag.   úwé
                                                Us.   paromá
                                                Au.   pà'ròimá
                                                Aw.   póriä

   Comment: Since each language has a number of specialized terms for
   arrow types it is difficult to be sure that equivalent terms have
   been chosen. *Ga.*, *Us.*, *Au.*, and *Aw.* seem likely to be cognate
   terms although the *Aw.* vowel reflexes are unusual. The *Ta.*, *Bi.*,
   and *Ag.* terms are likely cognate and seem to reflect some kind of
   reduplication.

3. bag   *una-N   Ta.   u'të
                                                Bi.   uqa
                                                Ga.   ù'ná.mì
                                                Ag.   unaan
                                                Us.   unáámma
                                                Au.   ù'ná.m'bá

   Comment: The *Ta.* and *Bi.* forms though probably cognate are ir-
   regular. Although *Ta.* **t** and *Bi.* **q** regularly correspond they are
   not the usual reflexes of *n. It is possible that *Ta.* **të** and *Bi.*
   qa are reflexes of *N but these would normally be reflexes of
   *Q.

4. banana   *qe-Q   Ta.   'qetë
                                                Bi.   è᷄qa
                                                Ga.   è.qí
                                                Ag.   áán
                                                Us.   eqá
                                                Au.   te'qá
                                                Aw.   peraré

Comment: This is the only example of initial *q therefore it is a rather uncertain reconstruction. However the set of correspondences does not match any other initial consonant.

5. bean   *ko-para-N

Ta.	'kohe
Bi.	o⁝pa⁝pana
Ga.	ko.qí
Ag.	mataah
Us.	koqá/kobárámmá
Au.	kòqá
Aw.	tobárá

Comment: The *Bi.*, *Aw.* and *Us.* forms seem to indicate a polymorphemic stem complex. The *Us.* forms mean the root of the native bean and the bean itself respectively. Whether such a distinction is made in the other languages is not clear. This is a case of *k being reflected in *Ta.* as k rather than t and may indicate a later borrowing.

6. belly   *-mu-Q

Ta.	'auhe
Bi.	amuaqa
Ga.	ámùqi
Ag.	amùh
Us.	amûqa
Au.	'ámùqà
Aw.	àmbiuq

Comment: The initial vowel may be attributed to a third person possessive prefix. This set of nasal correspondences is unique.

7. blood   *nade-V

Ta.	'nare
Bi.	pìqdíká
Ga.	na'rei/korà'mi
Ag.	nááré
Us.	naaemá
Au.	nàe'má
Aw.	kóraq/onu

Comment: Loss of medial *d in *Us.* and *Au.* is unique. The *Aw.* forms do not appear to be cognate to the forms from the other languages except the alternate *Ga.* form. The *Bi.* form seems unrelated.

8. breast   *nä-N

Ta.	'namë
Bi.	na⁝m⁝á
Ga.	ná.mì
Ag.	naan
Us.	náámma

Au.	'nà.mbà
Aw.	nä

Comment: *Ta.* reflex of *N unusual.

9. brother (older)   *-kwä-

Ta.	bèkarë
Bi.	apasa:pa
Ga.	tènti wai
Ag.	awahe
Us.	awaaóma
Au.	àwà'ómá
Aw.	awäwá

Comment: All of the languages reflect polymorphemic forms but the stems bë-, -pa-, -wa-, -wa-, -waa-, -wa- and -wä- respectively are obviously cognate. Regular.

10. brother (younger) *pa-Q

Ta.	'qëtë
Bi.	
Ga.	'páqi
Us.	abáqa
Au.	ábá'komà
Aw.	ábákawa

Comment: Polymorphemic forms but stems reflect regular correspondences.

11. cloud   *kona-N

Ta.	to'nëbu/uro'murë
Bi.	o:námú
Ga.	ko'nami/àyòni
Ag.	áyón
Us.	konnámmá/kunnomimá
Au.	ài'námbá
Aw.	saboná/irabúyá

Comment: *Ta.* **bu**, *Bi.* **mu**, *Ga.* **mi** and *Us.* **mma** are regular correspondences of *N. Initial *k are t, loss, k and k in these languages respectively.

12. come   *ye-

Ta.	'aniro
Ga.	yé.nò
Us.	(y)iyo
Au.	tiyò
Aw.	sire

Comment: The *Ta.* form is probably not cognate to the others. (y) in the *Us.* form indicates that it is lost in this particular form of the verb and retained in others. The difference in the vowels reflects morphophonemic change.

13. daughter   *-dämu-N

Ta. ra'burë
Ga. dàmúmmì
Us. ayáámûmma
Au. á'yámùko
Aw. ayäungáwa

Comment: This is the only example of this set of correspondences
for the reconstruction of *d. Also the loss of *-m- in *Aw.* is
unique. The initial vowels in *Us.*, *Au.*, and *Aw.* are 3rd person
possessive prefixes. As in most kin terms the final syllables of
the various forms represent formatives of one kind or another.

14. dog   *iya-N

Ta. 'bairi
Bi. paini
Ga. ìyámì
Ag. iyan
Us. iyámmá
Au. i'yámbá
Aw. iya

Comment: The *Ta.* and *Bi.* forms are obviously cognates as opposed to
the forms from the other languages. However since dogs are late
introductions into these cultures the history of these forms is
likely to be other than direct inheritance.

15. ear   *ä-Q-ra-N

Ta. a'to
Bi. ᷄áágó?
Ga. à.kàmì
Ag. aahtarén
Us. ááraramma/ááqa
Au. 'á.qà
Aw. äre

Comment: A polymorphemic form has been reconstructed here to ac-
count for seeming irregularities in correspondences. The two
terms in *Us.* provided the clue to this explanation. The first of
the two terms refers to the external ear and means literally
'ear-fruit'. The second of the two terms refers to the inner
ear, the understanding or mind.

16. ground   *bara-V

Ta. 'batë
Bi. maqa
Ga. màkà
Ag. wárá
Us. maramá
Au. màrà'má
Aw. marakó

Comment: This set of reflexes for *r needs still to be justified.

17. grease (fat) *watawe-N

Ta. 'bëhëberë/ka'ntebu
Bi. paqdame:na
Ga. bàsàpémi/ano.ni
Ag. anu
Us. matawémma/ainómma
Au. masawémbe
Aw. maiyawe

Comment: This is one of the few good sets of correspondences for *t.

18. father *-po-V

Ta. 'qo
Bi. aksipa
Ga. apo
Ag. apohé
Us. aboáma
Au. abo'wamá
Aw. abowá

Comment: The k of the Bi. form is probably a reflex of *p but the rest of the form is not easy to account for. However a comparison with the form for mother seems to justify a polymorphemic breakdown of the forms.

19. fence *kuru-V

Ta. tu'tukë/tu'bikë
Ga. kukuni
Us. kurumá
Au. kurimá/kusa'má
Aw. wíra

Comment: The two terms in both Ta. and Au. seem to indicate that these are polymorphemic but the correspondences are still quite good.

20. fire *ida-V

Ta. i'hë
Bi. iqda
Ga. ikai
Ag. írá
Us. iramá
Au. ira'má
Aw. ira

Comment: Reflexes of V in Ga., Us., and Au. are i, ma and ma respectively. Elsewhere there is loss.

21. flying fox *kämpä-N

Ta. 'kankarë
Bi. ka:ka:na
Us. kaapaammá

Au.	ka.mpa.mba
Aw.	täpä

Comment: This is one of the few clusters postulated for the proto form and needs much more confirmation.

22.	fruit	*+ra-N	*Ta.*	tëbë
			Ga.	akami
			Us.	arammá
			Au.	arambá
			Aw.	ara/sera

Comment: The initial vowel on all of the forms but *Ta.* may be fossilized third person prefixes which are now restricted to body parts and kin terms. *Ta.* forms regularly lose these prefixes.

23.	ginger	*kwi-N	*Ga.*	bími
			Us.	wímma
			Au.	kwímba
			Aw.	ki

Comment: This is the only occurrence of k in *Aw.* as a reflex of *kw.

24.	grandfather	*-näpu-V	*Ta.*	'naqurë
			Us.	anáábúómá
			Aw.	anäbuwá

Comment: Stem correspondences are regular.

25.	grandmother	*-rärao-V	*Ta.*	ta'torë
			Ga.	-kaka
			Us.	arááráómá
			Au.	-rarao
			Aw.	àrärawá

Comment: The *Aw.* -wa is a separate morpheme and probably not a reflex of *o.

26.	hand	*-yä-u-	*Ta.*	'kauqu
			Bi.	asáúku
			Ga.	aya.mi
			Ag.	ayaan
			Us.	ayáámma
			Au.	áyáamba
			Aw.	ayän

Comment: The *Ta.* and *Bi.* forms seem to indicate that there has been a change from an N class to a Q class. This may be accounted for

by the presence of **u** in these forms which has no corresponding reflex in the other languages and may be representative of some proto morpheme.

27. he   *kwe/bi-

         Ta.   'bibë
         Bi.   mipa
         Ga.   bèni
         Ag.   wehi
         Us.   wemá
         Au.   kwe'má
         Aw.   wega

Comment: *Ta.* and *Bi.* forms go back to *bi while the other languages have forms going back to *kwe. Other pronoun forms seem to indicate that both forms may have been inherited. Evidence from other related language families will prove valuable here.

28. head   *-qno-N/pia-

         Ta.   qi'etë
         Bi.   akiaqa
         Ga.   aqnomi
         Ag.   ahnon
         Us.   aqnómma
         Au.   aqnómbá
         Aw.   ayeqnó

Comment: The *Aw.* form seems to suggest a polymorphemic shape other than the usual for body and may explain the *Ta.* and *Bi.* forms which do not seem to be cognate with the *Ga.*, *Ag.*, *Us.*, or *Au.*

29. house   *nä-N/më-Q

         Ta.   'nabu
         Bi.   maaqa
         Ga.   máqi
         Ag.   maah
         Us.   naammá
         Au.   na.m'bá
         Aw.   nä

Comment: That two different stems are represented here is suggested by *Ta.* **maqa** 'home place'; *Us.* **mááqa** 'home or place' and *Ga.* **i'na.mi** 'sleeping house for men and women'.

30. husband   *-kwë-

         Ta.   'bati
         Ga.   wapui
         Us.   awaiqá
         Au.   awai'ko
         Aw.   wë

Comment: There may be some significance to the i in all of the forms but *Aw.*, but what it is is not clear from present evidence.

31. knee   ***-rau-N**

Ta.	'tori
Bi.	aqo:ri
Ga.	àkò.nì/àkūqì
Ag.	árón
Us.	araayummá
Au.	àràum'ba
Aw.	arau

Comment: The class correspondence is imperfect and may indicate some morphemic process not accounted for by this reconstruction.

32. liver   ***-ru-N**

Ta.	'tubu
Bi.	an:a:ma
Ga.	ákúqì
Ag.	amaapón
Us.	árumma
Aw.	aru

Comment: The *Bi.* and *Ag.* forms seem not to be cognate with the other forms. The *Ga.* reflex of *N is not the normal one and needs to be further investigated.

33. louse   ***nu-N**

Ta.	nu'më
Bi.	árú
Ga.	númì
Ag.	nun
Us.	nûmma
Au.	nùm'bá
Aw.	nu

Comment: The *Bi.* form is probably not cognate. The *Ta.* reflex of *N is the same as in the form for breast.

34. man   ***kwe-(t)-V**

Ta.	bainti
Bi.	paiqi
Ga.	bàntà
Ag.	wáántá
Us.	waamá
Au.	kwài'má
Aw.	wë

Comment: A form in *Us.* **wáátigoma** 'man or person' seems to suggest that there may be a need to reconstruct some sort of *t phoneme, here indicated in parentheses. It may have been a complex sequence. This set of correspondences should be compared with

those for 'husband'.   The difference between bound and free in some of the languages should be noted.

35. meat   *+ma-(t)-Q   Ta.   mëti
                                                  Bi.   amaqi
                                                  Ga.   àmàqi
                                                  Ag.   ámáti
                                                  Us.   amaqá
                                                  Au.   àmàqá

  Comment: The initial a of all the forms except the Ta. may represent a fossilized possessive prefix. It is not clear whether the final syllable of each form represents reflexes of *Q or whether t should be reconstructed.

36. mother   *-no-V   Ta.   'no
                                                  Bi.   ansiɸa
                                                  Ga.   ènà noi
                                                  Ag.   anohé
                                                  Us.   anóama
                                                  Au.   á'nówama
                                                  Aw.   anówa

  Comment: See the comment for 'father' for an explanation of the Bi. form.

37. name   *-wi-Q   Ta.   'autu
                                                  Bi.   auqu
                                                  Ga.   àbìqì
                                                  Ag.   awih
                                                  Us.   awîqa
                                                  Au.   á'wíqa
                                                  Aw.   awiq

  Comment: It is not clear whether the Ta. and Bi. forms are cognate with the other forms or not but it seems rather doubtful.

38. nose   *-hi-Q   Ta.   'aiqi
                                                  Bi.   aiki
                                                  Ga.   àsìqi
                                                  Ag.   átíh
                                                  Us.   aiqá
                                                  Au.   aiqá
                                                  Aw.   abiyä

  Comment: This is the only example of this set of correspondences reflecting *h and needs confirmation.

39. one   *boda   *Ta.*   bo'haiqa
                                             Bi.   mò:qdá:′
                                             Ga.   màna
                                             Ag.   manaa
                                             Us.   mθrama
                                             Au.   mò'rámà
                                             Aw.   morá

Comment: The *Ga.* and *Ag.* forms are probably not cognate with the forms from the other languages.

40. penis   *-poi-   *Ta.*   'ake
                                             Ga.   àpè
                                             Us.   abema
                                             Au.   apoiko
                                             Aw.   pegara

Comment: This set of correspondences should be compared with the set for 'armpit'. The retension in *Ta.* of the reflexes of the initial **a** prefix is unusual.

41. pig   *poe-V   *Ta.*   'querë
                                             Bi.   kúára
                                             Ga.   póni
                                             Ag.   pon
                                             Us.   pomá
                                             Au.   póima
                                             Aw.   poéräq

Comment: The *Aw.* form may be polymorphemic although it is also possible that the -**räq** is a reflex of *V.

42. rain   *ä-Q   *Ta.*   'aqu
                                             Bi.   à:kù
                                             Ga.   àqi
                                             Ag.   ááh
                                             Us.   aaqá
                                             Au.   à.qá
                                             Aw.   ibo

Comment: Compare with 'ear'.

43. road (path)   *ä-N   *Ta.*   'arë
                                             Bi.   à:nà
                                             Ga.   à.ni
                                             Ag.   páríparih
                                             Us.   aammá
                                             Au.   aambá
                                             Aw.   ä

Comment: Compare the reflexes of **N** here and the reflexes of **Q** in the set of correspondences for 'rain'.

44. root   *+ru-Q/+nu-Q

Ta.	'tuqë
Bi.	atùkà
Ga.	ákùqí/ánùqì
Ag.	arúh
Us.	ánûqa
Au.	á'núqà
Aw.	ánúq

Comment: Compare with 'liver'. *Ga.* has forms reflecting both of the reconstructed forms while *Ta.*, *Bi.*, and *Ag.* reflect only *-ru-Q and *Us.*, *Au.*, and *Aw.*, reflect only *-nu-Q.

45. say   *te-

Ta.	'tiro
Bi.	qiqdano
Ga.	sequ
Ag.	temíh
Us.	tiyo
Au.	siyo
Aw.	irarúwo

Comment: All forms are polymorphemic but the stems in all but *Aw.* are clearly cognate. Compare these forms with the forms for 'come'.

46. seed (planting)   *+yu-N

Ta.	'kubu (seedling)
Bi.	àsùmú
Ga.	àyùmi
Ag.	áyún
Us.	ayummá
Au.	àràmba/aumá
Aw.	äyu

Comment: Neither of the *Au.* forms are cognate with the others. *Ta.* reflects the regular loss of initial vowel of possessive prefix. Although retained in the other languages it is not now productive with this stem.

47. shoulder   *-pu-N

Ta.	'ubu/kururu
Bi.	akumu
Ga.	ápùmi
Ag.	apun
Us.	ábûmma
Au.	àyóimá
Aw.	ako

Comment: An initial **g** would be expected for the *Ta.* form. The *Au.* and *Aw.* forms seem to be neither cognate with one another nor with the forms from the other languages.

48. smoke   *(u)mu-N

Ta.	'murë
Bi.	muna
Ga.	íkkùni
Ag.	íhkún
Us.	úmúmma
Au.	ú'múmba
Aw.	aúne

Comment: There is not enough evidence to determine whether the *Ta.* and *Bi.* forms reflect a loss of initial *u, or whether the *Us.* and *Au.* forms reflect an addition. The *Ga.* and *Ag.* forms may be compounds with the words for 'fire'. The *Aw.* form is probably not cognate.

49. sugar cane   *yà-Q

Ta.	'kaqë
Bi.	sààká
Ga.	yà.qí
Ag.	yááh
Us.	yaaqá
Au.	tà.qá
Aw.	säq

Comment: Perfectly regular.

50. tail   *+be-

Ta.	'bekë/rë'tirë
Bi.	aratira
Ga.	ámèni/amendimi
Ag.	amé
Us.	améráamma
Au.	à'méra.mba
Aw.	ëwegárá

Comment: Most of the forms in this set appear to be more complex than the form reconstructed. However there is insufficient evidence for the reconstruction of a more complex form and some type of compounding may be in evidence.

51. taro   *ya-N

Ta.	'kërë
Bi.	sàná
Ga.	yàmi
Ag.	umánti
Us.	yammà
Au.	mai'yámbà
Aw.	ango

Comment: Compare with 'sugar cane'. The *Au.* form looks as though it might be a compound cognate with both the *Ag.* form and the forms reflected in *Ta.*, *Bi.*, *Ga.*, and *Us.* of **ya-N**.

52.	ten	*tiyänkë-	*Ta.*	
			Bi.	qisaukuara
			Ga.	tìyánkani
			Ag.	tiyaamikán
			Us.	tiyáákae
			Au.	sì'ánkai
			Aw.	neangú

Comment: These are polymorphemic forms meaning roughly 'my two hands'.

53.	that	*bi-	*Ta.*	bihë
			Bi.	muquna
			Ga.	mini
			Ag.	ma
			Us.	minnáma
			Au.	mi.ndámà
			Aw.	miná

Comment: The *Bi.* and *Ag.* forms are probably not cognate with the others.

54.	thigh	*-ru-Q	*Ta.*	'abundërë
			Ga.	àkùqì
			Us.	árûqa
			Au.	árúqa
			Aw.	arù

Comment: Compare with 'liver' and 'root'. The *Ta.* if cognate with the other forms is an unusual correspondence.

55.	this	*ma-	*Ta.*	'mana
			Bi.	maana
			Ga.	màna
			Ag.	mi
			Us.	maannáma
			Au.	mà.ndáma
			Aw.	mäna

Comment: Compare with 'that'. The *Ag.* forms seem to be reversed.

56.	tongue	*-mäpi-V	*Ta.*	maq'iri
			Bi.	ámá:kĭrí

	Ga.	ànàpini
	Ag.	amaapín
	Us.	amáábîma
	Au.	àmá.bí
	Aw.	anëbi

Comment: The n reflex of *m in both Ga. and Aw. is unusual.

57. tree   *yë-V

	Ta.	kë'tëri
	Bi.	sàqárí
	Ga.	yà.ni
	Ag.	yáá
	Us.	yaamá
	Au.	tài'má
	Aw.	wangá/të

Comment: Compare with 'sugar cane' and 'taro'. The Ta. and Bi. forms may indicate that a more complex form should be reconstructed.

58. water   *no-N

	Ta.	në'mëri/në'mëi
	Bi.	namari
	Ga.	nò.mi
	Ag.	nón
	Us.	noəmá
	Au.	nòmbá
	Aw.	nò/waní

Comment: The Aw. form waní may tie in with the Ta. and Bi. forms.

59. wife   *-nä-Q

	Ta.	'natë
	Ga.	tenti nàqi
	Us.	ánáaqa
	Au.	àwài'nínkó
	Aw.	anäkawa

Comment: Compare with 'breast' and 'house'.

60. wind   *uwë-V (ukwë)

	Ta.	u'bai
	Bi.	úpáí
	Ga.	tìsòbá.nì
	Ag.	uwaa
	Us.	uwááma
	Au.	ùndámà
	Aw.	soiriq

Comment: Both of the suggested reconstructions seem to be equally possible. The Au. form which would be expected to provide the deciding evidence is an unusual correspondence.

2.2 The reflexes of each of the phonemes reconstructed in the preceding section are given below. The most common reflex for a given language is listed first followed by other reflexes either regular or unique. If a given reflex occurs only once or twice it is followed by a number in parentheses which indicates the number of the form in section **2.1** which contains the correspondence set in which that particular reflex occurs. If no number appears after a given reflex it indicates that the reflex is fairly common and examples may be found by checking the Index of Reconstructed Phonemes at the end of this section. A diagonal line between two symbols indicates two orthographic representations of the same phoneme. Initial only reflexes are marked by a hyphen following the symbol; a symbol between two hyphens indicates a reflex limited to medial position; and reflexes which are not limited as to position of occurrence are unmarked.

*p   *Ta.*   **q**; **-k-** (1 and 40); loss (47)
       Bi.   **k**; **-p-** (5)
       Ga.   **p**; **-pp-** (1)
       Ag.   **p**
       Us. & Aw.   **p-/-b-**
       Au.   **p-/-b-**; **-p-** (40)

*t   *Ta.*   **t-**; **-h-** (17); **-nt-** (34); **-t-** (35)
       Bi.   **q-**; **-qd-** (17)
       Ga.   **t/s**; **-q-** (35); **-nt-** (34)
       Ag.   **t**; **-nt-** (34); **-t-** (35)
       Us.   **t**
       Au.   **s**
       Aw.   **-y-** (17)

*k   *Ta.*   **t-** (11 and 19); **k-** (5 and 21)
       Bi.   loss (5 and 11); **k-** (21)
       Ga., Us., Au.   **k**
       Aw.   **t**

*r   *Ta.*   **t**; **-b-** (54)
       Bi.   **q**; **-t-** (44); **-p-** (5)
       Ga.   **k**
       Ag.   **r**; **-ht-** (15)
       Us., Au., Aw.   **r**

*d   *Ta.*   **-h-**; **r** (7 and 13)
       Bi.   **-qd-**
       Ga.   **d-** (13); **-k-** (20); **-r-** (7)
       Ag.   **r**
       Us., Au., Aw.   **r**; **-y-** (13); loss (7)

*b *Ta.* b
  Bi., Ga., Us., Au. m
  Ag. w- (16); -m- (50)
  Aw. m-; -w- (50)

*w *Ta.* b
  Bi. p- (17); -p- (60); -m- (17)
  Ga. b- (17); -b- (37); -p- (17)
  Ag. -w- (37 and 60)
  Us., Au., Aw. m- (18); -w- (37, 60, and 17)

*kw *Ta.* b
  Bi. p (2 and 60); p (9 and 34)
  Ga. b/w
  Ag., Us. w
  Au. kw-; -w-
  Aw. w; k- (23

*m *Ta.* m-; -b- (13); loss (6)
  Bi., Ag., Us., Au. m
  Ga. m; -n- (56)
  Aw. m- (55); -mb- (6); -m- (56); loss (13)

*n *Ta., Bi., Ga., Ag., Au., Aw.* n
  Us. n; -nn- (11)

*y *Ta.* k
  Bi. s
  Ga., Ag., Us. y
  Au. t-; -y-
  Aw. s-; -y-; t- (57)

*q (4) *Ta.* q
  Bi., Ga., Us. loss
  Au. t
  Aw. p

*h (38) *Ta., Bi., Us., Au.* loss
  Ga. s
  Ag. t
  Aw. b

Note: a number in parentheses immediately following the reconstructed phonemes indicates that there is only that one occurrence of that particular phoneme.

*mp (21)   *Ta.*   nk
            Bi.   k
            Us., Aw.   p
            Au.   mp

*nk (52)   *Bi., Ag., Us.*   k
            Ag., Au.   nk

*qn (28)   *Ga., Us., Au., Aw.*   qn
            Ag.   hn

*ä   *Ta.*   a; ë (9)
        Bi.   a:/aa; a (9)
        Ga.   a; a.; ai (9)
        Ag.   aa; a (9)
        Au.   a./aa; a (9 and 25); ai (59)
        Aw.   ä

*a   *Ta.*   ë; a; ai (39)
        Bi.   a; ai (5 and 39)
        Ga.   a; a. (3); ai (20)
        Ag.   a; aa (3 and 7)
        Us.   a; aa (3 and 7)
        Au.   a
        Aw.   a; a. (3); o (2)

*ë   *Ta.*   ai (34 and 60); a (30); ë (57)
        Bi.   ai (34 and 60); aa (29); a (57); ua (52)
        Ag.   aa; a (52)
        Ga.   a; a. (52)
        Us.   aa; ai (30); ae (52)
        Au.   ai
        Aw.   ë

*e   *Ta., Us., Au., Aw.*   e; i (12 and 45)
        Bi.   e:; i (12 and 45)
        Ga.   e; e. (2, 4, and 12); ei (7)
        Aw.   e

*i   *Ta., Bi., Ga., Ag., Us., Au., Aw.*   i

*u   *Ta., Bi.*   u
        Ga., Ag., Us., Aw.   u; loss (26)
        Au.   u; i (19); loss (26)

*o   *Ta., Ga., Ag., Us.*   o

```
        Bi.   o; loss (18 and 36)
        Au.   o; oi (2)
        Aw.   o; ia (2)
```

*ao (25)   Ta.   o
           Ga., Aw.   a
           Us., Au.   ao

*au (31)   Ta., Bi., Ga., Ag.   o
           Us.   aayu
           Aw.   au

*oi (40)   Ta., Ga., Us., Aw.   e
           Au.   oi

*oe (41)   Ta., Bi.   ua
           Ga., Ag., Us.   o
           Au.   oi
           Aw.   oe

*ia (28)   Ta.   ie
           Bi.   ia

*N   Ta.   bu; rë; më (8 and 33); bë (22)
     Bi.   mu; na; m:a (8 and 33)
     Ga.   mi; mmi (13); ni (31, 43, 48); qi (31 and 32)
     Ag.   n
     Us.   mma
     Au.   mba
     Aw.   loss

The *Ta.* and *Bi.* reflexes of *N in numbers 3, 5, 15 and 31
are not clear.

*v   Ta.   loss; rë; ri (56 and 57); kë (19)
     Bi.   loss; rq; ri (56 and 57)
     Ga.   ni; loss; i (7 and 20)
     Ag.   loss; n (41 and 56)
     Us.   ma
     Au.   ma; loss (56)
     Aw.   loss

*Q   Ta.   t + vowel; q + vowel
     Bi.   q + vowel; k + vowel
     Ga.   qi
     Ag.   h; ti (35)
     Us., Au.   qa
     Aw.   q, loss (54)

Index of Reconstructed Phonemes

(Giving the forms in section 2.1 in which each occurs)

3.0 In the preceding section phonemes were viewed as separate from their respective systems and were compared as historically corresponding. This section will attempt to present the phonemes of each language as they relate to their particular systems and to compare them as parallel points of related systems viewed as wholes. The allophonic and distinctive feature structure of each phoneme will be presented.

The information concerning phonemic contrasts and allophonic variation is drawn directly from the analyses of colleagues who have been studying the various languages for periods ranging up to five years.[8] In some cases the analyses are more tentative than others but have been accepted as the best analyses at present available. A phonemic statement was not available at the time of this study so no systemization of the phonemes of Binumarien will be presented.

On the basis of the available phonemicizations a distinctive feature analysis has been made of each system. To facilitate this analysis a slight change has been made in the phonemicization of [ŋ] in Gadsup, Auyana and Awa. On the basis of shared features [ŋ] in each of these languages has been assigned to /m/ rather than /n/ since no change need be made in the complementary distribution statement except the **m** to **n** substitution. Also to simplify the distinctive features analysis the complex contoid sequences have throughout been omitted from consideration. They are in effect treated as clusters of phonemes, but this is not intended as an endorsement of that particular interpretation.

3.1 In order to compare the relevant features of each system more readily they have been arranged in table form. The four categories indicated are: consonants, vowels, complex contoid sequences and distinctive features. Phonemic differences of note are the following: the lack of a **y** phoneme in *Ta.*; the labio-velar and fricative series in *Au.*; the r̃ versus **d/r** contrast in *Ag.*, the lack of **d/r** phoneme in *Aw.* and its seven vowel system; and the *Us.* five vowel system. Difference of distinctive features are: *Au.* & *Ta.* Strident-Mellow; *Us.* & *Au.* Sharp/Flat-Plain; *Au.* & *Aw.* Continuous-Discontinuous; and *Ta.*, *Ga.*, *Ag.*, & *Au.* Tense-Lax.[9]

Lg.	*Consonants*				*Vowels*			*Complex Sequences*			*Features*
Ta.	p	t	k	q	i		u	mp	nt	nk	Cons., Voc.,
	b	r			e	ë	o				Comp., Grave,
	m	n				a					Nasal, Tense,
											Strident

Lg.	Consonants	Vowels	Complex Sequences	Features
Ga.	p t k q b/w d/r m n y	i u e ä o a	mp nt nk qp qt qk mb nd qm qn qy	Cons., Voc., Comp., Grave, Nasal, Tense
Ag.	p t k h/q b/w d/r g m n y r̃	i u e ä o a	qp qt qk qb qd qm qn	Cons., Voc., Comp., Grave, Nasal, Tense
Us.	p t k q m n w y r	i u e a o	qp qt qk qw qy qm qn m: n:	Cons., Voc., Comp., Grave, Nasal, Sharp-Flat
Au.	p t k kw q b d g gw ꝑ s m n w y r	i u e ä u a	mp nt nk mb nd qm qn	Cons., Voc., Comp., Grave, Nasal, Tense, Sharp-Flat, Discontinuous
Aw.	p t k q m n w y s	i u e ä o ë a	mp nt nk qp qt qk qm qn nw ns dw	Cons., Voc., Comp., Grave, Nasal, Strident, Discontinuous

3.2 Finally the differences between the allophones, distinctive features and historical sources of the phonemes of each language will be considered. Distinctive features are coded as follows:

A - Consonantal

B - Vocalic

C - Compact
D - Grave
E - Nasal
F - Tense
G - Sharp/Flat
H - Strident
I - Discontinuous

Sub-scripts:

1 - plus
2 - minus
3 - irrelevant

Coded in parentheses immediately following the phoneme symbol are the features which are the same for that particular phoneme in all the languages. Those features which occur only in some but not all of the languages are listed by code in parentheses following the language or languages where they are distinctive. Following the distinctive features are the allophones of the given phoneme in each of the languages. Lastly the proto-phonemes which are reflected by the phoneme in question. Where no indication is given as to the historical source of a given phoneme there is no evidence yet available as to the nature of that source. Since a statement of the Binumarien phonemes is not available there can be only an indication as to the source of a given phone. Because the specifications of the vowel phonemes do not vary as greatly as the consonants only the latter have been included.

/p/ $(A_1 B_2 C_2 D_1 E_2)$

    Ta. $(F_2 H_2)$ [p], $[p^h]$, $[\phi]$

    Bi.   <   *kw; *w; *b; *-p-

    Ga. (F_2) [p], $[\phi]$ <   *p; *-w-

    Ag. (F_2) $[p^h]$, $[\phi]$ <   *p

    Us. (G_2) [p], $[p^h]$, [b], $[\beta]$ <   *p

    Au. $(F_2 G_3 I_1)$ [p]   <   *p

    Aw. $(H_3 I_3)$ [p], [b], $[\beta]$ <   *p; *q; *h

/t/ $(A_1 C_2 D_2 E_2)$

    Ta. $(B_2 F_2 H_2)$ [t]   <   *t; *k-; *r-; *Q

    Bi.   <   *-r-

Ga. (B_2F_2) [t], [ts], [s]   <   *t; *h

Ag. (B_2F_1) [tʰ], [s]   <   *t; *h; *Q

Us. (B_2G_2) [t̬], [t], [s]   <   *t

Au. $(B_2F_2G_2I_1)$ [t]   <   *y-; *q

Aw. $(B_3H_2I_1)$ [t], [d], [r]   <   *k; *y-

/r-d/ (A_1E_2)

Ta. $(B_3C_2D_2F_1H_2)$ [l̆], [ř], [d]   <   *d; *V; *N

Bi.   <   *V

Ga. $(B_3C_2D_2F_1)$ [d], [ř]   <   *d

Ag. $(B_3C_2D_2F_3)$ [l̆], [ř], [t], [ty]   <   *d; *r

Us. $(B_1C_3D_3G_3)$ [l̆], [ř]   <   *d; *r; *Q

Au. $(B_1C_3D_3F_3G_3I_3)$ [l̆], [ř]   <   *d; *r; *Q

/b-w/ $(A_1B_2C_2D_1E_2)$

Ta. (F_1H_2) [b], [β], [w]   <   *b; *kw; *w; *-r-; *N; *-m-

Ga. (F_1) [b], [β], [w]   <   *kw; *w

Ag. (F_1) [p], [β], [w], [w̟]   <   *kw; *-w-; *b-

Us. (G_3) [w]   <   *kw; *-w-; *b

Au. $(F_1G_3I_1)$ [w]   <   *-w-; *b

Aw. (H_2I_2) [w]   <   *kw; *-b-

/k/ $(A_1B_2C_1D_1E_3)$

Ta. (F_2H_2) [k], [k̩]   <   *y; *-p-; *k-; *V

Bi.   <   *p; *k-; *V; *Q

Ga. (F_2) [k], [x]   <   *k; *r; *-d-

Ag. (F_2) [k], [x]

Us. (G_2) [k], [kʰ], [g], [g̬]   <   *k; *kw

Au. $(F_2G_2I_1)$ [k]   <   *k

Aw. (H_2I_3) [k], [g], [g̬]   <   *kw-

/y/ $(A_1B_2D_2E_2)$

Ga. (C_1F_1) [y], [y̨], [dž]   <   *y

Ag. (C_1F_3) [y], [y̨]   <   *y

Us. (C_3G_1) [y], [y]   <   *-d-; *y
Au. $(C_1F_1G_3I_2)$ [y]   <   *-y-; *-d-
Aw. $(C_3H_3I_2)$ [y], [z]   <   *y; *-d-; *-t-

/m/ $(A_1B_2C_3D_1E_1)$

Ta. (F_3H_3) [m]   <   *m-; *N
Bi.   <   *m; *b; *-w-; *N
Ga. (F_3) [m], [ŋ]   <   *m; *b; *N
Ag. (F_3) [m]   <   *m; *-b-
Us. (G_3) [m]   <   *m; *b; *w-
Au. $(F_3G_3I_3)$ [m], [ŋ]   <   *m; *b; *w-
Aw. (H_3I_3) [m], [ŋ]   <   *m; *b-; *w-

/n/ $(A_1B_2C_3D_2E_1)$

Ta. (F_3H_3) [n]   <   *n
Bi.   <   *n; *N
Ga. (F_3) [n]   <   *n; *-m-; *N; *V
Ag. (F_3) [n]   <   *n; *N; *V
Us. (G_3) [n]   <   *n; *N
Au. $(F_3G_3I_3)$ [n]   <   *n; *N
Aw. (H_3I_3) [n]   <   *n; *-m-

/q/ $(A_2B_2C_3D_3E_3)$

Ta. (F_3H_2) [ʔ]   <   *p; *q; *Q
Bi.   <   *t; *n; *r; *Q
Ga. (F_3) [ʔ]   <   *h; *q; *Q
Us. (G_3) [ʔ]   <   *Q
Au. $(F_3G_3I_3)$ [ʔ]   <   *h; *q; *Q
Aw. (H_3I_3) [ʔ]   <   *h; *q; *Q

/b/ $(B_2C_3D_3E_3F_3)$

Ta. (A_3H_1) [h], [s]   <   *t; *d; *h; *y
Ag. (A_2) [h], [ʔ]   <   *Q

/s/ $(A_1B_2C_2E_2)$

Bi.   <   *y

$Au.$ $(D_2F_2G_3'{}_2)$ [s] < *t

$Aw.$ $(D_1H_1'{}_1)$ [ts], [dz] < *y-

/kw/ $Au.$ $(A_1B_2C_1D_1E_2F_2G_1'{}_1)$ [kw] < *kw

/p/ $Bi.$ < *-p-; *kw

$Au.$ $(A_1B_2C_2D_1E_2F_2G_2'{}_2)$ [ɸ] < *p

$Au.$ /gw/ $(A_1B_2C_1D_1E_2F_1G_2'{}_1)$ [gw]

" /g/ $(A_1B_2C_1D_1E_2F_1G_2'{}_2)$ [g]

" /b/ $(A_1B_2C_2D_1E_2F_1G_2'{}_1)$ [b]

" /d/ $(A_1B_2C_2D_2E_2F_1G_2'{}_1)$ [d]

$Ag.$ /g/ $(A_1B_2C_1D_1E_2F_1)$ [g]

" /r̃/ $(A_1B_2C_2D_2E_3F_1)$ [r̃]

NOTES

1. This paper was prepared for a seminar in "Problems in Comparative and Historical Analysis" held at the University of Hawaii, Fall Semester 1964 and conducted by Professor George Grace. The author is indebted to Professor Grace for his encouragement and suggestions. A grant from the East West Center made possible the author's study at the University of Hawaii and sincere appreciation is expressed to the Center.

2. McKaughan in including both lexico- and phonostatistic information makes the evidence from statistics more convincing but other considerations, such as degrees of intelligibility and grammatical comparison are also important.

3. Specifically: Lovings' "A Preliminary Survey of Awa Noun Suffixes"; Marks' "Auyana Nouns"; Frantz's "Grammatical Categories Indicated by Gadsup Noun Affixes" and Nicholson's "Fore Phonemes and Their Interpretation".

4. Whether or not this class correspondence extends outside of the Eastern Family needs to be investigated. Also to be investigated is the correspondence in terms of cognate morphemes of the five Gadsup classes to the three classes of the other languages. This should reveal whether Gadsup has developed two additional classes or if an originally more complex system has been reduced to three in all the other languages.

5. The *Ta.* and *Bi.* reflexes of N which are given in section 2.2 may be explainable in terms of other complex sequences but it is not immediately obvious what the nature of these might be.

6. Vincents for Tairora adopt a unit solution; Lovings for Awa, Marks for Auyana, Luff and Goddard for Agarabe and Frantz for Gadsup have chosen a cluster and Bee in "Usarufa Distinctive Features and Phonemes" suggests that both solutions are equally possible for Usarufa.

7. The recent borrowings from Neo-Melanesian demonstrate correspondence regularity. It may prove interesting to compare these borrowings from Neo-Melanesian with inherited cognate sets to see if there is a parallel in phoneme and morphophonemic correspondences.

8. The specific sources are: "Usarufa Distinctive Features and Phonemes" by Bee; "Gadsup I: Phoneme and Toneme Units" by Frantz;

"Tentative Statement of the Phonemes of Agarabe" by Goddard and Luff;
"Awa Phonemes, Tonemes and Tonally Differentiated Allomorphs" by
Loving; "A Tentative Statement of the Phonemes of Kosena" by Marks;
and "Tairora Phonemic Statement" by Vincent.

9. A unit interpretation of long nasals would introduce the tense-
lax opposition in Usarufa.

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USARUFA DISTINCTIVE FEATURES AND PHONEMES[1]

DARLENE BEE

0. INTRODUCTION

0.1 General. Usarufa, a language spoken by approximately 850 persons in the Eastern Highlands District of the Territory of New Guinea, reflects many of the features which are common to the languages classified by Wurm[2] as the EAST NEW GUINEA HIGHLAND STOCK. It is therefore hoped that a presentation of some of the aspects of Usarufa phonemics and morphophonemics will give insight into problems of analysis faced by those studying other languages in the Stock. The specific contribution which this paper hopes to make is in the area of distinctive features analysis which has heretofore been lacking in the descriptive statements of New Guinea languages.

In an *Oceania Linguistic Monographs: Studies in New Guinea Linguistics*, 1962, problems of interpretation and analysis are discussed in three of the articles.[3] The problems are basically the same in all three articles: (1) interpretation of contoid and vocoid clusters and (2) the decision as to which if any of a series of phonetic variants to unite as single phonemes when a given variant is in identical complementary distribution with more than one other phonetically similar variant. Young in her article, "The Phonemes of Kanite, Kamano, Bena Bena and Gahuku" suggests several interpretational possibilities and selects the one most suitable for her purposes of comparison. R. and R. Nicholson in "Fore Phonemes and Their Interpretation" go more deeply into the problems involved and show the implications of two different interpretations of the Fore system. Bee and Glasgow in "Usarufa Tone and Segmental Phonemes" rely heavily on pattern pressure and phonetic similarity for their conclusions. None of these analyses consider distinctive features and therefore miss some of the clues that such an approach might offer. This paper attempts to present the Usarufa material from a distinctive feature point of view and to show how such an approach does offer analytical clues and yet leave some areas open to non-unique solutions.

The Usarufa-speaking area is located in a pocket surrounded by Kamano, Kanite, Fore and a small segment of Auyana speakers. All of these languages except the Auyana have been classified by Wurm as members of language families distinct from Usarufa. Nevertheless most adult Usarufa speakers speak at least one of the three more distantly related languages and many speak all three. Contrariwise very few Fore, Kamano or Kanite speakers are able to speak Usarufa. Also of

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note is the fact that except for the residents of the village of
Ilafo on whose ground a small group of Auyana speakers have settled,
few Usarufa speakers admit to speaking or understanding Auyana which
is so closely related that the two may be dialects of one language.
The problems of multi-lingualism will not be discussed here but there
may be reflections of such multi-lingualism in the phonological
systems of the speakers involved. Realizing this to be true it is
nevertheless more convenient for purposes of this paper to present the
Usarufa system as though the speakers were mono-lingual. It may be
possible to use this material as a spring board for investigation of
language contact. The influences of the growing knowledge and use of
Neo-Melanesian (Pidgin English) will also have to be taken into such
consideration.

0.2 Definitions. The following terms will be defined with reference
to the Usarufa system:

> *STRESS GROUP* - a phonological unit with one primary stress whose
> placement is determined by the distribution of pitch features
> within the unit.

A stress group may consist of two or more morphemes within a single
word or it may consist of one or more words. Morphemes and words are
defined by morphological criteria which will not be discussed here.
The stress group has been chosen as the unit of primary distribution
for phoneme classes because it presents the least amount of interpre-
tational ambiguity.

> *CONSONANTS* - those phonemes which are consonantal plus, vocalic
> minus and which occur stress group initially and medially.

> *VOWELS* - those phonemes which are vocalic plus, consonantal minus
> and which occur stress group initially, medially and finally.

> *LIQUID* - that phoneme which is both consonantal and vocalic plus
> and which occurs only stress group medially.

> *GLIDE* - that phoneme which is both consonantal and vocalic minus
> and which occurs stress group medially and finally.

The distributional-distinctive feature basis for the distinctions
between phoneme classes in Usarufa may be summarized in chart form as
follows:

PHONEME CLASS	DISTINCTIVE FEATURES DISTRIBUTION IN STRESS GROUP				
	Consonantal	*Vocalic*	*Initial*	*Medial*	*Final*
Consonants	+	-	+	+	-
Vowels	-	+	+	+	+
Liquid	+	+	-	+	-
Glide	-	-	-	+	+

1. PHONEMES

1.1 Phonetic Inventory.
Defined in terms of position within the stress group the following vocalic phones occur:

Stress Group Initial		Stress Group Medial		Stress Group Final	
[i]	[u]	[i]	[u]	[i]	[u]
		[ɪ]		[ɪ]	
[e]	[o]	[e]	[o]	[e]	[o]
[ɛ]	[ʌ]	[ɛ]	[ʌ]		[ʌ]
	[a]		[a]		[a]
		[ɤ]	[ɨ]		

INITIALLY [ɛ] fluctuates with [e] when occurring with high pitch and preceding either an acute and/or checked consonant or the glide [ʔ].

     [énʌimʌ/énʌimʌ] 'yesterday'

     [éʔkùrʌiyè/éʔkùrʌiyè] 'it is dark'

MEDIALLY contiguous to acute phones [i] fluctuates with [ɪ];

     [mininímʌ/mɪnínímʌ] 'that woman'

     [tiíniyè/tiɪ́niyè] 'he will say it'

     [yíniyè/yínɪyè] 'he will come'

[e] and [ɛ] fluctuate under the same conditions as stress group initially;

     [pétórîʔʌ/pétórîʔʌ] 'brimmed hat'

     [kéʔòʔkèʔʌ/kéʔòʔkèʔʌ] 'every kind'

[ʌ] fluctuates with [ɛ] preceding unchecked nasal phones when following [l] or [y];

     [wʌyʌ́m:ʌ/wʌyém:ʌ] 'white'

     [ilʌmʌ́/ilèmʌ́] 'fire'

and [l] occurs only following [i] and following [ʌ] if preceding acute vowel phones or [a].

     [tilùm:ʌ́] 'my liver'

     [ʌlíbùriʔʌ] 'a variety of sweet potato'

     [ʌláátiyò] 'Show him!'

FINALLY [e] fluctuates with [ɪ] following acute phones and [r].

[kàáyʌré/kàáyʌrí] 'two'

[nʌnúnè/nʌnúnì] 'I will eat'

[kóìyè/kóìyì] 'he goes'

[a] in all positions occurs only contiguous to [a].

[nààm:ʌ́] 'house'

[áárʌrʌ̀m:ʌ̀] 'his ear'

Non-vocalic phones occur within the stress group as follows:

Stress Group Initial			Stress Group Medial				Stress Group Final
[p]	[ƚ]	[k]	[ʔp]	[ʔƚ]	[ʔk]	[ʔ]	[ʔ]
[m]	[n]		[b]	[t]	[g̈]		
[w]	[y]		[m]	[n]			
			[m:]	[n:]			
			[ʔm]	[ʔn]			
			[w]	[y]			
			[ʔw]	[ʔy]			

1.2 Interpretation. The interpretation of sequences of non-vocalic phones within the stress group presents the first major problem of analysis. The interpretation which is chosen will affect the phoneme and distinctive feature inventories, the description of syllable structure and the statement of morphophonemic change. The extent and nature of the effect must be considered when making the decision as to which interpretation most adequately handles the data.

Several possibilities of interpretation of sequences of non-vocalic phones might be considered:

(1) *Interpret the sequences of glottal plus consonant as clusters of two diverse phonemes.* This interpretation simplifies (i.e. numerically) both the phoneme and distinctive features inventories. The description of syllable structure with this interpretation remains relatively simple. However a problem of determining syllable boundaries is introduced which also reflects into morpheme segmentation.

(2) *Interpret sequences of glottal plus consonant as single complex phonemes.* This interpretation increases the number of phonemes and the number of distinctive features needed to define them. However, the increase is balanced by an exceedingly simple statement of syllable structure with no problem as to borders.

Also, some aspects of morphophonemic change are more easily stated with this interpretation.

(3) *Interpret long nasals as a cluster of two like phonemes.* With this interpretation consonant clusters would occur which with other interpretations are non-existent and which would be restricted to like nasal phonemes. Syllable structure is more complex with this interpretation and problems of segmentation arise which tend to make this interpretation unappealing.

(4) *Interpret long nasals as single complex phonemes.* This interpretation presents roughly the same advantages and disadvantages as interpretation (2).

(5) *Interpret length as a prosodic feature occurring with nasal phonemes.* This interpretation reduces the phoneme inventory by two and does not introduce the complications of interpretation (3) into the description of syllable structure.

Weighing the advantages and disadvantages of each interpretation and combination of interpretations two solutions have been selected for discussion in this paper. The choice has not been because the two chosen are obviously greatly superior to all other possible combinations of interpretation but because they seem to have about equal simplicity rating and they most adequately satisfy certain intuitive feelings which have been acquired in the course of learning Usarufa as a medium of communication and in preliminary testing of native reaction through literacy experimentation.[4] The two solutions will be referred to as Solution I and II as follows:

Solution I (Cluster Solution). Adopting interpretations (1) and (5) interpret sequences of glottal plus consonant as clusters of two diverse phonemes and length as a prosodic feature of nasal phonemes.

Solution II (Unit Solution). Adopting interpretations (2) and (4) interpret sequences of glottal plus consonant and long nasal phones as single complex phonemes.

The decision as to which of the two solutions is to be preferred will be left to the objective evaluation of the reader.

1.3 Inventory of Phonemes. An Articulatory description of phonemes and charts showing environmental contrasts by use of permutable sets appear in the appendices.

On the basis of complementary distribution which is described in section 1.1 five vowel phonemes, /i/, /e/, /a/, /o/, and /u/, and one liquid /r/ may be established. The assignment of [ɪ] and [ɛ] which occur in fluctuation with [i]-[e] and [e]-[ʌ] respectively, to phonemes /i/ and /e/ respectively has been made on the basis of the limiting factors involved. The phones which are least limited as to

environmental factors for fluctuation have been united. The decision
as to which phones to unite into single phonemes could have been
avoided by use of the concept of neutralization of contrast in the
environments involved.

The analysis of non-vocalic phones with Solution I gives a simple
complementation statement for seven consonant phonemes, /p/, /t/, /k/,
/m/, /n/, /w/, /y/, and a single glide phoneme, /ʔ/.

The analysis of non-vocalic phones in Solution II is not so im-
mediately obvious. The difficulty arises from the fact that initial
stop phones, [p], [t̮], and [k] are in complementary distribution with
both medial [b], [t], [ɡ] and medial [ʔp], [ʔt̮], [ʔk]. Which medial
set, if either, should be united with the initial set? In a previous
analysis it was decided that the initial set and the preglottalized or
checked medial set were phonetically more similar and should therefore
be united as allophones of single phonemes. However, an analysis of
the distinctive features of the Usarufa system reveals that both the
voicing and the friction which were used to determine the degree of
phonetic similarity are non-distinctive to the system. This, there-
fore, leads to a reversal of the previous analysis and would analyze
initial [p], [t̮], [k] and medial [ʔp], [ʔt̮], [ʔk] as separate phonemes,
/p/, /t/, /k/, and /ʔp/, /ʔt/, /ʔk/, with [b], [t] and [ɡ] as allo-
phones of the former. It would, of course, be possible to avoid the
problem entirely by again using the notion of neutralization of con-
trast.[5] In either case sixteen consonant phonemes result. This
doubles the number of oral consonants and triples the nasal conso-
nants. However, it may be noted that the total number of consonants
is still relatively low. The non-vocalic phonemes in the two solu-
tions may be compared as follows:

Solution I					*Solution II*			
p	t	k	?		p	t	k	?
					?p	?t	?k	
m	n				m	n		
					?m	?n		
					m:	n:		
w	y				w	y		
					?w	?y		

2. DISTINCTIVE FEATURES

2.1 Inherent Features. Six inherent features are needed to define
the fourteen phonemes of Solution I and eight to define the twenty-
three of Solution II. The fundamental source features, *CONSONANTAL/*

NON-CONSONANTAL and *VOCALIC/NON-VOCALIC* divide the phonemes into four classes: consonant, vowel, liquid and glide. The *GRAVE/ACUTE* tonal opposition may be considered the primary resonating feature which divides both consonants and vowels into two oppositional classes. The *COMPACT/DIFFUSE* feature which affects only vowels and plain consonants may be considered a secondary resonating feature. The supplementary resonator *NASAL/ORAL* divides consonants into two classes and a secondary tonal feature *SHARP-FLAT/PLAIN* occurs with the oral consonants.

In addition to the foregoing features Solution II introduces a tertiary tonal feature, *TENSE/LAX* with nasal consonants and a secondary consonantal source feature of *CHECKED/NON-CHECKED* with all consonants.

The *SHARP-FLAT* composite opposing *PLAIN* is to be interpreted as follows: grave phonemes participate in the opposition *FLAT/PLAIN* and acute phonemes in the opposition *SHARP/PLAIN*.

The distinctive feature chart which follows shows the distinctive feature components of each phoneme. Symbols are to be interpreted as follows: plus (+) indicates that the feature listed is a component of the phoneme in question; minus (-) indicates that the feature opposed to the one listed is a component of the phoneme in question; and ∅ indicates that the feature listed is irrelevant to the phoneme in question, i.e. nowhere is that feature the only feature to distinguish that phoneme from some other phoneme.

In three cases phonemes which might have been marked ∅ have been marked otherwise. These are: the marking of /t/ and /ʔt/ as compact minus; the marking of /k/ and /ʔk/ as grave plus; and the marking of /a/ as compact plus. The reasons for the markings which were selected will be discussed immediately following the chart.

Distinctive Features

Phoneme	Con.	Voc.	Comp.	Grave	Nasal	Sh-Fl	Check	Tense
i	−	+	−	−	∅	∅	∅	∅
u	−	+	−	+	∅	∅	∅	∅
e	−	+	+	−	∅	∅	∅	∅
o	−	+	+	+	∅	∅	∅	∅
a	−	+	+	±	∅	∅	∅	∅
ʔ	−	−	∅	∅	∅	∅	∅	∅
r	+	+	∅	∅	∅	∅	∅	∅
p	+	−	−	+	−	−	−	∅
t	+	−	−	−	−	−	−	∅

Distinctive Features - continued

Solution II
Only

Phoneme	Con.	Voc.	Comp.	Grave	Nasal	Sh-Fl	Check	Tense
k	+	-	+	+	-	-	-	Ø
w	+	-	Ø	+	-	+	-	Ø
y	+	-	Ø	-	-	+	-	Ø
m	+	-	Ø	+	+	Ø	-	-
n	+	-	Ø	-	+	Ø	-	-
m:	+	-	Ø	+	+	Ø	-	+
n:	+	-	Ø	-	+	Ø	-	+
?m	+	-	Ø	+	+	Ø	+	-
?n	+	-	Ø	-	+	Ø	+	-
?p	+	-	-	+	-	-	+	Ø
?t	+	-	-	-	-	-	+	Ø
?k	+	-	+	+	-	-	+	Ø
?w	+	-	Ø	+	-	+	+	Ø
?y	+	-	Ø	-	-	+	+	Ø

A close examination of the preceding Distinctive Features Chart and of the Definitional Distinctives Chart to follow will reveal that nowhere is compact (3) the only feature which distinguishes /t/, /?t/ or /a/ from any other phoneme nor is grave (4) the only feature to distinguish /k/ or /?k/ from any one other phoneme. Therefore these features would be expected to be marked Ø for these particular phonemes. However since either the compact or the grave feature is needed to distinguish /t/ from /k/ and /?t/ from /?k/ and since the choice of which is more or less arbitrary both have been marked as components of both phonemes. In the case of /a/ compact has been marked plus because of the ± marking of the grave feature. This may raise some theoretical problems and two alternate statements of the distinctive feature components of /a/ may be given:

1. /a/ may be considered compact (+), and grave (+), in which case /e/ and /o/ would be marked compact (±) and /i/ and /u/ compact (-).

   In terms of the allophonic variants of the phonemes involved it seems unrealistic to consider /a/, the phonetic value of which is usually [ʌ], as more compact than /e/ which sometimes has the phonetic value of [ɛ].

2. The sharp-flat/plain opposition may be extended to the vowels as

a flat/plain opposition. The vowels would then be defined as follows:

	Con.	Voc.	Comp.	Grave	Flat
i	−	+	−	−	−
u	−	+	−	+	+
e	−	+	+	−	−
o	−	+	+	+	+
a	−	+	∅	+	−

This solution would eliminate the necessity for any complex middle term but does not as accurately reflect the phonetic facts since rounding is often hardly noticeable with the Usarufa /o/ and /u/.

The solution chosen, therefore, seems to best represent the phonetic actualizations of the phoneme and also gives a more elegant description of the system as a whole. The ± is to be read: in opposition to /e/, /a/ is grave (+), in opposition to /o/ it is grave (−).

The Definitional Distinctives Chart, which will follow, shows the feature or features whereby each phoneme is distinct from each other phoneme and is to be read as follows:

/p/ is distinguished from /t/ by feature number 4, i.e. grave/ acute; from /k/ by feature 3, compact/diffuse; from /m/ by feature 5, nasal/oral; from /n/ by combination D, i.e. features 4 and 5, grave/acute and nasal/oral; etc.

The following table summarizes the information on this second chart and compares the relative functional load of each feature with reference to the number of pairs of phonemes it helps to define and the number of pairs in which it is the only feature which distinguishes the two phonemes in question.

Functional Load of Features as to number of pairs of phonemes each defines:

FEATURE	AS ONLY FEATURE		AS REDUNDANT FEATURE	
	Solution I	Solution II	Solution I	Solution II
1 - Consonantal	12	21	48	102
2 - Vocalic	12	21	48	102
3 - Compact	3	4	16	30
4 - Grave	7	11	41	118
5 - Nasal	5	15	10	60
6 - Sharp-Flat	3	6	6	24
7 - Checked	−	7	−	49
8 - Tense	−	2	−	4

Total Pairs define: 91 and 253 (Solutions I and II)
Pairs uniquely defined: 42 and 86

(When more than one feature distinguishes between two phonemes both are here called redundant.)

Definitional Distinctives

```
p                                        Code:

4  t                                     1 - Consonantal/non-consonantal

3  c  k                                  2 - Vocalic/non-vocalic

5  D  5  m                               3 - Compact/diffuse

D  5  D  4  n                            4 - Grave/acute

6  F  6  5  D  w                         5 - Nasal/oral

F  6  F  D  5  4  y                      6 - Sharp-flat/plain

2  2  2  2  2  2  2  r                   7 - Checked/unchecked

1  1  1  1  1  1  1  B  ?                8 - Tense/lax

B4  B  BC B4  B  B4  B  1  2  i          B - 1 and 2

 B  B4 B3  B  B4  B  B4  1  2  4  u      C - 3 and 4

BC B3 B4 B4  B  B4  B  1  2  3  c  e     D - 4 and 5

B3 BC  B  B  B4  B  B4  1  2  C  3  4  o F - 4 and 6

BC BC B4 B4 B4 B4 B4  1  2  C  C  4  4  a
```

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 7  47 37 57 D7 67 F7  2  1 B4  B  BC B3 BC ?p

47  7  C7 D7 57 F7 67  2  1  B B4 B3 BC BC  4 ?t

37 C7  7  57 D7 67 F7  2  1 BC B3 B4  B B4  3  C ?k

57 D7 57  7  47 57 D7  2  1 B4  B B4  B B4  5  D  5 ?m

D7 57 D7 47  7  D  57  2  1  B B4  B B4 B4  D  5  D  4 ?n

67 F7 67 57 D7  7  47  2  1 B4  B B4  B B4  6  F  6  5  D ?w

F7 67 F7 D7 57 47  7   2  1  B B4  B B4 B4  F  6  F  D  5  4 ?y

 5  D  5  8  48  5  D  2  1 B4  B B4  B B4 57 D7 57 87 47 57 D7 m:

 D  5  D  48  8  D  5  2  1  B B4  B B4 B4 D7 57 D7 47 87 D7 57  4 n:
```

A diagrammatic display of the phonemes in terms of the inter-relation of distinctive features shows the functional load of each feature from another angle. On the diagrams which follow each distinctive feature opposition (consonantal/non-consonantal and vocalic/non-vocalic are combined for diagramming purposes into a consonantal/vocalic opposition) is represented by a line which intersects with other distinctive feature lines according to the distributional relationship of one feature to another. Phonemes are represented by dots within the areas defined by the intersecting distinctive feature lines. These dots are connected by lines to form geometric figures which illustrate the systematic arrangement within the system.

The composite diagrams show the entire phonemic system as defined by Solution I and II respectively. The individual diagrams are abstractions from the composite for Solution I and show the relationship of each phoneme participating in a given opposition to each other phoneme participating in that opposition.

Some may find these diagrams little more than geometric doodlings and see little meaning in them. Others, it is hoped, may see the systematic relationships between phonemes and distinctive features more clearly than other methods of presentation allow.
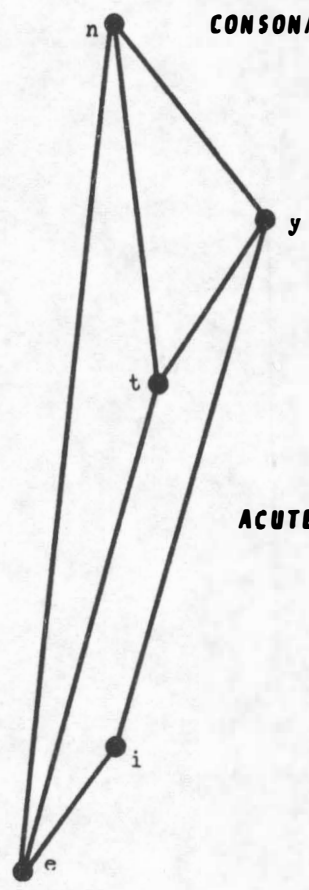
COMPOSITE DIAGRAM FOR SOLUTION I
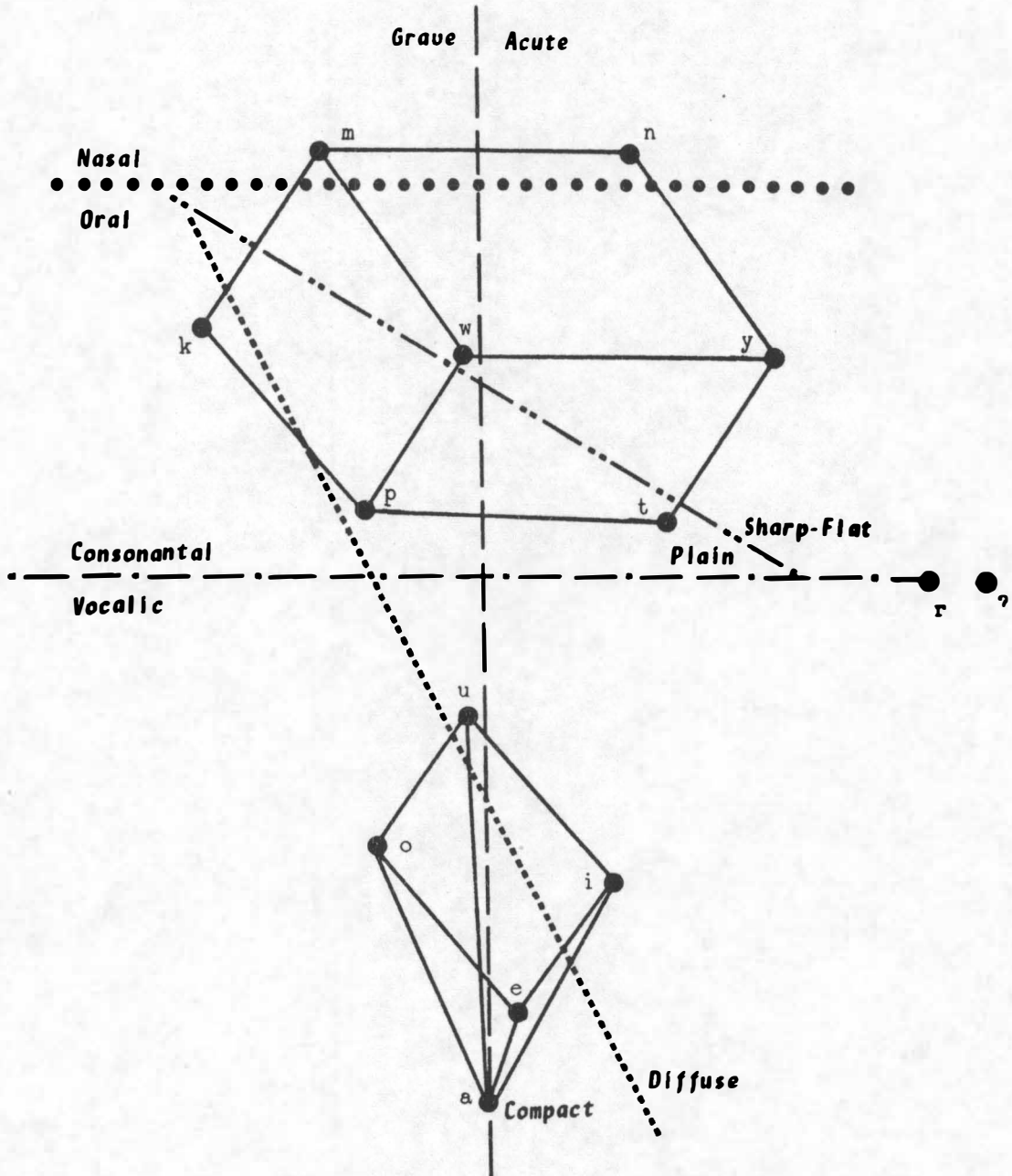
COMPOSITE DIAGRAM FOR SOLUTION II
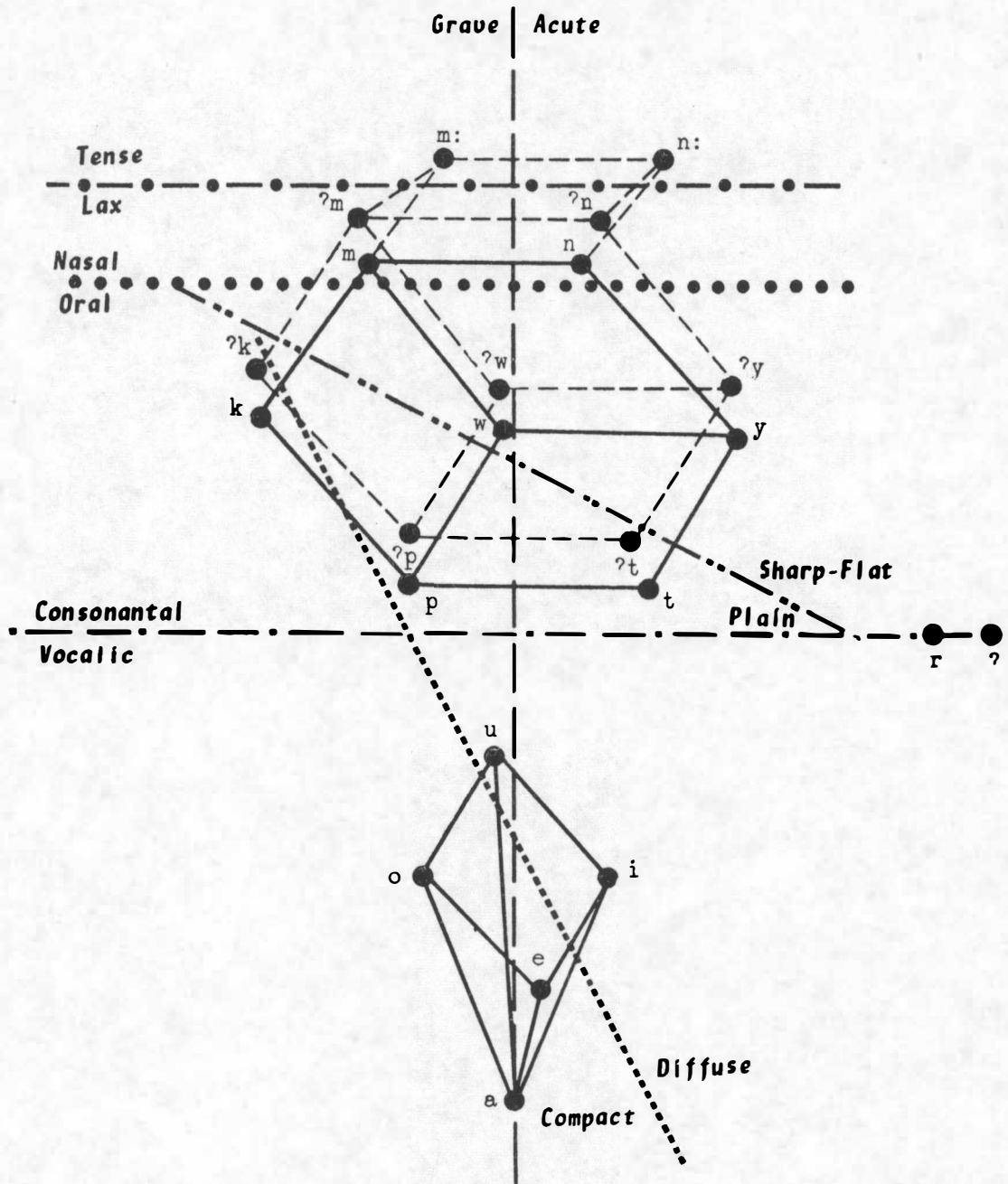
OPPOSITIONAL SUB-CLASSES
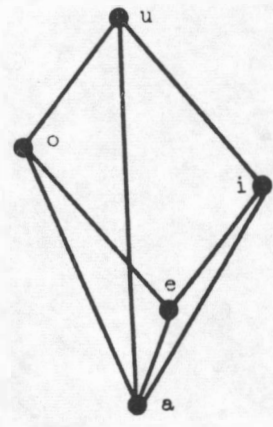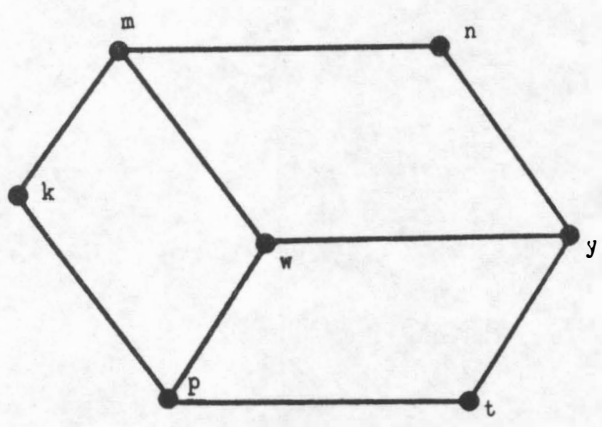
CONSONANTAL

VOCALIC

ACUTE

GRAVE

COMPACT

DIFFUSE

PLAIN
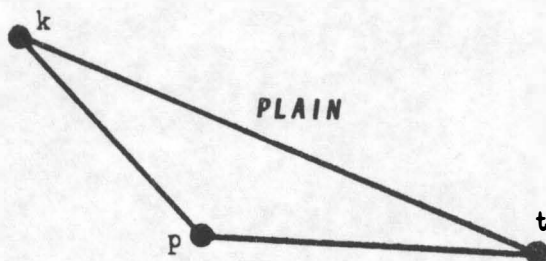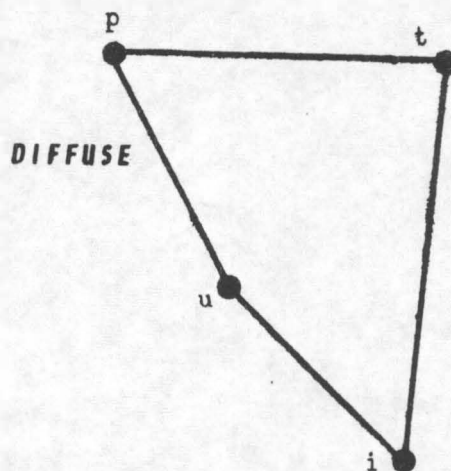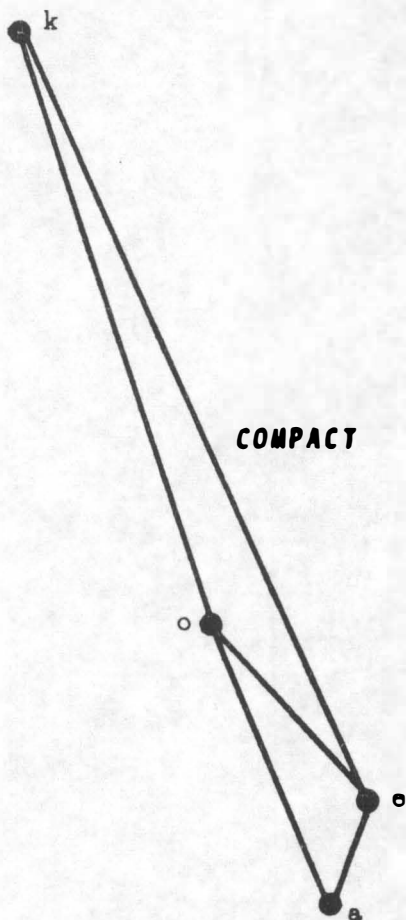
ORAL
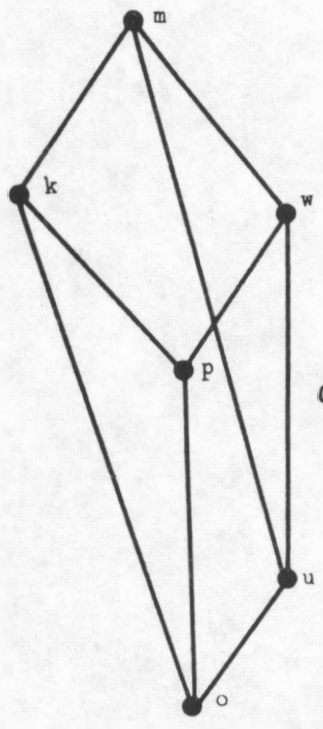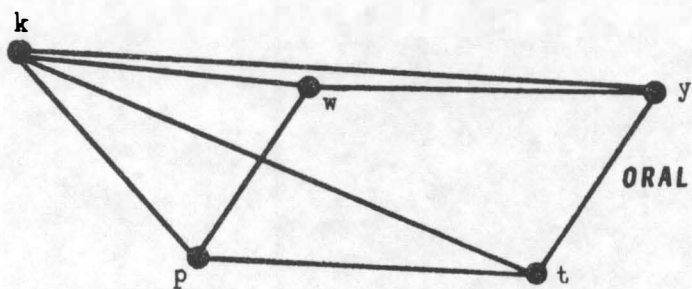
2.2 Prosodic Features. Both solutions require three degrees of pitch or three contrastive tones. Each syllable peak contains one of the three pitch features, high (´), low (unmarked), and falling (ˆ). Stress may be considered a component of the pitch feature being conditioned by tone placement.[6] Each stress group contains no more than one series of syllables with high and/or falling pitch. Therefore a sequence high-low-high is not possible within the system.

Phonemic pitch contrasts may be seen in the following sets of three syllable words:

high-high-low	ápúm:a	'lump'
high-low-low	ápuma	'ripe'
high-falling-low	apûm:a	'shoulder'
high-high-low	waíma	'tree kangaroo'
low-high-low	waíma	'house rat'
low-low-high	waimá	'needle'
low-low-high	iyamá	'water fall'
low-high-high	iyámá	'feces'
high-low-low	úni?a	'a variety of sugar cane'
high-falling-low	únî?a	'cut worm'
high-low-low	káwe?a	'glue'
low-high-high	kawé?á	'cooked food'
high-high-high	káúmá	'door step'
low-low-high	kaum:á	'a type of tree'
high-low-low	páum:a	'section'
low-high-low	kapúma	'bow string'
low-low-high	kapumá	'type of tree'
high-high-low	kóáma	'type of bird'
high-falling-low	poâm:a	'type of bird' (different from above)
high-low-low	táoma	'frog'

With Solution I a prosodic feature of length is added whose distribution is limited to stress group medial nasal phonemes. The most common occurrence of this length is in the second and final syllables of words. Contrasts may be seen in Appendix II.

A non-contrastive lengthening of the vowel of a high pitch penultimate syllable or of a low pitch penultimate syllable preceding a high pitch final syllable is to be distinguished from the feature of length which occurs contrastively with nasal phonemes.

3. DISTRIBUTION OF PHONEMES

Although it is not the purpose of this paper to give a definite statement of the higher level units of Usarufa Phonology, it is nevertheless appropriate to make some statement of the distribution of phonemes within such higher units. Reference has already been made to the distribution of phonemes within the stress group but no mention has been made of the distribution of the phoneme within the syllable which is between the phoneme and the stress group in hierarchical classification. Therefore a few words will be devoted to a consideration of syllable structure and the distribution of phoneme classes within it.

The syllable structure of Solution I may be described in one of two ways:

1. Syllables consist of either an onset plus a peak or of a peak without an onset. The onset may consist of a single non-vowel phoneme or of a glide plus a consonant phoneme. The syllable peak consists of a single vowel phoneme.

2. Syllables consist of: an onset plus a peak; a peak and a coda; an onset, a peak and a coda; or a peak with neither onset nor coda. All non-vowel phonemes may occur as syllable onsets, syllable peaks are single vowel phonemes and the syllable coda is always a glide.

Whichever description is chosen, and the choice may depend on further acoustic examination of the data, the distribution of phoneme classes within the syllable is subject to the following restrictions: consonants may be preceded only by those phonemes which are consonantal minus and must be followed by at least one vowel; a liquid must occur intervocalically; a glide must be preceded by a vowel and may be followed by either a consonant or a vowel; and up to four vowels may occur in sequence.

The syllable structure as defined by Solution II is as follows: a syllable consists of either an onset plus a peak or a peak without an onset; single vowel phonemes occur as syllable peaks and all other phoneme classes occur as onsets. The distribution of phoneme classes within the syllable is subject to the following restrictions: all non-vowel phonemes except unchecked consonants occur only intervocalically; unchecked consonants occur only preceding a vowel and may optionally be preceded by only a vowel phoneme; and up to four vowels may occur in sequence.

4. MORPHOPHONEMICS

The statement of morphophonemic processes which is given here is that which applies equally to all word and morpheme classes. Other

types of morphophonemic change take place within and/or between specific word or morpheme classes but are more appropriately discussed in a morphological rather than a phonological context. Also not included in this discussion is a statement of the morphophonemics of tone or pitch which can only be discussed with reference to specific word classes. A discussion of the morphophonemics of the tone of nominals appears in the 'Usaruʹa Tone and Segmental Phonemes' article which was previously mentioned.

The statement of morphophonemic change will be presented first as viewed from Solution I and then in terms of Solution II. Illustrative examples in section **4.3** apply to both solutions.

4.1 *Solution I.* A cluster solution makes possible the statement of morphophonemic change in terms of phonological classification. All morphemes are classified as to whether they end with a glide (**Q**), a vowel (**V**), or a nasal (**N**). In combination within a word or stress group the (**V**) class remains unchanged; in the (**N**) class before obstruents (**N**) is manifested as /ʔ/, before nasals as length of the nasal, and as /n/ before vowels; in the (**Q**) class (**Q**) is manifested as /ʔ/ except within the same word before vowels in which case it is manifested as /r/. Following morphemes of the (**N**) class /w/ and /y/ are replaced by /k/ and /t/ respectively. Following morphemes of the (**Q**) class within a word /m/ drops out.

A formulization of the foregoing morphophonemic processes is:

V + p > vp	N + p > ʔp	Q + p > ʔp
V + t > vt	N + t > ʔt	Q + t > ʔt
V + k > vk	N + k > ʔk	Q + k > ʔk
V + m > vm	N + m > m:	Q + m > ʔm/ʔ
V + n > vn	N + n > n:	Q + n > ʔn
V + w > vw	N + w > ʔk	Q + w > ʔw
V + y > vy	N + y > ʔt	Q + y > ʔy
V + v > vv	N + v > nv	Q + v > rv/ʔv

(v represents any vowel phoneme)

4.2 *Solution II.* With a unit solution morphophonemic change is best stated in terms of morphological classification. All morphemes are classified into one or another of three classes on the basis of the types of morphophonemic changes which take place when morphemes come together within the same word or stress group. The basic form of a given morpheme is that form which occurs in isolation and/or following within the same word or stress group Class I morphemes. Morpheme initial obstruents are replaced by checked obstruents; initial nasals by tense nasals; initial /w/ and /y/ by /ʔk/ and /ʔt/ respectively and initial vowels are preceded by /n/ when following Class II morphemes within the same word or stress group. Following Class III morphemes

initial consonants are replaced by their checked counterpart with the exception that within the same word /m/ is replaced by /ʔ/; initial vowels are preceded within the same word by /r/ and between words within the same stress group by /ʔ/.

This may be tabulated as follows:

Basic or Form occurring following Class I	Form occurring following Class II	Form occurring following Class III
p	ʔp	ʔp
t	ʔt	ʔt
k	ʔk	ʔk
m	m:	ʔm/ʔ
n	n:	ʔn
w	ʔk	ʔw
y	ʔt	ʔy
v	nv	rv/ʔv

4.3   Illustration *(all examples are written phonemically)*

Nominals (citation forms occur with nominal suffix {-ma})

Nouns

waamá	'man'
waam:á	'possum'
wááʔa	'noise'
yóm:á	'garden'
yóma	'mud'

Descriptives

môrama	'one'
anóm:a	'big'
kaayaʔá	'two'

Descriptive + Noun

môrawama	'one man'
anóʔkama	'a big man'
kaayaʔwámá	'two men'
anóʔtoma	'a lot of mud'
kaayaʔyóm:á	'two gardens'

(The reduction of /aa/ to /a/ is a morphophonemic change unrelated to that discussed here.)

Noun + {-e} 'indicative'

waaé	'It is a man.'
waané	'It is a possum.'
wááre	'It is a noise.'
yóné	'It is a garden.'

      yóe.   'It is mud.'

Noun + {-ko} 'stative' + {-e} 'indicative'

    waakóé   'It is the man.'
    waaʔkóé 'It is the possum.'
    wááʔkóé 'It is noise.'
    yóʔkóé   'It is the garden.'
    yókoe   'It is the mud.'

Noun + {-pa} + {-e} 'indicative location'

    yóʔpáré 'It is in the garden.'
    yópare   'It is in the mud.'

Verbs

Stem: **na-**   'to eat'
Affixes: {ke-} 'present continuative'
          {-u} '1st person singular subject'
          {$\emptyset_1$} '2nd person singular subject'
          {$\emptyset_2$} '3rd person plural subject'
          {-e} 'indicative'
          {-po} 'certitive'

    kénaune   'I am eating.'
    kénaane   'You are eating.'
    kénaae   'They are eating.'

    kénauʔpo 'I definitely am eating.'
    kénaaʔpo 'You definitely are eating.'
    kénaapo   'They definitely are eating.'

(The change from /a/ to /aa/ in the 2nd singular and
3rd plural forms is a morphophonemic change unrelated
to that under consideration.)

APPENDIX I

ARTICULATORY DESCRIPTION OF PHONEMES AND THEIR ALLOPHONES

/p/   A bilabial obstruent.

[p]   A voiceless lightly aspirated bilabial stop which occurs stress group initially (with Solution I: medially following glottal stop).

[ƀ]   A voiced bilabial fricative which occurs intervocalically, stress group medially.

/t/   Alveolar obstruent.

[ṭ]   A voiceless lightly aspirated alveo-dental stop which occurs stress group initially (with Solution I: and medially follow-ing glottal stop).

[s]   A voiceless grooved fricative which occurs only in fluctua-tion with /t/ in a limited number of words. (Mainly in those words which are borrowed or which are cognate with words in languages which have an /s/ phoneme.)

[t]   A voiceless lightly aspirated alveolar stop which occurs only intervocalically stress group medially.

/k/   A velar obstruent.

[k]   A voiceless lightly aspirated velar stop which occurs stress group initially (with Solution I: and medially following glottal stop).

[g̯]   A voiced velar fricative which occurs intervocalically stress group medially.

/m/   A voiced bilabial nasal which occurs in all consonantal positions within the stress group.

/n/   A voiced alveolar nasal which occurs in all consonantal positions within the stress group.

/w/   A voiced high back non-syllabic vocoid with slight bilabial friction which occurs in all consonantal positions within the stress group.

/y/   A voiced high front non-syllabic vocoid with slight palatal friction which occurs in all consonantal positions within the stress group.

/r/	A voiced alveolar flap which occurs only stress group medially between vowels.
[r]	An alveolar flapped vibrant which occurs intervocalically except following /i/ and between /a/ and /i/; /a/ and /e/; and /a/ and /a/.
[l]	An alveolar lateral flap which occurs following /i/ and between /a/ and /i/; /a/ and /e/; and /a/ and /a/.
/ʔ/	A voiceless glottal stop which occurs stress group finally, intervocalically stress group medially (for Solution I: and before consonants stress group medially).

The following consonants are with Solution II only:

/ʔp/	A voiceless preglottalized bilabial stop which occurs intervocalically stress group medially.
/ʔt/	A voiceless preglottalized alveo-dental stop which occurs intervocalically stress group medially.
/ʔk/	A voiceless preglottalized velar stop which occurs intervocalically stress group medially.
/ʔm/	A voiced preglottalized bilabial nasal which occurs intervocalically stress group medially.
/ʔn/	A voiced preglottalized alveolar nasal which occurs intervocalically stress group medially.
/ʔw/	A voiced preglottalized high back non-syllabic vocoid with slight bilabial friction which occurs intervocalically stress group medially.
/ʔy/	A voiced preglottalized high front non-syllabic vocoid with slight palatal friction which occurs intervocalically stress group medially.
/m:/	A long voiced bilabial nasal which occurs intervocalically stress group medially.
/n:/	A long voiced alveolar nasal which occurs intervocalically stress group medially.
/i/	A voiced high front vocoid which occurs in all vocalic positions within the stress group.
[i]	A voiced close high front vocoid.
[ɪ]	A voiced open high front vocoid which occurs in fluctuation with [i] stress group medially contiguous to acute phones,

and with [e] stress group finally following acute phones and [r].

/e/   A voiced mid front vocoid which occurs in all vocalic positions within the stress group.

[e]   A voiced close mid front vocoid.

[ɛ]   A voiced open mid front vocoid which occurs in fluctuation with [e] stress group initially and medially when occurring with high pitch and preceding either an acute and/or checked consonant or the glide /ɪ/ and with [ʌ] stress group medially preceding unchecked nasals when following /r/ or /y/.

/ə/   A voiced central vocoid.

[ʌ]   A voiced mid central vocoid which occurs in all vocalic positions within the stress group.

[a]   A voiced low central vocoid which occurs only contiguous to another /ə/.

/u/   A voiced high back vocoid which occurs in all vocalic positions within the stress group.

/o/   A voiced mid back vocoid which occurs in all vocalic positions within the stress group.

APPENDIX II

ENVIRONMENTAL CONTRASTS

1. *Initial Consonants and Medial Vowels*

píma	'a proper name'	pé?ma	'pour'
tí?a	'my pain'	tero	'say it!'
kíma	'key'	kemá	'I'
wíma	'ginger root'	nere	'I eat'
yíye	'he comes'	wemá	'he'
		yemá	'they'

póma	'pig'	púmá	'knife'
tôma	'saw'	túma	'my body'
komá	'indifference'	kúm:a	'axe'
nom:á	'water'	múmá	'vomit'
yómá	'garden'	nûm:a	'lice'
		yúma	'bottom string of bag'

páá?a	'found'	ká?ma	'cut'
táá?a	'my ear'	ma?má	'put'
káá?a	'dew'	wá?ma	'chase'
máá?a	'ground'	ya?má	'test'
wáá?a	'noise'		
yaa?á	'sugar cane'		

2. *Medial Consonants: Obstruents*

ápûm:a	'shoulder'	opó?a	'a green'
ká?pû?a	'preparation'	ó?poma	'faded'
atú?a	'dead leaves'	tótowaai?a	'an insect'
a?tuma	'a trap'	o?tóma	'jews-harp'
ákúm:a	'lump'	pókoma	'the pig'
á?kû?a	'a smell'	to?kôm:a	'blue'

3. *Medial Consonants: Nasals*

kemá	'I'	amamá	'digit'
kem:á	'me'	yam:á	'taro'
pé?ma	'down'	ka?mam:á	'chuck holes'

enám:a	'a grass'	áname	'leaf'
en:ákómá	'your character'	án:áma	'vine'
ke?náám:á	'still'	a?náma	'wall'

NOTES

1.   This paper was originally submitted as a Master's Thesis at Indiana University, Bloomington, Indiana, U.S.A. and is based on materials collected under the auspices of the Summer Institute of Linguistics.

2.   Wurm, S.A., "The Languages of the Eastern, Western, and Southern Highlands, Territory of Papua and New Guinea" in A. Capell, *Linguistic Survey of the South-Western Pacific* (new and revised edition), South Pacific Commission, Technical Paper No.136. Noumea, New Caledonia, January 1962.

3.   Oceania Linguistic Monographs No.6, *Studies in New Guinea Linguistics* by members of the Summer Institute of Linguistics, New Guinea Branch, published by University of Sydney, Australia, 1962.

4.   The author resided in the Usarufa speaking village of Kaagu (Orona) for a period of approximately twenty-four months at various intervals between September 1958 to May 1962.   During the period of residency in the village of Kaagu virtually all transactions and communication with the members of the village was carried on in Usarufa.   Most of the data for phonemic analysis was gained monolingually and Neo-Melanesian used only to a limited extent for investigation and cross-checking of grammatical categories.   Native reactions to many phonemic conclusions were checked informally with neighbours and friends in the village situation.   A more formal check of native reaction to phonemic analysis as reflected in the orthography based on that analysis was carried out in the summer of 1961 in a pilot literacy class of five adult males of the village.   The results, although by no means conclusive, tend to lend support to a unit solution.   However, it will be worthwhile to attempt a similar literacy experiment based on the cluster solution.

5.   For use in the establishment of a practical orthography this alternative has been selected.   Thus only the medial sets are in contrast, the initial set representing a neutralization of that contrast.   **b, t, g** would be the orthographic representation of the non-checked medial set and **p, ?t, k** the representation of the unchecked set.   The initial set would be represented by **p, t** and **k**.

6.   A more definitive statement of the tone and stress features appears in the previously mentioned Bee, Darlene and Glasgow, Kathleen Barker, "Usarufa Tone and Segmental Phonemes", *Studies in New Guinea Linguistics*.

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