Predictability of Stress in a Polynesian Language: Stress Patterns in Tuamotuan

Hiroshi Kuki

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1.0. Introduction

This study is based upon a corpus of recorded tapes and a subsequent analysis of them during linguistic fieldwork in Papeete, Tahiti, French Polynesia in June-August 1967 with the supervision of Professor Bruce Biggs under the Polynesian Pre-History Program of the Bernice P. Bishop Museum, Honolulu, Hawaii, and also on further study in Laie and Honolulu, Oahu, Hawaii, in 1967-68.

Earlier versions of this paper were read twice before my fellow Polynesian linguists: in May 1968 at the University of Hawaii, Honolulu, Hawaii, U.S.A., and in June 1969 at the University of Auckland, Auckland, New Zealand. I am grateful to the following professors, senior colleagues and fellow Polynesian linguists of mine for their detailed comments on earlier versions of this paper and their subsequent constructive criticisms and valuable ideas during discussions of the problems treated in this paper: Professors B. W. Bender, V. Carroll, S. H. Elbert and G. W. Grace of the University of Hawaii, Professor B. G. Biggs of the University of Auckland, Professor I. Dyen of Yale University, Miss A. Yasuda* and Dr R. Hsu of the University of Hawaii and Mr Yves Lemaitre of O. R. S. T. O. M. of Tahiti.

The analysis of phonology presented here is based primarily upon the speech of three informants: Mr Robert Palmer (a half New Zealander informant from the atoll of Takaroa), Mr Takehu Munanui (a half Chinese informant from the atoll of Hao) and Miss Marguerite White (a half European informant from the atoll of Hikueru).

Tuamotuan is the first language of nearly 10,000 Polynesians living in the Tuamotuan Archipelago and in Tahiti, both in French Polynesia. In 1967, 6,664 Tuamotuans were reportedly living in the Tuamotuan Archipelago and the number of Tuamotuans living in Tahiti, also as of 1967, was estimated at 2,000 to 2,5001).

1) Personal communication dated February 15, 1968, from Mr Jean Gasmann, Administrator of the Tuamotuan Archipelago through Mr Yves Lemaitre, then of Lycée Paul Gauguin and now of O. R. S. T. O. M., both in Papeete, Tahiti. *Now, Frau Doktor Ayako Graefe of Bremen.
From ten to fifteen Tuamotuans are at Laie, Oahu, Hawaii, some 30 miles northwest of Honolulu, Hawaii, either as students at the Church College of Hawaii or as employees at the Polynesian Cultural Center. Both are institutions of the Church of Jesus Christ of the Latter-Day Saints. Some Tuamotuans are married to U.S. citizens and live in the United States as entertainers or as housewives. Half of them are in Honolulu, Kaneohe, and Waimanalo, all on the island of Oahu, Hawaii; and according to Tuamotuans in Tahiti, a few live in California and Miami, Florida. At the Church College of New Zealand, some 80 miles south of Auckland, there are about twenty people from Tahiti, most of whom are, reportedly, Tuamotuans.

The 80 or so atolls, which constitute the Tuamotuan Archipelago, are situated approximately in the middle of the Polynesian Triangle. The geographical location of the Tuamotuan Islands is described by Edwin H. Bryan, Jr., as below:

Tuamotuan Islands (also called the Low Archipelago), are a coral island group in the South Pacific Ocean, politically a part of French Polynesia which is a member of the French Community. Situated between latitudes 14° and 25° S. and longitudes 135° and 149° W., the group comprises 75 atolls, scattered over the 1000-mile arc from Makatea (Society Islands) 140 miles northeast of Tahiti, to Mangareva (Gambier Islands).

Tuamotuan is one of the five Polynesian languages spoken in French Polynesia, the other four languages being Tahitian, Marquesan, Mangarevan and (the language of) Austral (Islands).

"...Tuamotuan...is clearly an east Polynesian language..." says Biggs (1965: 378). All other major scholars in Polynesian and Oceanic linguistics the world over seem to agree on this point as may be seen in Walsh-Biggs (1966 a), Biggs (1967 b), Capell (1962),

2) Personal communication dated March 31, 1968, from Dr Chris Corne of the Department of Romance Languages, University of Auckland, Auckland, New Zealand.


To Tuamotuans of today, their land is /tua + motu/ and the language and the people are /pa'u + motu/.

Middle-aged Tuamotuans who can read and write either have been to Tahiti for schooling or are a product of personal efforts by religious groups such as Bishop Mazé's labors since 1919 on the atoll of Hikueru4).

Education is given all in French by French and Polynesian teachers both in the Tuamotuan Archipelago and in Tahiti. No Tuamotuan nor Tahitian is being taught at schools either in the Tuamotuan Archipelago or in Tahiti in spite of the fact that Tahitian, for example, is still the first and everyday language of practically every person born and raised in Tahiti.

Current Tahitian-Tuamotuan orthographies are based upon the Tahitian Bible and the Tahitian version of THE BOOK OF MORMON. They vary from one mission group to another, especially with regard to their use of diacritics, and, like orthographies for a great majority of the languages of the world today, none of them is phonemic.

No systematic grammar has so far been published for Tuamotuan. There are a few sketchy notes on Tuamotuan such as Audran (1917, 1918, 1919a, 1919b, 1922, 1929, 1930) and Rey-Lescure (1954), but they are all very short, frequently comparative, or else contain partial lexical information. Klieneberger (1957: 131) lists several other similar works published in English, French, and German.

There are hundreds of pages of texts in Tuamotuan compiled earlier in this century. The most voluminous of all are the 262 pages of texts by Caillot (1914, 1932) and 317 pages of texts by Stimson (1933a, 1933b, 1934). It is believed that there are some partial texts elsewhere under the heading of FOLKLORE etc. as in Henry (1928),

especially in old issues of BMB and BSEO.

Tregear (1893-95) is the first and the oldest Tuamotuan lexicon known. The number of entries is small (76 pages) and it is not too informative. For one thing, a long vowel is not so marked. Equally small is White (n. d.), but it is excellent, first of all in that each entry has at least one sample sentence. Long vowels are also correctly marked for the most part.

A voluminous 623 page dictionary of Tuamotuan was published in 1964. Stimson (1964) under discussion, however, has already been reviewed by at least four authorities in Polynesian linguistics, i.e. Biggs (1965), Elbert (1965), Hohepa (1966 a) and White (1965). This paper, too, is in a sense a partial review of Stimson (1964).

2.0. Descriptive Framework

The descriptive framework used here is that of Dr Biggs as presented in Biggs (1961). Carroll (1965 a), Newbrand (1951), and Trager-Smith (1957) have also been consulted occasionally.

The title of this paper “Predictability of Stress” does not imply predictability of stress in generative terms. Rather, the purpose of this paper is to describe stress patterns as they occur in Tuamotuan in the descriptive terms.

Three styles of speech are distinguished in this paper, namely slow deliberate speech, fast deliberate speech and natural speech. Robert Palmer, for example, patiently gave me hundreds of basic words and sentences using the words in the so-called citation form, repeating any word and any sentence three times each. The type of speech of an informant session is defined as deliberate speech. Two different subtypes of deliberate speech were further distinguished. Occasionally, certain ways of articulation were observed only during our informant sessions. An example is / = túga + âné =/ (v. §. 5.1.1.) for ‘the male of two siblings.’ This type of slower deliberate speech, which reveals several crucial points of Tuamotuan phonology most
clearly, is designated as slow (er) deliberate speech. Deliberate speech occasionally approached natural speech, especially after several repetitions of a given word or a sentence. In other words, ways of articulation at times approached or became identical with those of natural speech. The latter type of deliberate speech is referred to as fast (er) deliberate speech in this paper. Natural speech is the type of speech often referred to as fast speech by other linguists. It is better referred to as natural speech, at least to my mind, because it sounds fast only to a non-native speaker. If a language a linguist has worked on for a year or two still sounds fast to him after the informant period, his work may not be too reliable.

Every effort has been made to try to cover all of these different styles of Tuamotuan speech. Although morphophonemics (to be published latter) will cover natural speech, analysis of phonology as presented here is principally based upon deliberate speech. My stress theory presented here is primarily based upon slower deliberate speech. Stress patterns in faster deliberate and natural speech are also discussed.

As is well known among Polynesian linguists today, the descriptive framework under discussion is based upon a high degree of correlation between a phonological phrase and a grammatical phrase.

A phonological phrase is bordered by final and non-final junctures, and is characterized by the presence of phrase stress /\ for which occurs once in every phrase. Tuamotuan utterances are thus divided into shorter stretches of phonological phrases and further into syllables and phones.

3.0. Summary of Phonology

3.1. Inventory of Phonemes

A phoneme is a class of phonetically similar and non-contrastive phones. Usual tests of complementation and contrast yield the follow-
ing phonemes.

3.1.1. Segmental Phonemes

(a) consonants
- stops /p, t, k, ' (glottal stop)/
- fricatives /f, h, v/
- nasals /m, n, g/
- median

(b) vowels

Table 1. Tuamotuan vowel phonemes

<table>
<thead>
<tr>
<th></th>
<th>front unrounded</th>
<th>central unrounded</th>
<th>back rounded</th>
</tr>
</thead>
<tbody>
<tr>
<td>high</td>
<td>/i/</td>
<td></td>
<td>/u/</td>
</tr>
<tr>
<td>mid</td>
<td>/e/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>low</td>
<td></td>
<td>/a/</td>
<td>/o/</td>
</tr>
</tbody>
</table>

Short vowels contrast with identical long vowels. Thus, vowel length is phonemic. Since a number of non-identical vowel pairs occur in Tuamotuan, they are interpreted as pairs of identical vowels and are presented by doubling the vowels in all cases. (v. Pike [1947: 61 a])

The phonetic symbolization used throughout this paper follows Smalley (1964).

3.1.2. Suprasegmental Phonemes

Besides the above-mentioned sixteen segmental phonemes, there are the following five suprasegmental phonemes:

(a) junctural phonemes
- /#/ final juncture
- / // / non-final juncture
- /+ / plus juncture

5) For a definition of a MEDIAN, see Gleason (1955: 52).
/.../ hesitation
(b) other suprasegmental phoneme
/*/ phrase stress

Plus juncture, which is difficult to deal with in the description of any language, and which has an important bearing on my stress theory as presented in this paper, will be discussed in detail in §. 6. 0.

3. 2. Summary of Phonology

Glottal stop is a recent addition to Tuamotuan from Tahitian. It occurs in free variation with /k/ and /g/ (velar nasal) in a number of lexical items shared both by Tahitian and Tuamotuan. It also occurs in a great many Tahitian loans used in contemporary Tuamotuan.

Glottal stop is also frequently used before utterances beginning with a monophthongal vowel6). In the latter case, glottal stop is interpreted as an intrusive along with the other intrusives, i.e. [y], [w], and perhaps /r/.

Phonetically, two types of stress occur; (1) phrase stress and (2) primary stress. Primary stress occurs predictably on a vowel penultimate to any of three junctures, i.e. final, non-final and plus (i.e. /#/; //, +/) and is non-phonemic. (v. §. 5.1.1.)

In fast styles of speech, a vowel immediately before final juncture (i.e. /#/) may be devoiced. (v. §. 5.1.2.2.) Also, certain vowels in vowel clusters may be semi-vocalized. (v. §. 5.1.2.3.) Both devoiced and semi-vocalized vowels do not count in predicting the occurrence of primary stress, and primary stress still occurs on the full vowel penultimate to any of the three junctures. Thus, the fact that primary stress occurs on a vowel penultimate to any juncture is applicable to both slow and fast styles of speech.

Phrase stress is largely predictable, occurring on the last primary

6) By a MONOPHTHONGAL VOWEL is meant a vowel in utterance-initial position not preceded by any intrusives.
Predictability of Stress in a Polynesian Language

stress available within a phonological phrase (v. §. 2.0.). It occasion-
ally occurs at an unexpected place. In the latter case, it has a mean-
ing of CONTRASTIVE EMPHASIS and is thus a phoneme and a
morpheme at the same time, but with relatively low functional load.
(v. §. 5.2.)

No mention of syllable is necessary in connection with stress.
Syllable is discussed in this paragraph, only because it serves as a
convenient reference point for the discussion of phonotactics. Syllabic
structures of Tuamotuan are V, CV, VV, CVV, VVV and CVVV.

A vowel is phonetically heard not only as a short vowel, a long
vowel but also anywhere in between in a well-defined environment,
i.e. \( V_1 \) in \( /(C)V_1(C)V_2(C)V_3 =/p \). This feature is tentatively
designated BLENDING in my Tuamotuan phonology. Primary stress
which occurs on \( V_2 \) is considered to be responsible for the occurrence
of BLENDING over \( V_1 \) in the above-mentioned environment.

In spite of the fact that vowel length is phonemic, a long vowel
is in free variation with a short vowel in a limited number of lexical
items, when such lexical items do not bear phrase stress. This is
clearly a case of neutralization between a short and a long vowel.

It is suspected that the whole language is rapidly changing due
to the strong political, economical and cultural influences of Tahitian.
The day might come when the author of the present paper is the
only speaker of Tuamotuan on the earth.

4.0. Historical Summary of Stress

There have been few, if any, detailed descriptions of stress in
Polynesian languages. A frequent remark is that stress occurs on
the penultimate vowel or syllable but PENULTIMATE TO WHAT
is seldom made clear and we are not always told how the syllable

\[ 7 \) An equal sign (\([=]\)) used here stands for any of the three junctures,
i.e. final, non-final and plus junctures (\(/\#, /\, +/\)).
is to be defined. Nevertheless, there is an element of truth in the
traditional view that stress is penultimate in Polynesian, though
Maori appears to be an exceptional case.

Biggs (1961: 8) regards primary stress in Maori as phonemic and
posits a non-phonemic secondary stress on the long vowel. Phrase
stress, called “contour stress” in Biggs (1961: 8 and 11), is defined
together with non-final junctures as “… phonemes of a different order,
being associated with intonational features and the marking of the
boundaries rather than with lexical or grammatical content.”

Presented in this paper is a major modification of Biggs’ stress
theory for New Zealand Maori, which actually is a result of my year-
long discussions of stress patterns of Tuamotuan with Dr Biggs both
in Tahiti (i.e. during our fieldwork in the summer of 1967) and at
the University of Hawaii (in the academic year 1967–68). Major
points of modification are as follows.

(1) Phonemic stress, which is called PRIMARY STRESS and is a
phoneme in Biggs (1961: 11), can be made predictable by “a proper
segmentation” (v. White [1965: 518]) of certain sequences of seg-
mental phonemes, i.e. by means of plus juncture (i.e. /+/ discussed
in §. 6.0.) as well as final and non-final junctures (v. §. 3.0.). Pho-
meric stress, which is referred to as NON-PHONEMIC PRIMARY
STRESS in this paper, occurs on a penultimate vowel, counting
back from any one of the three junctures mentioned above.

(2) Secondary non-phonemic stress, mentioned in Biggs (1961: 11),
which is stated to occur predictably on any long vowel (i.e. a
sequence of two identical vowels in close transition) is predictable,
NOT BECAUSE it occurs on any long vowel BUT BECAUSE it
is necessary to mark plus juncture (/+/ after any long vowel on
the basis of certain observable phonetic facts as will be examined
in §. 6.0.

(3) The phonemic stress not only in slower deliberate speech but also
in natural speech can be made predictable. Stress placement is
predictable for all styles of speech by one notation and stress theory.

(4) Phrase stress always occurs at a place where primary stress would normally occur. Consequently, phrase stress is considered to occur as superimposed upon primary stress, this being on the last primary stress available within a phonological phrase in a great majority of cases. When phrase stress occasionally occurs at an unexpected place, it has a meaning of 'contrastive emphasis'. It is thus a phoneme, although its functional load is relatively light.

A hypothesis that stress, whether phonemic or non-phonemic, occurs on a penultimate vowel or syllable has been mentioned by many other scholars both verbally and in written form for several other Polynesian languages. Thus this phenomenon appears to be more or less pan-Polynesian, at least to a certain degree just as a hypothesis that stress, whether phonemic or non-phonemic, occurs on the initial syllable of nominals appears to be more or less pan-Germanic8).

Minor differences among different Polynesian languages are naturally expected and my theory as presented in this paper does not claim to be applicable, as it stands, to any other Polynesian languages. The reason is that Tuamotuan is the only Polynesian language I

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8) From what little I know of German and Dutch, for example, it is not conceivable that stress patterns of English apply without modifications to these two other Germanic languages. (Compare the articulation of: the Japanese grammar, die Japanische Grammatik, and de Japanische Grammatica in English, German and Dutch, for example. (In a great majority of cases, primary stress seems to occur on the identical vowel or syllable, but what about secondary, tertiary and weak stresses?) Likewise, it cannot be anticipated that stress patterns in Tuamotuan will apply without modifications to any other Polynesian languages except perhaps Tahitian. From what little I observed of Marquesan by being with Dr Biggs occasionally during his informant sessions, a penultimate vowel before final juncture seems to be twice as prolonged as a single vowel in other positions. This feature is not shared by Tuamotuan, for example.
have worked on so far.

5.0. Stress in Tuamotuan

In the following discussion, and throughout 5.0., three styles of speech are distinguished, namely, slow deliberate speech, fast deliberate speech and natural speech, as defined in §2.0. The placement of stress varies somewhat according to the style of speech, and it has been my aim to account for stress placement in all styles of speech by one notation and stress theory.

Phonetically, two types of stress occur, (1) phrase stress and (2) primary stress.

Phrase stress is largely predictable. When it is not predictable, it has a meaning of 'contrastive emphasis'. Thus it is both a phoneme and a morpheme (/\*/\*). Primary stress is predictable and is not phonemic. Although not normally marked in phonemic writing, primary stress is marked by ['] over phonemic presentation of examples in this section.

5.1. Primary Stress

5.1.1. Primary Stress in Deliberate Speech

In slower deliberate speech, primary stress occurs on the vowel penultimate to any juncture (i.e. final, non-final and plus). (In the following examples, /=/ is not a new phoneme, but simply indicates any juncture and thus stands for any one of /#, /*, //, +/; i.e. final, non-final and plus junctures, respectively.)

The minimum domain of primary stress is two single vowels, identical or non-identical, either or both of which may be preceded by a consonant, (i.e. /=C V =/).

e.g.

9) Phrase stress (/\*/\*) will thus be marked only when it occurs in an unusual position and has a meaning of 'contrastive emphasis'. Otherwise it will be omitted in my phonemic writing of Tuamotuan.
The maximum domain of primary stress is three single vowels, one, two or all of which may be preceded by a consonant, (i.e. / = (C) V (C) V (C) V =/).

e.g.

/ = teí =/ 'this'
/ = igóa =/ 'name'
/ = 'aóre =/ 'no, not'
/ = 'oóna =/ 'he'
/ = piráu =/ 'pus'
/ = tapúu =/ 'private'
/ = roúru =/ 'hair'
/ = taáku =/ 'my (extrinsic possession)'
/ = 'atáma =/ 'Adam'
/ = tagáta =/ 'man'

It follows that in slow deliberate speech, any sequence containing more than three vowels must include more than one primary stress.

e.g.

/ = táa + púu =/ 'cut'
/ = haére + mái =/ 'come'
/ = ráa + káu =/ 'tree'
/ = úa + ína =/ 'alcoholic drink'
/ = ráa + tóu =/ 'they all'
/ = róe + róe =/ 'guts, belly'
/ = máa + úí + úí =/ 'painful'
The presence or absence of a consonant before any vowel does not count in predicting the occurrence of primary stress, as may be clearly seen from the diagrams given already.

Although the above examples occur with the indicated stress pattern in extremely slow deliberate speech, certain facts in Tuamotoan phonetics necessitate some modifying statements.

The second member of a long vowel (i.e. a sequence of identical vowels in close transition to be discussed in §6.0.) is never re-articulated, even in slower deliberate speech. Thus, when either member of a long vowel is stressed, the other member is also stressed. In the examples given already, /='e=/, /=ke=/, /=taa+puu=/, /=raa+kau=/, etc. are very rare and are generally articulated as /='e=/, /=ke=/, /=taa+puu=/, and /=raa+kau=/, respectively. In these examples, non-phonemic primary stress is also usually heard on the second member of each long vowel, due to non-re-articulation of the second member.

In /='oona=/ and /=taaku=/ which were also given already,
primary stress occurs on the second member of each long vowel. In this case, primary stress usually begins on the first member of each long vowel, which is also due to the non-re-articulation of the second member of a long vowel. Thus, the most frequent stress patterns are /='óona=/ instead of /='oóna=/, and /tááku=/ instead of /=taáku=/, respectively, even in deliberate speech.

The only exception occurs when a long vowel occurs immediately before a final juncture, as in /=kée #/'different' and /=káá+kii #/ 'neck', in which case primary stress is not heard over the second member of a long vowel due to the immediately following final juncture (/#/).

To sum up, primary stress occurs on the penultimate vowel of either /=(C) V (C) V=/ or /=(C) V (C) V (C) V=/ which are the two typical domains of Tuamotuan stress, where V is a short single vowel and each V may be preceded by a consonant. Vowels receiving no primary stress are UN-stressed.

The only exception occurs when either member of a long vowel is stressed, in which case the other member also becomes stressed, except when the latter occurs immediately before a final juncture /#/.

Of all the UN-stressed vowels, the one immediately before final juncture /#/ is the weakest.

Syllables (v. §3.2.) of only a single vowel bordered by junctures such as /='i=/ and /='te=/ are never stressed by definition, the minimum domain of primary stress being /=(C) V (C) V=/.

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10) If a stressed single vowel may be defined as one mora long, an utterance-final single vowel may be defined as half a mora long, as in the last /a/ of:
   /tagata #/ 'person' (v. Newbrand (1951: 22))

11) One of the most striking features of Tuamotuan morphophonemics is that mono-vocalic grammatical words (called preposed minor morphemes to be discussed on some other occasion) such as /e/ 'a', /te/ 'the' and almost all verbal particles such as /a/ 'imperative particle', /i/ 'past particle', etc. are often completely dropped in natural speech. The reason is obviously because these grammatical words receive no phonetic stress (i.e. non-phonemic primary stress) due to their mono-vocalic structures.
5.1.2. Primary Stress in Natural Speech

In faster deliberate speech and in natural speech, the following phonetic facts predictably change the stress patterns described in §5.1.1.

(a) Identical vowels across plus juncture (/+/) coalesce into a single long vowel (i.e. a sequence of two identical vowels in close transition), which expands the maximum domain of stress to /=(C) V₁ (C) V₂ V₃ (C) V₄=/ where V₂ and V₃ are identical.

(b) Vowels are occasionally devocalized before final-juncture. Also, certain vowels in vowel clusters are semi-vocalized. These devocalized vowels and semi-vocalized vowels do not count as FULL vowels in predicting the occurrence of primary stress, which still occurs predictably on a FULL vowel penultimate to any of the junctures; i.e. final, non-final and plus junctures.

These devoiced and semi-vocalized vowels which occur only in faster deliberate speech and in natural speech, are allophones of their respective vowel phonemes. Thus, phonemically, they are assigned to their non-devoiced and non-semi-vocalized counterparts, respectively\textsuperscript{12).

The ways these phonetic facts about Tuamotuan faster deliberate speech and natural speech affect the stress patterns described in §5.1.1. will be explained with examples in further detail in the

\textsuperscript{12) Semi-vocalized vowels, such as /i/ of /keiga/ ‘bone’, are more consonantal than the other vowels and sound like part of a following or preceding vowel, thus producing a kind of diphthong like that of English, together with the following or preceding vowel.
following subsections.

5.1.2.1. The Maximum Domain of Primary Stress in Natural Speech

Two adjacent identical vowels in open transition (i.e. with an intervening plus juncture /+/) coalesce into a long single vowel with both members stressed in faster deliberate speech and natural speech.

e.g.

/=hiá (+) átu=/ (from /=hía+átu=/)

'passive marker (grammatical word)' and 'away from the speaker (grammatical word)'

/=hoki (+) ía=/ (from /=hóki+ía=/)

'also (grammatical word)' plus 'reference (grammatical word)'

/=túga+áne=/ 'the male of two siblings', which was given in §.5.1.1., occurs only in slow deliberate speech and never occurs in faster deliberate speech or in natural speech. The articulation in the latter styles of speech is invariably /=tugá (+) áne=/.

As may be seen from the three examples given already, the maximum domain of primary stress in natural speech of Tuamotuan is /= (C) V1 (C) V2 V3 (C) V4 /= where V2 and V3 are identical and where V3 is not preceded by a consonant. In this case, primary stress occurs on both V2 and V3. This expanded maximum domain of primary stress in natural speech may be regarded as a special variation of the maximum domain of primary stress for slow deliberate speech, i.e. /= (C) V (C) V (C) V /=14 15.

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13) Plus juncture in parentheses stands for loss of plus juncture in faster styles of speech.

14) A single vowel bearing phrase stress (/~/) in Marquesan is phonetically twice as long as a single vowel in other positions, although its phonemic interpretation is a short single vowel. This extended maximum domain of Tuamotuan primary stress of /= (C) V1 (C) V2 V3 (C) V4 /=, where V2 and V3 are identical, is in close accordance with the above-mentioned feature of Marquesan phrase stress. Thus, this feature may be regarded as an areal feature covering at least all cases of Marquesan phrase stress and some cases of Tuamotuan primary stress. (Continue to next page)
5.1.2.2. Devoicing of Utterance-Final Vowels

The final vowel may be devoiced before a final juncture and especially after a voiceless consonant.

e.g.

the last /a/ in /tágata#/ ‘man’
the last /i/ in /pákoti#/ ‘scissors’

In this case, the penultimate vowel counting back from the devoiced vowel receives the primary stress, if there is a vowel before the preceding juncture. The ultimate vowel of /máki#/ ‘sick’, for example, is often devoiced but this does not change the stress pattern, the minimum domain of primary stress being /=(C)V(C)V=/.

5.1.2.3. Vowel Reduction in Vowel Clusters

A RISING VOWEL CLUSTER is defined as a vowel cluster in

From what little I have heard and read about Hawaiian, Marquesan, Tahitian and Tuamotuan, I am tempted to agree with Dr. Green’s classification of Eastern Polynesian languages given in Green (1966: 34), which categorizes Marquesan into a Marquesic subgroup of Central Eastern Polynesian Languages and Tuamotuan into a Tahitic subgroup. It is a well-known fact among linguists today that there is an areal feature or two found across language families in many geographical areas of the world.

This tendency toward an occurrence of a long vowel (i.e., a sequence of two identical vowels in close transition) in a stressed position bearing either phrase stress (as in the case of Marquesan) or primary stress (as in the case of Tuamotuan primary stress in natural speech) may be an areal feature covering a still wider area of Polynesia.

15) In natural speech, plus juncture before mono-vocalic forms such as /na/ ‘a little away’ and /ra/ ‘very away’ is invariably lost, with a subsequent change of stress pattern. In this case, a vowel before the lost plus juncture may also be prolonged.

e.g.

(a) /ˈhʌe + rɛe (+) ra/ (from /ˈhʌe/plus/ra/)  
(b) /ˈdʌo + rɛe (+) ra/ (from /ˈdʌo/plus/ra/)

A phonetic break is heard in unexpected places such as (a) between /hʌe/ and /rɛe/ and (b) between /ˈaʊə/ and /rɛe/ in the above examples.

This feature of natural speech, however, properly belong to morphophonemics and will be discussed exhaustively in a forthcoming paper on morphophonemics and morphology-syntax of Tuamotuan together with other morphophonemic features.
which the second member vowel is higher in point of articulation than the first member, such as /ai/.

A FALLING VOWEL CLUSTER is defined as a vowel cluster in which the second member vowel is lower than the first member, such as /ia/\(^{16}\).

Vowel reductions in fast styles of speech of Tuamotuan mainly involve rising vowel clusters. Thus, the second member of a rising vowel cluster is semi-vocalized in a great many cases.

Vowel reduction in fast styles of speech in Tuamotuan may be summarized as follows:

(a) Following the low vowels /a/ and /o/, any vowel is semi-vocalized.

(b) Following the mid vowel /e/, the high vowels /i/ and /u/ are semi-vocalized.

(c) High vowels /i/ and /u/ are semi-vocalized when they PRECEDE each other.

When the high vowels /i/ and /u/ are juxtaposed, as in /iu/ and /ui/, it is the first member that is semi-vocalized.

When the low vowels /a/ and /o/ are juxtaposed, as in /ao/ (phonetically [Áo]) and /oa/ (phonetically [Áa]), it is the second member that is semi-vocalized.

An implication of these statements is that no vowel reductions take place in falling vowel clusters except when the first member of a falling vowel cluster is /u/. Thus, /=pápa+hía=/ ‘liver’, for example, remains /=pápa+hía=/ in fast styles of speech also, and */=páhía=/, for example, does not occur.

Semi-vocalizations of individual vowels are discussed with illustrations in detail below, according to their heights.

\(^{16}\) The reader should note that the terms RISING and FALLING in this usage differ in meaning from the same terms as they are traditionally applied to diphthongs. In fact, RISING vowel clusters are most frequently falling diphthongs when both vowels are not syllabic.
5.1.2.3.1. Semi-vocalization of the High Vowels /i/ and /u/

Like the mid vowel /e/ to be discussed next, the high vowels /i/ and /u/ are semi-vocalized when they occur as second members of rising vowel clusters.

e. g.

/=kéiga=/ (from /=keíga=/) ‘bone’
/=páími=/ (from /=paími=/) ‘if’
/=taátou=/ or more frequently /=táátou=/
(from /=táa+tóu=/) ‘we all (incl.)’
/=raátou=/ or more frequently /=ráátou=/
(from /=ráa+tóu=/) ‘they all’
/=raakau=/ or more frequently /=radkau=/
(from /=raa+káu=/) ‘tree’

/u/ is different from /i/ and /e/ in that it is also semi-vocalized when it occurs as a first member of a falling vowel cluster.

e. g.

/=henua=/ (from /=henua=/) ‘homeland’
/=taáua=/ or more frequently /=tááua=/
(from /=táa+úa=/) ‘we two (incl.)’
/=raáua=/ or more frequently /=rááua=/
(from /=ráa+úa=/) ‘they two’

When /i/ and /u/, which are of the same height, are juxtaposed, it is the first member of each vowel cluster that is semi-vocalized.

e. g.

/=máa+úiúi=/ (from /=máa+úi+úi=/) ‘painful’
/=níuníu=/ (from /=niu+níu=/) ‘wire’

5.1.2.3.2. Semi-vocalization of the Mid Vowel /e/

The mid vowel /e/ is semi-vocalized only when it occurs as a second member of a rising vowel cluster.
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5.1.2.3.3. Semi-vocalization of the Low Vowels /a/ and /o/

The low vowels /a/ and /o/, which are of the same height, are semi-vocalized only when they occur in juxtaposition. Both in /ao/ (phonetically [əʊ]) and /oa/ (phonetically [ɔə]), the second member of each vowel cluster is semi-vocalized.

It is important to note that both /ao/ and /oa/ are phonetically rising vowel clusters.

5.1.2.3.4. Domain of Vowel Reduction

Vowel reduction in vowel clusters may often take place in only one of the vowel clusters available within an utterance.

Occasionally, more than one vowel within a single vowel cluster has been recorded as semi-vocalized.

e. g.

/='aore=/ (from /='aore=/) 'not'
/=páuroa=/ (from /=pau+r6a=/) 'all'

More frequently, vowel reduction takes place in more than one vowel cluster available within an utterance.

e. g.

/=aufoa=/ (from /=áu+f6u=/) 'to pay'
/=pauraa=/ (from /=pau+r6a=/) 'all'

Occasionally, more than one vowel within a single vowel cluster has been recorded as semi-vocalized.

e. g.
This is accountable in the following way.

First, /u/ of /=ua+ina=/ is considered to have been semi-vocalized, producing /=u+a+ina=/. Secondly, /i/ is considered to have been semi-vocalized, producing the final form:

/=u+a+ina=/

Special mention should be made of a non-consonantal characteristic of the glottal stop /*/ in natural speech.

The glottal stop /*/ is not clearly articulated, especially in faster deliberate speech and in natural speech. Its presence in such a case is predicted only by the laryngealization of its neighboring vowels, especially those directly following it. The lack of clear-cut articulation of the intervocalic glottal stop /*/ affects the stress pattern also.

e. g.

/=máitai'/i=/ (from /=mai+tá'i=/) 'good, well'

as in:

/=máei+mái+tá'i+kóe #/

'How are you?'
(Lit. 'Are you well?'

but

/#'ée # méa+máitai'/i #/

'Yes, I am fine.'

e. g.

/=fá'ahouu=/ (from /=fá'a+hóu=/) 'again'

/a'i/ in the above examples is often articulated without a clear-cut articulation of /*/ and approaches /ai/. Since /ai/ is a rising vowel cluster, /i/ in both /=mái+/ and /tá (')i/ is semi-vocalized. Thus the primary stress shifts as far front as /a/ in /=mái+/. In /=fá'a+hóu=/, /a'i/ is also articulated without a distinct articulation of /*/ (glottal stop) and approaches /aa/. As was ex-
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plained in §. 3. 2., a long vowel is occasionally heard as a phonetically short vowel. Thus, a very fast form of /=fá’a+hóu=/ is /=fá(’)/hóu=/.

Vowel reduction obviously takes place for general economy of articulation. From a viewpoint of communication, it seems vowel reduction helps one to convey one's message much faster.

Although the following discussion is basically irrelevant to my stress theory proper, is obviously a good example of mixing levels, and remains an educated guess at best, it seems that a certain kind of structural pressure is also involved in Tuamotuan vowel reductions.

First of all, as was discussed in §. 5. 1. 1., the typical domains of Tuamotuan primary stress are /=C V (C) V=/ and /=C V (C) V=/, where V is a short single vowel and one, two or all V's may be preceded by a consonant. Except for reduplications, many Tuamotuan words\(^{17}\) are either bi-vocalic or tri-vocalic and have only one primary stress. When a word has more than three vowels, strong structural pressure seems to work toward either of the above-mentioned typical domains of primary stress. When there are any vowel clusters available within such a word, vowel reduction seems to take place most readily.

\[ /=fáutá(’)/a=/ \text{ (from } /=fáu+taú’a=/) \]

\text{‘a place name, i.e. a stadium in Pirae, Papeete, Tahiti, French Polynesia’}

As may be seen from previous examples, an important fact about vowel reductions in fast styles of speech in Tuamotuan is that when vowel reductions take place within a word, an intervening plus juncture is frequently cancelled. The higher the frequency of a particular word, the more frequent is the occurrence of a fast form resulting

\(^{17}\) By word I mean the smallest item which will be offered in isolation by an informant.
from vowel reductions discussed in this section.

Not only structural pressure toward the maximum domain of 
\(=/=(C)V(C)\hat{V}(C)V=/\) but also structural pressure toward the shorter domain of primary stress (i.e. 
\(=/=(C)\hat{V}(C)V=/\) seems to work on a tri-vocalic word. Probably for this reason, a phonemically long vowel is heard as a phonetically short vowel in faster styles of speech.

e.g.
\(=/=t\ddot{o}k\ddot{u}=/\) (from 
\(=/=t\ddot{o}k\ddot{u}=/\) 'my (intrinsic possession)'
\(=/=t\ddot{a}p\ddot{u}u=/\) (from 
\(=/=t\ddot{a}+p\ddot{u}u=/\) 'to cut'

In utterance-final position under phrase stress which is heavier and louder than primary stress (v. §. 5. 2.), this phenomenon never occurs.

e.g.
\(=/=t\ddot{o}k\ddot{u}#/\) or more frequently 
\(=/=t\ddot{o}k\ddot{u}#/\) 'my'
\(=/=t\ddot{a}+p\ddot{u}u#/\) or more often 
\(=/=t\ddot{a}+p\ddot{u}u#/\) 'to cut'

Some cases of partial reduplications in Polynesian languages may also be historically accountable in terms of vowel reductions presented in this section. In Tuamotuan, at least, 
\(=/=p\ddot{a}e=/\) 'side', for example, has two different reduplicated forms of 
\(=/=pap\ddot{a}e=/\) and 
\(=/=p\ddot{a}e+p\ddot{a}e=/\). Both of these two forms have the same meaning and choice is completely dependent upon the individual speaker. It is suspected that the shorter form of 
\(=/=pap\ddot{a}e=/\) is a result of a faster form of 
\(=/=p\ddot{a}epa\ddot{e}=/\) further reduced into 
\(=/=pap\ddot{a}e=/\) due to its frequent use.

It is a well-known fact that a few most frequently used verbs in French, Japanese and Russian are the most irregular verbs in these languages. Other similar examples are contractions in English involving auxiliaries which are a class of the most frequently used words in the English language. The same principle seems to be roughly
applicable to the frequency of vowel reductions in Tuamotuan also\textsuperscript{18}).

An important point to remember is that vowel reductions in Tuamotuan are basically a feature of faster styles of speech.

All of the following stress patterns as tested on my informants for final verification (and all of which have been accounted for in the previous sections) are actually used by them and are acceptable to them.

<table>
<thead>
<tr>
<th>Slow Speech</th>
<th>Fast Speech</th>
</tr>
</thead>
<tbody>
<tr>
<td>/=f'ara+oa=/</td>
<td>/=far'aoa=/</td>
</tr>
<tr>
<td>/=m'a+a+ui+ui=/</td>
<td>/=m'a+auiui=/</td>
</tr>
<tr>
<td>/='au+fdu=/</td>
<td>/='aufoa=/</td>
</tr>
<tr>
<td>/='aufou=/</td>
<td>/='aufou=/</td>
</tr>
<tr>
<td>/=pa+roa=/</td>
<td>/=pauroa=/</td>
</tr>
<tr>
<td>/=k'ou+t'ou=/</td>
<td>/=ko'utoa=/</td>
</tr>
<tr>
<td></td>
<td>/=ko'utoa=/</td>
</tr>
</tbody>
</table>

5.2. Phrase Stress (/\'/)  

Phrase stress is heavier and louder than primary stress. The domain of phrase stress is the phonological phrase defined earlier. (v. §. 3. 2.). It occurs once in every phonological phrase.

Phrase stress occurs at a place where primary stress would normally occur including predictably shifted places already discussed in detail in §. 5.1.2. Thus phrase stress is considered to be superimposed on primary stress. It is predictable in a great majority of cases, occurring on the last primary stress available within a given phrase.

e. g.

/\# e+raiti//ta+t\'a+t\'ou+kat\'iga//i+teie+h\'ana \#/

‘Our food today is rice.’

\textsuperscript{18}) This paragraph is meant to be a synchronic statement and not a diachronic one. The author of this paper believes that this paragraph is in no way in conflict with the Young Grammarians’ hypotheses on diachronic linguistics.
Any utterance (i.e. phonological sentence), even one made up of as few as two single vowels, either or both of which may be preceded by a consonant, must contain phrase stress, i.e. /#(C)V(C)V#/.

* e.g. 
  
  /# ăha /

  ‘What is it?’

Phrase stress occasionally occurs at positions other than that described above and in such cases it indicates CONTRASTIVE EMPHASIS of the particular morpheme on which it occurs. Thus, it is a phoneme and at the same time it is a morpheme, meaning ‘contrastive emphasis’.

* e.g. 
  
  /# tagâta+ińu+úa+ïna+rőa+teräke #/

  ‘That person certainly is an ALCOHOLIC DRINK drinker.’

  which contrasts with:

  /# tagâta+ińu+úa+íná+rőa+teräke #/

  or:

  /# tagâta+ińu+úa+íná+rőa//teräke #/

  ‘That person is an alcoholic drink drinker.’

Although it is strictly speaking a phoneme, phrase stress is not marked in my examples given phonemically, except when it has a meaning of CONTRASTIVE EMPHASIS and occurs at an unexpected place. In these cases, phrase stress tends to occur on content words (to be called MAJOR MORPHEMES in my discussions of Tuamotuan morphology-syntax) rather than on functional or relational words (to be called MINOR MORPHEMES). This is consistent with its morphemic role as ‘emphasis’.

Since there can be more than one primary stress in a single phonological phrase, degrees of loudness of different primary stresses within a phrase very slightly. Phrase stress is much heavier and louder than any of the primary stresses. Thus, those primary stresses
closer to the phrase stress are louder than those more removed from it. Since phrase stress generally occurs on the last primary stress available in a phrase, the primary stress occurring closest to the utterance-initial position is generally the weakest.

6.0. Plus Juncture

Plus Juncture (/+/) marks open transition between two segmental phonemes, and is in phonemic contrast with close transition. It occurs at a point of possible pause which may or may not be actualized.

Examples of contrast are:

/tama+i ti/ ‘child’
/mai+ta’i/ ‘good’
/faka+ea/ ‘to breathe’
/kaefa/ ‘husband’
/fare+iti/ ‘toilet (lit. ‘small house’)’
/reira/ ‘aforementioned place’

The phonetic basis for the contrast of close and open transitions between vowels is as follows.

Typically the articulation of a vowel followed by another vowel in close transition is somewhat modified toward the articulation of the following vowel. In /ae/ as in:

/pae/ [pæɛ] ‘five’
/tae/ [tæɛ] ‘to arrive’
/kaefə/ [kʰɛɪɛfə] ‘husband’

for example, /a/ is typically a low front unrounded vowel ([æ]) and is front rather than central as compared, for example, with /a/ ([ʌ] when stressed and [ɔ] when unstressed) of:

/’api/ [Ɂpʰi] ‘page’
/ata/ [Ɂtʰɔ] ‘cloud’
Similarly, the second of two vowels in close transition is usually modified somewhat toward the point of articulation of the preceding vowel. Thus /e/ as in /pa'e/, /tæe/ and /kae'fa/ is typically a lower-mid unrounded vowel ([ɛ]) and is one notch lower and lax, as compared, for example, with /e/ ([e] when stressed and [e'] when unstressed), as in:

/vahine/ [vəhɨnɛ] 'woman'
/gaike/ [ŋi kiθɛ'] 'dog'
/rehu/ [ɾɛhu] 'ashes'
/mea/ [me ə] 'thing'

Vowels in open transition, on the other hand, do not affect each other in this manner, thus making for audible phonetic differences between underlined segments of phonemes, as in:

/tama+i ti/ vs. /mai+ta'i/
/faka+e a/ vs. /kae'fa/
/fare+i ti/ vs. /reɪɾa/

for example.

In the articulation of /faka+ea/ in slower deliberate speech, there is also a perceptible interruption or delay in the manner of transition from /a/ to /e/. According to the tradition of American structural linguistics, this interruption or delay is interpreted as plus juncture, symbolized /+/ in this paper.

Identical vowels in open transition are characterized by re-articulation of the second vowel. Identical vowels in close transition on the other hand, are not separated by any break.

e. g.
/te+haga+ata/ [tʰɛ'ɾ. həŋ. ɾtʰə] 19) 'clouds'

19) In phonetic presentation of some examples in this section, the symbol ['. ] (i.e. a lowered dot) is used to indicate a phonetic break.
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/'aa+pii/  [ʔː . pǐː]  'new'

Certain phonetic co-relations between plus juncture and phonetic stress are observed:

observation (a) Plus juncture occurs after an unstressed vowel which is preceded by a stressed vowel, i.e. in the environment \( \hat{\nu} \langle C \rangle \hat{\nu} \).

observation (b) No sequence of unstressed vowels, i.e. \( \ast \hat{\nu} \langle C \rangle \hat{\nu} \), ever occurs in close transition.

Thus, even when no direct contrasts are available, plus juncture \( /+// \) has been marked in this paper in the following environment:20)

(a) after any unstressed vowel preceded by a stressed vowel with or without an intervening consonant; i.e. \[ \hat{\nu} \langle C \rangle \hat{\nu} \] /+/. Example:

\[ \text{[m̃tʰə]} /+\]/ 'eye'

(b) between any two unstressed vowels, i.e. \( \ast [\hat{\nu} \langle C \rangle \hat{\nu}] \) does not occur in my phonetic transcription of Tuamotuan, only \[ \hat{\nu} \langle C \rangle \hat{\nu} \] /+/. Example:

\[ \text{[m̃tʰə]} /+\] / [tʰə ʔtʰə] /+/'man's eye'

In some styles of speech, a break (symbolized by a lowered dot \[.\]) in the following phonetic presentation) is audible between a vowel and an immediately following consonant, as in:

/pae+pae/  [p̃eː . p̃eː]  'side'

/kara+poga/  [k̃aɾə . p̃oŋə]  'throat'

This break is not perceived as a pause but is characterized by:

(1) a very brief decrescendo of articulatory energy over the preceding vowel.

(2) a slight prolongation of the preceding vowel, and

(3) an increase of energy in the articulation of the following conso-

20) In phonetic presentation of some examples in this section, the symbol ['] is used to indicate phonetic stress and the symbol ['] to indicate phonetic non-stress or weak stress.
The marking of plus juncture as a phoneme between a vowel and a consonant receives phonetic support on the basis of the above-mentioned phonetic characteristics.

The break is not always audible, especially in faster deliberate speech and in natural speech. Furthermore, /pae+pae/ does not contrast with */paepae/, for example. Plus juncture (/+/) is nevertheless marked between the first /pae/ and the second /pae/, partly because the first /pae/ corresponds to environment (a) stated already. This is done because otherwise not only plus juncture, which has been established as a phoneme already, but also phonetic stress (marked by [''] in the above examples for demonstrative convenience) would also have to be marked as a phoneme. (i.e. */' /), (v. §. 5. 1.)

Use of both plus juncture and phonetic stress in phonemic writing of Tuamotuan would be redundant when a contrast in terms of plus juncture is also available, as in:

*/fâre+iti/ ‘toilet’
*/реira/ ‘aforementioned place’

which were also given earlier. Thus it appears reasonable to establish only plus juncture as a phoneme, because phonetic stress can then be made predictable by means of plus juncture already established as a phoneme.

Plus juncture is also marked after any long vowel (i.e. a sequence of two identical vowels in close transition) immediately followed by a consonant on the basis of the following phonetic fact noted in slower deliberate speech.

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21) These phonetic characteristics, especially features (1) and (3) here, are in close accordance with characteristics of plus juncture in Maori as described by Biggs (1961: 12).

22) In slower deliberate speech, however, plus juncture is heard as a phonetic break at all times.
It is an easily observable fact about Tuamotuan faster deliberate speech and natural speech that the second member of a long vowel is never re-articulated and that the first member vowel invariably receives phonetic stress which is carried over to the second member vowel due to the non-rearticulation of the second member.

Given below, however, are typical articulations of long vowels in slower deliberate speech in which the second member of a long vowel is not especially re-articulated and is not stressed. Furthermore, it is lax as compared with the tense first member and is also centralized.

/noo+hea/ \[- 3nī\] 4he1\] 'from where?'
/naa+hea/ \[- 3nā\] 4he1\] 'how?'
/kaa+kii/ \[- 2k\] 3kι\] 'neck'
/kee+roa/ \[- 3k\] r3\] 'really original'
/taa+puu/ \[- 2t\] 3p\] 'to divide'

Thus a long vowel actually corresponds to environment (a) given earlier. For this reason, it seems valid to mark phonemic plus juncture (/+/) after the second member of any long vowel at all times.

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(a) Abbreviations

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(e) Other works
Predictability of Stress in a Polynesian Language


(Received December 10, 1972)

POSTSCRIPT:

Following Biggs (1961) on New Zealand Māorí, a landmark piece of work written within the framework of American structural linguistics in the long history of Polynesian linguistics, Carroll (1965) described Nukuoro, a Polynesian outlier in Micronesia, Kuki (1967, Unpublished Seminar Paper) Tuamotuan phrase structure, Pawley (1966) Samoan, Yasuda (now Frau Doktor A. Graefe of Bremen, West Germany, 1968, Unpublished M. A. thesis), Penrhyn, etc. etc. all of which resulted in Pawley's "Grammatical Reconstruction and Change in Polynesia and Fiji" in Arther Capell Festschrift (1970). This paper, also a landmark piece of work in the long history of Polynesian phonology, ought to shed light on many of the mysteries encountered in proto-Polynesian reconstruction work, long under way by B. G. Biggs, D. S. Walsh and associates including the writer of the present paper as well.

Should the writer's job have been exclusively supervised by University of Hawaii's Dr. B. W. Bender alone, however, this and other works on Tuamotuan phonology would have been written along the lines presented in Chomsky–Halle (1968) or the following:


Note that the writer's intention lies both in synchronic and diachronic linguistics.

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