III: PROTO-MICRONESIAN PROSODY

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1. Introduction

Jackson, in his 1983 dissertation (The internal and external relationships of the Trukic languages of Micronesia), presents a substantial number of phonological, grammatical, and lexical innovations which, taken together, provide compelling evidence for establishing a Micronesian subgroup of Oceanic. This work, of major significance to Austronesian linguistics, confirms the existence of a subgroup that has been assumed in the literature since at least 1949.[1] Nevertheless, the innovations cited by Jackson fail to fully account for another compelling type of subgrouping evidence—namely, the phonological similarities these languages exhibit synchronically.

Among the thirteen phonological innovations Jackson cites in support of Micronesian, eleven involve changes in the segmental inventory between either Proto-Oceanic (POC) or Proto-Eastern Oceanic (PEO) and Proto-Micronesian (PMC).[2] The remaining two he summarizes as 'the loss of final vowel information' and 'regressive assimilation patterns among vowels' (Jackson 1983:351-52). It is only these latter two innovations, however, which begin to suggest what it was about PMC that gave rise to the characteristic phonological properties of the contemporary daughter languages.[3]

To illustrate those properties of Micronesian languages that mark them as being phonologically distinct, it is useful to compare them with the languages of another Oceanic subgroup—here, Polynesian. One may note:

1) All Micronesian (MIC) languages, with the single exception of Gilbertese, have segmental inventories larger than the inventory reconstructed for Proto-Micronesian (PMC). The language with the largest number of segmental phonemes is Kosraean, with thirty-five consonants and twelve vowels. Excepting some Outliers, all Polynesian (PN) languages have segmental inventories that are reduced in comparison to the one reconstructed for Proto-Polynesian (PPN).[4] The largest segmental inventory of a Triangle Polynesian language includes just twelve consonants and five (which occur both short and long) vowels, as in Tongan.

2) All MIC languages exhibit, either synchronically or diachronically, multiple rules of vowel lenition, resulting in the

devoicing, raising, fronting, and/or deletion of vowels. No PN language exhibits lenition of comparable scope.[5]

3) As a result of the lenition of vowels, all MIC languages exhibit *underlying* geminate and homorganic nasal-obstruent consonant clusters. As Biggs (1978:701) notes: "Polynesian languages are characterised by the absence of consonant clusters and syllable-final consonants."[6]

4) The existence of clusters in MIC languages has led to changes in permissible syllable structures. All MIC languages tolerate closed syllables. Closed syllables are rare in PN.[7]

5) All MIC languages exhibit complex rules of vowel alternation, both at a morphophonemic and allophonic level, again, of a scope unparalleled in PN.

It is impossible to gain an understanding of the roots of the properties of MIC that are different from those of PN simply by investigating the segmental inventories of the proto-languages reconstructed for these two subgroups. Compare figures 1 and 2 below:

p	t	k	ʔ	i		u
f	s	h		e		o
v					a	
m	n	ŋ				
	l					
	r					

Figure 1. Proto-Polynesian inventory of phonemes[8]

p	t	t'	k	i		u
p^w				e		o
f	s	s'	x		a	
m	n	ñ	ŋ			
m^w						
	l					
	r					
			w			

Figure 2. Proto-Micronesian inventory of phonemes[9]

PPN is reconstructed as having an inventory of thirteen consonants and five (short and long) vowels. PMC is reconstructed as having an inventory of seventeen consonants and the same five (short and long) vowels. Clearly, while the inventories of these two proto-languages are different, they are not dramatically so. Furthermore, nothing about these inventories clearly portends that these two systems would evolve so differently.

There should not, of course, be anything surprising about these observations. To understand the genesis of those phonological features common to MIC languages, but distinct from those of other subgroups within Oceanic, one must reconstruct not just the segmental inventory of PMC, but its entire phonological component. That is, the phonological characteristics of MIC languages previously noted can best be understood as the result of the retention, extension, or suppression of a constellation of phonological processes present in PMC. Sound systems must be viewed as dynamic and, from a historical perspective, vectorial.[10] The rules of which they are composed have both magnitude (the likelihood of persisting) and direction (thus giving rise to what is commonly called *drift*).

No new methodology is required to reconstruct the phonological component of a proto-language. The comparative method suffices. Evidence for proto-rules is established by investigating phonological phenomena in the daughter languages. For example, phonological rules that were operative in PMC might be synchronically evidenced (a) as fully productive processes, (b) as rules applicable only in certain morphological environments, or (c) as fossils, no longer productive in any phonetic or morphological context, but evidenced in a small number of forms exhibiting phonological and/or morphological irregularity.

Some PMC phonological rules have, in fact, previously been reconstructed to account for the genesis of such widely attested phenomena in MIC languages as 'compensatory lengthening' (Rehg, 1984b) and final vowel lenition (Rehg 1984b and 1991). This paper explores other aspects of the phonological system of PMC—namely stress and pitch, the prosodic phenomena that apparently set the stage for subsequent phonological developments in MIC languages.

The information available on stress and pitch in Micronesian languages is, as one might expect, limited and of varying reliability; this paper summarizes all published and unpublished sources known to the author. Fortunately, these data suffice to represent all of the probable subgroups of Micronesian proposed by Jackson (1983). These subgroups are represented in the following figure:[11]

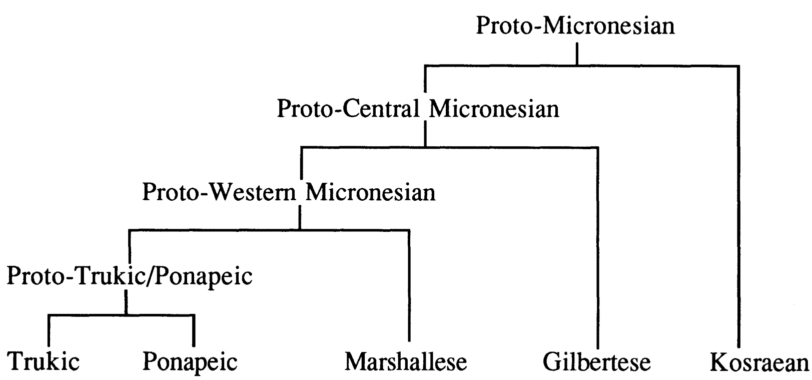

Figure 3. Historical relationships within Micronesian (possible subgroups)

Ponapeic includes Ponapean, Mokilese, and Pingelapese. Trukic represents a dialect continuum that includes, among other languages, Lagoon Trukese, Mortlockese, Satawalese, Woleaian, and Ulithian. Marshallese, Gilbertese, and Kosraean are each a single language.[12]

2. *Micronesian stress and pitch: synchronic data*

In the following discussions, the term 'pitch' is employed in its conventional sense. The term 'stress' is more problematic. Stress is commonly equated with 'intensity' (or 'loudness'), but in most Micronesian languages intensity apparently plays only a marginal role in determining relative degrees of prominence among stress bearing units. Precisely what the acoustic correlates of stress are in each of these languages remains to be determined.[13]

Because of the paucity of information available on the prosodic characteristics of these languages, the discussions of stress and pitch that follow are typically restricted to describing just the prosodic characteristics of the final phonological phrase of a simple declarative sentence—what, for these languages, might be termed an 'unmarked terminal prosodic contour'.[14] The mora, symbolized as 'V', is assumed to be the prosody bearing unit in all of these languages.

Section 2.1 provides a discussion of prosodic phenomena in Ponapeic, the subgroup best known to the author. Here, a somewhat more detailed account is provided so the reader may be familiar with the prosodic system of at least one Micronesian language. These data, with emphasis on the patterning of stress and pitch in the unmarked terminal prosodic contour, are then compared in section 2.2 to what is known about the prosodic systems of Trukic, and in section 2.3 to prosodic systems in other Micronesian languages.

2.1 *Stress and pitch in Ponapeic*

The Ponapeic subgroup consists of Ponapean, Mokilese, and Pingelapese.[15] Discussions of stress and pitch patterns in this subgroup focus primarily on Ponapean (PON), the only Ponapeic language for which sufficient data are available. Corroborative evidence is cited from Mokilese, while apparently innovative developments are noted in Pingelapese. Except for Pingelapese, all observations about prosody in this section are based upon impressionistic rather than instrumental data.

While an exhaustive description of PON prosody is beyond the scope of this paper, as well as the cognizance of its author, some basic claims about stress and pitch in this language can be advanced. These claims appear plausible because they are consistent (1) with how other phonological phenomena sensitive to prosody operate, and (2) with how independent observers have described the prosodic systems of other Micronesian languages.

In PON, as probably in any language, the study of prosody is a knotty undertaking. A particularly troublesome aspect of this language for the English-speaking investigator is that primary stress and high pitch do not necessarily cooccur.[16] For example, when the PON word *sakanakan* 'bad' is pronounced in isolation (thus representing a phonological phrase), it exhibits the following prosodic pattern.

sakànakán

High pitch occurs on the penultimate mora, while primary stress is on the final mora; secondary stress occurs on alternate preceding morae.[17]

Pitch is relatively easy to discern in PON. Stress is more elusive; precisely what its acoustic correlates are is not certain.[18] Evidence supporting the position that stress does pattern as noted above, however, comes from Mokilese, a Ponapeic language bordering on mutual intelligibility with both PON and Pingelapese. In Mokilese, unstressed vowels may undergo weakening. In word-initial syllables, this frequently (though apparently not invariably) results in vowel raising; in word-medial syllables, syncopation may result.[19] In the following examples all vowels undergoing weakening in Mokilese are those marked as unstressed in PON.[20]

Ponapean	Mokilese	Gloss
mwengé	mwinge	'eat'
mesé	mijoa	'face' (3ps.)
àramás	armaj	'person'
àperé	aproa	'shoulder' (3ps.)
menìpiníp	menipnip	'thin'
isìpwukí	ijipwki	'seven-hundred'
dìpwekèlekél	dipkelkel	'stumble'
ìmwisèkalá	imwjekla	'finished'

Longer utterances in PON, of course, exhibit more complex contours. An example illustrating how pitch and stress pattern in a simple declarative sentence follows (where *Irr.* = irrealis aspect marker and *Cl* = classifier).

ohl aká	pahn wahlá	pwihk menó	ni imwomwó
NP	VP	NP	PP
man pl	*Irr. carry-there*	*pig Cl-that*	*to house-your-there*

'The men will carry that pig to your house.'

Data like these, as well as other facts not considered here, provide evidence for the following informal and tentative claims about stress and pitch in PON.

> 1) At the phrase level, primary stress occurs on the final V; secondary stress occurs on alternate preceding V's. (Long vowels are treated as VV sequences—V corresponds to a mora. In PON, apparently only segments as sonorant as glides may function as morae.)[21]
>
> 2) The last stressed V within a prosodic phrase is the most prominent; a prosodic phrase corresponds roughly to a surface syntactic phrase.
>
> 3) The unmarked pitch contour of a non-final prosodic phrase is 234 (mid, high, extra high); that of a final prosodic phrase is 231 (mid, high, low). High pitch occurs on the penultimate V of the phrase.[22]
>
> 4) Successive prosodic phrases are terraced for pitch; therefore, the neutral (level 2) pitch range of phrase n+1 is downstepped from that of phrase n.

The position of stress and high pitch in the unmarked terminal prosodic contour of PON, the unit under scrutiny in other Micronesian languages, may more succinctly be described as follows.

> *Stress:* Primary stress occurs on the final V.
>
> *Pitch:* High pitch occurs on the penultimate V; the overall pitch pattern is 231.

Recent studies by Susan McClintock as well as Cathy S. P. Wong and Chin-Chin Tseng suggest that stress and pitch pattern differently in Pingelapese.[23] Based on instrumental data, McClintock argues that stress (as measured by intensity) and pitch (as measured by frequency) cooccur. Wong and Tseng, using the same equipment and the same informant, report different results. McClintock, Wong, and Tseng all agree, however, that in Pingelapese stress does *not* occur on the final V, nor does high pitch always occur on the penultimate V. Just how these phenomena *do* pattern in this language remains unclear.

2.2 Stress and pitch in Trukic

Limited information on prosody is available for four Trukic languages—Ulithian, Pulo Annian, Woleaian, and Puluwat. These languages are spoken across the Trukic continuum and are representative of the diversity within this, the largest subgroup of Micronesian. As the following discussions reveal, however, just how stress and pitch function in these languages remains far from clear.

2.2.1 Ulithian

Sohn and Bender (1973) offer the following observations about stress and pitch in Ulithian (ULI):

> *Stress:* Stress is described as being governed by the following rule (Sohn and Bender 1973:74):
>
> $$\begin{bmatrix} V_iV_i \\ V \end{bmatrix} \longrightarrow \begin{bmatrix} \acute{V}_iV_i & \\ \acute{V} / \_\_\,CCV\ \{C, \#\} \end{bmatrix}$$
>
> Sohn and Bender note: "...stress (which is non-phonemic) is not clearly recognizable, and it subphonemically accompanies a long vowel or a short vowel preceding a long consonant. However, a short vowel preceding a long consonant followed by a long vowel is not stressed."
>
> *Pitch:* "Four contrasting phonemic pitch levels are recognized: 1, 2, 3, and 4. 2 3 1 pattern is the most common in statements and interrogative-word questions.... (Sohn and Bender 1973:37)."

It is not possible, unfortunately, to discern from these statements, nor from the examples exemplifying them, how stress and pitch are assigned in unmarked terminal prosodic contours. The statement about stress indicates only that bimoraic syllables bear stress (with the *caveat* noted above). The description of pitch relates a contour, but does not specify how pitch is assigned.[24] Consequently, ULI data are not further considered in this paper.

2.2.2 *Pulo Annian*

Oda (1977:20-21) prefaces her comments on stress and pitch in Pulo Annian (PUA) with the statement: "It is not clear whether Pulo Annian is a stress or a pitch accent language...". She proceeds however with the following assumption: "We will...tentatively say that Pulo Annian has a stress assignment rule, and that the unit of stress assignment is a breath group, either a word, a phrase, or a sentence." Her claims about stress and pitch in this language are as follows:

> *Stress:* "Stress falls on the second voiced vowel before a pause." (Oda 1977:14 notes that final vowels are devoiced before phrase [pause ?] boundary. See section 3.1 for further discussion.)
>
> *Pitch:* "A simple statement, a question-word question, and a simple command have the intonation contour 2-3-1." Oda presents no rules for assigning pitch levels, but it appears from her examples that pitch level 3 is assigned to the penultimate V.

Oda's comments on PUA prosody are tentative and cursory, hence difficult to evaluate, but it would appear that in this language stress and pitch may disassociate. Consider therefore the following form, based upon an example provided by Oda (1977:21) in her discussion of PUA intonation:

$\acute{2}$ 3 1
[panangọ̥] 'Walk inside.'

This form is in part hypothetical, since Oda does not mark stress or devoicing in this example; but, her rules of vowel devoicing and stress predict that forms like the one above *do* occur. What is peculiar about such a predicted form is that stress precedes high pitch. This is the opposite of PON and most other Micronesian languages.

If forms such as the one above do actually occur, it might be that, in PUA, stress assignment is mora-sensitive while pitch assignment is syllable-structure sensitive. Stress is assigned to the penultimate voiced V (presumably because voiceless V's are treated as extrametrical—i.e., do not count for prosodic purposes) and high pitch is assigned to the penultimate syllable. It is thus final vowel devoicing that leads to the possibility that stress and pitch might not cooccur. This explanation seems plausible, but, given the paucity and nature of available data, it is purely speculative.

2.2.3 *Woleaian*

Sohn (1975:36) provides the following observations about stress and pitch in

Woleaian (WOL).

> *Stress:* "In Woleaian...intensity is not particularly significant, because all vowels are pronounced with equal intensity in general."[25]

> *Pitch:* The pitch pattern of simple declarative sentences is 331, where 1 represents the lowest pitch. Sohn notes that "...the dropping is effected always on or beginning with the last voiced...vowel of a sentence." (Final vowels occur both voiced and voiceless in WOL, as discussed further in section 3.1.) An examination of Sohn's data permits the following restatement of his claims: High pitch occurs on the second to the last voiced vowel; low pitch occurs on the last voiced vowel.

2.2.4 Puluwat

Brief comments on stress and pitch in Puluwat (PUL) are provided by Elbert (1974:13-14). He observes:

> *Stress:* "Stress is about even on all syllables, with these noticeable exceptions..."
>
> 1) "CVCV words seem stressed on the final vowels..."
> 2) "Syllables beginning with h- are usually stressed." [Two of the three examples involve surface final or antepenultimate stress; the third example probably involves a long vowel. It thus seems likely that the presence of /h/ is irrelevant.]
> 3) "A number of words of the shape $C_1V_1C_2V_2C_3V_3$ have stress on V_1 and V_3 and weak stress on V_2"

Observations (1) and (3) suggest that in PUL stress occurs on the final V and on alternating preceding V's, as in PON.

> *Pitch:* Elbert's observations on pitch are largely restricted to the transcription of sample sentences, along with a few comments on discourse or emotive uses of pitch. It appears that the pitch contour of simple declarative sentences is 231, with high pitch on the penultimate mora.[26]

2.3 Stress and pitch in other Micronesian languages

The remaining languages to be considered are Marshallese, Gilbertese, and Kosraean.

2.3.1 Marshallese

A careful analysis of stress in Marshallese (MRS) is provided by Bender (n.d.:125). His basic conclusions may be summarized as follows:

> *Stress:* Primary stress occurs on the final syllable; alternating preceding syllables are assigned secondary stress (where each syllable contains only a single short V; MRS does not exhibit phonemic contrasts of vowel length).

Bender has not yet undertaken the analysis of pitch in MRS. The following tentative claim about pitch assignment in declarative sentences is based upon my observations:

> *Pitch:* The basic pitch pattern is 231, with high pitch on penultimate syllable.

2.3.2 Gilbertese

Harrison (n.d.) characterizes Gilbertese (GIL) stress and pitch as follows:

> *Stress:* Primary stress occurs on the penultimate mora of a phonological phrase, which is normally equivalent to the syntactic phrase.
>
> *Pitch:* High pitch occurs on the antepenultimate mora.

2.3.3 Kosraean

Lee's (1975:32-9) account of stress and pitch in Kosraean (KSR) is summarized below:

> *Stress:* Primary stress normally occurs on the penultimate syllable, but any syllable can in fact bear primary stress, depending upon discourse considerations.[27]
>
> *Pitch:* The unmarked pitch contour of KSR is 231. High pitch always falls on stressed syllable.

KSR, like MRS, does not exhibit phonemic contrasts of vowel length.

2.4 Summary of synchronic data

The figure below provides a summary of the observations made about stress

(´) and pitch (¯ _) in the preceding sections. In this figure, lines (1) and (2) schematize synchronic forms that respectively were short and long vowel final in Proto-Micronesian (PMC).[28] S_0 represents any number of segments, including zero. $\underset{\circ}{V}$ represents a short voiceless vowel, V a short voiced vowel, VV a long vowel, and (V) a vowel potentially subject to deletion depending upon its quality and environment. The left-facing bracket (]) is employed to represent the rightmost boundary of an unmarked terminal prosodic contour.

Table 1. Surface representations of stress and pitch in MIC

	PUA	WOL	PUL	PON	MRS	GIL	KSR
1)	$S_0\acute{V}C\bar{V}C\underline{\underset{\circ}{V}}]$	$S_0\bar{V}C\underline{V}C\underset{\circ}{V}]$	?	$S_0\bar{V}C\underline{\acute{V}}C]$	$S_0\bar{V}C\underline{\acute{V}}C]$	$S_0\bar{V}C\underline{\acute{V}}C(\underline{V})]$	$S_0\bar{V}C\underline{V}C]$
2)	$S_0\acute{V}C\bar{V}\underline{\underset{\circ}{V}}]$	$S_0\bar{V}C\underline{V}]$	$S_0\bar{V}C\underline{\acute{V}}]$	$S_0\bar{V}C\underline{\acute{V}}]$	$S_0\bar{V}C\underline{\acute{V}}]$	$S_0\bar{V}C\underline{\acute{V}}(\underline{V})]$	$S_0\bar{V}C\underline{V}]$

The motivation for the structure of this figure will become clear in the following section.

3. *Reconstructing stress and pitch for PMC*

Based upon synchronic observations of stress and pitch in MIC languages, it is possible to reconstruct patterns of stress and pitch in PMC. Before this task can be undertaken, however, it is necessary to consider first a significant fact about MIC languages—namely, that they all exhibit rules of final vowel lenition, or what Bender (1969b:43) terms "erosion from the right".

3.1 Final vowel lenition in MIC languages

An extensive discussion of vowel lenition phenomena in MIC languages is provided in Rehg 1991. The following chart summarizes lenition processes affecting final vowels:

Table 2. Lenition of final vowels

Language(s)	Short Vowels	Long Vowels
PUA	$V \rightarrow [-vd]/VC_1\_\_\_\,\|\|$	$V \rightarrow [-vd]/V\_\_\_\,\|\|$
WOL	$V \rightarrow [-vd]/VC_1\_\_\_\,\|\|$	$V \rightarrow 0/V\_\_\_\,\|\|$
PUL, PON	$V \rightarrow 0/VC_1\_\_\_\#$	$V \rightarrow 0/V\_\_\_\#$
MRS	$V \rightarrow 0/VC_1\_\_\_\#$	(d?) $V \rightarrow 0/V\_\_\_\#$
GIL	$V_{+hi} \rightarrow 0/VN\_\_\_\,\|\|$	(o) $V_{+hi} \rightarrow 0/NV\_\_\_\,\|\|$
KSR	(d) $V \rightarrow 0/VC_1\_\_\_\#$	$V \rightarrow 0/V\_\_\_\#$

All the above rules are assumed to operate synchronically unless preceded by (d), indicating that the rule is attested only diachronically; (d?) signals that the diachronic status of the rule is unclear. Optional rules are marked by a preceding (o). A double vertical stroke (||) represents phrase boundary, a cross-hatch (#) represents word boundary, and N represents [+nasal]. GIL also devoices short vowels in specific phonetic contexts not considered here.

3.2 Reconstructed representations

By considering the preceding rules of final vowel lenition in combination with the observations made in section 2 about stress and pitch phenomena in these languages, we can represent probable earlier patterns of stress and pitch in these languages by (1) removing the effects of final vowel lenition and (2) imposing patterns of stress and pitch on the resulting forms.

Table 3. Pitch and stress marked on reconstructed representations

	PUA	WOL	PUL	PON	MRS	GIL	KSR
1)	$S_0\acute{V}C\bar{V}C\underline{V}]$	$S_0\bar{V}C\underline{V}C\underline{V}]$	?	$S_0\bar{V}C\underline{\acute{V}}C\underline{V}]$	$\bar{S}_0VC\underline{\acute{V}}C\underline{V}]$	$S_0\bar{V}C\underline{\acute{V}}C\underline{V}]$	$S_0\bar{V}C\underline{V}C\underline{V}]$
2)	$S_0\acute{V}C\bar{V}\underline{V}]$	$S_0\bar{V}C\underline{VV}]$	$S_0\bar{V}C\underline{\acute{V}V}]$	$S_0\bar{V}C\underline{\acute{V}V}]$	$S_0\bar{V}C\underline{V}(G)\underline{V}]$	$S_0\bar{V}C\underline{\acute{V}V}]$	$S_0\bar{V}C\underline{VV}]$

The reconstructed representations above are consistent with the claim that all morphemes in PMC ended in either a short or a long vowel.

Note in the representations above that all languages, except PUA and KSR, exhibit stress on the penultimate V and high pitch on the antepenultimate V. The apparent exceptionality of PUA may simply be an artifact of the problems associated with analyzing pitch and stress in this language noted in section 2.2.2. If stress and pitch do disassociate in PUA as noted above, the rules governing these phenomena are almost certainly innovative. KSR is unique in that both high pitch and stress occur on the antepenultimate vowel. However, it is significant to note that, in all MIC languages except KSR, deleted final vowels or their reflexes are recoverable from suffixed forms (e.g. PON *ki:l* 'skin', *kili +n* 'skin of' <POC *kuli +*ni*). KSR has apparently lost these final vowels irretrievably. Lee and Wang (1984:436) comment: "There is no synchronic evidence for retention of historical vowels, even in underlying forms. The variation one is apt to encounter within a single possessive paradigm, as well as the competition between alternative paradigms for the same noun, both testify to the present fluctuating state of KSR morphophonemics." Thus, KSR may pattern differently because the synchronic underlying representations of this language are different.

3.3 Reconstruction of stress and pitch rules for PMC

Given the preceding observations, it is clearly possible to reconstruct unmarked stress and pitch patterns back to Proto-Central Micronesian (see figure 3). Only the facts of KSR might stand in the way of reconstructing back to PMC. The observation that KSR has undergone considerable restructuring, coupled with additional observations about PMC presented in section 4, provide motivation for attributing the rules below to PMC.

3.3.1 PMC stress

The rule governing primary stress in an unmarked terminal prosodic contour in PMC is reconstructed as follows.

> *Primary Stress Assignment*
>
> $V \longrightarrow [+\text{stress}] / \_\_\_\_ C_0V]$
>
> Stress the penultimate mora of a phrase—i.e. the penultimate syllable of a VCV sequence or the final syllable of a CVV sequence.

3.3.2 PMC pitch

The rules governing pitch assignment in an unmarked terminal prosodic contour in PMC are reconstructed as follows.

Pitch Assignment

IAR	AC	RS
$VCVC_0V]$ —>	$VCVC_0V]$ —>	$VCVC_0V]$
H L	H L	H L

Assign high pitch to the antepenultimate mora of the phrase; assign low pitch to all following morae.

Non-linear notation is employed in formulating these rules. The first rule is the *Initial Association Rule (IAR)*, which links high pitch to the antepenultimate V of a prosodic phrase. By the *Association Convention (AC)*, assumed to be a universal, low pitch is assigned to the second V. Finally, a rule of *Rightward Spread (RS)* spreads low pitch to any unassociated V to the right.

4. The interaction of rules of stress and pitch with other phonological rules in PMC

The preceding rules governing stress and pitch in PMC are reconstructed on the basis of sometimes very sketchy synchronic analyses of these phenomena in the daughter languages. However, additional evidence in support of these rules is available. Such evidence comes from a consideration of how the prosodic rules reconstructed here interact with phonological rules earlier reconstructed for PMC. The rules considered for this purpose are those that govern final vowel lenition and trimoraic lengthening.[29]

4.1 Final vowel lenition

Based on synchronic patterns in MIC languages (as summarized in section 3.1), the following rules of final vowel lenition were reconstructed for PMC in Rehg 1991:

Final Short Vowel Devoicing

$$\begin{bmatrix}+\text{syl}\\ +\text{high}\\ -\text{long}\end{bmatrix} \longrightarrow [-\text{vd}]/[+\text{syl}][+\text{nas}]\_\_\_\,\|$$

Phrase-final short high vowels of polysyllabic words devoice after a nasal and before pause.

Final Long Vowel Shortening (Optional)

$$\begin{bmatrix}+\text{syl}\\ +\text{high}\\ +\text{long}\end{bmatrix} \longrightarrow [-\text{long}]/[+\text{nas}]\_\_\_\,\|$$

Phrase-final long high vowels optionally shorten after a nasal and before pause.[30]

It is plausible to assume that final short vowel devoicing was motivated, at least in part, by the absence of stress on such vowels. Final long vowel shortening was apparently a consequence. Since final short vowels were devoiced, final long vowels could be shortened in the same environment without neutralizing underlying contrasts of length. Such shortening was facilitated, of course, by the fact that it was the first mora of long vowels that bore stress.

These final vowel lenition phenomena thus lend support to the position that stress occurred on the penultimate mora in PMC, a claim consistent with stress patterns in many other Oceanic languages.

4.2 The trimoraic length constraint

If PMC stress occurred on the penultimate V of a phrase, and high pitch on the antepenult, this implies that an unmarked terminal prosodic contour was optimally mapped onto a phrase containing at least three morae. Happily, it seems clear that PMC phrases were indeed minimally trimoraic, as a result of both syntactic and phonological constraints.

The argument that all syntactic phrases were minimally trimoraic in PMC rests on the assumption that there were two basic phrase types—nominal and verbal. Given that nouns and verbs were minimally bimoraic in Proto-Micronesian (as in Proto-Oceanic), then nominal and verbal phrases were trimoraic as a result of the following constituency.

Nominal Phrase: Article + N (/*te* + C_0VC_0V/)

Verbal Phrase: Subj. Pron. + V (/$C_0V + C_0VC_0V$/)

Nominal phrases consisted of an article, reconstructed as **te*, and a minimally bimoraic noun.[31] Verbal phrases consisted of a minimally monomoraic subject pronoun (probably proclitic) and a minimally bimoraic verb.

In certain constructions, however, articles and subject pronouns apparently need not have been present. Two such possible construction types are exemplified by data from GIL.

Article + Noun		*Noun Only*	
te ika	'the fish'	i:ka	'fish'
te pwapwai	'the root of a taro-like plant'	pwapwai	'roots of a taro-like plant'
Subj. Pron. + Verb			*Verb Only*
E piri.	'He ran.'	Pi:ri!	'Run!'
E anene.	'He sang.'	Anene!	'Sing!'

The absence of the article in an NP in GIL gives the noun a generic reading. Subject pronouns are deleted in commands. Note, however, that when an underlying bimoraic N or V stands alone in a phrase, the first vowel of the N or V is lengthened, resulting in a surface trimoraic phrase.

The lengthening phenomenon noted above is examined in detail in Rehg 1984b. There it is argued that a rule of lengthening like that exhibited in GIL can probably be reconstructed for PMC. This rule, crucially ordered after stress assignment, is as follows:

Phrase Initial Stressed Vowel Lengthening

V —> [+long]/ || (C)___

Lengthen a V bearing primary stress if it occurs in a phrase-initial syllable.

An alternate explanation, also entertained in that paper, is that such lengthening is the result of the following constraint on phrases.[32]

Trimoraic Lengthening

$[C_0VCV]_P$ ===> $[C_0V{:}CV]_P$

Lengthen the first V of a bimoraic base when that base is syntactically isolated as the sole constituent of a phrase.

Regardless of which rule best characterizes the motivation for lengthening, the consequence is the same. Phrases in PMC were minimally trimoraic, thus satisfying the constraints on phrase length imposed by prosody.[33]

It thus seems plausible to claim that PMC distinguished between minimal 'phonological words' and minimal 'phonological phrases'. A minimal 'phonological word' consisted of two morae, forming a bimoraic *foot*.[34] A minimal 'phonological phrase' consisted of three morae, forming what might be termed a trimoraic *utterance*.[35] It is the existence of this minimally trimoraic phonological phrase that permits the patterning of PMC stress and pitch as described in this paper.

5. *Conclusion*

Comparative evidence supports the claim that unmarked terminal prosodic contours in PMC bore primary stress on the penultimate mora and high pitch on the antepenultimate mora. Additional evidence for this analysis comes from the presumed interaction of these prosodic rules with other rules reconstructed for PMC—namely, those governing final vowel lenition and phrase-initial vowel lengthening. The fact that all of these reconstructed rules interact in a coherent manner attests to their plausibility.

The prosodic system of PMC reconstructed here can also be argued to have played a crucial role in the phonological developments of its daughter languages. It is likely, therefore, that the disassociation of stress and pitch in PMC contributed to the erosion of the perceptual salience of final vowels. As Oda suggested about PUA, it may be that PMC and its daughter languages function in some respects like pitch-accent languages. In this case, what is of major prosodic significance is not 'stress' or 'intensity', but rather the drop in pitch that occurs on the penultimate vowel.[36] Final V's in such a system are then not only unstressed, but the pitch pattern they bear is redundant. This point is illustrated by the following forms: (a) exemplifies a language in which high pitch (and stress) cooccur on the penultimate mora; (b) illustrates the stress/pitch pattern of PMC.

a) $\overline{\mathrm{C}\acute{\mathrm{V}}}\underline{\mathrm{CV}}$

b) $\overline{\mathrm{CV}}\underline{\mathrm{C}\acute{\mathrm{V}}\mathrm{CV}}$

The prosodic insubstantiality of final V's in PMC might then have facilitated their lenition. And, as argued in Rehg 1991, it is precisely the lenition of final V's that precipitated the development of the distinctive phonological features of MIC languages noted in section 1.0. This scenario is, of course, speculative, but it is not unreasonable. The claim that the prosodic patterns of PMC played a crucial role in the evolution of its daughter languages has considerable intuitive appeal.

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NOTES

1. Matthews (1949-50:436) noted that the languages of the Carolines, the Marshalls, and the Gilberts, as opposed to those of Palau and the Marianas, constitute a "nuclear, non-Indonesian type". This purported subgroup was consequently called "nuclear Micronesian" by Bender (1971) and others. In this paper, following Jackson (1983), I simply label this subgroup "Micronesian".

2. The phonemic inventories of Proto-Oceanic and Proto-Eastern Oceanic are apparently identical.

3. One might argue that these synchronic phonological similarities are the result of diffusion. It seems to me, however, that such an argument would be difficult to defend. One would first need to demonstrate that contact occurred, either directly or indirectly, among languages spoken on small islands scattered throughout a geographical area larger than the continental United States. Secondly, one would need to show that such contact was sufficiently extensive that it resulted in the borrowing of phonological rules. It seems reasonable that, under such circumstances, one might also find evidence for extensive lexical borrowing; however, little evidence of this nature exists (but see Rehg and Bender 1990).

4. Elbert (1965:440) reports: "Phonological features long described as characteristic of the

languages of Triangle PN. do not hold for Outlier PN. According to the tentative data available, the phonemic systems of all of them except Si. [Sikaiana] and OJ. [Ongtong Java] have expanded..."

5. This, however, is not to say that such lenition *never* occurs. Vowel devoicing, for example, is apparently quite common in Polynesian languages (e.g Samoan and Tahitian), at least in casual speech styles. Unfortunately, as Biggs (1978:698-699) has noted: "There are few detailed descriptions of the sounds of contemporary Polynesian. This is understandable in the case of earlier descriptions by linguistically unsophisticated missionaries and such.... But, it is difficult to understand modern linguists who author dictionaries without a single word of phonetic elucidation of their chosen orthographies."

6. But, as Biggs (1978:713) also notes, geminate consonants do occur in Ellicean (Tuvalu) and in some (all?) of the Outliers. He also observes that clusters of non-identical consonants occur in West Futuna and Mele-Fila. It may be the case, however, that such clusters only occur in rapid speech; hence, they may not occur underlyingly.

7. Closed syllables occur in only the languages noted in the preceding footnote. In Ellicean and the Outliers, they occur only if one assumes that the initial C of a geminate cluster is part of the coda of a preceding syllable.

8. The inventory here is from Biggs (1978:708-709).

9. Adapted from Jackson 1983:353. The symbols I employ here to represent PMC phonemes differ from those in Jackson; /pw mw ng s s'/ in this paper respectively correspond to Jackson's /p' m' g z d/. Jackson also tentatively reconstructs PMC *T, but evidence for this phoneme is marginal.

10. *Rule* and *process* are used interchangeably in this paper. I employ the term *vectorial* in its mathematical sense. Of course, little, if anything, is understood about the vectorial properties of phonological rules. It seems likely, though, that these are largely determined contextually (in the broadest sense of this term). That is, it is the system of which a rule is a part that ultimately determines its magnitude and direction. One might metaphorically approach such systems in terms of their ecology. An understanding of the *ecological* forces that determine the survival, modification, and extinction of phonological rules, and the conditions that determine such outcomes, should be a prime objective of historical linguistics.

11. See Jackson 1983:433. Jackson's chart also includes subgrouping relationships within Trukic and indicates the possibility that the Ponapeic languages subgroup with what he terms Proto-Central Trukic.

12. I generally employ the traditional English names of these languages. Some of these languages have alternate names based upon new, indigenous spellings of the names of the islands where they are spoken; these are Pohnpeian (Ponapean), Lagoon Chuukese (Lagoon Trukese), and Kiribati (Gilbertese). "Kosraean" (formerly Kusaiean) is used in this paper since this new spelling has gained some currency in the linguistic literature.

13. The term *accent* might be preferable to *stress*, as suggested in Section 5.0. There is no widespread agreement among phonologists, however, as to the precise meaning of either term.

14. This is, of course, the prosodic pattern that is imposed on citation forms of words.

15. Another communalect commonly cited in association with Ponapeic is Ngatikese, spoken on Ngatik (now also called Sapwuafik) atoll. Ngatikese, however, is almost certainly a dialect of Ponapean.

16. High pitch and stress apparently cooccur only on words of the shape #(C)VV#. PON forms like /adaad/ illustrate that high pitch occurs on the penultimate mora and not the penultimate syllable. (I employ in this paper what I assume to be familiar notation. The lines associated with each V represent relative degrees of pitch height; ´ represents primary stress and ` represents secondary stress.)

17. English speakers typically react to such forms as auditory illusions. While training Peace Corps volunteers to speak Ponapean, I have observed that they variously pronounce this form as sakaNAkan and saKAnakan, where the syllable in capitals receives both primary stress and high pitch.

18. In hyperarticulated speech, stress does involve loudness. In more normal speech styles, however, I do not hear stressed V's as being inherently louder than unstressed ones. Nevertheless, in some way that I do not yet fully understand, stressed morae clearly carry the *beat*.

19. Apparently, high vowel devoicing and vowel reduction in MOK also occur in unstressed syllables, although additional constraints are involved. Harrison, however, does not attempt to describe stress in Mokilese and offers another, more complex, explanation of these phenomena (Harrison 1976:26-27, 38-41).

20. Conventional spelling is employed in these examples. In both Mokilese and Ponapean *d* represents a voiceless dental stop, *mw* a rounded, velarized bilabial nasal, and *ng* a velar nasal; *h* after a vowel signals vowel length.

21. It is not yet clear if stress is also assigned at the word level in Ponapean.

22. If high pitch is assigned to the second mora of a long vowel, then the entire long vowel exhibits high pitch. If high pitch is assigned to the first V, however, falling pitch occurs.

23. These studies were conducted in 1991 to partially satisfy the requirements of a field methods course at the University of Hawaii. Data were obtained from Engly Ioanis and were processed on a pre-release second edition of a Kay Electronics Visi-Pitch (Model 6097).

24. Only three examples of the 2-3-1 pitch pattern are provided. In two cases, high pitch occurs on the penultimate syllable, while in the third it is on the fifth syllable from the end.

25. The claim that stress contrasts do not occur or are difficult to discern is a common claim among investigators of Micronesian languages.

26. Elbert uses line-notation to mark pitch contours. These lines are printed in such a manner that it is difficult to discern with absolute certainty which syllable (or mora) is bearing which pitch level.

27. The use of stress for emphasis is not possible in a language like Ponapean. Instead, the syntactic device of focusing is typically employed.

28. Only open syllables occurred morpheme-finally in PMC.

29. Rehg and Marck 1991 (currently being revised for publication) also cites low vowel raising (LVR) as additional evidence for the PMC rules of stress and pitch reconstructed in this paper. See Bender (1969a and 1973) and Sohn (1971) for earlier discussions of LVR.

30. PUA data suggest that this rule should be rewritten to devoice the second mora of a long vowel rather than to delete it. I resist doing this, however, until I am able to confirm that final long vowels in PUA do consist of a voiced followed by a voiceless mora.

31. See Bender 1981 for further discussion of PMC **te*.

32. Other Micronesianists, notably Sheldon Harrison, prefer this second account of lengthening.

33. The only context in which high pitch and stress might have cooccurred on the same mora is in phrases consisting of a single morpheme of the shape CVV, where VV represents a long vowel. It is of course possible, though not likely, that such forms were phonetically manifested as CV:V and were also trimoraic. Measurements of length of comparable utterances in GIL might resolve this issue.

34. Monomoraic prepositions, conjunctions, etc. were, of course, normally part of phrases; they were not phonological words as defined in this paper. In most contemporary Micronesian languages, these particles often function as clitics.

35. The term *utterance* is employed here for lack of a better term. One would certainly expect that speakers of PMC could 'utter' even monomoraic morphemes if called upon to do so. Yet, the term is not entirely inappropriate, given the propensity of speakers of languages like Gilbertese to 'utter' both article and noun when asked to name things in their language.

36. Note that Woleaian exhibits a 3-3-1 pitch pattern. Pitch-drop rather than pitch rise is the distinctive prosodic feature of this language.

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