SCHWA IN PALAUAN

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The language under investigation in this study is Palauan (PAL).[1] It is spoken by approximately 13,000 people in the Palau Islands, located among the Western Caroline Islands, about 500 miles east of the island of Mindanao, Philippines. Though little work has been done along historical and comparative lines, it is generally believed that PAL should be classified as a member of the Western Austronesian division of the Austronesian language family.

Since 1900, a number of studies varying in scope and depth have been done on PAL. The Walleser grammar (1911) and dictionary (1913) are the earliest known works, and are written in a traditional style. The Capell grammar (1949) is an overall sketch of the language done in conjunction with the Coordinated Investigation of Micronesian Anthropology (CIMA). During the fifties, the McManus dictionary was compiled. It is comprehensive in nature and served as an invaluable aid in conducting the field work for this present study. Three phonemic analyses, Hsu (1960), Carlson (1968), and Flora (1969), have been done, the latter two being detailed and complete accounts of the taxonomic phonemes and their distribution throughout the language. Pätzold (1968) is a comprehensive account of the structure of PAL, but its value is questionable since it was based solely on data taken from written sources, such as Walleser (1911) and (1913) and Capell (1949). The first analysis done in the framework of generative phonology is Wilson (1972), a study of the phonology and syntax of verb affixes. Josephs (1975), a reference grammar of PAL, is an overall treatment of PAL structure written primarily for the Palauan community. Flora (1974) is a generative analysis of the major phonological processes which exist in PAL.

The particular focus of this article is the analysis of phonetic schwa in PAL, the identification of its various sources in underlying structure, and the presentation of the phonological rules needed to derive phonetic schwa from these sources. The theoretical framework in which the analysis is based is that of generative phonology as formulated by Chomsky and Halle (1968) in *The Sound Pattern of English*.

Basic to a discussion of phonetic schwa in PAL is a clear understanding of how stress is assigned to words. Below is our formulation of the stress rule:

1. Stress Assignment

$$V \rightarrow [+\text{stress}] \; / \; __C_0\langle VC_0\rangle]_{\langle \text{stem} \rangle}\#$$

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> In unsuffixed forms, stress the penultimate stem vowel. In suffixed forms, stress the rightmost vowel. When there is no penultimate stem vowel, that is, in the case of a monosyllabic stem, stress the only available vowel.

To illustrate the operation of this rule, we present below some data from the verb system of PAL. We have listed some surface forms of underlying /CVCVC/ verb stems. Although a discussion of the affixes found on these forms and the phonological rules which affect them is beyond the scope of this paper, an examination of these forms can lead to an understanding of stress placement. For each example, we give the underlying stem, the present middle, the present middle inchoative, and the future participle, in that order.[2]

2.	*to patch*	/tabak/	
		/m+tabak/	mətábək
		/m+tabak+a/	mətəbəká
		/tabak+l/	təbákl
	to tie	/le?ot/	
		/m+le?ot/	məlé?ət
		/m+le?ot+a/	mələ?ətá
		/le?ot+l/	lə?ótəl
	to halve	/doba?/	
		/m+doba?/	mədóbə?
		/m+doba?+a/	mədəbə?á
		/doba?+l/	dəbá?əl
	to shave	/tamik/	
		/m+tamik/	mətamík
		/m+tamik+a/	mətəmka'
		/tamik+l/	təmíkl

These examples are representative of a vast number of underlying /CVCVC/ verb stems, and so they can be relied upon for information regarding stress assignment. Notice that the unsuffixed forms, that is, the present middle forms, are stressed on the penultimate stem vowels. Whereas the suffixed forms, that is, the present middle inchoative and future participle forms, are stressed on the rightmost vowels. In the case of the present middle inchoative, the rightmost vowel is a suffix vowel, while in the future participle, the rightmost vowel is a stem vowel.

Stress assignment operates throughout the language as it does in the verb system. Take, for example, the following nouns:

3.	/badu/	bád	*rock*
		bədúl	*his rock*
		bədəmám	*our (excl.) rock*
	/keri/	kér	*question*
		kərílí	*his question*
		kərəmám	*our (excl.) question*
	/mada/	mád	*eyes*
		mədál	*his eyes*
		mədəmám	*our (excl.) eyes*

As with verbs, these nouns are stressed on the penultimate vowel if they are unsuffixed, and on the rightmost vowel if they are suffixed.

One of the major sources of phonetic schwa is the group of underlying vowels which are subject to reduction when unstressed in certain environments. Below we give some examples from the noun system:

4.	/mada/	*eyes*	mád
	/mada+k/	*my eyes*	mədák
	/mada+mam/	*our eyes*	mədəmám
	/keri/	*question*	kér
	/keri+k/	*my question*	kərík
	/keri+mam/	*our question*	kərəmám
	/skorəs/	*stick*	skórəs
	/skorəs+e+k/	*my stick*	skərəsék
	/skorəs+mam/	*our stick*	skərəsám
	/ʔabu/	*ashes*	ʔáb
	/ʔabu+k/	*my ashes*	ʔəbúk
	/ʔabu+mam/	*our ashes*	ʔəbəmám

Our discussion of the vowel reduction process will be concerned primarily with nouns, although the process permeates the language and affects all classes of words.

What, then, are the specifics of the vowel reduction rule? First, only stem vowels are affected. The vowels of prefixes are never reduced to schwa, even though they are unstressed. Take, for example, the following nouns which contain the instrumental prefix /o-/:

5.	olámk	*razor*
	oləmkék	*my razor*
	olásəʔ	*axe*
	oləsəʔék	*my axe*

Second, the applicability of the rule to stem vowels varies depending upon the quality of the vowel and its position in the stem. The unstressed stem vowels /a e o/, that is, nonhigh vowels, are regularly affected by the rule in all positions. The high vowels /i u/ are treated differently. Only those unstressed high vowels that are stem final and followed by a suffix are reduced to schwa by the vowel reduction rule. For example:[3]

6.	/keri+mam/	kərəmám	*our question*
	/keri/	kér	*question*
	/keri+l/	kəríl	*his question*
	/badu+mam/	bədəmám	*our rock*
	/badu/	bád	*rock*
	/badu+l/	bədúl	*his rock*

However, the situation is different if the unstressed high vowel is flanked on both sides by stem consonants. In this position, the high back vowel is regularly deleted. For example:

7.	/subad/	súbəd	*announcement*
	/subad+e+k/	spədék	*my announcement*
	/o+rusu/	orús	*needle*
	/o+rusu+k/	orsúk	*my needle*

The deletion rule may be formulated as follows:

8. High Vowel Deletion

$$\begin{bmatrix} V \\ +back \\ +high \\ -stress \end{bmatrix} \rightarrow \emptyset \; / \; [X \; \underset{stem}{[+cons]} \; __ \; \underset{stem}{[+cons]} \; Y]$$

When the high front vowel is flanked on both sides by stem consonants, it behaves as the most stable of vowels. Normally it is subject neither to deletion nor reduction. For example:

9. /diŋa/	díŋ	*ear*
/diŋa+k/	diŋák	*my ear*
/ʔilt/	ʔílt	*ointment*
/ʔilt+e+k/	ʔílték	*my ointment*

There are a few examples to indicate that perhaps there is a trend toward deleting high front vowels as well as high back vowels. However there are many more examples of high front vowels which do not delete than of those that do.

In summary, then, an unstressed high back vowel flanked by two stem consonants is deleted by the High Vowel Deletion rule (8). A few high front vowels in this same environment are marked to undergo this rule exceptionally. Unstressed nonhigh stem vowels flanked by two consonants are reduced to schwa. Unstressed high vowels in stem-final position are also reduced to schwa when flanked by two consonants. The Vowel Reduction rule may be formulated as follows:[4]

10. Vowel Reduction

$$\begin{bmatrix} V \\ -stress \\ +stem \\ \langle +high \rangle \end{bmatrix} \rightarrow [-tense] \; / \; C \; __ \; \langle + \rangle \; C$$

Unstressed nonhigh stem vowels flanked by two consonants are reduced to schwa. Unstressed high stem vowels flanked by two consonants also reduce to schwa if a morpheme boundary is present between the vowel and the consonant to its right, that is, if the vowel is in stem-final position.

This rule, then, can account for innumerable cases of phonetic schwa as the surface realisation of an underlying tense vowel.

We turn now to another phonological process which results in a large number of schwas in phonetic representation, that of epenthesis. Consider the following data:

11. /buʔi/	*spouse*	búʔ
/buʔi+k/	*my spouse*	bəʔík
/ʔusəm/	*beard*	ʔúsəm
/ʔusəm+e+k/	*my beard*	ʔəsəmék

/ʔuri/	*laughter*	ʔúr
/ʔuri+k/	*my laughter*	ʔerík
/duʔa/	*skill*	dúʔ
/duʔa+k/	*my skill*	dəʔák

It appears that in these cases the unstressed high back vowel between two stem consonants has been reduced to schwa rather than deleted. In fact, deletion has taken place, and the schwas which appear in place of the deleted vowels are the result of an epenthesis rule. Notice that in each case a glottal stop appears to the right or left of the underlying back vowel. As a rule, glottal stop does not join with any consonant to form a cluster. If through affixation or some phonological process such as vowel deletion, a glottal stop appears adjacent to a consonant, a schwa is inserted between them. For example, there is a verbal affix /-l-/ which is inserted to the right of an initial stem consonant to form the past participle of the verb. When the initial consonant is glottal stop, a schwa appears between it and the /-l-/ infix.

12.

/kesi/		*scrape*
/k+l+esi/	klés	*scraped*
/balo?/		*shoot*
/b+l+alo?/	blálə?	*shot*
/ʔarom/		*taste*
/ʔ+l+arom?/	ʔəlárəm	*tasted*
/ʔamu/		*break*
/ʔ+l+amu/	ʔəlám	*broken*

This schwa epenthesis rule may be formulated as follows:

13. Glottal Schwa Epenthesis

* ʔ Ø C ə
1 2 3 ⇒ 1 2 3

The string glottal stop plus consonant and its mirror image, consonant plus glottal stop, become glottal stop plus schwa plus consonant and consonant plus schwa plus glottal stop respectively.

The derivation of a form from (11) would proceed as follows:

14.

	bú?	bəʔík
	spouse	*my spouse*
	/buʔi/	/buʔi+k/
Stress	búʔi	buʔí+k
Final Vowel Deletion	búʔ	-
High Vowel Deletion	-	bʔí+k
Vowel Reduction	-	-
Glottal Schwa Epenthesis	-	bəʔík
	búʔ	bəʔík

The process of schwa epenthesis also takes place within clusters of dental consonants, usually of the consonant-liquid type. Consider, for example, the past participle forms of dental-initial verb stems.

15.

/t+l+abak/	təlábək	*patched*
/s+l+ubad/	səlúbəd	*announced*
/d+l+asaʔ/	dəlásəʔ	*carved*

Consonant-liquid dental clusters are not permitted in final position either. For example, when the future participle marker /-l/ is suffixed to a stem ending in a consonant, we find the following forms:

16.	/tabak+l/	təbákl	*to be patched*
	/kidib+l/	kidíbl	*to be gathered*
	/le?ot+l/	lə?ótəl	*to be tied*
	/tabud+l/	təbúdəl	*to be peeled*

Notice that when a dental consonant precedes the /-l/, a schwa intervenes. To account for this we posit the rule:

17. Dental Schwa Epenthesis

$$\emptyset \rightarrow \overset{V}{[-\text{tense}]} \; / \; \begin{bmatrix} -\text{son} \\ +\text{ant} \\ +\text{cor} \end{bmatrix}^{C} __ \begin{bmatrix} -\text{son} \\ +\text{ant} \\ -\text{cor} \\ -\text{nas} \end{bmatrix}^{C}$$

There is another type of schwa epenthesis which operates in widespread fashion throughout the verb morphology in PAL. Verb stems are subject to a great deal of affixation in the formation of various tenses and aspects. We find the process of schwa epenthesis particularly productive among verb prefixes.

The first of the affixes that we will consider is the Verb Marker (VM).[5] This productive affix which appears in a vast number of verbs has the underlying form /m/, though it is realised in a variety of positions in the word and in a variety of phonetic shapes: [m], [mə], [o], and [u]. For the purposes of this article, we are concerned, obviously, with the phonetic realisation [mə] of the VM /m/, since it contains a schwa.

Consider first the following active transitive verb forms of the present middle and present imperfective aspects, in which the VM shows up as a first position prefix having the surface phonetic shape [mə-]:[6]

18.			Middle	Imperfective
	/dasa?/	*carve*	mədásə?	məlásə?
	/sesob/	*burn*	məsésəb	məlésəb
	/lo?ad/	*break cord*	məló?əd	məló?əd
	/kimud/	*cut hair*	məkímd	məŋimd

The VM also appears as a [mə-] prefix in some stative verbs, which resemble English adjectives. For example:

19.	/dakt/	mədákt	*afraid*
	/du?a/	mədú?	*skilled*
	/?edi/	mə?éd	*thirsty, shallow*
	/?uu/	mə?úw	*shady*
	/rur/	mərúr	*bashful*

We choose to represent the VM as /m/ in underlying form, because there is a good deal of evidence to show that the schwa which appears in the [mə-] prefix is predictable and can be inserted by an epenthesis rule. For example, consider the past tense forms of the verbs in (18):

20.	/dasaʔ/	*carve*	mildásəʔ	millásəʔ
	/sesob/	*burn*	milsésəb	millésəb
	/loʔad/	*break cord*	milloʔəd	milloʔəd
	/kimud/	*cut hair*	milkímd	milŋímd

When the Past Tense marker /-il-/ is positioned to the right of the VM to form the past tense, the surface phonetic shape of the VM is [m-]. These facts suggest that schwa epenthesis takes place when the VM is followed by a consonant, but not when it is followed by a vowel. Our formulation of the rule will read as follows:

21. Prefix Schwa Epenthesis

$$\emptyset \rightarrow \overset{V}{[-\text{tense}]} \;/\; \# \;[+\text{cons}] + __\; [+\text{cons}]$$

Insert a schwa to the left of a consonantal segment if a single consonantal prefix precedes it.

It is easy to see how this rule would convert the forms below:

22.	/m+dasaʔ/	mədásəʔ	*carve (middle)*
	/m+dakt/	mədákt	*afraid*

There are at least two other verbal prefixes which, if a schwa epenthesis rule were included in the analysis, could be represented in underlying form as single consonants, as we have suggested for the VM. A small class of stative verbs is marked on the surface by a [bə-] prefix. For example:

23.	/ralm/	*water*	bərálm	*watery*
	/sokəl/	*ringworm*	bəsókəl	*infected with ringworm*

Another small class of stative verbs is marked by a [kə-] prefix. For example:

24.	/dorom/	kədórəm	*sharp*
	/debo/	kədéb	*short*

There is one last schwa epenthesis process we wish to discuss. It takes place in word-final position before a pause if a word ends in a consonant cluster or in two consonants separated by a schwa. When words of this shape are not followed by a pause, the schwa does not appear. Thus we have the following alternations:

25.	dákt	dáktə	*fear*
	málk	málkə	*chicken*
	ŋálək	ŋáləkə	*child*
	ʔúsəm	ʔúsəmə	*beard*

The rule may be written as follows:

26. Phrase-final Schwa Epenthesis

$$\emptyset \rightarrow \overset{V}{[-\text{tense}]} \;/\; C(\text{ə})C__\;\|$$

Since this epenthesis occurs in a very restricted environment and is completely predictable, we do not represent the schwa in the surface phonetic forms that we cite throughout this study.

Thus far, we have shown that surface phonetic schwas are present in the language as a result of two phonological processes, vowel reduction and epenthesis. It would be ideal if we could explain all occurrences of surface schwa in these ways. However, a problem arises when we consider words like the following:

27.	ŋálək	*child*
	ŋələkék	*my child*
	kəmúr	*tail*
	kəmrík	*my tail*
	ʔúsəm	*beard*
	ʔəsəmék	*my beard*

Each of these forms contains a schwa in the unstressed syllable of the unpossessed form. It is clear that these schwas are not epenthetic when we consider forms like the following:

28.	málk	*chicken*
	məlkék	*my chicken*
	kmál	*very*
	mərásm	*to sew*

These examples contain the clusters [lk#], [#km], and [sm#]. The examples in (27) have these same strings of consonants separated by a schwa: [lək#], [kəm#], and [səm#]. We must conclude that the schwas in question are not epenthetic and are not present for the purpose of breaking up unwanted consonant clusters. Therefore, they must be reductions of underlying tense vowels. However, it is not possible to determine which tense vowels underlie which schwas, since forms like those in (27) are not derivationally related to other forms in which the tense vowel appears on the surface. Since any decision about which tense vowels underlie these schwas would be an arbitrary one, we have chosen to represent them as underlying schwas.

We should at this point consider the Wilson (1972) analysis of this problem. In 2.5. of her dissertation, she describes possible ways of handling the indeterminacy of the vowels underlying these schwas. She chooses to represent such vowels as /V/, that is, a segment marked [+syllabic], an unspecified vowel. She is unconvinced that underlying forms must be fully specified and wishes to employ the principle of maximum use of phonological rules. According to this principle, her rule that reduces unstressed interconsonantal vowels would also apply to underlying /V/ and convert it to surface schwa. This well-motivated and productive rule would then be maximally employed. To posit underlying schwa would be to minimise the use of the vowel reduction rule. Another reason for Wilson's positing underlying /V/ is that she finds it unconvincing to posit underlying schwa for those vowels which are deleted rather than reduced. She is referring to certain underlying stem-final vowels which never surface, but which are required for the correct application of her stress rule. It should be pointed out that unlike the stress rule we have adopted, Wilson's rule states that stress is assigned to the penultimate vowel in a word of two or more syllables. Suffixed and unsuffixed forms are stressed in the same way in her system. Take for example the following forms:

29.	bád	*rock*
	bədúk	*my rock*

It is clear that the second example in (29) will not be stressed correctly according to her rule, given our underlying forms.

30. /badu/ *rock*
/badu+k/ *my rock*

However, because of her conviction that her stress rule is correct, Wilson assumes that the underlying form of the suffix in (29) is not /-k/, but /-kV/, and that after stress has been assigned to the penultimate vowel, the final unspecified vowel of the suffix is deleted by the same rule that deletes the stem-final vowel of the unsuffixed form in (29). Her derivation of these forms would proceed as follows:

31.

	/badu/	/badu+kV/
Stress	bádu	badú+kV
Final Vowel Deletion	bád	badú+k
Vowel Reduction	-	bədú+k
	bád	bədúk

Wilson treats all suffixes consisting of a single consonant in this manner, that is, by placing the unspecified vowel /V/ in word-final position, so as to ensure correct stress placement. An analysis which posits underlying schwa in this position is unattractive to her. However, there is no motiviation whatsoever for positing any vowel at all in this position, if one accepts the hypothesis that suffixed and unsuffixed forms are stressed differently, as we have demonstrated. Thus the problem of which vowel to posit in forms like the second example of (29) is completely eliminated, and we are free to focus in on the more basic problem of the indeterminacy of the vowels which underlie schwas in examples such as those in (27). Our position is the following: when a surface schwa cannot be accounted for by means of the Vowel Reduction rule (10), the Glottal Schwa Epenthesis rule (13), the Dental Schwa Epenthesis rule (17), the Prefix Schwa Epenthesis rule (26), we represent it in underlying form as a schwa. It would seem that the language is moving from a position in which the underlying quality of all schwas could be determined to a position where this is no longer true. At this point, the underlying quality of only some schwas can be determined. It is our prediction that as the language develops in the future, the number of schwas whose underlying quality can be determined will diminish, and that there will arise contrasts between schwas and tense vowels that cannot be accounted for by phonological rules. At that point, the status of underlying schwa will be more secure than at present.

There is rather solid evidence to support this prediction from the verb system, specifically from future participle forms, which are composed of the underlying verb stem plus a suffix /-l/. Below we give some examples:

32.

/tabak+l/	təbákl	*patch*
/dakul+l/	dəkúll	*bury*
/da?ob+l/	dəŋóbl	*cover*
/samik+l/	səmíkl	*peel*
/sesob+l/	səsóbl	*set fire*
/rusa?+l/	rsá?əl	*pound*
/kimud+l/	kmúdəl	*cut hair*
/lo?ad+l/	lə?ádəl	*break cord*
/barot+l/	bərótəl	*hide*

Their derivations are straightforward:

33.

	dəkúll	bərótəl
	/dakul+l/	/barot+l/
Stress	dakúl+l	barót+l
Vowel Reduction	dəkúl+l	bərót+l
Dental Schwa Epenthesis	-	bərótə+l
Epenthesis	dəkúll	bərótəl

In the case of stems with the underlying shape /CVCVC/, such as those in (32), it is the future participle form which alone reveals the true identity of the vowel in the last syllable. Take for example the various inflected forms of the stem /təbak/ *'to patch'*:

34.

Present middle	mətábək
Present imperfective	məlábək
Present perfective	
singular	tobəkíy
plural	twábək
Past participle	təlábək
Instrumental	olábək
possessed	oləbəkék
Gerund	oməlábək
possessed	omələbəkék

None of these forms gives any hint as to the underlying representation for the vowel of the last syllable of the stem. In each case the surface manifestation is schwa. The future participle [təbákl] is the only form that can give us this information. In all the other forms the vowel has been changed to schwa by the Vowel Reduction rule.

Consider now the inflected forms of those /CVCVC/ stems that have a high back vowel in the last syllable. For example:

35. /dakul/ *to bury*

Present middle	mədákl
Present imperfective	məlákl
Present perfective	
singular	doklíy
plural	θmákl
Past participle	dəlákl
Instrumental	olákl
Possessed	oləklék
Gerund	oməlákl
Possessed	omələklék
Future participle	dəkúll

If we did not have the future participle of this verb, we would have to assume that the underlying form of the stem is /dakl/. But the future participle tells us that it is /dakul/. In all the other forms the vowel /u/ has been deleted by the High Vowel Deletion rule (8).

Suppose the information contained in future participles of /CVCVC/ stems were not available to us for some reason. One consequence of this would be that a very large number of underlying forms would look very different from the way they do now. Instead of having the shape /CVCVC/ where both vowels are full vowels, they would have the shapes /CVCəC/ or /CVCC/. This would increase the number of underlying schwas in the language and strengthen the status of

this vowel as an underlying segment. It would also minimise the application of the Vowel Reduction rule and the High Vowel Deletion rule. These rules would still be needed for other forms and so would remain well motivated. However, the number of forms to which they would apply would be greatly lessened.

The state of affairs that we have just described is precisely that which we predict will exist in the near future, and for the following reasons. The future participles we have cited above in (32) are used mainly by older generations of Palauans. Rarely is a young person able to produce them in an elicitation session. Sometimes, when presented with such a form, the young person will admit that he understands it and has heard older people using it, but he does not use it himself. Among young people a new future participle suffix /-all/ has come into use. Consequently, for some verbs we find two future participles. For example:

36.			Conservative	Innovative
	/daŋob/	*cover*	dəŋóbl	dəŋəbáll
	/ba?id/	*break taro*	bə?ídəl	bə?ədáll
	/te?ib/	*pull out*	tə?íbl	tə?əbáll
	/ŋerod/	*hoist*	ŋəródəl	ŋərədáll
	/reŋod/	*tie*	rəŋódəl	rəŋədáll
	/lo?ad/	*break cord*	lə?ádəl	lə?ədáll
	/sesob/	*set fire*	səsóbl	səsəbáll

For some verbs we find only the innovative form, as in:

37.			
	/sikəs/	*pole raft*	sikəsáll
	/riŋət/	*chew*	riŋətáll
	/b+riid/	*scatter*	bəridáll

Either the conservative form never existed or it has disappeared, since in some cases both old and young people use the innovative form.

Consider what happens to forms to which the innovative suffix is added. For example:

38.	/daŋob/ *cover*		
	/daŋob+all/	daŋob+áll	dəŋəb+áll
		Stress	Vowel Reduction

Because the suffix contains a vowel, it attracts the stress which in turn causes the rightmost stem vowel to be subject to Vowel Reduction. The result of this is that no inflected form of this stem shows what vowel truly underlies the surface schwa which always appears as the rightmost vowel. Consequently, the underlying form must be /daŋəb/ rather than /daŋob/. It is only because we still find the conservative future participle [dəŋóbl] that we can with assurance posit the underlying form /daŋob/.

It is our prediction that in time all the conservative future participles will disappear, not only because they are being replaced with the innovative forms, but also because there are other syntactic constructions which can successfully convey the meaning which future participles convey. One such construction is exemplified below:

39.	kir+é+k	əl məlábək ər a báyl
	responsibility - my	*patch* *clothing*
	I must patch the clothing.	

This type of sentence is used much more frequently than the one which employs the future participle, which we give below:

40. a báyl a təbákl
clothing patch
The clothing should be patched.
The clothing ought to be patched.

Elimination of the conservative future participles is one manifestation of a trend which had its origins in earlier stages of the development of PAL. It is easy to see the effect of this trend if we look at some words which today have the underlying forms /CVCC/ or /CVCəC/, where the schwa does not alternate with a full vowel. Through comparison with other languages, we are able to establish the fact that these words once had the shape /CVCVC/, in which both vowels were full vowels that later were deleted or reduced to schwa, depending on their quality. For example:

41.

PAL			PAN
dákt	*fear*	/dakt/	*takut
málk	*chicken*	/malk/	*manuk
ŋáləк	*child*	/ŋaləк/	*anak
ŋíkəl	*fish*	/ŋikəl/	*ikan

The present-day forms have resulted from application of the High Vowel Deletion rule and the Vowel Reduction rule to forms like those reconstructed for PAN. For example, a word like *takut lost its u by High Vowel Deletion. Perhaps there was a stage in the language when a form of this word with an u alternated with one without an u as a result of various types of affixation and stress assignment. Then it still would have been possible to represent this word as /takut/. Today this is no longer possible, since the stem meaning *fear* always appears on the surface as [dakt] or [dəkt-]. It does not have an alternate containing an [u] in the last syllable, and so must be represented as /dakt/ in a synchronic analysis.

A word like *anak had its rightmost vowel reduced to schwa by Vowel Reduction. Perhaps there was an earlier stage when this word showed up sometimes with an a and sometimes with a schwa in the last syllable. Then it would have been possible to represent this word as /ŋalak/. However, since today the stem for *child* always appears as either [ŋaləк] or [ŋələк-], it must be represented as /ŋaləк/ in a synchronic analysis.

In such cases we see the language moving from a stage in which some stems had the shape /CVCVC/ with two full vowels to the present stage in which they have the shapes /CVCC/ or /CVCəC/. Elimination of conservative future participles continues this trend toward reshaping underlying forms. A large number of active transitive verb stems of the shape /CVCVC/ will have to be represented as /CVCC/ or /CVCəC/ when their conservative future participles disappear, since there will no longer be a way of identifying a full vowel for the last syllable.

Thus, for stems originally of the shape /CVCVC/, we have some variety in present-day underlying forms: /CVCVC/, /CVCəC/, and /CVCC/. Gradually, as the conservative future participles disappear, there will be an increase in the number of /CVCəC/ and /CVCC/ forms, at the expense of the /CVCVC/ forms. In one sense this movement toward the reshaping of underlying forms is one of simplification. Instead of three possible underlying forms for original /CVCVC/ words, as we have today, there will be two, /CVCC/ and /CVCəC/. Furthermore,

in a disyllabic form, it will not be necessary to know which of six possible vowels belongs in the second syllable, since it will always be schwa. The Stress Assignment rule will also be simplified and will read: stress the rightmost tense vowel. There will be no need to distinguish stress placement in suffixed forms from stress placement in unsuffixed forms. Suffixed /CVCəC/ and /CVCC/ forms will receive stress on the vowel of the suffix as they do with the present rule. Recall that the only suffix without a vowel that occurs on present-day /CVCVC/, /CVCəC/, and /CVCC/ forms is the conservative future participle suffix /-l/, which will eventually disappear. An unsuffixed /CVCəC/ form will receive stress on its penultimate vowel, not because stress is penultimate in suffixed forms as in the present-day system, but because the rightmost vowel of the stem is not tense. An unsuffixed /CVCC/ form will, of course, receive stress on its only vowel.

In summary, then, we have shown that phonetic schwa in PAL has several sources. It can be the reduction of an underlying tense vowel, in which case it is derived by means of the Vowel Reduction rule. It can also be the result of any one of four epenthesis rules. In some cases, schwas appear that cannot be derived by means of the reduction rule, the epenethesis rules, or any other rule. For these cases, we have posited underlying schwas and have shown that, because of a trend that is resulting in the change of underlying forms of stems, the status of such underlying schwas is becoming stronger in the language.

NOTES

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2. The underlying forms used in this paper are the same as those used in Flora (1974). As it is not possible to present here all the arguments for their justification, the reader is directed to Chapters Two and Three of that work.

3. The unsuffixed forms are affected by a productive rule of Final Vowel Deletion of the form:

$$[\text{-stress}] \rightarrow \emptyset \; / \; \underline{\quad} \; \#$$

A discussion of this rule may be found in Flora (1974), Chapter Two.

4. This formulation of Vowel Reduction is only the first version of the rule in Flora (1974), where a new formulation was developed (60) for the broader picture of PAL phonology presented there. The version given here is quite adequate for the purposes of this article.

5. An extensive discussion of the Verb Marker may be found in Chapter Two of Flora (1974).

6. The alternations exhibited in the stem-initial consonants of these examples are quite widespread throughout the PAL verb system. They can be accounted for by a set of rules discussed in detail in Chapter Three of Flora (1974).

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