REGISTER IN WESTERN CHAM PHONOLOGY[1]

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0. INTRODUCTION

An almost family-wide trait of Mon-Khmer languages has been called *register*. The term first used for Khmer by Henderson (1952) describes the binary opposition of certain features such as vocalic openness, voice quality, pitch, and consonant voicing. Where not present synchronically, register is often reconstructable in the proto form (cf. Smith 1973). Studies by Haudricourt (1954) and others have shown the relationship between such tonal languages as Vietnamese and Mon-Khmer register languages. It is perhaps not unreasonable to inquire further whether register may have even existed as a feature of Proto-Austroasiatic.

Austronesian languages have certain characteristics in common with Austroasiatic, such as affixation, syllable patterns as well as some shared vocabulary; enough so that Wilhelm Schmidt postulated Austric as the super-family. Javanese has been described as having both breathy vowels and a lowering of pitch following voiced consonants.[4] Eastern Cham has pitch as a prosodic feature in analogous phonological words.[5] The present paper looks at Western Cham[6] phonology and concludes that its primary opposition is register.

As register has been applied to many Mon-Khmer languages,[7] so now in Western Cham[8] the notion of register is further applied to Austronesian.[9] Since Western Cham is no longer viewed as genetically connected with Mon-Khmer, how is it then that Western Cham has register? Did it arise from the long interplay between Western Cham and Khmer? Western Cham has co-existed in a checkerboard pattern with Khmer for some four hundred years. Before that Proto-Chamic and some of its daughter languages developed alongside of Old and Middle Khmer for upwards of one thousand years. On the other hand, might there be an ancient prosodic bifurcation in Western Cham, Khmer, and other mainland languages which antedates the period of their common history? If that is the case, perhaps Western Cham offers register, which is not evident in the island representatives of Austronesian, as evidence to be accounted for in the reconstruction of Proto-Austronesian.

1. PHONOLOGICAL WORD

The phonological word in Western Cham is marked for two defining features: stress and register. The phonological word may be represented for stress as

PW → (SỲLL) SÝLL

where the main syllable is obligatory and has heavy stress, and the preliminary syllable is optional and has weak stress. Every phonological word ends with heavy stress. In the small class of three syllable words noted below (note 12), the first syllable is weakly stressed, and the second syllable is further reduced; the final syllable receives heavy stress. Thus the first, second, and third syllables in the Western Cham word may be called pretonic, atonic, and tonic respectively.

The other feature which functions at the phonological word level in Western Cham is register. Briefly for Khmer (Henderson, 1952) this involves the following oppositions: *voice quality* - normal, head, clear, and tense versus deep, breathy, spulchral, chest, and relaxed; *vowel quality* - more open, onglided versus close, centering diphthongs; *pitch* - relatively higher versus relatively lower (larynx also lowered); and finally, *initial*[10] *(written)*[11] *consonants* - (original) voicelessness versus (original) voicing, for the first register versus the second register respectively.

Gregerson (to appear) has suggested that the physiological basis for Mon-Khmer register as well as other variously designated phenomena in other languages of the world is the position of the tongue root. Western Cham appears to employ precisely this parameter tongue root

advancement ([TRA]) at the phonological word level.

$$PW \rightarrow \left\{\begin{matrix}[+TRA] \\ [-TRA]\end{matrix}\right\}$$

Phonological words thus marked define two registers or prosody oppositions which constitute constraints on vocalic and consonantal occurrences within the phonological word. Every segmental occurrence (whether vowel or consonant) of the feature [TRA] within the phonological word must agree as to its sign (±) with every other occurrence.

$$PW \rightarrow \neq[\alpha TRA]\hat{}\ldots\hat{}[\alpha TRA]\neq$$

Each is dealt with in turn below.

In terms of segmental types, the phonological word in Western Cham conforms to the following formula:

$$PW \rightarrow (C_2V_2)C_1(C_3)V_1(C_4)$$

where C_1 is the tonic syllable initial consonant; C_2 the optional atonic syllable consonant; C_3 an optional /l/ or /r/ as a tonic syllable cluster; C_4 the tonic syllable final consonant; where V_1 is the tonic syllable vowel and V_2 is /a/ ([a]∿[ʌ]).[12]

C_1V_1	/da/	*'duck'*
	/po/	*'master'*
$C_1V_1C_4$	/kan/	*'fish'*
	/ʔbaʔ/	*'contagious'*
$C_1C_3V_1$	/gla/	*'crazy'*
	/jru/	*'medicine'*
$C_1C_3V_1C_4$	/hrum/	*'sheath'*
	/blăy/	*'to buy'*
$C_2V_2C_1V_1$	/taha/	*'aged'*
	/tasi/	*'comb'*
$C_2V_2C_1V_1C_4$	/kakan/	*'to chew the cud'*
	/manayh/	*'pineapple'*
$C_2V_2C_1C_3V_1$	/cakla/	*'lightning'*
	/pahla/	*'to hold a ceremony'*
$C_2V_2C_1C_3V_1C_4$	/madrum/	*'guava'*
	/tañraʔ/	*'dazzling'*

2. CONSONANTS

The primary opposition in the set of consonant segments is the tongue root advancement ([TRA]) feature. This feature divides the consonants into two natural classes by which they are mapped on to the syllable level of the phonological word. Other distinctive features of Western Cham consonant phonology are [±continuant], [±glottal], [±nasal], [±aspiration], [±coronal], and [±anterior]. The following charts the consonant segments:

	[-TRA]				[+TRA]			
	[+ant -cor]	[+ant +cor]	[-ant +cor]	[-ant -cor]	[+ant -cor]	[+ant +cor]	[-ant +cor]	[-ant -cor]
[-asp] [-gltt]	p	t	c	k	p(*b)[13]	t(*d)	c(*j)	k(*g)
[+asp] [-cont]	ph	th	ch	kh	ph(*bh)	th(*dh)	ch(*jh)	kh(*gh)
[+gltt]	?b	?d	?j	?				
[-nas] [+cont]		s		h	w	l	y	r
[+nas]					m	n	ñ	ŋ

CHART ONE

The [+TRA] stops are not voiced synchronically. What then distinguishes between the otherwise identical sets of stops? Is the feature [TRA] merely a dummy feature? The evidence seems to indicate otherwise. A voiceless stop [+TRA] precedes a vowel segment of the same vowel height and voice quality as does the voiced segment $\begin{bmatrix}+\text{TRA}\\+\text{cont}\end{bmatrix}$. If no neutralising of vowel height or voice quality thus results in the direction of what is found in a [-TRA] stop-vowel sequence, it is perhaps safe to inquire whether the $\begin{bmatrix}+\text{TRA}\\-\text{cont}\end{bmatrix}$ set is not actually characterised by an advanced tongue root. Though such an advanced tongue root is undetectable to the human eye, we expect that acoustic measuring of Western Cham stops will indicate a difference between the two sets based on the position of the tongue root. Gregerson's arguments (to appear) for the feature TRA further support our hypothesis.

While the two sets of stops are *only* distinguished by [TRA], the pairs of /s,l/ and /h,r/ have other features that distinguish them, though not relevant here.

Any consonant in Chart One above may be the tonic syllable initial consonant, the C_1 of the segment formula, as long as it agrees with the PW [TRA] type. Furthermore, every C_1 consonant may be preceded by an

atonic syllable. The atonic syllable consonant is much more restricted as to what may occur. Consonant segments marked [+asp] are not permitted, with rare exception, e.g. /thanăw/ *'magical power'* from /thăw/ *'to know'* by infixation. Consonants marked [+glottal] are excluded with the regular exception of /ʔ/. Historically words with an /ʔa-/ atonic syllable were very common. Presently most such words may drop the atonic syllable, so it is expected that the direction of the language is towards excluding all [+glottal] syllables of this type.

/ʔabih/ → /bih/ *'all'*

Of segments marked $\begin{bmatrix}+\text{cont}\\+\text{nas}\end{bmatrix}$ only /m/ is permitted as the atonic syllable initial consonant with the exception of /n/ in a few words which may vary with /l/ among the dialects.

/nagăr/ ∿ /lagăr/ *'country'*

Thus the admissible atonic syllable initial consonants may be charted as follows:

p	t	c	k	p(*b)t(*d)c(*j)k(*g)
			ʔ	
s			h	m
				w l y r

As has been indicated above, the position of the tongue root is the most important limitation on consonant occurrence. Consonant segments are admitted into any pretonic, atonic, or tonic syllable consonant initial position when their [TRA] values agree with the [TRA] specification of the phonological word. Thus in monosyllables, /m/ e.g. is admitted into a syllable initial consonant position for phonological words specified as [+TRA], but it would be rejected from phonological monosyllables of [-TRA] specification.

$PW_{[+TRA]}$	/bom/	*'one with night blindness'*
	/ŋuy/	*'to wear below the waist'*
$PW_{[-TRA]}$	/tom/	*'to meet'*
	/sit/	*'small'*

(All phonemic examples in this paper replace [+TRA] /p t c k/ with /b d j g/ for easy recognition.)

Dissyllables also conform to the phonological word [TRA] specification.

$PW_{[+TRA]}$	/daning/	*'wall'*
	/mabŭʔ/	*'drunk'*
	/babayh/	*'sheep'*
	/ramɔŋ/	*'tiger'*

$PW_{[-TRA]}$	/tasi?/	*'ocean'*
	/hacih/	*'clean'*
	/ka?jah/	*'bad'*
	/hasĭt/	*'a little'*

Underlying this harmony of [TRA] specification with the phonological word is the phenomenon:

(1) $\begin{bmatrix}+TRA\\-cont\end{bmatrix}\begin{bmatrix}-TRA\\+cont\end{bmatrix} \rightarrow [+TRA][+TRA]$

(2) $[-TRA]\begin{bmatrix}+TRA\\+cont\end{bmatrix} \rightarrow [-TRA][-TRA]$

Some consonants which normally carry the feature [αTRA] will be marked [-αTRA] in certain environments. In (1) above, tonic syllable initial $\begin{bmatrix}-TRA\\+cont\end{bmatrix}$ consonants will be marked [+TRA] when preceded by an atonic initial $\begin{bmatrix}+TRA\\-cont\end{bmatrix}$ consonant. (2) allows the opposite. [+TRA] is marked [-TRA] in any tonic syllable initial [+cont] consonant whose atonic syllable is [-TRA].

$PW_{[+TRA]}$	/bahăw/	*'new'*
$PW_{[-TRA]}$	/karo/	*'healthy'*
	/han+ŋ/	*'crossbow'*

The phonological word [TRA] harmony specification rule is blocked at one point in Western Cham phonology. The following occur contrary to expectation:

(3) $\begin{bmatrix}-TRA\\+cont\end{bmatrix}\hat{}\begin{bmatrix}-TRA\\+voc\end{bmatrix}\hat{}\begin{bmatrix}+TRA\\-cont\end{bmatrix}\hat{}\begin{bmatrix}+TRA\\+voc\end{bmatrix}$

(4) $\begin{bmatrix}+TRA\\+cont\end{bmatrix}\hat{}\begin{bmatrix}+TRA\\+voc\end{bmatrix}\hat{}[-TRA]\hat{}\begin{bmatrix}-TRA\\+voc\end{bmatrix}$

To deal with this occurrence such tonic syllable segments must have the limiting feature [+RULE BLOCK] added to the above string of segment features. Thus a disharmonious syllable sequence is allowed into Western Cham phonology.

$PW_{[+TRA]}$	/lasăy/	*'cooked rice'*
	/lakăw/	*'to request'*
$PW_{[-TRA]}$	/kabaw/	*'buffalo'*
	/hadom/	*'how much'*

The maximum expansion of the phonological word in Western Cham allows for three syllables. Such sequences of syllables also are constrained by the [TRA] phonological word feature specification. In cases of the phenomenon noted in (1) and (2) above and in the contrary to expectation occurrences in (3) and (4), the three syllables

$Syll_1$	$Syll_2$	$Syll_3$
(pretonic)	(atonic)	(tonic)

are dealt with first as $Syll_1$ and $Syll_2$ considered together, and then their combined output as a unit is added to $Syll_3$.

$$(Syll_1 + Syll_2) + Syll_3$$

/balakiəŋ/ *'hornbill'*

It may seem strange that the initial syllable in Western Cham phonological words is ever consistent with the $PW_{[TRA]}$ sign and that the few inconsistencies occurring are found in the tonic syllable. The tonic syllable thus seems to lose some of its importance, which alone carries stress and vowel differentiation (pretonic and atonic syllables have only /a/). The answer lies in a look at the proto language types which stress the penultimate syllable and which permit the full array of vowels in non-final syllables. Therefore Western Cham comes from ancestors in which stress and full vowel displays occurred on the penultimate syllable. The synchronic vowel restriction to and stress placement on the final syllable in Western Cham perhaps hints at the direction of [TRA] specification in the future.

It is evident in Western Cham that there are some consonant segments, viz. [+cont], which are especially sensitive to the sign of the phonological word [TRA] specification. On the other hand, consonants marked [-cont] resist that same specification in certain environments. There seems to be a ranking of consonants as to strength. While the concept of consonant ranking is nothing new (compare Pike (1954) on Mexican languages and Purtle (1969) on Southeast Asian languages), it remains to be spelled out exactly what is the relationship of consonant ranking to the concept of tongue root movement.

The consonant chart on page 20 may be quartered along the lines of [±TRA] and [±cont]. From this division it may be seen that atonic and tonic initial consonants may combine into words in sixteen potential pairs. Of these, we find fifteen combinations actually occurring in Western Cham. Only the $\begin{bmatrix}+TRA\\-cont\end{bmatrix}\begin{bmatrix}-TRA\\-cont\end{bmatrix}$ initial consonant sequence combination does not occur. Synchronically this has become the sequence $\begin{bmatrix}-TRA\\-cont\end{bmatrix}\begin{bmatrix}-TRA\\-cont\end{bmatrix}$.[14]

Clustering is a regular feature of Cham. The optional C_3 consonant admits either /l/ or /r/. In every case the cluster formed conforms to the conditions on consonant occurrence noted above. Both /l/ and /r/ are [+TRA] but may be realised as [-TRA] to occur with the word patterning of [TRA] where necessary. What is an atonic syllable plus a tonic syllable and what is a tonic syllable plus /l/ or /r/ are distinguished

by such minimal pairs as /barah/ *'to swell up'* and /brah/ *'pounded rice'*. A cluster may be preceded by an atonic syllable, as in /pa?blɔə?/ *'to deceive'*. /r/ may cluster with the following consonants:

	p	t	c	k	p(*b)	t(*d)	c(*j)	k(*g)
?b		?j						
	s		h	m		n		ñ

/l/ is more restricted, not occurring with [+nas] nor with $\begin{bmatrix}-\text{cont}\\+\text{cor}\end{bmatrix}$.

/w/ might be also considered a consonant segment which is admitted into clustering, as /Cw/ + /a/ (the only vowel with which it occurs). Instead in this environment it is analysed as /ɔə/ below. /h/ is not analysed as C_3 because it has the limited occurrence of being found with voiceless stops only. Nasals and alveolar stops cluster phonetically with preceding /h/ and /s/ respectively, but this is not construed as phonemic, because they do not allow an atonic syllable to precede them and because native speakers separate them in deliberate speech.

/ham+/	[hm+]	*'wet farm'*
/sadaŋ/	[sta·ŋ]	*'sugar'*

Final consonants (C_4) are indicated by the following array:

p	t		k
			?
			h
m	n		ŋ
w	l	y	r
w?		y?	r?
		yh	

Register has no visible effect on final consonants in Western Cham. Though there may be some carry-over effect from the rest of the syllable, it is not detectable without instrumentation. It is probable that in the final consonants the tongue root resumes a neutral position (see note 10).

/w y r/ represent semiconsonant counterparts of [u i +] respectively. /w? y? r?/ are analysed as complex phonemic units. The generality lost in this analysis is offset by the economy gained in the corresponding vowel analysis. Not to take /w? y? r?/ as complex final units would necessitate /w y r/ being analysed with preceding vowels as off-glides. This grouping would add a three-vowel category to the glides, greatly burdening economy in description. The same reasoning applies to /yh/.

Some historical comment on Western Cham consonants is in order here. As mentioned earlier, there was originally a distinction between voiced and voiceless stops. The Cham script, now largely in disuse among

Western Cham speakers, makes this distinction. Final /y?/ was originally final */c/ and final /yh/ was once final */s/. As noted above, consecutive consonants of the form [+TRA, -cont][-TRA, -cont] in Proto-Chamic have become [-TRA, -cont][-TRA, -cont] today. *ba?ar becomes /pa?ar/ *'paper'*.

Eastern Cham today has the eight [+TRA, +cont] consonant segments as [-TRA]. Though no available analysis of Eastern Cham deals with phonemes in terms of tongue root position, it is recorded to have a lower pitch in words analogous to what Western Cham has as [+TRA] for the [-cont] consonants. That this parallel is lacking for the consonants marked [+cont] shows a massive switch since Proto Cham. Apparently this change came from the influence of Khmer which has a complete correspondence of like [TRA] sets with Western Cham.

/p b ph bh ?b/

Tonic Syllable Initial:

/p/	[p]	/pă?/	*'to string'*
		/kapah/	*'cotton'*
/b/	[p]	/bom/	*'one with night blindness'*
		/tabɛə?/	*'to go out'*
/ph/	[pʰ]	/pha/	*'thigh'*
		/capha/	*'trousers'*
/bh/	[pʰ]	/bhi?/	*'monk'*
		/pabha/	*'to distribute'*
/?b/	[ʔb]	/?bă?/	*'salty'*
		/pa?băŋ/	*'door'*

Atonic Syllable Initial:

/p/	/pacăŋ/	*'to protect'*
/b/	/badăn/	*'body'*

Tonic Syllable Initial containing /r l/:

/p/	/prah/	*'to dig, scratch'*
	/papruŋ/	*'to enlarge'*
	/pla/	*'to plant'*
	/taplə?/	*'to overturn'*
/b/	/brăy/	*'to give'*
	/kabray?/	*'to scrape'*
	/blăy/	*'to buy'*
	/?ablɔə/	*'elf, fairy'*
/?b/	/?brŏm/	*'arrow'*
	/?bleŋ/	*'slanted, unlevel'*
	/pa?blĕn/	*'to glance disapprovingly'*

Tonic Syllable Final:

/p/	[p˂]	/krap/	*'bamboo instrument'*

/t d th dh ʔd/

Tonic Syllable Initial:

/t/	[t]	/tŭl/	*'mattress'*
		/matăw/	*'child-in-law'*
/d/	[t]	/diwʔ/	*'wife, life'*
		/hadăy/	*'after'*
/th/	[tʰ]	/thŭl/	*'dust'*
		/mathɔən/	*'beautiful (non-human)'*
/dh/	[tʰ]	/dhan/	*'branch'*
		/padhih/	*'funeral ceremony'*
/ʔd/	[d]	/ʔdih/	*'to sleep'*
		/paʔdiʔ/	*'to hurt'*

Atonic Syllable Initial:

/t/		/tabăw/	*'sugarcane'*
/d/		/dagăy/	*'tooth'*
/th/		/thanăw/	*'magical power'*

Tonic Syllable Initial containing /r/:

/t/		/tra/	*'more, further'*
		/katrăw/	*'pigeon'*
/d/		/drăy/	*'classifier for animals'*
		/padrah/	*'to speed something up'*

Tonic Syllable Final:

/t/	[t˂]	/ŋăt/	*'to be careful'*

/c j ch jh ʔj/

Tonic Syllable Initial:

/c/	[tš]	/cuʔ/	*'to wear above the waist'*
		/macih/	*'to sketch'*
/j/	[tš]	/jip/	*'Thursday'*
		/kajuh/	*'wrinkled'*
/ch/	[tšʰ]	/chɛə/	*'spinning wheel'*
		/kacha/	*'marijuana'*
/jh/	[tšʰ]	/jhŭl/	*'to push'*
		/pajhaŋ/	*'to look with a light'*
/ʔj/	[ʤʏ]	/ʔjuəl/	*'light (weight)'*
		/kaʔjah/	*'bad'*

Atonic Syllable:

/c/	/ca?bu/	*'to expose to sun'*
/j/	/jadu/	*'deflated'*

Tonic Syllable Initial containing /r/:

/c/	/cray?/	*'to shine'*
	/pacro?/	*'to feed'*
/j/	/jr̥/	*'cane'*
	/lajrăw/	*'crowded'*
/?j/	/?jrăw/	*'thornless bamboo'*

Tonic Syllable Final:

/c/ historically */c/ but has become /y?/ (see /y?/)

/k g kh gh ?/

Tonic Syllable Initial:

/k/	[k]	/kăn/	*'poor'*
		/laka/	*'wound, sore'*
/g/	[k]	/gah/	*'direction'*
		/lagɛh/	*'easy'*
/kh/	[kʰ]	/khan/	*'to tell'*
		/lakhah/	*'to marry'*
/gh/	[kʰ]	/gha/	*'root'*
/?/	[?]	/?aw/	*'shirt'*
		/la?an/	*'cold'*

Atonic Syllable Initial:

/k/	/ka?iŋ/	*'waist'*
/g/	/gaba?/	*'to walk'*
/?/	/?khăr/	*'letter, character'*

Tonic Syllable Initial containing /r l/:

/k/	/krĕ?/	*'a kind of tree'*
	/kakran/	*'saw fish'*
	/klɛh/	*'to separate'*
	/paklɔh/	*'to break, sever'*
/g/	/grɛ/	*'bed'*
	/lagrăm/	*'cadence'*
	/glɛh/	*'exhausted'*
	/taglaw/	*'a kind of tree'*

Tonic Syllable Final:

/k/	[kˀ]	/lak/	*'to hit the target'*
/?/	[?]	/la?/	*'flat'*

/s h/

Tonic Syllable Initial:

/s/	[s]	/sa/	*'one'*
		/tasăw/	*'breast'*
/h/	[h]	/hay/	*'also'*
		/kahɛ/	*'a kind of fish'*

Atonic Syllable Initial:

/s/		/sa?bo/	*'colour'*
/h/		/hadăr/	*'to recall'*

Tonic Syllable Initial containing /r l/:

/s/		/srăm/	*'to practise'*
		/pasru/	*'funny'*
		/slo/	*'specialised marriage word'*
		/maslăr/	*'pale'*
/h/		/hri/	*'to sing'*
		/mahrăy/	*'day before yesterday'*
		/hlăy/	*'where'*
		/dahliŋ/	*'to tie'*

Tonic Syllable Final:

/s/ historically */s/ but has become /yh/ (see /yh/)

/h/		/tah/	*'far'*

/w l y r/

Tonic Syllable Initial:

/w/	[ʉ̯]	/waw/	*'stringed instrument'*
		/yawa/	*'spirit'*
/l/	[l]	/lăw/	*'to file'*
		/talăy/	*'string, line'*
/y/	[y]	/yăw/	*'as, like'*
		/kaya/	*'rich'*
/r/	[ɡ]	/raw/	*'to wash'*
		/tariəŋ/	*'diligent'*

Atonic Syllable Initial:

/w/		/wajɛ̆p/	*'bond'*
/l/		/lanuəy/	*'moss'*
/y/		/yam+n/	*'sweet'*
/r/		/ralɔ/	*'flesh'*

Tonic Syllable Final:

/w/	[ᵘ]	/săw/	*'dog'*

/w /	[ᵘ?]	/săw?/	*'smoke'*
/l/	[l]	/tŭl/	*'mattress'*
/y/	[ⁱ]	/glay/	*'forest'*
/y?/	[ⁱ?]	/lay?/	*'to say'*
/yh/	[ⁱh]	/nayh/	*'intelligent'*
/r/	[ᵊ]	/săr/	*'seed'*
/r?/	[ᵊ?]	/mir?/	*'younger uncle'*

/m n ñ ŋ/

Tonic Syllable Initial:

/m/	[m]	/may/	*'to come'*
		/yam+n/	*'sweet'*
/n/	[n]	/nay/	*'queen'*
		/banay/	*'female animal'*
/ñ/	[ɲ]	/ñuy/	*'gnat'*
		/tañ+/	*'ear'*
/ŋ/	[ŋ]	/ŋuy/	*'to wear below the waist'*
		/paŋăt/	*'to caution'*

Atonic Syllable Initial:

/m/	/malăm/	*'night'*
/n/	/nagăr/	*'country'*

Tonic Syllable Initial containing /r l/:

/m/	/mray/	*'cotton thread'*
	/tamra?/	*'lead (metal)'*
/n/	/nrə?/	*'bridle'*
	/tanrăw?/	*'weight'*
/ñ/	/tañra?/	*'dazzling'*

Tonic Syllable Final:

/m/	/jam/	*'dish'*
/n/	/jan/	*'to rain'*
/ŋ/	/caŋ/	*'to wait'*

3. VOWELS

Western Cham has a basic three by three phonemic vowel system. This is comparable to Eastern Cham and other Chamic languages. Lee (1974) discusses the vowel inventory of Chamic languages and then compares it with the rest of Austronesian where a four vowel system is the norm. It is evident that all of Chamic increased its vocalic distinctions to approximate roughly the existing array of Mon-Khmer languages at an early date.

		[-bk]			[+bk]	
				[-rd]	[+rd]	
		[-gl]	[+gl]		[-gl]	[+gl]
[+hi]	[+lg]	i	iə	ɨ	u	uə
	[-lg]	ɪ̆			ŭ	
[-hi -lo]		e		ə	o	
[+lo]	[+lg]	ɛ	ɛə	a	ɔ	ɔə
	[-lg]	ɛ̆		ă	ɔ̆	

CHART TWO

The three by three vowel system comes from a back versus nonback tongue position; the back vowels further divide as to rounding; and a three way tongue height distinction: high, mid, and low. Further vowels come from the features [long] and [glided] giving 18 syllable nuclei. The short vowels occur with only some of the finals with which long vowels occur, and never in open syllables. Thus long vowels are taken as the norm. Shortness is usually noted by shorter duration only, but a difference in vowel height is noted in the following cases. Short /ɪ̆/ becomes [ɩ] before all nasal and alveolar finals; before other finals it is heard as [i]. Its long counterpart is heard as [i·] with all finals. Similarly short /ŭ/ becomes [ʊ] before alveolar finals (but not nasals); [u] elsewhere. Long /u/ is heard as [u·] in every case. /ɛ/, though heard as [a^{e}] when long, is [ɛ] short in most regions. /Vh/ is phonetically short. It is the only V̆C combination which does not have a long counterpart. It is written without the diacritic.

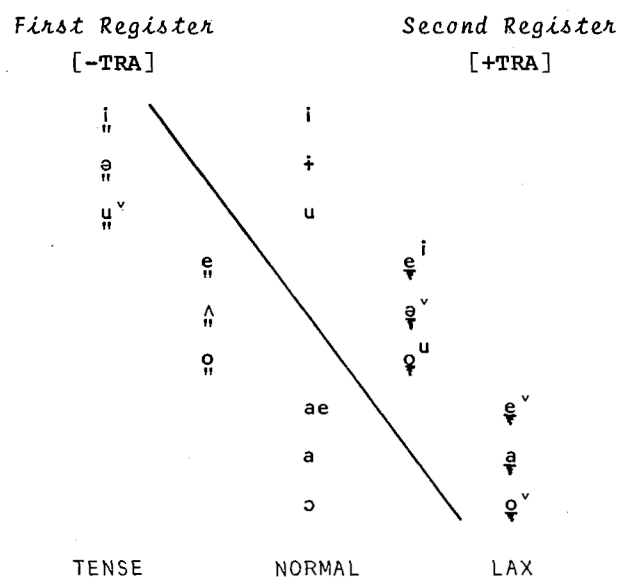
/i ɛ u ɔ/ may also be modified with a glide to [ə]. Thus there is a three-way contrast with the long and short vowels and glides:

/tu?/ *'section'*
/tŭ?/ *'stew'*
/tuə?/ *'a kind of tree'*

/a/ has an onglide [^{u}a] (sometimes [ua]) which as noted above could be analysed as a cluster, /Cwa/. Instead it is here analysed as /ɔə/. The other three vowels plus glide to neutral vowel are phonetically [i^{ə}], [ɛ^{ə}], and [u^{ə}]. What presses us to analyse [^{u}a] as /ɔə/ is the parallel case of /ɛə/. Synchronically Western Cham has developed /ɛə/ from an earlier [^{i}a]. There are still traces of [^{i}a] ∿ [^{i}ɛ] though it is now overwhelmingly [ɛə]. Eastern Cham maintains the older form /ya/ or [^{i}a]. Therefore we adjust our phonemicisation to account for an

almost completed change. Eastern Cham has /ya/ and /wa/ where Western Cham has the shifted forms /ɛə/ and /ɔə/ respectively. /pa?dɛə?/ [paɗɛᵊ?] ~ [paɗⁱɛ?] *'hot'*: shift nearly complete. /dɔən/ [tᵘan] *'to pick'*: shift only beginning.

The feature [TRA] is an integral part of the Cham vowel system. Chart Two, though phonemic, would represent only half of the phonetic realisation of the vowel system. It may be marked [+TRA] for example, and a second parallel chart marked with the opposite [-TRA]. Register opposition in Cham is phonetically more evident in the vowel, though its domain is over consonant and vowel alike. First, all nine vowel pairs contrast in voice quality with the second register being slightly breathy. The high vowels for first and second register respectively contrast as tense (V̰) versus normal (V) voice quality. The mid vowels contrast as tense (V̰) versus lax (V̞). The low vowels contrast as normal (V) versus lax (V̞).[15] This phenomenon is shown more clearly by the following charting of the vowels that are heard phonetically in Cham (note however that environment causes some adjustments below):



As Gregerson (to appear:11-12) notes, this opposition of voice quality is conditioned by the forward/backward movement of the tongue root. He also notes the effect of the position of the tongue root on tongue body height, and thus on vowel height. First register is usually manifested by a lower vowel than the second register. /a i/ alone do not show this lowering. Second register also displays a lower pitch in analogous vowels in Western Cham.[16] Length and glided vowels occur equally in

both registers. What is found in one register is parallelled in the second.[17]

Words which are marked [+TRA] take a second register vowel, that is, a vowel which may differ from the first register counterpart in voice quality, vowel height, and/or pitch. An advanced tongue root constrains the vowels and consonants such that only those marked [+TRA] are admitted, whichever the syllable. In atonic syllables, which take only /a/ except in non-adapted loans and names, tne vowel differs only in vowel quality, whereas the main focus of the tonic syllable allows for difference in vowel height as well.

The following examples are illustrative of the various vowel manifestations in given environments. As noted before, a vowel preceding final /h/ is always short, so examples in that environment are omitted here.

Nonback Vowels /i a ɛ/:

/i/	[i·]		/sit/		*'small'*
			/mañi/		*'sound'*
/iə/	[iə̆]	(___/w/∿/w?/)	/iəw?/	[iə̆^{u}?]	*'to see'*
			/iəw/	[iə̆^{u}]	*'to call'*
	[iə]	(elsewhere)	/siət/		*'to slide on seat'*
			/kiə/		*'close fit'*
/ɪ̆/	[ɪ]	(___ [+nas] [+cor] [+ant])	/khɪ̆m/	[k^{h}ɪm]	*'to smile'*
			/hasɪ̆t/	[hasɪt]	*'a little'*
	[i]	(elsewhere)	/klɪ̆k/	[klik]	*'to tickle'*
/e/	[e̝]	($C_{[-TRA]}$___/?/)	/pate?/	[pate̝?]	*'sarong'*
	[e^{i}]	(elsewhere)	/plen/	[ple^{i}ŋ]	*'instrument'*
			/page/	[pake^{i}]	*'tomorrow'*
/ɛ/	[e̞·]	($C_{[+TRA]}$___)	/mɛ?/	[me̞·?]	*'mother'*
	[ae]	($C_{[-TRA]}$___)	/pɛt/	[paet]	*'out of shape'*
/ɛ̆/	[ɛ]		/sɛ̆t/		*'same as'*
			/tɛ̆?/		*'worn out'*
/ɛə/	[ɛə̆]	(___/h/∿/?/)	/?bɛəh/	[ʔbɛə̆h]	*'enough'*
			/paʔd ʔ/	[paʔdɛə̆?]	*'hot'*
	[ɛə]	(elsewhere)	/hɛə/		*'to cry'*
			/tɛən/		*'stomach'*

Back Unrounded Vowels /ɨ ə a/:

/ɨ/	[ə·]	($C_{[-TRA]}$___C)	/pɨ?/	[pə·?]	*'flower petal'*
	[ɨ·]	(elsewhere)	/lanɨŋ/		*'wide'*
			/hɨ/		*'you (fam.)'*

/ə/	[ʌ]	($C_{[-TRA]}$—$\begin{bmatrix}-ant\\-cor\end{bmatrix}$)	/tə?/	[tʌ?]	*'to weigh'*
	[ə̰ˇ]	($C_{[+TRA]}$—$\begin{bmatrix}-ant\\-cor\end{bmatrix}$)	/bə?/	[pə̰ˇ?]	*'to dam'*
	[ɨ]	([+nas]—$\begin{bmatrix}-ant\\-cor\end{bmatrix}$)	/mə?/	[mɨ?]	*'to carry'*
	[ʌ·]	(elsewhere)	/?dʌ/		*'to equal'*
/a/	[a·]		/kan/	[ka·n]	*'fish'*
/ă/	[a]		/kăn/	[kan]	*'poor'*

Back Rounded Vowels /u o ɔ/:

/u/	[u·]		/tu?/		*'section'*
/ŭ/	[ʊ]	(—$\begin{bmatrix}+ant\\+cor\end{bmatrix}$)	/thŭn/	[t^hʊn]	*'year'*
			/drŭt/	[tɡʊt]	*'dimple'*
	[u]	(elsewhere)	/tŭ?/	[tu?]	*'stew'*
/o/	[o̤]	($C_{[-TRA]}$—C)	/pom/	[po̤m]	*'woods'*
	[o^{ʊ}]	(elsewhere)	/lo/	[lo^{ʊ}]	*'many'*
/ɔ/	[ɔ̰ˇ·]	($C_{[+TRA]}$—)	/dɔ?/	[tɔ̰ˇ·?]	*'to be at'*
	[ɔ·]	($C_{[-TRA]}$—)	/tɔ?/	[tɔ·?]	*'bottom'*
/ɔ̆/	[ɔ̰ˇ]	($C_{[+TRA]}$—)	/bɔ̆?/	[pɔ̰ˇ?]	*'to rot'*
	[ɔ]	($C_{[-TRA]}$—)	/pɔ̆?/	[pɔ?]	*'to peel'*
/ɔə/	[^{ʊ}a]		/hɔə?/		*'to eat'*
			/thɔə/		*'to travel'*

NOTES

1. Special appreciation is due Kenneth Gregerson for his suggestions at various stages in the development of this paper, and Ernest W. Lee for comments from his background in Chamic studies.

2. Summer Institute of Linguistics, Phnom Penh, Khmer Republic.

3. Ministry of National Education, Phnom Penh, Khmer Republic.

4. Henderson (1965), Horne (1961).

5. Blood (1967).

6. Western Cham is a member of the Chamic subfamily of Austronesian. It is spoken in certain parts of the Khmer Republic (Cambodia) and in the western section of the Vietnamese Delta region. Its speakers number some 30,000 persons in Viet Nam and something in excess of 150,000 in Cambodia. Other Chamic member languages include Roglai, Eastern Cham, Chru, Jarai, Rade, and Haroi. (In the literature Eastern Cham or Coastal Cham is usually referred to simply as Cham, and Western Cham usually as Cambodian Cham or Khmer Islam. This description represents about a year's contact with Cham speakers in the Phnom Penh area in 1972-3.

7. See Gregerson (to appear) who lists eight Viet Nam languages with register (p.5). Also Shorto (1967) for Mon.

8. Chamic was once classed within Mon-Khmer by such early investigators as Schmidt (1907) and Przyluski (1924). Such studies as Pittman (1959), Thomas (1963), and Lee (1965) provide good evidence for putting it with Austronesian.

9. Lee sees some evidence for register in Haroi. Ernest W. Lee (personal communication). Henderson (1965), using the term phonation-type, and Lee (1974) find evidence of register in Austronesian.

10. Pittman (1972) reports register-related effects of final consonants for Jireli, a Tibeto-Burman language of Nepal.

11. The Khmer script taking the surd/sonant distinction of the Indic scripts either applied it to its own voiceless/voiced distinction, now lost (the prevailing view), or applied it by analogy to a vocalic opposition, the precursor of the present binary vocalic system. David D. Thomas (personal communication) suggests the features [± voicing] and [± voice quality] were both present in Old Khmer.

12. There is a small class of three syllable words in Cham which are described by the formula:

$$C_2V_2C_2V_2C_1V_1(C_4)$$

It seems evident that these words, representing less than one per cent of lexical entries (apart from those usual two syllable verbs which take the productive prefix /pa-/), were more numerous historically. It does not appear that this is an unusual class, say, of loan words, but an indigenous set which once had more members. As this class is being dropped from normal speech, it is the atonic syllable (C_2V_2) or the atonic vowel alone /a/, when C_2 is /m/, which is being deleted. In the former case, the new pattern fits the normal formula for the phonological word. In the latter case, a new phonological word pattern is appearing:

$$C_2V_2m.C_1V_1(C_4)$$

$C_2V_2C_2V_2C_1V_1(C_4)$	$\longrightarrow$	$C_2V_2C_1V_1(C_4)$	
/galaba?/	∿	/gaba?/	*'to walk'*
$C_2V_2C_2V_2C_1V_1(C_4)$	$\longrightarrow$	$C_2V_2m.C_1V_1(C_4)$	
/tamanɛə/	∿	/tam.nɛə/	*'to dance'*
/samalăn/	∿	/sam.lăn/	*'nine'*

Because of its rareness, this class of words will not be included in the general discussion to follow.

13. The set of [+TRA] stops has been devoiced since Proto-Chamic which had the voiceless/voiced distinction:

p	t	c	k	b	d	j	g
ph	th	ch	kh	bh	dh	jh	gh

14. The original analysis of this paper is worth summarising here. The division of [±TRA] and [±cont] was also the basis of a chart reproduced here:

	A	B
1	p t c k ph th ch kh ?b ?d ?j ?	b d j g bh dh jh gh
2	s h	m n ñ ŋ w l y r

Register **A** and **B** in Western Cham words were accounted for by the following "dominance" rules:

1. **A + A = A**
2. **B + B = B**
3. $A_1 + B_1$ = **second element**
4. $B_1 + A_2 = B$
5. $A + B_2 = A$

These rules (after Purtle (1969) for Khmer), not ordered with respect to each other nor within the left hand members, indicate register of tonic syllable. Quadrant A_1 and B_1 are equally strong, they both dominate A_2 and B_2. A_2 also dominates B_2. This analysis is based entirely on the consonant "strength". The consonant was seen to "dominate" or determine the register characteristics of the following vowel. And based on the above five "dominance" rules, certain atonic syllable initial consonants exerted their strength over an intervening tonic syllable initial to determine the registerness of the tonic syllable vowel. The present analysis in terms of the position of the tongue root provides a clearer statement of what is actually happening.

In the following examples, consonant dominance is seen acting in the combining of various syllables to form words. In the examples, a grave accent /ˋ/ is added to indicate clearly second register.

$A_1 + B_1$	/ka/ + /bàw/ → /kabàw/	*'buffalo'*
$B_1 + A_1$	no examples, historically B_1 has become A_1.	
$B_1 + A_2$	/bà/ + /hăw/ → /bàhăw/	*'new'*
$A_2 + B_1$	/ha/ + /dòm/ → /hadòm/	*'how much'*
$A_1 + B_2$	/ka/ + /rò/ → /karo/	*'strong'*
$B_2 + A_1$	/là/ + /kaw/ → /làkaw/	*'to step over'*
$A_2 + B_2$	/ha/ + /nɨŋ/ → /hanɨŋ/	*'bow'*
$B_2 + A_2$	/là/ + /săy/ → /làsăy/	*'cooked rice'*

15. Compare Javanese: normal versus lax, breathy opposition.

16. Compare Eastern Cham: lower pitch for original voiced stops.

17. Compare centering and glides in Mon and Khmer (Shorto) (Henderson).

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