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THE REGISTER SYSTEMS OF THAVUNG

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1. INTRODUCTION[1]

a. *The origin of the tone system*

The current explanation of the historical origin of the Thavung (t'əviiŋ) tone system follows closely the hypothesis introduced by André-G. Haudricourt in 1954. This eminent French linguist had posited that the pitch distinctions of Vietnamese, a language closely related to Thavung, had originated in response to conditioning by word-final consonants.[2] Three proto-tones had developed phonetically: Rising (*sắc-nặng) before final occlusives, falling (*hỏi-ngã) before final spirants, and *ngang-huyền (probably level) elsewhere. By the 6th century A.D. they had become phonemic upon loss of final ʔ and h. And by the 12th century, they had split upon merger of initial oral stops into the six tonemes that appear in modern standard Vietnamese, Hanoi dialect (Thompson 1965:39-41).

The discovery of Thavung by Michel Ferlus in 1965 made necessary only a minor modification of Haudricourt's thesis. The ancestor of this language, which I shall term Pre-Thavung, had obviously separated from the common Vietic stock at a time when only two of the proto-tones, rising and level, existed. These had become phonemic in Pre-Thavung upon loss of -ʔ, and had then split upon merger of initial oral occlusives to yield the four tonemes of modern Thavung. In the branch of Vietic that evolved into Vietnamese, falling tone had developed subsequent to the departure of Pre-Thavung, after which things proceeded according

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[1]I am indebted to Michel Ferlus of the Centre National de la Recherche Scientifique in Valbonne, France, for his generous provision of materials on Thavung and other Mon-Khmer languages and for his valuable comments on my studies of the phonological history of Thavung.

[2]Vietnamese and the Muong (Mường) dialects comprise one subgroup, Viet-Muong, of the Vietic branch of the Mon-Khmer language family of South East Asia. Thavung and other languages, such as Pakatan and Pong, comprise another subgroup.

to the original 1954 hypothesis.

b. *Problems with the current theory*

The tone-origin hypothesis expounded by Haudricourt stood unchallenged for more than 20 years, and it has since lost little of its credibility.[3] But the hypothesis has always had one serious weakpoint, which Haudricourt himself had recognized in the 1954 paper (Haudricourt 1954:81). It is unable to explain why a large set of Vietnamese words with final continuants has reflexes of the rising tone. Vietnamese bốn 'four' has, for example, high rising tone when it should have in accordance with the hypothesis a reflex of the old level tone. The discovery of Thavung disclosed that the same anomaly is present in its tone system. Thavung poon^{3} 'quatre'^{4} has high glottal tone, which is supposed to be a reflex of the rising proto-tone. In contemplation of this perplexity, Haudricourt had directed our attention to the glottalized continuant finals of Lushai, an unrelated area language of the Tibeto-Burman family. The inference is, of course, that Vietic may have had such finals at the time when pitch distinctions were evolving. But evidence to confirm that proposition is still lacking.

Thavung presents two other new problems for the hypothesis, which concern interestingly the same problematic proto-tone. Words possessing occlusive and spirant finals take only tones allegedly derived from the level proto-tone. And this group includes some having final glottal stop, the very consonant that is supposed to the *causa causans* of the Vietic tone systems. In order to obviate these anomalies, the hypothesis must be modified again, and the words with -ʔ classified as loans. The additional modification would have Pre-Thavung splintering away from common Vietic after rising tone had appeared before -ʔ and before this pitch distinction had spread analogously to words having the other stops in final position. The words to be classified as loans number only 11, but the classification is a bit unpalatable because core vocabulary items, such as Thavung phaluʔ^{1} 'six', are included. The other problem arises upon comparison of the toneme characteristics of Thavung and Vietnamese. Pitch contour is uniformly level in Thavung, both level and glided in Vietnamese. But the physiological process

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[3]Gregerson and Thomas, 1976, were the first, as far as I know, to publish a critical commentary on the tone-origin hypothesis.

[4]I have kept Ferlus' glosses for all modern Thavung words.

creating *sắc-nặng is one that must result, as Haudricourt described it, *in a rising pitch and none other. It remains to be* explained how the proto-tone's reflexes became level pitched in modern Thavung.

The issues discussed thus far might be viewed as not detracting significantly from the overall validity of the current tone origin theory. They might simply reflect independent developments in the individual languages, and additional study or information might be expected eventually to resolve them. But the results of my study of the Daic loan vocabulary in the Thavung lexicon have signaled the presence of a flaw so fundamental as to undermine the validity of the entire theory for Thavung tonal history (Hayes 1983:113). In that study, it was shown that the merger of initial stops in Thavung postdates the 13th century A.D. and that words borrowed from the Daic languages, which had three tones before the end of that century, reflect none of the pitch distinctions of the loaning languages. The appearance of the two original Vietic tones is not dated. But whatever its timing actually was, the hypothesis of Haudricourt makes it obligatory that Pre-Thavung had at least two tonemes by the time that the merger of initial stops took place. But if that were indeed the situation, vocabulary borrowed from other tonal languages should have carried with it some trace of its indigenous tone characteristics. Since it does not, the implication is that Pre-Thavung did not have significant pitch distinctions and was therefore not yet a tonal language.[5]

c. *Purpose of this paper*

In reaction to similar problems, Kenneth J. Gregerson and David D. Thomas proposed in 1976 that Vietnamese may have originally had a two-register system with two tones, instead of the

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[5]The absence of Daic tone characteristics is most obvious in the lack of loanwords possessing either of the Thavung glottal tones. Lao, the Daic language that has apparently had the most influence on Thavung, has high rising tone in fang 'to bury' and dɨay 'spur of a cock'. If these forms had been borrowed prior to initial stop merger in Thavung, their correspondents, Thavung phang[1] 'enterrer' and kdɨa[1] 'ergot', should have taken *sắc-nặng tone, since it was per Haudricourt a rising tone, instead of the level-tone reflexes they have. It is not certain that phang[1] was borrowed prior to initial merger, but kdɨa[1] apparently dates back to the early Pre-Thavung period (see section 4.c. of this paper).

three-tone system of Haudricourt.[6] More importantly, they called for more detailed work systematically relating Mon-Khmer register phenomena to Vietic tone history. In this paper, I propose to do exactly that and to present on the basis of the comparison a new hypothesis about the origin of tones in that branch of Vietic that evolved into Thavung. This presentation will demonstrate that Pre-Thavung did not have a tone system, as Haudricourt might have thought, but did have a register system, if not exactly as Gregerson and Thomas proposed for Vietnamese. Since 1976, the ground has been well prepared for such an effort, most notably by Gregerson in his "Tongue-Root and Register in Mon-Khmer" (1976) and Ferlus in his "Formation des registres et mutations consonantiques dans les langes mon-khmer" (1979). This paper could not have been written without their contribution to our synchronic and diachronic knowledge of the Mon-Khmer phonological systems.

2. THE TONAL REGISTER SYSTEM

a. *Description*

The prosodic system of Thavung consists of tone and voice register subsystems.

The tone subsystem

The tone subsystem is a level-pitch register system. Its four tonemes have a two-way contrast. As shown in Figure 1, pitch height distinguishes two registers, each containing two tonemes. By definition, pitch contour is nonglided. A glottal feature distinguishes between clear and glottal tones within each register. The glottal tones are enunciated with laryngeal constriction occurring near the end of the nucleic vowel.

Figure 1. The Thavung Tones

Register	Clear	Glottal
High	/v^1/	/v^3/
Low	/v^2/	/v^4/

Examples:

puyh^1	'balayer'	poon^3	'quatre'
pOOk^2	'attacher'	pOO^4	'porter sur le dos'

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[6]Gregerson and Thomas 1976:82. They dealt with problems relating specifically to Vietnamese, which I shall not discuss here.

Tones may occur only in monosyllabic words and the second (or main) syllable of disyllabic forms. The first (or pre-) syllable of such forms is atonal. Words with final occlusives /p, t, c, k, ʔ/ and spirants /h, yh/ may take only clear tones.

Tone distribution shows a clear tone bias: 665 words or 91.2% of the 729 indigenous forms in the lexicon collected by Ferlus have clear tones (502 Tone 1, 163 Tone 2), while the remaining 64 words (8.8%) have glottal tones (58 Tone 3, 6 Tone 4).

The voice register subsystem

The voice register subsystem consists of two series of vowels in complementary distribution. As shown in Figure 2, one series may appear only in the high register, the other only in the low register. All except the offglided vowels have contrastive length.

Figure 2. The Voice Register Subsystem

High Register	Low Register
/ia ɨa ua	/ia ɨa ua
i ɨ u	i ɨ u
e o	
ɛ ə ɔ	E ə O
a /	A /

This division into two series is rather arbitrary, for actually only three vowels are phonetically different from their opposites in the other register. These are /E, A, O/, which are prediphthonguized [eɛ, əa, oɔ] and articulated with a small degree of breathiness.

b. *Comparison with the Mon-Khmer register systems*

The register system is the most typical prosodic structure in Mon-Khmer. All words in the lexicon belong to one or the other of two prosodically distinct sets or registers.[7] The registers contrast by at least one phonemic distinction and often differ by other phonetic features, as well.

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[7]The Tɔdrah dialects have three registers, which may however be reanalyzed as only two, cf. Gregerson and Smith 1973:145-50. And Sedang went through an intermediate three-register stage, cf. Smith 1972:16 and section 5.b. of this paper.

Historically, the registers correlate to two sets of words possessing differently voiced initials, and the contrast between them correlates to the voicing distinction previously opposing those initials. The registers came into being as that voicing contrast was lost by unvoicing of the voiced set of initials. In their descriptive studies, Gregerson and Ferlus have shown that the devoicing process may produce a large variety of phonetic phenomena as a sort of compensatory reaction to the loss of the old voicing distinction. At least one of these phonetic manifestations then acquires phonemic status, thereby replacing the old voicing contrast and serving to distinguish the two registers from one another. All forms with voiceless initials prior to the loss of the earlier contrast now belong to the "high" register, all those with formerly voiced (now voiceless) initials belong to the "low" register.[8] Four general types of replacement contrasts can be identified, which in turn give four general types of register systems: Voice, vowel, glottal, and tonal.

In the voice register system, breathy voice quality is the primary replacement contrast. The low register is marked for this quality; that is, words in this set are articulated with breathiness, those in the high register or unmarked set are enunciated with clear or normal voice. This type of system also frequently has vocalic differentiation, which serves as the primary replacement contrast in the vowel register system. Here, relative changes in tongue height alter vocalic nuclei. Typical effects are lowering and opening of high and mid vowels, raising and closing of low vowels, often accompanied by prediphthonguization. Either register may be marked for vocalic differentiation. In the glottal register system, laryngeal or pharyngeal constriction supplies the replacement contrast. The high register is marked for this constriction, which may occur with varying intensity and duration and be superimposed on initials, nuclei, or finals. Unmarked forms have clear or nonconstricted articulation. The glottal mark[9] often conditions the mutation or loss of final consonants. In the tonal register system, pitch distinctions replace the old voicing

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[8]Other terms have been used, cf. Gregerson 1976:323 ff. Technically, high and low are appropriate only for the tonal register system, referring as they do to its high and low pitch onsets. But they serve well as a common point of reference.

[9]The term "the glottal mark" refers to glottal marking or markedness.

contrast. The high register takes relatively higher pitch modulation, the low register relatively lower.

Many of the phonetic features associated with the devoicing process lack stability. Some are transient. Breathy voice quality is thought, for example, to occur in all register systems, but it often disappears rapidly and completely from its low register environments. Some wander about. The glottal mark, for example, tends to migrate towards the final segment of the phonological word. Some of the features are mutually exclusive. The glottal mark does not normally occur in conjunction with vocalic differentiation or relative pitch height; the tonal register system does not normally have laryngeal constriction or vocalic differentiation.

When the Thavung prosodic system and the four general types of Mon-Khmer register systems are compared, one gets the impression I used to get upon entering the central market of old Saigon: There is something here for everyone! Thavung has the pitch contrast of the tonal register system, the laryngeal constriction of the glottal register system, the vocalic differentiation of the vowel register system, and the breathy voice quality that is the distinctive mark of the voice register system. There is too much richness of phonetic detail; there coexist too many phones that are incompatible in the typical Mon-Khmer register system.

This multiplicity of phonetic features would present an enormous puzzle to descriptive linguist and historical comparativist alike, were it not for a rare insight provided by Ferlus to the possibilities for historical change that exist, perhaps uniquely, in the Mon-Khmer languages. This insight is that a register system may contain a multiplicity of synchronic register features that have been "stacked up" diachronically. In other words, a register system of one time level, which had its particular compensatory phonetic features, can evolve into a new register system, which has its particular replacement contrast and other phonetic characteristics. Both of these may differ from, or even be incompatible with, the features of the old system, some of which may nevertheless still be in the phonological inventory of the new system.

Ferlus unearthed the first evidence for that type of historical evolution in Pearic, another branch of Mon-Khmer that

is distantly located from Thavung.[10] In Chong, phóon 'four' has two phonemes which are characteristic of two types of register systems and which are incompatible in any one register, if not also in any one register system. The glottal mark (denoted by acute accent) belongs to the present glottal register system of the language, while the aspirated initial stop is a compensatory reaction feature found in both the voice and vowel register systems. The implications of the synchronous coexistence of those two phonemes are that an earlier stage of Chong had a register system, whether voice or vowel we cannot tell at first glance, and that the present glottal register system evolved out of that older structure. And for the new register formation to take place, Chong had to develop somehow a new series of voiced stops to replace those previously devoiced. These diachronic developments may be depicted as shown in Figure 3.[11]

Figure 3. Evolution of the Chong Register Systems

Register	First Stage					Second Stage					Third Stage				Register
High	p	t	c	k	→	ph	th	ch	kh	→	ph	th	ch	kh	High
Low	b	d	j	g	→	p	t	c	k	→	p	t	c	k	
						b	d	j	g	→	p	t	c	k	Low

c. *Inferences of the comparison*

The comparison of the Mon-Khmer register systems and the Thavung prosodic system confirms that they have many features in common at phonemic and subphonemic levels. It seems thus appropriate to conclude that the Thavung system may represent some rather unusual subtype of the Mon-Khmer systems, rather than a tone system of the types found in the unrelated Daic, Sinitic, and Tibeto-Burman languages located in and around the areas occupied by the Vietic languages. If the Thavung system is a Mon-Khmer tonal register system, then its historical origin and evolution could be expected to parallel those of other Mon-Khmer languages. And if it does, the historical developments in Thavung should be amenable to analysis and description by similar means, provided that the right approach can be found.

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[10]Ferlus 1979b:38-40. The Pearic languages are located in western Cambodia and in adjacent borderlands of Thailand, Thavung several hundred kilometers to the northeast in central Laos.

[11]*Ibid.*, 39. This display is a modification of the chart used by Ferlus.

The insight provided by Ferlus suggests a suitable approach. To penetrate the time depth, one may begin by eliminating the replacement contrast of the present level and reconstituting the old contrast of the previous time level. This process is then repeated until all such contrasts have been eliminated, at which time the language of the next earlier time level should not have a register system.

3. THE GLOTTAL REGISTER SYSTEM

a. *Elimination of the tonal registers*

The primary contrast of the Thavung tonal register system is the distinction between pitch levels. Hence, this distinction is suspect as being the replacement contrast and thus a candidate for elimination. Among the subphonemic distinctions, breathy voice and vocalic differentiation have the same distribution as the low pitch feature. Hence, they are suspect as phonetic reactions to the last devoicing process and thus also candidates for elimination. Glottal constriction is distributed in both registers; hence, it is suspect as a feature of the older system and thus a candidate for retention. The features of the present register system are now eliminated, as indicated, and the old initial voicing contrast is restored, as depicted in Figure 4.

Figure 4. Elimination of Tonal Registers

Thavung								Pre-Thavung					
												Vowels	
Register	Initials				Tones			Initials				Clear	Glottal
High	p	t	c	k	v^1	v^3	←	*p	t	c	k	*v	*v́
Low	p	t	c	k	v^2	v^4	←	*b	d	j	g	*v	*v́

The result of this first step is not another more primitive tone system, but rather a glottal register system. Looking forward in time now, the evolution from glottal to tonal register system can be depicted as restructuring of initials, as in Figure 5, or as restructuring of prosodic features, as in Figure 6.

Figure 5. Restructuring of Initials

Glottal Register											Tonal Register							
											High				Low			
High	*p	t	c	k	→	*p	t	c	k	→	p	t	c	k				
						*b	d	j	g	→					p	t	c	k
Low	*p	t	c	k	→	*p	t	c	k	→	p	t	c	k				
						*b	d	j	g	→					p	t	c	k

Figure 6. Restructuring of Prosodic Features

Glottal Register			Tonal Register	
			High	Low
High	*v́	→	v^3	v^4
Low	*v	→	v^1	v^2

b. *Elimination of the glottal registers*

The primary contrast of the Pre-Thavung glottal register system was clearly between laryngealized and clear articulation of nucleic vowels. Whether other prosodic features were present is not immediately clear, but their presence (except for transient breathy voice) is not suspect because glottal register systems tend to have only laryngeal tensing or constriction. Again looking backward in time, the glottal contrast can now be eliminated, and the still earlier initial voicing contrast restored. The result, which is portrayed in Figure 7, is a stage of Pre-Thavung that does not have any register features, as far as we can tell.

Figure 7. Elimination of the Glottal Registers

Glottal Register System						Non-Register System			
Register	Initials				Vowels		Initials			
High	*p	t	c	k	*v́	←	*p	t	c	k
Low	*p̰	t	c	k	*v	←	*b	d	j	g

All such features having been eliminated, a deeper penetration of the past via this method of internal reconstruction is not possible.

c. *Problems with the method*

Reconstructing a glottal register system for a stage of Pre-Thavung, which I shall call Late Pre-Thavung (LPT) for lack of a more imaginative term, resolves some of the problems discussed in 1.b. above. The presence of glottal tones in words with continuant finals is thereby well explained, while the discordant pitch contour correspondences between Thavung and Vietnamese are no longer relevant. And the reasons for Pre-Thavung's inattention to the Daic tonal inflections are now doubly clear. But one of the old problems remains, and some new ones have raised their ugly heads out of the shadowy depths of the sands of time.

The limitation placed on the occurrence of tones in forms with word-final occlusives and spirant consonants still requires explanation. This limitation also presents a new problem. At the stage of the language antedating LPT, to which I shall refer as Early Pre-Thavung (EPT), the voicing of the initials of those forms cannot be determined, as the following examples will show.

Gloss	Thavung	LPT[1 2]	EPT
'sourd'	tEEk[2]	*dɛɛk	*ʔdɛɛk ~ ndɛɛk?
'mourir'	cəət[1]	*ceet	*ceet ~ jeet?

Another new problem appears when restoration of the voicing contrast creates at the EPT level such reconstructions as these:

'oiseau'	ciim[1]	*ciim	*jiim
'flèche'	kam[1]	*kam	*gam

Examination of cognate data suggests that it is very unlikely that these proto-forms had voiced initials at such an early period as EPT must represent in Vietic history. The dating of that period cannot even be estimated at present, but the bulk of the cognate Mon-Khmer words indicate that the antecedents of those proto-forms had voiceless initials in Proto-Mon-Khmer. And forms from the more distantly related Munda languages, such as Sora kənsím 'chicken' and Khaṛia kɔm 'arrow', suggest that their voiceless initials may date back to the common Austroasiatic era.

Such problems obviously detract from the credibility of the tone-origin hypothesis presented here. For that reason, I decided to include two additional sections in this paper, one presenting a reconstruction of the Pre-Thavung initial stops

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[1 2]The Pre-Thavung vowel system reconstructible from the voice register subsystem shown in 2.a. is as follows:

*/ia	ɨa	ua
i	ɨ	u
e	ə	o
ɛ	a	ɔ /

This reconstruction is probably valid for the latter part of the LPT period. Earlier vowel developments have not been fully worked out, but some changes, such as *e → *ə and *ə → *o, are established. Hence, the LPT and EPT vowel reconstructions are subject to future modification.

and another dealing with general problems encountered in reconstructing the phonological systems of Pre-Thavung.

4. THE PRE-THAVUNG INITIAL STOPS

a. *The modern stops*

Three series of occlusive phonemes, voiceless unaspirated, voiceless aspirated, and voiced unaspirated, occur as initials of tonal syllables:

/p	t	c	k	ʔ
ph	th	s	kh	
b	d	j		/

/s/ is included because it is a replacement for an old voiceless aspirated *ch, which merged with an older sibilant at a recent date, probably during the modern era.

With some exceptions, all of the consonants may be followed by any of the four tonemes. The exceptions are that /ph/ does not appear with Tone 3 and only /p, t, k/ occur with Tone 4.

b. *The LPT stops*

Restoration of the old voicing contrast leads to reconstruction of voiceless and voiced series of unaspirated initial stops:

Thavung		EPT
		*/p t c k ʔ
/p• t c k ʔ/	←	{
		b d j g /

Gloss	Thavung	LPT	Gloss	Thavung	LPT
'quatre'	poon^{3}	*póon	'porter'	pOO^{4}	*bɔ́ɔ
'balayer'	puyh^{1}	*puyh	'paillote'	pAAy^{2}	*baay
'avare'	ktii^{3}	*ktíi	'aval'	ktii^{4}	*kdíi
'amer'	tang^{1}	*tang	'sourd'	tEEk^{2}	*dɛɛk
'neuf'	ciin^{3}	*cíin			
'oiseau'	ciim^{1}	*ciim	'acide'	cuu^{2}	*juu
'poisson'	kaa^{3}	*káa	'ours'	ckuu^{4}	*cgúu
'flèche'	kam^{1}	*kam	'porc'	kuul^{2}	*guul
'tube'	ʔoong^{3}	*ʔóong			
'manger'	ʔan^{1}	*ʔan			

The low tone of ʔih^{2} 'grand' would suggest the presence of a voiced glottal stop in LPT. No such stop has been recon-

structed because this is the only word in its class and other Mon-Khmer languages are not known to have voiced glottals. A presyllabic element with a voiced initial presumably gave the word its register status.

Most Thavung forms possessing voiceless aspirated initials are of Daic origin. If they have low tones, such forms are modern borrowings and can be excluded from this paper. If they have high tones, the words may have entered the language in either the modern or Pre-Thavung eras. Due to parallel development in the Daic languages, only those forms derived from Daic words having voiced initials can be firmly identified as LPT borrowings.

Gloss	Thavung	LPT	Daic
'hâcher'	aphak^{1}	*ʔaphak	*vək D
'cymbales'	sɛɛng^{1}	*chɛɛng	*jɛɛng B
'graver'	akhwat^{1}	*ʔakhwat	*gwat D

The following can be identified as indigenous forms:

'taro'	thoo^{3}	*thóo
'renifler'	asil^{3}	*ʔachír
'coupe-coupe'	khɔɔ^{3}	*khɔ́ɔ

The antecedents of the voiced stops of Thavung obviously had voiceless and voiced characteristics; hence, series of voiceless and voiced proto-stops must be reconstructed, as follows.

Thavung		LPT
/b d j/	←	*/ʔb ʔd ʔj mb nd ñj/

Gloss	Thavung	LPT	Gloss	Thavung	LPT
'lance'	bool^{3}	*ʔbóol			
'champignon'	bɔɔc^{1}	*ʔbɔɔc	'macérer'	tbəng^{2}	*tmbəng
'potage'	adoo^{3}	*ʔaʔdóo			
'cerf'	kdii^{1}	*kaʔdii	'montrer'	cdəəy^{2}	*cndɔɔy
'se lever'	jool^{3}	*ʔjóor			
'porc-épic'	jii^{1}	*ʔjii	'détendre'	jAAl^{2}	*ñjaar

The choice of the form of those proto-phonemes is based on the fact that other Mon-Khmer languages have preglottalized and prenasalized stops, which govern high and low registers,

respectively, in those languages having registers.

To recapitulate, the LPT initial stop system was as follows:

*/p	t	c	k	ʔ
ph	th	ch	kh	
ʔb	ʔd	ʔj		
b	d	j	g	
mb	nd	ñj		/

c. *The EPT stops*

The techniques used in reconstructing the LPT stop system may be applied in determining the nature of some of the EPT plosives. Restoration of the older voicing contrast establishes the following unaspirated, preglottalized, and prenasalized series:

LPT

*/p t c k ʔ ← {

b d j g / ← {

EPT

*/p t c k ʔ

b d j g

ʔb ʔd

mb nd ñj ngg /

Gloss	Thavung	LPT	EPT
'quatre'	poon[3]	*póon	*poon
'avare'	ktii[3]	*ktíi	*ktii
'neuf'	ciin[3]	*cíin	*ciin
'poisson'	kaa[3]	*káa	*kaa
'tube'	ʔoong[3]	*ʔóong	*ʔoong
'balayer'	puyh[1]	*puyh	*buś[13]
'amer'	tang[1]	*tang	*dang
'plier'	ciip[1]	*ciip	*jiip
'laver'	akuul[1]	*ʔakuul	*ʔaguul
'porter'	pOO[4]	*bɔ́ɔ	*ʔbɔɔ
'aval'	ktii[4]	*kdíi	*kaʔdii
'paillote'	pAAy[2]	*baay	*mbaay
'aller'	tii[2]	*dii	*ndii
'acide'	cuu[2]	*juu	*ñjuu
'porc'	kuul[2]	*guul	*ngguul

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[13]Final sibilants changed to laryngeal spirants, apparently in late EPT: *[h,s] → h, *ś → yh and h/vowel [+ front]_#.

At this level, little evidence exists to indicate that aspirated stops belonged to the phonological inventory. The LPT examples given above may be shown to have had initial sequences in EPT.

Gloss	Thavung	LPT	EPT
'taro'	thoo^{3}	*thóo	*sroo?
'renifler'	asil^{3}	*?achír	*cahir
'coupe-coupe'	khɔɔ^{3}	*khɔ́ɔ	*kahɔɔk

Cognates support the validity of these proto-forms:

EPT	Cognates
*sroo?	Khmu? sro? 'taro'
*cahir	Pacoh caxĕr, Vietnamese hỉ 'to blow one's nose'
*kahɔɔk	Ngeq hooq, Jeh hok 'spear'

The *thóo reconstruction is actually a late LPT form. Its immediate post-register formation correlate was *sróo 'taro'.

It is not possible to ascertain the antecedents of the LPT preglottalized and prenasalized stops by simply restoring an old voicing contrast. These complex initials are the products of structural and articulatory changes involving sequences of occlusive and other consonantal phonemes.

One source of the preglottalized stops is the changes wrought by the mutation of *r. The following items reflect mutation of presyllabic *r.

'écorce'	khabɔh^{1}	*kha?bɔh	*krpɔh
'enceinte'	phadəə^{1}	*pha?dəə	*prtəəh

The mutation of *r apparently began well after the LPT glottal register system was formed; hence, the immediate post-formation forms of the last two examples were *krpɔh and *prtəə. The mutation of medial *r, which occurred in one sequence as follows, is reflected in the next two examples.

EPT *nr → *ndr → LPT *dr → *?d

'potage'	adoo^{3}	*?a?dóo	*?nroo?
'cerf'	kdii^{1}	*ka?dii	*knrii

In two cases, a preglottalized stop was borrowed:

Gloss	Thavung	LPT	EPT
'mois'	dɨan^{1}	*ʔdɨan	---
'ergot'	kdɨa^{1}	*kaʔdɨa	*kaʔdrɨay

The source of the former was apparently Southwestern Daic *ʔdɨan A, cf. Siamese dɨan A1 'month'.[14] The latter form, which is from Daic *ʔdrɨai A 'spur of a cock', apparently came into EPT, lost its preglottalized initial during the register formation, and then acquired a new one due to *r mutation in LPT.[15]

Coalescence of consonantal sequences is another source of the LPT preglottalized stops. The following examples show sequences involving two stops.

'lance'	bool^{3}	*ʔbóol	*ʔapool
'champignon'	bɔɔc^{1}	*ʔbɔɔc	*ʔapɔɔc
'singe'	doo^{1}	*ʔdoo	*ʔatook
'saisir'	jup^{1}	*ʔjup	*ʔacup
'cendres'	buuñ^{1}	*ʔbuuñ	*ʔabuuñ
'monter'	doom^{1}	*ʔdoom	*ʔadoom
'long'	joon^{1}	*ʔjoon	*ʔajoon

The next examples reflect coalescence of stop and continuant phonemes.

'porc-épic'	jii^{1}	*ʔjii	*ʔayiim
'vent'	kjuu^{1}	*kaʔjuu	*kaʔ||yuu

In the latter, syllabic juncture is indicated between the medial consonants to avoid the appearance that a unit phoneme, *ʔy, was involved. It is difficult, however, to exclude the possibility that presyllabic *r was present in this set and in some of the other examples shown in this paragraph.[16] EPT *ʔapool 'lance, javelin' can, for example, stand as it is. But a cognate form, Pacoh tampôl 'to toss', suggests that EPT had a verb-

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[14]Li 1977:91 and 281, indicates that the Proto-Tai form was *ʔbrɨen A.

[15]This is the only Daic loan identified in EPT thus far, and it may really be an indigenous form. Vietnamese cựa 'spur (of rooster)' and rựa 'billhook' suggest Vietic *kɨa 'to spur', which may have been infixed to give *krnɨa 'spur' and thence by metathesis Pre-Thavung *knrɨa → *kndrɨa, etc.

[16]None of the many Mon-Khmer forms cognate to kjuu^{1} has a glottal element.

al form, *tmpool 'to throw (javelin)', from which *trpool 'javelin' was derived by infixation of the instrumental *r morphophoneme. Hence, this word may have evolved as EPT *trpool → LPT *trpóol → *tha?bóol → Thavung bool^{3} 'lance, javelot'. But we cannot be sure that *trpool was not already reduced to *?apool in EPT.

The prenasalized stops derive also from coalescence of two phonemes. In the following examples, a nasal and a stop fell together.

Gloss	Thavung	LPT	EPT
'macérer'	tbəng^{2}	*tmbəng	*tm||bəng
'montrer'	cdəəy^{2}	*cndɔɔy	*cn||dɔɔy

The change sequence, using the first form as a model, was as follows:

EPT		LPT		
m||b	→	m||p	→	mb

The syllabic juncture in EPT, which was maintained in LPT for a short time, explains why such sequences did not perform in the same manner as the EPT prenasalized stops. Presumably, voiceless stops could have occurred in similar environments, but as noted earlier, the Thavung lexicon contains no forms with voiced initials and Tone 4. In the following set, a nasal and a glide coalesced:

'détendre'	jAAl^{2}	*ñjaar	*nyaar

Cognates suggest that the EPT verb was *pnyaar, cf. Souei pyaal, Khmer yār 'to stretch out'. In one example, a prenasalized LPT stop developed due to *r mutation. Retention of the medial nasal in the early LPT form, *kndrɔɔng, apparently precluded the normal preglottalization of the medial stop.

'carapace'	khadOOng^{2}	*khndɔɔng	*knrɔɔng

It must be noted that in several of these reconstructions, the voicing of the EPT main syllable initial may not be correctly shown due to the problem with occlusive and spirant finals mentioned earlier. The result in some cases would, however, not be different in LPT. For example, *?acup or *?ajup would result in *?jup.

In other cases, the indicated reconstruction is invalidated

by the indications of the cognate material. For Thavung kdɔɔy[1] 'doigt', the EPT proto-form could be set up as *ka?||dɔɔy. But cognates such as Ngeq ndooy 'middle finger' and Pacoh ndoi 'fifth finger or toe' suggest that *?ndɔɔy would be correct.

As indicated in the preceding paragraphs, the EPT initial stop system was as follows:

*/p	t	c	k	?
?b	?d			
b	d	j	g	
mb	nd	ñj	ngg	/

5. DISCUSSION OF PROBLEMS

a. *Reconstruction of initials*

In reconstructing the Pre-Thavung initial consonants, four general problems must be dealt with: The anomalous voiced initials of the EPT proto-forms noted in 3.c.; the means whereby new series of voiced plosives were created in LPT; the existence of a voiced glottal stop in EPT; and the occurrence of only clear voice and nonglottal tones in words with stop and spirant finals, which was mentioned in 3.c. and elsewhere above.

As stated earlier, some initial stop reconstructions at the EPT level seem arbitrary and conflict with the indications of the cognate material from other Mon-Khmer languages.

To resolve this issue for such forms as EPT *jiim 'bird', a seemingly plausible solution is to posit presyllables with voiced initials and change the objectionable voicing. This procedure would give EPT *gaciim, which one cognate, Old Mon kiñcem 'bird', would seem to support as being a viable alternate construction. But that revision clashes immediately with what we know about the general rules of register harmony.[17] These rules

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[17]The term "register harmony" is attributed to David D. Thomas, cf. Fribergs and Pittman 1974:14. Register harmony refers to the set of rules that governs the determination of main-syllable register affiliation by presyllable initial consonants. In brief, consonants are either dominant, in which case they can permeate other consonants to determine that affiliation, or recessive, in which case they cannot permeate other consonants. Typically, stops, sibilants, and spirants are dominant, continuants recessive. But stops cannot permeate other stops, and sibilants and spirants are recessive after stops. Pre-Thavung register harmony has not been firmly established, but it does not appear to contradict the typical rules cited here.

state that stops are not recessive or permeable to the influence of other consonants. Hence, the presyllable initial could not influence the register affiliation of the main syllable of *gaciim, and the palatal initial of the latter syllable should have caused the glottal effect to appear, which it did not.

In searching for a solution that will work, the desired causative features must be kept foremost in mind, as they were also in the analysis of the LPT complex initials discussed in 4.c. above. These features are voicedness and palatization, the first to produce the clear voice of LPT *ciim, the second to insure that the antecedent initial is one that could plausibly evolve into *c. The Old Mon form cited above provides in this case just the model needed, for its internal sequence, -ñc-, has segments possessing the desired features. On that model, the EPT proto-form can be reconfigured as *ñciim or perhaps even *kñciim. But at the same time, two critical observations must be made about the nature of the EPT *ñc element. First, it had to function as a voiced unit phoneme, and secondly, it had to contrast with the *ñj initial already reconstructed for EPT.

The implication of those observations is that EPT had a fifth series of initial stops, which was prenasalized and voiceless */mp, nt, ñc, ngk/. The question naturally arises as to whether such phonological entities are possible in area languages, but Franklin E. Huffman has already furnished us an affirmative response. In his study of the Mon-Khmer register languages, it was shown that a dialect of Mal has exactly such a series, /mp, nt, ñc, ngk/.[18] It is described as lax, slightly aspirated, prenasalized, and followed by breathy vowels. It also contrasts with a voiced series, /mb, nd, ngg/. These EPT stops are now reconstructible in the following examples.

Gloss	Thavung	LPT	EPT
'paume'	kpaang[1]	*kpaang	*kmpaang
'crabe'	ktaam[1]	*ktaam	*kntaam
'oiseau'	ciim[1]	*ciim	*ñciim
'flèche'	kam[1]	*kam	*ngkam

The EPT proto-forms are corroborated by the cognate material shown next. But the decision to reconstruct these initials in any proto-form must depend for the moment very much on what indications the cognate material furnishes us.

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[18]Huffman 1976:582-3. Mal belongs to the Khmuic branch of Mon-Khmer.

EPT	Cognates
*kmpaang	Chrau lapang 'hand'
*kntaam	Jeh kɑtam, Pacoh atam 'crab'
*ñciim	Old Mon kiñcem 'bird'
*ngkam	Chrau căm, Old Mon kaṁ 'arrow'

The creation of new voiced stops in Pre-Thavung and Thavung is the product of two general processes of phonological change. One process is presyllable reduction, which reflects the trend to monosyllabism generally operative throughout the entire South East Asia area over the past millenium or more. The other process is an assimilatory change related to the formation of the register systems.

The reduction process can be amply demonstrated in the historical evolution of Thavung tkɔɔy[1] 'corne', which has cognates in Pacoh tancoi 'horn, antler', Jeh to'kòy 'horns', Souei tkɔɔy, Nha Heun dway 'corne', and Vietnamese còi 'whistle, horn'. The common Vietic form may have been *tVng||kɔɔy, a fully disyllabic word with an unreduced vowel (V) in the first syllable. This vowel was subsequently reduced to a shwa sound and then perhaps to latent shwa, to give *təng||kɔɔy and then *tng||kɔɔy. As the reduction process continued, the final consonant of the old first syllable, long before reduced to presyllable status, and the initial consonant of the old second syllable coalesced to form the lax, voiceless, prenasalized stop of EPT *t||ngkɔɔy. The new main syllable initial then became a simple voiceless stop in LPT *tkɔɔy, its nasal element disappearing as a result of the assimilatory process to be discussed below. The cognates display various stages and possibilities in the reduction process, cf. the unusual initial mutation of Nha Heun and the monosyllabicity of the Vietnamese form, which is the ultimate goal of that process.

The general process of presyllable reduction can be formalized, using C and V for any permissible consonantal and vocoid phonemes, respectively, as follows:

$$CV(C)||CV(C) \rightarrow C(ə)(C)||CV(C) \rightarrow C||CV(C) \rightarrow CV(C)$$

This process may lead to interim creation of new stops of both voiced and voiceless varieties. The changes discussed in 4.c. and just above illustrate some common patterns of that creation. Two of the most common patterns are coalescence of presyllabic glottal stop and nasal phonemes with the main syllable initial stops. These patterns may be formalized in the following manner, with S representing any nonglottal stop and N any nasal consonant.

$$C(ə)(C)||CV(C) \rightarrow \left\{ \begin{array}{l} Sə||SV(C) \rightarrow ?ə||SV(C) \rightarrow ?||SV(C) \\ SN||SV(C) \rightarrow ?N||SV(C) \rightarrow N||SV(C) \end{array} \right\} \rightarrow SV(C)$$

The glottal stop may appear as a presyllable initial, but the reduction process tends to condition the merger of presyllabic oral stops (and sometimes nonstop consonants, as well) with the glottal stop, which serves as a sort of consonantal shwa. The presyllabic nasals tend to shift to the point of articulation of the following stops. The following array depicts the changes occurring upon coalescence:

?||[p, t, c, k; b, d, j, g]	→	?b	?d	?j	?g
N||[p, t, c, k]	→	mp	nt	ñc	ngk
[b, d, j, g]	→	mb	nd	ñj	ngg

These changes are neither compulsory nor singular events. Any given form entering the above patterns on the left does not necessarily exit on the right in the reduced form shown. A presyllabic element is often dropped in one language, retained in another, and the respective synchronic forms may reflect two different stages in the reduction process. The patterns recur frequently due to reprefixation and infixation and without restriction to any given stage in a language's history. The general process is often intimately involved with register formation. It would appear, for example, that such new phonemic entities as *mp and *mb would normally converge to *mb. But in Pre-Thavung, register formation intervened, with the result that *mp was simplified to *p, and so on. In the final analysis, however, the reduction process must be considered as independent from that formation. As such, it is clearly a function of the general trend to monosyllabism, as register formation may very well also be. The causes of that trend are unknown, and they may involve factors that are not solely linguistic.

The assimilatory process is a secondary effect of the register formation process, and must be distinguished from assimilatory changes involved in presyllable reduction. It operates to simplify the complex unit phonemes formed by the reduction process, as shown next. In his discussion of consonantal mutation, Ferlus described a similar simplification in

mp	nt	ñc	ngk	→	p	t	c	k
?b	?d	?j	?g					
				} →	b	d	j	g
mb	nd	ñj	ngg					

Darang, where */ʔb, ʔd, ʔj, ʔg/ have become /b, d, j, g/.[19] The reduction of preglottalized stops would seem to be a fairly clear-cut example of total assimilation. The tense and glottal features of the stop were transferred to the following vowel in the glottal register system, and the stop became nontense and voiced. The action and result were identical in the tonal register system, but the effect was nonglottalized, tense, and higher frequency pitch modulation. The phonational mechanics underlying the simplification of the prenasalized units are not quite as clear. The primary change is loss of nasality, and it is not clear whether the loss should be attributed to the devoicing process or assimilation of the feature into the breathiness or lax pitch modulation of the following vowel's articulation. An alternate view is that the nasal element was simply lost due to similar points of articulation and voicing, without reference to register formation. This view may well be correct in some instances, but I have opted to include the simplification of prenasalized stops in a general assimilatory process of change, since it does seem to be intimately related to register formation and reduction of preglottalized phonemes in Thavung.

As Ferlus has shown, the glottal mark is the product of gradually increasing tenseness in the articulation of voiceless initials during the register-formation period. This tenseness may result in constriction of the vocal cords, which occurs initially in near simultaneity with the articulation of those initials. This quasi-simultaneity tends to interfere with that articulation, and turbulence is avoided by one of the three solutions shown next (P and B represent voiceless and voiced stops, respectively).

$$PV(C) \rightarrow \begin{cases} ʔBV(C) & \text{pre-glottalization} \\ P ʔ V(C) & \text{post-glottalization} \\ P\acute{v}(C) & \text{regressive displacement of constriction} \end{cases}$$

The third solution is obviously the one preferred by the Pre-Thavung glottal register system, and its choice may further clarify the simplification of preglottalized stops discussed just above. However, it is possible that the first solution was applied in a few cases, such as the following:

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[19]Ferlus 1979b:42-44, 55-57, 60, 65-68. The preglottalized stops of Darang, a member of the Palaungic branch of Mon-Khmer, evolved from older */p, t, c, k/ as mutations produced by the register-formation process. See next in text.

Gloss	Thavung	LPT	EPT
'allumer'	tbat^{1}	*ta?bat	*tapat
'étroit'	kdɛɛt^{1}	*ka?dɛɛt	*katɛɛt
'demain'	ajiiw^{1}	*?a?jiiw	*?aciiw

The indications of the following cognates are somewhat obscure due to the low tones of two Vietnamese forms. But this format may be preferable to the usage of syllabic juncture, e.g. *ta?||pat ~ *ta?||bat; in any event, it represents an exception to the more general rule of regressive displacement.

EPT	Cognates
*tapat	Vietnamese bắt lửa 'to set on fire'
	Old Mon bat 'to secure'
	Chrau văt 'to hold, carry'
*katɛɛt	Vietnamese dẹt 'to be flat'
	Pacoh kiteat 'to squeeze, press out'
*?aciiw	Vietnamese chiều 'early evening'
	Pacoh cheau nhíp 'until dark'

To explain the register status of LPT *?an 'to eat', either a voiced glottal stop initial or a presyllable with a voiced initial stop must be reconstructed in the underlying EPT proto-form. The latter solution is objectionable on register harmony grounds, but apparently ? is recessive after other stops in at least one example, cf. ?ih^{2} 'grand' in 4.b. above. But an alternate and more economical solution is suggested by the changes discussed just above. The point and manner of articulation of the initial glottal stop and the laryngeal constriction of the high glottal register are so nearly identical that it seems reasonable to assume that the latter was totally assimilated into the former. Hence, the EPT proto-form was also *?an 'to eat'. Exceptions occurred, as usual, and LPT *?óong 'tube en bambou' reflects the behavior of the glottal mark in other high register environments.

The reconstruction of voicing in EPT forms possessing occlusive and spirant finals is a problem that must in general remain unresolved. The correct voicing can be established in some cases from the context, as in EPT *kr?aak → Thavung kha?aak^{1} 'corbeau', but usually only on the collective indications of the available cognate material, and with the expected reservations. This problem will be addressed further in the next subsection.

b. *Reconstruction of finals*

The main problem encountered in reconstructing the Pre-

Thavung final consonants is accounting for the interactions between those consonants and the glottal mark.

In other glottal register systems, the regressive displacement of the glottal mark may cause a variety of phonological changes. Systematic mutation may occur, as in Ong, a language of the Katuic branch of Mon-Khmer, where final */p, t, c, k/ were converted to /ʔm, ʔn, ʔñ, ʔng/. Final consonants may be lost, as in Sedang, a language of the Bahnaric branch, where final */p, t, c, k, ʔ, l, r, yʔ, h, yh/ have disappeared. The glottal mark is often lost in the process, in which case the forms in which the changes took place "shift" automatically into the low or clear voice register. The developments in Sedang are depicted in Figure 8, which is a modification of a chart used by Kenneth D. Smith in his reconstruction of Proto-North Bahnaric (S represents any stop or spirant, grave accent breathy voice) (Smith 1972:16). The intermediate stages show a three-register system in which laryngealized, clear, and breathy vowels contrasted.

Figure 8. Development of the Sedang Registers

Proto-Hre-Sedang Register	Stage 1	Stage 2	Early Sedang Register	
Tense	*v	*v́	*v́	*v́ Glottal
	*vS	*vS	*v	*v Clear
Lax	*v̀S	*v̀S	*v̀S	*vS

The absence of glottal tones in Thavung words with occlusive and spirant finals can be attributed to neutralization of the glottal contrast in those environments. In view of the changes taking place in other glottal register systems, it seems reasonable to conclude that this neutralization occurred in conjunction with the development of laryngeal constriction. Hence, the same forms took only clear voice during the LPT period, and neutralization began to take effect during the register-formation period of EPT. Using the developments in Figure 8 as a model, Figure 9 has been constructed to reflect the

Figure 9. Development of the LPT Registers

EPT Voice Quality		Stage 1	Stage 2	LPT	Register
Tense	*Pv(R)	*Pv́(R)	*Pv́(R)	*Pv́(R)	Glottal
	*PvS	*Pv́S	*PvS	*PvS	Clear
Lax	*Bv̀(R)	*Bv̀(R)	*Pv̀(R)	*Pv(R)	
	*BvS	*BvS	*PvS	*PvS	

events of that formational period (R represents any continuant consonant). This figure seems to imply that EPT had register contrast; this is possible, but not necessarily true. It can only be assumed that in late EPT, forms with voiceless (P) initials became articulated with greater tenseness, those with voiced (B) initials were articulated with breathiness, and that the opposition was subphonemic. As time passed, the tenseness was augmented until laryngeal constriction (acute accent) appeared. This constriction soon came into conflict with the stop and spirant (S) finals (Stage 1), and the conflict was resolved by loss of constriction and the shifting of forms with those finals into a new clear register (Stage 2). That loss was probably due to the fact that those final consonants were also tense and more stable and resistant to loss; however, see the next paragraph. As noted earlier, breathy voice is often transient. Hence, its disappearance "shifted" forms with old voiced (now devoiced) initials into the clear register, in effect merging them with those forms that had identical voiceless initials and finals.

As might be expected, the general rules expounded above were not unbroken. In a few forms, the glottal mark exercised an effect that was just as destructive as that seen in Sedang. In some of the examples shown here, constriction was retained after loss of the final consonant; in others, both vanished.

Gloss	Thavung	LPT	EPT
'singe'	doo^{1}	*ʔdoo	*ʔatook
'coupe-coupe'	khɔɔ^{3}	*khɔ́ɔ	*kahɔɔk
'pou'	kəə^{3}	*kə́ə	*kəəyʔ
'mâcher'	añaa^{3}	*ʔañáa	*ʔañaam
'porc-épic'	jii^{1}	*ʔjii	*ʔayiim
'épais'	kbuu^{1}	*kaʔbuu	*kapuul
'ergot'	kdɨa^{1}	*kaʔdɨa	*kaʔdrɨay
'hameçon'	phalɛɛ^{1}	*phlɛɛ	*prlɛɛh

These reconstructions are supported by the following cognates:

EPT	Cognates
*ʔatook	Vietnamese độc 'monkey'
*kahɔɔk	Jeh hok 'spear'
*kəəyʔ	Souei sangkəəyʔ 'punaise'
*ʔañaam	Muong Khen nhám 'to chew'
*ʔayiim	Vietnamese dím 'hedgehog'
*kapuul	Bahnar hơʔbâl, Ngeq kabuun 'thick'
*kaʔdrɨay	Proto-Tai *ʔdrɨai A 'spur of a cock'
*prlɛɛh	Pacoh parléh 'hook'

The fundamental premise of Haudricourt's hypothesis calls for a glottal tone to appear in every environment in which a glottal stop had been the word-final segment in EPT. That correlation does hold for four of the five examples he cited; Thavung does not have the fifth. Beyond those, it is difficult to find cognate forms possessing a glottal final to match with Thavung glottal tones on open syllables. The developments portrayed in Figure 9 suggest that the effort is a waste of time, anyway.

The glottal mark was neutralized before occlusives, and the glottal stop is an occlusive. Hence, neutralization could be expected to occur before EPT *ʔ. That seems to be true in the case of Thavung phaluʔ^{1} 'six', for the cognate evidence indicates strongly that the EPT form must have had a voiceless initial. But if so, the few examples of -ʔ in the modern language suggest that neutralization before EPT *ʔ was an exception to a more general rule. This rule could have taken only one of two forms: (1) *v́ʔ → *v́ (merger of glottal mark and stop, with loss of stop) or (2) *v́ʔ → *v (loss of both). The paucity of glottal tones in modern Thavung argues for acceptance of the second rule, but other evidence for this rule's validity comes from a different quarter.

Restoration of the EPT voicing contrast leads to postulation of voiced sibilants and spirants in word-initial position. Such initials are atypical of Mon-Khmer phonological inventories, and an alternate solution would normally be reconstruction of presyllables with voiced initials. This action would not conflict with register harmony because the relevant initials would be recessive after voiced stops. But if forms with sibilant and spirant initials had a glottal stop final, then neither voiced initials nor presyllables would be necessary, if the rule, *v́ʔ → *v, had applied. The following sets exemplify this concept. The cognate data support the correctness of the first proto-form, cf. Khmuʔ tiʔ and Lawa teq 'hand'. They do not support the second one. However, Chrau huch 'to smoke' suggests that the EPT form may actually have been *kahɔɔc. If this were the case, then the glottal mark influenced the dissimilation of the final palatal to give *kahɔɔyʔ, after which the rule did apply.

Gloss	Thavung	LPT	EPT
'main'	sii^{1}	*sii	*siiʔ
'fumée'	kahɔɔy^{1}	*kahɔɔy	*kahɔɔyʔ

On the basis of the above observations, the general changes affecting the EPT final glottal stop may be shown as follows:

EPT Voice Quality		Stage 1	Stage 2	LPT	Register
Tense	*v?	*v́?	*v	*v	Clear
Lax	*v̀?	*v̀?	*v̀?	*v	

Apparently, words with glottal finals followed the general tendency of words with other occlusive finals to neutralize the glottal contrast and shift into the low or clear register. Confusion between the similar articulations of the glottal phones led generally to neutralization or loss of both. But exceptions occurred, such that the rule, *v́? → *v?, operated in some cases. We may suspect that in other exceptional cases, *v́? → *v́ also operated. Hence, some of the open-syllable forms with glottal tones may indeed have had a final glottal stop in EPT. I have reconstructed this stop only where the preponderance of the cognate material indicates it. The following sets are illustrative.

Gloss	Thavung	LPT	EPT
'feuille'	slaa^{3}	*sláa	*slaa
'riz'	akoo^{3}	*?akóo	*?akoo
'poisson'	kaa^{3}	*káa	*kaa
'chien'	cɔɔ^{3}	*cɔ́ɔ	*cɔɔ
'six'	phalu?^{1}	*phlu?	*pru?
'tu, vous'	?ə?^{1}	*?e?	*?e?
'ça, cela'	la?^{1}	*?la?	*?laa?

In my earlier papers, the antecedent of vv^{3} was represented as *v?, cf. Hayes 1983:85. Corrections are required in the following words, which do not appear elsewhere in this paper.

'chemin'	khalaa^{3}	*khláa	*kraa
'riz paddy'	alɔɔ^{3}	*?a?lɔ́ɔ	*?arɔɔ
'fruit'	phaləə^{3}	*phlée	*prlee
'tombeau'	thaloo^{3}	*thlóo	*trloo
'excrément'	kha?ɛɛ^{1}	*kha?ɛɛ	*kr?ɛɛ?
'uriner'	kha?ɔɔ^{1}	*kha?ɔɔ	*kr?ɔɔ?
'un panier'	sakhɔ?^{1}	*khcɔ?	*krcɔ?
'sein'	phanuu^{2}	*bhnuu	*?brnuu?

The loss of the final glottal stop in EPT forms possessing voiced initials may be viewed as a sort of pull chain reaction to two other changes. First, there was probably some free variation between Pv́? and Pv? syllables, as the *v́? → *v rule was applied, and secondly between Pv̀? and Pv?, as breathiness was lost in PvS syllables. Hence, these two changes combined to pull Pv̀? syllables in the direction of Pv? → Pv.

c. *Alternate interpretations*

The tone-origin hypothesis presented here is based on analysis utilizing one system-specific method of internal reconstruction, and it reflects the results of work in progress. As such, the hypothesis is not intended to be engraved in stone, as is. EPT may turn out to be Proto-Vietic or at least a dialect of common Vietic, but external comparison with the other Vietic languages remains to be done. That comparison will probably not invalidate the hypothesis but may well call for minor modification of it. But some of the present data are subject to alternate interpretations, and I think it worthwhile to mention briefly two of them.

It can be argued that the two hypotheses are amenable to integration. That is, two proto-tones developed, but *sắc-nặng was not a rising pitch. It was instead high level glottalized or simply level glottalized, contrasting with nonhigh or level clear pitch. Then, the glottal register system developed, and open-syllable forms with laryngealized vowels appeared. These forms then merged with similar ones having glottalized pitch. The pitch distinction may or may not have disappeared. Whatever the merged prosodic phone was, it spread to high register forms with continuant finals, but not to those with occlusive and spirant finals. Thereafter, the tonal register system developed, as shown above (or see next paragraph for an alternate view). I have rejected this interpretation because it appears that most forms with glottal stop finals lost them and acquired clear voice and tones. It is also difficult to account for the behavior of words with voiced initials and glottal stop finals within the framework of this interpretation.

It can also be argued that the two levels of register formation are not necessary. The register distinctions remain subphonemic in some languages for long periods of time or perhaps even disappear without devoicing and merger of initial plosives. Thus, it should be plausible that the glottal feature developed, but the voiced stops did not become unvoiced until the pitch height feature had already appeared. The following array depicts such a course of evolution:

Pre-Thavung Voice Quality		Stage 1	Stage 2	Thavung	Register
Tense	*Pv(C)	*Pv́(C)	*Pv(C)	Pv(C)[1]	High
			*Pv́(R)	Pv(R)[3]	
Lax	*Bv̀(C)	*Bv̀(C)	*Bv(C)	Pv(C)[2]	Low
			*Bv́(R)	Pv(R)[4]	

I have rejected this interpretation because in order to get the Stage 2 forms that later took Tone 1, it would be necessary to posit a rule whereby *Pv́(R) syllables were deglottalized and to classify such syllables that later took Tone 3 as exceptions to that rule. The motivation for a deglottalization rule would presumably be analogy with the neutralization taking place before final occlusives and spirants, but such a rule seems unnatural and contrary to the developments occurring in other glottal register systems.

6. CONCLUSION

a. The possibility of multiple-stage register formation offers an unusual and highly productive opportunity for internal reconstruction in the Mon-Khmer register languages. In the preceding pages, it was shown that an early stage of Pre-Thavung had neither tones nor registers. But phonological changes beginning in that period led to the formation of a glottal register system and massive alteration of the language's word-initial and word-final structures. In time, that system evolved into the tonal register system of modern Thavung. This evolution permits us to understand better the historical origin and functions of the following characteristics of Thavung phonology.

(1) The glottal feature of the tonemes.
(2) The clear tone bias of toneme distribution.
(3) The appearance of glottal tones in forms with continuant finals and their absence in those with occlusive and spirant finals.
(4) The disparate tonal contours of Thavung and Vietnamese.
(5) The absence of Daic pitch distinctions in loan vocabulary.
(6) The correspondences (or lack of them) between Thavung initial and final consonants and those of other area languages, both related and unrelated.
(7) The role of final glottal stop in the development of the prosodic system and its influence on word-final structure.

b. But the validity of the tone-origin hypothesis presented here cannot be taken automatically to mean that other Vietic tone systems evolved identically or analogously. Gregerson and Thomas (1976) have proposed that Vietnamese may have had a tonal register system, Thompson (1979:242) has suggested that Proto-Viet-Muong developed vocalic differentiation (a voice or vowel register system?) before its tones emerged, and Ferlus (1979b:69) has hypothesized that Vietnamese may have had a glottal register system. It remains to be seen, however,

whether such developments actually took place or whether Haudricourt's hypothesis is still an adequate explanation of the tonal history of the Viet-Muong subgroup of Vietic.

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