PHONETIC DESCRIPTION AND PHONOLOGICAL FUNCTION:

SOME REFLECTIONS UPON BACK UNROUNDED VOWELS IN

THAI, KHMER AND VIETNAMESE

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Linguists have long been aware of the difficulties that may arise from the use of the same set of descriptive terms for phonological as well as phonetic entities. The best-known case is probably that of the labels *consonant* and *vowel*, where confusion arises when sound segments which are by any general phonetic definition vowels turn out to function like consonants in specific languages, and vice versa. That is to say, the description of a sound in general phonetic, i.e. *non*-language specific, terms may sometimes conflict with the phonological interpretation of the 'same' sound within a given language.

A clear example of this state of affairs is seen in the varying function of aspiration after voiceless stops. In languages like English it occurs regularly in certain contexts but is never contrastive and is thus treated as 'allophonic' only. In languages like Thai and Khmer on the other hand, contrasts between voiceless aspirated and unaspirated plosives, as evidenced by numerous minimal pairs, are clearly 'phonemic'. These two languages share a Sanskritic-type spelling system which represents both the aspirated and the unaspirated series by single symbols, suggesting that the members of the aspirated series are felt to be 'unitary' in the same sense as those of the unaspirated series. Although phonetic and phonemic transcriptions usually employ two roman letters for each member of the aspirated series, Thai /ph, th, kh/ are almost invariably treated as being 'monophonemic', like /p, t, k/.[1] The aspirated stops of Khmer are from the general phonetic point of view no different from those of Thai: the same general phonetic labels apply, and for the purposes of phonetic description they are the 'same' sounds as their Thai counterparts. But their phonological role is different. The occurrence in Khmer of morphologically related pairs of words, such as khoh(s) 'to be wrong', kɔ̆mhoh(s) 'fault'; thùm ∾ thom 'big', tŭmhùm 'size'; khɤŋ 'angry', kɔ̆mhɤŋ 'anger', - alongside many parallel pairs such as krŭp 'all', kŭmrŭp 'to complete'; sdɤy 'to speak', sɔ̆mdɤy 'speech', etc., - has led linguists to treat the aspirated stops in such instances as clusters of stop + /h/ from the phonological point of view. In other contexts, e.g. before liquids, the presence or absence of aspiration after stops in Khmer is allophonic, not phonemic as it is in Thai. While Khmer initial khl is phonetically indistinguishable from Thai initial khl-, its phonological status is different. In Khmer there is no /khl/: /kl/ contrast as in Thai; *the aspiration of voiceless stops before l is allophonic only.*[2] Thus, considerations both of morphological patterning and of allophonic distribution have impelled linguists to recognize differences in the phonological status of aspirated stops in the two languages, and, in the case of Khmer, even within a single language.

What has perhaps not been so generally observed is the fact that similar disparities may exist between the phonetic descriptions of vowels in general terms and their phonological status in specific language systems. This has struck me particularly in connection with the back unrounded vowels, which are such a characteristic feature of the Tai languages and their neighbours. The close and half-close back unrounded vowels [ɯ] and [ɤ], (and sometimes the more open [ʌ] also), are found in Thai, Khmer and Vietnamese, as well as in many of the minority languages of the area, but their phonological rôles vary from language to language, and sometimes from context to context within the same language. In the rest of this paper I wish to draw attention briefly to the phonetic nature of these vowels, to the descriptive labels and symbols that have been attached to them, and to certain peculiarities in their distribution in Thai, Khmer and Vietnamese, which call for interpretation in phonological terms. I hope, moreover, that this glimpse of the varying synchronic rôles of the vowels may perhaps shed some light, however dim, upon possible conditioning factors for some of the problems of Tai diachronic phonology to which William Gedney has recently drawn our attention.[3]

The phonetic nature of the vowels

From the articulatory point of view, there is no doubt that these vowels are what the I.P.A. system of description labels as 'back unrounded'. This does not mean that they are always 'fully back', and indeed my auditory impression is that the tongue positions for Thai [ɯ] and [ɤ] are often a little further front than for [u] and [o] respectively, but nevertheless they remain 'back of centre', and are phonetically 'back' vowels rather than central ones, i.e. they are *not* like I.P.A. [ɨ] and [ə], but more retracted than these. In teaching Thai pronunciation to English-speaking students one is sometimes tempted to think that the (Southern British) English [ə:] in *turn* is acceptable for the Thai [ɤ:], but one has only to listen to beginning Thai students' attempts at British English *first term, early bird*, etc. to be forced to recognize how much more retracted the Thai vowel is.

Descriptive Labels and Symbols used

The true nature of the sounds has, I believe, often been obscured by the subtle tyranny exercised over our minds by the symbols used to represent them. Since few printers and even fewer typewriters are furnished with the official I.P.A. symbols for the back unrounded vowels, linguists have had recourse to other symbols such as ü, y and ɨ for [ɯ], and to ȯ and ə for [ɤ], etc. *What symbol is used is theoretically un*important provided the description is right, but in practice I have found that Thai and English students alike have sometimes been misled by them.

Further confusion may arise in the minds of students and readers in that many writers on Thai, wishing to introduce the vowel phonemes systematically and with as little fuss as possible, present them schematically in a neat and symmetrical 3-way system, as for example:-[4]

(Gedney)	Front	Back Unrounded	Back rounded
	i, ii	ɨ, ɨɨ	u, uu
	e, ee	ə, əə	o, oo
	ɛ, ɛɛ	a, aa	ɔ, ɔɔ

(Noss)	Front	Back Unrounded	Back Rounded
	i	y	u
	e	ə	o
	ɛ	a	ɔ

(Anthony)	Front	Central	Back
	i:	y:	u:
	e:	ə:	o:
	ɛ:	a:	ɔ:

(Abramson)	Front	Central	Back
	i	ɨ	u
	e	ə	o
	æ	a	ɔ

	Front (Unrounded)	Central	Back Rounded
(Haas)	i	y	u
	e	ə	o
	ɛ	a	ɔ
(Purnell)	i	ɨ	u
	e	ə	o
	ɛ	a	ɔ

That so many writers have labelled [ɰ] and [ɤ] as *central*, along with [a], does not, of course, necessarily mean that they believed them to be central in tongue position. More probably the writers in question were not much concerned with phonetic detail, and chose 'central' as a convenient label for vowels which are neither the familiar front un-rounded nor back rounded, but something 'between the two' in some sense, i.e. spread like a front vowel, but more retracted, like a back one.

From an acoustic point of view, as Abramson's spectrograms clearly show[5], there is a very real sense in which [ɰ] and [ɤ] are 'central' or 'intermediate' between front and back. In the average formant frequency values of what Abramson writes ɨɨ and əə, F_1 is a little *higher* than that of ii, uu and ee, oo respectively, while F_2 is *lower* than that of the corresponding front vowels, ii, ee and *higher* than that of the corresponding back rounded vowels uu, oo.[6] The relationships of the formant structures of the series ii : ɨɨ :

uu and of ee : əə : oo is clearly comparable with that of the series
ææ : aa : ɔɔ; in other words, ɨɨ, əə and aa are what used to be termed
'compact', as contrasted with their front and rounded back counter-
parts. From the acoustic point of view, [ɯ] and [ɣ] are no more
closely related to [u] and [o] than they are to [i] and [e], which
appears to justify some such label as 'central'. This is all to the
good provided the label is *not* taken to relate to tongue position, but
to acoustic quality, i.e. to the shape of the vocal tract as a whole.
Unfortunately, the graphs commonly used to display the relative for-
mant frequencies of vowels[7] are deliberately plotted in such a way as
to make the results look reassuringly like the familiar vowel quadri-
lateral used in articulatory phonetics. I have found that students
are frequently inclined to correlate a more forward position on the
formant graph thus plotted with a more forward tongue position, leaving
out of account the enormous acoustic importance of the rounding or
spreading of the lips. In Abramson's graphs, ɨɨ and əə are centrally
placed, with ɨɨ sometimes even 'closer' to ii than to uu.

By and large, what has been said above about the ways in which
classificatory labels, displays, and what Gedney has called 'accidents
of transcription', may mislead the unwary applies equally to Vietnamese
and Khmer. There seems, however, to have been less inclination to
label [ɯ] and [ɣ] as 'central' in Vietnamese, perhaps because the
Vietnamese official roman orthography uses modified forms of the
letters u and o for these vowels.[8] In Khmer the problem for linguists
has been to find *enough* roman letters and combinations of letters to
represent the great variety of vocalic variation in the language; the
vowel system is too complex to allow of simple 3 x 3 schemata such as
have been put forward for Thai.[9]

The distribution of unrounded back vowels in diphthongs

As is well known, there are distributional constraints in Thai
upon the first element of diphthongs and triphthongs moving towards a
close front or close back vowel. Only the vowel a, long and short,
may form the starting point of diphthongs moving towards both i and
u.[10] i, e, ɛ may move towards u, u, o, ɔ may move towards i; ɯ, ɣ
may move only towards i, i.e. they behave in this respect like *back*
vowels. Similarly, in the triphthongs, iə → u, uə → i, and ɯə → i.
This is set out in the diagrams below. It is emphasised in view of
what has been said above about the way in which schematic displays may
mislead the reader that these diagrams are to be taken as convenient
for the illustration of phonological function, but are not, except in
a very general way, to be regarded as representing tongue positions.
In teaching Thai pronunciation I use the conventional quadrilateral
vowel figure, but when it comes to demonstrating the way in which
such vowels are used in the formation of diphthongs I find the tri-
angular diagram useful.[11]

iu⟶
iəu ⟵ ui ⟵ ɯi
iəu u i uəi i ɯəi

e(:)u o:i ɣ:i
ɛ(:)u ɔ(:)i

i u

ai au
a:i a:u
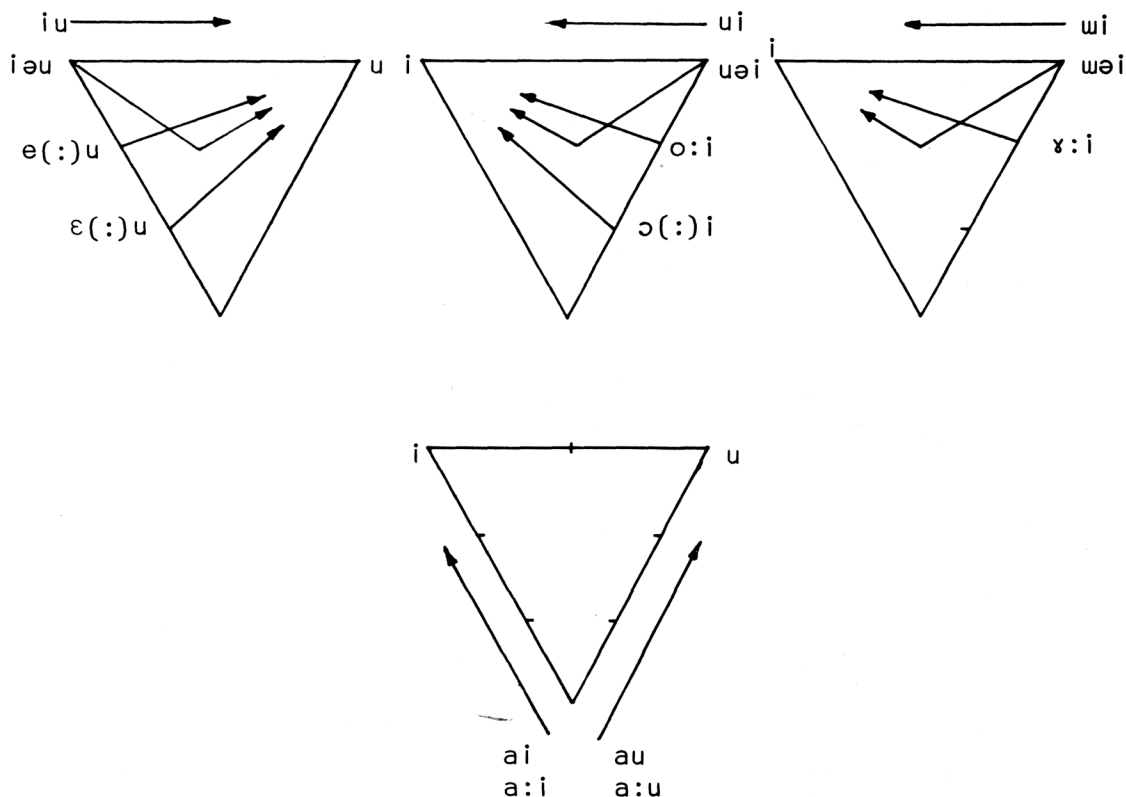
<u>a</u> may be said to be the only vowel to behave as a *central* vowel, i.e.
non-front and non-back. There is clearly some rule operating which or-
dains that FRONT may move to BACK; BACK may move to FRONT; and CENTRAL
may move to either BACK or FRONT. What may *not* happen is that FRONT
moves to (CLOSE) FRONT, or BACK to (CLOSE) BACK, as happens in English
[ei, ou].[12]

In Northern Vietnamese the position is somewhat different. The
rule that inhibits FRONT → FRONT, and BACK → BACK operates here also,
but we find <u>ɯ</u> and <u>ɣ</u> aligned with <u>a:, a, ə</u> as being vowels which may form
the starting point of diphthongs and triphthongs that move towards either
front or back; i.e. the phonetically 'back unrounded' vowels operate in
this language and in this context as 'central', viz:

iu⟶
iəu u ⟵ ui
i uəi

eu oi
ɛu ɔi

ɯi · ɯu
ɯəi ɯəu

ɤi ɤu

əi əu

ai au
a:i a:u
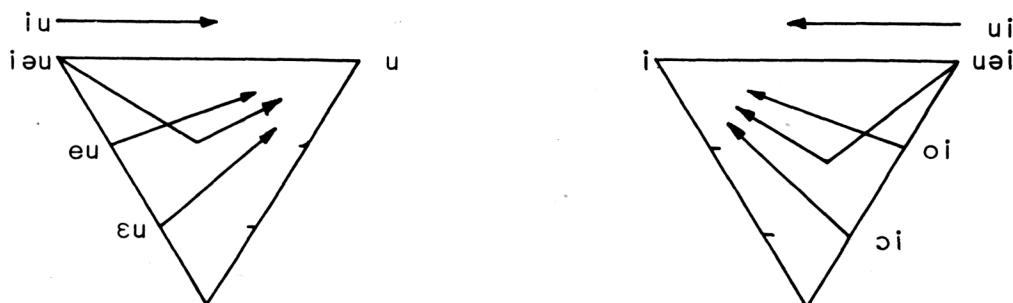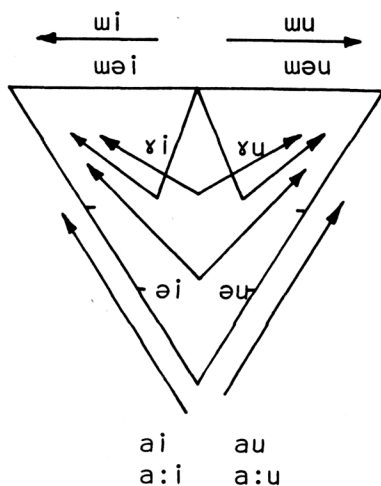
   We thus see that in Thai vowels which are phonetically back
(though often labelled 'central') function like back vowels in this
context, i.e. they are phonologically as well as phonetically *back*.

   In N. Vietnamese on the other hand, vowels which are phonet-
ically *back* function in this context as *central*; i.e. they are phonet-
ically *back* but phonologically *central*.

   This is not the whole story, however. In their distribution ɯ
and ɤ are not quite like central or back vowels in either Thai or Viet-
namese. There are, for example, only two contrastive degrees of open-
ness instead of three; and it has to be noted that in Bangkok Thai,
whereas [ɯəi] and [ɤ:i] are well attested, [ɯi] occurs so far as I am
aware in one highly specialised exclamation[13] only, while there is also
only one instance of N. Vietnamese [ɤu], in a somewhat rare word for
'gums'. Instability of the phonological status of ɯ in N. Vietnamese
is implied by the substitution by many speakers of [iəu] for [ɯəu].
Furthermore, if we look at the other Tai or Vietnamese dialects we dis-
cover patterns which suggest that both phonological rôles and phonologi-
cal rules are dynamic rather than static, and that the unrounded back
vowels are perhaps even more liable to change in this respect than their
front unrounded and back rounded counterparts.

   In the Southern Thai dialect, Phuket (Ph.), as described by
Somchit Piyatham, the diphthongisation rules excluding the movements
FRONT → (CLOSE) FRONT and BACK → (CLOSE) BACK appear to have given way
to a process whereby there may be an open glide onto close vowels. Gedney
cites a similar state of affairs in Lung Ming.[14] The phonology of these
dialects thus permits vocalic movements FRONT → (CLOSE) FRONT and BACK →
(CLOSE) BACK.

Compare: Ph.   ˋsej   'colour' ; Bangkok (B.) /sĭi/
            Ph.   ˆpej   'year'   ; B. /pịi/
            Ph.   ˋsow   'you'   ; B. /sǔu/ (<Lao?)

In Phuket such diphthongal forms exist side by side with pure vowels,
as in ‚phi: 'elder sibling', -phu: 'male' etc. There is a suggestion
in Somchit's data that the conditioning factor here may be tonal, since
she notes that the close pure vowel finals i:, ɯ: and u: do not occur
on the high falling, mid falling or rising-falling tones, whereas the
examples she gives of the finals ej and ow are on high falling or
rising-falling tones. Her data include one example each of two fur-
ther diphthongs which are not permitted in Bangkok Thai, namely ɤw
[ɤw] as in ‚lɤw 'to be carried as a rumour' (cp. B. /lɯ/) and ɯj
[ɯi] as in ‚mɯj 'hand' (B. /mɯ/). Both these words, it will be noted,
are on the mid falling tone, i.e. one of the tones on which pure close
vowel finals do not occur in Phuket, so that we may expect the Phuket
'open-glide' rule to operate here. According to this rule [‚lɤw] is
quite regular, but [‚mɯi], which has the movement BACK → FRONT, ap-
pears inexplicable. It is possible, however, that tonal conditioning
factors may be accountable, in part at least, for the variations i i ∾ ey,
ɨ ɨ ∾ əɣ, and uu ∾ ow that trouble Gedney.[15]

In the case of Vietnamese, a change in the focus of attention
from the Northern (Standard) dialect to that of the South also shows
variation in diphthongisation patterns and in the distribution of back
unrounded vowels in general. A phonetic feature of S. Vietnamese which
has plagued phoneticians is the tendency of non-back vowels to become
centralised before final consonants other than labials. While this
does not directly affect the back unrounded vowels themselves, it
greatly adds to the number of phonetic vowel qualities that require
to be noted, and I find that in notes made when I was investigating
S. Vietnamese I felt obliged to distinguish phonetically vowel quali-
ties which I symbolised [ɪ, ɨ, ẹ, ʊ, ʌ, ə] in addition to the usual
[i, e, ɛ, a, ɔ, o, u, ɯ, ɣ]. It is not surprising in these circum-
stances to find that S. Vietnamese [ɯ] and [ɣ] appear regularly to
be more retracted than their N. Vietnamese counterparts. A further
characteristic of the Southern dialect, and one which *does* affect
the back unrounded vowels, is a diphthongisation process, rather like
that recorded for Phuket and Lung Ming, which applies to vocalic
finals in open syllables. We find variation in open syllables of the
type [i ∾ ɾi, e ∾ ẹɪ, ɣ ∾ ʌɣ, u ∾ ʊu, ɯ ∾ ɤɯ]. The N. Vietnamese triph-
thongs [iəu, uəi, ɯəi, ɯəu] fall together in S. Vietnamese with the
diphthongs [iu, ui, ɯi, ɯu] respectively. Amidst all this phonetic
variation, involving fairly complex 'realisation rules', the phono-
logical status of ɯ and ɣ seems to me to be *central* in both Southern
and Northern dialects.[16]

Back unrounded vowels in Khmer

Khmer has long and short back unrounded vowels which are in de-
scriptive phonetic terms not different from those of Thai and Vietnamese.
Their distribution and relationships are, however, very different from
those we have been looking at so far. Distribution in diphthongs does
not of itself seem to be particularly significant for the status of
these vowels in Khmer; vowel quantity, on the other hand, is certainly

relevant. Short ɯ and ɤ in Khmer do not behave in at all the same way as long ɯ: and ɤ:, and as a consequence the phonological rôle of short ɯ and ɤ is different from that of long ɯ: and ɤ:.

For those unacquainted with the phonetics and phonology of Khmer, it must be pointed out that vowel quality in this language is closely associated with the preceding consonant. Khmer consonants may for this purpose be classified in two Series, according to whether the symbol by which they are represented in Khmer orthography is one which corresponds to either the High (สูง) or Mid (กลาง) series in Thai on the one hand, or to the Low (ต่ำ) series on the other; i.e. the division is roughly into those represented by symbols which correspond to voiceless consonants in Sanskrit (Series 1) or to voiced ones (Series 2). In Khmer pronunciation nowadays the difference is not usually one of voicing, but of an articulatory complex for which I some years ago suggested the terms 'register'.[17] 'Register' is a term for a complex of such features as the potential voicing and tenseness or laxness of stops, vowel quality, voice quality or phonation features such as breathiness, creakiness, etc., and associated pitch features. To be brief, the vowels of the Second Register, i.e. those following consonants of Series 2, tend to be closer and often more centralised than the vowels written with the same orthographic symbol occurring after consonants of Series 1, or to be monophthongal counterparts of what after Series 1 are open on-glide diphthongs rather like those we have noted in Phuket and S. Vietnamese.

Using the Thai symbols that correspond most closely to the Khmer ones,[18] this means that we have the following relationships between spelling and pronunciation:-

Corresponding Thai Symbol:	Pronunciation[19]	
	First Register	Second Register
อี	ɤy [ɤi]	ì:
อุ	o:	ù:
อื	ɤ:	ɯ̀:
แอ	ae [aɛ]	ɛ̀:
ออ	ɔ: [ɒ:]	ɔ̀: [ɔ̰:]
เออ	aə [ʌɤ, aɤ]	ɤ̀:

We thus have here two kinds of register-linked relationships between vowels: (i) diphthongal v. monophthongal, as [ɤi∽ì:, ʌɤ∽ɤ̀:, aɛ∽ɛ̀: and (ii) a relationship of degrees of closeness, as [o:∽ù:, ɤ:∽ɯ̀:, ɒ:∽ɔ̀:]. Both these types of relationship are reflected in some of the puzzling correspondences in comparative Tai phonology pointed out by Gedney, and one may be permitted to speculate as to whether there have been conditioning factors at work in Tai similar to those operating in Khmer 'register'. The mechanics of 'register' are as yet imperfectly understood, but the feature itself is widespread among the Austroasiatic

languages of South East Asia and even among some Austronesian languages; and if, as some scholars have claimed on quite other grounds, Thai is to be regarded as genetically related to Austroasiatic and/or Austronesian languages,[20] we should perhaps not be surprised to find traces of vowel relationships of this kind in the family.

It is in any case clear from the few examples presented that the relationship obtaining between Khmer [ʌɤ, ɤ:, ɯ̀: and ɤ̀:] is radically different from that between Thai or Vietnamese ɯ and ɤ. Attempts have been made to handle the Khmer vowels without recourse to the concept of 2 separate consonant series or 2 registers, but the phonemic system that results is one of great complexity and subtlety, and, more importantly, is one which in some respects runs counter to the feeling the native speaker has for the relationships between the vowels, and to the occasional evidence of instances in the language where a vowel has 'crossed over' from one register to another.

The Khmer short unrounded back vowels play yet another rôle. There is still a register-linked relationship between short [ɤ] on Register 1, and short [ɯ̀] on Register 2, but the phonological specification of short [ɤ] and [ɯ̀] may be summed up as + CLOSE, - ROUND, 'backness' and 'frontness' being phonologically irrelevant in the case of short vowels. In First Register syllables, [ɤ] is in complementary distribution with [e], which is found only before palatal consonants and [h], and in some Indic loanwords. In Second Register syllables, [ɯ̀] is in complementary distribution with [è], which occurs before palatal consonants, and with [ì] which occurs before [h] and in Indic loanwords. The phonological system operating for short vowels may be summed up thus (where ∽ = 'in complementary distribution with') :-

	First Register		Second Register	
	- ROUND	+ ROUND	- ROUND	+ ROUND
CLOSE	e ∽ ɤ	o	ì ∽ è ∽ ɯ̀	ù
OPEN	a	ɔ	ɛ̀ə ∽ ɔ̀ə[21]	ùə

ɯ̀ and ɤ are thus both specified phonologically as *short, close* and *non-round,* plus the Register difference. The 'backness' which is part of the *phonetic* specification of [ɯ̀] and [ɤ] is not *phonologically* relevant here. This differs sharply from the status of Second Register long back unrounded vowels in which length, backness, non-roundness and degree of openness are all phonologically relevant.

Conclusion

No solutions to problems such as those posed by Gedney in relation to comparative Tai phonology have been proposed. It is hoped, however, that it has been demonstrated that similar phono-

logical problems can be discerned in neighbouring languages also, and tentative suggestions have been made as to some of the variables that may be in play in such cases. It is further hoped that attention has been drawn to the need for care in the selection of descriptive labels, both in the interests of phonetic accuracy and of deeper linguistic understanding of the varied and ever-changing rôles of sounds within phonological systems.

NOTES

[1] Trager is exceptional in deciding, for reasons of 'economy' presumably, to treat the aspirated phonemes as clusters of unaspirated phonemes followed by the phoneme /h/.

[2] For a more detailed account see HENDERSON 1952.

[3] See GEDNEY 1972.

[4] See bibliography for relevant references.

[5] See ABRAMSON 1962, pp. 37-43.

[6] ABRAMSON pp. 66-67.

[7] As, for example, in ABRAMSON pp. 44-48.

[8] For measurements of formant frequencies of Vietnamese vowels, and for formant charts of the type already discussed, see DƯƠNG-ĐỨC-NHỰ. As it happens (perhaps because of the charts?), Nhự is one of the few Vietnamese linguists to use the label 'central' for [ɯ] and [ɤ].

[9] HUFFMAN 1970 (pp. 8-9) claims that whatever analysis is made of the Khmer vowel system "thirty-one vocalic contrasts must be maintained for an accurate representation of standard Cambodian syllables."

[10] Some linguists treat the final elements of these diphthongs as phonemic /y/ and /w/, but this interpretation does not alter the point at issue. Even if we regard the phonetic diphthongs as being phonologically sequences of vowel phonemes with following /y/ or /w/, we still have to account for the absence of front vowel phonemes before /y/ and of rounded back vowel phonemes before /w/.

[11] See the similar diagrams in PANUPONG 1972.

[12] This restriction may be seen as related to an even more general rule whereby there is a strong tendency to avoid the repetition of certain features within a syllable. Examples

include the avoidance of w-clusters before rounded vowels, and of clusters such as bw-, pw-, phw-, and tl-, thl- etc. In clustering patterns, the velar stops k- and kh- are akin to the 'central' vowel a in that they are the only stops that may cluster with following -w-, -l- or -r-; i.e. they are phonologically -LABIAL and -APICAL (or whatever feature or features are stated for w, l and r in this context). Note that there is nothing 'universal' about this kind of constraint: many Tibeto-Burman languages abound in such clusters as pw-, phw-, bw-, mw-; tl-, thl-, etc.

[13] If my memory is correct, the word is used as an exhortation in some form of rowing.

[14] GEDNEY 1972.

[15] For other possible factors, see next section below.

[16] This is what I have tried to symbolize in HENDERSON 1966 by the use of the raised ə-symbol.

[17] See HENDERSON 1952.

[18] This correspondence is not exact, but close enough to make the point at issue clear, I hope, to readers familiar with Thai orthography.

[19] *In the transcription of the Khmer forms, the underlined symbols* correspond to those used in JACOB 1974. I.P.A. versions are shown, where helpful, in square brackets. The grave accent is used throughout to mark Second Register syllables, and is intended to indicate all or any of the complex of phonetic features that may accompany such syllables. See p. 15.

[20] The best known champion of this hypothesis is undoubtedly Paul Benedict. See bibliography.

[21] This is not the place to discuss the curious variation ὲəɰɔə which raises queries about the appropriateness of the specification - ROUND. JACOB 1974 briefly describes the contexts in which one or the other is used, esp. p. xv.

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