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AN APPRAISAL OF RESEARCH IN THE PHONETICS AND PHONOLOGY OF THAI*

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Since the Second World War there has been a considerable amount of research activity within Thai phonetics and phonology, first by foreign scholars but more recently also by Thai linguists and phoneticians. Thai being a language that plays a central role in connection with such theoretical issues as manner distinctions within stop consonants (VOT, etc.), or inherent pitch and tonogenesis, it was found expedient to take stock of the overall activity in this field. The present paper attempts to combine a survey of the field with some comments on controversial or neglected issues. The emphasis in this presentation is on descriptive and diachronic/comparative studies; work on speech disturbances, language acquisition, or language teaching is mentioned only occasionally.

I. INTRODUCTION

The topic of this paper is Thai phonetics and phonology. These terms are understood here in a broad sense, viz. as comprising not only descriptive study but also studies in diachrony (sound change) and linguistic reconstruction. One major reason for considering synchrony and diachrony together is that Thai linguistics is an outstanding example of the fruitfulness of combining these two "axes" of linguistic research. This means,

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on the one hand, carrying out descriptive work with a view to the "historical" implications of the results; on the other hand, it means doing comparative work and linguistic reconstruction on a firm descriptive basis and with a view to the possibility of defining interesting issues for the empirical study of extant languages and dialects.

For obvious reasons this review article must be confined to research on Thai proper, i.e. Standard Thai and Thai dialects. Thus, in principle, it disregards research on other Tai languages and dialects, even though the latter have to a considerable extent been studied with Thai as an (implicit or explicit) reference, and even though this research often provides data that are both typologically and genetically essential for Thai studies in the narrower sense. - Needless to say, evidence from other Tai languages and dialects plays a prominent role in the literature on the reconstruction of Proto-Tai; still it can hardly be questioned that Thai, particularly Central (or "Standard") Thai has been investigated in more detail than other members of the language family, so that a narrowing of the scope to Thai studies does not do injustice to the level of achievements of the field as a whole.

It must be admitted right away that the present report is hopelessly ambitious in scope, a.o. because there are reports of numerous (largely unpublished) theses and unpublished papers which have not been accessible to me. The remarks below are based on familiarity with a (somewhat randomly limited) subset of the literature; still, I have been audacious enough to give references (without comment) also to work I have not read myself, because I find the high level of activity in the field to be a highly distinctive feature in itself (which is, in a sense, as interesting as the "state of the art").

II. SEGMENTAL PHONOLOGY AND PHONETICS OF MODERN THAI

For ease of reference it may be expedient to start the section on segmental sounds by giving a brief survey of the immediately contrastive (surface-phonemic) consonant and vowel segments in Central Thai. These inventories, which can be elicited from standard textbooks, are given here in a broad transcription with a minimum of commitment to any particular phonological interpretation.

Syllable initial nonsyllabic segments:

p^h	t^h	c^h	k^h	
p	t	c	k	
b	d			
f	s			and: h ʔ
m	n		ŋ	
	l,r			
w		j		

Comments: (1) The consonants in the topmost row may be taken alternatively as aspirated stops or as clusters of stop + /h/, but the former solution is generally adopted (there being no strong arguments in favour of the cluster solution). - (2) There are a number of syllable initial combinations of an aspirated or unaspirated voiceless stop with a nonnasal sonorant (see the last two rows of the chart above), as in [kʰwɑ:j] *'buffalo',* [klaj] *'distant'; the inventory of such clusters will not be given here (see Noss 1964 for details). - (3) The glottal stop* [ʔ] *may be said to be predictable and hence it can be dispensed with in phonemic transcription: /ʔɔɔk/ or /ɔɔk/ 'to go out'.*

Syllable final nonsyllabic segments:

p	t	k	
m	n	ŋ	and (at least): ʔ
w		j	

Note: the status of [ʔ] is controversial, see IIA below.

Syllable medial syllabic segments:

i	ɯ	u
e	ɤ	o
ɛ	a	ɔ

plus diphthongal sequences: iə ɯə uə

Comments: (1) There are various diphthongal or even triphthongal sequences ending in a labial or palatal glide; these may be taken to end in phonemic /u i/ or in phonemic /w j/ (the latter solution is assumed here, for reasons mentioned in the text below). - (2) There is a clear-cut length contrast with simple vowels, the long vowels being interpretable as vowel + length or as sequences of two identical vowels: /ra:w/ *or* /raaw/ *'approximately' vs.* /raw/ *'we'. As for the complex items* /iə ɯə uə/ *these normally count as long (for occasional instances of short diphthongs see the text below).*

A. SEGMENTAL PHONOLOGY

The segmental phonology of the Thai syllable has been dealt with in numerous publications (see Bibliography) which cannot be reviewed here. The following remarks are confined to a few issues. (The overall pattern and the standard phonemicizations are treated e.g. in Henderson 1949, Haas 1964, and Noss 1964, which represent more or less different approaches. Also cf.

Vichin Chantavibulya 1959a, ch. X, for a detailed prosodic restatement of the sound pattern in the Southern Thai dialect of Songkhla.)

One major issue is the segmental or prosodic status of certain features of the FINAL PART OF THE SYLLABLE. A prosodic interpretation is proposed by various scholars, e.g. Hashimoto (1979): the final stops and nasals are variants, reflecting a "performance feature" of staccato (shorter syllable and stop ending) vs. legato (longer syllable and nasal ending).

There certainly is a fundamental difference between syllables with final stops and nasals, but this is part of an all-pervasive difference between "dead" and "live" syllables, i.e. between syllables checked by means of a final stop and all other syllables. The latter distinction is generally recognized as being useful both in descriptive and in comparative work. Marvin Brown (1965, 1976) argues that at least for Ancient Thai syllable final stops were in fact nasals plus a "dead tone". For Modern Thai he has come to a conclusion (1976, p. 33, 36) somewhat reminiscent of that of Hashimoto. He now finds that "deadness" is neither a property of tone nor of final consonant but of the syllable as such: spoonerisms and reduplication patterns suggest that it is a separate syllable component /ʔ/. Both analyses may remove a redundancy which is otherwise present for open syllables in a long vowel [V:] versus syllables in a short vowel [Vʔ]: these differ in "deadness" just as do syllables in [Vm] vs. [Vp], etc., and hence vowel length may be considered redundant in [C_0V:] and [C_0Vʔ] syllables.

It is indeed an interesting feature of Thai if there is a clear-cut dichotomy between syllables with a resonant termination (including open syllables) and syllables with a non-resonant termination. This dichotomy, then, combines with a phonotactic dichotomy between syllables with and syllables without a final consonantal segment. We may thus set up four syllable types resulting from the intersection of the two dimensions:

	resonant termination	non-resonant termination
with -C	VC^{nasal}	VC^{stop}
without -C	V: / VV	Vʔ

This scheme seemingly exhausts the general manner-of-articulation possibilities with regard to the final part of the syllable, that is, it specifies that there is (i) no possibility of syllables ending in consonantal resonants other than nasals, (ii) no possibility of a voicing or aspiration contrast of final stops, (iii) no possibility of final continuant (non-occlusive) obstruents. All of this is, incidentally, seen very clearly from the adaptation of loanwords, in which a final lateral is replaced by /n/, a sibilant by /t/ (in words such as *football*, *English*).

Phonologists working within the more phoneme-oriented tradition (like the present author) have to face the necessity of determining whether the consonant system should be regarded as defective in syllable final position, or whether one should speak of extensive neutralisation here. The former solution forces the analyst to choose between /p t k/ and /b d g/ as syllable final stop phonemes (incidentally, the "prosodic" solution outlined above does not in itself account for the lack of palatals finally). The /b d g/ solution, which has been advocated by Haas (1964, p. XI), has the obvious drawback that it introduces an otherwise unnecessary phoneme /g/. Moreover, it has been challenged by Abramson (1972), who observes that the final stops are unvoiced, so that /p t k/ rather than /b d g/ is an adequate transcription. This observation must be supplemented by information concerning the voicing conditions in case of adjacent stops in syllables such as /klàp bâan/, but it seems safe to state that the final stops are basically of /p t k/ type, and this is also the prevalent phonemicization (it is the phonemicization chosen also in Brown 1967 for didactic purposes).

The prosodic approach certainly has its merits when applied to syllable terminations in languages such as Thai. It provides for compact and structurally revealing descriptive statements which may be favourable also in a diachronic framework. Indeed, it may well be that "dead" and "live" syllables are psychologically real categories for language users. However, this does not mean that there is necessarily something special about the production of syllables in Thai (and typologically similar languages), as seems to be implied by Brown's (1965, 1976) references to what he calls "Control Phonology" and later to Action Theory.

Action theory is a very promising way of acquiring new insights into the way in which speech gestures may be planned and controlled centrally, but obviously the crucial issue here is to what extent the general format of such planning and control is structure-bound and language-specific. Is it likely, for example, that a Thai speaker produces a syllable such as [ʔim] in terms of quite different principles of syllable organization than a speaker of German does? (Thai /ʔim/ 'full' and German /im/ 'in the -', with a predictable initial glottal attack, sound sufficiently similar for this to be an interesting comparison.)

In fact, the case for Brown's and others' prosodic solution is not quite as strong as it may seem at first sight. This solution predicts that a short unchecked vowel cannot terminate a syllable, but what then about such syllables as the particle [kʰâ] without a final glottal stop? Brown himself actually gives an example of minimal contrast between final /ʔ/ and zero in his excellent AUA Thai course, viz. /háʔ/ vs. /há/ (as short forms of /kʰráp/ and /kʰá/, respectively, cf. Brown 1968, p. 139). One may say with Bee that *"final particles ... have their own 'particular' phonology"* (Bee 1975, p. 26, with

explicit reference to the minimal pair /há?/:/há/), but why not allow for an extension of the syllable scheme to include the peripheral type /C$_0$V$_0$/ (or /C$_0$Vh/??, cf. Rischel & Thavisak 1984, p. 245) with a short, unchecked vowel?

In modern Thai VOWEL LENGTH cannot be made entirely a function of syllable termination anyway, or at least it would be a rather strained solution in cases of vowel plus a final resonant, i.e. a nasal or a semivowel. Brown first seems inclined to handle such contrasts as /kan/:/kaan/ in terms of "delayed onset" under the dead tone analysis, but he ends up with what seems a straightforward length contrast for modern Thai. (For vowel length in a comparative/diachronic perspective, see also Brown 1979). As I see it, this logically entails that the analysis also accounts for the minimal contrast between, say, /kʰáa/ on the one side and /kʰá/ or /kʰá?/ on the other, that is, a potential distinction between long and short open syllables, for which the particles fill a gap (also cf. the remark on "linker syllables" below).

The only remaining skewness, then, is the absence of a contrast between /?/ and zero finally after a long vowel, i.e. the absence of a contrast of the type /kʰaa?/:/kʰaa/ or /kʰáa?/: /kʰáa/. Although there is no such contrast open syllables may certainly have a glottalized termination associated with particular types of tone, i.e., we are in a sense back to the "prosodic" treatment of syllable final /?/ (possibly as an aspect of phonation type, cf. Egerod 1971, p. 167-169).

An apparent or real difference of distribution or of distinctiveness of /?/ after long versus short vowels is not very surprising. Such a situation may occur also in the analysis of other South-East-Asian languages, and it is not confined to tone languages. It may be a real crux for the analyst, and altogether it is quite appropriate that glottalization in Thai has been the object of much discussion and speculation, cf. the next section. (For the glottal stop in Thai phonology, see also Gandour 1974a.)

The PHONETIC DIPHTHONGS of Thai fall into two very different categories, viz. those ending in a palatal or velar glide ("falling" diphthongs, formerly - and still in some dialects - with a three-way distinction between [-i], [-ɯ], and [-u]) and those ending in a rather open central vowel. As for the latter there is general agreement on an analysis in terms of vowel complexes, viz. either as /ia ɯa ua/ or as /iə ɯə uə/. The former solution is probably preferable if the latter entails an identification of the final component with the single phoneme /ə/, which is otherwise a back vowel [ɤ] (both when it is long and when it is short, also see the reference to Henderson in section IIB below). On the other hand, the transcriptions /ia ɯa ua/, when used for didactic purposes (as in Brown 1967-68), may be slightly misleading if it is not explicitly stated that the termination is really of "schwa"-type, i.e. [-ə]. Phonetically, the most straightforward (though least economical) solution is to render the diphthongs as /iə ɯə uə/

with a status more or less as separate phonemic units though of a complex kind (see the remarks on "short" diphthongs below as support of this special status), and to render the back vowel [ɤ, ɤ:] as /ɤ, ɤɤ/.

The diphthongs /iə ɯə uə/ (or however phonemicized) behave in various respects like long vowels. This similarity is taken care of if both diphthongs and long vowels are represented as sequences of two vowel phonemes. However, in the overall system the analysis is complicated by the existence of marginally occurring short diphthongs, shortness here being, according to Henderson (1949), a feature proper to onomatopes and some foreign words. Haas (Spoken Thai I, p. 284) gives the example: [pʰía] (title for a person of a certain rank) vs. [pʰía?] (imitative of a slapping or banging sound) in which she identifies a difference between high tone with a "strained effect" and high tone with a final glottal stop. In an alternative terminology the former example has the (normal) long diphthong, the latter the (exceptional) short diphthong. The question, then, is whether such pairs represent a difference between structures without and structures with final /?/ (but possibly with some degree of glottalization in both cases as a concomitant feature of the high tone), or a difference between diphthongs counting as long vowels and diphthongs counting as short vowels. A third solution is chosen by Noss (1964, p. 15): Noss symbolizes the normal long diphthongs as /ia ɯa ua/ but the short ones as /iə uə/, which is of course technically possible.

As mentioned already, Henderson (1949) points out that the short diphthongs belong to a specific subset of syllables, which obviously have a marginal status in the overall system. This idea is elaborated for the Southern Thai dialect of Songkhla by Vichin Chantavibulya (1959). She finds that there are in that dialect pairs such as

ˊsiə ˊsiə

vs. ˊsiə ˊsiə?

both meaning something like 'don't do it that way or you'll soon spoil it' but having different status since the former expression may be used by a junior speaking to a senior member of the family, and the latter by a senior member of the family addressing a junior one. As to the phonetic difference between such syllables with and without the glottal stop she observes that the last element of the syllable is "markedly fronter if followed by ?: [ˊsiə ˊsiɛ?]", which puts the question of a proper phonemicization of this difference into relief. - Except for such functional pairs Vichin Chantavibulya finds diphthongs with a glottal termination only in a few words (p. 100). She eventually chooses to set up a "secondary system" for deviating syllables including those with VV?, and finds that the words concerned are always either sentence-final particles, phonaesthetic words, onomatopes, personal names, exclamations, or of foreign origin" (p. 119-121). By making such a separation between a primary (i.e. central) and a secondary

(i.e. marginal) system she arrives at a solution which, she observes, *"avoids the necessity of setting up a quantity system for open syllables"* (p. 127).

To round off this discussion of syllable finals I shall mention also that the final components of falling diphthongs allow for alternative phonemicizations. From the point of view of general linguistics it is a commonplace that one may debate whether diphthongs with a palatal or labiovelar termination end in /i u/ or in /j w/. In the case of Thai there is in fact overwhelming evidence in favour of the usual VC interpretation of such diphthongs, since the final component sides with syllable final consonants in two important respects: (i) short and long vowels contrast before the second component (/raw/:/raaw/, etc.), (ii) diphthong plus final consonant is not a permitted structure, just as no syllable ends in a consonant cluster (hence the final consonants are deleted after diphthongs: /waj/ for wine, etc., see further Karnchana Nacaskul 1979, p. 157). It is, on the other hand, worth noting that the analysis which posits final /w j/ upsets the otherwise restrictive pattern of nonsyllabic terminations, which allows only segments specified as having oral closure ± nasality (stops and nasals). The phonemes /w j/ fall outside the general consonant pattern and must probably be granted status as a special set of semivowels occurring both syllable initially and syllable finally, as done by Haas (1964, p. XI).

The "true" diphthongs mentioned earlier combine with final /w j/ to form phonetic triphthongs: /iəw/, /ɯəj/, /uəj/ (as may be expected, there is no possibility of a length contrast here, unlike the sequences with monophthong plus /j w/: /aaj/ vs. /aj/, etc.). The existence of these triphthongs is a further argument for a differential phonemic representation of the various types of phonetic diphthongs, viz. as /VV/ in some cases and /VC/ in others, since the triphthongs are uncontroversially handled as /VVC/-structures under that analysis (which in fact is used by some but not all scholars).

Apart from the details of segmental analysis mentioned above I think the most interesting issue in segmental phonemics is the existence in polysyllabic words of syllables of REDUCED COMPLEXITY compared to "normal, full" syllables. Leaving aside the final particles there are unstressed word initial syllables as in /map^{h}ráaw/ and word-internal "linker-syllables" such as the second syllable of /rátt^{h}abaan/. Henderson (1949) deals with these in terms of "Prosodies of polysyllables"; a more recent, extensive account is given in Bee (1975). The existence of such reduced syllables as part of polysyllabic words is a topic which deserves further consideration (cf. the typological resemblance with "minor" syllables in Mon-Khmer languages).

B. SEGMENTAL PHONETICS

There are not many published studies specifically devoted to the instrumental-phonetic investigation of Thai VOWELS or

DIPHTHONGS. The authoritative treatise is the investigation of vowels and tones by Abramson (1962). The spectral characteristics of Thai are documented in Abramson's study, but there is no doubt that such data abound in several research centers, including some of the universities in Thailand (the Kay Elemetric sonagraph is available in more than one place), so that these data, if brought together, might provide even more solid evidence on the phonetics of a vowel system of the 3x3 type, for general phonetic reference.

Henderson (1975a) considers the place of articulation of the vowel series that is intermediate between the front unrounded and the back unrounded series and emphasizes that the intermediate ones (/ɯ/, etc.) are really back not central vowels, and that this should be reflected in the choice of symbols (cf. above p.48). It may be mentioned here that for the high vowel /ɯ/ both y̲ and ʉ occur as symbolizations in language teaching materials (personally I think y̲ is definitely the most natural choice, provided that it is made clear to the student that this symbol has nothing to do with either French or German front rounded [ʏ] or English non-syllabic "y" [j]).

Vowel DURATION in Thai, in particular, has attracted the attention of both Thai and foreign scholars, cf. Kanda Sittachit (1972), Abramson (1974). One reason for considering durational data is that there is an interesting interplay between vowel duration and prosodic characteristics of the syllable, as pointed out in a comparative and diachronic perspective in Gandour's instrumental study (1977). Another important aspect of vowel duration is the variation accompanying rhythmical patterning (see section IV below).

The phonetic properties of Thai CONSONANTS have been studied more extensively. By far the most studied aspect is the manner of articulation of initial and final stop consonants. One reason for this interest is that the manner features involved are crucial in the context of hypotheses about tonogenesis (see later), but quite apart from this, Thai has come to be one of the languages referred to over and over again in connection with general phonetic theories about aspiration, voicing, and voice onset time (VOT). This applies specifically to the initial stops, of course.

There are, however, other reasons for taking interest in the language specific documentation of the nature of these consonants in Thai. What is the proper phonetic specification of the initial and the final stops? This question is of interest both as a prerequisite to scientifically based language teaching, and as a prerequisite to the proper placement of Thai in a language typology.

As for the INITIALS, the acoustic appearance of a three-way contrast of aspirated voiceless vs. unaspirated voiceless vs. voiced poses no inherent problems (it very nicely illustrates the descriptive expedience of the concept of VOT). However, there have been various suggestions about the laryngeal mechanism involved in the production of these stops. Various authors

have suggested that there may in some instances be concomitant glottal closure involved.

Harris (1972) suggests that *"utterance initial voiced stops and approximants are usually preceded* [my underlining] *by glottal closure"*, which is interesting in a diachronic perspective, since there is very strong comparative evidence for positing Proto-Tai /*ʔb *ʔd/ as antecedents of Thai /b d/ in initial position, as argued by Li (1943 and later work). Initial /b d/ are very strongly voiced in Thai and invite a careful physiological investigation to ascertain what articulatory adjustments contribute to this strong kind of voicing as against the slighter voicing of the "b d g" series found word initially in some varieties of German and - bordering on unvoiced lenis articulation - in English. - Vichin Chantavibulya (1959, p. 67-70) working on the Songkhla dialect found that phrase internally, in examples such as /-dɔ:k, buə/ 'it's a lotus', *"voice is heard throughout but without any indication of constriction in the larynx"*. (In the same position she observes that /k/ initially in the second syllable is often voiced (sometimes fricative) if this syllable is unstressed.) - To me the initial, voiced stops in Thai sometimes sound slightly implosive, and their articulatory characteristics may be relevant to the general issue: how do we define the difference between implosive and non-implosive articulation of voiced stops?

As for the initial series /p t c k/, Brown (1965) and Harris (1972) speak of simultaneous oral and glottal closure (and release). This was not confirmed by preliminary observations by means of the fiberscope made by Rischel and Thavisak (1984): the glottis did not appear to be really firmly closed, which agrees with the assumptions of Gandour and Maddieson (1976, p. 187).

Another question is whether some of these stops are accompanied by a secondary articulation in the supralaryngeal tract. Egerod (1961, p. 65 and oral communication) has observed that /ii/ begins with what he describes as a velarized quality after /p t/ (to which he ascribes a velar pressure), and that there is also an audible modification of the beginning of /uu/ after these consonants. Harris (1972, p. 13) also speaks of velarization with /t/ before close front vowels. It seems to be the prevalent opinion among Thai scholars that the peculiar quality of these stops before high vowels is in fact a matter of velarization. Gandour and Maddieson (1976), however, have found that the larynx is sharply raised for the stop in such cases, and they assume that there is also a pharyngeal constriction which can explain *"the commonly observed 'dark' quality of vowels, especially the high front vowel, following this stop series"*. (Their argument against the assumption of closed glottis is that stops should sound ejective if the larynx raising were accompanied by glottal closure.) - The observations of Rischel and Thavisak clearly indicate that there is a narrowing in the low pharynx, appearing as a retraction of the epiglottis, i.e. a (low) pharyngealization. One would not expect such a gesture

to be accompanied by velarization in a narrow sense, so the question is whether there is at all such a thing as velarization of /p t/ initially in Thai (or whether the auditory assessment of "velarized" simply is not selective enough, cf. a similar issue with regard to "emphatic" consonants in Arabic). The acoustic effects of constrictions in the back oral cavity and the pharynx are deceptive, so it takes physiological investigation to settle this issue in a definitive manner.

If this is strictly a matter of tongue-root retraction, it is interesting in a geographical perspective, cf. the extensive discussion of tongue root articulation as a feature of register in Mon-Khmer languages.

From the point of view of Thai phonology it is noteworthy that the feature tongue root retraction seems to be always most prominent with /p t/ (this is confirmed by fiberoptic observation). One might speculate whether this has something to do with the fact that /p t/, unlike /c k/, participate in a voicedness contrast (with /b d/): is it the case that "epiglottalization" serves to enhance this contrast, whereas it is less essential with the retracted points of articulation (both because of the lack of contrast here and because voicing occurs less willingly with non-anterior articulation)? As pointed out by Egerod (personal communication), the assumption of velarization would provide a straightforward answer: this feature is auditorily "effective" only with consonants having anterior articulation, and it is indeed questionable whether "velarization" is from a general phonetic point of view a possible secondary articulation with /c k/.

As regards stops in SYLLABLE FINAL position, it has been established, as mentioned above, that these are basically unvoiced. It is also assumed that these stops are glottalized, cf. Harris (1972, p. 11ff.). The question of glottalization (or possibly laryngealization?) in final stops is crucial in a diachronic perspective (see below). - It would be useful to have access to published data on the behaviour of the final consonants (with regard to voicing assimilation and presence or absence of glottalization) in a variety of environments ranging from the position before pause to the position immediately before a voiced stop in a following stressed syllable (of the same stress-group).

As for the oral articulation of Thai consonants there is an abundance of valuable impressionistic and, in part, instrumentally based information in the literature, e.g. in Harris' paper (1972). Some of this information refers to dialects other than Central Thai (Standard Thai) but is often very suggestive also

for the articulatory description of consonants in Central Thai, cf. the numerous palatograms and the detailed descriptions in Panupong (1972). Consonant articulation has been described also as a sociolinguistic variable (cf. Beebe 1976, Tanwattananun 1982).

III. PROSODIC FEATURES OF THE SYLLABLE IN MODERN THAI

Before going into the intricacies of Thai prosody it seems expedient (as with the segmental items above) to present first the immediately contrastive items on the syllable level. The tabulation will be limited to the "tones" (tonal contours) occurring on isolated syllables containing a long syllabic or a voiced final (or both); the more restricted sets of tones occurring in other types of syllables or in connected speech require special comment (see text).

Central Thai has five tones, which are generally symbolized by diacritics place over the (first) vowel symbol in the transcription of the syllable:

(not marked): "mid" (slightly falling at end)

◌̀ : "low" (slightly falling)

◌́ : "high" (rising, ± laryngealization at the end)

◌̌ : "low rising"

◌̂ : "high falling"

Note that the tone marks occurring in the Thai script have no straightforward relation to these five tones of modern Thai, though the tone category of a monosyllable is generally uniquely predictable from the choice of consonant symbols plus the use of tone marks (this will be touched upon later in connection with diachronic studies).

Tone is the phonological characteristic of Thai par excellence. The five tones of Central Thai have been the object of study above all by Abramson (1962 and later, see Bibliography), who has given detailed acoustic descriptions and studied the tones also from the point of view of perception (also cf. Gandour 1978). Basic phonetic research has also been done by others; it should be mentioned in particular that Gandour and Erickson both deal with the production of Thai tones in a general theoretical framework (theses and various papers, see Bibliography).

It is well established that the tonal system of Thai is a contour tone system though involving not only rising and falling but also more or less level tones. The latter are found to be

the ones that are most easily confused (in the case of mid and low tone) since the most important perceptual cue may be relative pitch level in this case (cf. Abramson 1975b, 1976). The "high" tone is not just high but high rising or high rising-falling, often with audible laryngealization at the end; Henderson (1982) observes that the manifestation of this tone has been changing during this century, tending now towards a more purely rising contour (there is, nevertheless, no major risk of confusion with the "rising" tone, which in fact is slightly falling at the beginning and rises only comparatively late in the course of the syllable).

From the phonological view one of the much debated issues is the possibility of a componential or feature analysis of Thai tones. Leben (1971 and elsewhere) advocates the possibility of a reductive analysis of tones, likewise Gandour (1975). Abramson (1978) challenges the idea of splitting tone contours into consecutive levels, one argument against such an analysis having to do with the behaviour of the tone shapes when they are reduced in connected speech.

As I see it, it is essential to distinguish between at least three categories of arguments if one wishes to advocate a componential analysis of tone: (1) In some languages (not Thai) there is a strong case for such a solution because of morphophonemic processes, composite tones arising from the combination of morphemes with simple tones: low + high → (low) rising, etc. (2) Phonetic and phonotactic evidence may support the analysis of some tones as composite, others as simple. (3) A componential analysis may give an expedient taxonomy, e.g. for dialect geographical purposes (3 levels: high, mid, low giving theoretically 3x3 = 9 possible contours with two components). Such a taxonomy is of course fruitful only if the analysis is reasonably adequate from a purely phonetic point of view; to take an example: is it satisfactory to label the tone of Central Thai lέεw "high" or [hi]+[hi] without any further qualification?

This leads over to another issue: how can instrumentally recorded tone curves be specified in terms of a finite number of numerical values? Is it best to state the time and frequency coordinates of the start, the end, and whatever major tonal break (a maximum or a minimum) there may be in between? To what extent is a specification of start, middle and end sufficient? Should the time coordinate be given in centiseconds, or in percentage of total duration? Should the frequency coordinate be given in absolute values (Hz) or in terms of tonal intervals (semitones)? What parameters are useful when dealing with tone in context (possibly involving either truncation or shrinkage of the total, unperturbated contour)? The literature is rich in solutions to such problems, but I do not think a simple answer can be given that covers all types of data and all uses of the tone descriptions.

There are by now several descriptive studies which deal with the tones of Standard Thai as well as those of other Thai dialects. Some of these are listed in the bibliography. In his pioneering work on comparative Tai (see later) Fang Kuei-Li has devoted several papers to the diachronic relationship between tones and initial consonants (cf. Li 1962, 1966, 1970); his descriptive work on tonal systems (and other aspects of phonologies) is concerned with Tai languages and dialects outside Thailand in the first place. Within Thai dialectology in a narrower sense there are quite a few studies of the tonal systems of individual dialects and also some comparative or contrastive studies, an early paper in this latter category being Haas (1958). Egerod (1961) and Brown (1965) gave comprehensive surveys of the tonal systems of a variety of dialects (including samples of Southern Thai, Central Thai, Northeastern Thai and Lao, Northern Thai, and Shan); Brown's monumental work remains the principal source of reference for tonal systems in Thai dialects. For references to other work on the dialects and their tones (predominantly by Thai scholars) see the bibliographical survey paper by Kalaya Thingsabadh (1984, p. 7-9).

The Thai dialects are found to differ significantly both in the realization of the individual tones and in the overall number of contrastive tones. Comparative work also discloses differences in the distribution of the tones on individual lexemes, which has become a major cue in genetic classification of Thai dialects (see later). The "tone chart", which is designed to bring out the systematic features of the distribution of tones on syllable structures, therefore plays a prominent role in these papers and monographs. This tends to make much of the literature on tones in Thai (dialects) less accessible to general linguists or phoneticians without some knowledge of the framework developed for comparative Thai studies, so much more since the "tone chart" refers not to phonological structures of modern Thai but to reconstructed structure types (fortunately for scholars who, like the present author, have a bad memory, these structures are largely retrievable from Thai orthography).

Also Tai languages and dialects not belonging to Thai proper have been studied extensively from the tonal point of view. Although these studies are, on the whole, kept outside the scope of the present paper, I wish to mention that Kanchana Ngourungsi (Patamadilok) in her work on the Tai Yai dialect (Lic.Phil. thesis, University of Copenhagen) observed what seems to be a coexistence of different tonal systems, possibly correlated with sex (the Tai Yai dialect is found in a small pocket in Northern Thailand). It is known from tonal studies elsewhere that interference of dialects with other dialects or regional norms may - at least in a transitional stage - tend to produce slightly different effects for (the majority of) men and (the majority of) women, probably because of differences in their pattern of social interaction with speakers of other language norms.

Another interesting issue in connection with tone is the impact of the intrinsic pitch of vowels, and the effect of consonant type on vowel pitch and hence on tone contour. There has been some study of this, also for Thai, particularly as regards the effect of different types of initial stop consonants (such as /ph p b/) on the pitch contour of the syllable (cf. e.g. Gandour 1974b, Erickson 1975). Amon Thavisak has also made some acoustic measurements of these aspects of tone in Thai at the University of Copenhagen. All evidence suggests that the pitch starts lower after voiced stops than after voiceless stops (which is universally true), whereas the picture is anything but clear as regards aspirated versus unaspirated voiceless stops. Pitch perturbation caused by segmental syllable composition seems to tend to be less in tone languages than in non-tone languages, but it certainly plays a role in Thai, both with regard to consonantal influence and with regard to the intrinsic pitch of vowels (the general rule of thumb being that high vowels are accompanied by slightly higher pitch than low vowels, everything else being equal).

These features of tone perturbation must be taken into consideration in all tone study involving acoustic measurements. Strictly speaking, this means that the contours of different tones are not comparable unless the syllables are segmentally identical, and that one may have to truncate the tone curve - or make some numerical compensation in order to arrive at the canonical tone shape if the initial consonant is of a type expected to have a significantly perturbating influence on pitch.

The interrelations of vowel length and glottalization with tone have been mentioned earlier and will not be taken up here. Dynamic and rhythmical aspects of syllable prosody will be dealt with in the next section.

IV. FEATURES AND MODIFICATIONS ASSOCIATED WITH CONNECTED SPEECH

In recent years there have been quite a few studies dealing with prosodic aspects of Thai phrases and utterances, although the bulk of empirical data is unpublished.

From the general linguistic/phonetic point of view one of the most interesting issues is: to what extent do tone languages exhibit a SENTENCE INTONATION superimposed, as it were, on the individual tonemes? This aspect of Thai grammar and phonology is covered by the recent study of Sudaphorn Luksaneeyanawin (1983) (the contents of which are only known to the present author through a two-page abstract and a short paper (1984)).

The study of SENTENCE INTONATION involves a number of complex issues, both phonetically and phonemically, but generally speaking the primary task is to come to grips with the relationship between intonation and syntax/semantics, a topic which transcends the boundaries of the present report. Rhythm and

intonation are interwoven as signals of the division of utterances into smaller units (possibly a hierarchy of units of different size); this aspect will be taken up below. It may be expedient, however, to refer here to the analysis of Noss (1964, p. 21). As part of his extensive analysis he sets up two "intonation phonemes" having to do with the way intonation contours are linked together: /./ = Pause, and /↑/ = an element meaning that a new intonation contour begins on a high pitch line (examples of how these function in clause constructions are found on p. 22 and 38-40 in Noss 1964).

Across languages intonation, and particularly the final part of the intonation contour, serves to express modalities (such as statement versus interrogation), and intonation is one of the major factors in signalling attitudes of the speaker. It is an interesting issue how intonation works in tone languages, of course. Abramson (1979b) recognizes three terminal pitch contours for "non-emotive" sentence prosody, partly on the basis of the work of Panninee Rudavanija (1965). Henderson (1949) focuses on the information carried by final particles, and describes a variety of types of "sentence tone" associated with these to express command, interrogation, etc.

A related issue is the existence of EMPHASIS as a prosodic category. Emphasis in the most general sense, as something to do with "underlining" (putting into relief) for insistence, for contrast, or just for focus, is found in the most diverse languages, with manifestations involving extra high (or extra low) pitch and possibly dynamic and durational features as well. Thai certainly has "intensification" manifested tonally, as in the first syllable of /díi dii/ 'very good' (see Haas 1946) but also other differences of enhancement of syllables. Like intonation proper, this complex of types and functions of syllable enhancement poses a descriptive problem in general, but it may be particularly interesting to study these matters in a language in which tone already has a considerable lexical load. Several authors recognize at least a categorial, binary difference between stressed (or: accented) and unstressed (or: unaccented) syllables, and the function of this dichotomy in relation to grammar has been investigated by Samang Hiranburana (1971).

A subject which has enjoyed considerable attention on the part of both Thai and foreign scholars, is the greater or lesser stability of lexical tones in positions of TONE COARTICULATION, i.e. before a closely succeeding prominent syllable. The literature comprises both impressionistic and instrumental studies, a major issue (perhaps first pointed out by Henderson 1949) being to what extent tonal neutralizations occur. Among contributions relevant to this issue are those by Noss (1964), Whitaker (1969), Samang Hiranburana (1972), and Abramson (1979a,c). S. Hiranburana sets up a taxonomy defining the set of "unaccented" syllables in Thai (loc. cit., p. 25-26) and finds that the tone changes occurring in these syllables cause a collapsing of the five distinctive contours of lexical tones into three level pitch contours: "mid", "modified low", and

"high". Abramson (1979c) challenges the view that all syllables should be considered to bear a phonemic tone; he finds that the pitch imposed on particles *"seems to be determined by the intonation of the whole sentence"*, and that although the results of this can sometimes be aligned with the lexical tones of Thai phonology, they are more often deviant. As for the preservation of tones in running speech, the general picture is that the shapes of tones in isolation undergo severe modifications in running speech, but, says Abramson, *"as I look at the contours and listen to the speech, I find preservation of the full system of five tones in running speech"*, although particles must be excluded from this statement, and other *"frequently used function words, such as modals and pronouns, often undergo tonal replacement"* (p. 386). Also see Abramson and Katyanee Svastikula (1983).

One further study must be explicitly mentioned here, a.o. for its extensive discussion of the approach to instrumental analysis, viz. Gsell (1979). As for neutralizations in colloquial speech, Gsell only recognizes two "Architonèmes" in unaccented position (p. 69), as against Abramson's inventory of three. As for language typology, Gsell notes that Thai cannot be said to have tonal sandhi, but only coarticulation.

Several studies deal specifically with RHYTHM, i.e., the clustering of syllables into larger units, and the phenomena of enhancement and timing serving to cue this clustering. References are legion, but it may be appropriate to single out for specific reference the studies of Noss (1972, with a useful survey of earlier literature) and Theraphan L. Thongkum (1976a, b, 1977, 1984).

In the grammar of 1964 Noss specifies rhythmic patterns as having six relative syllable durations. These are analysed in terms of the intonation phoneme /./ (pause) vs. /,/ = phrase boundary, the stress phoneme /:/ (sustained stress), plus two extra phonemes /-/ and "space". All these prosodic phonemes when occurring alone or in mutual combinations specify the relative duration of the syllable preceding the symbol(s), the longest duration occurring before /: ./, successively shorter durations before other symbols down to /-/, and syllables not followed by any such symbol (including space) being very short. - Noss sets up three stress phonemes, the Sustained Contour /:/ mentioned already, plus Loud Onset /!/ and Normal Onset /'/ (both written before the syllable in question), as in /!paj/ 'Let's go!' vs. /!paj:/ 'Sure (he) went!' vs. /'paj/ 'Yes (he) went' vs. /'paj: kan/ 'They went' vs. /'ɔ̀ɔg: paj/ '(He) went out' vs. /'ɔ̀ɔg paj: khráb/ '(He) went out, sir' (p. 21). These stress phonemes or phoneme combinations are also employed in a careful specification of tone allophones, Noss recognizing well-defined differences in contours under varying stress (p. 18-20).

This whole descriptive system is posited with a wealth of illustrations and interesting applications to grammar (ch. II), but with no theoretical discussion of the analysis. In his

paper of 1972, however, Noss has a principled discussion of rhythm and stress. He states (p. 37) that syllables do have discernibly different relative lengths, i.e., as he puts it, that *"rhythm is a phonetic feature of Thai"*. He also notes that there is general agreement on some kind of phonetically marked unit which is larger than a syllable and smaller than an utterance, though there is disagreement on the status of this unit (rhythm-group, stress-group, pause-group?).

His paper is a comment on the standing issue whether rhythm and stress are independently phonemic properties of Thai, or whether one depends on the other (either so that rhythm is determined by stress, or so that stress is determined by rhythm). While suggesting that instrumental research is desirable, Noss himself has used a slow-speed playback technique to assess relative differences of syllable length by ear. He thus arrives at contrasts like the following (numbers indicating relative duration, 1 being longest and 5 shortest):

	tham	maj	maa	aw	sìi	mooŋ
(a)	3	3	2	4	3	1
(b)	4	4	4	2	3	1

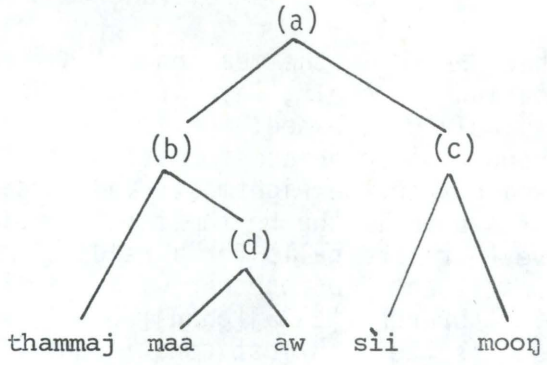
which, with durational pattern (a), has the reading: 'why do you choose to come at 4 o'clock?', but with pattern (b): 'why come to get it at 4 o'clock?'.

Noss' point is that such contrast give evidence that *"rhythm in Thai, if not phonemic, is at least interesting"* (p. 41).

It is not difficult to see that there is something interesting going on here, but it remains an open question how to handle such contrasts. This largely depends on how one defines STRESS, and on whether it is considered desirable to account for rhythmical clusters with reference to a category of stress, like this is done for the so-called "stress-timed" languages (like English). On reading (b) of the utterance above, it is obvious that the surface rhythm reflects a semantico-syntactic clustering of /maa/+/aw/ into one complex unit; on a more "surfacy" level, however, there is a further clustering with the lexical item /thammaj/. The items /sìi/+/mooŋ/, in turn, form a semantico-syntactic unit reflected phonetically. We thus get the following hierarchical structure (disregarding for simplicity the internal structure of /thammaj/):

$$[_a[_b[\text{thammaj}][_d[\text{maa}][\text{aw}]]_d]_b[_c[\text{sìi}][\text{mooŋ}]]_c]_a$$

or, in the visually more expedient tree structure notation:



Now, provided that every branching is assigned a rhythmical feature of final weight, and provided that "final weight" is interpreted (in Thai phonetics) primarily in terms of duration, we can in fact generate the relative durations of Noss' example by a simple algorithm (which shall not be dealt with here). - Similarly with example (a), provided that the hierarchical structure is now supposed to have its major (highest) branching after /maa/:

$$[_a[_b[\text{thammaj}][\text{maa}]]_b[_c[\text{aw}][_d[\text{sìi}][\text{mooŋ}]]_d]_c]_a$$

This kind of analysis raises the immediate question: to what extent are such analyses semantico-syntactically supported? To the extent that there is agreement between rhythm and syntactic structure posited on independent grounds, there is a pay-off both ways: syntax helps to "explain" (in the sense of providing a basis for generating) the rhythmical aspect of sentence prosody, and the latter may be adduced as support of a certain phrase structure analysis. To the extent that there is disagreement, there may be residues in syntactic structure which have not been taken properly care of hitherto, and there may also be syntax-independent rhythmical principles at play. Or the whole analysis may be inadequate.

As seen e.g. from the examples analysed by Noss, there are cases which do not yield to an exhaustive analysis of the type outlined above, e.g.

	thâa	chán	sŭuŋ	ĭik	nít	nɯŋ
(a)	4	4	2	3	1	3
(b)	4	2	3	4	1	3

meaning in both cases: 'if X (i.e. /chán/) were just a little taller/higher', the difference being that X is understood to

mean 'I' under reading (a) but to mean 'the shelf' under reading (b). Such contrasts may involve both differences of stress and of phrase assignment, as noted by Noss, but it is a question on what level of description it is relevant to speak of stress.

One may claim that /chán/ in the meaning 'I' differs from /chán/ in the meaning of 'shelf, layer (etc.)' in that the former is underlyingly unstressed, the latter stressed. There must then be a condition on phrase formation saying that an unstressed item cannot be the rightmost (and hence heaviest) constituent under a node in the rhythmical tree-structure. Reading (a) above therefore calls for a readjustment so that the first two constituents go together with the third one to form one rhythmical branch [[thâa][chán][sǔuŋ]], whereas on reading (b) /chán/ is the rightmost constituent of [[thâa][chán]], and /sǔuŋ/ is free to go together with [[ɨ̀ik][nít]] to form one other branch (under a higher node than that separating [ɨ̀ik] and [nít]). The next question, then, is whether the alleged "stress" difference between the two words /chán/ (a) and /chán/ (b) is lexical (inherent) as a phonological feature, or whether it reflects a difference between a "major" lexical category (including such nouns as /chán/) and a "minor" lexical category (including such pronouns as /chán/).

Incidentally, the pair of clauses above also illustrates another important kind of "residue" found with the iambic (rightmost-constituent-heaviest) conception of rhythmical trees. This residue has to do with phrase final "particles" in the widest possible sense of this word. Obviously, /nɯŋ/ in the examples above upsets the possibility of setting up a requirement to the effect that <u>every</u> branch in a rhythmical tree must be terminated by at least one "heavy" constituent placed as much to the right (under the node in question) as possible. If, however, such a principle cannot be upheld, the whole principle of analysis collapses. This means that the only way to save the analysis is to introduce a special rule for certain particles, stating that they are, or may be, "extrametrical" (to use a term coined within recent metrical theory in phonology), i.e. that they may not count in the building up of the tree-structure. Sentence final particles such as /khâ/, /khráp/ (and variants such as /hâ/, /há?/) obviously belong here, together with /ná/ and some others, and this helps to put their deviation from other lexical items (in terms of segmental complexity) in its proper perspective. Particles are not the only short syllables; other syllables as well may occur in reduced versions (of the type /C_0V/ with a short vowel not followed by glottal stop) but only as <u>non-final constituents</u> under a node in the rhythmical tree. Particles, however, may be extra-metrical, and those that always are may have a structure which would not permit them to ever occur as the heavy (i.e. rightmost) constituent under a metrically counting node: this is true of both syllables of /ná há/, for example.

The approach outlined above is based on an "iambic" rhythm principle, which seems to be operative in a process-like fashion on constituents such as /tɔ̀ɔ 'paj/ 'next', which before a stressed syllable in the same phrase exhibits either "iambic reversal" or loss of stress on the whole sequence /tɔ̀ɔ paj/, as in /'tɔ̀ɔ paj 'níi/ or /tɔ̀ɔ paj 'níi/ 'from now on; following; (as) follows' (from Haas 1964, p. 188 - Haas indicates stress by an acute accent after the syllable in question).

There is, in the present author's opinion, a strong case for this principle at least on an abstract level of Thai phonology. The question is whether it holds in surface phonology/phonetics.

Theraphan L. Thongkum (cf. above) works within the opposite framework, as it were. She posits a foot with the "beat" on the first not the last syllable. This means that light syllables in final position fall in place and do not have to be regarded as extra-metrical. On the other hand, there will be a residue of light syllables occurring before the first full beat, and obviously the occurrence of such initial syllables will be an entirely normal situation even for structures not containing words of "minor" lexical categories, cf. the non-final syllables of such sequences as /phôɔ mêɛ/ 'father and mother', /klàp bâan/ 'return home', adverbial /thâa jàŋŋán/ 'if so', etc. etc., which certainly need not be preceded by any lexical material. The solution to this in her framework of description is to use the Abercrombian idea of a silent beat preceding the seemingly pretonic syllables so that these are in fact posttonic, viz. belonging to a foot without a manifested head syllable:

If this is the appropriate "surface" solution, and it may well be, then there is a discrepancy between underlying and surface organization of the prosodic structure. There is, however, nothing particularly controversial in that (a similar discrepancy has been noted for Danish in recent work).

Th. L. Thongkum has done acoustic measurements of duration, which seem to support the validity of the Abercrombian parsing of syllable sequences into feet, but probably more research is needed before it can be decided with certainty whether light syllables go exclusively with either the preceding (silent or segmentally supported) beat or the following beat, i.e., whether they are to be regarded as exclusively posttonic or pretonic or both ("tonic" being understood here to refer to the placement of the beat). This is indeed an empirical issue, which can be approached at different levels of analysis, e.g. by acoustical measurement (as done by Th. L. Thongkum), but also by perceptual studies.

It is certainly of interest also to find evidence for more abstract psychological patterns having to do with rhythmical parsing. One of the very interesting fields of study in this context is poetic METRE and the accentuation of syllables in renderings of verse. I have entirely refrained from including considerations of the Thai literature on this subject here because of personal ignorance about the performance of Thai poetry (quite generally I find this a difficult field of study because composition and performance of poetry often reflect traditions associated with a specific style of speech).

A central issue for Th. L. Thongkum is to what extent durational relationships support the notion that Thai is a SYLLABLE-TIMED language, or to what extent they point toward STRESS-TIMING. There is much debate in the international phonetic literature on the role of either the single syllable or the foot (or whatever term may be appropriate for a cluster of syllables) as the basic unit of measure: are syllables spaced relatively evenly within a sentence, or is this rather true of feet? If languages differ significantly on this point, then tone languages such as Thai are a priori expected to be candidates for the former type of behaviour. However, both Th. L. Thongkum's measurements, and general observation of speech performance, indicate that Thai cannot be called truly syllable-timed (like Lisu), nor truly stress-timed (like English) but represents a mixed type: syllable-stress-timed rhythm.

V. DIACHRONY AND RECONSTRUCTION

Tai (understood as a wider term including Thai as well as some other languages) is one of the language families to which the comparative method has been applied with much success in this century. The genetic relatedness among the languages dubbed "Tai languages" is well established, whereas the relationship of Tai to other Southeast or East Asian languages is a controversial issue.

It would go beyond the scope of the present paper to review the literature on comparative Tai phonology. The bulk of scholarly work in this field will be taken into consideration here only to the extent that it is indispensable for a proper understanding of issues in the comparative and diachronic study of Thai proper, "Thai" being understood in a narrow sense, i.e. to a first approximation, as a common denominator for dialects of the language of Thailand (though Lao and Shan etc. are often included).

Within Thai proper, the pioneering comparative and diachronic work was done by Egerod (1961) and Brown (1965), the approach of the latter being to trace the sound shifts leading from an assumed common ancestor: Ancient Thai to the modern dialects (also cf. Jones 1965b). In recent years several descriptions and comparative studies of dialects in Thailand have been performed (see the survey by Kalaya Thingsabadh 1984), for the most part by Thai scholars and students. At the same

time the general comparative and diachronic research has been continued by scholars such as Brown (1975), Gedney (1972, 1973), Chamberlain (1972b), and Strecker (1979a, 1979b), just to name some of the work done.

One of the things that make it complicated to view the individual Thai dialects in a comparative and historical perspective is that it is not self-evident how to define what dialects belong to one and the same language, as it were. One would hardly a priori expect the linguistic boundary between Thai and non-Thai dialects to coincide with the present national boundary, but even if the concept of "Thai dialects" is defined on a purely descriptive-linguistic basis, one cannot be certain that the resulting cluster of dialects derive directly from a common ancestral language, to the exclusion of other dialects. The classification of Tai languages in general is quite controversial (cf. Chamberlain 1975), and this is also true of the "Southwestern branch" of Tai to which the Thai dialects belong, according to the classification of Li (and Chamberlain). From a synchronic point of view the most obvious conflict between different classificatory principles is found with the so-called Northeastern Thai dialect in Thailand, which is in essential respects just a variety of Lao.

These complications, however, do not make it irrelevant to perform studies for which the scope is (in the first analysis) strictly limited to the appropriate dialects within Thailand, viz. "Northern Thai", "Northeastern Thai", "Central Thai" (to which Standard Thai belongs as a normative sociolect), and "Southern Thai". There may well be uniting features that make it interesting to speak of a Thai dialect geography in this narrow sense, since in relatively recent time there has been an influence exerted by Central Thai on certain other dialect areas within Thailand, as well as mutual contacts among these other areas. In fact, much scholarly activity is being devoted these years to such dialect geographical work within Thailand proper, and not surprisingly, transitional dialect areas are coming into focus. These transitional areas are a challenge to dialect classification, but they are highly interesting also from a historical point of view (being evidence of earlier cultural contact or migration routes, etc.). This is true, e.g., of the Thai Isan - Thai Khorat area investigated by Vichin Panupong (1983), cf. Brown's characterization of Thai Khorat as "central Thai with a Lao accent" (Brown 1965, p. 23).

When considering dialects (or languages) in a historical perspective it is always the linguist's delight if it is possible to set up a "Stammbaum" with an ancestral language from which all modern dialects spring as separate branches (the greater or lesser mutual relatedness among dialects being reflected in the hierarchy of branchings). Strictly speaking, however, this is only likely to work with dialects that have been geographically separated from each other ever since (maybe before) the dialect split. Obviously, Thailand is a place where migrations and cultural and political dominance have to a large extent

had the opposite effect, i.e. to cause dialects to influence each other. This raises the basic question to what extent one can pinpoint what is "original" (or: pure) Northern Thai, Northeastern Thai, etc.

A. PHONOLOGICAL RECONSTRUCTION

Since the early sixties the conceptual framework of research on Thai language history has been somewhat reminiscent of that of Romance linguistics, the gross features of the reconstructed ancestral language being taken essentially for granted, and the phenomena of modern dialects being derived from this source, much as Romance languages and dialects are ultimately derived from Latin. Needless to say, in the case of a reconstructed source language the explanatory advances in "historical" linguistics will in actual practice go both ways: inferences from modern data serve to refine the reconstruction, i.e. the present is used to explain the past, just as the confrontation of different (attested or reconstructed) chronological stages entails the use of the past to explain the present (with a very free quotation from W. Labov).

It is, however, no simple matter to determine what chronological stage to reconstruct in order to account for the modern dialects of Thai. As for the attested older stages, the language of the Ayudhaya period (14th to 18th century A.D.) has a special provenance, and cannot be set up as a common denominator. It is rather different with the language of the preceding Sukhothai period, which is archaic enough to be a useful point of reference. King Ramkanhaeng the Great created the Thai script in 1283 (on the basis of Mon and Khmer scripts), thanks to a long stone inscription from 1292 written in this script (as well as later material) the structure of Old Siamese of 700 years ago is well documented. Egerod (1961, p. 74) takes this stage of the language as his point of reference in dialect comparison, though *"a few features, especially in Southern Thai, seem to antedate Old Siamese"*. The Sukhothai language (Old Siamese) he takes to be *"the direct ancestor of Central Thai of today"*.

Needless to say, it takes an interpretation of the phonological status and the phonetic value (or values) of each letter of the Sukhothai script to arrive at a transcription of Old Siamese which can be used directly for reference in work on sound change and dialect splits in Thai. If Central Thai is taken to be a continuation of Old Siamese, reconstruction of the latter naturally involves a backward projection from the pronunciations of words in the modern language, as well as a consideration of the discrepancies between phonology and orthography in the modern language which may be taken to reflect phonological changes having taken place since King Ramkamhaeng's time. The latter aspect (conservative spellings in modern Thai) is highly relevant because the orthography is quite faithful to tradition. Most of the changes in question appear as phonological

mergers, e.g. between voiced and voiceless sonorants, or between the old diphthongs */aɨ/ and */aɯ/ (with the consequence for modern Thai that the pronunciation is largely predictable from spelling but not the other way round).

Another important source of knowledge (or of qualified assumptions) about the phonology of Old Siamese is the orthographical rendering of old loanwords, e.g. from Sanskrit. These are not a priori proof of the standard values of the Thai letters at the time the loanwords were borrowed, however. For one thing, it might be the case that some letters of the Sukhothai script were used with special phonetic values in Indic loanwords (possibly more in accordance with the values of the related letters in the Indic script in question), so that these do not count in assessing the values of the letters in genuine Thai words of that period. Secondly, we cannot know a priori to what extent the pronunciation of such loanwords in Old Siamese differed from their pronunciation in the lending language. However, it is known that the creator of the Sukhothai script was well versed in Sanskrit and Pāli, and it is most natural to assume that the letters had largely the values one would expect from the renderings of loanwords, though this creates something of a gap between the phonology of Modern Thai and the phonology of Old Siamese. To take just one (important) section of the phonology, there is in fact overwhelming comparative evidence corroborating the assumption that of the letters that are used to represent an aspirated stop in Modern Siamese only some had this value in Old Siamese, others representing a voiced stop, cf. loanwords such as /phút(tha-)/ 'Buddha', /thêep, theewaa/ 'divinity, god' in Modern Thai with obvious cognates with voiced initial in Indic.

On this and on several other points Old Siamese seems to have been closer to Proto-Tai, as reconstructed by Haudricourt, Li and others, than to Modern Thai. The old system of stop consonants, if exemplified by the labials, is supposed to have looked as follows with its modern reflexes:

Old	Modern
*ph	ph
*p	p
*b	ph
*ʔb	b

the reflex of old /*ph/ being written with a so-called "high consonant" in Thai, and the reflex of old /*b/ with a so-called "low consonant". In the Thai script there is a similar distinction between "high" and "low" consonant letters for the voiceless fricatives, which likewise reflects the old manner distinction.

In the case of sonorants there was likewise a distinction between two categories. One category was constituted by initials combined with voicelessness (i.e. /*m̥/ or /*hm/, etc. - the

Thai script spells these as sequences with initial "high" h followed by the ordinary "low consonant" letter representing the sonorant in question). The other category was constituted by voiced initials (/*m/, etc., represented in Thai script as single, "low" consonants). With /*j/ there are even reflexes of a three-way contrast between voiceless, plain voiced, and glottalized (/*j̥/ or /*hj/; /*j/; /*ʔj/).

So much for initials. Looking now at the remainder of the syllable we find three kinds of components expressed in writing, viz. a vocalic nucleus, a final consonantal part (which is not an obligatory component of the syllable), and a component expressed by presence or absence of the so-called "tone marks". It is generally assumed that these tone marks, of which the more common ones are "máj èek" (the Arabic figure "1" as a diacritic over the consonant letter before the vowel) and "máj thoo" (the Arabic figure "2" placed in the same fashion), were used in Old Siamese to represent different (to a greater or lesser extent tonal) prosodies from which the present tonal systems of the various dialects have developed (see section B below). According to the authoritative Proto-Tai reconstructions of scholars such as Haudricourt and Li, these prosodies are reflexes of an original system comprising three main categories: A (no tone mark in Thai script), B ("máj èek"), and C ("máj thoo"), each of which defines a laryngeal state or phonation type in the final part of the syllable.

The distinctions reflected by the tone marks in Thai script intersect with a distinction between so-called "live" and "dead" syllables, the latter being syllables ending in a stop consonant, and also with a distinction between long and short vowels (cf. the remarks on syllable structure in Modern Thai in section II A above). For "Ancient Thai", a proto-language (much antedating Old Siamese of the Sukhothai period) which Brown (1965) sets up as the frame of reference for his diachronic study, Brown himself posits an integrated system comprising four final laryngeal components plus a distinction of length versus shortness, which combine to form a total of five components: whisper ("w"), voice ("v"), creaky ("c"), glottalization with length ("longstop", "q"), and glottalization with shortness ("shortstop", "k"). Now, how do these compare to the phonetic interpretations suggested for the Proto-Tai categories A, B, and C by other scholars? Haudricourt (in the "Additional Note" to the 1972-version of his paper on tonal splitting, as formulated by Court) finds that there is partial agreement between Brown's reconstruction and his own in that they both have glottalization for category C, but that they differ on assigning features or components to categories A and B. Brown's "whisper" occurs in the case of category A, and his "voice" in the case of category B, whereas Haudricourt reconstructs rather the opposite for cognates in Austroasiatic and Proto-Miao: "voiced final vowel or sonorant" for category A, and "final -h or other fricative" for category B. - This discrepancy is indicative of the rather hypothetical status of these phonetic interpretations of reconstructions.

B. DIACHRONY: THE ORIGIN OF THAI TONES

Although the diachronic literature deals with quite a number of changes from the proto-language to Modern Thai (some of which are dialect specific and others more general), the only issue to be considered in detail here is the loss of manner distinctions in consonants and the concomitant development of tones in Thai. This is a challenging issue because of the different tonal developments in the various Tai languages and also within the Thai dialects in the narrower sense. The presentation here will deal only summarily with the diachronic reorganization of syllables by which consonantal distinctions were replaced by tonal ones, and the attempts that have been made within the last two decades to explain the changes in terms of phonetic and psychological processes. However, the survey is intended to be explicit enough to pinpoint what is obvious and what is controversial with regard to TONOGENESIS in Thai (for the concept "tonogenesis", see Matisoff 1973, Henderson 1982). Put differently, the summaries and comments in this and the following section are directed at questions such as (1) How did the Thai tones come into being? and (2) is the development in Thai illustrative of universal mechanisms causing tonogenesis to happen?

When looking at the possible connection between laryngeal features of syllable initials + finals and tonogenesis, it may be useful to keep in mind that in principle tonal contrasts or specific tonal manifestations can arise in a number of ways. For one thing there may sometimes be phonetically different pitch contours associated with long and short vowels, and under certain conditions such contours may conceivably come to acquire the status of different tones; likewise, contraction of two consecutive syllables into one may be the source of a tonal contrast with items that were monosyllabic "from the start". Such sources of tones may be relevant in explaining the tones of Proto-Tai and very early Thai (ideas along these lines have been expressed in passing by various scholars but not worked out in detail for Thai).

To mention quite another type of source, specific shapes of tonal contours may be borrowed from one dialect into another (cf. Chamberlain 1972a). It has been argued (Brown 1965, p. 157) that coalescences or splits in tonal systems are not borrowed, but I am not at all convinced (in spite of Chamberlain 1972a) that this holds true as a principle; it is at any rate clear - as evidenced par excellence by South-East Asian languages - that non-tonal languages may become tonal by diffusion of an areal feature of tonemicity. At the very least, one must admit that the tendency to develop tones out of other properties of syllables may spread as an areal phenomenon; it is an important empirical issue how far this idea (also cf. Brown 1965, p. 62) can explain the facts without the assumption of direct borrowing of tonal contrasts.

However, as mentioned already, everybody agrees that there is - in Thai and many other Asian tone languages - a direct connection between the development of lexical tone and the loss of certain contrasts among initial consonants. This is what Brown (1975) refers to as the GREAT TONE SPLIT. I think the best way to state briefly what this is all about, is to cite the introductory passage from Brown's paper:

> *"The great tone split was a sound change that swept through China and northern Southeast Asia nearly a thousand years ago. It was probably the 'greatest' sound change we have record of today, for it affected almost all of the words of almost all of the languages of this vast area (...) Simply put, voiced, glottal, and aspirate initial consonants split all existing tones in two (or three) and then partially coalesced, thereby shifting some laryngeal distinctions from initials to tones. A typical example is shown below.*
>
> | | | |
> |---|---|---|
> | *phaa* | *phá́a* | *phá̀a* |
> | *paa* | *paa* | *paa* |
> | *baa* | *bàa* | *phàa* " |

(Brown 1975, p. 33).

There are three points to be made about the general nature of this great tone split: (1) It should be noted that the split into different tones (e.g. high, mid, and low, as suggested by the transcription above) has an obvious affinity to the perturbating effect of initial consonants on the pitch (fundamental frequency) of a following vowel which is well-known from numerous acoustic-phonetic studies of living languages (cf. references in section III above); hence the relationship between tonogenesis and mechanical pitch perturbation is a crucial issue. - (2) It should be kept in mind that what occurs with the great tone split is not necessarily tonogenesis in the typological sense that a language becomes tonal; rather, one must allow for two diachronic possibilities: (a) that an already existing tone system was multiplied, as it were, by the tone split (this is assumed for languages such as Chinese and Thai), or (b) that a previously non-tonal language became tonal. - (3) The great tone split does not always work in the phonetically transparent way illustrated above; on the contrary, the tonal reflexes may be totally at variance with the phonetic predictions. (This crux, which is referred to in this paper as the "tone split paradox", will be dealt with in section C below.)

To return to the general origin of the tones of modern Thai in its dialects, the idea is that (as mentioned already in section A) the tones stem from the interplay between the pitch-perturbating initial components and various properties of the remainder of the syllable, viz. properties that are expressed in Thai writing as short versus long vowel, "live"

syllable (resonant termination, including open syllable) versus "dead" syllable (non-resonant termination), and the choice of "tone mark". The intersections of these dimensions create a roster of slots which are filled differently for different dialects (with or without mergers between the tonal reflexes in the various slots, and with different manifestations of the individual tones). The filling out and confrontation of such tone charts (on the basis of Gedney 1973) has become one of the major concerns of comparative Thai dialectology.

As a result of the complex interplay of various components it holds true for all modern dialects that the tones are only very indirectly linked to the old tone marks. In Central Thai, for example, "máj èek" has both falling and low tone as reflexes (depending on the etymological status of the initial consonant(s)), "máj thoo" has both high and falling reflexes (likewise depending on the initial), and "zero" (absence of tone mark) may correspond to any of the five tones in the modern language, i.e., mid, rising, high, falling, or low tone (depending on vowel length, on the specific combination of initial and final consonants, and on the etymological status of the initial). In other dialects the details are more or less different but in principle the picture is similar.

Because of the conservative character of Thai orthography the tone of a particular syllable is normally retrievable from its spelling (according to the orthoepic rules of the dialect in question), at least for Central Thai. The orthographical representation of tones, on the other hand, is only in part predictable because of mergers among initials, such as

$$\left.\begin{matrix}*ph\\ *b\end{matrix}\right\} > ph \qquad\qquad \left.\begin{matrix}*j\ (hj)\\ *j\\ *ʔj\end{matrix}\right\} > j$$

which combine with partial mergers among the prosodies represented by tone marks. These latter mergers are dialect specific. In Standard Thai (Central Thai), for example, it is so that the combination "high" consonant (± "low" consonant) + "máj thoo" (in "live" or "dead" syllable) has merged with the combination "low" consonant + "máj èek" or "dead" syllable, the result being in all cases a falling tone. Thus sequences such as /phâa/, /nâa/, /phâap/ are in principle (and often in actual practice) genuinely ambiguous with regard to their etymological source and their spelling.

After this lengthy introduction to the tonogenesis issue, the possibility of tracing and of explaining the actual mechanism of diachronic change will be dealt with in the next section.

C. TONOGENESIS MECHANISMS AND THE TONE SPLIT PARADOX

Taking for granted that the present tones of Thai reflect the interplay between laryngeal properties of the syllable onset and laryngeal properties of the remainder (tones or other old prosodies, etc.) in the proto-language the next question is how to trace what really happened in the process of tone split in Thai (and possibly in all of northern Southeast Asia and China).

Brown (1965) describes the development from Ancient Thai to modern Thai dialects in terms of REGISTER and CONTOUR. Register, he says, developed *"as the initials unloaded distinctions unto the tones"*, Modern Thai having three such registers, viz. R1 characterized by low pitch, R2 characterized by mid pitch, and R3 characterized by high pitch. These registers (not to be confused with what is now called "register" in Mon-Khmer studies!) he assumes to be controlled by the cricothyroid and thyro-arytenoid muscles (which are indeed the major pitch-controlling muscles). Contours he supposes to have developed gradually and to have become associated with specific registers; it might then happen that register distinctions were lost, and the distinction was carried by contours alone (p. 58). He distinguishes three kinds of contour for Modern Thai, viz. C1 appearing as low dull tone, C2 appearing as mid normal tone, and C3 appearing as high bright tone. These contours are supposed by Brown to be produced by different degrees of contraction (due to rotary movements of, or pressure on, the arytenoids as controlled by the lateral crico-arytenoid muscles): strong contraction = C1, mid contraction = C2, and weak contraction = C3. The idea, then, is that the actual pitch movements of tones in Thai dialects reflect combinations of contour and register with syllable final components ("endings") although, as he points out himself, the phonetic reality cannot be derived very directly from such a componential representation.

As for the emergence of tonal differences among dialects, Brown claims that endings were the most stable components, contours and registers varying much more from one dialect to another.

This whole analysis is ingenious and interesting, but the integration of very mechanistic phonetic considerations with a rather abstract componential analysis is in my view a problematic undertaking, both in the case of modern dialects (for which instrumental analyses are highly desirable) and much more in the case of the reconstructed proto-language.

The question is to what extent it is possible to predict the tonal effect of various kinds of syllable onsets and syllable terminations. As for the latter there has been comparatively little research on the effect of such differences as presence versus absence of a final voiceless consonant. This phonetic issue is particularly relevant in connection with attempts to

explain the remote origin of the three (or more) prosodies in Proto-Tai and in other proto-languages of the area, which is a topic outside the scope of the present paper (see references to Haudricourt and others in section A above). It is, however, also relevant to the understanding of the later development in Thai (cf. the importance of the concepts "dead" and "live" syllable), as is the possible effect of the presence or absence of a glottal syllable termination (glottal constriction or closure), see e.g. Egerod (1971). Here is a field in which more instrumental research on present-day languages of the area is called for.

It is at first sight different with the effect of syllable onsets on the pitch of the remainder of the syllable. The general pitch-perturbating effects of resonants versus obstruents, or of voiced versus voiceless consonants, in syllable initial position are well-known, cf. the survey of these effects in Lea (1973). As for Thai, there has recently been a considerable amount of research serving, a.o., to show the interrelations between consonant articulation, durational features, and pitch movements on the basis of contemporary insights into speech physiology and with the use of modern apparatus. This research (see e.g. Abramson 1975a, Erickson 1975, Gandour 1974b, Gandour and Maddieson 1976) of course deals with contemporary Thai but is in part done with a direct view to the diachronic perspectives of the findings.

The general phonetic literature clearly points to voiced stops having a pitch-lowering influence on the onset of a following vowel as compared to voiceless stops, although Painter (1978, p. 263, 265, 273-274) finds that *"the actual difference in frequency between the sets is very small compared to the difference between high and low tones* [in tone languages such as Yoruba, JR]" and expresses scepticism toward the current explanation of tonogenesis as due to this effect of consonants on vowel pitch.

It is much less clear whether aspirated voiceless stops cause a higher pitch than do unaspirated voiceless stops. There is simply conflicting evidence (also cf. section III above). One conceivable reason for this is that unaspirated stops may be produced in different ways in different languages, and perhaps even within one language or dialect: with or without glottalization, with or without supraglottal constriction (e.g. the type of tongue root retraction observed for Thai /p t/), and with or without vertical movement of the larynx (cf. Gandour and Maddieson 1976). Unless such parameters - which have an aerodynamic influence - are totally under control it seems hard to make precise predictions about the pitch perturbating effect of consonant articulation. I think this should be kept in mind when the origin of tones as mechanical pitch perturbations is at issue, especially because it may be hard to reconstruct such details of articulation (unless one renounces on independent evidence and allows for complete circularity, in which case the reconstruction is of limited explanatory interest, of course).

To judge from the phonetic literature, then, there is nothing strange with the tonal development depicted schematically by Brown (1975) in the quotation above (section B). Languages or dialects in which the tonal reflex after old voiced consonants (e.g. /*b/ > /ph/ in Thai) is low-pitched, i.e. what Brown calls "voiced-low" dialects, behave according to expectation. But then the above mentioned tone split paradox presents itself: some dialects, on the contrary, have a high-pitched tonal reflex after old voiced consonants, i.e., they are "voiced-high". In his 1965-monograph Brown ventured a physiological explanation of the paradox that - in the framework of his description - the initial components aspirated, glottalized, and voiced have caused respectively high, mid, and low register in some dialects but respectively low, mid, and high in others. Brown suggests that there were two possible ways for the vocal cord adjustment to react to aspiration; as I understand him the idea is that the vocal cords might be in a state of tightness, and a pitch rise would then result from the opening of the glottis, or they might be slackened so as to give in, with a resulting pitch drop in the latter case. These two options being available some dialects chose one, others the other option.

It is hard to evaluate the physiological plausibility of such an explanation, although it does not seem a priori unlikely that some of the variability in the general phonetic results concerning pitch perturbation after consonants have to do with the existence of different production mechanisms for aspirates. However, as long as there is not independent evidence for such differences in laryngeal adjustment (with exactly the desired effect) to have existed in the proto-language, it seems that the question must be left totally open.

In his 1975-paper Brown approaches the question from a quite different angle. He no longer claims that there were variable production mechanisms underlying the differential tonal developments of the dialects; instead he states that

> *"There seems to be complete agreement in the literature on how different consonant types go about splitting tones: voiced initials tend to lower tones and aspirate initials tend to raise them; and the tones with glottal initials* [i.e., consonants of /*p/-type as well as consonants of /*ʔb/-type, cf. Strecker 1979a, p.77] *get drawn one way or the other (giving two different levels for the old tone) or else stay in between (giving three)."*

(Brown 1975, p. 33).

Nevertheless he finds that most Thai dialects, with the exception of Southern Thai dialects, show definite voiced-high correlations, that is, exactly the opposite of the pattern one would expect from the universal phonetic tendencies.

Before going into the crucial issue: Brown's new explanation of the tone split paradox, I shall summarize how he and Strecker

(1979b) explain a number of more specific discrepancies among the tonal systems of the various dialects (within the "voiced-high" and the "voiced-low" group, respectively). Brown refers to the operation of two forces working on register and contour (tonal components in his analysis, see the beginning of this section), viz. "the principle of least effort" and "the need to maintain distinctions" (p. 40). In the extensive and impressive follow-up paper by Strecker (1979b) it is pointed out that the latter force (maintenance of tonal contrast) may cause tones that are too close to move further apart either by changes in overall pitch or by modifications of pitch contours, such modifications (rises or falls) affecting either the final or (e.g. in the Chiengmai dialect of Northern Thailand) the initial part of the tones. - It is immediately seen that the principle of least effort and the maintenance of distinctions (or, in Strecker's terminology, the principle of "psychological distance") may be in conflict within individual tonal systems; this leaves the linguist with a powerful tool since there is considerable freedom in explaining why the tones came out differently in different dialects, viz. as a consequence of one or the other force taking the lead in each individual case. The whole explanatory frame becomes even more powerful because it is necessary to assume some kind of tonal reorganization (so that in principle dialects which are now voiced-low may be originally voiced-high, and vice versa).

In addition to the more abstract forces mentioned above Strecker further finds evidence for two general tendencies: high-falling tones tend to fall more than medium- or low-falling tones, and conversely, low-rising tones tend to rise more than medium- or high-rising tones. These tendencies are documented with a wealth of material including a wide variety of Tai dialects inside and outside Thailand. - Interestingly enough, there seems to be a correlation with the voiced-high/voiced-low categorization: a high-falling tone falls relatively much in a voiced-high dialect but less in a voiced-low dialect. This, of course, fits neatly into the general idea of maintaining psychological distance between tones. However, as mentioned in Strecker's Appendix (p. 73), Southern Thai dialects actually run counter to the generalization by being voiced-low but having two falling tones of which the higher falls longer than the lower one (an observation which Strecker incidentally mentions as a possible stumbling-stone for the whole explanatory framework).

After this digression I shall return to the main issue: why are there "voiced-high" in addition to "voiced-low" dialects? Brown (1975) now suggests that the explanation may be a psychological one having to do with the way listeners focus their attention when perceiving tonal contours. His explanation is based on the contention that the pitch in syllables beginning with voiced consonants is higher throughout most of the syllable although the pitch of the voiced consonant is lower, compared to syllables beginning with voiceless consonants. *"The natural working of the larynx in any synchronic description is"*, says Brown (p. 44), *"for tones or intonations in*

syllables with voiced initials to start lower but be higher". He claims that this is seen from the pitch contours for Thai in Erickson (1974) and for English in Lea (1973).

If it is indeed the case for Thai that the tonal contour found after a voiced initial (for a given tone) typically rises above the contour after a voiceless initial, we may have here an interesting case of compensation: *"The tone signal is such as to produce the desired pitch regardless of environmental factors"* (Brown 1975 p. 44). This may well be essential in a tone language (as against a non-tonal language). Now, Brown further speculates that the listening strategy with regard to pitch may proceed in either of two ways, causing dialects to become voiced-high and voiced-low, respectively: speakers of the former dialects are assumed to "start at the center of a syllable and work out", whereas speakers of the latter dialects "start at the point where the vowel begins and work out" (p. 45). A dialect may thus become voiced-high if a listener narrows his focus down to the syllable center and hears the pitch as higher after the voiced consonant (by successive imitation, the argumentation continues, pitch allophones emerge which are dissociated from the initials and reinterpreted as phonemic tones). - Strecker (1979) tends to accept Brown's hypothesis (which, by the way, Brown himself carefully refers to as "sheer speculation", p. 45), and provides arguments against other conceivable explanations, some of which are taken up below on the basis of Strecker's excellent survey.

Before looking in detail at Brown's specific suggestion one may address the more general question: is it likely that a relatively low pitch after voiced initial can be reinterpreted categorially as a higher tone than the pitch after voiceless initial, and are there perceptual mechanisms and strategies which may account for such a categorization? The important paper by Abramson and Erickson (1978), using synthetic stimuli presented to Thai listeners, suggests that the categorization is non-trivially related to the choice of initial consonant, so this is definitely an area that deserves further consideration in tonogenesis studies. - To return to the alleged cross-over of pitch contours after voiced and voiceless initial, Brown refers a.o. to the graphs in Lea (1973). I do not find Brown's interpretation of these compelling, however, and altogether the phonetic literature is not indicative of a general tendency for the lower initial pitch to be followed by a higher final pitch after voiced than after voiceless initial. Moreover, Brown's ingenious explanation replaces one crux by another: is it likely that listeners begin to focus on differences between parts of the pitch contour if the alleged cross-over is not mechanically caused but is perceptually motivated in the first place, viz. as a means to ensure perceptual sameness?

Finally, the assumption that a speaker may listen selectively to either part of the pitch contour or the whole pitch contour of a syllable and perceive the selected part as the overall pitch is, if not a priori inconceivable, at any rate highly radical if seen on the background of current assumptions about pitch perception.

Thus, as I see it, we are still not much closer to a real explanation of the tone split paradox.

One alternative to the across-the-board hypotheses of Brown and Strecker (attempting to explain the scenario on the basis of principles affecting the system as such), is to assume that tone shifts are not totally dependent on the system: the voiced-high situation may arise through unsystematic changes affecting individual tones. Brown and Strecker (p. 55) are most decidedly not in favour of such an explanation, but considering the general limitations on predictability in historical phonology I think we have to admit that this may be precisely what happened in voiced-high dialects.

Another interesting possibility is that the developments have to do with the chronology of events; Strecker (p. 56) cites an unpublished paper by Jay Fippinger for the following suggestion:

> *"(...) certain consonant changes took place before the tones underwent splitting, and (...) one set of consonant changes took place in the voiced-low dialects and a different set took place in the voiced-high dialect. Therefore the consonantal environment affecting the tones was different in the two types of dialects, which explains why the tones underwent a different type of splitting in each case."*

I wish to mention one aspect of the consonant development which may be relevant here. One of the developments assumed to be involved in the tone split is the change from initial /*b/ to /ph/ (and similarly for the other points of articulation). Now, such a change of a voiced stop into a voiceless aspirate is in itself a real crux. Why did /*b/ not coalesce with /*p/ instead of bypassing it, as it were? One possibility is that /*p/ was set apart by being glottalized; this, however, does not account for the phonetically strange line of development [b] > [ph] (via [p], or what?). Egerod (1961, p. 76-77) speculates whether we may have instead a development from a voiced aspirated stop via a voiceless stop with voiced aspiration to the voiceless aspirated stop of Modern Thai, that is, something like [bɦ] > [pɦ] > [ph]. (There seems to be a parallel to the suggested development of voiced into voiceless aspiration in Chinese.) I am not sure that there is an easy phonetic explanation for such a chain of events, but at least it represents a unidirectional process having to do with increasingly delayed voicing.

As far as I can see, it must remain an open question whether stops of /p/-type were glottalized or not at the time of the

great tone split (in spite of Strecker's insistence that the reflexes of these consonants "are accompanied by simultaneous closure of the glottis" in most or all modern Tai dialects for which detailed phonetic descriptions are available, 1979, footnote 15; see section II B above for counter-evidence). If, further, it is likely that the consonants generally reconstructed as /*b/ etc. were, during a long time span, aspirates but with voicing specifications differing from one chronological stage to the other, one should be a little careful with a mechanistic application of the phonetic principle of pitch lowering after voiced as against voiceless stops. We simply do not know enough about the relevant parameters of consonant articulation in the proto-language, or at chronologically successive stages in the history of Thai.

Strecker (1979b, p. 57-58) also communicates that John Grima (personal communication) has proposed a phonetic explanation which ties the tone split to the development of register Understood as a split of vowels into two sets) in Mon-Khmer languages. One might, according to Grima, assume that the development in the Tai languages went through a register stage, viz. according to the following scheme (where "a̰a̰" stands for creaky, "a̤a̤" for breathy voice, and Arabic figures for components of a rising tonal contour):

	Consonant difference	>	Register difference	>	Tone difference
Voiced-high	paa 24		pa̰a̰ 24		paa 13
	baa 24		paa 24		paa 24
Voiced-low	paa 24		paa 24		paa 24
	baa 24		pa̤a̤ 24		paa 13

According to this hypothetical scheme the pitch contour is lowered in some dialects after voiceless initial via creaky phonation, in others after voiced initial via breathy phonation. Strecker mentions the observation that breathy voice still occurs after originally voiced stop in certain Southern Thai dialects (according to Egerod 1961) in favour of this hypothesis.

As I see it, both the relative chronology hypothesis and the register hypothesis are in principle open to verification or refutation by external evidence and worthy of careful consideration in future work. At the same time it must be taken for granted that the tone split paradox may ultimately turn out to be explicable only in rather abstract psychological terms referring to the way a tonal system is mentally represented and reorganized as a function of specific structural properties of the language and of general "forces" operating on tonal systems (if such forces can be empirically shown to exist).

D. ADDITIONAL REMARKS ABOUT SOUND CHANGES AND DIALECT DIFFERENCES

Although the preceding sections have been devoted to problems directly or indirectly associated with the "Great Tone Split" there were also other major changes which affected the phonological structure of Thai syllables. As for vowels, there were shifts particularly in the diphthongs (taken in the wide sense). Not only did the peculiar diphthong /aɯ̂/ merge with /aj/ (/aî/) in most areas (outside the Northeast), and the vowel /ɯ̂/ merge with /i/ (completely or partially) in Northern Thai dialects, but the spelling of the sequences now pronounced /aj aw iə wə uə/ is clearly suggestive of major changes from Old Siamese (also cf. the particular, diphthong-like spelling of the vocalic complex now pronounced /ɔ?/). Further, there were (more or less dialect-specific) changes in vowel length, so that it is now only partly predictable from spelling what length to assign to a vowel of the set /ɛ a ɔ/ (see further Hartmann 1976, Brown 1979).

In initial consonant clusters there is a widespread loss of the liquid in the sequence muta cum liquida (/paa/ for /plaa/, etc.). Altogether, the phoneme /r/ has been the most vulnerable member of the initial consonant inventory, changing either to /l/, /h/, or (in the just-mentioned clusters) zero. There is considerable dialectal variation associated with the /f/-/khw/ complex. It may be mentioned also that /*ɲ/ changed to /j/ in most dialects. These phenomena are being studied in Thailand in a comparative dialectologist framework and in a sociolinguistic perspective (cf. Beebe 1975, Tanwattananun 1982).

The most pervasive changes took place in syllable-final position, all finals (in inherited words as well as loanwords) eventually merging into a very small set of possible consonant types (cf. section IIa above on permissible finals). As with tonogenesis we are here faced with an important areal phenomenon posing a host of inherently interesting questions (How old are the present severe limitations on possible finals?, How are the old loanword spellings to be interpreted phonologically with reference to Old Siamese pronunciation?, etc.). However, this issue is not debated in the current literature on Thai to the same extent as the tonogenesis issue, and the present author does not feel in a position to give a concise and adequate appraisal of the Stand der Forschung in this area.

VI. FINAL REMARKS

There has been an impressive activity within phonetic and phonemic research on Thai within the last few decades. This research was initiated by predominantly Western scholars but Thai scholars are now doing extensive work in Thai dialect geography and Thai phonetics (which may not be so apparent from the present paper because of its emphasis on issues with a general linguistic perspective, and on presentations of these issues in print). Apart from historical phonology, for

which the recent study of a variety of dialects is extremely fruitful though little known outside the sphere of Thai specialists, there are several such general issues which invite further study in a Thai context. Thus the pitch-perturbating effect of initial consonants deserves a cross-dialect study, since many Thai dialects seem basically very alike in segmental phonetics though they differ widely in tone shapes. As regards dialects, I wish to mention quite another type of inherently interesting issue, viz.: what is the relative importance of tonal versus segmental differences for the mutual intelligibility among dialects (in cases where lexical differences can be eliminated from consideration)? As the tones of the various dialects differ very much in distribution and phonetic shape (e.g., high for low, and vice versa), this provides an ideal case for studying language users' ability to "normalize" the speech input from other dialects even in case of drastic differences in tone pattern, and thus to understand each other after some minimum of adaptation. (The situation is the more interesting since segmental dialect differences are surprisingly few in comparison with the tone differences.)

VII. BIBLIOGRAPHY

The bibliographical references given below are supposed to illustrate the high level of activity within the synchronic and diachronic study of Thai phonetics and phonology within the last few decades. For this reason I have not limited the list strictly to references which I consider central to the issues raised in this paper, and I have not even limited it to items I have had access to myself: quite a few items are secondary references only. This is true in particular with regard to several of M.A. or Ph.D. theses (dissertations) listed here. The reader should be aware that the addition of the word thesis or diss. in parentheses signals that the work may be unpublished and not easily available (and that the reference may perhaps be inadequate). The reason for this somewhat risky listing of (possibly spurious) references is that the very existence of such work is illustrative of the considerable interest and zeal devoted to this field by Thai students and others. (Other unpublished manuscripts, however, are as a rule disregarded, even in the case of important congress papers.)

The list includes not only work on Central Thai but also some items concerning other dialects of this language. On the other hand, I have considered it appropriate to limit the scope - by and large - to Thai proper, i.e. not to include work dealing with other Tai languages, even such that are spoken in Thailand, to any considerable degree. On the other hand, the list includes several items within the field of comparative Tai study, because the comparative aspect, and the reconstruction of Proto-Tai, are of paramount importance for the ways in which research on Thai phonetics and phonology has developed.

Needless to say, the bibliography makes no claim whatsoever with regard to completeness of coverage of any aspect of Thai studies; it is absolutely only meant to be illustrative of what is going on. (Also see Note p. 93.)

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As for the special subject of aphasia studies dealing with Thai language, see the following papers with ample references:

Gandour, Jack and Rochana Dardarananda 1984: "Voice onset time in aphasia: Thai. II. Production" and "Prosodic disturbance in aphasia: vowel length in Thai", Brain and Language 23, p. 177-205 and 206-224, respectively.

As for recent work within Thai dialectology (primarily by Thai scholars and students) important additional references can be found in Kalaya Tingsabadh (1984).