

ACHIEVEMENTS AND CHALLENGES IN THAI PHONETICS

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0. Introductory remarks

It may be appropriate to explain the background of the present paper - its *raison d'être*, as it were - by way of introduction. These explanatory remarks may at the same time serve as a general apology for the shortcomings of the paper.

When the present author was kindly invited to contribute to the International Conference on Thai Studies, I felt that I could do this only in the capacity of an observant and interested outsider. Having little personal experience in the field, I am at least not burdened with scholarly biases, and I have therefore felt that I might make the most meaningful contribution to this Conference by attempting to give a general appraisal of one component of Thai studies, as it presents itself in all its impressiveness to an outside linguist.

The component in question is THAI PHONETICS. This term is understood here in a broad sense, viz. as including both phonology and instrumental phonetic study, and 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, 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.

And now comes the really apologetic part: while working at this paper I have come to realize that it 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").

1. Segmental phonology and phonetics of modern Thai

1.1 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 (which is basically very simple) and the standard phonemicizations are not given here (see references such as Henderson 1949, Haas 1964, and Noss 1964, which represent more or less different approaches).

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 (1978, 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 [C₀V:] and [C₀Vʔ] 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, nothing else. This 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	h	V?

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 latter 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 /klāp bāan/, 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).

To the present author there is something appealing in the prosodic solution to the analysis of syllable terminations. However, it should be emphasized that this is a strictly phonological issue. As such it may be essential both in diachrony and in connection with patterns of reduplication, etc., but the specific limitations on syllable structure in Thai should not lead us to assume that there is something quite special about the way people produce these syllables. Brown (1965) refers to "control phonology" as the theory underlying his analysis, and in his later work (1976) he explicitly refers to Action Theory. However, I fail to see that action theory

is immediately applicable here. Action theory is interesting for phonetics as an approach to the question of how speech gestures are planned and controlled (it is indeed a very promising way of acquiring new insights in speech physiology), but it would hardly predict that a Thai speaker handles a syllable such as [ʔim] quite differently from the way a speaker of, say, English or German does it.

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. hăʔ vs. hă (as short forms of /khráp/ and /khâ/, 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 /hăʔ/:/hă/), but why not allow for an extension of the syllable scheme to include the peripheral type /C₀V/ (or /C₀Vh/??, 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, /khâa/ on the one side and /khă/ or /khăʔ/ 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 /ʔ/ and zero finally after a long vowel, i.e. a contrast of the type /khăaʔ/:/khăa/ or /khâaʔ/:/khâa/. There is no such contrast, but 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 /ʔ/ (possibly as an aspect of phonation type, cf. Egerod 1971, p. 167-169).

An apparent or real difference of distribution or of distinctiveness of /ʔ/ 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.)

To round off this discussion of syllable finals I shall mention also that the final components of phonetic 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 2nd 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 diphthongs that end in a more open quality are clearly vowel complexes, also from a phonemic point of view. Accordingly, they are rendered either as /ia ua ua/ or as /iə uə uə/. A possible argument against the former solution is that it is phonetically less natural (Brown 1967-68 uses this solution, but in my view this may be slightly misleading for the student, who may be tempted to pronounce a full "a"-sound here). The termination is really of "schwa"-type (i.e. [ə]); on the other hand, it is not the same sound as that of the vowel phoneme often rendered as /ə/ (or long: /æ/), so the phonetically and pedagogically most illuminating (though least "economical") solution is to render the diphthongs as /iə uə uə/, and the single vowel phoneme as /ɤ/ (see reference to Henderson below with regard to argumentation for the symbol /ɤ/).

The just-mentioned phonemic diphthongs pattern like long vowels (which - also for this reason - invite a phonemicization as sequences of two identical vowel phonemes). Like the long vowels diphthongs occur before /w j/, the result of diphthong plus /w j/ being phonetic TRIPHTHONGS: /uəj/, etc.

There is one strange skewness with /iə uə/, viz. that there are marginally occurring short diphthongs of these types. Henderson (1949) suggests that shortness here is a feature proper to onomatopes and some foreign words; Noss (1964, p. 15) symbolizes the long (i.e., normal) diphthongs as /ia ua/, the short ones as /iə uə/, which is, of course, technically possible.

Apart from the details of segmental analysis mentioned above I think the most interesting issue in segmental phonemics is the existence of syllables of REDUCED COMPLEXITY compared to "normal, full" syllables. Leaving aside the final particles there are unstressed word initial syllables as in /maphrāaw/ and word-internal "linker-syllables" such as the 2nd syllable of /rātthabaan/. 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).

1.2 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 sonograph 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 1.1). It may be mentioned here that for the high vowel /ɯ/ both y and u occur as symbolizations in language teaching materials (personally I think y 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 [y] 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 3 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.

To me the Thai stops 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. This agrees with the assumptions of Gandour & 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 & 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 & 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 an area linguistic 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 this feature seems to turn up only with /p t/ not with /c k/ (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 laryngealized, cf. Harris (1972, p. 11ff.). It would be useful to have access to published data on the behaviour of the final consonants in a variety of environments ranging from the position before pause to the position immediately before a stressed syllable (in the same phrase) which begins with a voiced stop. - The question of glottalization (or possibly laryngealization?) in final stops is crucial in a diachronic perspective (see below).

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).

2. Prosodic features of the syllable

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 theo-

retical 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) discussed the possibility of a reductive analysis of the tones. Gandour (1975) and Abramson (1978) challenge 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 situation in terms of morphophonemic processes, composite tones arising from the combination of morphemes with simple tones: low + high \rightarrow (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 $3 \times 3 = 9$ 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 l  w "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, unperturbed 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. The study of Thai tones in the framework of comparative Thai dialectology was initiated by Egerod (1961) and Brown (1965). The 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, Univ. 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 /p b/) on the pitch contour of the syllable (cf. a.o. 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 cut back 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 perturbing 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.

3. 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).

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 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 (1977) 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 /dii 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 1948) 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).

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).

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. /'ðɔg: paj/ '(He) went out' vs. /'ðɔg 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):

	tham	maj	maa	aw	sii	moon
(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?'.

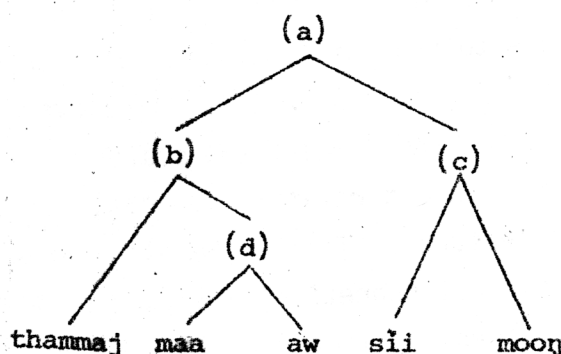
Noss' point is that such contrast give evidence that "rhythm in Thai, if not phonemic, is at least interesting" (p. 41).

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 /sii/+moon/, in turn, form a semantico-syntactic unit reflected phonetically. We thus get the following hierarchical structure (disregarding for simplicity the internal structure of /thammaj/):

$$[_a[_b[_{thammaj}][_d[maa][aw]]_d]_b[_c[sii][moon]]_c]_a$$

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/:

$$[_a[_b[_{thammaj}][maa]]_b[_c[aw][_d[sii][moon]]_d]_c]_a$$

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	chăn	sũuŋ	iik	nít	nyŋ
(a)	4	4	2	3	1	3
(b)	4	2	3	4	1	3

meaning in both cases: 'if X (i.e. /chăn/) 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 /chăn/ in the meaning 'I' differs from /chăn/ 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][chăn][sũuŋ]], whereas on reading (b) /chăn/ is the rightmost constituent of [[thâa][chăn]], and /sũuŋ/ is free to go together with [[iik][nít]] to form one other branch (under a higher node than that separating [iik] and [nít]). The next question, then, is whether the alleged "stress" difference between the two words /chăn/ (a) and /chăn/ (b) is lexical (inherent) as a phonological feature, or whether it reflects a difference between a "major" lexical category (including such nouns as /chăn/) and a "minor" lexical category (including such pronouns as /chăn/).

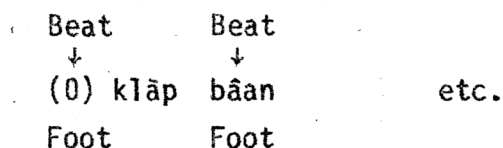
Incidentally, the pair of clauses above also illustrates another important kind of "residue" found with the iambic (rightmost-constituent-heaviest) conception of rhythmical trees. This residue has to do with phrase final "particles" in the widest possible sense of this word. Obviously, /nyŋ/ in the examples above upsets the possibility of setting up a requirement to the effect that every 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/, /hâ?/) 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 /C₀V/ with a short vowel not followed by glottal stop) but only as non-final constituents 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 hâ/, for example.

The approach outlined above is based on an "iambic" rhythm principle. 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, in her work (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 /phôo mēe/ 'father and mother', /klāp bâan/ 'return home', etc. etc. /thāa yāngān/ '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. Th.), 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. Th. 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. Th.'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.

4. Phonological reconstruction

Tai languages constitute one of the language families for which the comparative method has given very convincing results in this century. The pioneers in this research include such outstanding scholars as Maspero, Haudricourt, Li, and Gedney (see references in the Bibliography). - The

generally interesting aspects of the reconstruction of a Tai proto-language comprise, above all, the set of stop consonants in syllable-initial position and the set of tones in the earliest state of the proto-language that can be directly inferred from the attested languages. It would lead too far here to go into detail with issues associated with the whole language family and with Proto-Tai as such; the following remarks will deal only with Thai studies in a narrower sense.

The pioneering comparative work within Thai proper, i.e. dealing with the genetic relationships among the dialects of Thai, was done by Egerod (1961) and Brown (1965), the approach of the latter being to trace the sound shifts leading from the assumed common ancestor: Ancient Thai to the modern dialects (also cf. Jones 1965b).

One of the most fruitful outcomes of this research is that it has initiated a burst of activity in the description of Thai dialects and sub-dialects, studies which combine descriptive, synchronic analysis with the use of a comparative framework. The greatest challenge is found with tones; there is now a wealth of information on this and on dialect differences in general, thanks to Egerod, Brown and several later, predominantly Thai scholars (most, but not all of whom belong to a research group now at the Linguistics Dept. of Chulalongkorn University). Unfortunately, the more recent work has only been published to a very limited extent (such as the papers by Vichin Panupong listed in the Bibliography).

One of the things that make it difficult to view the dialects in a comparative and historical perspective, is the question whether it is adequate to view DIALECTS OF THAI as one well-defined cluster, which can be isolated from all other Tai languages and dialects. The classification of Tai languages in general is quite controversial (cf. Chamberlain 1975), and this is also true of the "Southwestern" branch to which Thai belongs acc. to Li and Chamberlain). How satisfactory is it to make dialect geography and/or comparative work dealing specifically with such concepts as "Northeastern, Northern, Central, Southern Thai"?—It is obvious (and well-known) that Northeastern Thai cannot be viewed in linguistic isolation from Lao as spoken in Laos, but still there may be uniting features making it interesting to speak of a Thai dialect geography in a narrower sense, a.o. because of the influence exerted by Central Thai on dialects of certain other areas, and other kinds of dialect mixing which are evidence of cultural contact or migrations. This is true of, e.g., the Thai Isan — Thai Korat area dealt with by Vichin Panupong (1983), cf. Brown's characterization of Thai Khorat as "central Thai with a Lao accent" (1965, p. 23) (another transitional area is being considered by Halida Rojanawathanavuthi).

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.

To return to RECONSTRUCTION, the first question is what chronological stage to reconstruct in order to account for the modern dialects of Thai in a narrow sense. Egerod (1961, p. 74) takes Old Siamese, understood as "the Siamese language of the time of Rama Khamheng (13th century A.D.)" to be the immediately relevant point of reference, the "direct ancestor of Central Thai of today", although he points out that "a few features, especially in Southern Thai, seem to antedate Old Siamese". For the reconstruction of Old Siamese one important source is "conservative script forms (including considerations of the rendering of old loan words)". - Behind Old Siamese there is Proto-Tai, the object of interest in several studies (see Bibliography) by Haudricourt and Li in particular (the Ancient Thai of Brown 1965 does not quite fall in with this distinction of main stations in the chronology; cf. the reference to Brown in the next section).

One central issue is: to what extent was the sound pattern of King Rama's time in agreement with the sound values one might assign to the letters of the Thai script on the basis of comparisons with, above all, Sanskrit? There is indeed overwhelming evidence that, for instance, the consonant symbols now representing "low" aspirated stop consonants /ph th ch kh/ used to symbolize voiced stops of some kind, in greater or lesser accordance with Sanskrit, although one must certainly be careful not to assume off-hand that they sounded the same in Old Siamese as in the lending language. The reconstruction leads to correspondences such as the following:

Old	Modern
*ph _____	ph ("high" consonant)
*p _____	p
*b _____	ph ("low" consonant)
*ʔb _____	b

i.e., a complex of sound shifts resembling the Germanic Lautverschiebung in type. Phonetically, however, the development of a voiced stop of some kind ("b") into a voiceless aspirate is a real crux. Egerod (loc. cit., p. 76-77) speculates whether we may have instead a development from aspirated voiced stop in the proto-language via a voiceless stop with voiced aspiration in Old Siamese to the voiceless aspirated stop of Modern Thai. The development of consonants of [pʰ]-type into voiceless aspirates seems to have a parallel in Chinese, but the phonetic mechanism involved is hardly non-controversial.

The reconstruction of tones is a very complex issue, as witnessed in the literature on the subject (see the remarks on tonogenesis in Thai in the next section). For the Old Siamese period the script suggests a distinction between at least three frequently occurring prosodies marked respectively by "máj êek" (the Arabic figure "1" as a diacritic over the initial consonant letter), by "máj thoo" (the Arabic figure "2"), and by absence of any prosodic mark. It is generally assumed that this was in fact a tonal distinction, although the tones of Modern Thai are only very indirectly linked to these old tone marks: in Central Thai "máj êek" has both falling and low tone reflexes, "máj thoo" both high and falling reflexes, and "zero" all 5 tones, i.e. mid, rising, high, falling, and low, as reflexes. This all depends on the segmental composition of the syllable, but it is not totally predictable in terms of Modern Thai segmental phonology, since "low" and "high" consonants, which have now merged, play a role for the distribution of the reflexes. In other dialects the tone shapes occurring as such reflexes are in part quite different.

No matter how the question of mechanisms causing tonogenesis is approached, it remains something of a crux how the apparently simplistic tone system of the 13th century was so drastically (and differently) reorganized in what came to be the modern dialects. I think that one should not take the possibility of accounting for the developments in terms of formulaic statements to mean that the present tone shapes all developed mechanically from the syllable structures and prosodies of Old Siamese.

1. Diachronic studies: sound change in Thai

There is today a wealth of literature dealing with sound change in Thai, and rather than trying to review this whole field of study I shall confine myself to scattered remarks on a few selected topics (otherwise, see Bibliography

Since the early sixties the conceptual framework of this research has been somewhat reminiscent of that of Romance linguistics, the gross features of the reconstructed ancestral Thai language being taken essentially for granted, and the phenomena of modern dialects being derived from this ancestral 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 (hopefully, the reader will not find this very free use of a quotation from W. Labov misleading).

The major issue in this context is TONOGENESIS (for this concept cf. Matisoff 1973, Henderson 1982). How did the tones of modern Thai dialects come into being? It is useful to keep in mind that in principle tonal contrasts or specific tonal manifestations may 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 by Egerod, personal communication, and in Brown 1979, p. 21 bottom).

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.

Nonwithstanding these possible additional sources of tone, the hypothesis that tonogenesis is associated with nonsyllabic, laryngeal features (or "phonation types", cf. Egerod 1971) has been so obviously successful in the case of Thai that this language has come to occupy a prominent place in general linguistic-phonetic studies of tonal mechanisms and their origins.

It is by now well-established, thanks to the research of Li and Haudricourt and other scholars, that the development of tones in Thai have to do with both initial and final properties of the syllable. As for the INITIALS, it is a matter of distinctions between old voiceless and aspirated initials, old plain voiced initials, and old glottalized initials, as mentioned already. As for the FINALS, the reconstructions posit a number of different states of the laryngeal structures or types of phonation; these - unlike the differences in initial position! - are the distinctions that are to some extent reflected in Thai writing by the use of diacritic tone marks. According to Li there are three categories, viz. A (reflected by no tone mark), B (reflected by "māj èek" and C (reflected by "māj thoo"). Brown (1965) posits four final laryngeal components plus a distinction of length versus shortness, which combine to form five components: whisper ("w"), voice ("v"), creaky ("c"), glottalization with length ("longstop", "q"), and glottalization with shortness ("shortstop", "k"). As pointed out by Haudricourt (in the "Additional Note" to the 1972-version on his paper on tonal splitting, as formulated by Court) there is partial agreement between Brown's reconstruction and his own in that they both have glottalization for category C, but they differ on assigning such 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.

Brown describes the development from Ancient Thai (which refers to an ancestral Tai language much predating the Old Siamese of the Sukhothai period) to modern Thai dialects in terms of REGISTER and CONTOUR. Register, he says, developed "as the initials unloaded distinctions unto the tones"; he posits three such registers for Modern Thai, viz. R1 characterized by low pitch, R2 characterized by mid pitch, and R3 characterized by high pitch. These registers he assumes to be controlled by the crico-thyroid 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 born by the 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 ap-

pearing 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 various types of final laryngeal components ("endings"), although, as he points out himself, the phonetic reality cannot be derived very directly from such a componential representation.

As for 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 extremely 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. It is in fact hard to approach the question of how to test the phonetic plausibility of Brown's hypotheses, and clearly, there are too many degrees of freedom in his system for it to be really explanatory. This appears clearly in that the initial components aspirated, glottalized, and voiced cause respectively high, mid, and low register in one branch of dialects, according to his analysis, but respectively low, mid, and high in another. Brown ventures a highly speculative explanation of this, suggesting a difference of tightness versus slackness in the vocal cords accompanying aspiration (one branch of dialects using one option, the other another option). This is hardly a fruitful approach toward an account of the tonal development (Egerod, personal communication, suggests differences in the relative chronology of single phases in the development).

There has more 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.

6. Final remarks

It has been shown that there has been an impressive activity within phonetic/phonemic research on Thai in the last few decades, and that - although this research was initiated by predominantly Western scholars - Thai scholars occupy a prominent place in the activities today, especially as regards

descriptive study. If there has been a bias in this paper toward references to work by the former category of scholars it is because these have to a greater extent explored the general linguistic or general phonetic perspectives of research on Thai, or directly addressed general issues which turned out to be conveniently dealt with on Thai material. 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 relationship within syllables between manner of articulation of initial consonants and pitch deserves a cross-dialectal 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. the relative importance of tonal versus segmental differences for the mutual intelligibility among dialects.

As said already, the study of Central Thai and of other Thai dialects has been exhibiting a high level of activity, comprising both monodialectal and contrastive studies. It is likely that the possible practical applications of such work has been an impetus in several instances, along with the purely scientific interest of new data and new findings. It is obvious that insights into the dialect-geographical and sociolinguistic situation of the Thai linguistic community may help to solve questions of language policy and/or to provide a basis for better teaching materials (some studies explicitly belong in a didactic framework), and it is important not to underrate what genuine insights into theoretical phonetics can contribute to this kind of work. Instructors are not supposed to teach advanced phonetics to language learners, but they should know as much as possible about what is really going on in speech. Likewise, textbooks should be based on the best of scholarly knowledge though they only mediate the most straightforward information. Hopefully, the close contact that exists between Thai linguistics and general linguistics and phonetics will, if anything, grow even closer in the future.

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 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 are, however, disregarded, even in the case of 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 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 (there is no consistency in this delimitation, however!).

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. - It may be appropriate to refer the reader to the excellent bibliography at the end of David Strecker paper in Thongkum et al. 1979, p. 229-240, which only in part overlaps with the present list (although quite a few of my references are based on it). On the other hand, a word of warning may be in order with regard to the bibliography in Gsell 1979, which is marred by inaccuracies (some of which may also have entered the present list).

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FINAL NOTE: With regard to recent theses, in particular M.A. theses, this bibliography has a strong bias in favour of work done at Chulalongkorn University, Dept. of Linguistics. This does not reflect any intentional emphasis or narrowing of the scope, but has to do with the fact that the author had access, when the bibliography was being written, to the small volume of abstracts here referred to as Abstracts ... Chulalongkorn Univ. 1983. The actual title of this publication is:

**นิตรสารการประกอบการอภิปราย เรื่อง "ภาษา ภาษาศาสตร์
กับความเข้าใจอันดีระหว่างชนในชาติ" ณ พฤษภาคม
- ๓ มิถุนายน ๒๕๒๖**