Thai Orthography and the History of Marking Tone

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How has phonemic tone come to be recognized and explicitly marked in practical orthographies? The Thai writing system has some claim to be considered the first practical orthography to mark phonemic tonal contrasts in an explicit and systematic way, using dedicated tone-marking symbols invented specifically for the purpose. To examine this claim, which has a number of controversial aspects, is our purpose here.[1] Sections 1–7 below present a background overview of the history of tone marking in several orthographic traditions. Sections 8–9 take up the Thai case in more detail and attempt to account for some puzzling anomalies in how the Thai system has developed.

While systems of suprasegmental marking prior to the Thai one can be found, in what follows I attempt to show that such systems appear to be confined (i) to special-purpose texts, such as the scholarly lexicography of Song-era Chinese, (ii) to languages whose suprasegmentals did not function as the tonemes of a fully tonal language, e.g. Hellenistic Greek, or (iii) to languages – in particular, to Burmese – currently employing a segmentally-based system for marking suprasegmental distinctions, with diachronic evidence leading one to suppose that tonal development was closely associated with lenition of the segmentals used in the representations of distinctions now more suprasegmental in nature. In this view, the suprasegmentals of (iii) would be seen as gradually developing a more fully contrastive status but accommodated orthographically

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1 H.R.H. Princess Galayani Vadhana has encouraged and stimulated research work on the early history of Thai writing through a series of lectures and publications; some parts of this paper were developed in these contexts. A version of the first part of this paper was presented in the Third International Symposium on Language and Linguistics, Chulalongkorn University (see Diller 1992). I am indebted to the organizers of the conference and to a number of authorities for discussing various points with me: David Bradley, Marybeth Clark, J.C. Eade, Jerold Edmondson, William J. Gedney, R.B. Jones, Wilaiwan Khanittanan, Harold Koch, S.O. Lee, Luo Yongxian, Prasert na Nagara, Hans Penth, R.K. Sprigg, B.J. Terwiel and Michael Vickery; the writings of E.G. Pulleyblank have also been useful. These and others have made valuable suggestions and supplied references, but none of the above is implicated in the paper's remaining shortcomings.

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by a preexisting convention of writing segmentals; thus tone marking would be a matter of change of interpretation rather than of the invention of new dedicated tone-marking symbols.

In terms of the evolution of orthographies generally, the Thai system makes a rather late appearance: it is documented on an inscription bearing the date 1292 A.D. and even this comparatively late date is not without some controversy (Chamberlain 1991). Although in the ensuing 700 years Thai influence has been limited to related nearby Southeast Asia orthographies, the claim above still merits investigation. – All the more, since the related wider issue concerning the world's tone languages has scarcely been explored in a systematic comparative way: when and under what conditions has phonemic "tonal awareness" arisen?

The history of orthographic systems would seem the reasonable place to start answering these questions. However Gelb (1957), Deringer (1968) and other standard authorities are naturally more concerned with segmental than with suprasegmental representations. From the point of view of Western discourse on the history of writing, how accent marking has evolved or how modern punctuation has arisen in part from Medieval intonational indicators would seem only of marginal interest to "the main story" – segmental history. How suprasegmental consciousness has developed in unfamiliar non-Western tone languages would be even more remote and exotic a problem. Yet a great many of the world's languages – Fromkin and Rodman (1978:86) tell us the majority of them – make use of phonemic tonal contrasts. That speakers of these languages at certain times in their histories have become conscious of the tonal distinctions they were making is clear from the evidence of orthographic practices as well as from technical treatises. One can even find instances of the recent invention of tone marking systems by otherwise illiterate speakers of such languages (Smalley et al. 1990).

Here too surely is part of the larger account of human linguistic awareness. Even this part of the story has a number of sub-narratives and what follows is firstly an attempt to give an admittedly programmatic and sweeping overview of the early history of tone marking and to identify some general trends. A second and more focused purpose is to investigate the specific claim made above. Should Thai in fact be accorded the honours of seniority as far as the invention of phonemic tone marking is concerned? Are there other close contenders?

A fuller study of the dawn of suprasegmental awareness would need to consider the marking of stress accent. In particular, close consideration would need to be given to Hittite so-called plene-writing, where "extra" vocalic indicators regularly appear, e.g. with certain caseforms in a nominal declension, but not with others. Scholars in the field have tended to discount this as unprincipled variation, but Hart (1980) discovered a correlation between these extra signs and Indo-European accentuation, which was similarly mobile in some nominal declensions. Thus, if Hart's interpretation of the facts is adopted, Hittite scribes

were clearly aware of suprasegmental features of their language, leading to direct orthographic representation.

For purposes here, only two accentual systems are briefly considered. Although Classical Greek and Sanskrit would not qualify as tone languages in the usual sense, each of these has subsequently exerted important influence on the recognition and marking of contrastive tonality in other fully tonal languages, as we see below. Thus suprasegmentals in these classical languages are taken up in the first section. Following sections summarise the tonal situations in Classical Chinese and Middle Korean. The discovery of phonemic tone by Western missionaries is then taken up, along with Vietnamese tone marking. Old Mon, Burmese, Tibetan and Pyu are briefly considered, and finally Thai, followed by a summary of main findings.

1. Tonal accents in Classical Greek and Sanskrit

The literary traditions of Classical Greek and Sanskrit each show the development of orthographic techniques to indicate suprasegmental phenomena. In each case these are diacritics added to segmental bases. Technical discussion of suprasegmental contrasts is found in the scholarly treatises of each tradition. It is convenient to consider these languages together because, for present purposes, they share several important features.

(i) The basic suprasegmental phenomena giving rise to each accentual system relate back to inherited Indo-European accentual phonology (although developments differ).

(ii) In each case, traditional grammarians described three distinct, but interrelated, accents characterized by different pitch/contour features (high, low and convex).

(iii) Accentuation related directly to poetic meters and overt accent-marking in the orthography undoubtedly was to have a normative role in the preservation of traditional poetic forms, probably in the face of diachronic sound change.

The consensus of scholarly opinion is that the parent Indo-European language and daughters Vedic Sanskrit and Classical Greek were not "tone languages" in the sense of regularly using contrastive pitch/contour to distinguish all items in the lexicon, but they did distinguish at least three types of accented syllables on the basis of pitch/contour as well as amplitude/intensity. Accent in these languages was partly predictable from syllabic length, which was in turn a function both of vowel quantity and of certain consonantal patterns. Contoured tonal accents (*svarita* in Sanskrit, circumflex in Greek) could arise through regular processes of syllabic contraction (Buck 1933:162).

The three familiar Greek accents, acute (´), grave (`) and circumflex (^), were originally perceived in musical terms by contemporary scholars. The same terms for music and speech were used: τόνος "tone" (from the root "to stretch", referring to strings of instruments), ὀξεῖα "sharp, high", βαρεῖα "low, deep" (Allen 1968:106). During the fourth century B.C. there was scholarly recognition and discussion of these accents, but no surviving orthographic indication.

Work of Wulstan (1971), Kilmer (1971), Cerny (1987) and others establishes the main conventions of Mesopotamian musical notation. Superscripts of this musical type may have been known to the Greeks by 300 B.C. Although some Greek inscriptions during this period may have had indications of musical pitch values for sung texts, systematic use of explicit marks to designate the accentual categories for Greek seems to have started at Alexandria about 260 B.C. and is traditionally associated with the name of Aristophanes of Byzantium (Allen 1968:114; Cohen 1958:245).

Probably by that time, at least in outlying parts of the Hellenistic area, earlier pitch/contour accentual values were giving way to one or more stress-based systems. Goodwin and Gulick (1930:28) plausibly suggest that the accent-marking system may have been motivated by the need to introduce Hellenistic learners of Greek to the "proper" conservative literary pronunciation. Grammarians such as Dionysius Thrax (2^{nd}–1^{st} century B.C.) continued to describe the three accents in musical terms, but as Kemp (1987:173) observes, such statements may have been prescriptive for rhetorical oratory and poetic recitation rather than descriptive of actual speech.

Although the grammar of Dionysius Thrax remained definitive for centuries and the Alexandrine system of accent marking was understood, expounded and transmitted by later grammarians, for nearly one thousand years accent marks were only rarely and sporadically used in practice. In early surviving papyri – texts which were often used for economic or personal purposes rather than for literary or liturgical ones – accents seem to have been known, but used mostly to resolve ambiguities (Allen 1968:114). Only gradually, through the Middle Ages, did the Alexandrine system become standard in practice. By the 7^{th} century A.D. it is clearly the norm for writing (Cohen 1958:245) but the relationship to what must have been a stress-based pronunciation system of the day remains unclear.

Turning to Sanskrit, we find a partial parallel. That there was awareness on the part of early language scholars of the complex suprasegmental system of Vedic Sanskrit is beyond doubt. The *Aṣṭādhyāyī* of Panini (possibly 400 B.C.) gives full treatment of three Vedic accents: high, low and falling: *udātta*, *anudātta* and *svarita* (Robins 1967:143).

The early history of Indic writing systems is still rather controversial, but in any case, Indic scripts in general do not indicate accentuation. An exception is in Vedic manuscripts. *Rg-Veda* texts regularly indicate *svarita* accent with a

superscript stroke and other accents with subscript strokes. Accents are often in red, as though added afterwards to otherwise black texts. In its cultural context, this Vedic system of accent marking is clearly intended as an aid for students' memorizing of the chants. Accurate oral recitation from memory is the goal and the accent-marked "textbooks" seem never to have had the function of sacred books in the sense of being revered for their own material essence. This accounts for why such texts do not occur in inscriptions, making it particularly difficult to assess the age of the accent-marking tradition.

Based on the living Vedic tradition as he found it in the last century, Haug (1886) was able to transcribe musical values for how the marked accents were then chanted. For example, for the two syllables of the word *kanya* "woman" he indicated rise of a major third followed by descent of one whole note. In the Vedic text, the first syllable *kan-* was marked with a subscript horizontal stroke (i.e. as *anudātta*) followed by *ya-* marked with a superscript vertical stroke (*svarita*).

Texts of the *Samaveda* show a more elaborate system of superscript numerals to indicate musical pitch, which is in a complex relationship with lexical accent based on stress (Whitney 1869). Unfortunately again the antiquity of this accent-marking system cannot be established with certainty – nor indeed can the writing down of Vedic texts in general.[2]

The motivation for indicating accents explicitly in Vedic texts may have been similar to the Greek case, but with an added religious dimension. The efficacy of Vedic chanting was taken to be a function of correct articulation. For suprasegmentals that were no longer a natural feature of oral speech, perhaps due to sound change or language contact, a need was felt to have the older systems at least preserved for pedagogical purposes through orthographic means.

2. Tonal awareness and Chinese scholarship

As far as can be determined on the basis of surviving records, Chinese represents the first instance of the tones of what is now considered a fully tonal language being recognized and analyzed. It remains a point of current debate as to whether, and during which periods, Chinese tones may have had concomitant segmental characteristics as well as suprasegmental pitch distinctions. In any case, the names of Ze Liang and Shen Yue are traditionally associated with the recognition of tone, dated to A.D. 488–489. Chen Yin-keh (1934, 1941) sum-

2 Haug (1886:17) speculates that the Vedas were written by 500 B.C.

marizes the traditional account of the circumstances under which the recognition of tones occurred. His description is worth quoting in full:[3]

> The *ju* or abrupt tone of the Chinese language was easier to define. The *ping, shang* and *chu* tones were, however, defined in emulation of the three tones which were based on the ancient Indian work (known in Chinese translation as *Sheng Ming Lun* (*Theory of Phonetics*) and used in the Chi and Liang Dynasties to intone the prose part of the Buddhist sutras. This is how the Theory of Four Tones of the Chinese language came to be defined. When the tones used in intoning the prose part of Buddhist sutras were adopted in the writing of the ornamental style of Chinese prose, the Theory of Four Tones gained universal acceptance. On the twentieth day of the second month in the seventh year of Yung Ming (A.D. 489), Tse Liang, Prince of Ching Ling, called a conference of Buddhist monks at his palace in the capital to differentiate and define the tones of the Chinese language for reading Buddhist sutras and chanting the verses contained therein. This was a most important occasion.

According to this text it would seem that through Buddhist activity in China the grammatical analyses of the Indian grammarians came to be known there. In particular, understanding of the three Sanskrit tonal accents mentioned in the preceding section appears to have played a critical role in the recognition and analysis of the Chinese tonal system of that period.

According to this traditional account the initial impetus for Chinese tonal awareness would have involved the transmission and rendition of Sanskrit Buddhist texts – i.e. a language contact or cross-language impetus. In the following centuries however the concern with tone came to characterize much indigenous Chinese literary activity. Poets, bureaucrats and others of the official class must have had a full comprehension of tonal distinctions, since regulation of tones was an important feature in much Tang-, Song- and Yuan-dynasty verse (e.g. the *ci*; also in the parallel-prose genre called *pian-ti wen*). Examinations required the ability to write tone-regulated verse.

Tonal regulation may have characterized certain types of folksong as well. The historical relationship of these forms to more literary and self-conscious tonal regulation remains a problem area.

In any case, traditional Chinese scholarship was well-aware of the original four-tone system and also of later developments affecting tone. The comprehensive *Qieyun* dictionary of 601 A.D. was arranged by the four tonal categories (Norman 1988:24) and earlier but no longer extant texts were probably similar. Forrest (1965:31, 171) states that by at least 1000 A.D. Chinese scholars were aware of a further register-like splitting of the earlier tone system ac-

3 The text quoted is from Ming (1964:4, 139) and was also noticed by Robins (1967:106). Original source: Chen, Yin-keh. 1941. Three questions concerning the theory of four tones. *Journal of Ching Hua University.* (n.p.) (Also pp.1143–1156 in Chen, Yin-keh (1977) *Complete Works of Yin-keh Chen.* Taipei: Tsiu Si Publisher.

cording to type of initial consonant (referred to as the *yin* and *yang* series, or female/voiceless and male/voiced). Japanese Buddhist monks studying in China were probably aware of this type of split as early as the ninth century according to Norman (1988:53, 57, citing Mei 1970).

Once again it would seem that, in the face of linguistic change, conservative projects of local literati gave rise to what could be considered a retroactive tonal marking system. In this case Chinese characters were assigned extra classificatory marks indicating their etymology in terms of the earlier four tone classes.[4] This etymological marking system was for purposes of dictionary classification and would not have reflected the contemporary tonal system in a direct way. The marking system was probably motivated by the tone splits mentioned above: as the earlier phonology ceased to be the naturally-acquired one, for scholarly purposes extra indicators helped to recall the older system, necessary for a mastery of traditional poetic forms.

Although literary and other scholarly evidence for the awareness of a four-tone system throughout the Tang-, Song- and later dynasties is incontrovertible and traditional lexicons classified and even marked Chinese characters by etymological criteria based on former tonal pronunciation, this was never a practical writing system. The historical record shows that in the traditional normative modes of Chinese writing characters were always used alone without extra tonal marking. The system was never modified either for official or for practical purposes to represent tone in a direct way.[5] Not until the present century was *pinyin* romanization officially introduced; even then, in common practice the tendency is strong to omit the system's overt tone marks for all but pedagogical purposes.

3. Middle Korean: a tonal language?

Prior to 1446 A.D. writing on the Korean peninsula was done by means of Chinese characters, but in that year King Sejong is credited with the invention of a semi-syllabic writing system, originally employing 28 basic forms, known as *hangul*. This system, somewhat modified and often combined in texts with Chinese characters, gradually gained in popularity and continues to the present as the official Korean writing system. Recently North Korea has opted for sole use of the *hangul* system to the exclusion of Chinese characters, which are still used in the mixed orthographic practice of the South (J.-P. Kim 1983:84; N.-K. Kim, 1992:285).

4 I am indebted to Jerold Edmondson for calling this practice to my attention.

5 Characters in some passages were intended to be read phonetically, as in transcribing foreign toponyms or other terms; see section 7 for a relevant case.

The system shows an advanced knowledge of articulatory phonetics, with letter shapes iconically referring to place of articulation. An interesting feature of the earliest specimens of the script is a system of dots accompanying the syllable forms, perhaps also iconic in motivation. These probably indicated pitch or a combination of pitch and stress (Lee 1979a, 1979b). According to Anderson (1978) and Lee (1979a) comparative Korean evidence suggests that the Middle Korean of King Sejong's period had a pitch-accent system with three values, as shown by the dot system. Under certain conditions these might have functioned contrastively, i.e. as tonemes. The subsequent phonological history of Korean indicates that the suprasegmental component underwent simplification into the present non-tonal accentual system, but differently for different local dialects. This hypothesis accords well with the orthographic facts, since the presumably tonal dots fell out of use some hundred years after their original appearance.

Although what may well have been tonal indications fell out of use before *hangul* became the generally accepted Korean writing system and although the phonetic facts of Middle Korean are not in any case fully understood, there remains a good chance that "tonal awareness" should be attributed to the inventor of this writing system. This speculation is strengthened by the general sophistication of the segmental syllabary and by the fact that Korea was characterized by a high degree of Chinese classical learning which would have included, as one would assume, familiarity with the Chinese tonal analysis mentioned above. In addition, through Buddhist scholarship it is likely that the phonological theory of the Indic grammarians was understood to some degree.

4. The Western discovery of Chinese tone

The discovery of the tonal nature of languages of East Asia by Westerners should be credited to Jesuit missionaries of the late 16th and early 17th centuries. In 1579 A.D. Michele de Ruggieri arrived in Macao and took up the study of Chinese, to be followed by Matteo Ricci, who was among the first Westerners to achieve a mastery of Chinese. His journal, known in Europe by 1615, has the following to say about Chinese tones:

> The use of accents and tones serves to lessen what I might call the difficulty of equivocation or doubtful meaning. In all there are five different tones or inflections, very elusive, and differing so slightly that they are not easily apprehended. By these different tones and inflections they make up for their scarcity of distinct sounds or notes, so that a single syllable, which with us would have a definite significance, will with them have at least five different meanings, which may differ widely ... because of the

> different tones in which they are uttered. The exact meaning of every spoken word is determined by its tone quality ...[6]

Ricci and his colleagues, who may well have been explicitly taught the traditional Chinese system by their Chinese teachers, also devised a transcription system for Chinese that indicated tones. In Figure 1, (1) and (2) represent Ricci's handwritten original; (3) shows the modern values.[7]

(1)	(2)	(3)	(1)	(2)	(3)
			萬	uán	wàn
歐	ēu	ōu	歷	lyĕ	lì
邏	ró	luó	三	cān	sān
巴	pà	bā	十	xa'	shí
利	Rí	lì	年	niên	nián
瑪	mà	mǎ	歲	cuí	suì
竇	tóu	dòu	次	çu	cì
撰	siuén	zhuàn	乙	yĕ	yí
并	pím	bìng	巳	zú	sì
羽	yù	yǔ	臘	là	là
笔	piç̆	bǐ	月	uie	yuè
			朔	sŏ	shuò

Figure 1. Ricci's Chinese Transcription

Both Ricci's journal description and the transcription system he used in practice indicate considerable attention to tone. Ricci's background, like that of other Jesuits, included the study of Greek. Also, he would have been very familiar with the Greek-like accent marks called *numes* that were added to Latin liturgical texts to facilitate proper intoning.

In transcribing Chinese, acute and grave accents were used, as well as a macron and inverted circumflex (also a *nume*). Differences between Ricci's system and modern *pinyin* shown in Figure 1 are only minor and for the most part accounted for by well-known subsequent sound changes. Ricci's system is the first practical orthography to transcribe Chinese tones in a systematic way.

6 Quoted from Gallagher 1953:27.

7 From a plate in C.W. Allan (n.d.), p.48. The text reads: "On the First of the Twelfth Month of the Thirtieth year of the reign of Wan Li Matteo Ricci of Europe wrote and signed this." Note that some apparent differences relate to superficial details of Pinyin transcription.

5. The representation of tone in Vietnamese

The history of tone-marking in Vietnamese is closely linked to the developments noted above. Prior to Western contact, Vietnamese had been written with modified Chinese (or *nôm*) characters. Vietnamese tones were not directly represented in the modification process. The Jesuit missionary Alexandre de Rhodes is credited with writing the first Vietnamese dictionary in 1651. A full set of diacritic marks was used and on the basis of comparative dialectal evidence indications are strong that the marking system was tonally accurate for the Hue dialect of its day.

For some 250 years de Rhodes' system (now referred to as *quốc ngữ*) remained in only marginal use in Vietnam and even Catholic religious texts were printed in modified Chinese script. As Marr (1981:144–167) establishes, it was not until the early decades of the present century that French colonial policy and the forces of Vietnamese nationalism combined in a complicated interaction to promote a revised version of de Rhodes' tone-marked system as the national orthography for Vietnam, as it is today. The present tone-marking system represents the six-tone Hanoi dialect somewhat more closely than it does five-tone southern varieties.

6. Tonal and register development in Mon-Khmer and Tibeto-Burmese

Register and phonation-type distinctions have been reported for a number of Austroasiatic languages in Southeast Asia, including some dialects of Khmer and Mon. There is little convincing evidence for non-contact dialects of Khmer making distinctions on the basis of pitch alone, although some dialects of Modern Mon have been reported to place more functional load on fundamental frequency. In most reports of Modern Mon however phonation and vowel quality are involved in register distinctions as well as fundamental frequency (Shorto 1962:x–xi).

The indication of this distinction in the Modern Mon writing system depends on consonant type – or rather, on consonant type in earlier stages of the language. Following a version of the same basic tonogenetic process involved in the Chinese *yin /yang* tonal split mentioned above, comparative Austroasiatic evidence indicates that, for Mon, former voiced consonants gave rise to syllables with a lower-pitched breathy quality. In time, this quality became the perceptually distinctive feature of the syllables and initial stop consonants subsequently became unvoiced. Thus Modern Mon suprasegmental distinctions are represented indirectly in the orthography by two series of consonants, each with a separate effect on how tone quality of a given syllable is interpreted.

Modern Burmese is similarly considered by some authorities to be a tone language, but others, including Bradley (1982), argue that register and phonation properties rather than pitch-determined tone should be taken as the basic characteristic of the phonological system. Quasi-segmental laryngeal features are in this account redundantly involved in pitch-related characteristics. Bradley (1982) and Jones (1988) further give a convincing diachronic picture of how Burmese quasi-tones developed historically in relation to Burmese orthography, with the method of indication based on symbols that either are, or in origin were, segmentals. Lehman (1992) reports that some Burmese varieties retained various of the segmental distinctions until the last century.

Hartmann (1986:7–8), Jones (1988), Bauer (1991) and others have traced the development of an Indic-derived script of the Southern Devanagari (Vengi-Pallava) type to write Old Mon perhaps as early as 600 A.D., with Old Burmese written in a closely derived script by the 12th century.

Scholars in the early part of the present century, such as those who compiled recensions of the Mon and Burmese inscriptions (*Epigraphia Birmanica*, 1.1:10–15) read Old Burmese as though tonal and they claimed that tones were represented in 12th-century Old Burmese script. This claim appears to have based entirely on interpreting Old Burmese phonology on the basis of Modern Burmese pronunciation.

This assumption, although still held by some, is less tenable in view of advances in Burmese tonogenetic theory as developed by such scholars as Maran (1971), Lehman (1973, 1992), Jones (1976, 1988), Thurgood (1976) and Bradley (1982), and others incorporating important general ideas of Maspero, Haudricourt, Matisoff and others. Prevailing scholarly opinion now supports the hypothesis that Old Burmese should not be considered a fully tonal language as of 1112 A.D., when the first dated inscription appears. Rather, following Jones (1988) and Lehman (1992), one can see spelling variation in early Burmese orthographic sources and differential preservation patterns in modern varieties as strongly suggesting that truly phonemic suprasegmental distinctions developed from segmental sources gradually, at first redundantly and somewhat sporadically. This was probably, although not uncontestably, after the time of first inscriptions. Preliminary non-contrastive allophonic distinctions – the quasi-tones – became involved in a predictable relationship involving laryngeal segments which had been present at the inception of writing; the segments later weakened (Jones 1988:206–207).

Old Burmese orthography made use of a symbol partially corresponding to the common Indic vowel-carrier sign and thus to be taken as a glottal stop. In 12th-century inscriptions this symbol occurred both syllable-initially and syllable-finally. It was this consonantal symbol in final position that earlier works claimed was used to indicate short tone. However the consensus among leading experts in Tibeto-Burmese studies is now that this sign essentially had a seg-

mental (glottal-stop) value in the 12th century, although incipient pitch features may have been present at that time as well. Subsequently the pitch features became more salient and also an abbreviated form of the glottal sign developed.[8] This sign became, in succeeding centuries, the subscript-circle tonal marker known in Modern Burmese as *auk mrac*. A similar set of events characterized the marker known as *hre pauk*, derived from Sanskrit *visarga*. In early inscriptions, this sign often alternates with final segmental *-h* (Thurgood 1976:19).

Tibetan presents a similar picture, but one which can be documented synchronically. Sprigg (1974) surveys a range of Tibetan dialects and shows that retention of complex initials is characteristic of more conservative non-tonal varieties, whereas dialects making tonal distinctions have simplified the original segmental system as reflected in the Indic-based orthography. Although Lhasa Tibetan is now arguably a fully tonal language, the comparative evidence cited by Sprigg indicates that this may be a relatively recent development. In the seventh century A.D. when the Tibetan alphabet originated from Indic source scripts, the language undoubtedly was pronounced with the complex initials shown directly in the script. There is no evidence for phonemic tone at that time.

In summary, according to the above analysis, Old Mon, Old Burmese and Classical Tibetan had no tone marking – and in fact had no phonemic tones – at the time their original writing systems took shape. Rather, these orthographies were characterized by segmental consonantal indicators which subsequently became associated with emerging phonemic tonal distinctions. For Mon and Tibetan, modern tonal features are now only indirectly indicated through a reinterpretation of what were originally segmental representations in the orthographies. In the case of Burmese, current tonal markers were later derived from earlier segmental symbols – from those representing the laryngeal consonants that gave rise to particular tones after the orthography had been adopted.

7. The Pyu inscriptions

The extinct and poorly-known Pyu language is documented on a few stone inscriptions, inscribed bricks and gold plates found in Burma mainly between 1870 and 1930. The following summary is based on Luce's (1985) account of the Pyu, known also as Piao in Chinese sources, and, at least during one period, as Turcul.

8 I am indebted to Dr. Wilaiwan Khanittanan for bringing Burmese material to my attention and to Dr. David Bradley for confirming to me that the view presented here is essentially in accord with the current consensus in Burmese historical linguistics.

At present not all texts have been deciphered and only some hundred words have been confidently transcribed and translated, as presented by Luce (1985, Chart M). Pyu texts are mainly Buddhist in content and are written in an Indic-based orthography spanning a period from about the seventh century A.D. to the Mongol presence in Burma of the late thirteenth century. In addition to the inscriptions, some of which are fortunately bilingual or provided with interlinear glossing, a few words of the language are known from a Chinese transliteration. During a visit to China of Pyu musicians in 800–801 A.D., the titles of twelve Pyu songs were transcribed twice using Chinese characters, once for meaning and once, according to Luce, for the sound value associated with the character at the time of the visit. Chinese records are also a key source in establishing the extent and main features of the Pyu kingdom.

Pyu is written from left to right, with various arrays of small circles placed above, under and to the right of about half of the hundred or so known lexical items. These are curious in that otherwise similar Indic scripts do not show this feature, apart from indications of nasalisation (*anusvara*) and final *-h* (*visarga*). Eight different arrays of such circles have been distinguished by Luce, who considers them to have been tonal indicators (1985:63).

But was Pyu in fact a tonal language and could it possibly have distinguished eight phonemic tones, as Luce suggests? A number of Pyu lexical items point to this language being genetically aligned with other nearby members of the Tibeto-Burmese family, or perhaps with Karen. Typologically, languages in this group, when they are tonal at all, show systems of fewer contrasts. Eight-tone systems are rare in any case, and in the region are documented for only a few languages further east, e.g. Hmong, none of which is in the Tibeto-Burman lineage. On typological grounds then it is unlikely that Pyu phonology was such that about half the vocabulary was of neutral (or unmarked) tone while the other half was distributed among eight further (marked) tones.

Another curious, and even suspicious, feature of the Pyu writing system is that no syllable-final consonants are indicated at all by segmental signs. Luce's discussion of the Chinese song-title transcriptions brings out an interesting related point (1985:73): in several cases in which Chinese characters were used in a phonetic function to transcribe Pyu words, final nasals like *-n*, *-ng* occur in modern Mandarin cognate forms. Now if widely-accepted linguistic reconstructions of Tang-era phonology were brought into comparison, additional consonantal endings would undoubtedly be indicated. That is, Tang-era transcribers wrote Pyu texts with characters that, at that time, had consonantal endings. (The details of such a comparison remain an important future project, but the general claim seems justified.)

Why this discrepancy? Perhaps it is a key to interpreting the curious Pyu circles. Rather than tonal indicators, at least some of the circles could plausibly have represented final consonants. A system of eight final consonants, but no

tones, would be far more typologically reasonable for a language of the Pyu lineage than one with no finals and eight tones. If this were so, the circles would have been a sort of shorthand, in terms of other Indic scripts, but perhaps suggested by the similarly-positioned Indic *anusvara*.

Although more comparative work is needed, even a glance at Luce's lists of Pyu forms seems to confirm this suspicion in some cases. Indic forms like *paṇḍit* "scholar" appear as *badi* with circular indicators. A related function of certain circles seems to have been to indicate semivowel off-glides or diphthongs or to mark similar modifications of vowel quality or quantity, perhaps in tandem with on-line signs. Subscript circles on an Indic loan such as *devo* "divinity" are perhaps of this type.

Finally the historical context of the Pyu tone-marking hypothesis needs to be considered. Luce credits the original proposal to Blagden, the pioneer of Pyu studies, who was working in the first two decades of the present century well before the advances in understanding Burmese tonal development mentioned in the preceding section. Blagden would naturally have assumed, along with compilers of the *Epigraphia Birmanica*, that modern Burmese tonal values were to be read backwards, in a literal way, into Old Burmese. To read similar (but of course many additional) tonal values into Pyu might not have seemed extravagant at that time, especially since comparative typological information behind the argument above was probably not available to Blagden.

In summary, the status of Pyu as a tonal language cannot be confirmed at present – let alone confirmed as one possessing what would have been in that case the most complex tone-marking orthography ever employed before the age of technical phonetic transcription. Indications are that signs read by Blagden and Luce as tonal indicators instead referred to segmentals. However the mysterious circles and other features of Pyu require further epigraphic and comparative-historical research before the verdict is in.

8. The Early Thai writing system

To substantiate the claim made here initially that Thai should be considered the first writing system to mark phonemic tone in a practical orthography, several conditions need to be established and considered in view of issues raised in the preceding sections. A firm time for the origin of Thai script is required; corroborating evidence that Thai was a fully tonal language by that time is needed and the actual signs in question have to be shown to be indicators of tone. On the basis of present evidence, a strong case can be made for each of these three preconditions but some controversy still surrounds several points.

That Thai was a fully tonal language by the period in question, the late thirteenth century A.D., is strongly indicated by decades of comparative-historical

research on the Tai language family.[9] This is not necessarily to imply a complete absence of segmental concomitants of pitch tone, such as glottal constriction, commonly found synchronically in the C tone category, and/or the presence of final *-h* or similar closures (see Jones 1965; Diller 1985:338–39; Gedney 1986, 1989). However Li (1976) has reconstructed a non-segmental four-tone system for Proto-Tai, a language predating the traditional date for the invention of Thai writing (1283 A.D.) by several centuries. Li's rationale for this must have been that all presently known Tai languages are tonal. The main features of Li's tonal reconstructions, if not all of the details, at least provide a plausible point of departure.

Comparative evidence adduced by Li indicates that the four-tone system is diachronically basic to all Tai varieties but maintained exactly in its original form by none. In this scheme, Proto-Tai is characterised by three tonal distinctions for open syllables (those ending in vowels or nasals), designated by Li as A, B, and C, and a fourth tonal category for stopped syllables, D. For Early Thai of the thirteenth century to reflect this system in a direct way would be reasonable.

After the Proto-Tai stage, further splittings of tones conditioned by phonation type of initial consonant occurred in a way similar to what happened in Chinese and in some Austroasiatic languages. For Tai, subsequent tonal shifting and merger have also occurred in the languages and dialects, but with much individual variation. Brown (1965:114) has suggested that Thai at the time the writing system took shape was characterised by the four tonemes mentioned above (i.e. A, B, C and D; in this case, with A and D similar in terms of pitch-contour features) and with a further allophonic differentiation conditioned by initial consonant phonation type. Later as these differences became distinctive, the conditioning consonantal phonation types merged and modern varieties, e.g. Standard Thai, now show the effects of this extra tonal differentiation which happened after the orthography had become fixed (Gedney 1978:13). This later differentiation was superimposed, as it were, on the earlier four-tone phonological system.

In the traditional account of the invention of Early Thai orthography, King Ramkhamhaeng of Sukhothai created the system in 1283 and then used it on an inscription which is explicitly dated 1292. This is now referred to as Inscription One. The writing system of this inscription is certainly Indic in general form and letter shapes show the more specific direct influence of a contemporary Indo-Khmer writing system of the period. On the other hand, in view of the

9 By current convention, the spelling "Tai" refers to the wider language family, represented in India, Burma, China, Vietnam, etc. while "Thai" is restricted to varieties in Thailand proper, especially, without further qualification, to the standard language. What is called "Early Thai" here refers to varieties spoken in central Thailand six or seven hundred years ago.

generally conservative tendencies characterizing the appropriation of Indic scripts in Southeast Asia, Inscription One shows four astonishing innovations.

(i) Several new letters were invented to accommodate what must have been Early Thai phonemic contrasts not made in contemporary Khmero-Indic source scripts. These included */e/#/ae/*, */ph/#/f/*, and */kh/#/x/*. The new signs were made by straight-forward modifications (extra tails, indentations, etc.) of the phonetically similar older ones.

(ii) Consonant clusters, such as *pl-*, *khw-*, etc., were written horizontally, on-line, contiguously as though to represent the cluster by a left-to-right iconic complex, rather than through a subscript vertical ligature characteristic of the source Indic systems.

(iii) Medial vowels of type *-i-* and *-u-*, written over and under the line respectively in all nearby Indic scripts, were also written on-line. This can best be seen as extending or reinterpreting the convention for writing initial-position Indic letters for these vowels, which was done in the source scripts on-line with special initial-vowel symbols. Thus the initial-vowel symbols were reinterpreted as medial (or rather, as potentially medial, since the initial reading was retained as a possibility).

(iv) If Proto-Tai vocabulary of tone-class B appears on the inscription, it is uniformly marked with a single superscript stroke; if of class C, with a superscript cross (like a plus sign). Vocabulary items belonging to classes A and D, as well as Indic loanwords, are left unmarked. Thus three of the four Proto-Tai tones are represented directly, with A and D differentiable by status of final segmental. It is important to emphasise that for the hundred or so items of Proto-Tai provenance on the inscription, tone marks accord with Proto-Tai tones as reconstructed through comparative evidence with virtually no exceptions.

The most plausible way to interpret these innovations is to take them as a unified system planned together. That is, (i) and (iv) each indicate the intention on the part of the orthography's inventor to represent differently sounding words discretely, i.e. to indicate phonemic contrasts – be they tonal or segmental. Where necessary, new signs were introduced to accomplish this goal. (ii) and (iii) taken together suggest an intention to clear the orthographic space available of segmental subscripts and superscripts so that the superscript marks of (iv) could be conveniently introduced. It may be that there were precursors of some form of Thai writing, as has been suggested by Coedès, Penth and others (see Diller 1993 for a review). The Ramkhamhaeng system however has all the indications of being planned as a unified – and rather radical – whole.

9. Subsequent Thai writing

Over the first four hundred years following the date of Inscription One, only two of the innovations were generally accepted, viz (i) and (ii): all subsequent texts distinguished the segmentals /*ae*/, /*f*/, etc. phonemically and with rare exceptions, continued to write clusters on-line.[10] Innovation (iii) however fared very poorly: after Inscription One the super- and subscript high vowel signs were restored in all extant texts, where they continue in use to this day.[11]

Innovation (iv), the tone-marking system of direct interest here, has had a puzzling history. About fifty inscriptions are known for the period spanning the century after the date of Inscription One. A few of these mark tones quite consistently following the Inscription One system, but most do so only sporadically and many do not mark tones at all.[12] (Superficially, the plus-like shape of the marker for C-category items comes to look more like the Arabic numeral 2.)

In view of the claim above that innovations (iii) and (iv) were originally linked – i.e. that interlinear space for tonal marking was cleared by placing all vowels on the same horizontal line – it is significant to note that the two innovations tended to be undone together as well, at least in the first instance. That is, in early fourteenth-century inscriptions one finds *-i-* and *-u-* vowels back in interlinear position, usually with tone marks absent. The few that are present may be marking particularly salient items (e.g. distinguishing important minimal pairs). Until much later, tone marks are absent in "super-high" position over the vowel *-ii*, perhaps to be accounted for by esthetic sensibilities.

Gradually a new principle of Thai writing practice can be discerned. By fifteenth century the dominant tendency in written prose is to write all vowels with distinct signs, with several extra superscript diacritics added to the earlier Ramkhamhaeng inventory to facilitate this (see Nantana Danvivathana 1987:

10 Occasionally clusters in *-r-* are written as ligatures. For the fate of one extra *kh*-like phoneme, see Diller (1991a, b).

11 The lack of success of this particular innovation may have been partially due to potential interpretive ambiguity it introduces. Thus on Inscription One a version of the on-line Indic /*i*/ symbol, which in source scripts had previously been written only word-initially, was now functionally extended to cover medial on-line *-i-* too. The same symbol could now be read either as syllable-initial, e.g. in the Thai version of "Indra", or as medial, e.g. in *kin* "to eat". In the opening line of Inscription One's text, the two functions occur together in the same word: the name of King Ramkhamhaeng's father is recorded as Indraditya (in modern pronunciation: *intharathít*).

12 Inscription 106, dated 1384, tone-marks about half of its B- and C-category items. The Inscription One system is used. Most items so marked have high-frequency tonal homonyms (Fine Arts Department 1983:108–117). This general situation holds for Inscription 38, of problematic date, and several others.

102f. for details). What were treated as inherent vowels in the earlier script were now overtly distinguished. Tones were only rarely marked.

Significantly, in this reformed practice the single-stroke tone marker for B-category items came to be used for entirely different purposes, including the marking of certain low vowels.[13] These vowels had been treated as inherent and left unmarked on Inscription One. Thus in Ayudhya-period Thai from about 1350 to 1700, the tendency was to represent all vowel phonemes distinctly with individual signs, including extra superscripts where necessary, and to leave tones to be interpreted from context. By contrast, Inscription One had indicated tones distinctly, but treated several vowels as contextually inherent and unwritten.

Still, it is unlikely that the Inscription One system was totally forgotten in subsequent centuries. Instead, there may have arisen a prose/poetry difference in writing conventions. The most common Ayudhian verse form, the *khlōng* poem, used a meter based on syllables with regulated tones reminiscent of the Tang Chinese *ci* verse cited above (Cooke 1980). The tones regulated were the original A, B, C, and D etymological ones, not any subsequent ones arising after later shifts and mergers.

Shifts certainly had occurred by the eighteenth century, as the scholar-merchant Simon de la Loubère (1687:173–177) visited Ayudhya and reported six tones, but did not mention tone marks, for the prose material of the period that he studied. On the other hand, a treatise on poetic meter and associated spelling conventions of the same period, the *Chindāmanī*, expounds a tone-marking system isomorphic to that of Inscription One, i.e. with two tonal markers distinguishing etymological B- and C-category items. The *Chindāmanī* is traditionally dated to the reign of King Narai (1656–1688). By this time, the marks would surely have been interpreted in a sense basically etymological, rather than directly phonetic as presumably had been the case four hundred years earlier at the time of their invention (Gedney 1978:15). Further, as Prince Damrong Rajanubhab noted (1991; the essay, probably written in the 1930's, is undated), the *Chindāmanī* stated that a trained scribe needed to understand the use of the extra vowel diacritics mentioned above, as well as punctuation signs

13 Traditionally, when used this way, the stroke is called *fŏn-tho':ng* "golden rain" in traditional Thai grammars, but its shape is generally indistinguishable from the B-category marker (called *máy-è:k*). Depending on the particular text, *fŏn-tho':ng* either marks unaccented short *-a-*, mainly in polysyllabic vocabulary, or else a long low back syllable-final vowel, or both. (These are the modern values; in earlier times the vowels may have had a similar quality.) Also, sometimes the same symbol is used to mark final consonants in Khmer- or Indic-derived vocabulary which must be modified when pronounced in Thai. Inscription 49, dated 1417, is one of the first to use the superscript stroke consistently for these purposes, i.e. as *fŏn-tho':ng*, to the exclusion of any tone-marking function. (Fine Arts Department 1983: 128–134, and writer's field observations.)

and similar forms. Thus a tendency toward a maximal diacritic system would seem to have been the norm for this period, but a norm not necessarily employed by all writers for all written genres.

Visual ornament may have been important in codifying norms. Traditional Thai poetry was often written with ornate visual display and it is likely that tone-marked regulated meter by this time had become partially visual rather than strictly phonetic, rather like the "sight-rhymes" of English poetry. The *Chindāmanī* shows that the earlier tone-marking system must have been preserved for several centuries by poets and others of the literati class, although, to judge from surviving samples, it had not earlier been the fashion to use the system regularly in more "functional" prose.

During the eighteenth century two extra tone marks were added, originally to accommodate the names of Chinese immigrants and junk captains, as established by Prince Damrong Rajanubhab (1991:386). The effect was also to bring the tone-marking system partially up to date in terms of the post-thirteenth-century tonal changes mentioned above – those conditioned by phonation type of initial consonant.[14]

In fact, it is likely that those later tone shifts had contributed to the temporary neglect of Inscription One's system. With the shifts, the spoken language came to be represented only indirectly ("etymologically", as it were, rather than phonetically) through the original marking.

Additional factors may have contributed to the temporary unpopularity of tone marking, both phonological and orthographic. As the Thai political centre in Ayudhya came to dominate what is now central Thailand, a dialect of Thai became the norm which probably differed tonally from the Sukhothai system to the north where the system had originated. There may have been little motivation to add what would have seemed non-functional Sukhothai tone marks.

Furthermore, as suggested above, in terms of visual esthetics, in the period following Inscription One and restoration of super- and subscript high vowels, along with the addition of yet another superscript sign representing the short *-a-* vowel, it may have been felt that tone marks would clutter the orthographic space unnecessarily. This would be especially true if tone marks were added above the other superscripts.[15]

By 1851, with the publication of the first Thai dictionary and the accession to the throne of King Mongkut, who was a strong proponent of language standardization, full tone marking again became standard practice in all written genres. It is interesting that several, but not all, of the extra vowel superscripts

14 Some extra consonants are documented from this period as well; see Danvivathana 1987:94.

15 This double superscript pile-up in fact characterizes the modern standard language, creating a minor challenge for modern printing technology. Double tiers are occasionally be found in seventeenth-century texts.

were also officially discontinued in Thai at this time, with inherent-vowel interpretations restored. (The special diacritic vowel signs for mid and low back vowels are retained in Lao.) King Mongkut's orthographic reforms thus restored certain principles of the Ramkhamhaeng system of Inscription One (consistent tone marking and several types of inherent vowels) while confirming other post-Ramkhamhaeng innovations (extra tone marks, extra consonant letters and a few extra superscripts). King Mongkut's reforms, and in effect modern Thai orthography, thus represent a diachronic hybridization. Furthermore, it is not unreasonable that the King's study of the Ramkhamhaeng Inscription itself may have been one important factor in his decision to select the particular Ramkhamhaeng-like features he chose to promulgate as part of the normative standard.

For the present argument, a recent debate over the Ramkhamhaeng Inscription's authenticity is rather tangential (Chamberlain 1991), since a few other inscriptions of the Sukhothai corpus do show clear evidence of Inscription One's tone-marking system.[16] The system as described above must in any case date from about the time of Inscription One's traditional date of 1292.

What then was the original motivation for Thai tonal marking? The key seems to have been a more generalized phonemic awareness, since the writing system also invented extra signs to represent contrastive vowel and consonant distinctions absent in the Khmero-Indic prototype scripts. Perhaps language contact features were involved in increasing phonemic awareness. As "atonal" Austroasiatic Mon and Khmer peoples were subjugated and came to speak the Thai of their masters in the thirteenth century, their predictable problems in making tonal distinctions may well have helped the masters to become aware of their own phonology and led them to mark their tones explicitly. Also, more external academic influences cannot be totally ruled out, although there is little direct evidence for them. Buddhist learning and Brahmin rituals might have brought Indic accentual phonology to the attention of Thai scholars, and one tone marker, the single superscript stroke used to mark B-category items, is in fact identical to the Vedic *svarita* sign. Finally, it is not impossible that Chinese four-tone theory may have been known to some degree in Sukhothai, but the Chinese population in Sukhothai that historical sources mention were potters – unlikely to be well-versed in matters literary. On the other hand, (somewhat unreliable?) tradition has it that King Ramkhamhaeng himself visited China, so the question perhaps must remain open. The issues of motivation and influence require more research.

16 See Note 12. For an argument that Inscription One makes spelling distinctions that could not have been successfully faked given knowledge available to King Mongkut in 1850, see Diller 1991a, b.

10. Conclusion

Suprasegmental awareness referring to accent is perhaps evidenced in Hittite cuneiform (c. fifteenth century B.C.) and is clearly indicated in the technical treatises of the Hindu grammarians by about 400 B.C. At an unknown period Vedic accents analysed in the treatises were also marked explicitly in texts. Similarly in the Greek case there was an early awareness of the language's accentual system and by 260 B.C. this was reified in the familiar Greek accent-marking system, at least for scholarly purposes, although Greek was not regularly written with accents for general purposes until a millennium later.

Among fully tonal languages, traditional sources document Chinese tonal awareness in the fifth century A.D. and attribute it to language contact factors involving Sanskrit. This was linked to the spread of Buddhism. Chinese scholars went on to develop a means to mark etymological tone categories for lexicographical purposes, but traditional character-based Chinese writing has never represented tone directly for practical purposes.

Chinese tonality was discovered again later, in the sixteenth century, by Western missionaries. Probably through their knowledge of Greek, supplemented by *numes* used in Latin liturgical texts, they devised a superscript tone-marking system. This missionary activity (recalling the role of Buddhist missionaries in China a millennium earlier) is also the basis of tone marking in Modern Vietnamese orthography. In addition it is the progenitor of modern technical systems of tone marking and their practical extensions, e.g. Chinese *pinyin*.

Early Thai is probably the first orthography of a fully tonal language to mark tones in a practical writing system. The traditional date of invention is 1283 A.D., in the Thai city-state of Sukhothai, with Modern Thai orthography preserving the original tone-marking system with only minor changes.

Slightly after the Thai system, the Middle Korean *hangul* writing of 1446 is another indigenous Asian orthography which seems to have marked tone, but both distinctive tones and their tone marks were lost and neither is characteristic of Modern Korean.

"Passive" tone marking characterizes another set of languages, including Mon, Burmese and Tibetan. For these languages, writing systems took shape at times when they were not yet fully tonal and as phonemic tonality developed gradually with loss of segmental distinctions, it was through a reinterpretation of what had essentially been segmental indicators that tone came to be represented – automatically, as it were.

By elimination, the only serious contender to Thai's title for seniority in the matter of practical tone-marking remains Pyu, an extinct language of Burma so

poorly known that little can be said until further work is carried out on the significance of its mysterious small circles.

From the above it can be seen that evidence for the arising of tonal awareness is clearest in situations of language contact and sound change. The latter case may involve the confrontation of poetic traditions with phonological shifts. Tones or pitch accents may be explicitly marked to preserve traditional poetic forms in the face of subsequent suprasegmental levelling. These marking systems have sometimes remained the province of scholars and specialists (as in the Chinese and Vedic cases) but for Greek the academic system eventually came into general use.

Language contact has involved both political subjugation, as is probable in the Thai case, and missionary activity, as in the Chinese discovery of Sanskrit accentual phonology and in the European discovery of Chinese and Vietnamese contrastive tone. In different ways, Thai contact with non-tonal Austroasiatic languages and Korean contact with Chinese tonality may have played a role in decisions to represent suprasegmental phenomena explicitly when each of these orthographies was formulated. It should be added that a high degree of phonemic sensitivity in general, as well as reliance on principles of economy and simplicity, characterise the invention of both the Thai and Korean systems. Marking tone is part of their wider genius.

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