To appear in R. Hickey (ed.), *The Cambridge Handbook of Areal Linguistics.*
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Southeast Asian tone in areal perspective

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1 Introduction

Tone is often presented as one of the quintessential features identifying mainland Southeast Asia (MSEA)[1] as a linguistic area (Henderson 1965; Matisoff 2001; Enfield 2011). For Matisoff, the proliferation of tone languages is '[p]erhaps the most striking phonological feature of the South-East Asian linguistic area' (2001: 291), while the ubiquity of tone tops Henderson's list of 'features…typologically characteristic of a South East Asian linguistic area' (1965: 401). The presence of tone in a large number of genetically unrelated languages has commonly been attributed to areal diffusion, with Chinese most commonly hypothesized as the ultimate source (Matisoff 1973; Pulleyblank 1986; Benedict 1996).

The reference to tone as a 'feature' in the preceding citations might suggest that there exists a simple typological dichotomy between languages with and without tone. Upon closer inspection, however, the phonetic, phonological, and typological characteristics of MSEA tone systems differ in important ways. To the extent that this diversity reflects substantive differences between languages, it raises the question of precisely what role contact has played in the evolution of tone in MSEA. In this chapter, we address this question through an examination of the phonetic and phonological properties of MSEA tone systems as well as of proposals regarding their evolution. After briefly discussing tone systems in the broader typological perspective, we present an overview of the phonetic, phonological, and genetic characteristics of MSEA tone systems, emphasizing the rich variability of tonal realization found in the region. Next, we discuss the ways in which languages can become tonal, reviewing evidence for the spread of tone through contact as well as for the idea that much of the observed tonality on the ground in modern MSEA might be traced to a small number of 'tonogenetic events' rather than a large number of borrowings. In light of this discussion, we consider whether a re-evaluation of the notion of tone as a canonical indicator of 'linguistic area' more generally is warranted. While our treatment is focused on a particular geographic region, we hope that this areal perspective on tone can also be of use to scholars working in other linguistic areas where large numbers of genetically unrelated tone languages are present.

2 Synchronic typology of tone in MSEA

2.1 On the definition of 'tone language'

[1] In this chapter, we use the term 'mainland Southeast Asia' (MSEA) to refer to the Indochinese peninsula comprising the modern states of Vietnam, Laos, Cambodia, Thailand, Myanmar (Burma), Singapore and the mainland territory of Malaysia.

Before discussing the tonal properties of MSEA languages, it may be useful to briefly review some standard approaches to classifying and typologizing tone systems. As suggested above, the notion of a fundamental dichotomy between 'tone languages' on the one hand and 'non-tone languages' on the other has tempted researchers since the dawn of prosodic analysis (Lehiste 1970). Unlike (segmental) phonological features such as presence versus absence of voiceless nasals or final consonant clusters, the essential qualities of tone have proven harder to pin down, but definitions of 'tone language' almost always involves some reference to the paradigmatic use of pitch. For example, Pike (1948: 3) offers the following: "A tone language may be defined as a language having lexically significant, contrastive, but relative pitch on each syllable". Hyman (2009:229) gives a similar definition: "A language with tone is one in which an indication of pitch enters into the lexical realization of at least some morphemes".

Setting aside the complications such definitions raise for the classification of languages such as Japanese or Swedish (so-called 'pitch-accent' languages), the primary role of pitch is also assumed by researchers who subdivide the set of tone languages into 'simple' and 'complex' based on the number and nature of the pitch movements. Pike himself distinguished between 'register-tone' and 'contour-tone' languages, with the former encompassing languages with a 'small, restricted number of tone contrasts between *level tonemes*' (1948: 5; emphasis ours), while the latter type comprise languages 'in which glides are basic to the system, with no level tonemes whatsoever' (*ibid.,* 8). Similarly, Maddieson (2011) makes a distinction between *simple* and *complex* tone languages where *simple* languages are 'essentially those with only a two-way basic contrast, usually between high and low levels' and *complex* languages are everything else.

Such classifications likely stem from the observation that African- and New World-type tone systems often have phonetically less complex tone systems compared to those of East and Southeast Asia. However, the differences between these systems may rest less with aspects of phonetic realization and more with the fact that the tone systems of African and New World languages tend to exhibit phonological properties such as decompositionality or spreading, as well as a tendency for tone to be employed for grammatical functions (inflection, derivation, etc.).[2] Conversely, tone may have less of a lexically contrastive function in Africa and the Americas, whereas purely tonal minimal pairs are extremely common in many MSEA languages. In any case, there is significant tonal variability in each of these areas, as we show for MSEA in the next section.

2.2 Variation in MSEA tone systems

[2] Note that languages with both of these properties exist in MSEA as well: the contour tones in several Naish languages have been argued to be properly analyzed as sequences of level tones (Michaud and Xueguang 2007; cf. Clements et al. 2011), and tone is frequently deployed to grammatical ends in Hmongic (Ratliff 1992b) and Tibeto-Burman (Henderson 1967) languages, especially those of the Chin group (Hartmann-So 1989; Hyman 2010; Watkins 2013; see also Ratliff 1992a).

In principle, a division between simple and complex tone languages could be useful for typologizing a given geographic region. At least in MSEA, however, the closer one stays to the phonetic ground, the less satisfying the simple/complex dichotomy becomes: not only is the boundary between tone and non-tone languages difficult to ascertain, but there is considerable variation in the properties of tone systems even between 'clearly' tonal languages (Abramson and L-Thongkum 2009). Here we consider several types of tone-related phenomena commonly encountered in MSEA: variation in pitch realization, phonation type, register, and the domain of tonal contrasts.

2.2.1 Variation in pitch realization

One reason that application of a simple/complex dichotomy to MSEA languages can be misleading is that there exists a large number of languages with just a two-tone system ('register-tone' languages in Pike's sense) but where one of the tones is phonetically realized as a contour, at least some of the time. One such example is Western Khmu (Kammu) (of the 'tone 1' variety given in Table 1), which contrasts a low and a falling tone – pitch apparently being the primary or sole phonetic parameter of relevance here. This contrasts with other Western dialects in which phonation type also plays a role.

Table 1: Tones in Khmu dialects (after Premsrirat 2001). The initial voicing contrast maintained in (toneless) Eastern Khmu is transphonologized into a low versus falling contrast in one Western dialect ('tone 1'), a low versus high contrast in another ('tone 2'), and a breathy versus falling contrast in a third ('register').

E. Khmu	*W. Khmu* (tone 1)	*W. Khmu* (tone 2)	*W. Khmu* (register)	*gloss*
buːc	pùːc	pʰùːc	pṳːc	'rice wine'
puːc	pûːc	pʰúːc	pûːc	'to take off clothes'
glaːŋ	klàːŋ	kʰlàːŋ	kla̤ːŋ	'stone'
klaːŋ	klâːŋ	kʰláːŋ	klâːŋ	'eagle'

It is not clear exactly how many MSEA languages have 'simple' (i.e., two- or three-tone) systems where one, or possibly both, of the tones are realized with rising, falling, or more complex pitch movements, in part because tone systems are often described solely for their phonological (i.e., contrastive) rather than phonetic properties. At the same time, care must also be taken when designating surface pitch movements to be inherent tonal properties, as non-lexical factors may also influence surface tonal realization. For example, the Tibeto-Burman language Naxi has four surface tones (high, mid, rising, and falling), but the falling tone is an intonational allotone of the high and mid (level) tones, while the rising tone is often the result of a (phonological) process of tonal reassociation (Michaud 2006, 2013).

2.2.2 Phonation types and tone: tone is not (only) pitch

A second factor complicating the analysis of tone in MSEA is that *voice quality,* or phonation type, is a crucial aspect of tone in many languages of the region.[3] By this we mean that a voice quality setting (modal, breathy, creaky, tense, etc.) is canonically present as an (obligatory) phonetic cue to the tone category along with pitch (and potentially other features as well). Far from being unusual, tone systems involving different phonation types are a common feature of many widely-spoken MSEA languages such as Vietnamese (Maspero 1912; Nguyễn and Edmondson 1997), Burmese (Watkins 2001; Gruber 2011) and Green Hmong (Andruski and Ratliff 2000); indeed, in an early survey Henderson remarked that '… "tone" is seldom, if ever, a matter of pitch alone' (1965: 404). Such systems are sometimes termed 'phonation-prominent' (Matisoff 1973) or 'mixed pitch/phonation type' (Andruski and Ratliff 2000); for brevity, we will use the term 'mixed' to refer to this type of system throughout this article.

The canonical example of a mixed tone system is Northern Vietnamese, where at least two and possibly three of the language's six tones (low-falling *hỏi,* broken-rising *ngã* and falling-glottalized *nặng*) involve glottalization or laryngealization along with a distinctive pitch movement (Nguyễn and Edmondson 1997; Pham 2003; Michaud 2004)[4], and where the voice quality setting serves as a crucial perceptual cue for listeners (Brunelle 2009; Kirby 2010). While most mixed tone systems involve either breathy or creaky/laryngealized voice quality alongside modally voiced tones, many Hmongic languages have tone systems involving modal, breathy, and creaky phonation types, and tone in dialects of the Tai-Kadai language Nùng is reported to involve both modal and glottalized phonation types along with either creaky or breathy voice (Nicolson 2000).

The widespread tendency of MSEA languages to involve phonation type as an integral part of tonal specification makes for a fuzzy boundary between mixed tone systems and so-called *register systems*, to which we now turn.

2.2.3 Register systems

In many MSEA languages, especially those of Austroasiatic or Austronesian stock, lexical contrasts are signaled by a 'bundle' of (broadly suprasegmental) features, such as phonation type, pitch, vowel quality, intensity, and vowel duration. Such languages have been termed *(voice-)register languages* in the Southeast Asian linguistic literature (Henderson 1952; Gregerson 1976; Ferlus 1979; Diffloth 1982). Here, register normally refers to a type of phonological contrast arising from the neutralization of voicing in onsets and subsequent phonologization of phonetic properties originally associated with voicing[5], but in rarer cases, the loss of final

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[3] Following Abercrombie (1967), Laver (1980), and others, we use the term 'voice quality' as a general term referring to voice settings for a variety of purposes, and 'phonation type' to refer to the phonetic realization of voice quality when employed for phonological purposes.

[4] The low-falling (*huyền*) tone in Northern Vietnamese is also optionally breathy (Nguyễn and Edmondson 1997).

[5] Note that this use of the term must be distinguished both from Pike's use of 'pitch registers' (referring to pitch levels) as well as from its use when referring to the

laryngeals conspires with voicing neutralization to lead to the development of complex register systems, as in some Pearic and Vietic languages (Di Canio 2009; Ferlus 2004; Enfield and Diffloth 2009). Depending on the language in question, register may be a property of the onset, the rime or the entire syllable; phonetically, however, register systems involve a common set of acoustic correlates, listed in Table 2 (the low register derives from former voiced stops and the high register derives from former voiceless stops).

It is important to note that not all of the phonetic properties in Table 2 are found in all register languages. For example, despite evidence that many of these properties are present to some extent in Eastern Cham at a fine-grained phonetic level (Brunelle 2005, 2006), this language primarily contrasts registers through pitch and voice quality. In modern Standard Khmer, register is expressed exclusively through vowel quality, although historical evidence and the acoustic analysis of more conservative dialects suggests that it may have passed through a stage in which phonation type was a prominent cue (Jenner 1974; Wayland and Jongman 2001, 2002). Huffman (1976) and Ferlus (1979) provide good overviews of the range of variation in register systems among Mon-Khmer languages.

Table 2: Possible phonetic correlates of register. High register typically develops from proto-voiceless stops, low register from proto-voiced/aspirated stops.

High register (voiceless stops, [*pa])	*Low register* (voiced stops, [*ba])
Higher pitch	Lower pitch
Tense/modal voice	Lax/breathy voice
Monophthongs/shorter vowels	Diphthongs/longer vowels
Raised F1 / lower vowels / [+ATR]	Lowered F1 / higher vowels / [-ATR]
Plain stops/shorter VOT	Aspirated stops/longer VOT

Since tone systems can also make use of phonation types, as we have just seen, this raises the question of how one decides whether one is dealing with a register system or a mixed tone system. Some researchers have suggested that register systems constitute a typological profile distinct from tone languages, including those of the 'mixed' variety. Di Canio (2009) provides a careful phonetic analysis of the Takhian Thong variety of Chong, which involves modal, breathy, tense, and breathy-tense phonation types, accompanied by (marginal) pitch differences. This suggests to him a fundamental distinction between register languages and tone languages:

> a register language is distinct from a tone language because contrastive phonation type typifies the former, while contrastive pitch typifies the latter. Phonation type is to a register language what tones are to a tone language.

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sociolinguistically distinct speech styles associated with many Austronesian languages (Uhlenbeck 1964).

The problem with this definition is that it is not always (or even usually) clear which feature is dominant, acoustically, perceptually, or phonologically. A classic example here is that of Burmese, which has been described both as a register system (e.g. Bradley 1982; Jones 1986) and as a (mixed) tone language (e.g. Watkins 2001; Gruber 2011). While the precise details are somewhat complicated, Burmese syllables can bear one of four registers/tones, shown in Table 3. However, Gruber (2011) has shown that glottalisation, creakiness and the presence of a high pitch target are all important perceptual cues, thus demonstrating that Burmese cannot be analyzed only in terms of pitch or voice quality.

Table 3: 'Tone' in Burmese. Examples and notation from Watkins (2001).

Low	/ma/	[maː˩]	'hard'
High	/má/	[maː˥]	'towering'
Creaky	/m̰a/	[m̰a˥˩]	'female'
Killed	/maʔ/	[maʔ˥˩]	'March'

Abramson and L-Thongkum (2009) also suggest a distinction between tone and register based on the prominence of the primary cue, with tone languages being primarily cued by pitch and voice-register languages primarily cued by phonation type. However, they acknowledge this boundary can be fuzzy, and suggest that tradition and researcher degrees of freedom are likely to play a significant role in the assignment of languages to one category or the other. A similar sentiment is echoed by Watson (1996: 202) in an essay on Pacoh vowel phonology:

> [t]here tends to be a dichotomy in voice quality ranging from breathy to clear to creaky, in pitch ranging from high to mid to low, in voicing of initial consonants, in vowel height between close and open, in vowel gliding between onglided, plain or offglided, and tension from tense to lax. In some cases there has been a general movement from a distinction between voicing in initial consonants to a distinction in vowel quality and/or pitch.

Enfield (2011: 69) suggests treating tone and phonation

> …as instances of a single sound system property because they each involve the use of laryngeal features for lexical contrast. While tone and phonation type are often considered to be fundamentally distinct phenomena, in fact most systems that are identified as one versus the other (in phonological terms) actually display properties of both (in phonetic terms; Henderson 1967: 171). Pitch contours, distinctions in phonation type, and glottalic effects are all produced in the larynx (specifically, by the vocal folds), and are all articulatorily independent of segmental speech sounds produced with the lips, teeth, and tongue (i.e., typical 'consonants'). Tone and phonation are intimately bound, not essentially distinct, and for this reason I do not regard the sound system of a classical MSEA tone language such as Vietnamese to be of a different species from that of a classical MSEA register language such as Kri (Enfield & Diffloth 2009).

While we are broadly in agreement with this position, it is worth noting that laryngeal and supralaryngeal features are at least weakly related via the connection of the tongue root to the larynx via the hyoid bone.

Additional evidence for the fluidity of laryngeal features in MSEA can be found in the comparison of related languages (or dialect continua) where the same set of segmental and suprasegmental properties seem to take on different degrees of prominence in different dialects. In other words, prominence is often *unstable*. The Khmu dialects described in Table 1 above constitute one such example; Lamet, a Palaungic Mon-Khmer language, is another. Narumol (1982) and Svantesson (1988) describe versions of the language with two contrastive voice registers, but no pitch (tone) distinction, while Conver (1999) describes a phonemic 2-tone system realized as high and low pitch. Conversely, Lindell et al. (1978) indicate that none of the dialects they studied made use either of tone or of contrastive phonation type distinctions. The nascent tone contrast in some dialects of Khmer shows similar variation, ranging from dialects that maintain differences in voice quality, f0 and vowel quality (Wayland and Jongman 2001) to dialects that retain vowel quality distinctions only, such as modern Standard Khmer.

There are at least two ways one might begin to address the issue of phonetic prominence in tone/register systems. One is to look at the weighting of cues in production by conducting e.g. linear discriminant or factor analyses of acoustic data (e.g. Andruski and Ratliff 2000 on Green Hmong; Abramson et al. 2004 on Suai, Abramson et al. 2007 on Khmu). Such studies may also reveal diachronic changes in progress. In their study of Khmu Rawk, for example, Abramson et al. (2007) found that male speakers no longer produce a measurable phonation type difference between voice registers, suggesting that F0 is becoming a more prominent cue for at least some speakers of this language.

The issue of establishing acoustic separability is in principle a separate undertaking from determining whether a given cue is used by native listeners in perception (see e.g. the previously cited work by Abramson and colleagues; Hombert 1977; Mazaudon and Michaud 2008; Brunelle 2009; Brunelle and Finkeldey 2011; Gruber 2011; Kirby 2014). This type of work involves experimental manipulation of acoustic properties of natural or resynthesized stimuli, using either an alternative forced-choice identification paradigm (and subsequent analysis of error rates and classification trees) or discrimination tasks (which facilitate analysis of reaction time data: see e.g. Gandour 1983; Kirby 2010). The interpretation of perceptual responses may be complicated by the existence of learned and/or inherent perceptual dependencies between cue dimensions (Brunelle 2012). Nevertheless, the available perceptual studies suggest that the relation between acoustic separability and perceptual weighting in MSEA tone and register systems is far from straightforward, and this remains an area of active research.

Even if a prominence hierarchy can be established, it is not clear that languages in which pitch is the most prominent aspect of the system are fundamentally different from languages in which voice quality, or vowel height, or even voicing are the most prominent aspects, or that any of these are different from languages in which no laryngeal cue is prominent. Indeed, given that redundancy is the default state of phonetic contrast (Lisker 1986), one might argue that clear

instances of 'pure tone' or 'pure voice quality' languages are actually rather unusual from a functional perspective, and that register systems or systems in flux would be expected if perceptual robustness were somehow privileged. Thus, while there may be a descriptive utility to terms such as 'register language', 'mixed pitch/phonation type tone language', etc. it is important to bear in mind that the borders between them are likely to be extremely porous.

As a final note, it is worth pointing out that while pitch and phonation type often cross-cut one another in the prosodic systems of MSEA languages, there are also languages that have segmentally anchored phonation type distinctions in addition to fully developed tone systems. One such example is the endangered Tibeto-Burman language Mpi, spoken in northern Thailand (Ladefoged and Maddieson 1996). This language has a system of six tones, each of which may co-occur with a plain or laryngealized (tense or stiff-voiced) vowel, as shown in Table 4. While this type of system seems to be relatively rare among MSEA languages, further examples may be found among the Sino-Tibetan languages spoken in China such as Yi and Bai (Edmondson et al. 2001), as well as in the Oto-Manguean languages of Central America such as Itsunyoso Trique (Di Canio 2012).

Table 4: Contrasting tones and phonation types in Mpi (after Ladefoged and Maddieson 1996: 316).

	Tone	Modal voice	Stiff voice
^{1}si	low rising	'to be putrid'	'to be dried up'
^{2}si	Low	'blood'	'seven'
^{3}si	mid rising	'to roll'	'to smoke'
^{4}si	Mid	(a color)	(classifier)
^{5}si	high rising	'to die'	(man's name)
^{6}si	high	'four'	(man's name)

2.2.4 The domain of tonal contrast

Another important aspect, implicit or explicit, in many definitions of 'tone language' is that the syllable is cast as the relevant domain over which relative differences in pitch are defined. The resulting problem of how to classify 'marginally' tonal languages such as Swedish or Japanese has led some prosodic typologists to propose a tripartite classification of 'tone', 'stress', and 'pitch-accent' languages (Ding 2006; van der Hulst 2011), although Hyman (2006, 2009) points out that the unique properties of pitch-accent can be difficult to separate from those of tone and stress.

Languages where lexical tones are associated to units larger than the syllable are hard to come by in MSEA, but one does not have to go too far to find such languages. Many Tibeto-Burman languages of the Bodish and Qiangic subgroups such as Tamang (Mazaudon and Michaud 2008), Naxi (Michaud 2007), and Prinmi (Ding 2001), spoken in nearby China, Tibet, and Nepal, are characterized by 'cumulative' tone systems, where distinctive pitch patterns are defined over units determined both prosodically and morphologically (Mazaudon

1973; Evans 2001a; Michaud and Mazaudon 2006; Hildebrandt 2007). In the Tibeto-Burman language Lizu (Chirkova and Chen 2013), for example, monosyllabic words contrast low(-rising) and high(-falling) tones, e.g. /^{R}ŋu/ 'silver' vs. /^{F}ŋu/ 'cow', while three pitch patterns are observed in disyllabic words: two mid-level pitch contours of equal prominence (/^{EP}midzɻ̩/ 'hare'), a left-prominent falling contour (/^{LP}midzɻ̩/ 'pepper'), and a right-prominent rising contour (/^{RP}mutsɻ̩/ 'cat').

Another way in which the 'domain' of tone can differ is in the extent to which it has diffused through the lexicon. Most tone languages of East and Southeast Asia have a restricted tonal inventory in syllables closed by an obstruent (often called 'checked' or 'dead' syllables). This impoverished inventory is usually attributed to the fact that these syllables preserved their segmental coda during the three-way split stage of tonogenesis (see §3.1) and therefore did not develop a contrastive tone. Tai-Kadai languages often have similar (though less systematic) restrictions between tones and onsets. In Central Thai, for instance, a high tone may not appear after a voiced onset. In some languages, these tone-consonant interactions are even more radical: tone is phonemically marginal, with pitch-based contrast restricted to certain words or phonological environments. For example, in several varieties of Khmer, an incipient tone contrast has developed following the loss of /r/ in onset position, leading to a small number of minimal pairs distinguished solely by pitch (Wayland and Guion 2005; Kirby 2014; see also §3.2), while in the Tibeto-Burman language Kurtöp, tone is only contrastive following sonorants and the palatal fricative /ç/ (Hyslop 2009). It is also not uncommon to find tones that are restricted to certain lexical strata, such as loanwords. For example, although Mal (T'in), a Mon-Khmer language of Thailand, contrasts both a falling and a rising tone, the rising tone is largely (though not exclusively) used with Thai loanwords (L-Thongkum and Chommanad 2008).

2.3 Some tonal characteristics of the individual language families

To give a different sense of the range of tonal diversity in MSEA, we include here a brief overview of the tonal properties of languages included in the database described in Brunelle and Kirby (2015). At the time of writing this database includes 186 Southeast Asian languages from five families. As noted by Matisoff (2001), migration patterns in Southeast Asia have traditionally been rather different from those in Europe; the result is that the branching-tree model of genetic relationships, already a simplification, is perhaps even less insightful in the MSEA case. For this and other reasons, sub-groupings and -branches are often contested; as such, we restrict our classification to major language families only.

As the preceding discussion makes clear, it is difficult to place MSEA languages into a single category on the basis of their lexical treatment of prosodic properties. Thus, instead of insisting on labels, we describe the languages in terms of the number of contrastive prosodic units, the number of distinct pitch units, and the number of voice quality dimensions they distinguish. In our database, we furthermore make note of properties such as consonant-tone restrictions; maximal

canonical word shape (mono-, sesqui-[6], or polysyllabic); and the complexity of codas. As we are relying largely on published sources, it is not always clear if descriptions should be interpreted phonetically or phonologically, but this approach has the advantage of allowing a more nuanced overview of the tonal properties of MSEA languages than would be gained by yet another arbitrary classification into a small number of sub-types.

2.3.1 Austroasiatic

Our sample contains 78 Austroasiatic languages (41.9%), all of them Mon-Khmer.[7] The vast majority of the AA languages in our sample are sesquisyllabic. Around a third of these (24) are non-tonal, while another third (27) have systems of two tones or registers. This includes languages such as Riang (Luce undated), Conver's Lamet (Conver 1999), and T'in (Lua') (L-Thongkum and Chommanad 2008) which are described as having two pitches but no phonation type differences; languages like Western Bru (L-Thongkum 1979) or Narumol's Lamet (Narumol 1982), described as register systems distinguished by phonation type differences only; and (most commonly) languages like Mon (L-Thongkum 1988) or Suai (Abramson et al. 2004), for which both phonation type and pitch distinctions are described.

The remaining Austroasiatic languages in our sample have systems of three or more tones. These languages almost always employ a combination of pitch and phonation type distinctions to signal tone categories. This set includes Vietic languages such as Rục (Nguyễn Văn Lợi 1993), Chứt and Thavung (Ferlus 1998), and Northern Vietnamese (Vũ Thang Phương 1981; Nguyễn and Edmondson 1997), as well as Pearic languages such as Takhian Thong Chong (Di Canio 2009), where each of the four phonemic phonation types (modal, tense, breathy, and breathy-tense) are consistently realized with a unique pitch. The notable exceptions here are Kháng (Edmondson 2010), a language with six tones but no reported phonation type distinctions, and Southern Vietnamese. Kháng has demonstrably had considerable recent contact with Tai-speaking groups, although the same cannot be said for Southern Vietnamese.

It is interesting to note that the tone sandhi phenomena that are so pervasive in language families such as Sino-Tibetan and Hmong-Mien are unknown in Austroasiatic languages, although complex tone spreading processes are attested in Kammu (Svantesson 1983). This could be due to a lack of thorough descriptions, but it is at least worth noting that tone sandhis are so far unattested in otherwise well-described Vietnamese dialects.

2.3.2 Austronesian

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6 A sesquisyllable (Matisoff 1973) is a disyllabic word composed of a main, stressed, final syllable that may contain the full range of phonological contrasts of a language, preceded by an unstressed reduced 'presyllable' that is subject to radical contrast neutralization.

7 While often used interchangeably with Mon-Khmer, the Austroasiatic group is also thought to include the Munda languages, spoken in India and Bangladesh. The internal classification of Mon-Khmer languages is complicated; see Diffloth (2005) and Sidwell (2013) for overviews of the issues involved.

While the Austronesian family contains many thousands of languages spoken by hundreds of millions of people, they are relatively thin on the ground in MSEA. There are just 20 Austronesian varieties in our sample (10.8%); of these, 11 are Chamic languages/dialects spoken in Vietnam and Cambodia, with the rest spoken in the Malay Peninsula and its vicinity. Austronesian languages of the Malay Peninsula tend to be disyllabic, while Chamic languages are mainly sesquisyllabic. Cham dialects proper show a tendency to monosyllabicity, the most extreme case being colloquial Eastern Cham, which has become almost entirely monosyllabic (Brunelle 2009a).

The majority of these varieties are atonal, but three dialects of Cham (Eastern Cham, Vietnamese Western Cham and Cambodian Western Cham) and two dialects of Raglai (Cac Gia Raglai and Southern Raglai) have developed register systems combining pitch and voice quality to various degrees (Lee 1966, 1998; Brunelle 2009b). Haroi, another coastal Chamic language, formerly had a register system that was restructured into a complex vowel system, in a manner reminiscent of Standard Khmer (Mundhenk and Goschnick 1977). Moken Dung, a Malayic language of the Andaman sea, is reported to have a two-tone system, although information about its source is scant at best (Naw Say Bay 1995). In short, some mainland Austronesian languages have undergone minor tonal developments, but this seems mostly limited to register.

Some other Austronesian languages spoken outside of mainland Southeast Asia, strictly construed, have also developed forms of tonality. Javanese has a register system normally described as a tense-lax stop contrast, but which is in practice almost identical to MSEA register systems (Fagan 1988; Adisasmito-Smith 2004; Thurgood 2004; Brunelle 2010); other Malayo-Polynesian languages of Indonesia, such as Sundanese and Madurese, have similar systems. Tsat, a Chamic language spoken in Hainan, has developed a five-tone contrast from laryngeal codas and onset voicing, just like Vietnamese or Chinese (Maddieson and Pang 1993).

2.3.3 Sino-Tibetan

Sino-Tibetan languages, including Chinese dialects, make up 19.9% of our sample (37 languages). All of these languages are tonal to some degree, ranging from the two-tone systems of Bwe Karen (Henderson 1979) or Daai Chin (Hartmann-So 1989) to five- and six-toned Loloish languages such as Akha (Lewis 1973) or Lisu (La Maung Htay 2011). Roughly half of the Sino-Tibetan languages are purely pitch-based (e.g. many Chin languages, Pa'o Karen), while the other half are mixed pitch/phonation-type systems (e.g. Lisu, Sgaw Karen).

Most of the Sino-Tibetan languages spoken in MSEA are polysyllabic, largely because of a more or less opaque concatenation of monosyllabic roots and affixes. There are however many exceptions (sesquisyllabic Burmese, [largely] monosyllabic Yue Chinese) and these languages rank among the most widely spoken.[8]

In addition to tone sandhi processes (where the surface tone realization is affected by tonal environment), which are especially common in Chinese dialects,

[8] Note that Burmese also contains a large number of polysyllabic loanwords, and that Chinese languages, especially Mandarin, contain many disyllabic compounds.

the tone systems of many Sino-Tibetan languages display tonal alternations such as spreading, re-association, contour simplification and OCP effects more commonly associated with African tone systems (Evans 2008; Michaud 2008; Hyman 2010, Watkins 2013). Besides these strictly phonological processes, Tibeto-Burman languages often have morphophonological tonal process and grammatical tones (Henderson 1967; Hyman and Haokip 2004).

2.3.4 Tai-Kadai

Tai-Kadai (also Kra-Dai) languages make up another 23.1% of our sample (43 languages). Tai-Kadai languages are mostly monosyllabic, although some languages have acquired sesqui- and polysyllables through borrowing from Khmer, Pali and Sanskrit and through occasional semantic bleaching of compounds. All Tai-Kadai languages in our database are tonal, with systems of 4 to 7 tones. Seventeen of these languages (39.5%) make no recorded use of voice quality, while the rest have mixed tone systems in which complex contour tones are combined with creakiness and/or glottalization. Interestingly, despite the complexity of Tai-Kadai tone inventories, no instances of tone sandhi have to our knowledge been reported in this language family.

2.3.5 Hmong-Mien

There are eight Hmong-Mien varieties in our sample (4.3%), which reflects the fact that most of these languages are spoken in China rather than MSEA per se. All Hmong-Mien languages are highly tonal, having between six and eight tones. In nearly all documented cases, phonation type contrasts (modal, breathy and/or tense/creaky) are an integral part of the tone system. For example, two of the seven tones in Hmong Leng (the low checked *-m* tone and the mid-falling *-g* tone) are creaky and breathy-voiced, respectively (Andruski and Ratliff 2000). The exception here appears to be Iu Mien (L-Thongkum 1997; Bruhn 2007), the only Mienic language in our sample to lack a phonation type contrast.

Tone sandhi processes are found in most Hmong-Mien languages, although they are reported to be highly variable and lexicalized (Ratliff 1987). However, tonal alternation is commonly employed for morphological purposes (word classes and compounding) as well as in ideophonic expressives such as *poob* [pɔ́ːŋ] ‘to fall’ vs. *poog* [pɔ̰̂ːŋ] ‘the sound of falling’ (Ratliff 1987, 1992b).

3 Tonogenesis

3.1 The usual path to tone

For those tone languages that can be reconstructed as having a prior toneless state, it is broadly accepted that the origins of lexical tones (dubbed *tonogenesis* by Matisoff 1973) normally lie in earlier laryngeal contrasts. The now-standard tonogenetic scenario was proposed by Haudricourt (1954) in a convincing demonstration that Vietnamese is indeed an Austroasiatic language despite having a well-developed tone system (although since that time, tones have been found in a

number of Austroasiatic languages). Haudricourt showed that Vietnamese underwent a two-step process of tonogenesis in which an initial three-way tone split (conditioned by laryngeal properties of the coda) was followed by a subsequent two-way split (conditioned by laryngeal properties of the onset), resulting in a system of six tones (Table 5). The precise phonetic outcome of the second split varies with language, but in general, voiceless onsets condition higher variants and voiced onsets lower variants; while in the initial phase, final glottal stops gave rise to rising tones while final aspirates have a pitch-lowering effect.

Table 5: Haudricourt's schematic view of Vietnamese tonogenesis. Following an initial three-way split into level, rising, and falling, a subsequent two-way split, conditioned by the voicing of the initial obstruent, produced the modern six-tone system. (The fourth column shows the diacritics used in Vietnamese orthography.)

BCE (no tone)	6th century (three tones)	12th century (six tones)	Modern Vietnamese
pa	A	A1	ba
ba	(level)	A2	bà
paʔ	B	B1	bá
baʔ	(rising)	B2	bạ
pah	C	C1	bả
bah	(falling)	C2	bã

Haudricourt then applied this scenario to other languages (Haudricourt 1961) and today there is little doubt that similar two-way and/or three-way splits were involved in tonogenesis in Chinese, Tai-Kadai, Karen, Tibeto-Burman languages of Nepal (Mazaudon 2012), Tsat (Maddieson and Pang 1993) and possibly Hmong-Mien (Ratliff 2013). Furthermore, the two-way split proposed by Haudricourt seems to be the driving force in the development of register in a large number of Austroasiatic (Ferlus 1979) and Chamic (Lee 1966) languages.

Shortly after publishing his canonical scenario, Haudricourt suggested the possibility of an initial two-way split involving a crucial stage of voice quality contrast, where voiced initials induce breathiness on the following vowel, which then causes pitch lowering (Haudricourt 1965). This idea has regularly been revisited since (Egerod 1971; Pulleyblank 1978; Diffloth 1989; Thurgood 2002; Ferlus 2009; Mazaudon 2012), and while it is still unclear if breathiness is a compulsory stage in the two-way tone split, the available data certainly suggest that this is a common evolutionary trajectory. Since then, based on observations by Gage (1985), the possibility that creakiness or tenseness plays a role in the three-way split alongside the glottal stop has been proposed by Ferlus (1998) and Diffloth (1986); while the phonetic explanation to support these accounts has yet to be fully worked out, it is worth noting that a similar account has been proposed for the origin of tones in Athabaskan languages (Leer 1999; Kingston 2005).

3.2 Less common paths to tone

Despite the prevalence of the canonical tonogenetic scenario, other types of tonogenetic mechanisms have been described for Southeast Asian languages. In the Palaungic languages U and Hu, tone is claimed to have developed from differences in vowel height and vowel length, respectively (Svantesson 1989, 1991). Table 6 gives examples of some Hu forms compared to those of related Lamet, demonstrating that the Hu tones are not related to the voicing of the initial consonant.

Segments other than stops and aspirates may also induce tonogenesis. In some dialects of Khmer, loss of /r/ in syllable onsets has led to an incipient tone contrast between words like /kruː/ > [kʰŭː] 'teacher' and /kʰuː/ > [kʰuː] 'venerable' or /rien/ > [hĭen] 'to learn' and /hien/ > [hien] 'to dare' (Thạch 1999; Wayland and Guion 2005; Kirby 2014). While Thạch (1999) proposes a contact-based explanation and Wayland and Guion (2005) suggest that phonologization of f0 was conditioned by a combination of the high degree of airflow necessary for trilling and subsequent devoicing of the trill, Kirby (2014) argues that this sound change may have arisen via the perceptual reanalysis of changes in spectral balance, coupled with the coarticulatory influence of the dorsal gesture accompanying /r/.

Table 6: Examples of Hu tonogenesis from vowel length (after Svantesson 1989).

	Hu	Lamet	
*short	jám	jạ̱m	'to die'
	phɬɲ	pɨ̱ɲ	'to shoot'
	θúk	khu̱k	'hair'
*long	jàm	jạ̱am	'to cry'
	thàɲ	tạ̱aɲ	'to weave'
	nasòk	jo̱ok	'ear'

Finally, suprasegmental contrasts may also serve as a source of lexical tone systems. Evans (2001ab) argues that certain Southern Qiang dialects developed tone systems after pitch accent, developed from an earlier lexical stress system, was re-analyzed in the wake of phonological reduction and heavy borrowing from Mandarin. While evidently uncommon in MSEA languages, this type of evolutionary trajectory is reminiscent of the probable path to tone in Germanic languages (e.g. Gussenhoven 2000).

4 Areality and contact

4.1 Contact-induced tonogenesis

The view that tone spread from Chinese to other languages of MSEA (Matisoff 1973, Pulleyblank 1986) is now so well-established that it is often considered as received knowledge (cf. the tonogenetic 'waves' posited by Ratliff 2002 and Mazaudon 2012). Unfortunately, in the absence of solid historical and

sociophonetic data, claims about contact-induced tonogenesis, however likely they may seem, remain unproven. Even for the most likely cases of contact-induced tonogenesis in MSEA, it is difficult to decide if we are looking at accidentally parallel internal developments or at contact.

Thomason (2001: 59-60) suggests a number of conditions that should ideally be met when making a case for a contact-induced structural change. In addition to clear recipient and donor languages, a strong case will seek to establish that the feature(s) in question were present in the donor language but *not* present in the recipient language prior to contact. While these conditions may be straightforward to establish when looking at morphemes or even syntactic structures, they are surprisingly difficult to meet in the case of a phonological feature like tone. For instance, Vietnamese is often claimed (quite reasonably) to have acquired tone while under Chinese influence, but it is unclear if this development occurred as a result of this contact or simultaneously with it. The first Sino-Vietic contact probably took place in what is now northern Vietnam around the time of the Qin dynasty (second century BCE), with Chinese administrative control solidifying under the Han empire around 100 BCE (Gernet 1996; Phan 2013). Given estimates that (toneless) Old Chinese was spoken until the early centuries CE (Pulleyblank 1962, 1978; Baxter 1992; cf. Ferlus 2009), and evidence from conservative Vietic languages that maintain four-way laryngeal distinctions or tonal contour systems (Ferlus 1996), it is not implausible to assume that initial emergence of tone in Vietnamese was an internal development.

In fact, since most cases of tonogenesis in MSEA involve the same regular internal factors (i.e., loss of laryngeal codas and neutralization of onset voicing), it is in general difficult to determine if contact is really playing a role or if we are just looking at independent parallel processes (although as Thomason 2001 correctly points out, the fact that a change *can* occur through internal factors in another situation is not necessarily a valid argument for rejecting contact). In the end, as discussed by Ratliff (2002), there are only two possible scenarios for contact-induced tonogenesis (besides the adoption of loanwords with their tones): 1) two atonal languages can become tonal simultaneously as bilinguals transphonologize the same laryngeal contrasts in both languages; or 2) an atonal language can become tonal because its speakers, who are bilingual in a tonal language and thus 'tone-prone', phonologize previously allophonic pitch variation. Proving either of these scenarios after the fact is probably impossible, at least in the absence of detailed acoustic and perceptual data gathered over several generations, but this does suggest that substantive proposals of contact-induced tonogenesis would include evidence of a high level of bilingualism in at least part of the language community in question.

4.2 Tone as an areal feature

Given all this variation, then, why is tone upheld as an areal feature of MSEA languages? Put differently, what is the evidence for tone as an indicator of areality? Aikhenvald and Dixon (2001) describe a Sprachbund as 'a geographically delimited area including languages from two or more language families, sharing significant traits (*which are not found in languages from these families spoken outside the area*)' (11; emphasis ours). This description is not meant to be used for

a single feature, but a quick look at the five MSEA language families suffices to note that tone does not bear the hallmarks of an especially 'areal' feature. While tonal Austroasiatic languages seem limited to MSEA, tonality in Austronesian languages is not limited to MSEA. Register is attested in Javanese, for example, and Tsat, a Chamic language of Hainan, is highly tonal. These languages could of course be included in a larger Southeast Asia area, but even then a number of Oceanic (Austronesian) languages of New Caledonia have also developed tone (Haudricourt 1971, Rivierre 1993). Hmong-Mien, Tai-Kadai and Sino-Tibetan are all spoken outside MSEA proper, and all of these families are highly tonal. All the Hmong-Mien languages of China have tones (and some of them are spoken so far north, that it would be hard to regard them as Southeast Asian proper), as do all Tai-Kadai languages, be they spoken in Southern China or in India, such as Aiton and Khamti (Morey 2005). As for Tibeto-Burman languages, many of their representatives in China, but also in the Himalayas, are tonal as well.

Of course, the criterion given by Aikhenvald and Dixon may be too restrictive for tone in MSEA. There could be areal convergence even if some of the language families were tonal before arriving in MSEA. However, in a recent study based on the same database of 186 languages as this chapter, we were unable to establish geographical proximity as a factor of tonal convergence independent of language family and word type (Brunelle and Kirby 2015). In the end, the real question that needs to be addressed is not why MSEA languages are so frequently tonal, but if the number of tonogenetic events in MSEA Austroasiatic and Austronesian in the past two millennia were higher than would have been the case if it had not been for contact.

That tone cannot unambiguously be shown to be a contact phenomenon (at least as measured by proximity) does not mean that MSEA is not a linguistic area full stop (Haig 2001; Aikhenvald 2006). Linguistic areas are not defined by any single feature, but by a cluster of features (Campbell, this volume), with different features having different weights, and much of the evidence for a MSEA linguistic area is based on convergence of grammatical and lexicosemantic features. In these respects, the Austroasiatic and Austronesian languages of MSEA are rather different from their non-MSEA counterparts. Matisoff (2001) provides a lengthy, though by no means exhaustive, list of some of these shared features, as well as of phonological features other than tone relevant for the establishment of a linguistic area (see also Enfield, 2005; Donohue and Whiting 2011).

4.3 The role of word shape in tonogenesis

If the role of contact in tonogenesis is downplayed, however, how are we to account for the relatively high frequency of tone in MSEA? The chief alternative is to assume that multiple tonogenetic events took place more or less independently in different languages of the region. Mechanistically, this is not problematic; the universality of microprosody (intrinsic F0 or 'pitch skip'), thought to be the 'seeds' of tonogenesis, is well established (House and Fairbanks 1953; Ohala 1973; Gandour 1974; Hombert 1978; Hombert et al. 1979; Hanson 2009). This, however, raises the questions of (a) what types of pressures/conditions might cause languages to rely upon and ultimately enhance these microprosodic differences into tone systems and (b) why the relevant conditions should have appeared in several

languages at more or less the same time (like in the two-way split that seems to have occurred in Chinese, Vietnamese and Tai-Kadai around the 10th century).

It is here that contact may play a role, albeit an indirect one, in the spread of tone throughout the region. Matisoff (1973, 2001) has repeatedly emphasized the relationship between monosyllabicity and tone, a correlation that we also found in the statistical study of our database (Brunelle and Kirby 2015; cf. Donohue 2012). Is it possible than instead of a direct relationship between contact and tonality, there is a more complex causal chain in which contact with monosyllabic languages favors monosyllabization, which in turn favors tonality? In our database we find that there is a strong correlation between monosyllabicity and numbers of tones; as you move to languages that retain presyllables, or morphology, one finds fewer or no tones, or word-level tones (as in many Tibeto-Burman languages). This is at least consistent with the idea that loss of segmental material makes a language increasingly 'tone-prone'.

While it seems unlikely that languages borrow the concept of monosyllabicity *per se* (much as it would be unusual to borrow a fully-formed tone system), they surely borrow large numbers of lexical items. If language A is primarily sesquisyllabic and language B primarily monosyllabic, and if there exists an asymmetric prestige relationship between A and B such that A borrows more from B than vice versa, this would increase the number of monosyllabic forms in the lexicon of language A. This could have the effect of encouraging further loss of segmental material, driving the language towards a canonically monosyllabic template and increasing the likelihood of phonologizing prosodic properties such as pitch, length, or voice quality. Such a trend would be even more likely if pre-existing structural factors favor monosyllabization (Brunelle and Pittayaporn 2012).

However, despite the empirical correlation between monosyllabization and tone, its mechanistic underpinnings remain unclear. One possible motivation could be driven by functional considerations. Consider the case of a sesquisyllabic language with a laryngeal contrast in final stops. If the presyllables were to reduce and eventually disappear, the burden of lexical contrast would now be borne entirely by the final laryngeal contrast, known to be perceptually fragile (Steriade 2001/2008). This fragility could increase the likelihood that previously redundant phonetic properties, such as differences in pitch or voice quality, could become enhanced (Kirby 2013), eventually transphonologizing if the cues to the segmental identity of the coda are subsequently lost (Hyman 1976). While perhaps intuitively plausible, the specifics of such an account remain to be worked out in sufficient detail to be tested experimentally.

5 Conclusions

In this chapter, we have reviewed the properties of tone and register systems of Mainland Southeast Asia (MSEA), describing both their synchronic diversity as well as a range of theories to account for their development. While MSEA may still earn the title of 'the ultimate Sprachbund' (Dahl 2008), the presence of 'tone' may not in and of itself constitute a particularly strong indicator of convergence. As we have seen, the tone systems of this region are extremely diverse and it is difficult to establish unambiguous cases where tone (or register) has been spread via contact.

More detailed acoustic and perceptual research on tone systems, together with longitudinal studies of speech communities, promise to enhance our understanding of the mechanisms underlying tonogenesis in MSEA and elsewhere.

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