**Phonologically-constrained change: The role of the foot in monosyllabization and rhythmic shifts in Mainland Southeast Asia**

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**Abstract**

Changes in word shapes in Mainland Southeast Asia are usually attributed to contact-induced typological convergence. However, little attention has been paid to the role of structural constraints in defining paths of change. In this paper, we describe two distributional gaps in paths of word shape shifts: (1) there are no attested cases of *direct* shift between trochaic and iambic rhythm and (2) monosyllabization does not occur in trochaic languages. We argue that universal phonetic tendencies and structural constraints on their phonologization that derive from the Iambic-Trochaic Law are sufficient to explain these gaps and seem to account for at least part of the typological convergence usually attributed to contact.

Les changements de formes morphologiques en Asie du sud-est continentale sont généralement attribués à une convergence typologique due au contact linguistique. Le rôle des contraintes structurales dans la détermination des changements possibles est cependant rarement considéré. Dans cet article, nous décrivons deux restrictions dans les changements affectant les types de mots : (1) il n'y a pas de cas attestés de glissement rythmique direct entre iambes et trochées et (2) la monosyllabisation ne se produit jamais dans les langues trochaïques. Nous avançons que des tendances phonétiques universelles et des contraintes structurelles régissant leur phonologisation et dérivant de la Loi iambique-trochaïque sont suffisantes pour expliquer les deux asymétries et semblent être en partie responsables de la convergence typologique qui est généralement attribuée au contact linguistique.

Veränderungen von Wortformen auf dem Festland Südostasiens sind meistens auf typologische Annäherungen aufgrund von Sprachkontakt zurückzuführen. Dennoch wurde der Bedeutung der strukturellen Kriterien, die den Veränderungsprozess definieren, bisher wenig Aufmerksamkeit gewidmet. Dieser Artikel befasst sich mit zwei Distributionslücken im Prozess der Wortformveränderungen: (1) es gibt keine Evidenz für eine direkte Rhythmusveränderung zwischen Trochäus und Iambus, (2) in Sprachen mit trochäischem Wortbetonungsmuster ist kein Prozess, der zur Einsilbigkeit führt, bekannt. Es soll gezeigt werden, dass universale phonetische Tendenzen und die strukturellen Kriterien, die zu ihrer aus iambisch-trochäischen Regeln abgeleiteten Phonologisierung führen, zur Erklärung dieser Lücken ausreichend sind. Außerdem scheinen sie zumindest einen Teil der oft als Folge des Sprachkontakts aufgefassten typologischen Annäherung zu begründen.

Mainland Southeast Asia is a stereotypical example of a geographical area where languages from genetically diverse families have come to share structural resemblances. These similarities are found in all components of the grammar. For example, in syntax, Bisang (1996) shows that languages of Mainland Southeast Asia share grammaticalization pathways in the domain of verbs and nouns. In semantics, Enfield (2001; 2003) shows how verbs meaning 'to acquire' have come to have a similar poly-functionality in a number of languages. In phonology, similar paths of tonogenesis have been found throughout the area (Haudricourt 1954; Maran 1973; Matisoff 1973; Gage 1985; Thurgood 1993; Matisoff 2001; Thurgood 2002).

Even more striking is the fact that some language families covering wide areas of Asia have split into typologically different sub-branches that coincide with geographical areas. The most eloquent examples are the Sino-Tibetan and Austroasiatic families, that are roughly divided into two linguistic sub-areas: the Indosphere and the Sinosphere (Matisoff 1990; Donegan 1993; LaPolla 2001; Donegan and Stampe 2002; 2004; Post 2009). Members of these families that are spoken in the Indian sub-continent tend to be head-final, trochaic and to have complex affixation, whereas those spoken in Southeast and East Asia tend to be head-initial, iambic and to have little or no morphology (cf. Donegan and Stampe 2004 for a full list of features). This strongly suggests that some sub-branches of Sino-Tibetan and Austroasiatic underwent a radical typological change. It is generally agreed that the transformation was towards more Indic features but it is unclear how it took place. While most authors attribute this change to contact (Matisoff 1973; LaPolla 2001; Matisoff 2001), there is little evidence of large-scale borrowing in the languages affected by it (Donegan and Stampe 2004; Post 2009). For this reason, Donegan and Stampe (1993; 2002; 2004) have proposed that the typological differences between Munda and Mon-Khmer, the two major sub-branches of Austroasiatic, must be accounted for by a rhythmic shift with far-reaching implications, a principle that was also recently invoked by Post (2007; 2009) for Sino-Tibetan languages of the Tani group.

The idea of overarching rhythmic constraints on structural change could have applications far beyond Munda and Tani. However, its detailed underpinnings have not yet been worked out, perhaps because of the lack of satisfactory reconstructions in relevant languages. In this paper, we explore some of the mechanisms that could be involved in rhythmic shifts by focusing on a low-level rhythmically-constrained change, monosyllabization. In Southeast Asia, it is common for canonically disyllabic languages to develop iambs with reduced initial syllables, also known as 'sesquisyllables' (Durie 1985; Thurgood 1999). It is also widely recognized that many sesquisyllabic languages undergo further reduction and become monosyllabic (Ferlus 1971; 1982; Alieva 1994; Thạch 1999; Thurgood 1999; Matisoff 2001; Ratliff 2006; Thurgood and Li 2007; Brunelle 2009; Michaud 2009). However, the intriguing fact that trochaic languages do not become monosyllabic has to our knowledge never been explained.

We propose that this asymmetry is grounded in prosodic constraints imposed by the Iambic-Trochaic Law (Hayes 1985; 1995). We also argue that the tendency for sesquisyllables

to become monosyllabic is less common than is usually assumed: the overwhelming majority of sesquisyllabic languages do not undergo monosyllabization, even when in contact with languages with more reduced word types. Without denying the significance of contact in language convergence, we believe it is necessary to reassess it after factoring in structural motivations. Besides monosyllabization, the metrical constraints we propose also make predictions about shifts between trochaic and iambic rhythm. We argue that direct rhythmic shifts are unlikely and that languages that have undergone such shifts probably went through a stage in which they had no word stress.

## 1. Canonical word shape in Southeast Asia and diachronic asymmetries

The prosodic word is the phonological domain that roughly corresponds to the morphological word, and thus the smallest prosodic constituent that can stand alone. It is also characterized formally as the prosodic category that is immediately larger than the foot (Selkirk 1981; McCarthy and Prince 1986; Nespor and Vogel 1986; Dixon and Aikhenvald 2002: 24-25; Zec 2005). A well-formed prosodic word in a given language must simultaneously meet all phonotactic requirements of the language, including metrical ones. Of crucial relevance here are requirements on the size of the prosodic word, and the type of feet that make up the prosodic word. This section first provides background on word size (§1.1) and foot typology (§1.2). The typological asymmetries in prosodic word reduction and the apparent absence of direct rhythmic shifts are then discussed in this light (§1.3).

### 1.1 Word size

Prosodic words come in a variety of sizes. In the Southeast Asian context, prosodic words are typically classified into four types: polysyllables, disyllables, sesquisyllables, and monosyllables. Because few languages of Mainland Southeast Asia have polysyllables (they are typically borrowed from Pāli and Sanskrit) and because they often do not undergo the same changes in word shape as other words, they will not be discussed in this paper. Although the remaining types of words are very common in languages of the area, only some languages allow all three. Khmer, as illustrated in (1), is a good example of an iambic language that has disyllables, sesquisyllables, and monosyllables (Huffman 1972).

(1) Disyllables, sesquisyllables, and monosyllables in Khmer (based on Huffman 1972)

| *Disyllables* | *Sesquisyllables* | *Monosyllables* |
|---|---|---|
| mɔnuh "human" | kᵊbal "head" | koun "child" |
| kɑkaːj "to scratch about" | sᵊdaəŋ "to be thin" | tuːk "boat" |
| bɑŋkaət "to originate" | lᵊbæəŋ "game" | kou "to stir" |

Disyllables are roughly characterized as prosodic words that consist of exactly two syllables. In the example above, the words /mɔnuh/ "human", /kɑkaːj/ "to scratch about", and /bɑŋkaət/ "to originate" each consist of two full syllables. At the other end of the scale, monosyllables are prosodic words that consist of exactly one syllable, as exemplified by Khmer /koun/ "child", /tuːk/ "boat", and /kou/ "to stir". Intermediate between the two are sesquisyllables. The term 'sesquisyllable', literally 'one-and-a-half syllable', was originally coined by Matisoff (1973) to refer to words that consist of an unstressed "minor" syllable followed by a fully stressed 'major' syllable. There seems to be two specific definitions of the sesquisyllable in the literature. While many authors take sesquisyllables to be any disyllabic words with a reduced number of contrasts in initial syllables (Larish 1999; Thurgood 1999), others take the more restrictive position that the syllabicity of the minor syllable is carried by a neutral vowel or a syllabic consonant (Diffloth 1976: 232; Svantesson 1983: 27). This is a definitional issue that has little impact on the topic at stake. What is important here is that sesquisyllables are disyllabic iambs with final stress and a reduced initial syllable.

**1.2 Foot type**

We assume a model in which stress is the surface manifestation of a metrical constituent called the foot (Hayes 1995; Goedemans and van der Hulst 2008). Stressed words contain feet that can have initial or final prominence. 'Iambic' languages are languages in which the metrical foot ends with a stressed syllable. In contrast, 'trochaic' languages have feet with initial stress. The contrast between iambic and trochaic feet is most clearly illustrated by the comparison between disyllables in the Austronesian languages Moken and Bugis in (2).

(2) Iambs in Moken vs. trochees in Bugis

| Moken (Iambic) | Bugis disyllabic roots (Trochaic) |
| --- | --- |
| buˈlaːn "moon, month" | ˈulɨŋ "moon" |
| maˈnɔk "chicken" | ˈmanuʔ "chicken" |
| maˈtaː "eye" | ˈmata "eye" |

While the Moken roots all have final stress, their Bugis counterparts have initial stress. In these two languages, a disyllabic word is exactly one foot in size. Being an iambic language, Moken assigns stress to the last syllable of the foot (Pittayaporn 2005a). Bugis, as a trochaic language, places stress on the first syllable of a foot formed from the left, which results in penultimate stress (Abas and Grimes 1995). Most languages in Mainland Southeast Asia are iambic, including Thai (Bennett 1994), Khmer (Henderson 1952; Huffman 1972), Kammu (Svantesson 1983; Pittayaporn 2005b) and Burmese (Green 2005), to cite a few. In contrast, few trochaic languages are spoken in Mainland Southeast Asia, but many languages found in its periphery belong to families that also span Mainland Southeast Asia, like most insular Austronesian languages (van Zanten, Stoel and Remijsen 2010), the Tibeto-Burman

languages of Eastern India, Bhutan and Nepal (La Polla 2003) and the Munda branch of Austroasiatic (Donegan 1993; Donegan and Stampe 2002; 2004).

Although feet can vary in size (in theory, unbounded feet have no fixed size), there is a strong tendency for feet to be binary either at the moraic or the syllabic level (Prince 1990; Hayes 1995).  We will see in section 1.3 that the fact that most Southeast Asian languages favor disyllabic roots, which usually contain a single foot, makes them especially amenable to the type of arguments we propose. It is also important to note that some languages do not clearly belong to either of the two types. First, as monosyllables can be either bimoraic iambs or trochees (Prince 1990; Hayes 1995), monosyllabic languages are ambiguous with respect to foot type. More interestingly, some languages have no word stress at all (Goedemans and van der Hulst 2008), like native varieties of Malay/Indonesian (van Zanten, Goedemans and Pacilly 2003; van Zanten and Goedemans 2009)[1]. In these languages, words have no metrical structure (i.e. no feet) and, as we will see, escape the restrictions imposed by metrical constraints. Finally, languages with lexically contrastive stress have lexically specified metrical structures. As they are unknown in Mainland Southeast Asia (although they are attested in Insular Southeast Asia), they will not be discussed here.

## 1.3 Asymmetrical changes in word shapes

The great homogeneity in word shape of the languages spoken in Mainland Southeast Asia offers a great opportunity for investigating the role of contact in typological shifts. The majority of the language families of the area (Sino-Tibetan, Austronesian, Tai-Kadai, Hmong-Mien and Mon-Khmer) originally had very few words with more than two syllables. Proto-Sino-Tibetan (Benedict 1972; Handel 1998), and Proto-Austroasiatic (Donegan and Stampe 2004; Diffloth 2005; Shorto 2006) are generally agreed to have been sesquisyllabic languages. The reconstruction of Proto-Hmong-Mien (Ratliff 2010) and Proto-Tai-Kadai (Ostapirat 2005) is still in its infancy, but reconstructed vocabulary items in these two languages do not exceed two syllables. This means that before the development of polysyllables through borrowing from Indic languages (Gedney 1974) or the fusion of compounds (Matisoff 2001), a Southeast Asian word was typically limited to a single foot, perhaps with a limited amount of affixation. Much longer word types have since developed in the Tibeto-Burman and Munda languages spoken in the Indosphere. The only proto-language of the area with longer words is Proto-Austronesian (Dempwolff 1934-1938; Blust 1988; Wolff 2010), whose roots were typically disyllabic but could be augmented by a number of affixes. In this section, we discuss two typological distributions that can be observed in Southeast Asian languages: an asymmetry in prosodic word reduction and the apparent absence of direct rhythmic shifts.

In the maximally disyllabic words common in Mainland Southeast Asian languages, changes in prosodic structures are limited to stress shifts, changes in phonological weight and

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[1] Non-native varieties, like the Indonesian spoken by Toba Batak speakers, show clear signs of trochaicity (Cohn 1989; McCarthy and Cohn 1998; van Zanten, Goedemans and Pacilly 2003; van Zanten and Goedemans 2009).

occasional syllable deletion. The absence of complicating factors, like non-binary feet, unparsed syllables, directionality of foot-parsing or extrametricality, makes Mainland Southeast Asian languages an ideal natural experiment for testing the simplest diachronic underpinnings of foot and word shape changes. The mechanisms proposed in this paper are therefore based on a kernel of explanatory factors that should be found in other linguistic areas (Salmons 1992 cites and/or discusses a number of European examples), as well as in modern Southeast Asian languages that allow longer words because of compounding or borrowing. However, in metrically more complex languages, these mechanisms would interact with numerous other parameters.

The first typological change we will look at is the reduction of the size of prosodic words. As mentioned in the introduction, a monosyllabization asymmetry is observed in Mainland Southeast Asian languages. While iambs commonly reduce to monosyllables, trochees never do. The examples in (3) show that conservative Việt-Mường languages (Maleng Brô, Kha Phong, Mãliềng) are still sesquisyllabic (a form of iambicity), while their sister language Vietnamese became monosyllabic by losing its presyllables.

(3) Monosyllabization in Vietnamese (Ferlus 1997)

| Maleng Brô | Kha Phong | Mãliềng | Vietnamese | Gloss |
|---|---|---|---|---|
| əkaʔ | əkaʔ$^3$ | əkaʔ$^3$ | cá [ka$^{A1}$] | "fish" |
| tˀkɔːlʔ | tˀkoːl$^{ʔ3}$ | tˀkoːl$^{ʔ3}$ | cối [koj$^{A1}$] | "mortar" |
| tˀpaʔ | tˀpa$^{56}$ | tˀpah$^1$ | vả [va$^{C1}$] | "to slap" |
| krhaːk | kˀhaːk$^7$ | kˀhaːk$^7$ | khạc [xaːk$^{D2}$] | "to spit" |

Note that different sets of words in the same language may not undergo monosyllabization at the same time. For example, Proto-Chamic words with minor syllables consisting of a voiceless stop followed by a liquid became monosyllabic before other types of syllables. For instance, *palăj "village" had gone all the way to plăj by the time of Classical Cham. In contrast, *dana:w "lake" was still tˀnaːw in Classical Cham (Aymonier and Cabaton 1906).

By contrast, trochaic systems never seem to undergo monosyllabization. This is true not only of the numerous trochaic languages with a combination of disyllabic roots and a complex affixation system (for example, the majority of Central and Eastern Malayo-Polynesian languages), but also seems to be true of disyllabic trochaic languages with little or no affixation, like the languages of Flores (Djawanai and Grimes 1995; Verheijen and Grimes 1995; Baird 2002) or Mandarin Chinese (Duanmu 1999). This is puzzling: at first glance, if a disyllabic iamb can lose its initial unstressed syllable, a disyllabic trochee could also drop its final unstressed syllable.

The second typological change of interest here is the change in the rhythmic profile of prosodic words. Like monosyllabization, this type of shift seems to exhibit distributional restrictions in Southeast Asia. On the one hand, languages without word stress could in

principle acquire either type of foot[2]. However, no case of languages with canonical disyllabic words undergoing direct stress shifts has been documented in detail (to our knowledge). Reconstructions suggest that some languages may have shifted from trochaicity to iambicity, but direct shifts from iambic to trochaic are not documented.

Development of word-stress from stresslessness is rare, but seems attested. Mandarin Chinese could be an example of such a shift. A growing body of evidence indicates that Old Chinese may have been sesquisyllabic (Sagart 1999; Ferlus 2004; Hsu 2009). By the time of Middle Chinese, the sesquisyllables were regularly reduced to monosyllables (Pulleyblank 1984; 1991). In Mandarin, monosyllabic words do not typically stand alone, but often occur in compounds. For example, *gú* "bone" does not occur alone but in combination with *tóu* "head" (Norman 1988; Duanmu 1999). At an early stage, such compounds probably did not have a clear stress pattern but showed roughly equal stress in the two syllables. This hypothesized stage of the Chinese language is reflected in Vietnamese, in which little evidence of stress is found outside reduplicative compounds (Ingram and Nguyễn 2006; Nguyễn and Ingram 2006). Many Southern Chinese dialects seem to preserve this type of compounds as they lack weakly stressed syllables (Norman 1988). However, in modern Standard Mandarin these compounds have been lexicalized as single phonological words. In these simplex prosodic words, the second syllable is usually reduced and has a neutral tone (Norman 1988; Duanmu 2000), manifesting trochaic rhythm, cf. *gútou* "bone". In short, Mandarin Chinese most likely developed from an iambic language into a language with no clear word-level stress before finally becoming trochaic.

The languages that may have undergone a direct shift from trochaic to iambic stress are a handful of Western-Malayo-Polynesian languages, an Austronesian sub-grouping in which stress in mostly penultimate (van Zanten, Stoel and Remijsen 2010). These languages are all closely related and are all spoken in (or close to) Mainland Southeast Asia (Chamic languages in Vietnam and Cambodia, Moken and Moklen in Thailand, Acehnese in northern Sumatra) (Lee 1974; Durie 1985; Larish 1999; Thurgood 1999; Pittayaporn 2005a). Examples from Chamic are given in (4):

(4) Iambization in Proto-Chamic (Thurgood 1999; Blust 2000)

| Proto-Malayic | Proto-Chamic | Gloss |
|---|---|---|
| *ˈikan (ikan ?) | *iˈkaːn | "fish" |
| *ˈbatu (batu ?) | *baˈtəw | "stone" |
| *ˈmati (mati ?) | *maˈtaːj | "to die" |

As suggested by the unstressed forms with question marks, it is possible that these languages went to a stressless stage before developing iambic rhythm, which would be consistent with

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[2] Languages with word stress can also lose it, something that happened at some point between Romance and Modern French, for instance.

the stress pattern found in closely-related modern day Malay dialects of the peninsula (van Zanten, Goedemans and Pacilly 2003; van Zanten and Goedemans 2009).

By contrast, direct shifts from iambs to trochees are unattested. A possible example is Munda. Donegan and Stampe (1993; 2002; 2004) propose that Proto-Austroasiatic was originally an iambic language that became trochaic during its transformation into Proto-Munda. First, they argue that certain Austroasiatic roots show remnants of a process of harmonization of vowels in the initial syllable and in the final syllable[3], eg. Sora ˈbulu < Proto-Munda *ˈbəlu < Pro-Austroasiatic *bəˈlu. This suggests that Munda languages reconfigured the reduced vowels of presyllables into full vowels to conform to their new metrical pattern. However, according to Donegan and Stampe, this would have been part of a complex rhythmic shift involving not only trochaic rhythm, but a number of structural traits. There is thus no evidence that the rhythmic change happened in one single step. Although reconstructions of Proto-Austroasiatic are still cursory, it is very possible that there was an intermediate stage between the iambs of Austroasiatic and the trochees of Munda during which words had no fixed stress. It is also plausible that the complex syncretic structures of Munda started to develop at that intermediate stage:  stress assignment has more room for maneuver in a language with longer words and is therefore more likely to change. To sum up the second distributional restriction, there are plausible examples of shifts from 1) stresslessness to iambicity or trochaicity and 2) from trochaicity to iambicity, but clear examples of languages with canonical disyllables shifting directly from iambic to trochaic are unattested.

The monosyllabization asymmetry and the absence of attested cases of direct shifts from iambs to trochees both suggest that structural constraints play a central role in contact-induced change. If contact alone were sufficient to explain changes in word shapes, no asymmetry or gap would be expected. Further, to conclude our short survey, it is crucial to note that despite the widespread view that Mainland Southeast Asian languages converge towards more monosyllabicity, only a small percentage are actually reported to have undergone changes in word shape. This fact contrasts with the common perception that language contact typically leads to changes in word shapes. First, rhythmic shifts are extremely rare, and possibly follow intricate paths in which the effect of contact is at best indirect. Second, few sesquisyllabic languages ever undergo monosyllabization, even when in contact with monosyllabic languages. A preliminary survey of 235 Austroasiatic languages listed in the Mon-Khmer Etymological Dictionary database (Sidwell and Cooper 2007-2011) returns only nine monosyllabic languages (Nyaheun, Vietnamese, Mường, Tho, Pong, Mal (Thin), La, Bolyu, and Wa), despite the fact that most Mon-Khmer languages are in close contact with monosyllabic national languages like Vietnamese, Thai and Lao. In this light, it seems necessary to explore the role of structural factors independently from contact.

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[3] Donegan and Stampe only give evidence from three roots, but Paul Sidwell (p.c.) supplied us with a half dozen additional ones.

## 2.  Phonological and phonetic motivations for changes in word shapes

In this section, we argue that the distributional gaps in word shape shifts stem from phonological constraints that harness and channel universal phonetic tendencies along well-defined paths. More specifically, we argue that phonetic effects attested cross-linguistically like word-final lengthening, stressed-syllable lengthening and unstressed-syllable reduction can be either checked or phonologized by the universal rhythmic principles subsumed under the Iambic-Trochaic Law. Contact can of course speed up change along these paths, but some convergence would still take place without it.

We adopt the commonly-held view that phonetics deals with gradient processes while phonology is categorical in nature (Cohn 1990; 1993; Pierrehumbert, Beckman and Ladd 2000; Zsiga 2000; Kingston 2007). Phonetic change follows general cross-linguistic tendencies that are defined by articulatory and perceptual constraints, but it can be blocked or accelerated by sociolinguistic factors or the functional necessity of preserving contrast. For example, word-final devoicing is phonetically grounded (Blevins 2006), yet it is not attested in all languages. Furthermore, many languages (like English), only have it as an non-phonological optional process. Such phonetic effects are phonologized only when they become regular and categorical sound patterns (Hyman 1977; Blevins 2004; Bermúdez-Otero 2007; Hyman 2008). Even though numerous studies on the relation between phonetics and phonology have shown that the boundary between the two domains is fuzzy (Pierrehumbert, Beckman and Ladd 2000; Cohn 2006; Hyman 2008), it is clear that in the case at stake, tangible phonetic processes alone do not explain the patterns of sound change that are actually attested. Phonetic processes provide the impetus for sound changes, but phonological constraints determine whether they can carry through and become part of the abstract phonological system.

### 2.1  Phonology:  The Iambic-Trochaic law

The Iambic-Trochaic Law (Hayes 1985; 1995) captures an important asymmetry in foot types. Based on cross-linguistic distributions and alternations, the Law states that two types of natural rhythmic groupings rule the metrical properties of languages.

(5) Iambic-Trochaic Law (Hayes 1995)
    a. Elements contrasting in duration naturally form groupings with final prominence (iambs).
    b. Elements contrasting in intensity naturally form groupings with initial prominence (trochees).

While the Iambic-Trochaic Law is usually believed to be grounded in either psycho-acoustic or cognitive universal properties (Bolton 1894; Woodrow 1909; Hay and Diehl 2007), recent research results suggest that this might be an unresolved question (Iversen, Patel and Ohgushi 2008). Moreover, its formal nature is somewhat controversial. Rather than

accepting it as a primitive, some authors have tried to derive it formally (Prince 1990; Kager 1993; Revithiadou 2004). However, regardless of its actual underpinnings, it captures a fundamental difference between iambs and trochees: an ideal trochee has an even duration while an ideal iamb is unbalanced. What is crucial is that the Law is phonological in nature as it categorically classifies rhythmic units into distinct types, namely trochees and iambs.

Another important cross-linguistic tendency that plays a role in the monosyllabization asymmetry is the strong requirement that feet be binary (Hayes 1985; 1995). In recent models, feet can be binary at either the syllabic or the moraic level. For example, the standard Optimality Theory constraint that captures foot binarity, FTBIN, states that "Feet are binary at some level of analysis (μ, σ)" (McCarthy and Prince 1986; Prince and Smolensky 1993). By combining the binarity requirement with the Iambic-Trochaic Law, Prince (1990) derives the *rhythmic harmony* scales in (6).

(6) Rhythmic harmony scales for iambs and trochees (adapted from Prince 1990)
   a. Iambs:          (μ.μμ) > (μμ), (μ.μ) > (μ)
   b. Trochees:       (μμ), (μ.μ) > (μμ.μ) > (μ)

The ideal iamb (μ.μμ) is binary and has two elements contrasting in duration. The two iambs (μμ)[4] and (μ.μ) are less harmonic because their two elements fail to contrast in duration, despite the fact that they are binary. Finally, (μ) satisfies neither of the two criteria. The same type of reasoning applies to the trochaic scale: (μμ), (μ.μ) are ideal trochees because they are binary and because their two elements have no durational contrast. The trochee (μμ.μ) is permissible, but not ideal because its two elements contrast in duration (a contrast in duration should force an iambic parsing). Finally, the degenerate foot (μ) is excluded because it is not binary and thus can contrast neither in intensity nor in duration.

We propose that these harmonic scales constrain the *phonological reinterpretation* (i.e. the phonologization) of independent universal *phonetic processes*. We argue that phonetic lengthening may become phonologized if it makes a foot more harmonic, while phonetic reduction may be blocked if it leads to a dramatic reduction of rhythmic harmony. These interactions will be discussed in more detail in section 2.3, after a review of the phonetic processes involved in section 2.2.

## 2.2 Phonetics: Lengthening and reduction

Three types of apparently universal phonetic tendencies seem to be at play in the word shape shifts taking place in Mainland Southeast Asia. The first one is the reduction of unstressed syllables, that is attested in numerous languages belonging to different families (Delattre 1969; Johnson and Martin 2001; Fletcher 2010). Under its most extreme form, unstressed syllable reduction can result in vowel syncope, which is widely attested

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[4] "On this accounting, [H] is a first rate trochaic foot because it has two formally equal parts (its moras), but by that very token [H] will rank below [LH] as an iamb" (Prince 1990: 360) [where H is a heavy syllable and L a light syllable].

diachronically. In the context of Mainland Southeast Asia, reduction of unstressed syllables seems to be the phonetic driving force behind the reduction and eventual loss of presyllables, illustrated respectively with Jarai and Khmer examples in (7) and (8).

(7) Sesquisyllabization in Jarai (Lafont 1968 for Jarai; Thurgood 1999 for Proto-Chamic)

| Proto-Chamic | Jarai | Gloss |
|---|---|---|
| *ratus | rᵊtuh | "hundred" |
| *hudang | hᵊdaːŋ | "shrimp" |
| *gigej | tᵊgəj | "tooth" |
| *bəsɛj | pᵊsəj | "iron" |

(8) Extreme reduction in Kiên Giang Khmer (Thach 1999)

| Standard Khmer | KG Khmer | Gloss |
|---|---|---|
| ɑŋkʰi | kʰi | "sit" |
| baŋcok | cok | "rice noodle" |
| ciɲcɨm | cɨm | "to feed" |

The second phonetic pressure at play in word shape shifts is stressed-syllable lengthening (Turk and Shattuck-Hufnagel 2000; Fletcher 2010) In disyllabic trochees, it results in a phonetic lengthening of initial stressed syllable, like in Galo (Post 2007). Interestingly, we could not find examples of phonologization of stressed-syllable lengthening in trochaic Southeast Asian languages.

(9) Galo[5] (Post 2007)
    'ta·bə    "sugarcane"
    'a·lo    "salt"

In iambs, stressed-final lengthening would be indistinguishable from another type of cross-linguistically attested phonetic effect, word-final lengthening (Beckman and Edwards 1990; Cutler and Butterfield 1990b; a; Byrd 1996; Turk and Shattuck-Hufnagel 2000; Byrd and Krivokapić 2006; Fletcher 2010). However, there is evidence that word-final lengthening might not be systematic in natural speech and might only be present phrase-finally or when it is necessary to provide clear cues to the listener (Cutler and Butterfield 1990a; Turk and Shattuck-Hufnagel 2000). Nevertheless, regardless of the actual phonetic motivation for the lengthening of the last syllable of disyllabic iambs, it is widely attested in Mainland Southeast Asia and is often phonologized, as in (10):

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[5] To avoid confusion, we use /V·/ for phonetic lengthening and /Vː/ for phonological length.

(10) Phonologization of final lengthening in Moken

| Proto-Malayo-Polynesian | Moken | Gloss |
|---|---|---|
| *bulan | buˈlaːn | "moon" |
| *batu | baˈtɔj | "stone" |
| *waRi | ʔaˈlɔj | "to buy" |

      The three reduction and lengthening mechanisms just described provide a range of possible paths of change which may become phonologized - but do not have to be - if they are compatible with the Iambic-Trochaic Law. This interaction of phonetic forces and phonological constraints is discussed in the next section.

## 2.3 The interaction between phonetics and phonology

      We propose that the driving forces behind shifts in word types in Southeast Asia are the phonetic pressures presented in §2.2. These phonetic pressures should be present and apply to a greater or lesser extent in all languages, irrespective of their canonical word shape or foot type. Our central proposal, however, is that not all of these phonetic pressures can be phonologized. Two general principles constrain rhythmic changes. First, radical phonetic reduction (i.e. deletion) should not be able to produce degenerate feet. Second, phonetic lengthening should be phonologizable, unless this leads to the creation of a more disharmonic rhythmic structure, as defined by the scales in (6). These rhythmic constraints, which follow from the Iambic-Trochaic Law, are responsible for the monosyllabization asymmetry.

      The paths of changes in word-type defined by the interaction of phonetic pressure and phonological constraints are illustrated in (11):

(11) Paths of word-type shifts
(SSL: stressed syllable lengthening, WFL: word-final lengthening, USR: unstressed syllable reduction)

$$
\begin{array}{c}
\text{Even trochee} \\
(\acute{\mu}.\mu)
\end{array}
$$

SSL  WFL  USR

$(\acute{\mu}{\cdot}.\mu)$ $(\acute{\mu}.\mu{\cdot})$ $(\acute{\mu}.\mu)$  Stress shift

*Uneven trochee *Illicit foot *Degenerate foot → Uneven iamb

*(μ́μ.μ)  *(μ́.μμ)  *(μ́)   (μ.μ́μ)

               USR

*Stress shift    Sesquisyllable

(μ.μ́μ)

USR

Monosyllabic iamb

(μ́μ)

   The monosyllabization asymmetry results from a complex interaction of factors. We see at the top of (11) that the three types of phonetic pressures discussed in §2.2 can affect trochees, but that they cannot become phonologized. The uneven trochee (μ́μ.μ) is unlikely to develop for two reasons. The first reason is that trochees are typically intensity-sensitive (as stated in the Iambic-Trochaic Law) and are therefore unlikely to phonologize durational cues[6]. The second reason is that, as already pointed out by Revithiadou (2004), a simultaneous application of stressed syllable lengthening and of word-final lengthening in uneven trochees would yield a foot with two phonetically lengthened syllables (μ́·.μ·), in which a durational contrast is unlikely to be perceived. As for the foot (μ́.μμ), it is ruled out because its heavy syllable is unstressed, an illicit foot in any metrical model. Finally, an application of unstressed syllable reduction to an even trochee (μ́.μ) is possible to a certain extent, but it cannot go all the way to vowel or syllable deletion, because that would leave an ill-formed degenerate foot (μ́). In short, disyllabic trochees can undergo phonetic changes, but these cannot be phonologized into new word types.

   Disyllabic iambs, on the other hand, have a clear path of change open to them. Even iambs are not included in (11) because they are unattested in Mainland Southeast Asia. If they ever existed in the history of any Southeast Asian language (possibly in Moken-Moklen and

---

[6] That said, a process of word-final syncope (VCV# → VC#) accompanied by a compensatory lengthening of the preceding vowel (Kavitskaya 2002 for a survey) should be available even in trochaic languages. The fact that this is not attested in the trochaic languages of Southeast Asia and its periphery could be due to structure preservation: compensatory lengthening is far more common in languages that already have a length contrast (Kavitskaya 2002; Blevins 2006), but few trochaic languages of the area have such a contrast.

Acehnese-Chamic, right after they shifted to iambicity), they would have rapidly undergone a phonetic and phonological lengthening of their final stressed syllables making them uneven and thus, more harmonic. Uneven iambs, regardless of how they developed, do not have the option of further lengthening their final syllable (phonologically at least), but can undergo reduction of their unstressed syllable. This results in sesquisyllabization, i.e. an increased imbalance between the main stressed syllable and the presyllable. Further application of the phonetic reduction of unstressed syllables leads to the deletion of the presyllable, yielding a monosyllable, which is still a valid, albeit not perfect, iamb. The resulting monosyllables could also be reinterpreted as moraic trochees.

The fact that monosyllabic iambs can develop from sesquisyllables, despite a net loss in rhythmic harmony as defined in (6), suggests that phonetic reduction has precedence over the Iambic-Trochaic Law. In the case of phonetic lengthening, however, rhythmic harmony always dominates: there are no attested cases of phonologization of phonetic lengthening causing a decrease in rhythmic harmony. This seems to be due to the fact that while lengthening can be phonetically present without being phonologically meaningful, reduction - and especially its most extreme form, deletion - cannot go unnoticed and must be reflected in the phonological representation. This comes down to saying that the Iambic-Trochaic Law cannot prevent a phonetic process from applying: it can only determine if it will be phonologized or not. It is the foot binarity requirement that blocks deletion.

The principles invoked to build (11) also make predictions about changes in foot type. They are symbolized by the two "stress shift" arrows. The arrow with a full line represents a direct shift from trochees to iambs, a change that is not attested, but could possibly be reconstructed for Chamic as we saw in (4). As any disyllabic word, a trochee should be subject to a certain degree of phonetic final lengthening. This lengthening might very well be reinterpreted as phonological weight at the same time as a stress shift takes place, thus triggering the development of canonical iambs. (A complicated variation on the same theme, which is not depicted in (11), is a shift from even trochees to even iambs, without a phonologization of final lengthening.) Since even iambs are licit (if not ideal), such a shift is not ruled out by the model, although, as we have seen above, even iambs are not attested in Southeast Asia, perhaps because of a rapid phonological encoding of phonetic final lengthening. On the other hand, the model makes a clear prediction that uneven iambs should not become trochees through a mere stress shift: this would result in the illicit foot ($\acute{\mu}.\mu\mu$), where stress and weight conflict (as symbolized by the dotted arrow). To sum up, basic metrical properties predict that a canonical trochee ($\acute{\mu}.\mu$) could shift to a well-formed iamb ($\mu.\mu\acute{\mu}$ or $\mu.\acute{\mu}$), while a canonical iamb ($\mu.\acute{\mu}\mu$) cannot shift directly to a trochee. In addition, we predict that languages without word stress are free to become either trochees or iambs, as there is no original foot structure to constrain them.

It is important to emphasize that in this model, metrical changes are contingent. Phonetic mechanisms applying to specific environments (stressed-syllables, unstressed syllables, final syllables) - irrespective of foot type - drive the changes. They can then be phonologized as long as the resulting structures satisfy the constraints imposed by the Iambic-Trochaic Law,

but they do not have to be. While accounting for the two asymmetries described in §1.3, this model avoids the teleological aspects of previous models of language contact and change, without claiming that all sesquisyllabic languages ought to become monosyllabic because of their structural make-up.

## 3.   Discussion and Conclusion

Shifts in prosodic word shape in Mainland Southeast Asian languages provide a window into the interaction between structural and contact-induced change. Although it is often viewed and construed as a defining element of the Mainland Southeast Asian linguistic area, language contact, as we have seen, can only be fruitfully considered in combination with structural factors.

Given the common and extensive nature of language contact in Mainland Southeast Asia, cases of change in word shapes are much rarer than we would expect if structural factors did not play a role. As pointed out in §1.3, only a small fraction of the languages spoken in the area have undergone shifts in word shape. First, shifts between iambs and trochees seem heavily constrained, even in geographical areas where languages with the two foot types are in contact. In fact, even direct shifts from disyllabic trochees to disyllabic iambs, which are allowed by our model, could be reconstructed but are not actually attested. Second, despite intensive contact between sesquisyllabic languages and monosyllabic (and polysyllabic) languages, most sesquisyllabic languages seem to remain stable over long periods of time. In fact, out of the dozens of sesquisyllabic Mon-Khmer and Chamic languages in contact with monosyllabic Vietnamese, no more than a handful have become monosyllabic. These facts sharply contrast with the general impression that language contact inevitably leads to changes in word shapes. If contact alone were causing Mainland Southeast Asian languages to converge, one would expect stress shifts and monosyllabization to occur far more often. While our model does not rule out the possibility that contact might favor or accelerate change, it eschews teleology and thereby allows us to accommodate the overall stability observed in the region.

More importantly, contact alone has no way of explaining the distributional gaps discussed here. Structural factors, on the other hand, straightforwardly capture them. The Iambic-Trochaic law is not an ad hoc explanation proposed with the specific purpose of accounting for the monosyllabization asymmetry, but a well-motivated and experimentally-tested principle independently proposed to account for synchronic phonological phenomena. The model proposed here also maintains a strict separation between universal phonetic tendencies and phonological constraints. The phonetic processes involved in word shape shifts, namely unstressed-syllable reduction, word-final lengthening, and stressed-syllable lengthening, drive diachronic change and apply across the board in all languages, though to different degrees. They may become phonologized (but do not have to) if the resulting forms

satisfy the restrictions imposed by the Iambic-Trochaic Law. In this sense, phonology reacts to phonetics, but phonetics cannot force phonological change.

From the wider perspective of areal linguistics, the proposal highlights structural factors as explanations for the prosodic convergence of Mainland Southeast Asian languages. Since most of the languages in the area belong to language families whose ancestors had similar word shapes (Sino-Tibetan, Austroasiatic, Tai-Kadai and Hmong-Mien were all originally sesquisyllabic), the changes they undergo, if any, are likely to take them down the same paths. Although the relative weight of contact and structure remains an issue for future research, it is clear that structural constraints play a vital role in defining paths of change.

## 4.    Acknowledgements

## 5.    References

Abas, Husen and Grimes, Charles E. 1995. "Bugis". *Comparative Austronesian Dictionary: An Introduction to Austronesian Studies* ed. by Darrel T. Tryon, 549-562. Berlin: Mouton De Gruyter.

Alieva, Natalia F. 1994. "The progress of monosyllabization in Cham as testified by field materials". *Proceedings of the Seventh International Conference on Austronesian Linguistics (ICAL)* ed. by Cecilia Ode and Wim Stokhof, 541-549. Amsterdam: Rodopi.

Aymonier, Étienne François and Cabaton, Antoine. 1906. *Dictionnaire cam-francais*. Paris: E. Leroux.

Baird, Louise. 2002. "Kéo". *Journal of the International Phonetic Association* 32:1.93-97.

Beckman, Mary and Edwards, Jan. 1990. "Lengthenings and shortenings and the nature of prosodic constituency". *Papers in Laboratory Phonology I:  Between the Grammar and Physics of Speech* ed. by John Kingston and Mary Beckman, 152-178. Cambridge: Cambridge University Press.

Benedict, Paul K. 1972. *Sino-Tibetan: A Conspectus*. Cambridge: Cambridge University Press.

Bennett, Fraser J. 1994. "Iambicity in Thai". *Studies in the linguistic sciences* 24:1.39-57.

Bermúdez-Otero, Ricardo 2007. "Diachronic Phonology". *The Cambridge Handbook of Phonology* ed. by Paul De Lacy, 497-517. Cambridge: Cambridge University Press.

Bisang, Walter. 1996. "Areal typology and grammaticalization: Processes of grammaticalization based on nouns and verbs in East and mainland South East Asian languages". *Studies in Language* 20:3.519-597.

Blevins, Juliette. 2004. *Evolutionary phonology: The emergence of sound patterns*. Cambridge: Cambridge University Press.

Blevins, Juliette. 2006. "A theoretical synopsis of Evolutionary Phonology". *Theoretical Linguistics* 32:2.117-166.

Blust, Robert. 1988. *Austronesian Root Theory: An Essay on the Limits of Morphology*. Amsterdam: John Benjamins.

Blust, Robert. 2000. "From Ancient Cham to Modern Dialects: Two Thousand Years of Language Contact and Change". *Oceanic Linguistics* 39:2.435-445.

Bolton, Thaddeus L. 1894. "Rhythm". *The American Journal of Psychology* 6:2.145-238.

Brunelle, Marc. 2009. "Diglossia and Monosyllabization in Eastern Cham: a Sociolinguistic Study". *Variation in Indigenous Minority Languages* ed. by James Stanford and Dennis Preston, 47-75. Amsterdam: John Benjamins.

Byrd, Dani. 1996. "A phase window framework for articulatory timing". *Phonology* 13.139-169.

Byrd, Dani and Krivokapić, Jelena. 2006. "How far, how long: On the temporal scope of prosodic boundary effects". *Journal of the Acoustical Society of America* 120:3.1589-1590.

Cohn, Abigail. 2006. "Is there gradient phonology?" *Gradience in Grammar: Generative Perspectives* ed. by G. Faneslow, C. Fery, R. Vogel and M. Schlesewsky, 25-44. Oxford: Oxford University Press.

Cohn, Abigail C. 1989. "Stress in Indonesian and bracketing paradoxes". *Natural Language and Linguistic Theory* 7:2.167-216.

Cohn, Abigail C. 1990. *Phonetic and phonological rules of nasalization*. Ph.D. dissertation, Linguistics, UCLA.

Cohn, Abigail C. 1993. "Nasalisation in English: phonology or phonetics". *Phonology* 10:1.43-81.

Cutler, Ann and Butterfield, Sally. 1990a. "Durational cues to word boundaries in clear speech". *Speech Communication* 9.485-495.

Cutler, Ann and Butterfield, Sally. 1990b. "Syllabic lengthening as a word boundary cue". *Proceedings of the 3rd Australian International Conference on Speech Science and Technology* ed. by R. Seidl, 324-328. Canberra: Australian Speech Science and Technology Association.

Delattre, Pierre. 1969. "An acoustic and articulatory study of vowel reduction in four languages". *International Review of Applied Linguistics in Language Teaching* 7:4.295-326.

Dempwolff, Otto. 1934-1938. "Vergleichende Lautlehre des austronesischen Wortschatzes: Induktiver Aufbau einer indonesischen ". *Ursprache. Zeitschrift für Eingeborenen-Sprachen 1: Beiheft 13 (1934), 2: Beiheft 15 (1937), 3: Beiheft 17 (1938)* ed. by Berlin: Dietrich Reimer.

Difloth, Gérard. 1976. "Minor-syllable vocalism in Senoic languages". *Austroasiatic Studies* ed. by Philip Jenner, Laurence Thompson and Stanley Starosta, 229-248. Honolulu: University of Hawai'i Press.

Difloth, Gérard. 2005. "The contribution of linguistic paleontology to the homeland of Austro-Asiatic". *The Peopling of East Asia: Putting Together Archaeology, Linguistics and Genetics* ed. by Laurent Sagart, Roger Blench and Alicia Sanchez-Mazas, 77-80. New York: Routledge/Curzon.

Dixon, R. M. W and Aikhenvald, Alexandra Y. 2002. "Word: a typological framework". *Word: A cross-linguistic typology* ed. by R. M. W Dixon and Alexandra Y. Aikhenvald, 1-41. Cambridge: Cambridge University Press.

Djawanai, Stephanus and Grimes, Charles E. 1995. "Ngada". *Comparative Austronesian Dictionary: An Introduction to Austronesian Studies* ed. by Darrell T. Tryon, 593-599. Berlin: Mouton de Gruyter.

Donegan, Patricia. 1993. "Rhythm and Vocalic Drift in Munda and Mon-Khmer". *Linguistics of the Tibeto-Burman Area* 16:1.1-43.

Donegan, Patricia and Stampe, David. 2002. "South-East Asian Features in the Munda Languages: Evidence for the Analytic-to-Synthetic Drift of Munda". *Proceedings of the Twenty-Eighth Annual Meeting of the Berkeley Linguistic Society* ed. by Patrick Chew, 111-120.

Donegan, Patricia and Stampe, David. 2004. "Rhythm and the Synthetic Drift of Munda". *The yearbook of South Asian languages and linguistics* ed. by Rajendra Singh, 3-36. New Delhi: Thousand Oaks.

Duanmu, San. 1999. "Stress and the Development of Disyllabic Words in Chinese". *Diachronica* 16:1.1-35.

Duanmu, San. 2000. *The Phonology of Standard Chinese*. New York: Oxford University Press.

Durie, Mark. 1985. *A grammar of Acehnese on the basis of a dialect of North Aceh*. Dordrecht; Cinnaminson, NJ: Foris Publications.

Enfield, Nick J. 2001. "On genetic and areal linguistics in Mainland South-East Asian: Parallel Polyfunctionality of 'acquire'". *Areal Diffusion and Genetic Inheritance: Problems in Comparative Linguistics* ed. by Alexandra Aikhenvald and Robert M. W. Dixon, 255-290. Oxford: Oxford University Press.

Enfield, Nick J. 2003. *Linguistic epidemiology : semantics and grammar of language contact in Mainland Southeast Asia*. London: Routledge/Curzon.

Ferlus, Michel. 1971. "Simplification des groupes consonantiques dans deux dialectes austroasiens du Sud-Laos". *Bulletin de la Société de Linguistique de Paris* 66.389-403.

Ferlus, Michel. 1982. "Spirantisation des obstruantes médiales et formation du système consonantique du vietnamien". *Cahiers de linguistique - Asie orientale* 11.83-106.

Ferlus, Michel. 1997. "Le maleng brô et le vietnamien". *Mon Khmer Studies* 27.55-66.

Ferlus, Michel. 2004. "The Origin of Tones in Viet-Muong ". *Papers from the Eleventh Annual Meeting of the Southeast Asian Linguistics Society* ed. by S. Burusphat, 297-313. Tempe: Arizona State University, Program for Southeast Asian Studies.

Fletcher, Janet. 2010. "The Prosody of Speech:  Timing and Rhythm". *The Handbook of Phonetic Science:  Second edition* ed. by William J. Hardcastle, John Laver and Fiona E. Gibbon, 523-602. Oxford: Blackwell.

Gage, William W. 1985. "Glottal stops and Vietnamese tonogenesis". *Diachronica* XV:1.1-28.

Gedney, William. 1974. *Indic Loanwords in Spoken Thai*. Ph.D. dissertation, Linguistics, University of Michigan.

Goedemans, Rob and van der Hulst, Harry. 2008. *Fixed Stress Locations*. Retrieved 08-07-2010, from http://wals.info/feature/description/14.

Green, Anthony Dubach. 2005. "Word, foot, and syllable structure in Burmese". *Studies in Burmese linguistics* ed. by Justin Watkins, 1–25. Canberra: Canberra: Pacific Linguistics.

Handel, Zev. 1998. *The Medial Systems of Old Chinese and Proto-Sino-Tibetan*. Ph.D. dissertation, Linguistics, Berkeley.

Haudricourt, André. 1954. "De l'origine des tons en viêtnamien". *Journal Asiatique* 242.69-82.

Hay, Jessica S. F. and Diehl, Randy. 2007. "Perception of rhythmic grouping: Testing the iambic/trochaic law". *Perception & Psychophysics* 69:1.113-122.

Hayes, Bruce. 1985. "Iambic and Trochaic Rhythm in Stress Rules ". *Proceedings of the XIth Annual Meeting of the Berkeley Linguistics Society* ed. by M. Niepokuj, M. VanClay, V. Nikiforidou and D. Feder, 429-446.

Hayes, Bruce. 1995. *Metrical Stress Theory:  principles and case-studies*. Chicago and London: University of Chicago Press.

Henderson, Eugenie. 1952. "The main features of Cambodian pronunciation". *Bulletin of the School of Oriental and African Studies* 14:1.453-476.

Hsu, Dong-Bo. 2009. "The syllable in Old Chinese: sub-syllabic processes, syllable structure, and the status of medial glides". *Journal of East Asian Linguistics* 18.361-395.

Huffman, Franklin. 1972. "The boundary between the monosyllable and the disyllable in Cambodian". *Lingua* 29.54-66.

Hyman, Larry. 2008. "Enlarging the scope of phonologization". *UC Berkeley Phonology Lab Annual Report* 382-409.

Hyman, Larry M. 1977. "Phonologization". *Linguistic studies presented to Joseph H. Greenberg* ed. by Alphonse Juilland, 407-418. Saratoga: Anima Libri.

Ingram, John and Nguyễn, Thị Anh Thu. 2006. "Stress, tone and word prosody in Vietnamese compounds". *Proceedings of the 11th Australian International Conference on Speech Science & Technology* ed. by Paul Warren and Catherine I. Watson., 193-198. Auckland: University of Auckland.

Iversen, John R., Patel, Aniruddh D. and Ohgushi, Kengo. 2008. "Perception of rhythmic grouping depends on auditory experience". *Journal of the Acoustical Society of America* 124:4.2263-2271.

Johnson, Keith and Martin, Jack. 2001. "Acoustic Vowel Reduction in Creek: Effects of Distinctive Length and Position in the Word". *Phonetica* 58:1-2.81-102.

Kager, René. 1993. "Alternatives to the Iambic-Trochaic Law". *Natural Language and Linguistic Theory* 11.381-432.

Kavitskaya, Darya. 2002. *Compensatory Lengthening: Phonetics, Phonology, Diachrony* New York: Routledge.

Kingston, John. 2007. "The phonetics-phonology interface". *The Cambridge Handbook of Phonology* ed. by Paul DeLacy, 401-434. Cambridge: Cambridge University Press.

La Polla, Randy J. 2003. "Overview of Sino-Tibeton Morphosyntax". *The Sino-Tibetan Languages* ed. by Graham Thurgood and Randy J. La Polla, London: Routledge.

Lafont, Pierre-Bernard. 1968. *Lexique Jarai*. Paris: École Française d'Extrême-Orient.

LaPolla, Randy. 2001. "The Role of Migration and Language Contact in the Development of the Sino-Tibetan Language Family". *Areal Diffusion and Genetic Inheritance* ed. by Alexandra Aikhenvald and Robert Dixon, 225-254. Oxford: Oxford University Press.

Larish, Michael D. 1999. *The position of Moken and Moklen within the Austronesian language family*. Ph.D. dissertation, Department of Linguistics, University of Hawai'i at Manoa.

Lee, Ernest W. 1974. "Southeast Asian Areal Features in Austronesian Strata of the Chamic Languages". *Oceanic Linguistics* 13.643-668.

Maran, Law. 1973. "On Becoming a Tone Language:  A Tibeto-Burman Model of Tonogenesis". *Consonant Types and Tones* ed. by Larry Hyman, 99-114.

Matisoff, James. 1973. "Tonogenesis in Southeast Asia". *Consonant Types and Tone* ed. by Larry Hyman, 71-96. Los Angeles: USC.

Matisoff, James. 1990. "On megalocomparison". *Language* 66.106-120.

Matisoff, James. 2001. "Genetic versus Contact Relationship: Prosodic Diffusability in South-East Asian Languages". *Areal Diffusion and Genetic Inheritance:  Problems in Comparative Linguistics* ed. by Alexandra Aikhenvald and Robert Dixon, 291-325. Oxford: Oxford University Press.

McCarthy, John J. and Cohn, Abigail. 1998. "Alignment and parallelism in Indonesian phonology". *Working Papers of the Cornell Phonetics Laboratory* 12.53-137.

McCarthy, John and Prince, Alan. 1986. *Prosodic morphology*, ms.

Michaud, Alexis. 2009. *Monosyllabization:  patterns of evolution in Asian languages*. Retrieved 01-08-2010, from http://hal.archives-ouvertes.fr/docs/00/43/64/32/PDF/Monosyllabicization_In_Asia_Michaud_preprint_Nov2009.pdf.

Nespor, Marina and Vogel, Irene. 1986. *Prosodic Phonology*. Dordrecht/Riverton: Foris Publications.

Nguyễn, Thị Anh Thu and Ingram, John. 2006. "Reduplication and word stress in Vietnamese." *Proceedings of the 11th Australian International Conference on Speech Science & Technology* ed. by Paul Warren and Catherine I. Watson, 187-192. Auckland: University of Auckland.

Norman, Jerry. 1988. *Chinese*. Cambridge: Cambridge University Press.

Ostapirat, Weera. 2005. "Kra-Dai and Austronesian: Notes on phonological correspondences and vocabulary distribution". *The Peopling of East Asia: Putting Together Archaeology, Linguistics and Genetics* ed. by Laurent Sagart, Roger Blench and Alicia Sanchez-Mazas, 107-131. London/New York: Routledge-Curzon.

Pierrehumbert, Janet B., Beckman, Mary E. and Ladd, D. Roger. 2000. "Conceptual foundations of phonology as a laboratory science". *Phonological Knowledge: Conceptual and Empirical Issues* ed. by Noel Burton-Roberts, Philip Carr and Gerard J. Docherty, 90-117. Oxford: Oxford University Press.

Pittayaporn, Pittayawat. 2005a. "Moken as a Mainland Southeast Asian Language". *Chamic and Beyond* ed. by Anthony Grant and Paul Sidwell, 189-209. Canberra: Pacific Linguistics.

Pittayaporn, Pittayawat. 2005b. *Tone, Minor Syllable, and Infixation in Kammu*. Presented at MCWOP, Ann Arbor.

Post, Mark. 2007. *A Grammar of Galo*. Ph.D. dissertation, Linguistics, La Trobe.

Post, Mark. 2009. "The phonology and grammar of Galo "words": a case study in benign disunity". *Studies in Language* 33:4.934-974.

Prince, Alan. 1990. "Quantitative consequences of rhythmic organization". *Proceedings of the Berkeley Linguistic Society* ed. by M. Ziolkowski, M.M. Noske and K. Deaton, 471-490.

Prince, Alan and Smolensky, Paul. 1993. *Optimality Theory: Constraint Interaction in Generative Grammar*. Rutgers University Center for Cognitive Science Technical Report 2.

Pulleyblank, Edwin G. 1984. *Middle Chinese: a study in historical phonology*. Vancouver: UBC Press.

Pulleyblank, Edwin G. 1991. *Lexicon of reconstructed pronunciation in early Middle Chinese, late Middle Chinese, and early Mandarin*. Vancouver: UBC Press.

Ratliff, Martha. 2006. "Prefix variation and reconstruction". *Variation and Reconstruction* ed. by Thomas D. Cravens, 165-178. Amsterdam: John Benjamins.

Ratliff, Martha. 2010. *Hmong-Mien Language History*. Canberra: Pacific Linguistics.

Revithiadou, Anthi. 2004. "The Iambic/Trochaic Law revisited". *Leiden Working Papers in Linguistics 1.1* ed. by Boban Arsenijevic, Noureddine Elouazizi, Martin Salzmann and Mark de Vos, 37-62.

Sagart, Laurent. 1999. *The Roots of Old Chinese*. Amsterdam: John Benjamins.

Salmons, Joe. 1992. *Accentual Change and Language Contact: Comparative Survey and a Case Study of Early Northern Europe* London: Routledge.

Selkirk, Elizabeth. 1981. "On the nature of phonological representation". *The cognitive representation of speech* ed. by John Anderson, John Laver and Terry Myers, 379-388. Amsterdam: North Holland.

Shorto, Harry. 2006. *A Mon-Khmer Comparative Dictionary*. Canberra: Pacific Linguistics.

Sidwell, Paul and Cooper, Doug. 2007-2011. *Mon-Khmer Etymological Dictionary*. Retrieved 2011-03-20, from http://sealang.net/monkhmer/dictionary/.

Svantesson, Jan-Olof. 1983. *Kammu Phonology and Morphology*. Malmo: CWK Gleerup.

Thạch, Ngọc Minh. 1999. "Monosyllabization in Kiengiang Khmer". *Mon-Khmer Studies* 29.81-95.

Thurgood, Graham. 1993. "Phan Rang Cham and Utsat: Tonogenetic Themes and Variants". *Tonality in Austronesian Languages* ed. by Jerold Edmondson and Kenneth Gregerson, 91-106. Honolulu: U of Hawaii Press.

Thurgood, Graham. 1999. *From Ancient Cham to Modern Dialects : Two Thousand Years of Language Contact and Change*. Honolulu: University of Hawai'i Press.

Thurgood, Graham. 2002. "Vietnamese and tonogenesis:  revising the model and the analysis". *Diachronica* 19.333-363.

Thurgood, Graham and Li, Fengxiang. 2007. "From Malayic to Sinitic:  The Restructuring of Tsat under Intense Contact". *SEALS XII: Papers from the 12th meeting of the Southeast Asian Linguistics Society (2002)* ed. by Ratree Wayland, John Hartman and Paul Sidwell, 129-136. Canberra: Pacific Linguistics.

Turk, Alice E. and Shattuck-Hufnagel, Stefanie. 2000. "Word-boundary-related duration patterns in English". *Journal of Phonetics* 28.397-440.

van Zanten, Ellen and Goedemans, Rob. 2009. "Prominence in Indonesian:  Stress, phrases and boundaries". *Wacana* 11:2.197-225.

van Zanten, Ellen, Goedemans, Rob and Pacilly, Jos. 2003. "The status of word stress in Indonesian". *The Phonological Spectrum. Volume II:  Suprasegmental structure* ed. by Jeroen van de Weijer, Vincent J. van Heuven and Harry  van der Hulst, 151-178. Amsterdam: John Benjamins.

van Zanten, Ellen, Stoel, Ruben and Remijsen, Bert. 2010. "Stress type in Austronesian languages". *A survey of word accentiel patterns in the languages of the World* ed. by Harry van der Hulst, Rob Goedemans and Ellen van Zanten, 87-112. Berlin: De Gruyter Mouton

Verheijen, JAJ and Grimes, Charles E. 1995. "Manggarai". *Comparative Austronesian Dictionary:  An Introduction to Austronesian Studies* ed. by Darrell T. Tryon, 585-599. Berlin: Mouton de Gruyter.

Wolff, John U. 2010. *Proto-Austronesian Phonology with glossary*  Ithaca Southeast Asian Program Publications, Cornell University.

Woodrow, Herbert. 1909. "A quantitative study of rhythm: The effect of variations in intensity, rate and duration". *Archives of Psychology* 14.1-66.

Zec, Draga. 2005. "Prosodic differences among function words". *Phonology* 22.77-112.

Zsiga, Elizabeth. 2000. "Phonetic alignment constraints: consonant overlap and palatalization in English and Russian". *Journal of Phonetics* 28:1.69-102.