CHAPTER 2

THEORETICAL BACKGROUND

2.1 Basics of Prosody

Prosody is an abstraction of prominence over segments. There has been a great debate on the nature of prosody, which encompasses stress, tone, and other metrical constituents. Two radical questions are otherwise raised in the literature. One is concerned about the formal structure of prosody, and the other follows whether such a representation is essentially needed. Some linguists argue for Liberman and Prince's (1977) "metrical grids" and "metrical trees", others (Hayes 1984) redefine them, and still others stand on neither side. With this reasoning, we first review stress which lists an array of linguistic issues.

2.1.1 Stress

Stress is perceptually distinct and phonetically described in terms of decreasing strength: [ˊ], [ˆ], [ˋ], [˘] (as equal to 1-2-3-4). Chomsky, Halle, and Lukoff (1956) pointed out that a

level of stress results from the binary distinction [±stress]. More generally, stress is a phoneme, bearing much a feature as [±nasal]. Though there exists stress which shows a particular pitch contour in an intonational pattern, or an extra/reduced vowel/consonant length, a lack of uniform phonetic correlates is still at issue.

(1) [labor' union]$_N$
2 1
[[labor' union]$_N$ president]$_N$
3 1 2
[[[labor' union]$_N$ president]$_N$ election]$_N$
4 1 2 3

(Chomsky & Halle 1968: 18; Kenstowicz 1994: 551)

In (1), stress is observed to have the greater-than-binary discriminations and the long-distance effect. The phrasal stress on *labor's* follows from a repetitive compound rule application, and accomodates with each cyclic convention.

English stress assignment is posited in Chomsky and Halle's (1968) well-known study *The Sound Pattern of English*. To take another example, consider one line of finger rhymes, where x is the stressed syllable.

(2) FR-100-1

(x) Nuclear Stress Rule

(x) Compound Stress Rule

[*zuo* [*huo-che*]]

[take [train]] 'take a train'

Stress in (2) is assigned throughout two cycles. At the first cycle, Compound Stress Rule is at work. The first syllable of compound *huo-che* 'train' then gets the stress. At the second cycle, only the syllable being nuclear appeals the stress. In a V-NN construction, the compound object is the nuclear on which the stress is located. It is worth noting that both rules are mutually excluded. The Compound Rule applies to the constituents that are lexical categories. The Nuclear Stress Rule (NSR), on the other hand, takes into account constituents that are syntactic categories (Chomsky & Halle 1968).

In other languages, stress location is not a simple matter. In Cairene Arabic, it is the prosodic size that counts (Kenstowicz 1994: 551-552). The stress on either the penult or the antepenult depends on if the preceding number of syllables is even. The counterexample is Polish that assigns its accent to the penult regardless of the syllable size. The word *naucźyciel* 'teacher (nom. sg)' allots the accent to the [*cie*] syllable when a suffix is added: *nauczyciél-a* 'teacher (gen. sg.)' Tyron (1970) states another type of proposal that stress comes from a stressed+unstressed module[6]. In Maranungku, the strong-weak rhythm is

[6] For Hayes' (1981) typological survey, he points out that a parametric approach is adequate. Namely certain stress systems are in a line with four basic patterns, which behaves rhythmically in either module. Some of examples are given respectively.

found as the word *Àpalàchicóla*, *càlifràgilístic*. Finally, the most affecting conditions are syllable weight and vowel quality. The syllable of a long vowel is often stressed; the accent of a short-vowel syllable falls on a closed syllable or a non-edge position.

In a nutshell, stress location is a mystery where different languages are sensitive to a variety of causes. English is widely investigated and well-known for the multiple stresses in a word. Stress shifts between a lexical level and a phrasal one, as noted in Nuclear Stress Rule (NSR) and Compound Rule made by Chomsky and Halle (1968). Some more findings in other languages also attract my attention. For example, stress is arbitrary and lexically determined in Russian, Japanese, and etc. My work will follow Duanmu's (2004) modification of NSR and Compound Rule (Chomsky & Halle 1968), in pursuit of the metrical issue on stress of Mandarin Chinese.

Duanmu (2004) indicates that stress is universal. In his analysis, the stress assignment of Chinese regulated verses is attributed to non-phonological factors, in particular, the syntactic non-head receiving stress. Consider (3).

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a. Maranungku (Tryon 1970): Primary stress is assigned to the initial syllable, and secondary stress is assigned to every other syllable, e.g. tíralk 'saliva,' mérepèt 'beard.'
b. Weri (Boxwell and Boxwell 1966): Primary stress falls on the final syllable, and secondary stress falls on each preceding alternate syllable, e.g. kùlipú 'hair of arm,' ulùamít 'mist.'
c. Warao (Osborn 1966): Main stress appears on the penult, with secondary stress falling on alternating syllables before the main stress, e.g. yiwàrańae 'he finished it,' enàhoròahàkutái 'the one who caused him to eat.'
d. Araucanian (Echeveria and Contreras 1965): Main stress is subject to the second syllable, and secondary stress falls on alternating following syllables, e.g. elúmuyù 'give us,' kimúbalùwulày 'he pretended not to know.'

(3) a. Word Stress

In a disyllabic word, the first syllable has stress.

b. Non-head Stress

The syntactic non-head has stress.

c. Examples (x=stress)

(i) Chomsky & Halle (1968)

(x) (x)	NSR
(x) (x)	Compound Rule
deng zhou	*wang qiu-yue*
board boat	watch autumn-moon
[V N]	[V N- N]

'(I) board the boat and watch the autumn moon.'

(ii) Duanmu (2004)

x x	Non-head Stress
deng zhou	*wang qiu-yue*
board boat	watch autumn-moon
[V N]	[V N- N]

'(I) board the boat and watch the autumn moon.'

(Duanmu 2004: 58-61)

In assigning stress within one cycle, Duanmu's (2004) non-head stress is superior to Chomsky and Halle (1968). In (3cii), the objects *zhou* 'boat' and *qiu-yu* 'autumn-moon' are the non-heads under the VPs and thus receive the phrasal stress. However, in (3ci), the final result comes out after two rules apply.

2.1.2 Prosodic Structure

Liberman (1975) proposes metrical grids as an autonomous level of representation for stress. The gird is composed of lines of asterisks (cf. Halle and Vergnaud 1987). It follows that three levels are reported, respectively the level of syllable, foot, and word. The words *Tennessee*, *Mississippi*, and *understand* are illustrated in (4).

(4)

	Tennessee	Mississippi	understand
2	*	*	*
1	* *	* *	* *
0	* * *	* * * *	* * *

Every syllable in a word projects a line 0 position that builds up the secondary stress in line 1 and primary stress in line 2. Two properties of metrical grids are clear here. First, the segmental property of stress is forbidden, and substituted by a horizontal scalar denotation. Second, phrasal stress (i.e. the long-distance effect) is shown in a vertical dimension, as in (5).

(5)

	Mississippi Mabel	→	Mississippi Mabel
3	*		*
2	* *		* *
1	* * *		* * *
0	* * * * * *		* * * * * *

Stress clash (see Liberman & Prince 1977, Prince 1983, Hammond 1984, and Hayes 1984) pushes the line 2 asterisk to the leftmost position. Rhythm Rule (Liberman & Prince 1977; Hayes 1984) disfavors stress clash, where two stress marks in one grid are adjacent. This explains the stress alternations in phrases.

Liberman and Prince (1977) put forth that metrical trees are the main indicator of the grids. The formal rules of (5) are repeated in (6) along with a construction of metrical trees.

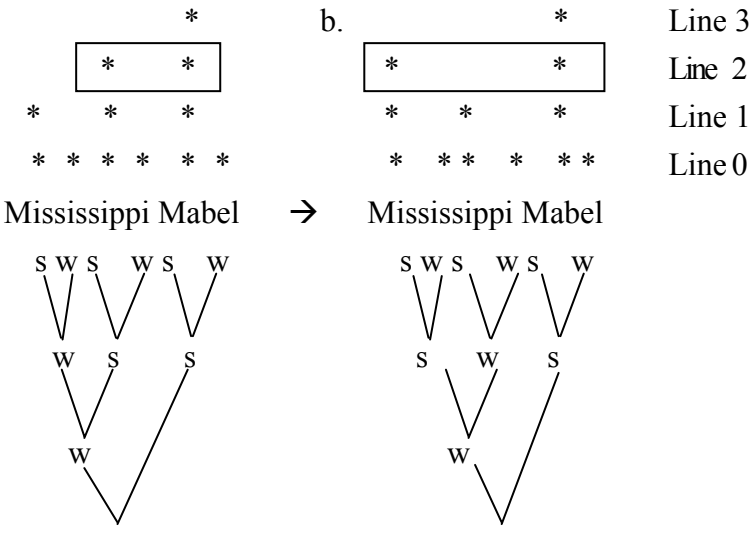
(5) *Grid Construction* (LP 1979: 315-16, 322)

a. As a place marker, assign every syllable a mark on the lowest level of the grid.

b. Assign a mark at level two to the strongest syllable of every phonological word.

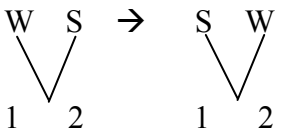
c. Assign sufficient additional marks so that the strongest syllable of every constituent labeled S has a higher grid column than the strongest syllable of its weak sister.

(6) a. b.



Mable in (6a) gets the largest nummber of marks and is more prominent in phrase level. The stress clash results in the tree relabeling of (6), formularized as the Rhythm Rule. See (7):

(7) *Rhythm Rule* (LP 1977)



Rhythm Rule alleviates this tension by accommodating two accent peaks on the initial and third syllable of *Mississippi*. Following LP's lead, Hayes (1984) suggests there be a gradient nature of eurhythmy, about which Rhythm Rule tells less. Eurhythmy in scansion means a four-syllable interval between two clashing grids. In (8) the definition is stated.

(8) *Quadrisyllabic Rule* (Hayes 1984: 46)

> A grid is eurhythmic when it contains a row whose marks are spaced close to four syllables apart.

(6b) reachs a greater eurhythmy with the desired four-syllable span on line 2. Rhythm Rule (LP 1977) and Quadrisyllabic Rule (Hayes 1984) seeks for the solution to stress clash. However, they are not the same. The former resolves the tension between two adjacent

stressed syllables. The latter shows certain gradient nature in eurhythmic judgments, where the spacing is of at most quadrisyllables: *Tennes**sèe** legis**lá**tion* or *Min**neà**polis con**néc**tions*.

Hayes (1984) is one of the opponents against the LP's (1977) representation of metrical grids and metrical trees. Some theories (Kiparsky 1979) disfavor the grid, others disregard metrical trees, while Hayes (1984) goes amid them. First, two structures in LP (1977) seem redundant. In work by Hayes (1984), trees represent stress, and grids indicate rhythmic structure where a horizontal span forms the rhythm. Second, the set of rules of eurhythmy work better than Rhythm Rule (LP 1977). Quadrisyllabic Rule (8) tells the degree of eurhythmy; Disyllabic Rule (9) handles equal spacing on the subscansion level; Phrasal Rule (10) prevents the initial syllable on the clashing level far from the other ones. The formal descriptions are given below.

(9) *Disyllabic Rule* (Hayes 1984: 48)

> The domains delimited on the level of scansion should be divided evenly by a mark on the next lower grid level.

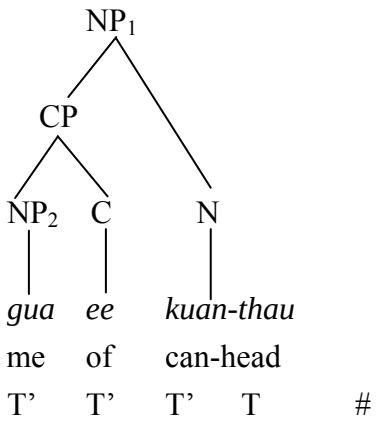
(10) *Phrasal Rule* (Hayes 1984: 52)

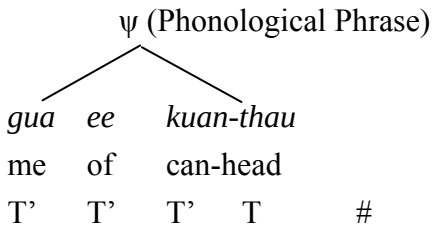
> A grid is more eurhythmic if its second highest level bears two marks, spaced as far apart as possible.

Phrasal phonology focuses on a phonological rule across word boundaries. A great debate is concerned with the rule-applying domains, and the application can be found in vowel reduction, stress shift, tone sandhi, and more others. The asymmetry lies in whether prosodic domains are part of consequences at the syntactic level (Chomsky & Halle 1968, Inkelas 1989), or a distinct level independent of the syntactic level (Selkirk 1978, 1980, 1981, Nespor & Vogel 1982, 1983). The former is the single-level hypothesis as laid down in SPE; the latter follows from the well-known Prosodic Hierarchy (Selkirk 1978, 1980, 1981, Nespor & Vogel 1982, 1983), and Strict Level Hypothesis (Selkirk 1984).

The single level hypothesis turns a syntactic hierarchical structure into a flat prosodic level. In (11), tone sandhi applies within a phonological phrase which arbitrarily subsumes a pronoun, a complement and a noun as its daughter.

(11) a. *input* b. *output*



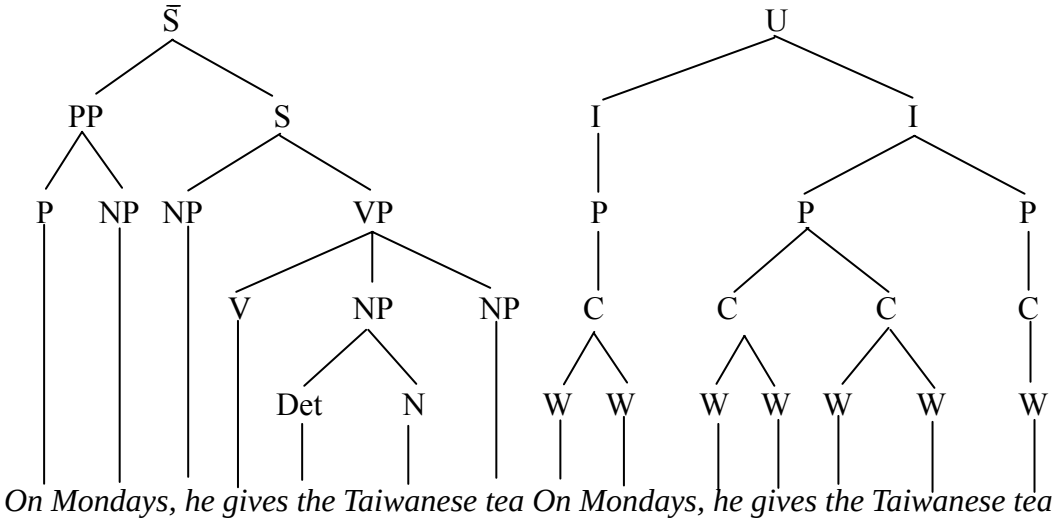


(Hsiao 1995: 84)

Inkelas (1989) comments on this SPE approach as being too powerful and unconstrained. In the following discussions, there are cases that can not be accounted for by such a single level. On the other hand, a handful of materials are subject to the Prosodic Hierarchy that mediates between syntactic components and phonological ones.

The Prosodic Hierarchy innovates from the syntactic structures by a set of rules which alters the syntactic brackets and gives a new phrasing of utterances, as developed in Selkirk (1978, 1980, 1981, 1986). This theory is proven fruitful in the works like Nespor and Vogel (1982, 1986), Hayes (1984) and others. The finding in my study of finger rhymes that a finger movement can be completed within a foot, a phonological phrase, or an intonational phrase gains many insights from this theory. See (12), as in Nespor and Vogel (1986):

(12) a. *Syntactic Structure* b. *Prosodic Structure*



Obviously, the prosodic structure (12b) is relational but not identical to the syntactic structure (12a). The prosodic labels are defined as follows: U=Utterance, I=Intonational Phrase, P=Phonological Phrase, C=Clitic Group[7] and W=Word.

Two principles are worth noting, one as bounding and the other as edges. English Rhythm Rule (LP 1977) is a stereotypical case that strictly complies with bounding principle. That is, a source element and a target element should stay at the same domain. In (12b) the working domain is the phonological phrase, where constituents *he gives the Taiwanese* are subject to Rhythm Rule.

Edge parameter is substantially crucial in prosodic phonology. For example, in Southern Min (Hsiao 1995), any syllable at the right edge of a prosodic domain[8] will retain its base tone, without undergoing tone sandhi. In Chimwi:ni (Kisseberth and Abasheikh 1974), for instance, the rightmost vowel of a phonological phrase should be short. With these two principles, the boundary symbol theory (Chomsky and Halle 1968, McCawley 1968, Selkirk 1972) comes in an intriguing fashion. Boundary symbols placed at the edges of syntactic constituents are used to block any applications of phonological rules. The number

[7] The Clitic Group is not introduced in the original version of the Prosodic Hierarchy by Selkirk (1980) and Nespor and Vogel (1982). The following discussions are in favor of the presence of the Clitic Group. To rationalize certain non-lexical items (i.e. prepositions, complements, conjunctions, and etc.), Nespor and Vogel (1982) suggests a cliticization rule into the analysis of phonological phrases. Hsiao (1995) also finds the different tonal behavior in functional elements, and takes the consideration of the Clitic Group. Bierwisch (1966) posits that a cliticization rule is one of the components in forming an intonational phrase.

[8] The phonological domain here refers to the phonological phrase, where the phrase-final syllable retains the base tone as an extraprosodic element not undergoing PTA (Prosodic Tone Alternation). However, End Pitch Spreading (EPS) and Low Pitch Default (LPS) could be possible, once the extraprosodic syllable loses its pre-linked tone value, and either has to occur in the domain of intonational phrase.

of boundary symbols decides the block strength. Selkirk (1984, 1986) modifies this idea as notable Strict Layer Hypothesis, for which the bracket numbers and hierarchical status are favorably keyed to such block strength. The sketch of Prosodic Hierarchy is given in (13), and Strict Layer Hypothesis shown in (16).

(13) *The Prosodic Hierarchy* (Selkirk 1972, 1978, 1980, 1981; Hayes 1989b)

Utterance (Ut)
|
Intonation Phrase (IP)
|
Phonological Phrase (PPh)
|
Clitic Group (CG)
|
Phonological Word (PWd)
|
Foot (Ft)
|
Syllable (Syll)

The prosodic hierarchy (Selkirk 1972, 1978, 1980, 1981; Hayes 1989b) is organized by a number of prosodic constituents, while Direct Reference to Syntax (Kaisse 1985) directly tackles the phonological rules in terms of syntactic bounding and edges. Bounding is the rule-applying domain; edge is the location of boundaries. Chomsky and Halle (1968: 372) found the counterexample for the direct reference to syntax. In (14), a Southern-Min example,

tone sandhi rules are sensitive to the phonological phrase, rather than to the syntactic XP.

(14) 'The wife of the boss loves eating the dish named *Bamboo-stem with Pineapples*'

a. Syntactic Structure

* T' T' T# T' T' T' T' T' T' T# Tone Sandhi Rule

[*thau-kee-niu*]$_{NP}$ [*ai-tsiah* [*ong-lai* [*tsha* [*sun-si*]$_{NP}$]$_{VP}$]$_{IP}$]$_{VP}$.

boss wife love-eat pineapple fry bamboo-stem

b. Prosodic Structure

T' T' T# T' T' T' T# T' T' T# Tone Sandhi Rule

[*thau-kee-niu*]$_{\psi}$[*ai-tsiah ong-lai*]$_{\psi}$ [*tsha sun-si*]$_{\psi}$. (ψ=Phonological Phrase)

boss wife love-eat pineapple fry bamboo-stem

That is, the syntactic structures cannot accurately predict the rule domain.

On the other hand, the alternative rule-applying domains can be found in the same syntactic structures. One of the evidence is Zec's (2005) investigation on pitch accents among function words in Standard Serbian, as shown in (15).

(15) This blue building is

a. * * *

[[nȁše]$_{PW}$ [pózorište]$_{PW}$]$_{PPh}$ 'our theatre'

our (NEUT) theatre

b. *

[naš [stûdio]$_{PW}$]$_{PPh}$ 'our studio'

our (MASC) studio

(Zec 2005: 83)

Two morphemes *nàše* and *nas* meaning 'our' are prosodically different. The former is a prosodic word including two syllables. The latter is not since it is constituted by a single syllable. Therefore, *nas* 'our (MASC)' obtains no accent and violates the OT constraint PWORDSIZE, a.k.a. the requirement of a minimal word. If the direct reference to syntax is true, it would be a task to explain these inconsistent phonological behaviors. Finally, the structural descriptions are not always valid. In metrics, the 'prosodic size' is more vital than the grammatical categories.

To sum up, the Prosodic Hierarchy is needed, with the supporting evidence in Selkirk (1980, 1981, 1984), Shih (1986), Hung (1987), Hayes (1989b), Hsiao (1991a, 1991b, 1995), among others. It is worthy noting that the Prosodic Hierarchy is not completely indepedent of syntax. The XP boundaries in some cases decide the domain of rule application. For the other cases, the grammatical information is not necessary. A variety of verse rhythms is derived from foot and syllables, both of which are in the lowest level of the prosodic hierarchy. The English metrists, *Shakespeare* and *Milton*, exploit an iambic rhythm in their poetry. Syllables are mapped onto an ideal foot template[9] (Prince 1983, Hanson &

[9] According to Prince (1993), stress is part of rhythm. Any peaks should be related to or adjacent to other troughs. One pair of stressed and unstressed syllables can constitute a metrical foot. The feet may differ in which edge (left or right) the stressed syllable occurs at. Consider below:

(1) a. *trochaic* (left-headed)

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  *
( * )
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b. *iambic* (right-headed)

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   *        line 1
( * )       line 0
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Kiparsky 1996).

The boundary symbol theory is remodeled as Strict Layer Hypothesis (Selkirk 1984, 1986, Nespor & Vogel 1986). The fundamental principle in the boundary symbol theory is: 'Rules applying across a given boundary must apply throughout all weaker boundaries, and rules applying before or after a given boundary must apply before or after all stronger boundaries' (Hayes 1984: 204). In (16), every prosodic constituent is exhaustively parsed into a prosodic unit.

(16) *Strict Layer Hypothesis* (Selkirk 1984, 1986; Nespor and Vogel 1986)

a. A given non-terminal unit of the prosodic hierarchy, X^P, is made up of one or more units of the immediately lower categories, X^{P-1}.

b. A unit of a given level of the hierarchy is exhaustively parsed by the superordinate unit. The parsed unit turns out to be one part of the superordinate unit.

In Optimality Theory (Prince & Smolensky 1993, 2004), two constraints EXHAUSTIVITY and NON-RECURSIVETY are used to allocate each prosodic constituent. Moreover, a given unit forms a relation with its immediate upper and lower level. A foot is superordinate to a syllable, but subordinate to a prosodic word. Zec (2005) posits the constraint HEADNESS to explain the relation of the top-down constituents. This property of government is explicitly

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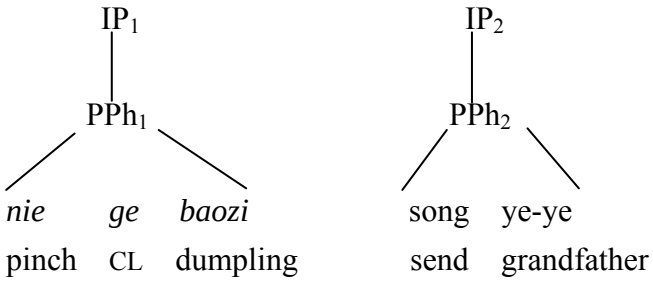
If the foot is left-headed, it is the trochaic foot; if right-headed, it is called iambic. It is the iambic parameter common to English poetry. In Mandarin, the trochee is prevailing, as in Chinese regulated verses (Duanmu 2004).

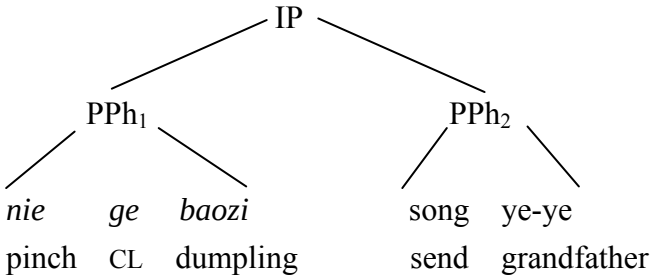
seen in many cases, such as vowel harmony and tone sandhi. Consider the example (17), one of the lines from my corpus of finger rhymes.

(17) FR[10]-087-2

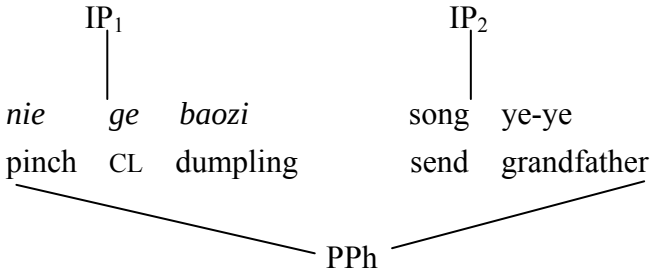
a. 'make a dumpling, and send it to my grandfather.'



b. 'make a dumpling, and send it to my grandfather'



c*. 'make a dumpling, and send it to my grandfather.'



In (17a) the intonational phrase[11] and the phonological phrase are tied up one to one. In

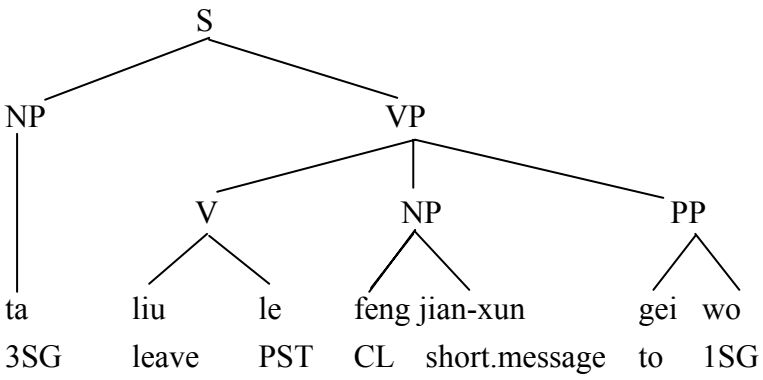
[10] The abbreviation FR means Finger Rhymes, the constructed corpus in my research.
[11] The intonational phrase accounts for how a finger movement is formed in recitation of the finger rhymes. More details will be available in the following chapters.

Strict Layer Hypothesis, one IP subsumes one or more phonological phrases, as seen in (17b). The last one (17c) will be refrained, due to the fact that two IPs with a discourse pause amid are unlikely to have only one phonological phrase.

2.1.3 Intonational Phrase

Intonational phrase manifests itself in many ways. Some statements are made that the IPs are formed based on the syntactic structures (Downing 1970, 1973; Bing 1979). However, the challenging observation (Halliday 1967; Selkirk 1978) is that an intonational phrase can be manipulated from alternative syntactic structures. A matrix sentence is a single IP. Nevertheless, many sentences are found consisting of more than one IP.

(18) 'He left a short message to me.'



(19) a. [ta liu le feng jian-xun gei wo]$_{IP}$
b. [ta]$_{IP}$ [liu le feng jian-xun gei wo]$_{IP}$
c. [ta liu le feng jian-xun]$_{IP}$ [gei wo]$_{IP}$
d. [ta liu le]$_{IP}$ [feng jian-xun]$_{IP}$ [gei wo]$_{IP}$
e. [ta]$_{IP}$ [liu le feng jian-xun]$_{IP}$ [gei wo]$_{IP}$
f. [ta]$_{IP}$ [liu le]$_{IP}$ [feng jian-xun]$_{IP}$ [gei wo]$_{IP}$
g. *[ta]$_{IP}$ [liu le]$_{IP}$ [feng jian-xun gei wo]$_{IP}$
h. *[ta liu le]$_{IP}$ [feng jian-xun gei wo]$_{IP}$

The sentence in (18) can be parsed into IPs in several ways, from (19a) to (19f). The ungrammaticality of (19g) and (19h) results from a violation of the sense unit condition, as described in (20). Two constituents NP and PP fail to form a sense unit, since these two are neither head/argument nor head/modifier.

(20) *Sense Unit* (Selkirk 1984)

a. Two constituents Ci, Cj form a sense unit if Ci depends on Cj.

b. A constituent formed by a head and, optionally, the head of any number of its modifiers and/or arguments

(21) *Syntactic-Prosodic Correspondence Rule for Intonational Phrase*

A matrix sentence must be exhaustively parsed into a sequence of (one or more) intonational phrases.

In effect, a well-formed intonational phrase must achieve both (20) and (21). An IP reflects a certain kind of semantic sense. In (18d), the subject NP and the verb constitute an

argument-head relation. The first IP *ta liu le* is semantically good, and is qualified to be an independent IP.

Apart from semantic constraints, a sentence's F_0 contour obtains in support of the presence of IPs. F_0 makes evident the presence of IPs and the alignment of metrical grids. In work by Cooper and Sorensen (1981), IP is syntactically determined. However, there is more than one representation of F_0 contour in many cases, as mentioned in (19). Pierrehumbert and Liberman (1982) posit that the theory of F_0 contour requires the other linguistic representations than the syntactic forms. Metrically, the grid construction rules proceeds in a cyclic[12] fashion, first applying to the constituents of an IP and then to the IP itself.

Pierrehumbert (1980) contends that the intonational contour is a phonetic indicative of IPs. A single-IP sentence includes two boundary tones (at the two ends of the sentence), one phrase accent (after the last pitch accent), and a number of pitch accents. Thus, the major difference between a single-IP sentence and a multiple-IP sentence lies in the location and number of boundary tones and phrase accents. Three phonetic facets are subject to the way of IP partitions (Pierrehumbert 1980). First, a sentence-medial continuation rise, in particular the one after a fall accent on the same syllable, allocates the presence of a boundary

[12] The grid construction is highly relevant to the pitch assignment that partly affects the stress pattern. In terms of the focus structure, the first application of pitch assignment is the Basic Focus Rule. The second is the Phrasal Focus Rule which makes complete the intonated surface structure. This nature of cyclicity is keenly observed by Kaisse (1985), who addressed that the postlexical rules can show the cyclicity so well as in the lexical rules.

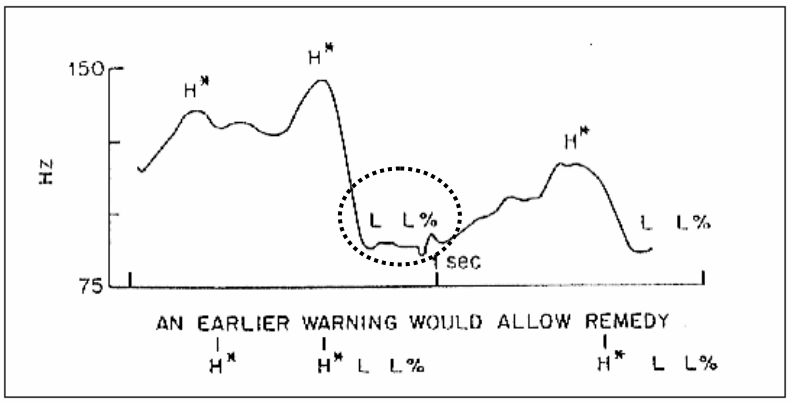
tone[13].

(22) HLⓗ

[After lunch]$_{IP}$, [we think we went for a drive.]$_{IP}$

In (22), the fall-rise on *lunch* builds up the first IP. The second evidence comes from a sharp and deep fall in F_0. When a low boundary tone is available, such a fall can be found at the end of an IP. See (23):

(23) A Sharp Fall of F_0

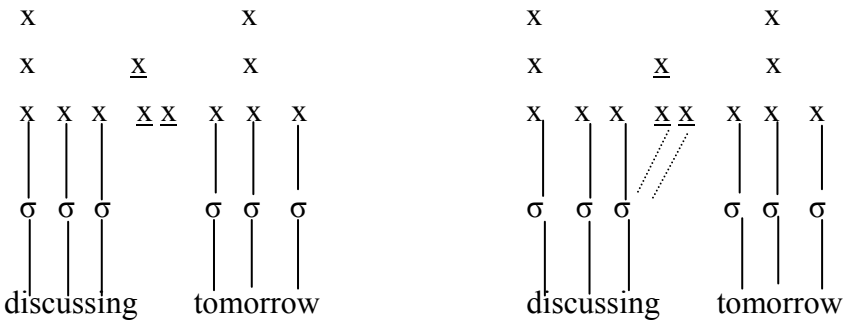


In (23), the sharp dip in F_0 appears between two accents on words *warning* and *remedy*. This dip implies where the IP *AN EARLIER WARNING* ends.

[13] The boundary tones are either H or L, and they are realized on the syllable immediately adjacent to the left or right extreme of the IP.

The last evidence is the timing. This timing effect leads to a clear break between IPs. At the end of an IP, there is usually a lengthening or a pause. Selkirk (1984) treated it as the consequences of the grid alignment.

(24) a. pausing[14] b. syllable-lengthening



Some lengthening is attributed to the tonal configurations at the end of IPs. That is, certain types of tonal contours require more time to reach (Lyberg 1979). On the other hand, assuming Silent Demibeat Addition (Selkirk 1984), we render a pause possible at the end of an IP.

(25) *Silent Beat Addition* (Selkirk 1984)
Add a silent demibeat at the end of the metrical grid aligned with
a. a word
b. a word that is the head of a non-adjunct constituent
c. a phrase
d. a daughter phrase of S.

[14] In the newly-built corpus, *Sinica COSPRO*, Tseng et al (2006) points out that the silent signal between phonological phrases is Breath Group (BG). It is available to end a preceding strip of words and embark another new one.

Following Selkirk (1984), Shih (1986) calls forth the importance of silent demibeat in metrics, as defined in (26).

(26) *Silent Beat Addition* (Shih 1986)

Add a silent demibeat at the end of each metrical (prosodic) constituent.

Eventually, there are some open questions on intonational phrasing. Sense Unit Condition offers a good way to divide a sentence into IPs. Some (Halliday 1967 et al) hold a firm attitude toward this pure semantic approach; others argue for (Downing 1970, 1973; Bing 1979, Selkirk 1978) the mixed way with syntax-based approach. For example, the tag questions or the relative clauses remain a big question in intonational phrasing, where syntactic structures do not always work.

2.1.4 Restructuring

The formation of intonational phrases shows degrees of variability. In phonology, there are far more linguistic or extra-linguistic factors affecting a string to be broken down into several types of intonational phrases. Basically, syntactic nodes play an important role in forming an intonational phrase.

(27) 'The baseball player *Chien-Min Wang* overcame the fear of having got hurt.'

a. Syntactic Structure
[*Wang Jian-Min*]$_{NP}$ [*[ke-fu le*] [*shou-shang* [*yin-ying*]$_{NP}$]$_{NP}$]$_{VP}$
WANG JIAN-MIN overcome FSP hurt shadow

b. Prosodic Structure
(i) **[**[*Wang Jian-Min*]$_{PPh}$ [*ke-fu le*]$_{PPh}$ [*shou-shang*]$_{PPh}$ [*yin-ying*]$_{PPh}$ **]$_{IP}$**
(ii) **[**[*Wang Jian-Min*]$_{PPh}$**]$_{IP}$ [**[*ke-fu le*]$_{PPh}$ [*shou-shang*]$_{PPh}$ [*yin-ying*]$_{PPh}$**]$_{IP}$**
(iii)* **[**[*Wang Jian-Min*]$_{PPh}$**]$_{IP}$ [**[*ke-fu le*]$_{PPh}$ [*shou-shang*]$_{PPh}$**]$_{IP}$ [**[*yin-ying*]$_{PPh}$**]$_{IP}$**

The matrix sentence is a single IP that is constituted by all the phonological phrases, as in the first example of (27b). However, the IP restructuring avoids the boundaries of the smaller IPs that do not coincide with the end of a noun phrase. It is the reason why the second example of (27b) is allowed while the third one is not.

Nespor and Vogel (1986) notice that IP restructuring takes place for physiological reasons and for the ease of language processing. Consider (28):

(28) a. **[**[Jane]$_{PPh}$ [claimed]$_{PPh}$ [that her necklace]$_{PPh}$ [had been taken away]$_{PPh}$ [last night]$_{PPh}$ [by one]$_{PPh}$ [of her roommates]$_{PPh}$ **]$_{IP}$**

b. **[**[Jane]$_{PPh}$ **]$_{IP}$ [**[claimed]$_{PPh}$ **]$_{IP}$ [**[that her necklace]$_{PPh}$ **]$_{IP}$ [**[had been taken away]$_{PPh}$ **]$_{IP}$ [**[last night]$_{PPh}$ **]$_{IP}$ [**[by one]$_{PPh}$ **]$_{IP}$ [**[of her roommates]$_{PPh}$ **]$_{IP}$**

c. **[**[Jane]$_{PPh}$**]$_{IP}$ [**[claimed]$_{PPh}$ [that her necklace]$_{PPh}$ [had been taken away]$_{PPh}$ [last night]$_{PPh}$ [by one]$_{PPh}$ [of her roommates]$_{PPh}$**]$_{IP}$**

d. **[**[Jane]$_{PPh}$ [claimed]$_{PPh}$ **]$_{IP}$ [**[that her necklace]$_{PPh}$ [had been taken away]$_{PPh}$ [last night]$_{PPh}$ **]$_{IP}$ [**[by one]$_{PPh}$ [of her roommates]$_{PPh}$ **]$_{IP}$**

e. **[**[Jane]$_{PPh}$ [claimed]$_{PPh}$ [that her necklace]$_{PPh}$**]$_{IP}$ [**[had been taken away]$_{PPh}$ [last night]$_{PPh}$ [by one]$_{PPh}$ [of her roommates]$_{PPh}$**]$_{IP}$**

In (28), the longer original IP is divided into smaller IPs, for the capacity of breath. As contended by Nespor and Vogel (Ibid), the length is a key point. A line too long is not preferred. Besides, there is a tendency to yield an average and uniform IPs within the same sentence.

The other factors, like the rate of speech and the style, also contribute to the IP restructuring. One would break sown a long IP into smaller ones, if his/her speech rate is slow. Generally speaking, the rate of speech is closely associated with the style. In the formal situation, speakers prefer slowing down the utterance to ensure the quality of speech. That is such that a formal style frequently leads to small IPs.

In English, IP restructuring is possible in the syntactically flat structures, as formulated in (29).

(29) *List restructuring (optional)*

In a sequence of more than two constituents of the same type, i.e., X_1, X_2, …, X_n, an intonational break may be inserted before each repetition of the node X, i.e. X_1, X_2, …X_n.

The repetition here refers to Xs other than X_1. The potential pause occurs at front of the repletion, and forms a break between IPs. The typical examples are given.

(30) a. The intern was told to combine the following: sour cream, whipped topping, pudding mix and milk.

b. **[**The intern was told to combine the following**]$_{IP}$ [**sour cream**]$_{IP}$ [**whipped topping**]$_{IP}$ [**pudding mix**]$_{IP}$ [**and milk**]$_{IP}$**

The list restructuring is fairly common in the sequence divided by a colon. In (30), the first restructuring IP covers the first X and the other IPs are all single X. The NPs of (30) are broken apart. The list restructuring violates the aforementioned NP constraint. It must be noted that this kind of restructuring is not obligatory in English.

In (31), the restructuring of IPs follow AP's branching.

(31) a. The beasts on the film *The Lord of the Rings* is big, fat, ugly and nasty.

b. **[**The beasts on the film *The Lord of the Rings* is big**]$_{IP}$ [**fat**]$_{IP}$ [**ugly**]$_{IP}$ [**and nasty**]$_{IP}$**

Hsiao (1991b, 1995) proposes the alternative of list restructuring. In Mandarin and Southern Min, the flat immediate constituents obligatorily undergo list restructuring. The major difference is the parameter of an intonational break which is inserted between the repetitions. See (32)-(33).

(32) *List restructuring (obligatory)*

In a sequence of more than two constituents of the same type, i.e., X_1, X_2, …, X_n, an intonational break may be inserted after each repetition of the node X, i.e. X_1, X_2, …X_n.

(33) 'Sky, Earth, Gentlemen, Families, Instructors'

IP_1	IP_2	IP_3	IP_4	IP_5
|	|	|	|	|
tian	*di*	*jun*	*qin*	*shi*
sky	earth	gentleman	family	teacher

The intonational break is imposed at the end of the repetitions. The coordinate construction as in (33) has five breaks following each word.

2.2 Generative Metrics

In generative metrics, meter is the realization of an abstract pattern on a sequence of words. SPE-based theory (Chomsky and Halle 1968) exhibits the distinct properties from the other phonological accounts that focus on the linear representations. The fundamental proposal is the stress which is hierarchically organized. Many contributions (Liberman and Prince 1977, 1979; Kiparsky 1979; Hayes 1984, 1989b, among others) are found, and many discussions are drawn in §2.1. In this section, I discuss this non-leaner structure with respect to verses. The review remains in the domains to which the rhythm rules apply, and

extends to whether a line is metrical or not.

2.2.1 Correspondence Theory

A set of correspondence rules (Halle and Keyser 1969, 1971) governs the abstract pattern in metrics.

(34) *Correspondence Rules*
Each element X of the meter corresponds to a single vowel or to a fully stressed vowel.

In (34) there are associations between the entities constituting the metrical pattern and the phonetic (phonological) properties of the word sequence. These links form a sense of rhythm, basically following two parameters. Consider (35):

(35)	XXX	XXXX	XXXXX	demibeats
	SWS	SWSW	SWSWS	trochaic parameter
	WSW	WSWS	WSWSW	iambic parameter

The metrical pattern introduces elements repeated some number of times. These abstract entities are demibeats representing quantitative values for duration (Lerdahl and Jackendoff 1983; Jackendoff 1989). The temporal organization of metrical demibeats yields the linguistic rhythm, as the musical beats does to musical rhythm. Demibeats should be

specified in metrical position, either strong (S) or weak (W). The left-headed output is trochaic meter, while the right-headed output is iambic.

The way of metrical mapping is different cross-linguistically. For example, in (36), the Spanish verse by the poet *Lope de Voga*, each vowel is isomorphic to a single demibeat.

(36) Spanish: XXXXXX
Zagala divina,
Bella labradora,
Boca de rubies,
Ojos de paloma.

(Halle and Keyser 1971: 141)

In English, stress is taken into account. It is the stressed vowels that are mapped into the metrical positions, as seen in (37).

(37) English: XXXX
Ráin, ráin, gó awáy
Cóme agáin anóther dáy
Líttle Jóhnny wánts to pláy.

(Halle and Keyser 1971: 145)

Both cases have a uniform metrical scheme, i.e. XXXXXX and XXXX respectively. The correspondence rule emphasizes the link between syllables and X's of the scheme. However,

the counterexamples are not ansent. The following is one of the Spanish verses.

(38) Yo sueño que estoy aquí
X XX **X** X X X
destas prisiones cargado,
X X XX X X X (X)
y soñé que en otro estado
X X X **X** X **X** X (X)
Más lisonjero me vi.
X X X X X X X
¿Qué es la vida? Un frenesi.
X X X **X** XXX
¿Qué es la vida? Una ilusión,
X X X **X** **X** X X
una sombra, una ficción
X X X **X** X X X
y el mayor bien es pequeño;
X X X X X X X (X)
que toda la vida es sueño,
X XX X X **X** X(X)
y los sueños, sueños son.
X X X X X X X

(Calderón De La Barca, La vida es sueño)

The vowel sequences (underlined) are the metrical equivalent of a single syllable and thus correspond to a single X. In Spanish verse, the phenomenon is known as the “synalepha” rule. The parenthesized X at the end of each line is feminine close, which is an optional variant of Spanish meters.

On the other hand, English meters are syntactically conditioned, as given in (39). The two stressed vowels aligned to a single metrical element must be within the same syntactic construction.

(39) Ríde a cóck-hórse to Bánbury Cróss
X **X** X X
To sée a fíne lády upón a whíte hórse
X **X** X **X**
Rings on her fíngers, bélls on her tóes
X X X X
Shé shall have músic wheréver she góes.
X X X X

(Halle and Keyser 1971: 145)

Consider the first two lines. The sequences *cóck-hórse*, *fíne lády* and *whíte hórse* are syntactically bounded without intervening vowels. Each pair (underlined) shares a single demibeat, not two. The correspondence rules are modified as in (40).

(40) *Correspondence Rules*

a. Each element X of the meter corresponds to a single vowel (e.g. Spanish) or to a fully stressed vowel (e.g. Englsih).

If (a) is not applied, then

b. One or more consecutive vowels are assigned a single metrical element X.
c. A sequence which bears one or two fully stressed vowels within the same syntactic constituent is linked to the same element X.

2.2.2 Metrical Tension

Metrical rules can be violated in a gradient manner. Youmans (1983) posits that there is no clear cut between acceptable and unacceptable metrical lines. The metrical well-formedness is gradient in nature. In correspondence rules, one-to-one mapping is the most unmarked. The metrical complexity (Halle and Keyser 1969, 1971) rises up, since the unmarked condition is not met. Recall the Spanish and English examples in §2.2.1. Metrists use numerals to represent their complexity (or metrical tensions). The lines of (38) have a complexity of 11, while those of (39) have 3.

The metrical tensions are also accounted for with the correspondence of stress to metrical positions. A stress maximum, a fully stressed syllable between two unstressed ones, should fall in a strong metrical position (Halle & Keyser 1971, Kiparsky 1975, among others). Otherwise, the line would be unmetrical. One line from *God's grandeur* by *Hopkins* is illustrated in (41), where W is a weak position, S a strong position, and x stressed syllable. The metrical template is iambic (WS) as follows.

(41) **x x** stress
Gè**n**erá**t**ions have trod, have trod, have trod.
W S**W** S W S W S W S metrical positions

(Rice 2000)

According to Halle & Keyser's (1971) correspondence rules, unstressed syllables in strong metrical positions are considerably common. Nevertheless, the stressed syllables in weak

metrical positions are rare and marked. For instance, the third syllable in (41), a stress maximum falling in weak metrical position, is considered odd.

Duanmu (2004) is allied to that Chinese regulated verses are also rhythmically conditioned by the stress maximum. A verse line is unmetrical if it has a stress maximum in a weak metrical position, as shown in (42).

(42) x x stress
deng zhou wang qiu-yue
board boat watch autumn-moon
[V N] [V N-N]
S W S W S metrical position
'(I) board the boat and watch the autumn moon.'

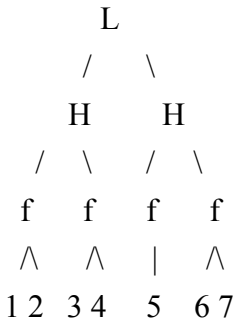
(Duanmu 2004: 61)

The stress maximum *zhou* 'boat' appears in weak metrical position. In this sense, this line is metrically bad.

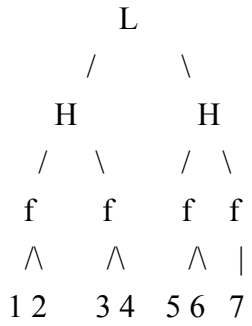
Chen (1979) suggests there is a match between a syntactic tree and an ideal template. In Chinese regulated verses, the metrical patterns are phrased hierarchically. The numbers from 1 to 7 represents syllables, and f means foot. Two foots are combined into the hemistiches, and the highest layer is metrical lines that comprise all constituents.

(43) Metrical template

a. Right-branching



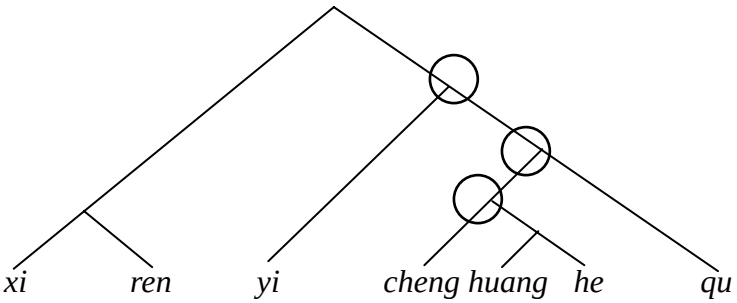
b. Left-branching



L = Metrical Line H = Hemistich
f = foot Numeral (1-7) = Syllable

The metrical tensions (Halle & Keyser 1971) are measured by a count of deviant nodes from an ideal template. Compare (43) and (44).

(44) ‘The ancient man has already gone riding a yellow crane.’



(Chen 1979: 410)

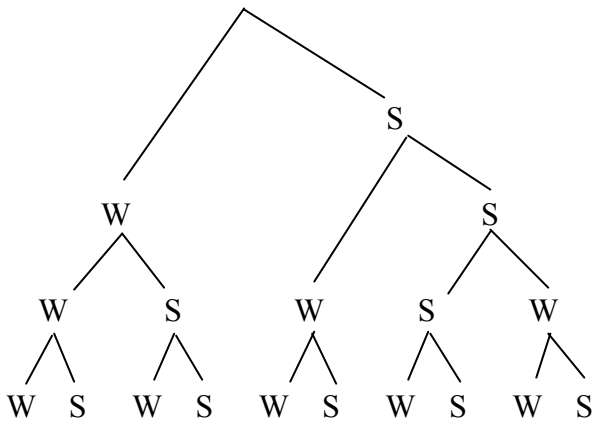
The line of Chinese regulated verses in (44) has 3 deviant nodes, for its syntactic bracketing is not isomorphic to the metrical foot of (43b). In any case, this line causes certain degree of metrical tensions.

Frequency is a scientific statement in support of the metrically unmarked objects (Halle and Keyser 1971; Kiparsky 1975, 1977, Chen 1979; Youmans 1989; Golstons 1998). There are no unaccepted lines in the verses that have been created. However, the frequency ensures a tendency that the metrically simple lines are common, while the metrically complex lines are rare. In this case, the lines with deviant nodes are not too many.

2.2.3 Metrical Hierarchy

The metrical hierarchy is the strictly-layered organization into which the metrical components are filled. Before Chen's (1979) metrical template, Kiparsky (1979) speculates on a metrical representation, as in (45).

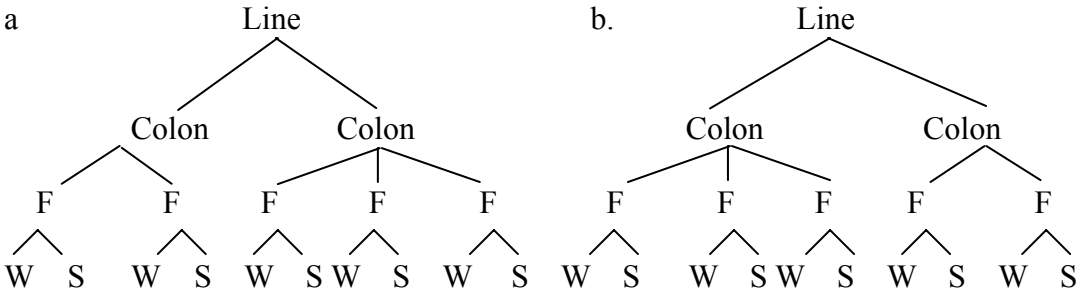
(45) *Metrical Representation* (Kiparsky 1977: 230)



The footing follows the iambic parameter, namely a weak position followed by a strong one. This proposal is famous for the argument that the correspondence of a morphosyntactic bracketing to the metrical straddling nodes is equally important to the evaluation of metrical tensions.

Piera (1980) and Youmans (1989) develop it as a three-level hierarchy. As in (46), each line is composed of cola, which is constituted by feet followed by a metrical strong or weak position.

(46) *Metrical Hierarchy*



(Hayes 1989: 256)

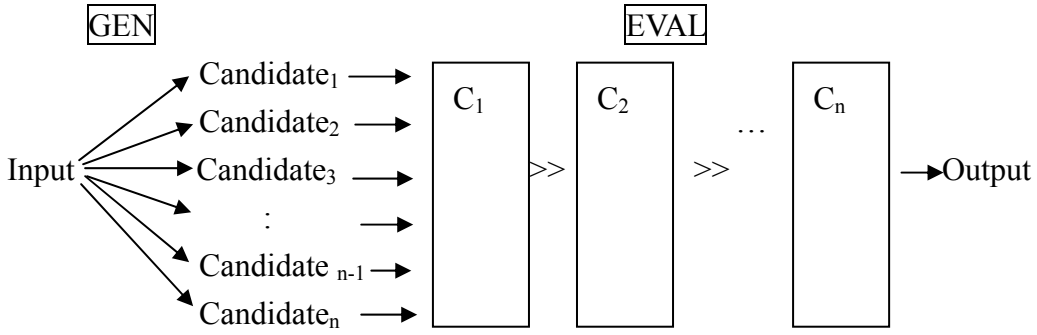
To conclude, there are two competing models on the metrical patterns. The SPE-based theory starts the hierarchical analysis in terms of stress. Halle (1970) and Halle and Keyser (1971) regards the metrical position as the abstract entities. Kiparsky (1975, 1977) rejects this view by suggesting the metrical model is based on a linguistic structure, such as stress. Therefore, there are iambic and trochaic parameters operating on the metrical trees.

2.3 Constraint-based Account

2.3.1 Basics of Optimality Theory

Optimality Theory (OT) is a constraint-based approach, first generalized by Prince and Smolensky (1993, 2004). The main idea of OT is that an optimal output surfaces through a competition with its infinite co-candidates. Unlike the generative phonology, the rules of derivational grammars are represented as a set of constraints which are ranked on a language-specific basis. In OT, these constraints are universal and violable. The higher-ranking constraints take priority in the winner selection. The optimal output is chosen with the minimal violations. Specifically, the best candidate incurs the least violations, particularly on the higher-ranked constraints. The surface form is known as 'the emergence of the unmarked.' The language typology results from different constraint rankings. The operation of OT is shown in the following schema.

(47) *OT Schema*



In OT, language processing is modeled with inputs and outputs, without intermediate representations. GEN(arator) randomly yields a set of candidates, which are the surface forms from each linguistic input. These representations undergo a parallel evaluation, where the universal constraints are ranked on a language-specific ground. The job of EVAL(uator) is to arrange the constraint rankings and to select the most harmonic representative with respect to grammar. The selected output is the optimal form in violation of no constraint or the lower-ranked and the least constraints.

The convention of OT is represented with a 'tableau.' In (48) the input is placed at the top left cell, and the candidates are all listed in the leftmost column. The relevant constraints are ranked at the top of the column. A solid line implies that one constraint dominates over the following one; a dotted line indicates that no ranking is needed. The asterisk * is assigned to the candidates that violates any given constraints. The symbol ☞ is given to the optimal output which violates the minimal and the lower-ranked constraints. The shaded area represents no competition for the candidates which are ruled out by the higher-ranked constraint.

(48) *OT Tableau*

/Input/	$Constraint_1$	$Constraint_2$	$Constraint_3$	$Constraint_4$	$Constraint_5$
a. $Candidate_1$			*	*(!)**	
☞b. $Candidate_2$			*		*
c. $Candidate_3$	*!				
d. $Candidate_4$		*!		*	

In (48), Candidate$_2$ is chosen, for it incurs two fewer violations of the lower-ranked constraints than Candidate$_1$. Candidate$_3$ and Candidate$_4$ fail in the evaluation of the first two constraints; the fatal violations are represented by the exclamation marks "!".

A summary of OT mechanism is given in (49).

(49) *OT Machinery*

Component	**Function**
GEN(erator)	Generates Candidates
EVAL(uator)	Evaluate Candidates
Constraints	Examine violations of candidates
Constraint Ranking	Define specific grammars
Tableaux	Offer a representation of the process of evaluation for the most harmonic output
☞	Point out the optimal form
*	Denote violations[15]
!	Represent fatal violations
Shade	Reject the competition

This thesis bears a great mark on Optimality Theory (Prince and Smolensky 1993, 2004), an insight to generative grammar that universal principles and linguistic typology can be equally attested. In OT, much effort (McCarthy 1997, 2004, Ito & Mester 1997, Jun 1998, among others) has been put into the evolution of formal accounts, including the opacity and the nature of GEN that are not fully captured in this approach. Sympathy Theory (McCarthy

[15] There are two types of violations in OT. One is gradient, while the other is categorical. The former measures the number of the violations. The latter is concerned about whether the candidates violate the constraint of interest.

1997, Ito & Mester 1997, Jun 1998) and Span Theory (McCarthy 2004) newly come forth to deal with opacity and generator restrictions respectively. This thesis is in pursuit of an OT account that refreshes the perspectives of generative metrics. Fortunately, Rice (2000), Hayes (2000), Kager (2001), Zuo (2002) and Hsiao (2006) take the initiative in prosodic and metrical phonology with a panoramic view. I briefly outline these records of Rice (2000), Zuo (2002) and Hsiao (2006) in §2.3.2. Further in §2.3.3, the fact that variations can be partially acceptable is reported.

2.3.2 OT for Rhythm and Metrics

Rice (2000) observes a wide variety of metrical poetry, and argues for the importance of the prosodic hierarchy. The difference of individual poets results from minimal violations of constraints and a hierarchical re-ranking. Rice's (2000) survey on classical Arabic meters, as in (50), indicates one fact that local violations are worse than global ones.

(50) The four common types in Ancient Arabic meters (Rice 2000: 8)

METER	METRA	LAPSE-FT	CLASH-FT	LAPSE-MTN	CLASH-MTN
☞tawiil	[LH.σH]				
kamiil	[ø<u>H.L</u>H]			*	
waafir	[L<u>H.</u>øH]				*
basiit	[σ<u>H.L</u>H]			*	

The constraint LAPSE disfavors a string of two unstressed moras. The other constraint CLASH prevents stress on adjacent syllables. The foot-specific constraints in (50) rank higher than the metron-specific constraints, by virtue of the prosodic hierarchy. And the optimal one, *tawiil*, is the most frequent type across the corpora, as predicted in the tableau.

Partial re-ranking of constraints can yield many possible grammars. Rice (2000) considers the way of partial re-ranking to be one of the crucial implications in OT. Zuo (2002) in agreement of this idea pursues sub-grammars in *Shijing*, the earliest written Chinese verse. Several constraints are posited as below.

First, BINMAX and BINMIN are used to limit the size of foot, i.e. no more and less than two syllables in a foot, respectively. Second, a good scansion of poetry should refer to the syntactic and prosodic structure. ANCHOR requires the boundary match at the lowest level of both structures, while ANCHOR-$I_{SB}O_{PHP}$ regulates the match of highest level, hereby SB and PhP standing for Strongest Boundary and Phonological Phrase. Third, *PHP-FINAL-MONOFT does not allow PhP-finally monosyllabic foot. Lastly, *Shijing* contains a substantial amount of interjections that are with different prosodic representations from lexical words, as termed as GOODFTINTERJ in OT. For simplicity sake, I will present the analyses of 6-syll line type, as in (51-52).

(51) 6-syll lines (Zuo 2002: #95)

Candidate Parses	BINMAX	BINMIN	GOODFTINTERJ	*PHP-FINAL-MONOFT	ANCHOR-I_{SB} O_{PhP}	ANCHOR-IO	ANCHOR-OI	ALIGNR (FT, IP)
a.☞ [[SS][SS]][SS] (SS)(SS)|(SS)								6
b.☞ [SS][[SS][SS]] (SS)|(SS)(SS)								6
c. [SS][S[S[SS]]] (SS)|(SS)(SS)						*!		6
d. S[[S[SS]][SS]] (SS)|(SS)(SS)						*!		6
e. [SS][S[S[SS]]] (SS)|(SS)(SS)						*!*		6

The candidates (a) and (b) are simultaneously chosen as optimal. In other words, both parses with the different PhP boundaries are allowed. One may think if any sub-hierarchy would discriminate these two cases of metrical harmony. See (52) in reply to this question.

(52) 6-syll lines (Zuo 2002: #96)

Candidate Parses	BINMAX	BINMIN	GOODFTINTERJ	NOFT	*PHP-FINAL-MO	ANCHOR-$I_{SB}O_{PHP}$	ANCHOR-IO	ANCHOR-OI	ALIGNR (FT, IP)	BINARITY	EVENENESS	LONG-LAST
a. [SS][SS]][SS] (SS)(SS)|(SS)									6	*	**	*!
☞ b. [SS][[SS][SS]] (SS)|(SS)(SS)									6	*	**	
c. [SS][S[S[SS]]] (SS)|(SS)(SS)							*!		6	*	**	
d. S[[S[SS]][SS]] (SS)|(SS)(SS)							*!		6	*	**	
e. [SS][S[S[SS]]] (SS)|(SS)(SS)							*!*		6	*	**	

In (52) the sub-hierarchy, as shown in the right-branching side, plays a crucial role in choosing the metrical most harmonious one. The candidate (a) loses, since it has a finally-short parse. Hence (b) emerges as the optimal candidate, corresponding to the sub-grammar of *Shijing*. Next let us move on to the issue of metrical beats.

Hsiao (2006) observes a phenomenon of beat-sharing in Taiwanese nursery rhymes, and proposes an OT analysis. There are four constraints formalized, as in (53).

(53) a. No Share: Every syllable is assigned a single demibeat.
b. Masculinity: a masculine rhythm is preferred.
c. F-Share: an F-category syllable shares a demibeat with an adjacent syllable.
d. IC-Share: two syllables that are morphosyntactic ICs share a demibeat.

Masculinity can outrank No Share to reach an unmarked rhythm in the corpus of Taiwanese nursery rhymes. F categories and syntactic ICs are subject to beat sharing to satisfy the higher-ranked Masculinity. The constraint ranking and the tableau are given in (54).

(54) CH-10-04 'run out and see'
tsao tshut-lai khuaN
run DIR-DIR look

	Masculinity	F-Share	IC-Share	No Share
a. x x tshut-lai	*!			
☺ b. x tshut-lai				*
c. x tsao tshut-			*!	*
d. x -lai khuaN			*!	*

Both morphemes in (54b) are directional markers, and violate no constraints except No Share. Therefore, (54b) wins against its competing candidates.

The nature of Optimality Theory is categorical. Some universal constraints, such as FOOT, PARSE, TROCH, IAMB (Tesar 1997, Hsiao 2006, among others), go into a robust interpretation. Each constraint under a consideration of generative phonology is strict to infinite possible linguistic objects in terms of their ranking. However, more and more linguists suggest re-tuning the ranking of constraints (Anttila & Cho 1998) to yield the form,

either optimal or suboptimal. It is true that UG subsumes language universals and language typologies as well.

2.3.3 Theories for Variation

Variation has been widely discussed in western theories, in terms of its aspects[16], its sources[17] and its types[18]. This thesis is not concerned little with the aspects of sociolinguistics. Rather, the emphasis is on the variation forms of both between and within individuals, which is common to the linguistic performance.

Performance rules are actually similar to the other phonological rules. Labov (1972) claims that a great majority of the transformational and phonological rules are subsumed into 'performance rules.' Both Kiparsky (1982, 1993) and Kaisse (1985) point out some postlexical rules are characteristic of lexical rules. One of the classical examples is Kiparsky's (1982) English /t, d/ deletion, the optionality of omission across different communities; later in his work (1993), multiple grammars are posited under the OT framework. Kaisse (1985) found that cyclicity obtains not only in lexical rules but postlexical rules[19] as well. Her study of fast speech offers much insight to the framework

[16] The aspects of variations are involved in linguistics and extralinguistics. One of the prevailing issues is between gender and register.
[17] They are typically referred to as time and space dimensions. Certainly there must be more to discuss.
[18] As defined in Reynolds (1994), variations are divided into change in progress and stable variation.
[19] In the Kaisse's (1985) framework, postlexical rules are classified into two levels. One is 'level P1 rules,' which apply between words; the other is 'level P2 rules,' which apply after inserted pause.

of lexical phonology. I follow their lead, and agree that speakers have alternative ways of describing the same pattern. In Optimality Theory (Prince and Smolensky 1993, 2004), these outputs of performance may be equally optimal.

Under the OT framework (Prince and Smolensky 1993, 2004), the treatment of linguistic variations calls for a great deal of attention. To my knowledge, there have been four models in terming with the diversity of languages (Kiparsky 1993; Reynolds 1994; Boersma 1998; Anttila 2001; Zuo 2002). They include (i) the multiple grammars model[20] (Kiparsky 1993; Kroch 1994), (ii) partially ordered grammars model[21] (Antilla 1995; Antilla and Cho 1998; Antilla 2000), (iii) the floating constraints model (Reynolds 1994; Nagy and Reynolds 1997; Zuo 2002), and (iv) the continuous ranking model (Boersma 1998; Boersma and Hayes 1999, 2001; Hayes 2000).

The multiple grammars model (Kiparsky 1993) takes the initiative in the variation investigations. The competition of different OT rankings accounts for more than one surface forms of intra- and inter-languages. The partially ordered grammars model and the floating constraints model follow the lead, and argue for the modified versions. In the partially ordered grammars model, the multiple grammars arise from a partial re-ranking of

[20] In the multiple grammars theory (Kiparsky 1993), the claim is proposed that the alternative ranking can represent certain part of the internalized language knowledge. Of his work, the model of /t, d/ deletion constitutes no fewer than six distinct grammars.

[21] The partial ranking grammars model is equally termed as the stratified grammars model, first noticed in the work of Tesar and Smolensky (1995). Antilla (2001) then postulates that some constraints are underspecified in their OT ranking. In this fashion, a variety of the representations for the Finnish genitive plural can be reasonably surfaced out.

some unspecified constraints. In the floating constraints model, some constraints are indeed fully articulated but the others may well be ‘mobile’ or ‘floatable’ amid a range. The three models embody a subtle difference in the designs of OT rankings, but all allow more than one optimal representations. The last model is the continuous ranking, where the grammars undergo a stochastic candidate evaluation. Simply, every possible surface form is gradiently well-formed. The ranking falls on a scale of likelihood, and different grammars depend on where the selection points are. In practice, the best model for variation remains inconclusive, and each of them undermines certain weaknesses.

In my study, any line of finger rhymes may well be differently scanned, in terms of the age of the readers. The younger the kids are, the less likely they are to read a long line. One point observed by Reynolds (1994) that the intraspeaker variation is the outcome from the competing grammars as in the interspeaker variations. An individual with more than one linguistic behavior is believed to possess a certain degree of inherent flexibility. To date, no evident conclusion is made as to which model is superior. The main goal of this paper is to adopt the partially ordered grammars model (Antilla 1995; Antilla and Cho 1998; Antilla 2000) and the floating constraints model (Reynolds 1994; Nagy and Reynolds 1997, Zuo 2002) which can handle variations of scansions of finger rhymes.

The major feature in the floating constraints model is floating constraints (FCs) whose ranking is variable, as opposed to the other OT intact constraints. This approach is quite

appealing in two ways. For one, it retains the fact that the constraints are universal. For the other, it uncovers linguistic dynamic changes or performance possibilities. This framework renders multiple grammars possible, not by renewing all constraints and ranking, but by directing few soft-ordered constraints. An illustration of such a variable constraint ordering is as below.

(55) The Floating Constraints Model

$$\left\{\text{..……⇦…….CONX..…...⇨……..}\right\}$$

$$\text{CONW} >> \quad \text{CONY}_1 >> \text{CONY}_2 >> \ldots >> \text{CONY}_n \quad >> \text{CONZ}$$

The constraint(s) shown on the higher level in the representation is the FC, while those on the lower level are “hard-ordered” or “anchored” constraints. The range over which the FCs is mobile is defined, according to the particular subset of fixed or anchored constraints (Y_1, Y_2,…, Y_n), not to the constraints (W and Z) which the FC lies between. In this sense, it is not necessary to clarify the ranking of FCs. A particular constraint X may be ranked at any position of the range falling between two other constraints W and Z. The exact landing site is relative to its anchored subset, namely above Y_1 and below Y_n. One decision of the FC’s landing site is one kind of language grammar.

This thesis investigates the rhythms in Mandarin finger rhymes. In Chapter 3, the organizations of prosody and meter are keenly concerned. The non-leaner structure reflects the property of various rhythms, as well as the metrical problems in prosodic tensions. The constraint-based approach offers an alternative way to these issues. In Chapter 4, the nature of finger movements is carefully examined in a perspective of intonational phrases. Of rhythmic structures, variations are well captured in an OT account.