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Tone and Non-tone Languages: An Alternative to Language Typology and Parameters*

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Linguists often classify languages into various types. In generative phonology, language typology is usually translated into parameters, such as the parameter for trochaic vs. iambic feet, or the parameter for syllable counting vs. mora counting. Focusing on the typology of tone and non-tone languages, I argue that the typological or parametric approach has four problems. First, it does not offer a clear-cut classification. Second, it does not capture similarities between different language types. Third, it does not capture differences within a given language type. Fourth, it does not offer a good guide for research. As an alternative, I offer a theory in which there is no typology or parameters. Instead, languages differ in their selection of various phonological inventories (vowel inventory, consonant inventory, tonal inventory, etc.). Each inventory selection has a specific set of properties, and the interactions among various inventory selections give the overall properties of a given language. The present theory is simpler, offers a better guide for research, and offers a better understanding of language differences and language universals.

Key words: tone, typology, parameters

1. Introduction

Linguists often classify languages into various types, such as tone vs. non-tone languages, stress vs. non-stress languages, trochaic vs. iambic languages, isolating vs. inflectional languages, SVO vs. SOV languages, and so on. In generative phonology, language typology is usually translated into parameters, such as the parameter for trochaic vs. iambic feet, or the parameter for syllable counting vs. mora counting (Halle & Vergnaud 1987, Hayes 1995).

In this article I argue that the typological or parametric approach has four problems. First, it does not offer a clear-cut classification. For example, there is no agreement on

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whether English is mora-counting (Hayes 1995) or syllable-counting (Halle & Vergnaud 1987), or whether Japanese is a tone or non-tone language. Second, it does not capture similarities between different language types. For example, although English is often classified as a non-tone language, it nevertheless makes use of pitch contours that exhibit similar properties as those found in tone languages (Goldsmith 1981, Pierrehumbert 1980). Third, it does not capture differences within a given language type. For example, both Mandarin Chinese and Shanghai Chinese have lexical tones, yet tones are much more stable in Mandarin than in Shanghai. Finally, and most importantly, the typological (parametric) approach offers little guide for research. For example, when we see a difference between two languages, the typological (parametric) approach cannot tell us whether the difference is real, so that no more research is needed, or whether the difference is only apparent, so that further research will reveal underlying similarities. This will become clear below.

As an alternative, I offer a theory in which there is no typology or parameters. Instead, languages differ in their selection of various phonological inventories, which all analyses must assume. For example, each language will select a vowel inventory, a consonant inventory, a tonal inventory, etc. Each inventory selection has a specific set of properties. For example, contour tones are more likely to split in one-tone and two-tone languages than in three-tone and four-tone languages. Similarly, contour tones are less likely to split in monosyllabic languages than in polysyllabic languages. The interactions among various inventory selections give rise to the overall properties of a given language. Other than differences in inventory selections, all languages should exhibit universal phonological properties, such as having binary feet and for pitch accents and lexical tones to be anchored on stressed syllables. Any language that appears to violate such properties calls for a close examination. The present theory is simpler, offers a better guide for research, and offers a better understanding of language differences and language universals.

In the following discussion I shall focus on one typological property—the typology of tone vs. non-tone languages. In §2 I discuss the difference between typology (parameters) and inventory selection. In §3 I discuss the problems with the typological approach. In §4 I offer a new theory of language differences. In §5 I discuss some further issues. In §6 I offer conclusions.

Much of the discussion below relies on research work that I have done in recent years. Some ideas are repeated in order to draw a big picture, a theory of phonological universals and differences without assuming typology or parameters.

2. Typology, parameters, and inventory selection

Languages can differ in many ways. For example, Mandarin Chinese has five vowels, Turkish has eight, and English has over ten. Similarly, some languages have only a few consonants and some have several dozen. In a trivial sense we can classify languages as one-vowel languages, two-vowel languages, three-vowel languages, and so on. Similarly, we can classify languages as, say, ten-consonant languages, eleven-consonant languages, twelve-consonant languages, and so on.

However, this is not the usual meaning of language typology. Rather, language typology refers to something more systematic, with a limited number of choices (Comrie 2001:25), in contrast to consonant or vowel inventories, where the number of choices is quite open. For example, we may speak of mora-counting languages, syllable-counting languages, and non-stress languages, where a language must choose one of the three options. Similarly, in terms of word order, we may speak of SVO languages, SOV languages, VSO languages, and so on, where the number of options is again limited and a language can only choose one of them. A typological difference also has other consequences. For example, whether a language is mora-counting or syllable-counting has consequences for where foot boundaries are and where stresses fall. In contrast, it is not obvious what consequences there are whether a language has fifteen or sixteen consonants. In other words, a language typology usually assumes a limited set of categories. In addition, which category a language belongs to often has other consequences in the grammar. In this sense, inventory size selections are not typological choices.

Parameters are similar to typology, in that the number of choices is limited for each parameter (usually binary), and different choices have different consequences. For example, Halle & Vergnaud (1987) propose a parameter for left-headed vs. right-headed stress in a foot, and a parameter for bounded feet vs. unbounded feet; such choices lead to different metrical structures. Different consonant or vowel inventory sizes are not parametric, because the number of choices (and their combinations) is quite open, and because there are no obvious consequences that follow from inventory sizes.

3. Problems with the typological approach

I discuss four problems with the typology of tone vs. non-tone languages: (a) lack of distinction between tone and non-tone languages, (b) similarities among tone and non-tone languages, (c) differences within tone languages, and (d) lack of guide for research. Before the discussion, a note on tonal representation is in order. Following Woo (1969), Yip (1980), and others working in generative phonology, I represent tones

with the features H (high) and L (low). Contour tones (rise or fall) are represented as combinations of level tones, illustrated in (1).

(1) High tone H
Low tone L
Rising tone LH
Falling tone HL

More complex tones, such as fall-rise and rise-fall, can be represented with three (or more) level tones. This representation of contour tones is similar to the representation of diphthongs as combinations of pure vowels (for example, the diphthong [ai] is the combination of the pure vowels [a] and [i]).

Two questions arise. First, how many heights of level tones do we need? Second, are there contour tones that cannot be analyzed as combinations of level tones? The first question does not concern us and will not be pursued here (see Duanmu 2000b for more discussion). The second question is discussed below.

3.1 Lack of distinction between tone and non-tone languages

Traditionally, tone is defined as the pitch contour on a word that can distinguish lexical meaning. An example in Mandarin Chinese is shown in (2). Unless otherwise noted, Chinese examples are transcribed in Pinyin romanization.

(2) HL LH
ma ma
'to scold' 'hemp'

With a falling tone (HL) the syllable [ma] means 'to scold' and with a rising tone (LH) it means 'hemp'. The difference cannot be attributed to stress but must be attributed to tone. In this regard, Chinese is a tone language.

In English, a word can be pronounced with different pitch contours, but it still has the same lexical meaning. An example is shown in (3).

(3) HL LH
cat cat
(neutral) (question)

The word *cat* has a falling tone in neutral intonation and rising tone (LH) in question

intonation, but its lexical meaning remains the same. Sometimes a pair of words can differ in neutral pitch contours. An example is shown in (4), where a hyphen indicates a syllable boundary.

(4)

H-L	L-HL
import	import
(noun)	(verb)

However, such words also differ in stress (shown with underline), such that their pitch difference can be derived from their stress differences (see below). Therefore, pitch alone does not contrast lexical meaning in English, and English is a non-tone language.

Chinese and English are perhaps the two extreme cases of tone vs. non-tone languages. Many languages are hard to classify. Let us consider three well-known examples: Japanese, Lithuanian, and Korean.

In Japanese, each word has a fixed pitch contour. However, each word has only one H tone (which may spread over two or more syllables). Some examples are shown in (5).

(5) Pitch-accent in Japanese

kakiga	H-L-L	'oyster'
kakiga	L-H-L	'fence'
kakiga	L-H-H	'persimmon'

A common analysis is that each of the words has an "accent" (shown with underline), to which H is associated (Block 1946, McCawley 1965, Haraguchi 1977). The H then spreads leftward to all syllables except the first. The location of accent may vary, as the location of stress may vary in English words. In the examples, the "accented" syllable is where H ends. In the first word it ends on the first syllable. In the second word it ends on the second syllable. In the third word it ends on the third syllable; should the third word have a suffix, the suffix would start with L.

Japanese is similar to Chinese in that the pitch contour is fixed for each word. On the other hand, Japanese is similar to English in that the pitch contour is not contrastive, in that it is predictable from the accent position. Thus, Japanese, and "pitch accent" languages in general, defies the dichotomy of tone vs. non-tone languages.

In Lithuanian, each word has one stress. A stressed long syllable can have one of two tonal patterns, LH or HL, shown in (6), from Halle & Vergnaud (1987:190), where stressed syllables are underlined.

(6) LH-L HL-L
viinas viiras
'wine' 'man'

It may seem that Lithuanian is a tone language, but it is also possible to analyze it as a pitch-accent language, similar to Japanese. For example, according to Halle & Vergnaud (1987), stress in a long syllable can fall on either the first mora or the second, and H is linked to the accented mora and L to other moras. This is shown in (7), where * indicates stress.

(7)
```
 LH  L       HL  L
  ||  |       ||  |
viinas      viiras
  |           |
  *           *
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In this analysis, tone is not contrastive any more in Lithuanian.

In Korean, ignoring boundary tones, a word can again have one of two tonal patterns, H or LH (Jun 1993, M. Kim 2000). Like Chinese, Japanese, and Lithuanian, the tone pattern of a word is fixed (in contrast to English, where the tonal pattern of a word is variable). However, unlike Lithuanian, the tonal pattern of a Korean word is predictable from the initial consonant. Thus, Korean presents another kind of problem for tonal typology.

In summary, a simple dichotomy of tone vs. non-tone languages does not offer a clear-cut typology. Nor does adding a third category of pitch-accent languages make the classification any better.

3.2 Similarities among tone and non-tone languages

In this section I discuss some apparent differences between tone and non-tone languages, with a focus on English and Chinese. I argue that upon close examination many differences disappear, and that there is much in common between English and Chinese. In particular, I argue that there is only one basic difference between English and Chinese, which is the number of lexical tones in neutral intonation.

3.2.1 Apparent differences between English and Chinese

Chinese is a typical tone language and English is a typical non-tone language. The

difference between them is fairly representative of what one can expect between tone languages and non-tone languages in general. At first sight, English and Chinese exhibit several differences, as well as some similarities. Consider the properties in (8), explained below.

(8)

	Chinese	English
Lexical tones	>1	0
Pitch accents	0	>1
Boundary tones	Yes	Yes
Stress	No?	Yes
Tone on minor stress	Yes	No
Downstep	Yes	Yes

3.2.1.1 Lexical tones

A lexical tone is a pitch contour that (a) is not predictable from other phonological properties, such as stress or segmental features, and (b) can distinguish word meanings. In addition, the lexical tone usually remains unchanged regardless of contextual meanings (see below). It is well known that Chinese has lexical tones and English does not. For example, Mandarin Chinese has four lexical tones, shown in (9).

(9)

H	LH	L	HL
ma	ma	ma	ma
'mother'	'hemp'	'horse'	'to scold'

Like Chinese, English also makes use of pitch contours. However, English pitch contours are not lexically contrastive, in that an English word can be pronounced with different pitch contours, yet it still has the same lexical meaning. An example is shown in (10).

(10)

HL	LH
cat	cat
(neutral)	(question)

Although pitch variation in English does not distinguish word meanings, it does express other meanings, such as question, surprise, disbelief, affirmation, and so on. Let us call them contextual meanings. Pitch variation that expresses contextual meaning is often called intonation. In generative phonology, intonation is analyzed in terms of pitch accents and boundary tones, discussed next.

3.2.1.2 Pitch accents and boundary tones

In generative phonology, the main difference between tone and intonation is functional, in that tone is used to contrast lexical meaning and intonation is used to contrast contextual meaning. In terms of phonological features, both tone and intonation are represented as sequences of H's and L's. In this sense, both Chinese and English have tones, whether they distinguish word meanings or not.

The generative analyses of tonal patterns in English, and of intonation in general, originate from Goldsmith (1981), Liberman (1975), and Pierrehumbert (1980). The basic proposal is to represent intonation as a combination of word tones called "pitch accents" and boundary tones. Each pitch accent is aligned with a stressed word, whereas boundary tones occur at certain syntactic boundaries (which are often translated into prosodic boundaries). The choices of pitch accents and boundary tones depend, in part, on the contextual meaning of a given sentence (although which intonation corresponds to which contextual meaning is not always precisely clear). By way of illustration, consider the intonation pattern in (11), where the hyphen indicates syllable boundaries and 0 indicates a toneless syllable. (For simplicity "phrase accent" is ignored.)

(11) Pitch accent: H*L
Boundary tone: L% (at sentence end)
Example: 0-H*-L-0-H*-L-H*-LL%
The blackboard is painted orange.

In (11) there are three pitch accents, aligned with the three stressed syllables (in *blackboard*, *painted*, and *orange*). Each pitch accent is H*L, where H* is aligned with a stressed syllable and L is aligned with the next syllable. In addition, there is a boundary tone L (traditionally indicated with %). The resulting sequence of tones for the eight syllables is 0-H-L-0-H-L-H-LL. Next consider the intonation pattern in (12), which shows the effect of different pitch accents.

(12) Pitch accent: HL* (nonfinal); H*L (final)
Boundary tone: %L (at sentence end)
Example: H-L*-0-H-L*-0-H*-LL%
The blackboard is painted orange.

This pattern differs from (11) in that the nonfinal pitch accents are HL*, instead of H*L. The new intonation pattern can express surprise or disbelief. Next consider the effect of boundary tones, shown in (13) and (14).

(13) Pitch accent: H*L
Boundary tone: L% (at sentence end)
Example: H*LL%
John

(14) Pitch accent: H*L
Boundary tone: H% (at sentence end)
Example: H*LH%
John

The intonation in (13) is neutral. In contrast, the intonation in (14), where the boundary tone has changed from L% to H%, can express a question.

We have seen that, depending on contextual meaning, an English word can have different pitch accents, as well as different boundary tones. In contrast, a Chinese word always has the same lexical tone, regardless of the contextual meaning, although the word can be followed by different boundary tones (Chao 1933). For example, a boundary L can express a contextual meaning of affirmation. Two examples are shown in (15) and (16).

(15)	H	+	L	→	H-L
	duo				duo
	many		affirm		'Certainly many'
(16)	LH	+	L	→	LH-L
	nan				nan
	hard		affirm		'Certainly hard'

The boundary tone L is realized after the original lexical tone is completed. Therefore the syllable is extra long, or equivalent to two syllables. Indeed, as Chao (1933:130) points out, very often boundary tones are realized on a separate interjection particle in Chinese, such as [a]. Another boundary tone is H, exemplified in (17) and (18), which can express the contextual meaning of a question.

(17)	H	+	H	→	H-H
	duo				duo
	many		question		'Many?'
(18)	HL	+	H	→	HL-H
	man				man
	slow		question		'Slow?'

Despite the use of boundary tones (or boundary particles), intonation in Chinese is much more subdued than that in English, because English intonation is expressed by both boundary tones and pitch accents, whereas Chinese intonation is expressed by boundary tones alone.

3.2.1.3 Stress

In English, stress is usually obvious to the native judgment. In contrast, stress in Chinese seems much less obvious, and some linguists consider Chinese to have no stress (Hyman 1977, Selkirk & Shen 1990). Indeed, a lack of native judgment on stress seems to be a property of tone languages in general. If Chinese has no stress, we cannot talk about pitch accents either, since pitch accents are by definition tonal units associated with stress.

3.2.1.4 Tone on minor stress

In English compounds, a word with secondary stresses usually does not carry a pitch accent. Consider the example in (19).

(19) H*-L
pan-cake

In the compound, *pan* has main stress and *cake* has secondary stress. However, there is only one pitch accent (H*), anchored on *pan*.

Unlike English, a word in Chinese often keeps its lexical tones whether it is used alone or in a compound. An example from Mandarin Chinese is shown in (20).

(20)	LH	H	LH-H
	you	deng	you-deng
	'oil'	'lamp'	'oil lamp'

This presents another apparent difference between English and Chinese.

3.2.1.5 Downstep

English intonation shows a downstep effect (Beckman & Pierrehumbert 1986), whereby within a downstep group each H has a lower pitch than the previous H if they are separated by L. In the next downstep group, the first H is reset to about the same

level as the first H in the previous downstep group. For example, consider the sentence in (21), where brackets indicate downstep groups.

(21) Downstep groups
0- [H*- L- 0- H*- L]- [H*- LL%]
The blackboard is painted orange.

There are two downstep groups. The first has two pitch accents and the second has one. In the first downstep group, the first H (on *blackboard*) has a higher pitch than the second (on *painted*). In addition, the H on *orange* is reset, so that it has about the same pitch as that on *blackboard*. Downstep groups are determined by both syntactic boundaries and phrasal stress (not the same as Pierrehumbert's "phrase accent", which is a tone), which I do not pursue here.

Like English, Chinese also has the downstep effect. For example, Chao (1968) points out that when two falling tones occur together, the second starts at a lower level than the first. Consider the examples in (22) and (23), where brackets indicate downstep domains.

(22) [HL HL]
da lu
big road
'big road'

(23) [HL] [HL]
dai lu
lead road
'to be the guide'

In (22), the two words form one downstep domain, in which the second H (on 'road') has a lower pitch than the first (on 'big'). In (23), there are two downstep domains, so the two H's are at about the same pitch level. The formation of downstep domains is again related to syntax and stress, which I do not pursue here.

3.2.2 A close analysis

The set of differences between Chinese and English seem to show up between tone and non-tone languages more generally, but the explanation for them remains unclear. In this section I offer an explanation. Consider the differences again, summarized in (24).

(24)		Chinese	English
	Lexical tones	>1	0
	Pitch accents	0	>1
	Stress	No?	yes
	Tone on minor stress	yes	no

First, I argue that Chinese also has stress. Then I argue that other differences follow from the fact that Chinese has lexical tones but English does not.

3.2.2.1 Why Chinese has stress

I offer three arguments for why Chinese has stress. I also discuss the reason why stress is hard to feel in Chinese. The first argument is that, as in any other language, Chinese does use stress for semantic contrast. An example is shown in (25), where contrastive stress is shown in uppercase.

(25) Wo xing HUANG, bu xing WANG
I surname HUANG, not surname WANG
'I (am) named HUANG, not named WANG.'

If Chinese uses stress anyway, it is possible that it uses stress in other places as well.

The second argument is that there is a clear contrast between full and weak syllables in Chinese. The rime of a full syllable is about twice as long as that of a weak syllable (Lin & Yan 1988, 1990). In addition, weak syllables undergo rime reduction by dropping the coda and moving a low nuclear vowel towards the schwa (Lin & Yan 1988). Finally, weak syllables lose their underlying tones, while full syllables keep them. An example of the contrast between full and weak syllables is shown in (26), from Beijing Mandarin Chinese, transcribed in phonetic symbols, where 0 indicates lack of tone.

(26) HL-HL HL-0
paa-paa → paa-pə
dad-dad
'daddy'

In Beijing Mandarin Chinese (but not in some other Chinese dialects), the second syllable of a reduplicated kinship word is de-stressed. As a result, the second syllable undergoes rime reduction, rime shortening, and tone loss. As Chao (1968) points out, native

speakers can easily distinguish full syllables from weak syllables. All full syllables have stress and all weak syllables lack stress. However, between two full syllables, it is indeed hard to tell which has more stress; we shall return to this below.

The third argument comes from the word-length effect. A rather peculiar property of Chinese is that many words have two forms, a disyllabic long form and a monosyllabic short form. Examples of such dual vocabulary are shown in (27), where the redundant word in the long form is shown in parentheses in the gloss.

(27) Dual vocabulary in Chinese

Long	Short	Gloss
ji-shu	ji	'skill-(trick)'
gong-ren	gong	'worker-(person)'
zhong-zhi	zhong	'to plant-(plant)'
da-suan	suan	'(big)-garlic'
shang-dian	dian	'(business)-store'
shu-cai	cai	'(vegetable)-vegetable'

It is often thought that the emergence of the long form is to avoid ambiguity. However, we shall see shortly that this view has a serious problem. (Other problems of the ambiguity-avoidance view are discussed in Duanmu 1999b.)

If each word has two forms, a two-word compound should have four possible combinations. However, in a noun-noun compound, only three of the combinations are viable. An example is shown in (28), where 1 is a monosyllabic word and 2 a disyllabic word.

(28) [noun noun] compound

2-2	ji-shu gong-ren
2-1	ji-shu gong
*1-2	*ji gong-ren
1-1	ji gong
	'skilled worker'

Similarly, in a verb-object phrase, three combinations are generally good and one is bad, as shown in (29).

(29) [verb object] phrase
2-2 zhong-zhi da-suan
*2-1 *zhong-zhi suan
1-2 zhong da-suan
1-1 zhong suan
'to plant garlic'

More puzzling still, it will be noted that the bad form is different in the two expressions: it is [1-2] in the noun-noun compound but [2-1] in the verb-object phrase. This effect is quite strong for expressions in which both words have elastic length. (For expressions in which one or both words lack elastic length, the analysis is different; see Duanmu 2000a for more discussion.) There is simply no explanation for the word-length effect if disyllabic words are created to avoid ambiguity. On the other hand, a comparison with stress in English provides a clue. Specifically, in a noun-noun compound, the first noun has more stress, whereas in a verb-object phrase, the object has more stress. In other words, in a given structure, the word that has more stress in English cannot be shorter in Chinese. If we consider stress and longer length to be both reflections of prominence, then a generalization emerges, shown in (30), where the more prominent word is in uppercase.

(30) Both English and Chinese
[NOUN noun]: NOUN has more stress or cannot be shorter than noun
[verb OBJECT]: OBJECT has more stress or cannot be shorter than verb

Duanmu (1999b, 2000a) also offers a more specific metrical analysis of the word-length effect. Let us look at the noun-noun case here. Let us assume that the basic foot type in Chinese is a syllabic trochee (Duanmu 2000a), similar to that in English (Halle & Vergnaud 1987). In addition, let us assume that compound and phrasal stress is assigned cyclically (Chomsky, Halle, & Lukoff 1956). The metrical structure of noun-noun compounds is shown in (31), where S is a stressed syllable, s an unstressed syllable, and underlining indicates the word with more stress.

(31) 2-2 (<u>Ss</u>)-(Ss)
2-1 (<u>Ss</u>)-s
*1-2 (<u>S</u>)-(Ss) violates foot binarity
1-1 (<u>S</u>-s)

In [2-2], each word forms a disyllabic trochee, and so there is no problem. In [2-1], the

first word forms a disyllabic trochee. The second word has no stress, so it does not need to be disyllabic. Thus, there is again no problem. In [1-2], the second word forms a disyllabic trochee. The first word is also stressed, owing to compound stress. However, the first word is monosyllabic, which violates foot binarity. This explains why [1-2] is bad. In [1-1], neither word can form a disyllabic trochee by itself, but the two words can for a disyllabic trochee together. So [1-1] is good, too.

I have argued that Chinese has stress. Hoa (1983) also offers an extensive study of stress in Chinese, although she believes that phrasal stress is cyclically assigned to the right. Hoa's position is shared by Chen (2000). However, it can be shown that, because Hoa assumes several additional rules, such as stress-clash avoidance and stress inversion, she predicts similar stress locations as Duanmu (2000a), except the final syllable, which is always stressed in her analysis (except for some lexical exceptions), probably owing to the final lengthening effect (see Duanmu 2004 for a comparison between Hoa 1983 and Duanmu 2000a).

Let us now consider why stress is obvious in English, but not always so in Chinese. First, consider why stress is obvious in English. There are two cases. The first is between a full (heavy) syllable and a weak (light) syllable, where the stress difference is clear in both languages. This is shown in (32) and (33).

(32) English heavy-light: stress is clear

	Pe-	ter	'Peter'
Length	long	short	
Reduction	no	yes	
Tone	yes	no	

(33) Chinese heavy-light: stress is clear

	paa-	pə	'daddy'
Length	long	short	
Reduction	no	yes	
Tone	yes	no	

In English, the heavy syllable is longer, has an unreduced vowel, and a tone (pitch accent). In contrast, the weak syllable is short, has a reduced vowel, and no pitch accent. Similarly, in Chinese, the heavy syllable is longer, has an unreduced vowel, and a lexical tone, whereas the weak syllable is short, has a reduced vowel, and no lexical tone. Thus, in both languages the difference between the two syllables is clear. Next consider the difference between two full (heavy) syllables, shown in (34) and (35).

(34) English heavy-heavy: stress is clear

	meat	ball
Length	long	long
Reduction	no	no
Tone	yes	no

(35) Chinese heavy-heavy: stress is unclear

	rou	wan	'meat ball'
Length	long	long	
Reduction	no	no	
Tone	yes	yes	

In English, both syllables are long and have unreduced vowels. However, the first syllable also has a pitch accent, whereas the second does not. Thus, the stress difference is still clear. In Chinese, both syllables are long and have unreduced vowels. In addition, both have lexical tones. Thus, the stress difference is much less obvious. (Chao 1968 and Hoa 1983 believe that in cases like (35), a subtle distinction in stress still exists. However, as Chao and Hoa note, it is difficult to obtain agreement among native speakers in such cases. In contrast, English speakers have no trouble in judging stress in (34), which is unambiguously on the first syllable.)

In sum, there is good evidence that Chinese has stress. In addition, all full syllables have tone in Chinese, whereas only syllables with main stress have pitch accents in English. This is the reason why the stress distinction between full syllables is clear in English but not in Chinese.

3.2.2.2 Preserving lexical contrast

We have seen that the presence of lexical tones in Chinese and its absence in English can explain the difference in stress judgment between the two languages. Let us take a closer look at this issue. Consider a compound made of two full syllables again. An English example is analyzed in (36), where * columns indicate stress levels.

(36)
```
   *
   *   *
meat-ball
 H*
```

The first word has main stress and a pitch accent (H in the neutral intonation). The second word also has secondary stress but no pitch accent. Why is there no pitch accent on the second word? The reason seems to be that there is no need: pitch accent is not

contrastive for lexical meanings in English, and one pitch accent (plus boundary tones) is enough to express contextual meanings. Indeed, compound stress does not seem to play a semantic role either, although it is assigned anyway. Next consider Chinese. An example is analyzed in (37).

(37) *
  * *
rou-wan ‘meat ball’
HL-LH

Let us assume that Chinese compounds have the same stress pattern as English compounds (main stress on the first word and secondary stress on the second word), which explains why the first word keeps its lexical tone. The question is why the second word also keeps its lexical tone. The answer seems to be that lexical tones are contrastive in Chinese. If the second word of a compound loses its tone, many lexical contrasts will be lost, for no obvious motivation. In other words, we can assume that a principle of structural preservation (for lexical contrasts) is present in both Chinese and English. In Chinese, it keeps the lexical tones on syllables with secondary stress. In English, pitch accents are not contrastive and so they can be omitted from syllables with secondary stress, without violating structure preservation.

The preservation of lexical contrasts can also explain why contextual meanings are not expressed in terms of pitch accents in Chinese. Since every Chinese word has a lexical tone, if it takes a pitch accent, it will lose its lexical distinction. Therefore, contextual meanings in Chinese are mainly expressed in terms of boundary tones.

3.2.3 Comparison between English and Chinese again

I have argued that the differences between English and Chinese derive from a single fact that Chinese has lexical tones and English does not. This is summarized in (38).

(38)

	Chinese	English
Lexical tones	>1	0
Pitch accents	Expected	Expected
Tone-stress anchor	Yes	Yes
Boundary tones	Yes	Yes
Stress obvious?	Expected	Expected
Tone on secondary stress	Expected	Expected
Downstep	Yes	Yes

Because Chinese tones are lexically contrastive, they cannot be replaced by pitch accents to express contextual meanings. In contrast, English has no lexical tones, and so its words can take different pitch accents to express contextual meanings. Similarly, because Chinese has lexical tones, words with secondary stress also have tones. In contrast, since pitch accents are not contrastive in English, there is no need to assign them to words with secondary stress. Finally, because all full syllables have tone in Chinese, their stress difference is not obvious. In contrast, because only main stress has a pitch accent in English, the stress difference between full syllables is still obvious. Other than the fact that Chinese has lexical tones and English does not, the two languages have a lot in common. Both have stress. Both have tones anchored on stressed syllables: lexical tones in Chinese and pitch accents in English. Both have boundary tones. Both have downstep effects. A simple typology of tone vs. non-tone languages does not reflect such intricate relations.

3.3 Differences within tone languages

Within tone languages, there are important differences. I discuss two cases: (a) deletion of non-initial tones and (b) contour tone split.

3.3.1 Deletion of non-initial tones

In Mandarin Chinese a syllable generally keeps its tone whether in isolation or in combination. In contrast, in Shanghai Chinese, non-initial syllables lose their underlying tones. The difference is shown in (39) and (40), transcribed in phonetic symbols.

(39) Mandarin: no tone deletion

HL	HL
tʲan-	hʷaa
tele-	phone

'telephone'

(40) Shanghai: deleting non-initial tone

LH	LH	→	L	H
di-	ɦo		di-	ɦo
tele-	phone			

'telephone'

In Mandarin Chinese, each word keeps its own tone. However, in Shanghai, the second word loses its underlying tone. In the traditional analysis, Shanghai has two special

rules, one deleting the tone from non-initial syllables and one spreading a tone of the first syllable to the second (Jin 1986). This is shown in (41).

(41)

Underlying			Deletion			Spreading	
LH	LH	→	LH		→	L	H
di-	ɦo		di-	ɦo		di-	ɦo
tele-	phone						
'telephone'							

In contrast, Mandarin Chinese simply does not have the deletion or spreading rule.

A problem with the traditional analysis is that it misses a correlation between syllable weight and the deletion of non-initial tones (Duanmu 1999a). Deletion of non-initial tones occurs only in "light-syllable dialects"—those that have CV syllables only, but not in "heavy-syllable dialects"—those that have both CV and CVX syllables, where CVX is a heavy syllable (either CVV or CVC). Given the difference in syllable weight, there is a way to derive the difference in tone deletion. First, we note that there is a relation between tone and stress, stated in (42).

(42) Tone-Stress Principle
Only stressed syllables can be assigned a tone pattern (pitch accents)

In languages like English, the Tone-Stress Principle requires pitch accents to be anchored on stressed syllables (Liberman 1975, Goldsmith 1981, Pierrehumbert 1980). In Chinese, the Tone-Stress Principle requires totally unstressed syllables to lose their underlying tones.

Given the Tone-Stress Principle, the difference between Mandarin Chinese and Shanghai Chinese can be explained as follows. In Mandarin, there is a contrast between heavy and light syllables. Each heavy syllable is a bimoraic trochee. Thus, every heavy syllable has stress, and so every heavy syllable can keep its underlying tone. In addition, since every heavy syllable has two moras, it can take two tonal features, HL or LH. The compound 'telephone' is analyzed in (43), where **m** is a mora.

(43)

HL	HL	
(mm).	(mm)	Moraic feet
t^{j}an-	h^{w}aa	
'telephone'		

In Shanghai, all syllables are CV, and there is no contrast between heavy and light syllables. Thus, no syllable is inherently bimoraic. A syllable is long when it occurs in a position that has compound or phrasal stress, such as the first noun in a compound. In this case, it can retain its underlying tone. Other syllables do not have stress and will lose their underlying tones. The compound 'telephone' is analyzed in (44).

(44)

Underlying			Deletion			Spreading	
LH	LH	→	LH		→	L	H
di-	fio		dii-	fio		dii-	fio
			(mm).	m		(mm).	m
			*			*	
			Compound stress				

When compound stress is assigned to the first syllable, it becomes long owing to a constraint known as the Weight-Stress Principle (or Prokosch's Law, Hammond 1997, Golston 1998), which requires stressed syllables to be heavy. In addition, by the Tone-Stress Principle, the first syllable can keep its underlying tone. The second syllable has no stress and so loses its underlying tone. The tone of the first syllable also splits over the two syllables, to be discussed next.

3.3.2 Contour tone split

In some tone languages, such as Shanghai Chinese and Mende, contour tones split into level tones when a toneless syllable is available. In other tone languages, such as Mandarin Chinese, contour tones do not split even if a toneless syllable is available. Consider Mende first (Leben 1973), shown in (45).

(45) Mende: contour tone split

	Monosyllable		Disyllable	
Pattern1	ko	H	pepe	H-H
Pattern2	kpa	L	bele	L-L
Pattern3	mbu	HL	kenya	H-L
Pattern4	mba	LH	nika	L-H

On monosyllables, Mende has four tone patterns: H, L, HL (fall), and LH (rise). On disyllables, HL splits into H-L and LH splits into L-H. We have seen earlier that contour tones also split in Shanghai. Another example is shown in (46), where 0 indicates lack of tone.

(46) Shanghai: contour tone split

LH	0	→	L	H	(*LH-0)
le-	le˧		lee-	le˧	
come	ASP				
'came'					

The underlying tone of the verb 'to come' is LH. When followed by the toneless aspect marker, LH splits into L-H.

Unlike Mende or Shanghai, contour tones do not split in Mandarin Chinese or most other Chinese dialects, even when a toneless syllable is available. An example from Mandarin is shown in (47).

(47) Mandarin: no contour tone split

LH	0	→	LH	0	(*L-H)
lai-	le		lai-	le	
come	ASP				
'came'					

It has been proposed that the difference between Shanghai and Mende on the one hand and Mandarin and other Chinese dialects on the other is the result of a parameter that determines the nature of contour tones in a given language (Pike 1948, Yip 1989, and references therein). The contour tone parameter is shown in (48).

(48)

Contour tone unit	Contour tone cluster
TBU	TBU
|	/\
°	H L
/\	
H L	
Mandarin	Shanghai, Mende

In Mandarin a contour tone is linked to the tone-bearing unit (TBU) as a single unit. In Shanghai and Mende a contour tone is made of two separate level tones, each is independently linked to the TBU.

The contour tone parameter analysis has three shortcomings. First, it fails to explain where the contour parameter comes from. In particular, why does Shanghai Chinese share the same parameter with the African language Mende, instead of with Mandarin Chinese? Second, it fails to explain the fact that contour tones only fall on

long syllables (Woo 1969, Duanmu 1994). Third, it fails to explain the fact that, in Chinese, contour tone split occurs only in those dialects that do not have CVX syllables, but not in those dialects that do.

Following Duanmu (1999a), I suggest that contour tones can split only under two conditions, given in (49).

(49) Contour tones split when
  a. there is a following free syllable, and
  b. tonal distinctions are maintained

First, consider the case in Shanghai Chinese, shown in (50).

(50) Shanghai: Two tonal patterns; distinction maintained

Word	Word+0
HL	H-L
LH	L-H

Ignoring the influence of the initial consonant voicing, Shanghai has two tonal patterns on monosyllables, HL and LH. When they split over a disyllabic unit, the distinction is still maintained on the initial syllable (H is still different from L). Therefore, contour tone split does not result in loss of tonal distinctions. Next consider Mandarin Chinese, shown in (51).

(51) Mandarin: Some distinctions will be lost under split

Word	Word+0	Word+0	
H	H-0	H-0	
HL	HL-0	H-L	(=H-0 or H-L)
L	L-0	L-0	
LH	LH-0	L-H	(=L-H)
	Actual	If split	

Mandarin has four tones on monosyllables. If they split over a disyllabic unit, some tonal distinctions will be lost. For example, if HL-0 becomes H-L, it will be similar to H-0, where 0 is usually realized with a low pitch. In addition, the change HL-0 → H-L will likely confuse with a real H-L. Similarly, if LH-0 becomes L-H, it will confuse with a real L-H. Since so many tonal distinctions would otherwise be lost, it is natural that Mandarin Chinese keeps contour tones intact. Finally, consider Mende, shown in (52), which forms an interesting contrast with Mandarin.

(52) Mende: distinction maintained under split

σ	σ-σ
H	H-H
HL	H-L
L	L-L
LH	L-H

Mende has four tonal patterns, similar to those in Mandarin. When contour tones split over a disyllabic unit, the four patterns still remain distinct overall. In particular, H-0 surfaces as H-H (after spreading the H over both syllables), which does not confuse with H-L (from HL-0). It is interesting to compare the relevant patterns in Mende and Mandarin, shown in (53).

(53)

Mende		Mandarin		
σ	σ-σ	σ	σ-σ	
H	H-H	H	H-0	(*H-H)
HL	H-L	HL	HL-0	(*H-L)

There are two ways to keep H-0 and HL-0 distinct. One is to change them to H-H and H-L, which is adopted in Mende. The other is to keep them as H-0 and HL-0, which is adopted in Mandarin. But why do languages adopt different strategies? I argue that it is again related to tonal distinctions. In Mandarin, most words are monosyllabic, and the occurrences of underlying H-H and H-L are very frequent. If H-0 and HL-0 regularly become H-H and H-L, there will be frequent losses of tonal distinctions. In contrast, in Mende many words are disyllabic (or longer), and the occurrences of underlying H-H and H-L are not frequent. Therefore, H-0 and HL-0 can become H-H and H-L without serious losses of tonal distinctions. (A further possibility is that Mende syllables are mostly CV, which is not inherently heavy. Thus, as in Shanghai, only the initial syllable has stress and can be anchored with a tone pattern.) The same analysis explains why LH-0 becomes L-H in Mende but not in Mandarin.

In summary, whether contour tones split or not depends primarily on the preservation of tonal distinctions, which in turn depends on the number and the kind of tone patterns a language has, and on whether tones occur densely (when most words are heavy monosyllables) or sparsely (when most words are polysyllabic or when all syllables are CV). There is no need to assume a contour tone parameter, nor can it capture the intricate interactions we have seen.

3.4 Lack of guide for research

The above discussion also reveals a more serious problem with the typological or parametric theory, namely, it offers no guide for research. In particular, when we see a difference between two languages, the theory does not tell us whether the difference is real, so that no further inquiry is needed, or whether the difference is only apparent, so that further research will reveal hidden similarities. For example, when one sees an apparent lack of stress in Chinese, one can readily assume a typology of stress vs. non-stress languages, or a parameter to that effect, as Hyman (1977) does, and that will be the end of inquiry, because the theory does not urge us to look for evidence that Chinese also has stress, which I have argued to be the case. Similarly, when one sees a difference in contour tone split between Mandarin Chinese and Shanghai Chinese, one can readily propose a typology of contour tones, as Pike (1948) and Yip (1989) do. And that will be the end of inquiry, because the theory does not urge us to look for a connection between contour tone split, syllable weight, and the number of tonal patterns in a language, a connection that I have argued does exist. Worse still, the typological/ parametric theory does not value the discovery of similarities across languages. For example, even if we discover that Chinese also has stress after all, and that contour tones in Mandarin are not units, the typological/parametric theory will consider the discovery to be trivial. The reason is that, according to the typological/parametric theory, languages can in principle differ in stress or tone, so that the next language may have no stress, or the next language may have contour tone units.

3.5 Summary

I have argued that a simple typology of tone vs. non-tone languages does not offer a clear-cut classification, does not reflect similarities between tone and non-tone languages, and does not capture differences within tone languages. In addition, the theory offers no guide for research in that it does not encourage research beyond labeling language differences, nor does it value the discovery of underlying similarities, should one happen to find them.

4. A theory without typology or parameters

In this section I propose a theory that specifies in which ways languages can differ (language differences) and in which ways they cannot (language universals). I propose that languages can differ only in three ways, stated in (54).

(54) Three ways in which languages can differ
   a. The association between sound and meaning
   b. The selection of inventories
   c. Different ways to satisfy the same linguistic requirements

The first difference is well known. For example, 'cat' is [kæt] in English but [mau] in Mandarin Chinese. The difference is completely arbitrary and there is no further linguistic explanation for it. (In some cases, the sound-meaning association may be due to sound symbolism. However, I assume that not all sound-meaning associations are due to sound symbolism.)

The second difference refers to such language choices as how many consonants to use, how many vowels to use, how many lexical tones to use, and so on. For example, Mandarin Chinese uses five vowels and English uses over ten. The difference is again arbitrary and there is no further linguistic explanation for it. It is true, however, that a given selection of an inventory does have specific consequences. For example, if a language selects one low vowel, the vowel may be unspecified for the feature [back], so that it may alternate between front and back according to the phonological environment. Similarly, if a language selects CV syllables only, there will be consequences in other aspects of phonology, such as stress, the density of lexical tones or pitch accents, and contour tone split. As discussed in §2, inventory selection is not the same as typological or parametric choices, because choices for the former are quite open, whereas choices for the latter are usually thought to be limited.

The third difference has not been discussed so far. Let us consider an example. Suppose there is a requirement that word stress must fall on a disyllabic trochee, and that an empty beat Ø is available in word final position. A word can have different stress locations without violating the requirement, as shown in (55), where S is a stressed syllable and s an unstressed one.

(55) Different ways to satisfy syllabic trochee

Word length	Stress patterns
s	(SØ)
ss	(Ss), s(SØ)
sss	(Ss)s, s(Ss), (Ss)(SØ), ss(SØ)

A language may choose initial stress, such as Chinese (Duanmu 2000a), or final stress, such as French (mostly), or allow various stress patterns at the same time, such as English. For example, for trisyllabic words, English uses (Ss)s as in *Canada*, s(Ss) as in *Chicago*, and (Ss)(SØ) as in *Tennessee*. There is no linguistic explanation for why a

language chooses a given way to satisfy a linguistic requirement, it seems to me.

Beyond the three ways in which languages can differ, I propose that all the remaining properties are universal. For example, both Chinese and English share the properties in (56).

(56) Weight-Stress Principle
Tone-Stress Principle
Moraic trochee
Syllabic trochee
Cyclic compound and phrasal stress
Rime reduction for unstressed syllables
Boundary tones
Downstep

It is beyond the scope of the present paper to discuss each of the properties in detail, or to discuss their role in other languages. Nevertheless, I shall offer some brief notes. The Weight-Stress Principle is supported by the fact that in Shanghai Chinese, stressed syllables are phonetically twice as long as unstressed ones (Zhu 1995), even though all syllables in Shanghai are CV. The need for both moraic trochee and syllabic trochee in Chinese is discussed in Duanmu (1999a). The need for both moraic trochee and syllabic trochee in English is discussed in H. Kim (2000).

The present proposal, if correct, has several advantages. First, it makes no additional assumption, because inventory selections must be assumed in any theory. Second, it offers a clear guide for research. If we see a language difference beyond the three ways noted above, we are urged to take a close look and find out whether the difference is real. If it is real, the theory must be modified. Third, the present theory offers a better understanding of various properties in different languages. For example, consider how the inventory of lexical tones affects intonation, stress, and contour tone split, shown in (57).

(57)

Lex. tones	Intonation	Stress	Contour tones	Examples
0	active	clear	split	English
1	limited	unclear	split	Korean, Japanese
2	limited	unclear	split	Shanghai
3 or more	limited	unclear	other factors	Mandarin, Mende

It is important whether a language has lexical tones or not. With no lexical tones, stress is easy to feel and intonation is active, whereas with even one lexical tone, stress

becomes hard to feel and intonation becomes subdued. On the other hand, the number of lexical tones is also important, because they affect the behavior of contour tones. Moreover, other factors affect tones, too, such as syllable weight and word length, as discussed in §3.

5. Further issues

In this section I discuss accent in Japanese and whether tone and intonation involve the same features. I also address some other issues related to the present proposal.

5.1 Accent in Japanese

A common analysis of Japanese tone is that it has one tone pattern, which is H associated with the accented syllable (or mora) of a word (Block 1946, McCawley 1965, Haraguchi 1977). The H then spreads leftward to all syllables except the first. The location of accent may vary, just as the location of stress may vary in English words. Some examples are shown in (58), where the "accented" syllable is underlined.

(58)	<u>ka</u>kiga	H-L-L	'oyster'
	ka<u>ki</u>ga	L-H-L	'fence'
	kaki<u>ga</u>	L-H-H	'persimmon'

In the examples, the "accented" syllable is where H ends. In the first word it ends on the first syllable. In the second word it ends on the second syllable. In the third word it ends on the third syllable; should the third word have a suffix, the suffix would start with L.

In the present proposal, Japanese has one lexical tone, which is linked to the accented (stressed) syllable. Because of the lexical tone, stress is hard to feel, and intonation is subdued. Both seem to be the case in Japanese.

There are, however, two other puzzles in Japanese phonology. First, the so-called "accent" has no phonetic or phonological correlate, except it is where H ends and L starts. It is unlike stress in Chinese and English, which falls on heavy (long) syllables, which are phonetically stronger than weak syllables. Second, besides words that have an accent, Japanese also has words that are thought to have no accent. These are words that end in H and, when a suffix is added, the suffix will continue with H. Some examples are shown in (59), cited in McCawley (1968:132), where the H in parentheses refers to the tone on the next syllable (in the suffix).

(59) Words without "accent"

katati	L-H-H-(H)	'form'
tomodati	L-H-H-H-(H)	'friend'
tamagoyaki	L-H-H-H-H-(H)	'omelet'

From the perspective of Chinese and English, all polysyllabic words have stress. If "accent" is related to stress phonologically (both being manifestations of phonological prominence), it is quite unusual for polysyllabic words to have no accent. In addition, the Tone-Stress Principle requires that lexical tones or pitch accents be anchored on stressed syllables, which is true in Chinese and English. It is unexpected, therefore, that tones in Japanese can occur in words without stress (or accent). One possibility is that unaccented words are assigned final stress, so that when there is no suffix stress falls on the last syllable of the word, and when there is a suffix stress falls on the suffix. However, I shall leave the final analysis open.

5.2 Do tone and intonation involve the same features?

In generative phonology, both tone and intonation are represented as sequences of H's and L's. This means that tone and intonation involve the same phonological features. If so, there are specific predictions as to which representations are possible. In particular, a phonological feature can only be articulated one at a time. For example, we cannot articulate [+round, +round] at the same time, nor can we articulate [+round, -round] at the same time. It follows that no phonological feature should be represented on two (or more) tiers simultaneously. For example, we cannot represent [+round] on top of another [+round] simultaneously, or [+round] on top of [-round] simultaneously. Similarly, it is not possible to have the so-called "simultaneous addition" of tone and intonation as suggested by Chao (1933) (although Chao's "successive addition" is possible). In other words, it is not possible to overlay a sequence of H's and L's (intonation contour) on top of another sequence of H's and L's (word tones). In what follows I discuss why tone and intonation involve the same phonological features. I also discuss the effect of stress on pitch range, which may give the impression of a super-imposed layer of intonation over tone.

There are two reasons to believe that tone and intonation involve the same phonological features. First, there is no evidence in articulatory phonetics that tone and intonation involve different articulatory gestures. Since phonological features are executed by articulatory gestures, it is reasonable to assume that tone and intonation involve the same phonological features. Second, tone speakers perceive intonation as tones. For example, Chinese speakers consider "boundary tones" (a part of intonation,

according to the standard intonation analysis) to be an extension of word tones, instead of something different. In addition, Chinese speakers perceive English intonation as tones. This can be shown with two examples. The first is from Chao (1980:42), which shows that when English words are borrowed into Cantonese Chinese, a stressed English syllable often becomes a high-toned Cantonese syllable. Consider the examples in (23), where stress in English is indicated by underline.

(60)	English	Cantonese
		H- L
	Oakland	[ok-løn]
		M- H- L
	Pacific	[p^{h}a-si-wik]

The choice of tones in Cantonese is understandable if we realize that the stressed syllable in English has H in neutral intonation. Obviously, Cantonese speakers hear the H in English as the same H in Chinese. A second example involves a rule in Mandarin Chinese, by which T3 (L) changes to T2 (LH) before another T3, or L+L → LH+L. As noted by Cheng (1968), the rule also applied when T3 is followed by an unstressed English syllable in code switching. This is shown in (61), where the point of interest is the tone of *xiao* 'small'.

(61)						
a.	L	L-H-L	→	LH	L-H-L	(*L L-H-L)
	xiao	professor				
	'small professor'					
b.	L	H-L-L		(*LH	H-L-L)	
	xiao	lecturer				
	'small lecturer'					

In (61a), the tone of *xiao* 'small' must change from L to LH. In (61b), the tone of *xiao* must remain L and cannot change to LH. The reason is that an unstressed syllable in English normally has L, which is heard as T3 (L), which triggers the Mandarin tone sandhi in (61a). In contrast, a stressed syllable in English normally has H, which does not trigger tone sandhi. This shows, once again, that Chinese speakers hear H and L in English intonation as H and L in Chinese tone. This is also true for bilingual speakers of Chinese and English, which shows that it is not an issue of misperception.

5.3 Other issues

I have proposed a list of properties in (56) and suggested that they are probably universal. A reviewer wonders how the claim can be proven if I have only discussed Chinese and English and if many languages remain to be studied. There are three answers. First, the present proposal is the null hypothesis; it makes no additional assumptions other than inventory selections, which all analyses must assume. Second, the present proposal is preferred because it is stronger than those that assume language typology or parameters. In other words, the present proposal is easily falsifiable, whereas a typological or parametric theory is hardly falsifiable. Third, many of the properties in (56) are not immediately obvious in Chinese and English. As I have argued, they are found to be present in both languages only after careful studies. It is possible, therefore, that apparent exceptions in other languages may turn out not to be so either.

A reviewer also notes that "no typologist claims that languages that belong to the same type … must be the same in other respects." Therefore, it is irrelevant to criticize typology for not capturing differences among languages of the same type. However, the reviewer's remark confirms the point that typology is hardly useful, beyond the convenience of superficial classification.

Finally, a reviewer points out that there may be distinctions that I fail to make, such as stress vs. accent for metrical prominence, and H and L in an intonation language (such as English) vs. H and L in a tone language (such as Chinese). I agree with the reviewer that "these notions are by no means clear-cut in the literature", as Yip (2002) has pointed out. What I have proposed is the null hypothesis, which assumes just two phonological entities, stress and tone. It remains to be shown, in my view, whether there is clear evidence for a further distinction of stress vs. accent metrically, or a distinction of H and L for intonation vs. H and L for tones.

6. Conclusions

I have argued that the typological or parametric approach does not offer a clear-cut classification of languages, nor does it offer much insight into similarities and differences among languages. In addition, it offers a poor guide for research, in that it cannot tell us whether an observed language difference is real or whether it is only apparent, and so we do not know whether research is needed to account for the difference.

As an alternative, I have proposed a theory in which there is no typology or parameters. Instead, languages can differ in their selection of various phonological inventories (vowel inventory, consonant inventory, tonal inventory, etc.). Each inventory selection has a specific set of properties, and the interactions among the inventory

selections give the overall properties of a given language. Beyond inventory selections, all languages share the same phonological requirements (which can sometimes be satisfied in different ways). Any apparent violation of the requirements calls for a close examination. The present theory is simpler, offers a better guide for research, and offers a better understanding of language differences and language universals.

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聲調與非聲調語言：
語言類型學與參數的替代方案

端木三

密西根大學

語言學家好將語言作種種類型分類。在生成音韻學中，語言類型之分係以參數爲之，諸如揚抑格抑抑揚格的參數，或計音節抑計音拍的參數等等。以聲調與非聲調語言而論，我認爲這種類型的或參數的辦法有四個問題。第一，無法作清楚的歸類。第二，無法掌握不同語言類型的相似性。第三，無法掌握同一類型不同語言的差異性。第四，無法提供好的研究指引。我將提出一個替代方案，這個方案中並沒有類型或參數，有的是各語言對音韻目錄（元音目錄、輔音目錄、聲調目錄等等）的不同選擇。每種選擇都有其特點，而個別語言的整體特徵即來自不同目錄選擇的相互作用。這個方案既簡單、有較好的研究指引，更能對語言差異與通則提供較佳的理解。

關鍵詞：聲調，類型學，參數