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Haruo Kubozono,
Mikio Giriko (Eds.)

TONAL CHANGE AND NEUTRALIZATION

PHONOLOGY AND PHONETICS

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Tonal Change and Neutralization

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Edited by
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Contents

Preface —— VII

Haruo Kubozono and Mikio Giriko
Introduction —— 1

Part I: **Tonal Neutralization**

Larry M. Hyman
Towards a Typology of Postlexical Tonal Neutralizations —— 7

Haruo Kubozono
Postlexical Tonal Neutralizations in Kagoshima Japanese —— 27

Toshio Matsuura
Tonal Neutralization and Lexical Category in Nagasaki Japanese —— 58

Yosuke Igarashi, Yukinori Takubo, Yuka Hayashi and Tomoyuki Kubo
Tonal Neutralization in the Ikema Dialect of Miyako Ryukyuan —— 83

Zendo Uwano
Accentual Neutralization in Japanese Dialects —— 129

Ray Iwata
Chinese Tonal Neutralization across Dialects: From Typological, Geographical, and Diachronic Perspectives —— 156

Part II: **Tonal Change**

Larry M. Hyman
Towards a Typology of Tone System Changes —— 203

Jonathan P. Evans
Common Tone Sandhi Processes across Sino-Tibetan Languages —— 223

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Pittayawat Pittayaporn
Phonetic and Systemic Biases in Tonal Contour Changes in Bangkok Thai —— 249

Haruo Kubozono
Bilingualism and Accent Changes in Kagoshima Japanese —— 279

Shigeki Kaji
From Nyoro to Tooro: Historical and Phonetic Accounts of Tone Merger —— 330

Carlos Gussenhoven
In Defense of a Dialect-contact Scenario of the Central Franconian Tonogenesis —— 350

Index —— 380

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Preface

This book originated from two international conferences that we organized in Tokyo in 2013—the 2nd International Conference on Phonetics and Phonology (2nd ICPP) held in January and the 3rd ICPP in December. These conferences were hosted by 'Phonological characteristics of the Japanese lexicon', a research project led by the first editor at the National Institute for Japanese Language and Linguistics (NINJAL) during 2010–2016. Since this project was focused on word accent and geminate consonants, the two conferences featured accent and tone as the main topic of their special sessions: tonal neutralization in the 2nd ICPP and tonal change in the 3rd ICPP. All chapters included in this volume are based on the oral talks presented by the speakers at these two conferences and/or at their satellite events.

Like other books of the same kind, this volume could not have been published without the help of many people and organizations. First of all, we would like to thank NINJAL for its generous financial support for the above-mentioned conferences as well as for the editorial work that followed them. We would also like to thank the external reviewers of individual chapters who read each manuscript carefully and provided us with invaluable comments, more than once in many cases. Our special thanks also go to the post-docs who devoted their time and energy over the years to the above-mentioned NINJAL project: Manami Hirayama, Yasunori Takahashi, Izumi Takiguchi, and Mayuki Matsui. Thanks to their great help, the six-year project restarted in April 2016 as a new project entitled 'Cross-linguistic studies of Japanese prosody and grammar' (2016–2022).

Fourthly, we cannot forget the help of Donna Erickson and John Haig who checked the English of individual chapters, more than once in most cases. Sayaka Goto, Gakuji Kumagai, and Natsuya Yoshida also deserve special mention here for their service as editorial assistants. Without these people's help, it would have been very difficult to publish this volume as it is now.

And last, but not least, we would like to thank the series editor, Aditi Lahiri, for reviewing all chapters and giving us appropriate advice at every important phase of our editorial work.

Haruo Kubozono and Mikio Giriko
Tokyo, July 2017

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Haruo Kubozono and Mikio Giriko

Introduction

This is a collection of articles on two closely related topics in tonal phonology: tonal change and neutralization. Neutralization is a phenomenon where a contrast or opposition that exists in a language is lost in some particular context(s) in its synchronic grammar. Tonal neutralization thus refers to a loss of tonal contrast, e.g. Tone A and Tone B, in one context although the contrast exists in other contexts of the same language. On the other hand, tonal change refers to a historical change in tone that takes place in the course of time. For example, a certain tone may change its phonetic value. It may merge with another tone so that the two tones become indistinguishable from each other in any context. Moreover, a system may acquire new tones or tonal contrasts for some reason.

This book aims to contribute to phonetics and phonology in the following three respects. First, it gives in-depth analyses of tonal changes and neutralizations. Neutralization and change have both been hot topics in the phonological research in the past, but no book has ever been published specifically on tone (except for books on tone sandhi). In this sense, this is the first book to be dedicated to tonal change and neutralization. Specifically, postlexical neutralization discussed in some articles is a new area in prosodic research. Second, the book covers a wide range of tone and pitch-accent languages in Asia, Africa and Europe, with a main focus on Asian languages. It includes new tonal data and analyses of various Japanese and Chinese dialects, many of which are endangered now. Most of these languages/dialects have so far only been reported on in local journals or books. Third, it presents not only novel unpublished data and analyses about individual languages/dialects, but also provides typological perspectives on tonal change and neutralization.

To achieve these goals, this book consists of two parts, Tonal Neutralization (Part I) and Tonal Change (Part II), comprised of six articles each. Each part starts with a typological survey by Larry Hyman, followed by analyses of individual languages/dialects most of which have not been seriously discussed in the literature.

Part I

The volume starts with **Larry Hyman**'s article entitled "Towards a typology of postlexical tonal neutralizations", which surveys a number of contributing

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factors that result in postlexical tonal neutralizations. Distinguishing between "intentional" vs. "incidental" neutralization, the author illustrates neutralizations which result from assimilatory processes, reductions, and overwriting (by morphology, syntax or intonation). He proposes typological generalizations on the basis of this analysis.

Hyman's typological study is followed by five articles which examine tonal neutralizations in individual languages. In an article entitled "Postlexical tonal neutralizations in Kagoshima Japanese", **Haruo Kubozono** analyzes how postlexical processes affect lexical tonal patterns and how postlexical tonal neutralizations can (or cannot) lead to a loss of lexical contrasts in Kagoshima Japanese, a southern Japanese dialect with two lexical tonal classes. He examines the interactions of lexical accent and two postlexical processes (question and vocative intonation) and demonstrates that while the dialect does not show any tonal neutralization at the lexical level, the lexical distinction is lost in some phonological contexts at the postlexical level.

Toshio Matsuura looks at Nagasaki Japanese, a sister dialect to Kagoshima, in his article "Tonal neutralization and lexical category in Nagasaki Japanese". He analyzes tonal neutralizations in this southern dialect, with particular reference to their morphological conditions. Like Kagoshima Japanese, Nagasaki Japanese has two contrastive tonal classes, which, according to previous studies, are neutralized in compounds if their first element contains three or more moras. Based on his original fieldwork, the author demonstrates that Verb-Verb compounds keep the lexical tonal distinction even if the first element contains three or more moras, while some Verb-Noun compounds do neutralize tonal contrasts.

In the article entitled "Tone neutralization in the Ikema dialect of Miyako Ryukyuan", **Yosuke Igarashi and his coauthors** examine tonal neutralizations in a Ryukyuan dialect, which has recently been discovered to have three tonal classes rather than two. Their fieldwork study shows widespread tonal neutralizations in this dialect where the three-way contrast can only be observed in very restricted contexts. They explore the prosodic conditions that bring about the observed neutralizations and propose generalizations about surface pitch patterning in utterances. They also demonstrate that long utterances often exhibit pitch patterns resulting from the Principle of Rhythmic Alternation, which can also trigger tonal neutralization in some cases.

Zendo Uwano examines tonal neutralizations across Japanese dialects in the article entitled "Accentual neutralizations in Japanese dialects". He proposes that tonal neutralizations in Japanese dialects can be classified into two types, narrow and broad neutralizations. The former is a typical or strict type of neutralization that refers to the pitch progression immediately before and after the accentual unit, while the latter is a non-typical neutralization characterized by

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pitch patterns differentiated by the preceding or subsequent environment. Based on this idea, the author considers six cases of neutralization of the former type and four cases of the latter type.

This is followed by **Ray Iwata**'s article entitled "Chinese tonal neutralization across dialects: From typological, geographical and diachronic perspectives". This article proposes a typology of Chinese tone sandhi based on the theory of neutralization. It puts forward two dichotomies, final-accented vs. initial-accented and context-free vs. context-dependent, which function as the triggers of tonal neutralization. The former dichotomy contributes to differentiating the domain of neutralization: lexical vs. postlexical, compound vs. phrase. In contrast, the dichotomy between context-free and context–dependent neutralizations assumes three levels of parameter extension: single, multiple, and extensive (or maximum). The typology thus established is exhibited by mapping each type of tonal neutralization.

Part II

Part II consists of six articles discussing tonal change in one way or another. It begins with **Larry Hyman**'s typological survey entitled "Towards a typology of tone system changes". In this article the author is mainly concerned with two issues: (i) how tone systems acquire more tonal contrasts and (ii) how tone systems lose tonal contrasts. According to his analysis, the first issue concerns laryngeal factors and the natural pitch effects that tones have on each other. On the other hand, the second concerns both tonal mergers and the restriction of tonal contrasts to certain positions of the word or phrase, which may ultimately lead to the complete loss of tone.

This typological survey is followed by five articles all of which discuss tonal changes in individual languages. In an article entitled "Common tone sandhi processes across Sino-Tibetan languages", **Jonathan Evans** points out patterns in tone sandhi processes that recur across the prosodically-diverse languages of the Sino-Tibetan family. The Sinitic branch specifies lexical tone on almost all syllables, while western Tibeto-Burman languages typically exhibit sparse tone specification. Despite these differences, dominant spreading tones are aligned with the left edge of the prosodic unit and spread rightward in both groups of languages. On the other hand, while dominant non-spreading tones in Sinitic are aligned with the right edge of their domain, Tibeto-Burman languages display variable placement of such tones. Accent-like properties of dominant tones are claimed to play a role, as well as typical word length and the paths of tonogenesis.

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Pittayawat Pittayaporn examines tonal changes in Thai in the article entitled "Phonetic and systemic biases in tonal contour changes in Bangkok Thai". Adopting a phonetically-based approach to sound change, the author proposes to account for the tonal contour changes in Bangkok Thai during the 20th century in terms of biases that exist in human speech. He claims that the changes are explicable by known patterns of phonetic variation and systemic constraints that introduce bias into the process of phonologization. He thus argues that the tonal contour changes are linguistically motivated just like most segmental changes.

This is followed by an article by **Haruo Kubozono** entitled "Bilingualism and accent changes in Kagoshima Japanese", which examines how one dialect changes its accent system when it meets another dialect of the same language. It demonstrates that the accent patterns of young Kagoshima speakers are heavily influenced by the pitch patterns of standard Tokyo Japanese, that they are particularly sensitive to the presence or absence of a pitch fall in Tokyo forms, and that they have phonological knowledge about accent rules in the standard dialect in addition to the accentual distinctions in individual words. This shows the extent to which bilingualism can change the accent system of a particular dialect. Furthermore, the article demonstrates that pitch accent patterns in other Japanese dialects are also heavily influenced by the accent patterns of the standard dialect.

Shigeki Kaji's article entitled "From Nyoro to Tooro: Historical and phonetic accounts of tone merger" takes us to the southwestern region of Uganda in Africa, where some closely related Bantu languages such as Nkore, Kiga, Tooro, and Nyoro are spoken. The author examines the similarities and differences between the tonal systems of these languages and proposes a historical scenario explaining the differences, focusing on the transition from the two-tone pattern system of Nyoro to the one-tone pattern system of Tooro.

An article by **Carlos Gussenhoven** entitled "In defense of a language-contact scenario of the Central Franconian tonogenesis" concludes this volume. It characterizes the Central Franconian dialects of German, including Limburgish as spoken in Belgium and the Netherlands, as well as Luxembourgish, as having (or as having had, until recently) a lexical tonal contrast. It argues against phonetically-motivated analyses that assume a development of allophonic pitch variation into contrastive tone. Instead, the article defends an account that assumes a morphological origin of the tone contrast due to dialect contact. The author carefully analyzes the arguments that have been raised against the latter view and elaborates on one of these to show that the facts it is based on actually support the dialect-contact view.

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Part I: **Tonal Neutralization**

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Larry M. Hyman

Towards a Typology of Postlexical Tonal Neutralizations

Abstract: This article surveys a number of contributing factors which result in postlexical tonal neutralizations, including properties of the target and trigger, the nature and extent of the process, and the domain within which the process occurs. Distinguishing between "intentional" vs. "incidental" and "recoverable" vs. "unrecoverable" neutralization, I illustrate neutralizations which result from assimilatory processes, reductions, and overwriting (by morphology, syntax or intonation). Of particular interest are systems such as Kalabari, an Ijoid language spoken in Nigeria, that exhibit reduction + melodic overwriting. After sorting out the different kinds of postlexical neutralization processes that occur (and in which environments), I present the typological generalizations which emerge. For example, one clear tendency is for the lexical N or V head of an XP to undergo modification in both head-initial and head-final languages. While this is clear in the case of tonal reduction and tonal overwriting, I consider how this generalization interacts with the tendency for tonal assimilations to be perseverative (vs. accentual phenomena, which are often anticipatory).

Keywords: tone, typology, neutralization, recoverability, reduction

1 Intentional vs. incidental neutralization

Specialists of accentual systems are well aware that word-based prominences often neutralize postlexically, and hence fail to receive full phonetic realization at the phrase level. Specialists of tone systems are equally aware that lexical tonal contrasts can be neutralized at the phrase level by a number of processes, some of which are suggestive of "accentual" behavior. In this article I attempt to provide an overview of the issues involved in postlexical (phrasal) tonal neutralizations across different languages and prosodic systems. Logically we can distinguish the following relevant parameters of tonal neutralization:

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(1) a. properties of the target (e.g. H, L, all tones)
b. properties of the trigger (e.g. a tone, domain boundary, grammatical construction, intonation)
c. nature of the process (e.g. assimilation, dissimilation, reduction, melodic overwriting)
d. extent of the process (e.g. total neutralization of all tones vs. of some tones)
e. domain of the process (e.g. compounds, phonological phrase, intonational phrase)

In what follows I will distinguish between *intentional neutralization*, where the process in question has neutralization as an explicit goal, vs. *incidental neutralization*, where the process in question has neutralization as an innocent bystander. It is well-known that tonal contrasts may not all be realized on words in isolation. A rather striking example of intentional neutralization occurs in Coreguaje [Tukanoan; Colombia], schematized in (2).

(2)	CVCV:	*underlying*	*statement*	*question*	CVV:	*underlying*	*statement*	*question*
		/H-H/	L-HL	H-L		/H/	HL	HL
		/H-L/	L-HL	H-L		/HL/	HL	HL
		/L-L/	L-HL	H-L		/L/	LH	HL
		/L-H/	L-HL	H-L				

As seen, all four combinations of underlying /H/ and /L/ on CVCV nouns merge as L-HL with statement intonation and as H-L with question intonation. Thus Gralow (1985: 3) states: "...we found that in certain frames there were four contrasting sets, but in isolation phrase stress completely neutralized the contrasts, at least in CVCV nouns." (As indicated in (2), CVV nouns also undergo neutralization, but maintain a distinction between /L/ vs. /H/ and /HL/ in statements.) Corejuage thus provides a rather dramatic example of how intonation often obscures tonal contrasts. Since words in isolation are subject to intonation, we are reminded of Pike's (1948) insistence on finding the best "frame" to reveal the full extent of the tonal contrasts. The Corejuage case is an example of *intentional* neutralization: the intonational melodies directly overwrite the lexical tones and thus directly enforce the neutralizations.

Sometimes it is not obviously an intonational melody that overwrites the lexical tones, but rather a boundary tone which has an effect. In Hakha Lai [Tibeto-Burman; Myanmar], words are largely monosyllabic, contrasting two different tones in isolation (Hyman and VanBik 2004: 823):

(3)							
a. HL	hmâa	'wound'	lûŋ	'heart'	râal	'enemy'
b. HL	kêe	'leg'	hrôm	'throat'	kôoy	'friend'
c. L	sàa	'animal'	ràŋ	'horse'	kòom	'corn'

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Although the noun tones in 3(a,b) are identical in isolation, when preceded by a toneless pronominal proclitic such as *ka* = 'my', they differ:

(4)	a.	HL	ka = hmâa	'my wound'	ka = lûŋ	'my heart'	ka = râal	'my enemy'
	b.	LH	ka = kěe	'my leg'	ka = hrǒm	'my throat'	ka = kǒoy	'my friend'
	c.	L	ka = sàa	'my animal'	ka = ràŋ	'my horse'	ka = kòom	'my corn'

As seen, the nouns in (4a) remain HL after *ka* =, while those in (4b) are realized LH. The natural analysis is to consider the latter to be underlyingly /LH/. The reason why /LH/ is realized HL in (3b) is related to the fact that Hakha Lai doesn't permit LH to be preceded by a H tone feature. Thus, as seen in (5a), a /LH/ + /LH/ sequence is realized LH + HL after *ka* =:

(5) a. /ka = kooy + kee/ → ka = kǒoy kêe 'my friend's leg'
LH LH LH HL

b. /kooy/ → kôoy 'friend'
%H LH HL

If we posit an initial %H boundary tone in (5b), the same rule will convert /LH/ to HL in utterance-initial (and) forms.[1] In this case the merger of /LH/ with /HL/ as [HL] is an example of *incidental* neutralization, the consequence of a tone rule triggered in turn by either a lexical or boundary tone.

That this second type of neutralization is incidental is seen rather clearly in closely related Kuki-Thaadow, which contrasts the three underlying tones in (6) (Hyman 2010: 32–33):

(6)	a. /HL/	vâa	'bird'	lâm	'path'	môot	'banana'
	b. /H/	thǒo	'fence'	gǎm	'country'	khǔoy	'bee'
	c. /L/	hlàa	'wing'	vòʔ	'pig'	hùon	'garden'

As indicated in (6b), /H/ words are realized LH in isolation. This can be related to a rule of L tone spreading whereby /L/ + /H/ is realized L + LH, as in (7a).

(7) a. /vòʔ + thóo/ → vòʔ thǒo 'pig's fence'
L H L LH

b. /thóo/ → thǒo 'fence'
%L H LH

1 A reviewer asks why %H is not realized in (3c). In response, note that level /H/ does not exist in Hakha Lai. If we instead posit the initial boundary tone as %LH, it will become L by a general rule in the language (LH + L → L + L) and thus have no effect on the initial /L/ in (3c).

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As in Hakhai Lai, a boundary tone is needed in (7b), this time %L, in order to predict the realization of /H/ as LH on isolation forms.[2] However, unlike the change of /LH/ to HL in Hakha Lai, in this case there is no neutralization, since Kuki Thaadow does not contrast /H/ and /LH/. This shows that boundary tones and tonal assimilation rules do not exist explictly to neutralize underlying contrasts, although there sometimes is an incidental neutralization.

2 Recoverable vs. unrecoverable neutralization

Often when two tones do merge phonetically, their underlying tones can be identified by their effect on other tones. Such a situation arises in Kuki-Thaadow, where rules of H tone spreading and contour simplification have the following effects:

(8)	a.	/H/ + /L/	→	H + HL
	b.	/HL/ + /L/	→	H + L

As seen in (9a,b), /gám/ 'country' and /môot/ 'banana' neutralize as H before /hùon/ 'garden':

(9)	a.	/khuoy + gam + huon/ H H L	→	khúoy gám hûon H H HL	'bee's country garden'
	b.	/khuoy + moot + huon/ H HL L	→	khúoy móot hùon H H L	'bee's banana garden'
	c.	/khuoy + voʔ + huon/ H L L	→	khúoy vóʔ hùon H H L	'bee's pig garden'

This is directly due to the rule in (8b), whereby the /HL/ of /môot/ is simplified to H before /L/. However, as also noted, the tones of /hùon/ are different: Rule (8a) has spread the H of /gám/ to produce [hûon], whereas H tone spreading does

2 As demonstrated in Hyman (2012), the properties of the tone heights are inverted in the two languages: L tones are stable in Hakha Lai, never being deleted, while H is never deleted in Kuki-Thaadow. Presumably this was the result of different tonogenesis processes in the two languages, much as one finds in H- vs. L-marked Athabaskan languages (see Kraus 1979[2005], Kingston 2005 and references cited therein). Justification of the underlying /H/ in Kuki Thaadow was presented in Hyman (2010), where it is shown that L tone spreading will not occur if the /H/ is following by another /H/ or /HL/: /gám/ + /thóo/ → gám thóo 'country fence', /gám/ + /vâa/ → 'country bird'. If we started with sequences of /LH/ we would have to delete both Ls on each. Although an analysis with /LH/ is possible, it would not affect the point being made here: a change from LH to H would not involve neutralization.

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not occur in (9b), since /môot/ has an underlying /HL/ tone. While the phrases in (9a) and (9b) thereby remain distinct, what we do see is a complete neutralization between (9b) and (9c). This is because the /L/ of /vòʔ/ undergoes H tone spreading (8a) to merge with the /HL/ of /môot/. Both then undergo contour simplification (8b).

Another distinction is therefore useful based on the syntagmatic recoverability of merged tones: *Recoverable neutralization* occurs when the underlying contrast can be recovered contextually, as in the case of [gâm] vs. [móot] in (9a) vs. (9b). *Unrecoverable neutralization* occurs when the underlying contrast cannot be contextually determined, as in the case of [móot] vs. [vóʔ] in (9b) vs. (9c). While such syntagmatic recoverability is especially common in tone, it also occurs in segmental phonology. Thus consider the following examples from Yaka, a Bantu language spoken in the Democratic Republic of Congo (Kidima 1991; Hyman 1995: 21):

(10)

			nasal harmony		*denasalization*	
a.	/m-mak-idí/	→	m-mak-i<u>n</u>í	→	m-bak-iní	'I carved'
b.	/m-bak-idí/			→	m-bak-idí	'I caught'

In (10a) the perfective suffix /-idí/ becomes [-iní] by long distance nasal harmony with the root-initial /m/ of the root /mak-/ 'carve'. This is followed by a rule of postnasal denasalization by which /mm/ becomes [mb]. In (10b), where the root is /bak-/ 'catch', there is no nasal harmony. As a result, the underlying contrast between the /m/ of /mak-/ and the /b/ of /bak-/ is recoverable from the nasal of [-iní] vs. the oral consonant of [-idí]. Of course if the roots had instead been directly followed by the general inflectional final vowel /-a/, as in other tenses, there would have been unrecoverable neutralization.

3 Morphologically triggered neutralization

At the lexical level it is extremely common for specific derivational or inflectional morphology to neutralize tones by assigning a tonal melody, as in Kalabari [Ijoid; Nigeria] (Harry and Hyman 2014: 650):

(11)

	transitive			*intransitive*		
a.	kán	H	'demolish'	kàán	LH	'be demolished'
	kɔn	L	'judge'	kɔ̀ɔ́n	LH	'be judged'
b.	ányá	H-H	'spread'	ànyá	L-H	'be spread'
	ɗìma	L-L	'change'	ɗìmá	L-H	'change'
	sá↓kí	H-↓H	'begin'	sàkí	L-H	'begin'

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c. kíkíma	H-H-L	'hide'	kìkìmá	L-L-H	'be hidden'
pákɪrɪ́	H-L-H	'answer'	pàkɪ̀rɪ́	L-L-H	'be answered'
gbóló↓má	H-H-↓H	'mix up'	gbòlòmá	L-L-H	'be mixed up'

As seen in the first column of examples, (transitive) verbs may have any number of tone patterns. On the right we see that there is a process of detransitivization whereby a /LH/ melody replaces the lexical tones of the verb: This will result in a rising LH tone on monosyllabic verbs, L-H on disyllabic verbs, and L-L-H on trisyllabic verbs. As seen in the following examples, the tonal melodies that are assigned by such processes are arbitrary (and can be all L):

(12) a. V → N (H͡L) in Standard Mandarin [tone marking changed]

shán	'to fan'	H	→	shân	'fan'	HL	(Wang 1972: 489)
lǐan	'to connect'	LH	→	lîan	'chain'	HL	
shù´	'to count'	L(H)	→	shû	'number'	HL	

b. N → A (all H) in Chalcatongo Mixtec [Otomanguean; Mexico]

bīkò	'cloud'	M-L	→	bíkó	'cloudy'	H-H	(Hinton et al 1991: 154;
sòʔò	'ear'	L-L	→	sóʔó	'deaf'	H-H	Macaulay 1996: 64)
káʔbā	'filth'	H-M	→	káʔbá	'dirty'	H-H	

c. A → V (L) in Lulubo [Central Sudanic; Sudan]

ōsú	'good'	M-H	→	òsù	'to become good'	L-L	(Andersen
àkēlí	'red'	L-M-H	→	àkèlì	'to become red'	L-L-L	1987: 51)
áfɔ́rɔ́	'yellow'	H-H-H	→	àfɔ̀rɔ̀	'to become yellow'	L-L-L	

4 Neutralization by postlexical reduction

There are three potential effects when the tones are reduced postlexically:

(13) a. reduction
b. reduction + a phonological effect triggered by the tone of a non-reduced word
c. reduction + melodic overwriting determined by construction

We discuss the first in this section. What is perhaps most striking about postlexical tonal neutralizations is that the result is often all L pitch. This is particularly so in languages with privative /H/ vs. Ø contrasts, suggesting that the process is one of tone deletion or "reduction". One such case comes from Haya, a Bantu language of Tanzania (Hyman and Byarushengo 1984), where L is unmarked in the following examples:

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(14)

	no reduction before DEM, NUM		*reduction before* POSS, ADJ	
	'that …'	'one …'	'our …'	'Kato's …'
'frog'	ekikéle kîli	ekikéle kîmo	ekikele kyáitu	ekikele kyaa káto
'basket'	ekikapú kîli	ekikapú kîmo	ekikapu kyáitu	ekikapu kyaa káto
'tale'	ekigano kîli	ekigano kîmo	ekigano kyáitu	ekigano kyaa káto

	'good …'
'frog'	ekikele kilúngi
'basket'	ekikapu kilúngi
'tale'	ekigano kilúngi

Although there is no reduction before demonstratives or numerals, the /H/ root tones of /é-ki-kéle/ 'frog' and /é-ki-kapú/ 'basket' are deleted before possessives and adjectives. (By a separate process the /H/ on the initial vowel /é-/ is deleted postpausally.) Many verb forms also lose their H tones when followed by a post-verbal element, e.g. the personal name *Kâto* in (15).

(15)

a. 'they tie' etc.	b. 'they tie Kato' etc.	
ba-kóm-a	ba-kom-a káto	Present habitual
bá-á-kôm-a	ba-a-kom-a káto	Today Past
ba-kom-íl-e	ba-kom-il-e káto	Yesterday Past
ba-a-kóm-ag-a	ba-a-kom-ag-a káto	Past Habitual
ba-laa-kôm-a	ba-laa-kom-a káto	Today Future
ba-li-kóm-a	ba-li-kom-a káto	General Future

Besides illustrating neutralization to L pitch, the examples in (15) illustrate Gussenhoven's (2006: 204) observation that "… in languages generally it is not uncommon for verbs to have reduced prominence in relation to their objects." Thus, verbs are often unaccented or toneless in languages such as Somali (Hyman 1981) and Basque (Hualde 1999). Haya also underscores the fact that there are often corresponding neutralizations in both noun and verb phrases.

Reduction to L is also well-known from Shanghai Chinese (Zee 1987; cf. Selkirk and Shen 1990). Thus, in (16), the tones are deleted from the non-initial words which are pronounced with L pitch:

(16) a. ɕɪŋ + vəŋ → ɕɪŋ vəŋ 'news' < ɕɪ̂ŋ 'new' (HL)
HL LH H L

b. ɕɪŋ + vəŋ + tɕia → ɕɪŋ vəŋ tɕia 'news reporting circle'
HL LH MH H L L

c. ɕɪŋ + ɕɪŋ + vəŋ + tɕi + tsɛ → ɕɪŋ ɕɪŋ vəŋ tɕi tsɛ 'new news reporter'
HL MH HL LH MH H L L L L

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However, as seen in (17), the endpoint of a contour tone, here the H of the /MH/ rising tone of *k^hʌʔ* ‘cough’ goes on the second word:

(17)	a.	khʌʔ + sɤ MH MH	→	khʌʔ sɤ M H	‘to cough’
	b.	khʌʔ + sɤ + dã MH MH LH	→	khʌʔ sɤ dã M H L	‘cough drops’
	c.	khʌʔ + sɤ + ɟʌʔ + sɪ̡ + bɪŋ MH MH LH MH LH	→	khʌʔ sɤ ɟʌʔ sɪ̡ bɪŋ M H L L L	‘cough tonic bottle’

A similar pattern involving noun compounding occurs in Barasana, a Tukanoan language of Colombia (Gomez and Kenstowicz 2000: 433–434) which contrasts H-H, H-L, L-H, L-HL on bisyllabic words (~ marks nasality, a prosodic property of morphemes):

(18)	a.	H-H + H-L	→	H-H + H-H	~ɨ́dé ~bídí	‘bird (sp.)’
		H-H + L-H	→	H-H + H-H	~kóbé cótɨ́	‘metal cooking pot’
		H-H + L-HL	→	H-H + H-H	héá ~gɨ́tá-á	‘flint stone’
		(~bídì ‘bird’)				
		(còtɨ́ ‘cooking pot’)				
		(~gɨ̀tá-à ‘stone-CL’)				
	b.	H-L + H-L	→	H-L + L-L	~újù ~kùbà	‘kind of fish stew’
		H-L + L-H	→	H-L + L-L	~kíì jècè	‘peccary (sp.)’
		H-L + L-HL	→	H-L + L-L	héè rìkà	‘tree fruits (in ritual)’
		(~kúbà ‘stew’)				
		(jècé ‘peccary’)				
		(rìká\` ‘fruits’)				

As seen, the neutralized tone of the second member of the compound depends on the tone of the first. One interpretation is that there is tone reduction + spreading of the last tone of the first word. As seen in the next set of data, this would not be an isolated case.

In Kalabari, an Ijoid language of Nigeria, bisyllabic nouns and verbs contrast the following five tonal patterns:

(19)	a. *verbs*		b. *nouns*	
L-L	sɛ̀lɛ̀	‘choose’	pùlò	‘oil’
H-L	kámà	‘increase’	bélè	‘light’
L-H	ɗɔ̀kí	‘discover, find out’	gàrí	‘garri’

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H-H		ɛ́rí	'see'	námá	'meat'
H-↓H	/HLH/	kó↓kó	'keep'	wá↓rí	'house'

In this head-final (OV) language, when an object is present, the verb loses its tones and copies the last tone of the object (Harry and Hyman 2014: 668):

(20)	a. the object ends L				ɛ́rí → ɛ̀rì	(= sɛ̀lɛ̀, kàmà, ɗɔ̀kì, kòkò)
	pùlò	'oil'	L-L	→	ò pùlò ɛ̀rì tɛ́↓ɛ́	'he has seen the oil'
	bélè	'light'	H-L	→	ò bélè ɛ̀rì tɛ́↓ɛ́	'he has seen light'
	lùbùlù	'sheath'	L-L-L	→	ò lùbùlù ɛ̀rì tɛ́↓ɛ́	'he has seen the sheath'
	b. the object ends H-H, H-↓H				sɛ̀lɛ̀ → sɛ́lɛ́	(= kámá, ɗɔ́kí, ɛ́rí, kókó)
	námá	'meat'	H-H	→	ɔ̀ námá sɛ́lɛ́ tɛ́↓ɛ́	'he has chosen the meat'
	wá↓rí	'house'	H-↓H	→	ɔ̀ wá↓rí sɛ́lɛ́ tɛ́↓ɛ́	'he has chosen the house'
	ɓúrúmá	'indigo'	H-H-H	→	ò ɓúrúmá sɛ́lɛ́ tɛ́↓ɛ́	'he has chosen the indigo'
	c. the object ends L-H				sɛ̀lɛ̀ → ↓sɛ́lɛ́	(= ↓kámá, ↓ɗɔ́kí, ↓ɛ́rí, ↓kókó)
	gàrí	'garri'	L-H	→	ɔ̀ gàrí ↓sɛ́lɛ́ tɛ́↓ɛ́	'he has chosen the garri'
	kʊ́kàlí	'fruit'	H-L-H	→	ɔ̀ kʊ́kàlí ↓sɛ́lɛ tɛ́↓ɛ́	'he has chosen the fruit'
					PRO object verb TAM	

In (20a), verbs become all L if the object ends L, while in (20b) verbs become all H if the object ends H-H or H-↓H (where H-↓H = a downstepped H). These changes take place independent of the input tone pattern or syllable length of the verb. The one complication is observed in (20c): When the object ends L-H, the H spreads, as expected, but a downstep is inserted by a general rule of the language. This, then, is a rather clear case of reduction + tonal assimilation.

5 Neutralization by postlexical reduction + melodic overwriting

In the previous section we illustrated straight reduction, as well as reduction combined with a phonological effect such as tone spreading from the preceding word. The third situation consists of reduction + assignment of a specific melody by construction. To illustrate this we can remain with Kalabari, where the noun occurs at the end of the noun phrase. As illustrated via the /H-H/ word *námá* 'meat, animal' in (21), a preceding modifier assigns one of four tone melodies to the following noun (Harry 2004; Harry and Hyman 2014):

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(21)		*construction*	*phrasal tones*	*example*	
	a.	N + N	HL	tʊ̀ɓɔ̀ námà	'the child's meat'
	b.	PossPro + N	HLH (→ H-ꜜH)	ìnà náꜜmá	'their meat'
	c.	Determiner + N	LH	tɔ̀ nàmá	'which meat?'
	d.	Quantifier + N	L	jà nàmà	'some meat'

Possessive noun assign HL, while possessive pronouns assign a HLH melody (realized in the example as H-ꜜH). Demonstratives and other determiners assign LH, while numerals and other quantifiers assign an all L melody. The five tone patterns on bisyllabic nouns seen earlier in (19a) are shown in (22) all to acquire the above tone melodies:

(22)					*'the child's' (HL)*	*'their' (HLH)*	*'which' (LH)*	*'some' (L)*
a.	námá	'meat'	H-H	→	tʊ̀ɓɔ̀ námà	ìnà náꜜmá	tɔ̀ nàmá	jà nàmà
b.	pùlò	'oil'	L-L	→	tʊ̀ɓɔ̀ púlò	ìnà púꜜló	tɔ̀ pùló	jà pùlò
c.	bélè	'light'	H-L	→	tʊ̀ɓɔ̀ bélè	ìnà béꜜlé	tɔ̀ bèlé	jà bèlè
d.	gàrí	'garri'	L-H	→	tʊ̀ɓɔ̀ gárì	ìnà gáꜜrí	tɔ̀ gàrí	jà gàrì
e.	wáꜜrí	'house'	H-ꜜH	→	tʊ̀ɓɔ̀ wárì	ìnà wáꜜrí	tɔ̀ wàrí	jà wàrì

As seen in (23), the whole noun phrase is implicated as intervening modifiers will also undergo reduction + melodic overwriting, e.g. of the determiner /LH/ melody:

(23) a. DEM + NUM + N : míꜜná + sɔ́ná + féní → míꜜná sɔ̀nà fèní 'these five birds'
L H

b. DEM + ADJ + N : mí + opu + sírì → mí òpù sìrí 'this big leopard'
L H

The examples in (24) similarly show that the two possessive melodies, /HL/ and /HLH/ are assigned to recursive genitive noun phrases:

(24) a. tʊ̀ɓɔ̀ + féní + námá → tʊ̀ɓɔ̀ fèní nàmà 'the child's bird's meat'
L-L H-H H-H H L

b. ì + féní + námá → ì fèní nàmá 'my bird's meat'
L H-H H-H H L H

For discussion of how these melodies are aligned, as well as other properties of the Kalabari tone system, see Harry and Hyman (2014).

While all of the above cases involve reduction of words "on the right", it is also possible to get quite comparable reduction of the PRECEDING word, as in

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Tommo So, a Dogon language of Mali. In Tommo So, adjectives and demonstratives, but not numerals, make the preceding noun all L (Heath and McPherson 2013; McPherson 2014):

(25)

					reduction to all L				*no reduction*	
	noun	*gloss*				*'black'*		*'this'*		*'three'*
a.	gámmá	'cat'	H-H	→	gàmmà	gɛ́m	gàmmà	nɔ́	gámmá	tàànd́ú
b.	tàgá	'shoe'	L-H	→	tàgà	gɛ́m	tàgà	nɔ́	tàgá	tààndú
c.	pállà	'strip of cloth'	H-L	→	pàllà	gɛ́m	pàllà	nɔ́	pállà	tààndú

As in Kalabari, intervening modifiers may also be affected by reduction:

(26)

		'black'	*'this'*		*'three'*	*'black'*
'cat'	gàmmà	gɛ̀m	nɔ́	gàmmà	tààndù	gɛ́m
'shoe'	tàgà	gɛ̀m	nɔ́	tàgà	tààndù	gɛ́m
'strip'	pàllà	gɛ̀m	nɔ́	pàllà	tààndù	gɛ́m

		'three'	*'these'*
'cat'	gàmmà	tààndù	nɔ̀ = mbé
'shoe'	tàgà	tààndù	nɔ̀ = mbé
'strip'	pàllà	tààndù	nɔ̀ = mbé

As was stated above, the expectation is that the target of reduction will be the lexical N or V of the corresponding NP/VP. Further evidence that most postlexical reduction targets the lexical head is that the trigger may occur on either side of the noun in Tommo So. Specifically, possessors precede the noun, while other modifiers follow. As seen in (27), possessive nominals and alienable possessive pronouns assign L; inalienable possessive pronouns assign bisyllabic H-H, trisyllabic H-L-L (McPherson 2014: 14–15):

(27)	a.	gámmá	'cat'	H-H	→	íí = gɛ	gàmmà	L-L	'the child's cat' (gɛ = def.)
					→	wómɔ	gàmmà	L-L	'his/her cat'
	b.	jàndúlu	'donkey'	L-H-Ø	→	sáná	jàndùlù	L-L-L	'Sana's donkey'
					→	ḿmɔ	jàndùlù	L-L-L	'my donkey'
	c.	bàbé	'uncle'	L-H	→	mí	bábé	H-H	'my uncle'
		ánígé	'friend'	H-H-H	→	mí	ánìgè	H-L-L	'my friend'

The examples in (27) establish that specific melodies can be assigned from either side of the noun, thereby setting up a potential conflict between triggers. For an analysis in terms of c-command, see McPherson (2014).

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6 Lexical triggers of phrasal phonology

In section 5 we saw that in both Kalabari and Tommo So specific constructions can assign different melodies to the head noun of the noun phrase, entrapping intervening modifiers on their way. In Kalabari this meant that the first modifier of the NP determines the melody for the whole NP, with some variation (see Harry and Hyman 2014). A seemingly related phenomenon concerns cases where it is the *lexical* identity of the first modifier (dependent) that determines the overall NP melody. To illustrate, let us start with another Ijoid language, the Bumo dialect of Izon. As described by Efere (2001: 158–159), Bumo distinguishes four tone classes A-D, whose tones and tone assignment properties are indicated in (28).[3]

(28)	*class*	*isolation tone*	*tone pattern determined by the A-D class of phrase-initial word*
	A	(L) H	all syllables in the phrase = H
	B	(L) H	first word = all H; subsequent syllables = L
	C	(L) H-L	first word keeps its HL drop, subsequent syllables = L
	D	(L) H	first word = all H, H on the first syllable of the second word; subsequent syllables = L

In (28) the L in parentheses refers to the fact that initial vowels can, but do not have to be L tone. As seen, classes A, B and D otherwise have all H tone, while class C exhibits a H to L pitch drop somewhere in the word other than on the last syllable. What is important is the effect on what follows. As seen in the following illustrations of the indicated A-D words in the frame … /náná kɪ́mɪ́/ ‘man who owns/has….’ (whose tones are deleted), the crucial distinction appears to be where a drop to L tone will occur, if any:

(29)	A	/bɛlɛ/	[bɛ́lɛ́]	‘pot(s)’	→	bɛ́lɛ́ náná kɪ́mɪ́	(no L; H all the way to the end)
	B	/warî/	[wárɪ́]	‘house’	→	wárɪ̀ nànà kɪ̀mɪ̀	(L starts on σ1 of second word)
	C	/sɛ̂rɪ/	[sɛ́rɪ̀]	‘scarf’	→	sɛ́rɪ̀ nànà kɪ̀mɪ̀	(L starts on σ2 of first word)
	D	/ikɪɛ̂/	[ìkíɛ́]	‘friend’	→	ìkíɛ́ nánà kɪ̀mɪ̀	(L starts on σ2 of second word)

As indicated in the underlying representations, which are a slight variant of Efere’s analysis, I have considered a “Japanese” analysis involving a /HL/ “pitch accent”. As seen, class A words have no pitch-accent. Class B and class C words contrast only in that the former has a pitch accent on the final syllable, while the latter has a pitch-accent on a non-final syllable. Class D words are “post-accenting”,

3 As in Kalabari, these effects are still “constructional” as they occur only in certain constructions, e.g. not between subject noun and verb.

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meaning that the H is assigned to the first syllable of the next word, followed immediately by a drop to L.

There are at least two significant differences between Kalabari and Bumo. The first is that the phrasal melodies are determined by construction (or word class) in Kalabari vs. by lexical classes which in turn might lend themselves to an underlying analysis such as the one considered in (29). The second one has to do with the issue of neutralization with which we are concerned. Strictly speaking, three of the tone patterns are neutralized as (L) + all H in isolation forms—the differences coming out only in phrasal contexts. If the /HL/ pitch accent analysis is correct, this directly results from the fact that both the syllable that carries the pitch accent as well as those which precede are pronounced H. This, then is a sort of reverse neutralization situation: lexical neutralization vs. postlexical contrast.

The Bumo case is not isolated, but in fact is found in tone systems even beyond Africa. In the Move dialect of Yagaria, a Papuan language of Papua New Guinea, Ford (1993: 196–7) distinguishes between tonally stable (S) vs. unstable (U) adjectives, illustrated in (30).

(30)	a.	S	hógà	'left'	→	hógà kàyàlè	'left pig'	(no change) + all L
		S	fáipái	'white'	→	fáipái kàyàlè	'white pig'	(no change) + all L
	b.	U_1	lòlé	'two'	→	lòlè kàyàlé	'two pigs'	(L-L + L-L-H)
		U_2	fèlá	'wild'	→	fèlà kàyálé	'wild pig'	(L-L + L-H-H)
		U_3	kòlí	'scared'	→	kòlì káyálé	'scared pig'	(L-L + H-H-H)

At issue is how nouns such as /kàyálè/ 'pig' are treated. In (30a) the stable adjectives keep their tones and the noun is reduced to all L. In (30b) the three classes of unstable adjectives, which are all L-H in isolation, become L-L, but condition a different tonal assignment on the following noun. Although Ford doesn't provide more data to test this, we can assume that the N + A sequence can have H tone(s) only on one of the two words. In all cases the adjective determines what happens to the lexical head noun whose underlying /L-H-L/ is not observed in any of the examples. Whereas the Bumo patterns differ in where a L tone begins, if present, the unstable adjective + noun patterns appear to differ in where a H begins on the noun, either on the third (U_1), the second (U_2) or the first (U_1) syllable of the noun. Syllables which follow are themselves also H. It is tempting to conceptualize this as a difference in where a /LH/ pitch accent is assigned. However analyzed, the tonal contrasts again are lexically neutralized in the word in isolation, but contrastive phrasally.

The third and final case I will consider is Urarina, an isolate spoken in Peru, in which most words occur as all L + one final H in isolation. As described by Olawsky (2006: 128), when occurring as object, the four tonal classes A-D of

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nouns assign a H tone differently on a following verb. This is illustrated in (31), where L tone is unmarked:

(31)	A	raaná	'peccary (sp.)'	→	raana rʉ́.a.kaa	'he has carried a peccary'
	B	obaná	'peccary (sp.)'	→	obana rʉ.a.káá	'he has carried a peccary'
	C	reemaé	'dog'	→	reemae rʉ.a.kaá	'he has carried a dog'
	D	makusajarí	'pepper'	→	makusajarí rʉ.a.kaa	'he has carried the pepper'

Olawsky summarizes the above patterns as follows:

(32)	*class*	*tone pattern determined by A-D class of the phrase-initial word*
	A	first word = L; H is assigned to initial syllable of following word
	B	first word = L; H is assigned to 2nd/3rd syllable of following word depending on syllable weight
	C	first word = L; H is assigned to last syllable [mora?] of the final word of the phrase
	D	first word keeps its final H tone, the following word being all L

As pointed out, the above systems show differences with the construction-triggered postlexical neutralizations in Kalabari and Tommo So. But there are also similarities, especially in considering how one might account for the tonal patterns. One possibility is to establish different co-phonologies (see Inkelas 2011 and references cited therein), either by construction or on the lexical triggers themselves which place tones differently on what follows. Concerning Ijoid in general, Williamson (1988) analyzes tonal classes such as Izon's A-D as having different floating tones to assign to the rest of the noun phrase (often with OCP violations). Woodbury (2012) presents an interesting parallel analysis in San Marcos Zacatepec Eastern Chatino (Otomanguean, Mexico), while Harry and Hyman (2014) show how at least three of the four tonal melodies of Kalabari develop diachronically from lost grammatical morphemes whose tones remain. Although apparently all Ijoid languages show tonal reductions within the phonological phrase, it is interesting that some trigger the melodic overwriting constructionally, others lexically.

7 Partial postlexical neutralization

One of the parameters mentioned in (1d) is the extent of neutralization. Most of the above examples have involved total neutralization: all tones have the same

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output in a given neutralizing context. In Northern Mao, an Omotic language of Ethiopia, there is only partial neutralization. As described by Ahland (2012: 145), "… the [nine] citation melodies of two-syllable nouns (the vast majority of nouns in the language) collapse into three melodies when they are modified by any element: MM, ML and LL." Ahland identifies these latter as "construction noun melodies" with clear reference to notion of "construct state" which Creissels (2009: 74) identifies as "a general label for noun forms that are obligatory in combination wi th certain types of noun dependents." The correspondences are shown in (33).

(33)	*Citation Tone Classes*		*"Construct Noun Melody"*
	H-H$_1$	→	M-M
	M-M, L-L, H-L$_1$, M-H, M-L	→	M-L
	H-H$_2$, H-L$_2$, L-H	→	L-L

As seen, there are two H-H and two H-L patterns, which are identified with subscripts. In the examples in (34) we see that the above changes take place on the noun independent of the tone of the preceding modifier (Ahland 2012: 147–149):

(34) a.	k'éts'é	'land'	H-H1	→	íʃ	k'ēts'ē	M-M	'the land'
				→	nà	k'ēts'ē	M-M	'this land'
b.	p'ɪ̄ʃē	'child'	M-M	→	íʃ	p'ɪ̄ʃè	M-L	'the child'
				→	nà	p'ɪ̄ʃè	M-L	'this child'
c.	múnts'è	'woman'	H-L	→	íʃ	mùnts'è	L-L	'the woman'
				→	nà	mùnts'è	L-L	'this woman'

Besides being only a partial neutralization, it is not clear whether this phenomenon is comparable to Kalabari and Tommo So. One difference is that intervening modifiers are not affected: "…only the head noun/nominal (i. e. whatever serves as the head of the NP) takes on the construct form" (Michael Ahland, p.c.). While McPherson reports a similar situation with respect to the head of relative clauses, the neutralizations otherwise generally affect the whole phonological phrase (where we have evidence, which unfortunately is lacking in Yagaria and Urarina). Still, there is no reason why comparable postlexical tonal neutralizations could not be partial.

8 Conclusions

In the preceding sections I have presented some of the factors which condition postlexical tonal neutralizations. Focus has been on what was termed intentional

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neutralization, i. e. cases where neutralization is principles rather than an innocent bystander, as it is in incidental neutralization. Especially in the lexical trigger cases in section 6, we saw rather impressive examples of neutralization recoverable only from the phrasal realizations. Clearly underrepresented here are cases where neutralization results from defocusing and other forms of accentual reduction. Whereas phrasal de-accenting does not cause a word-stressed syllable to become stressless in a language like English (where the correlates of stress include non-pitch cues), de-accenting a H tone often causes the tone-bearing unit to become toneless. An example from Nubi, an Arabic-based Creole spoken in Uganda is discussed by Gussenhoven (2006: 206). Whereas the H tone is contrastive in *pángisa* 'to rent to someone' vs. *pangísa* 'to rent from someone', the two words merge as all L tone in gerund deaccenting reduction. The result is ambiguity: *pangisa júa séma má* 'renting a house to/from someone is not good.'

One inescapable generalization from the above examples is that reduction/neutralization most frequently involves a non-head targeting the head of a construction. In (35) the modification of the lexical head is schematized as N → N', V → V' triggered by X, which stands for a modifier, specifier, or complement, whether preceding or following the N or V:

(35)	*N → N' / __ X*	*N → N' / X __*	*V → V' / __ X*	*V → V' / X __*
	Haya (14)	Shanghai (16) (17)	Haya (15)	Urarina (31)
	Tommo So (25)	Barasana (18)	(+ many more)	Kalabari (20)
		Kalabari (21)		
		Tommo So (27)		
		Yagaria (30)		
		N. Mao (33)		

I know of no case where the head is systematically the trigger of neutralization on modifiers within the noun phrase, or where the verb is the trigger of neutralization on, say, a direct object. However, it does appear that lexical triggering can go from head to modifier, as seen in the following adjective + noun sequences in Urarina (Olawsky 2006: 122):

(36)	B	hjaané	'achiote (tree)'	→	hjaane lanáhaj	'red achiote'
	C	hjaané	'urine'	→	hjaane lanaháj	'red urine'

Recall from (31) that the four classes of object nouns A-D determine the tonal output on a following verb. The two nouns in (36), a minimal pair in terms of their phrasal effects, do the same to the following adjective 'red': the class B noun *hjaané* thus assigns a H to the second syllable of 'red', while the homophonous class C noun *hjaané* 'urine' assigns a H to the final syllable of 'red'. The question is whether we should expect to find cases where nouns cause following adjectives

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to neutralize their tones? If yes, then the generalization derived from (35) is false, and lexical heads can be both targets and triggers of postlexical tonal neutralizations. If no, then we still may be able to hypothesize that lexical determination of postlexical tone can either go from non-head to lexical head or from left-to right. In this case we would not expect the mirror image of Urarina, with the adjective preceding the noun. Related to this is a potential directional asymmetry: Since non-assimilatory processes typically involve a nonhead trigger and a lexical head target, and since tonal assimilations are typically perseverative, we might expect few(er) cases of postlexical tonal neutralization by assimilation in head-final languages.

Of course there is always the possibility that we may not be able to unambiguously identify which element is the trigger and which is the target. This naturally brings us to languages like Japanese and Basque which have tone/accent assignment rules that potentially override the tonal properties of both constituents, particularly in the case of compounding. As an example, in Tokyo Japanese the following three compounding patterns are observed when the second element is short (Kubozono 1993: 15–16):

(37)	a. preaccenting:	ká̲bùto	‘helmet’	+ musi	‘insect’	→	kabutó̲-mùsi ‘beetle’
	b. deaccenting:	syá̲kài	‘society’	+ tó̲ò	‘party’	→	syakai-too ‘Socialist party’
	c. N-initial:	pé̲rùsya	‘Persian’	+ né̲kò	‘cat’	→	perusya-né̲kò ‘Persian cat’

Concerning Basque, Hualde (1995: 184) states that “in present-day western varieties, compounds are normally accented on either the last syllable of the first member or the first syllable of the second member, with preferences depending on the variety.” Excepting the cases with lexical triggers, the constructional neutralizations involved a trigger which keeps its tones vs. a target or targets whose tones are neutralized. In the case of compounding, the tone patterns are sometimes defined over the whole constituent. An interesting question is whether there is anything comparable to this at the higher phrase level, i. e. configurations which assign a melody to the whole construction, thereby neutralizing the tones of the lexical head AND the non-head(s).

To summarize, we have seen the following in the above discussion:

(i) Postlexical tonal neutralizations can be either an incidental byproduct of a tone rule or a boundary tone, or an intentional effect of a neutralizing process, e.g. intonation, reduction, constructional melody assignment.

(ii) Constructional neutralizations typically involve a lexical head target and a non-head trigger, which can occur on either side of the head.

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(iii) Although postlexical tonal neutralization is usually total, it may also be partial, as in Northern Mao.
(iv) While postlexical neutralization may be more expected in a two-height privative /H/ vs. Ø system, it is also attested in /H, L/ and multiheight systems, e.g. in Northern Mao, which contrasts /H, M, L/.
(v) For this reason postlexical tonal neutralization may not be probative in determining whether a prosodic system is tonal vs. accentual. Neutralization by reduction occurs in both accentual and full-fledged tone systems.

With regard to this last point, while lexical stresses may become modified at the phrase level, e.g. by rhythm rules (e.g. *thirtéen* vs. *thírteen línguists*), reduction, etc., in stress-accent systems, words do not assign different stress patterns to other words at the phrase level, whether by construction or by lexical trigger. It would thus be quite surprising to find a language which makes Kalabari-like stress assignments: (i) nominal possessors assign initial stress to the following noun; (ii) possessive pronouns assign penultimate stress to the following word; (iii) determines assign final stress to the following noun; (iv) numerals have no effect on the following word (whose stress remains as in the isolation form). Similarly, there are no Bumo-like stress systems whereby a lexical category distinguishes word classes A-D which assign different stress placements on the following word. Given the absence of such stress-accent systems, neutralizing constructional melodies may be another indication that tone can do things that nothing else can (Hyman 2011).

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Haruo Kubozono

Postlexical Tonal Neutralizations in Kagoshima Japanese

Abstract: On the basis of original fieldwork, this article examines aspects of postlexical tonal neutralizations in Japanese by analyzing how postlexical processes affect lexical tonal patterns and how postlexical tonal neutralizations can (or cannot) lead to a loss of lexical contrasts. Its main focus is on Kagoshima Japanese, a southern Japanese dialect with two lexical tonal classes (Types A and B), and specifically, on its question and vocative (calling) intonation. This dialect does not show any tonal neutralization at the lexical level at least in its traditional system, where the tonal contrast is well preserved in long as well as short words: Type A words consistently have a pitch fall, while Type B words consistently lack this phonetic feature. However, the lexical distinction is lost in some phonological contexts at the postlexical level. In interrogative sentences, neutralizations do occur, but only in monosyllabic words. In vocative sentences, on the other hand, they occur both in monosyllabic and polysyllabic words. These postlexical neutralizations can be attributed to the fact that question and vocative prosody invariably introduce a pitch fall in Type B words as well as Type A words. However, question and vocative prosody show tonal neutralizations to different degrees since they manifest the pitch fall in different ways.

Keywords: tonal neutralization, Kagoshima Japanese, question intonation, vocative intonation, postlexical process

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1 Tonal systems and distinctions in Kagoshima Japanese

Kagoshima Japanese (henceforth KJ for short) is a Japanese dialect spoken in the south of Japan, estimated to have about one million speakers (see the map below). Its prosodic system is distinct from that of the standard variety known as Tokyo Japanese in many crucial ways (Hirayama 1951; Uwano 1999; Kibe 2000; Kubozono 2007 2010, 2012b). This system is known to involve no tonal neutralizations at the lexical level (Kubozono 2004a, 2004b, 2007), i. e., its two tonal classes are always kept distinct. However, our recent fieldwork study has revealed that tonal neutralizations occur at the postlexical level, where postlexical processes modify lexical tonal patterns (see Hyman 2018 for similar cases in other languages). This article examines this interaction in detail to clarify how exactly lexical tonal contrasts are lost. It also discusses whether these postlexical tonal neutralizations in the synchronic grammar can lead to tonal changes at the lexical level.

KJ is different from Tokyo and many other dialects of the language in having an N-pattern system as against a multi-pattern system (Uwano 1999; Kubozono 2012b, 2013). N-pattern systems are differentiated from multi-pattern systems in having a fixed number of tonal contrasts irrespective of the length of the word. The prosodic system of KJ specifically permits only two tonal patterns no matter how long the word may be. Following Hirayama (1951), we call the two tonal classes in KJ Type

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A and Type B.[1] In citation or declarative forms, Type A words assign a H(igh) tone (or high pitch) on the penultimate syllable, whereas Type B words have an H tone on the final syllable. These two patterns can be reinterpreted as those with and without a pitch fall, respectively, and hence as accented versus unaccented words in phonological terms (Haraguchi 1977; Shibatani 1990). In (1) and the rest of this article, dots /./ indicate syllable boundaries and capital letters high-pitched portions.

(1) a. Type A words
A.ka ‘red’, a.ka.SIN.goo ‘red signal’
b. Type B words
a.O ‘blue, green’, a.o.sin.GOO ‘green signal’

A second prosodic feature that characterizes KJ as against Tokyo Japanese and many other dialects of the language concerns the basic unit used to measure phonological distances and to assign H tones. KJ is a typical ‘syllabeme’ dialect (Sibata 1962), which means that the location of H tones is determined by counting the number of syllables from the end of the word/phrase. Thus, Type A and B words assign an H tone to the penultimate and final syllables, respectively, not to the penultimate/final moras, as shown in (1).

The syllabic nature of this system can also be seen from the alternations in (2), which illustrate how surface tonal patterns alternate between careful and casual speech. These alternations demonstrate that tones are assigned to the phonological strings on the basis of the syllable after segmental changes such as vowel and consonant deletion have taken place.[2]

(2) Type A
ke.MU.ri ~ KE.mui ‘smoke’
ke.da.MO.no ~ ke.DA.mon ‘wild animal’
en.PI.tu ~ EN.pit ‘pencil’
ku.bo.ZO.no ~ ku.BO.zon ‘Kubozono, a family name’

Type B
i.NU ~ IN ‘dog’
ni.wa.to.RI ~ ni.wa.TOI ‘chicken’
a.o.en.pi.TU ~ a.o.en.PIT ‘blue pencil’
ma.e.zo.NO ~ ma.e.ZON ‘Maezono, a family name’

1 The distinction between these two tonal classes in native words is largely lexical so that it is impossible to explain why /A.ka/ ‘red’ and /a.O/ ‘blue, green’ are Type A and Type B morphemes, respectively. Loanwords, on the other hand, typically take Type A (Kibe and Hashimoto 2003). Moreover, the tonal pattern of polymorphemic words is predictable since they follow a compound tone rule to be described shortly.

2 KJ admits only three vowel sequences as diphthongs, i. e. /ai/, /oi/ and /ui/, while processing all others such as /ae/ and /ao/ as vowel sequences across a syllable boundary (Kubozono 2004b).

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This generalization admits only a few exceptions, all of which appear in old, frozen expressions: e.g. /sai.goo.saA/ 'Mr. Saigo' and /waz.zeE.ka/ 'remarkable'. These exceptions apparently underwent segmental changes *after* tones are assigned: /sai.goo.sa.MA/ → /sai.goo.saA/, /waz.za.RE.ka/ → /waz.za.E.ka/ → /waz.zeE.ka/.

The syllabic system of KJ can be compared with the moraic system of Koshikijima Japanese, one of its sister dialects spoken on a small island about 40 km off the coast of Kagoshima (Kamimura 1941; Kubozono 2010, 2012a, 2012b, 2016). In this sister system, H tone is realized on the penultimate mora (Type A words) and the final mora (Type B words), as exemplified in (3).[3]

(3) Comparison of Kagoshima and Koshikijima patterns

Tonal class	Kagoshima	Koshikijima	Gloss
Type A	TOo	TOo	ten
	BA.ree	ba.REe	volleyball
	ZI.kan	zi.KAn	time
	ke.DA.mon	KE.da.MOn	wild animal
Type B	TOO	toO	tower
	IN	iN	dog
	ni.HON	NI.hoN	Japan
	mi.KAN	MI.kaN	orange

The fact that KJ employs the syllable rather than the mora for lexical tonal contrasts comes to bear crucially upon tonal neutralizations at the postlexical level as it turns out that tones are apparently assigned on a moraic basis in some postlexical processes. We will discuss this in sections 3–5 in detail.

A third salient feature of KJ prosody is the lack of tonal neutralizations at the lexical level. There are two major reasons for this. For one thing, the tonal distinction is well preserved in short words at least in the speech of middle-aged and older people (see the next section for recent changes in younger speakers' speech). Thus, monosyllabic words keep a contrast between Types A and B, with the former type involving a pitch fall while the latter is pronounced with a flat pitch pattern, as shown in (4). This difference is illustrated in Fig. 1, where /TOo/ 'ten' (Type A) and /TOO/ 'tower' (Type B) are compared.

(4) Tonal patterns of monosyllabic words

Type A		Type B	
Tonal pattern	Gloss	Tonal pattern	Gloss
TOo	ten	TOO	tower

3 Unlike KJ, Koshikijima Japanese can have two pitch peaks (or H tones) in three-mora or longer words. The basic rule is to keep one Low-toned syllable between the two H tones. See Kubozono (2010, 2012a, 2012b, 2016) for details.

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ZYUu	gun	ZYUU	ten
TAi	Thailand	TAI	sea bream (fish)
KAi	lower rank	KAI	shellfish
BAn	evening	BAN	order
SAn	three	SAN	frame

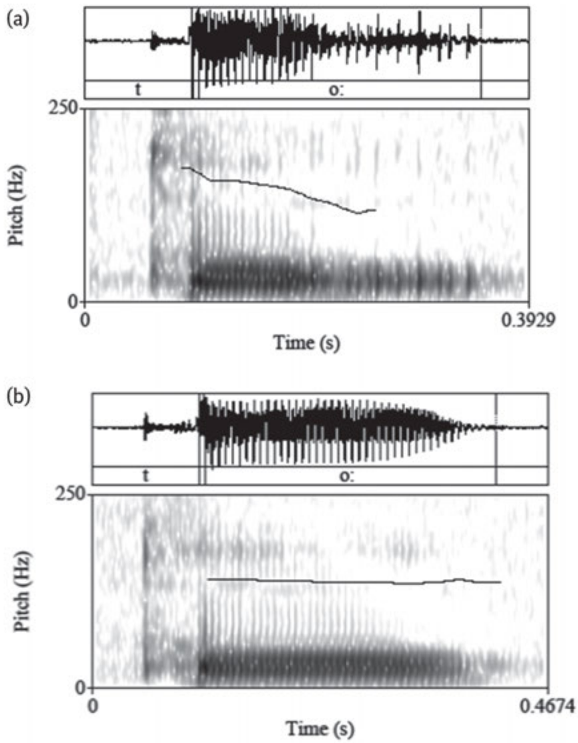

Fig. 1: Typical F0 contours of (a) /TOo/ 'ten' (Type A) and (b) /TOO/ 'tower' (Type B) in citation/declarative forms in Kagoshima Japanese.

The same is true of monomoraic words like those in (5). The two tonal classes are distinguished from each other in terms of the presence or absence of a pitch fall in the traditional phonology of KJ: /hì/ 'sun' has a pitch fall, whereas /hī/ 'fire' does not (see section 2 for neutralizations in young speakers' speech).[4] This suggests

4 Kibe (1997) and Ishihara (2004) suggest that the tonal contrast is lost in monosyllabic words in KJ, but my own observation of three middle-aged and older speakers (56, 76 and 77 years old) shows that they can readily distinguish between the two classes of monomiraic words including those in (5).

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that the presence or absence of a pitch fall rather than the position of the H tone is the most important feature distinguishing between the two tonal classes in KJ (see Ishihara 2004 for a similar view).

(5) Tonal patterns of monomoraic words

Type A		Type B	
Tonal pattern	Gloss	Tonal pattern	Gloss
kà	mosquito	kā	department
kì	emotion	kī	tree
hà	leaf	hā	tooth
hì	sun, sunshine	hī	fire
gò	five	gō	the game of *go*

Note that the lack of tonal neutralization at the lexical level is not widely observed in Japanese dialects. In Tokyo Japanese, for example, the traditional tonal contrasts in monomoraic nouns have already been lost in citation forms and are kept only when nouns are placed in phrases (McCawley 1968: 133; Haraguchi 1977: 19–20; Vance 1995). Thus, in present-day Tokyo Japanese, both young and old speakers use a flat pitch pattern rather than a contour one for both accented and unaccented monomoraic words although their original tonal contrast is well preserved in phrasal expressions, i. e /HI-ga/ 'fire-NOM' vs. /hi-GA/ 'sun-NOM'. Essentially the same situation is found in Koshikijima Japanese, a sister dialect of KJ. In this dialect, too, tonal contrasts in monomoraic nouns are lost in citation forms, with both Type A and Type B words pronounced with a flat pitch pattern, i. e. Type B, while the contrasts are preserved in phrasal expressions (Kamimura 1941; Kubozono 2012a). Seen in this light, the tonal distinction in KJ described in (5) is remarkable and can be regarded as a feature characteristic of this particular dialect.

In addition to short words, long words do not exhibit tonal neutralizations either, at least in the traditional prosodic system of KJ. A major reason for this is that tonal patterns of long words and phrases are rule-governed. Specifically, compound words follow the famous compound rule known as 'Hirayama's Law' (Hirayama 1951) by which the tonal pattern of the initial morpheme spreads over the entire domain of compounds. This is illustrated in (6), with the two morphemes /A.ka/ 'red' (Type A) and /a.O/ 'blue, green' (Type B). Hyphens /-/ indicate morpheme boundaries.

(6) Left dominant compound accent rule in KJ

a. A.ka 'red', a.KA-pen 'red pen', a.ka-en.PI.tu 'red pencil', a.ka-SIN.goo 'red signal'
NA.tu 'summer', na.tu-ya.SU.mi 'summer holiday'
o.REN.zi 'orange', o.ren.zi-I.ro 'orange color'

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b. a.O ‘blue’, a.o-PEN ‘blue pen’, a.o-en.pi.TU ‘blue pencil’, a.o-sin.GOO ‘green signal’
ha.RU ‘spring’, ha.ru-ya.su.MI ‘spring holiday’
ne.zu.MI ‘rat’, ne.zu.mi-i.RO ‘rat color, grey’

This compound tone rule is shared by the sister dialects of KJ such as Koshikijima Japanese (Kubozono 2010, 2012a, 2012b) and Nagasaki Japanese (Sakaguchi 2001). It is not shared by Tokyo Japanese, however, since this standard variety has its own compound tone (or accent) rule by which the phonological structure of the final member determines the phonological structure of the compound expression. Putting details aside (Poser 1990; Kubozono 1995, 1997), compound nouns in Tokyo Japanese fall into two prosodic types, accented and unaccented, with the former but not the latter involving a sudden pitch fall. This prosodic distinction is determined by the final member of the compound. Unaccented compounds, which obviously represent a marked case, are due to so-called ‘deaccenting morphemes’ such as /i.ro/ ‘color’ and /too/ ‘party’ (McCawley 1968; Kubozono 2008). These special morphemes are either monomoraic or bimoraic and exert a deaccenting effect on the whole compound, as exemplified in (7a). If the compound noun does not end in such a deaccenting morpheme, it bears a compound accent on a certain syllable, as in (7b):[5] In (7) and the rest of the article, lexical accents in Tokyo Japanese are marked by apostrophes (’), which are placed immediately after the accented mora.[6] This distinction between accented and unaccented compounds represents the basic tonal distinction in Tokyo Japanese (Kubozono 2008, 2011a).

(7) Right dominant compound accent rule in Tokyo Japanese
a. o.re’n.zi + i.ro’ → o.ren.zi-i.ro ‘orange, color; orange’
ne.zu.mi + i.ro’ → ne.zu.mi-i.ro ‘rat, color; gray’
b. a’.ka + sin.goo → a.ka-si’n.goo ‘red, signal; red signal’
a’.o + sin.goo → a.o-si’n.goo ‘blue, signal; green signal’
na.tu’ + ya.su.mi’ → na.tu-ya’.su.mi ‘summer, holiday; summer holiday’
ha’.ru + ya.su.mi’ → ha.ru-ya’.su.mi ‘spring, holiday; spring holiday’

Returning to compound nouns in KJ, they do not undergo tonal neutralization no matter how long they may become. This is, in fact, the case with most middle-aged and older speakers of the dialect (see section 2 below for recent changes

5 A default compound accent is placed on the rightmost, non-final foot of the compound (Kubozono 1995, 1997, 2008).
6 Words without an apostrophe are ‘unaccented’ words, or words involving no abrupt pitch fall at the phonetic output.

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as well as Kubozono 2018a). This fact can be compared with the situation in Nagasaki Japanese, another sister dialect of KJ. This dialect has two lexical tonal classes (Types A and B) just like KJ and is subject to the same compound tone rule, i. e. Hirayama's Law. However, it exhibits tonal neutralizations in long words in the speech of all speakers, i. e. not only young speakers but also older speakers. Typically, compound nouns show a bias towards Type B (flat pitch pattern) if their first members are three moras long or longer. These words are not subject to Hirayama's Law any more and show the Type B pattern even if their first component is a Type A morpheme, which shows a pitch fall when pronounced in isolation (Matsuura 2014).[7] This is illustrated in (8), where the behavior of the three-mora Type A noun /me.ROn/ 'melon' should be compared with that of the two-mora Type A noun /MO.mo/ 'peach'.[8] It is interesting to find that two sister dialects in the same region thus display different behaviors with respect to the degree of tonal neutralization at the lexical level.

(8) Tonal neutralization in compound nouns in Nagasaki Japanese
  a. me.ROn (A) + do.ro.boo (B) → me.ron-do.ro.boo (B) 'melon, thief; melon theif'
     mi.kan (B) + do.ro.boo (B) → mi.kan-do.ro.boo (B) 'orange, thief; orange thief'
  b. MO.mo (A) + do.ro.boo (B) → mo.MO-do.ro.boo (A) 'peach, thief; peach thief'
     ma.ME (B) + do.ro.boo (B) → ma.me-do.ro.boo (B) 'bean, thief; bean thief'

2 Multilingualism and tonal neutralization

While tonal neutralizations do not occur in the traditional system of KJ, as we saw just above, young speakers show a marked tendency to merge the two tonal classes in their speech. There are two types of words where these tonal changes occur (see Kubozono 2018a for a more detailed discussion).

First, monosyllabic words tend to change their tonal patterns in citation forms. A careful observation reveals that monomoraic monosyllables tend to be pronounced without a pitch fall, while bimoraic momosyllables favor a falling pitch pattern (Kubozono 2012c). Thus, /hì/ 'sun' and /hī/ 'fire' are now both pronounced with a flat pitch pattern, i. e. /hī/ (original Type B), while /TOo/ 'ten' and

7 Sakaguchi (2001) and Matsuura (2014) differ in the description of the neutralization in compounds. While Sakaguchi (2001) attributes the neutralization to the length of the whole compounds, Matsuura (2014) emphasizes the importance of the first member's length by demonstrating that neutralization typically occurs in compounds whose first member is more than two moras long.

8 Type B patterns in this dialect are denoted by small letters throughout.

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/TOO/ 'tower' tend to merge into /TOo/ (original Type A). The fact that monomoraic and bimoraic monosyllables are tonally merged in opposite directions can be understood in a straightforward manner if the pitch patterns in Tokyo Japanese are taken into consideration. In this standard dialect, all monomoraic nouns are now pronounced with a flat pitch pattern, e.g. /hī/ 'fire', 'day', while most bimoraic monosyllables take a falling pitch pattern, e.g. /TOo/ 'ten', 'tower', 'party'. Young native speakers of KJ, who are practically bilingual between their native and standard Tokyo dialects, seem to follow the tonal patterns found in the standard variety even when speaking their native dialect. Specifically, they assign a falling pattern to the type of words that are pronounced with a pitch fall in Tokyo Japanese, and a flat pitch pattern to the type of words involving no pitch fall in the same standard variety. Young speakers of KJ are thus sensitive to the presence or absence of a pitch fall in the pronunciations of Tokyo Japanese and carry this tonal feature onto the pronunciations of their native dialect. These correspondences are summarized in Tab. 1, where (A) and (B) denote Type A and Type B forms in KJ.

Tab. 1: Correspondences between Kagoshima (old/new) and Tokyo patterns.

Traditional pattern in KJ	New pattern in KJ	Tokyo pattern	gloss
hì (A)	hī (B)	hī	sun, sunshine
hī (B)	hī (B)	hī	fire
TOo (A)	TOo (A)	TOo	ten
TOO (B)	TOo (A)	TOo	tower

A second type of word that undergoes a tonal change in a new variety of KJ is compound words that were originally subject to Hirayama's Law. Many young speakers do not apply this tonal rule any longer and assign either Type A or Type B pattern depending on the tonal pattern of the entire compound word in Tokyo Japanese (Kubozono 2006, 2007). Thus, /haru-yasumi/ 'spring holiday' and /natu-yasumi/ 'summer holiday' in (6) are no longer tonally distinguished by young speakers, who assign a falling pattern for both words instead. In contrast, /orenzi-iro/ 'orange color' and /nezumi-iro/ 'rat color, gray' both take a non-falling pattern in the new system. These changes can be explained in a straightforward manner if the tonal patterns of the same words in Tokyo Japanese are taken into account. In Tokyo Japanese, compound accent patterns are determined primarily by their final members, as we saw above. For example, compound nouns ending in /yasumi/ 'holiday' involve a pitch fall, as we saw in (7b), whereas those ending in the deaccenting morpheme /iro/ 'color' do not, as in (7a). Young native speakers

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of KJ appear sensitive to the presence or absence of a pitch fall in Tokyo Japanese forms and incorporate this feature into their pronunciations of the same compounds in their native dialect (Kubozono 2007, 2018a). This is summarized in the following table.

Tab. 2: Correspondences between Kagoshima (old/new) and Tokyo patterns.

Traditional pattern in KJ	New pattern in KJ	Tokyo pattern	gloss
natu-yaSUmi (A)	natu-yaSUmi (A)	naTU-YAsumi	summer holiday
haru-yasuMI (B)	haru-yaSUmi (A)	haRU-YAsumi	spring holiday
orenzi-Iro (A)	orenzi-iRO (B)	oRENZI-IRO	orange (color)
nezumi-iRO (B)	nezumi-iRO (B)	neZUMI-IRO	gray

It is to be noted here that the new prosodic system of KJ in Tab. 2 employs the same strategy that is used for monosyllabic words illustrated in Tab. 1. Namely, young native speakers of KJ are heavily influenced by the tonal patterns of standard Tokyo Japanese and choose between falling (Type A) and non-falling (Type B) patterns in their native pronunciations by copying the tonal pattern of each word in the standard dialect. However, they do not copy the entire prosodic forms of the standard dialect, but only pay attention to the presence or absence of a pitch fall. In other words, they do not pay attention to other prosodic features such as the position of a pitch rise or pitch fall. They employ this strategy in pronouncing monosyllabic words and compound words alike in their native language. These tonal changes in progress in young KJ speakers will be discussed later in this article in conjunction with the tonal neutralizations we observe in some postlexical prosodic processes.

3 Question intonation in Kagoshima Japanese

3.1 Tonal neutralizations in question prosody

Having understood the basic prosodic structures of KJ and the recent tonal changes therein, let us now discuss postlexical processes in this dialect. We will consider two processes, question intonation and vocative intonation, the latter being roughly equivalent to ‘calling contour’ (Ladd 1996) or ‘vocative chant’ (Gussenhoven 2004). In KJ, these processes exhibit similar prosodic patterns involving a moraic (versus syllabic) tonal assignment at least in part, while

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differing from each other with respect to the extent to which the tonal contrast is lost. We will discuss question intonation first in order to better understand the more complex patterns of vocative intonation in the next section (section 4).

A most salient feature of question intonation in KJ is that pitch falls at the end of interrogative sentences (Kibe 2010; Kubozono 2011b).[9,10] Thus, sentence-final particles are realized with a low or mid tone in both Wh (8) and Yes/No questions (9).[11] /?/ indicates that it is an interrogative sentence. /IT.ta/ 'went' and /ki.TA/ 'came' are Type A and Type B verbs, respectively.

(9) a. DAI ga IT.ta ka? 'Who went?'
A.ya DAi ka? 'Who is that?'
b. DAI ga ki.TA ka? 'Who came?'[12]
A.ya NAI ka? 'What is that?'

(10) a. DAI ka IT.ta ka? 'Did anyone go?'
b. DAI ka ki.TA ka? 'Did anyone come?'

In the framework of Autosegmental Phonology (Goldsmith 1976; Haraguchi 1977), these intonation patterns can be interpreted by positing a low tone for the question particle. Some examples are shown below, where citation/declarative forms (11) and question forms (12) are compared with each other for both Type A (11/12a) and Type B (11/12b) verbs, with the low tone of the question marker being italicized. The low tone attached to the question marker can be interpreted as a boundary tone, or L%, in the framework of Autosegmental Metrical Phonology (Pierrehumbert and Beckman 1988; Ladd 1996). Declarative and interrogative sentences in KJ differ from each other in that this boundary tone is present in the latter but not in the former.[13]

9 Rialland (2007) reports a variety of pitch patterns for interrogative sentences in African languages, including the pattern involving a pitch fall.

10 This pattern of question prosody is observed in the periphery of the Japanese Archipelago, i. e. in the north of Japan as well as in the south (Kubozono 2011b). In comparison, a sentence-final pitch rise is the characteristic feature of question prosody in Tokyo Japanese and other dialects in the central part of the country.

11 Prosodically, Wh and Yes/No questions are distinguished from each other in terms of the prominence relationship between the elements in the sentences. Thus, Wh questions in (9) receive the highest prominence on the Wh element, i. e./DAI-ga/ 'Who-NOM', whereas Yes/No questions in (10) receive the highest prominence on the sentence-final verbs (Kubozono 2018b).

12 Wh questions ending in a Type B verb followed by the question particle permit a second tonal pattern involving a H tone on the final particle: e.g. /DAI-ga ki.ta-KA/ 'Who came?' (Kubozono 2018b).

13 According to Annie Rialland (personal communication), many African languages that lack a boundary L% as a marker of declarative sentences have a falling intonation in interrogative

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(11) a. it.ta ‘(I) went’ b. ki.ta ‘(I) came’

H L L H

(12) a. it.ta-ka? ‘(Did he) go?’ b. ki.ta-ka? ‘(Did he) come?’

H L *L%* L H *L%*

This boundary tone analysis can be supported, at least in part, by the fact that the sentence-final low tone attached as a question marker is phonetically different from a lexical L tone, the tone linked to the final syllable of Type A words. To be specific, the tonal value of the sentence-final question particle /ka/ is somewhat variable in KJ and is usually halfway between low and mid tones. However, it is definitely higher than the word-final low tone in Type A words. Thus, /NAI-ka/ (what + question particle) ‘What (is it)?’ can be clearly distinguished from the citation form of the noun /NAI.ka/ ‘internal medicine’: the question particle /ka/ in the former is not as low as the word-final low-toned /ka/ in the latter noun.

The same falling pitch pattern is observed when question particles are omitted in the final position.[14] In sentences without a final question particle, the sentence-final word, whether verb or noun, keeps its lexical tonal pattern intact if it is a Type A morpheme. In this case, the High-Low melody is realized over the final two syllables as in (13), optionally accompanied by final-vowel lengthening if the final syllable is monomoraic as in (12a/b). Let us call this syllable-based tonal assignment ‘Pattern I’. Citation (or declarative) forms are given in [ ] for comparison.

(13) a. IT.ta?~IT.taa? ‘(Did you/he) go?’ [IT.ta]
b. na.TU.o?~na.TU.oo? ‘(Was it) Natsuo?’ [na.TU.o]
c. RON.don? ‘(Is this) London?’ [RON.don]
d. BAA.tyan? ‘(Was it) Grandma?’ [BAA.tyan]

While the lexical tonal pattern remains largely intact in the question intonation in (13), one finds a different situation if the final word is a Type B word. In this case, too, a pitch fall occurs in final position, thus deviating from the lexical tonal pattern

sentences. This generalization does not hold in Japanese, however, since many dialects of the language including Tokyo Japanese have a rising intonation for questions although they lack a boundary L% specifically for declarative sentences (apart from the phrase-final boundary tone) just like KJ.

14 Old-aged speakers show some reluctance to this omission, while speakers in their sixties and younger speakers permit this in their natural speech.

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of Type B. However, the pitch fall is realized within the final syllable, not over the final two syllables. This pitch pattern, which is called 'Pattern II' and illustrated in (14), apparently involves assigning H-L tones on the basis of the mora: i. e., the penultimate mora is assigned an H tone, while the final mora is linked to an L tone.

(14) a. ki-TAa? '(Did you/he) come? [ki.TA]
b. ha.ru.Oo? '(Was it) Haruo?' [ha.ru.O]
c. ZOo? '(Was it) an elephant?' [ZOO]
d. o.baa.TYAn? '(Is it) Grandma?' [o.baa.TYAN][15]

In (14), the pitch fall in the final position is particularly noticeable if the word ends in a light syllable as in (14a/b), where the sentence-final vowel is obligatorily lengthened.[16] The same tonal pattern is also observed if the final word ends in a heavy syllable, although it is not accompanied by vowel lengthening. What is commonly observed here is that a pitch fall is used as a prosodic marker of question prosody and is realized in the final syllable.

The tonal patterns in (13) and (14) can be accounted for in a straightforward manner if one assumes that the question particle leaves its tone even after it is deleted: the unlinked tone is simply relinked to the final syllable of the sentence-final word. This is represented in (15) and (16), which should be compared with (12a/b), respectively.

(15) a. it.ta-ka? → b. it.ta? '(Did you) go?'
H L *L%* → H L *L%*

(16) a. ki.ta-ka? → b. ki.taa? '(Did you) come?'
L H *L%* → L H *L%*

This autosegmental account can also explain why sentence-final vowel lengthening occurs obligatorily only in Type B words ending in a light syllable. As shown in (16b), the final syllable in this type of word is linked to an H-L sequence and is naturally lengthened in order to accommodate this complex tone sequence. In contrast, the final syllable in Type A words is linked to an L-L sequence, as in

15 /o/ is an honorific prefix and yields a Type B pattern on the prefix-noun sequence in KJ.
16 This generalization implies that the obligatory vowel lengthening in question is a phonological phenomenon to be measured in a binary fashion and is qualitatively different from the optional vowel lengthening in Type A words, e.g. /it.ta?/ 'went', /baa.tyan/ 'Grandma' or Type B words ending in a heavy syllable, e.g. /zoo/ 'elephant'. The latter is probably a phonetic process involving gradient changes in duration.

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(15b), which could be phonetically equivalent to a single low tone. Lengthening of the final vowel is simply not required here. Similarly, the final heavy syllable of Type B words is not necessarily lengthened since, being phonologically bimoraic, it is phonetically long enough to accommodate the H-L sequence within itself. This is illustrated in (17).

(17) a. o.baa.tyan-ka? → b. obaa. tyan? '(Is it) Grandma?'

L H *L%* → L H *L%*

Seen in this light, the prosodic pattern which we called 'Pattern II' in (13) can be understood as a consequence of the tonal reassignment by which the sentence-final syllable is associated with both the word-final H tone of Type B words and the L% tone originally stemming from the question particle. In other words, the mora-based tonal assignment in the question prosody of Type B words may be an epiphenomenon resulting from the requirement that the sentence-final syllable must accommodate two tones, a lexical H tone coming from the sentence-final word and a postlexical L% tone signaling questions.

The discussion of question prosody so far can be summed up in the following three points. First, both Type A and Type B words use the same pitch pattern, i. e. falling pitch, to signal questions. Second, the pitch fall is realized apparently in different domains between the two tonal classes: it is realized between the final two syllables in Type A words, as in (13), and between the two moras within the final syllable in Type B words, as in (14). Finally, the two tonal patterns are not generally neutralized. While both patterns involve a pitch fall, their contrast is maintained in terms of the position or domain where the pitch fall is realized: over the final two syllables in Type A words, e.g. /na.TU.o?/, /BAA.tyan?/, and within the final syllable in Type B, e.g. /ha.ru.Oo?/, /o.baa.TYAn?/.

These three features are obviously interrelated with each other. Realizing a pitch fall in sentence-final position is the utmost requirement of the postlexical process of question intonation in KJ, while maintaining the lexical tonal contrast is another important requirement of the system. These two requirements can be met if and only if the pitch fall is realized in different domains, i. e. within a final bisyllabic window (Type A) versus within a final monosyllabic window (Type B). This difference is schematized in (18). The tonal contrast is thus preserved in this system at the expense of the principle of syllable-by-syllable tone assignment.[17]

17 Zendo Uwano (personal communication) interprets this as suggesting that Type A and Type B contrast with each other in terms of the position of pitch rise: at the beginning of the penultimate syllable (Type A) vs. the final syllable (Type B). According to this interpretation, the position of

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(18) Question prosody

a. Type A

... σσσ]

LHL *L%*

b. Type B

... σσ]

LH *L%*

Given the representations in (18), one may naturally wonder if a tonal neutralization might occur in monosyllabic words. Since monosyllabic words can only have a monosyllabic window, it is expected that both Type A and Type B monosyllables should realize the question prosody within their sole syllables. This speculation can be borne out empirically. Tonal neutralizations actually occur in this specific context in KJ. For example, both monomoraic and bimoraic monosyllables in (4)-(5) above cannot keep the tonal contrast, with the segmentally homophonous pairs becoming tonally homophonous, too. Moreover, due to vowel lengthening in monomoraic words, monomoraic monosyllables and their bimoraic counterparts are pronounced with equal durations. This is shown in (19), where citation forms are given in brackets for comparison. Fig. 2 shows typical F0 patterns of (i) /TOo?/ 'ten?' (Type A) and (ii) /TOo?/ 'tower?' (Type B).

(19) a. monomoraic monosyllables

Type A	Type B
HAa? 'leaf?' [hà]	HAa? 'tooth?' [hā]
GOo?'five?' [gò]	GOo 'the game of *go*?' [gō]

b. bimoraic monosyllables

Type A	Type B
TOo? 'ten?' [TOo]	TOo? 'tower?' [TOO]
ZYUu? 'gun?' [ZYUu]	ZYUu? 'ten?' [ZYUU]
TAi? 'Thailand?' [TAi]	TAi? 'sea bream?' [TAI]

The tonal neutralization shown in (19) can be represented as in (20), with the minimal pair of nouns /hà/ 'leaf' (Type A) and /hā/ 'tooth' (Type B). The tonal contrast can be readily preserved in sentences with the question particle /ka/ since the nouns themselves can bear the tonal distinction, i. e. HL vs. H. If the final particle is omitted, on the other hand, the sole syllable of the nouns comes to carry the postlexical L% tone of the particle in addition to their own lexical tones. In this particular phonological context, monosyllabic words can no longer

pitch rise is the distinctive feature of this system, and this distinctive feature is well preserved in question prosody, where an additional feature of pitch fall is assigned to Type B. While this account sounds interesting, it does not hold in vocative prosody as we will see in the next section.

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discriminate between the two tonal classes, with HL-L% (Type A) becoming phonetically indistinguishable from H-L% (Type B).[18]

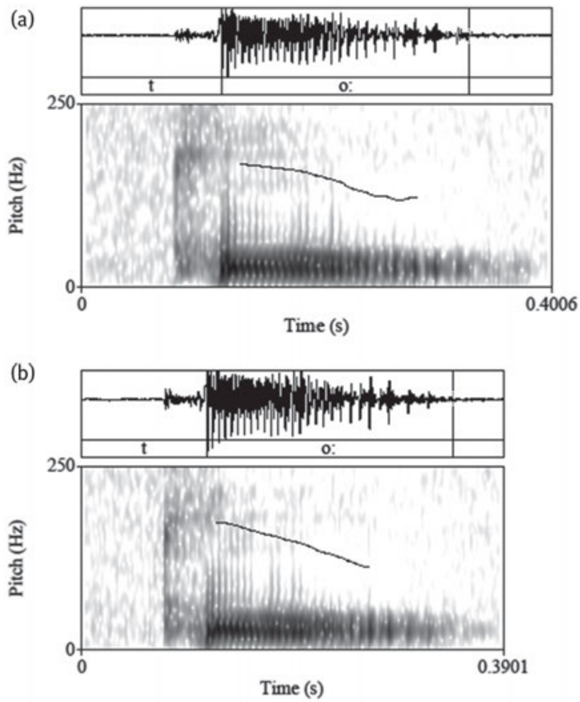

Fig. 2: Typical F0 contours of (a) /TOo?/ 'ten?' (Type A) and (b) /TOo?/ 'tower?' (Type B) in interrogative forms in Kagoshima Japanese.

(20) a. Type A

ha-ka? → haa?

H L *L%* → H L *L%*

b. Type B

ha-ka? → haa?

H *L%* → H *L%*

18 Some native speakers suggest that the two tonal classes can be distinguished from each other by pronouncing Type A monosyllables with a High-Low pattern and their Type B counterparts

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It is probably worth considering the tonal neutralization observed in the question prosody of KJ in a wider context. Hyman (2018a) proposes several parameters to describe tonal neutralizations in general:

(21) a. incidental (vs. intentional)
b. unrecoverable (vs. recoverable)
c. properties of the trigger: intonation (or a boundary tone)
d. nature of the process: assignment of a specific tone by construction
e. extent of the process: total (vs. particial)

In light of these parameters, the neutralization process illustrated in (19)-(20) can be described as follows. First, the tonal neutralization we observe in monosyllabic words in KJ is not an intentional one in nature since neutralization is produced not as an explicit goal but as an ‘innocent bystander’. Second, it is ‘unrecoverable’ rather than ‘recoverable’ since the underlying contrast between Type A and Type B cannot be recovered contextually, i. e. from the tone of the neighboring elements. Third, the trigger of the neutralization process is intonation, or a specific boundary tone (L%) introduced by a particular intonational structure. This is related to the fourth parameter, i. e. the nature of the process. In the neutralization in KJ in question, it is due to the assignment of a particular tone introduced by a particular construction (interrogative sentence), rather than tone assimilation, dissimilation, or reduction. The fifth parameter is not directly relevant here since KJ has only two distinctive tonal patterns and these patterns participate in the neutralization.

3.2 Tonal neutralizations and changes

Having understood that monosyllabic words in KJ exhibit tonal neutralizations at the postlexical level, one may naturally wonder if these neutralizations in the synchronic grammar may lead to a loss of tonal contrast at the lexical level. Specifically, tonal neutralizations in monosyllabic words may eventually result in the merger of the two tonal classes in historical perspectives.

Recall that young native speakers of KJ have almost lost the tonal contrast in monosyllabic words in citation forms (section 2). This might be taken as suggesting that the postlexical neutralizations discussed in this section have triggered tonal changes at the lexical level. However, this interpretation cannot

with a Mid-Low pattern, that is, by pronouncing the former with a steeper pitch fall than the latter. This intuition is yet to be corroborated experimentally.

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be supported by empirical data. It is true that monosyllabic pairs of bimoraic length such as /TOo/ 'ten'—/TOO/ 'tower' and /BAn/ 'night'—/BAN/ 'one's turn' have merged into /TOo/ and /BAn/, i. e., into a falling pattern, in the young speakers' citation (or declarative) forms. That is, the two tonal classes have merged into the typical Type A pattern here. This pattern of tonal change is identical to the neutralization pattern we observe in question prosody, as shown in (19b) and Fig. 2. However, the same explanation does not hold in monomoraic pairs such as /hì/ 'sun'—/hī/ 'fire' and /hà/ 'leaf'—/hā/ 'tooth'. Young native speakers of KJ have lost the tonal contrast here, too, but they pronounce these monomoraic words with a flat pitch pattern rather than a falling pattern, as mentioned in section 2 (Tab. 1). In other words, the two tonal classes have merged into the Type B pattern. This pattern of tonal change at the lexical level is different from the neutralization pattern that we observe at the postlexical level shown in (19a). This means that the explanation based on the postlexical neutralizations cannot account for the opposite directions of tonal changes observed between bimoraic and monomoraic monosyllables in young speakers' speech.

On the other hand, the tonal changes now in progress in monosyllabic words can be accounted for in a principled way if they are interpreted as a result of dialect contact or bilingualism. As mentioned in section 2, the standard Tokyo dialect has also lost the tonal contrast in monosyllabic words: monomoraic words are now pronounced with a flat pitch pattern, while bimoraic monosyllales are produced with a falling pitch pattern. The new tonal patterns employed by young KJ speakers are identical to these tonal patterns in the standard variety (Tab. 1 above). In other words, young KJ speakers have changed their tonal shapes of monosyllabic words as if they had copied the standard Tokyo patterns with respect to the presence or absence of a pitch fall. This interpretation can be supported by a wide range of evidence observed in the speech of young KJ speakers (see Kubozono 2018a for more details).

In sum, the tonal neutralizations in monosyllabic words observed in KJ question prosody cannot be directly linked to the tonal changes that are in progress at the lexical level in the dialect. The latter changes can best be interpreted as a result of language (dialect) contact. This suggests that tonal neutralizations at the postlexical level are independent of tonal changes at the lexical level. This is basically true of the second type of postlexical tonal neutralization we will see in the next section.

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4 Tonal neutralizations in vocative intonation

4.1 Background

Having understood the tonal forms of question prosody in KJ, let us now discuss vocative intonation and tonal neutralizations observed in this postlexical process. Let us begin with the morphological structure of vocative forms. Japanese dialects are similar to English and different from Latin, Bulgarian, Korean and Taiwanese[19] in having no particular morphological marker for vocative forms. Thus, a bare form is used in Japanese dialects when calling a person and pronouncing his/her name in isolation: e.g. /ha.ru.o/ 'Haruo', /ha.na.ko/ 'Hanako', /ta.roo/ 'Taro', etc.

On the other hand, different Japanese dialects seem to employ different prosodic strategies. Some dialects do not generally change the tonal pattern in the citation form when calling people, while others modify the citation form to some extent. Tokyo Japanese basically belongs to the former group, and KJ to the latter group.

In Tokyo Japanese, one and the same tonal pattern is generally used for both citation and vocative forms. This is illustrated in (22), with the names /HA.ru.ko/ (accented) and /ha.RU.O/ (unaccented). Citation and vocative forms may involve different degrees of intensity and/or pitch boost, but they do not change the basic tonal pattern of the words with respect to the position of the H tone. Consequently, the two basic tonal types—accented (pronounced with an abrupt pitch fall) and unaccented (without a pitch fall)—are kept distinct from each other in vocative intonation. In (22) and the rest of the article, /./ and /!/ in word-final position are used to denote the tonal pattern in citation and vocative forms, respectively.

(22)

Citation form	Vocative form	
HAruko.	HAruko!	'Haruko'
oKAasan.	oKAasan!	'mother'
haRUO.	haRUO!	'Haruo'
oBASAN.	oBASAN!	'aunt'

19 In Latin, vocative forms often have their own morphological marker as exemplified by the famous phrase *Et tu, Brute!* 'You, too, Brutus', where the nominative form *Brutus* alternates with the vocative form *Brute*. Similarly, vocative forms are distinguished from nominative forms in modern Bulgarian, too: *mama* 'mother (nominative)' vs. *mamo* 'mother (vocative)'.

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One exception to this generalization is the vocative form used by a person when talking to another person with an intimate relationship. If a child is asking her family member for a favor, for example, she is likely to produce an extra pitch fall within the final syllable, as in (23). This pitch pattern often makes the utterance sound rather childish. In Tokyo Japanese, this type of intonation pattern is observed in highly limited contexts and, moreover, does not lead to the neutralization of the major accent types, accented and unaccented.[20] This compares with the calling intonation patterns in KJ, which we will discuss in the next section.

(23)

	Citation form	Vocative form	
	oKAasan.	oKAaSAn!	'mother'
	HAruko.	HAruKOo!	'Haruko'
	oBASAN.	oBASAn!	'aunt'

4.2 Basic facts

As mentioned above, no systematic work has been done on vocative intonation in KJ. The work reported in this article is hence based upon our own experiments in the field. This fieldwork looked at seven native speakers aged between 56 and 77 (four male and three female speakers) of KJ to examine the tonal patterns they use in question and vocative intonation. They are all from the western part of Kagoshima Prefecture, where the two-pattern prosodic system is attested. The experiments consist of a production experiment and a preliminary perception experiment. 50 test words were used in both experiments including those in (24), which are well balanced between the two tonal classes (Types A vs. B) and word-final syllable structures (Heavy vs. Light). /tyan/ (or *chan*) is a suffix added to children's names to show personal intimacy or affection, roughly equivalent to /-i/ in English names, e.g. Danny for Dan, Johnny for John, Billy for Bill, etc. Hyphens /-/ again denote morpheme boundaries.

(24)

Type A	Type B
na.TU.o 'Natsuo'	ha.ru.O 'Haruo'
RYOO.ko 'Ryoko'	yoo.KO 'Yoko'
ryoo.KO-tyan 'Ryoko-chan'	yoo.ko-TYAN 'Yoko-chan'
BAA-tyan 'grandma'	o.baa-TYAN 'grandma'
kyoo.too-SEN.sei 'vice principal (of school)'	koo.tyoo-sen.SEI 'principal'

20 Sadanobu (2005) refers to children's chants where the lexical contrast between accented and unaccented words is lost.

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The experiments have revealed two resemblances between vocative and question prosody in KJ. First, both vocative and question forms are marked by a final pitch fall. Namely, a pitch fall rather than a pitch rise or any other prosodic feature is used to signal vocative and question intonation alike. Second, both Pattern I and Pattern II are employed: a pitch fall is realized between two syllables in some cases, while it is manifested within the final syllable in others.

On the other hand, vocative prosody is crucially different from question prosody in that the two tonal patterns—Patterns I and II—are found both in Type A and Type B words. In other words, one and the same word permits two variant prosodic patterns (Patterns I and II). This is exemplified in (25) for Type A words and in (26) for Type B words. Again, citation forms are given in [ ] for comparison.

(25) Type A (Pattern I ~ Pattern II)
na.TU.o! ~ na.tu.Oo! [na.TU.o]
RYOO.ko! ~ ryoo.KOo! [RYOO.ko]
BAA-tyan! ~ baa-TYAn! [BAA-tyan]
kyoo.too-SEN.sei! ~ kyoo.too-sen.SEi! [kyoo.too-SEN.sei]

(26) Type B (Pattern I ~ Pattern II)
ha.RU.o! ~ ha.ru.Oo! [ha.ru.O]
YOO.ko! ~ yoo.KOo! [yoo.KO]
o.BAA-tyan! ~ o.baa-TYAn! [o.baa-TYAN]
koo.tyoo-SEN.sei! ~ koo.tyoo-sen.SEi! [koo.tyoo-sen.SEI]

Again, Pattern I involves a pitch fall between the final two syllables. In contrast, Pattern II involves a pitch fall over the final two moras in the final syllable: this syllable undergoes vowel lengthening if it is light, to attain a phonological bimoraic length. Pattern II deviates from the lexically-determined prosodic patterns not only in involving a pitch fall in Type B words but also in realizing the pitch feature within the final syllable in both tonal classes of words.

That vocative prosody induces a pitch pattern deviating from the lexical pattern of Type B words can be seen from the following minimal pair of sentences: (27a) contains a lexical or nominative form of /obaatyan/ 'Grandma',[21] while (27b) involves the vocative form of the same noun. The former is a sentence addressed to a third person, while the latter is addressed to the Grandma herself.

(27) a. o.baa.TYAN GEN.ki?
Grandma well
'Is Grandma well?'

21 To be precise, this pattern represents a nominative case without the nominative marker /wa/.

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b. o.baa.TYAn GEN.ki?
Grandma well
'Are you well, Grandma?'

Putting aside phonetic details, Pattern I in Type A words corresponds to the citation form of the same tonal class in phonological shape: e.g. /BAA.tyan!/ [BAA.tyan]. Other vocative patterns in (25) and (26) are different from the corresponding citation forms. Of these, Pattern II in Type A words and Pattern I in Type B words are characteristically found in vocative prosody. Interestingly, Pattern I in Type B words is identical to the citation form of Type A words, where the H tone is linked to the penultimate syllable.

One may naturally wonder here how native speakers differentiate the two tonal patterns in language use, e.g. whether the two vocative patterns have different pragmatic implications or they are used in different pragmatic contexts. A close examination of our data has revealed two such factors. One of them concerns the tonal class itself: Type A words tend to prefer Pattern I to Pattern II, while Type B words display opposite preferences. In the production experiment, the speakers spontaneously produced Pattern I for Type A words (86 %) more frequently than Pattern II (14 %). For the other tonal class (Type B), they showed a bias in the opposite direction: Pattern I (30 %) vs. Pattern II (70 %). These tendencies may be attributed to the fact that Pattern I is identical to the lexical tonal pattern of Type A words, while Pattern II is more similar than Pattern I to the lexical tonal pattern of Type B words (see (25) and (26)).

These biases become weaker in our preliminary perception experiment, however. When presented with both Pattern I and Pattern II for the same word,[22] most of the seven speakers we looked at permitted both prosodic patterns equally well. Asked if a particular pattern sounds natural enough for a particular word, the subjects generally responded positively to both Pattern I and Pattern II. Tab. 3 gives the ratios by which the subjects judged as 'natural enough'.

Tab. 3: Results of naturalness judgments.

Tonal class \ Prosodic Pattern	Pattern I	Pattern II
Type A	98 %	82 %
Type B	80 %	100 %

22 Each subject was asked to judge the naturalness of each prosodic pattern for the randomly presented test words after hearing each pattern once. He/she was also asked about the contexts in which each pattern is typically used in daily life.

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While the biases become smaller in the perceptual experiment, it is still true that Type A words prefer Pattern I to Pattern II, while Type B words favor Pattern II to Pattern I. In addition to these tendencies, there is a pragmatic factor responsible for the distribution of the two prosodic patterns, I and II. All subjects agree that Pattern II implies a more intimate relationship between the speaker and the hearer than Pattern I. They also agree that Pattern II is used in more casual and friendly contexts than Pattern I. The reality of this pragmatic factor can be seen clearly in the comparison between personal names with and without /tyan/, an affection-adding suffix: e.g. /ryoo.ko/ vs. /ryoo.ko-tyan/ (Type A) and /yoo.ko/ vs. /yoo.ko-tyan/ (Type B). Tab. 4 compares these pairs of words by looking at the pattern that the subjects spontaneously produced in the production test. While different prosodic patterns are preferred by different tonal classes (A vs. B), one can find a clear effect of /tyan/ by which Pattern II is prompted. Given that /tyan/ boosts the degree of the speaker's intimacy or affection towards the hearer, the fact in Tab. 4 agrees with the native speakers' intuition that Pattern II has a more intimate implication than Pattern I.

Tab. 4: Results of production test.

Prosodic Pattern / Test Word (tonal class)	Pattern I	Pattern II
ryoo.ko (Type A)	100 %	0 %
ryoo.ko-tyan (Type A)	80 %	20 %
yoo.ko (Type B)	60 %	40 %
yoo.ko-tyan (Type B)	20 %	80 %
ha.ru.o (Type B)	80 %	20 %
ha.ru.o-tyan (Type B)	20 %	80 %

4.3 Postlexical neutralizations

So far, we have seen the two prosodic patterns (I and II) found in vocative intonation in KJ. We have also seen that two factors are at work behind the distribution of these two patterns. While the choice between the two prosodic patterns is thus linguistically controlled to some extent, it is nevertheless arbitrary in most cases. In fact, the two prosodic patterns are actually accepted by the subjects for one and the same word in one and the same context. To take one example, the name /ha.ru.o/ (Type B word) can take /ha.RU.o!/ (Pattern I) and /ha.ru.Oo!/ (Pattern II) in the same pragmatic context. These variant patterns are basically independent of the speaker, the tonal class (Type A or B), and the pragmatic context in which the words are produced. This interpretation is consistent with the perception data

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in Tab. 3, which shows that both prosodic patterns are accepted as ‘natural’ by the native speakers.

That Pattern I and Pattern II can both be used for Type A and Type B words means that the tonal contrast is often lost in vocative intonation. Thus, the lexical distinction between /ryoo.KO-tyan/ (Type A) and /yoo.ko-TYAN/ (Type B) is lost as the two words are pronounced with Pattern I, as in (28), or with Pattern II, as in (29).

(28) a. ryoo.KO-tyan! (Type A)
b. yoo.KO-tyan! (Type B)

(29) a. ryoo.ko-TYAn! (Type A)
b. yoo.ko-TYAn! (Type B)

Similarly, the tonal contrast between /na.TU.o/ (Type A) and /ha.ru.O/ (Type B) is lost as they are pronounced with Pattern I, i. e. /na.TU.o!/ vs. /ha.RU.o!/, or with Pattern II, i. e. /na.tu.Oo!/ vs. /ha.ru.Oo!/. Again, one and the same person can produce this same tonal pattern for both tonal classes of words in one and the same context.

Finally, it is worth pointing out that the tonal neutralizations observed here do not represent a new development in KJ. Unlike the tonal changes in monosyllabic words discussed in section 2 above, the tonal neutralizations in vocative intonation are observed in the speech of middle-aged and older generations. This suggests that they exist in the traditional system of KJ as an integral part of its prosodic structure. Moreover, the neutralizations in vocative prosody cannot be linked to the tonal changes that young KJ speakers show in the lexical/citation forms of monosyllabic words, where monomoraic and bimoraic words merge into a flat pitch pattern and a falling pattern, respectively. The tonal neutralizations in vocative prosody always result in falling pitch patterns. In this sense, the tonal neutralizations observed in the vocative intonation of KJ occur independently of the ongoing historical tonal change at the lexical level.

5 Comparison with question intonation

In the preceding section we saw how vocative prosody is produced in KJ. The discussion can be summed up in three points. First, vocative intonation is signaled by a pitch fall in both tonal categories. This forces Type B words to deviate from their lexical tonal forms in which no pitch fall occurs. Second, vocative intonation involves two variant patterns both in Type A and Type B words: In one prosodic pattern, a pitch fall occurs within the final syllable rather than across the

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final two syllables in polysyllabic words. In this respect, too, postlexical prosodic forms can deviate from lexical ones.

Note that these two features are shared by question prosody in the same dialect. Both postlexical processes, in fact, involve a pitch fall in word-final position and can produce tonal patterns that deviate from those determined at the lexical level. However, vocative prosody is different from question prosody in one crucial point. Namely, both tonal classes can take two variant tonal patterns one of which involves a pitch fall between the final two syllables and the other within the final syllable. This feature gives rise to tonal neutralizations in vocative prosody much more freely than in question prosody.

To summarize, vocative prosody is crucially different from question prosody in yielding tonal neutralizations in wider phonological contexts. This crucial difference is due to the fact that the former postlexical process permits two tonal patterns—Pattern I and Pattern II—for both Type A and Type B words, whereas the latter process permits only one tonal pattern for each tonal class—Pattern I for Type A words and Pattern II for Type B words. In the latter process, tonal neutralizations occur only in monosyllabic words. Tab. 5 summarizes this difference in terms of the tonal pattern each tonal class can take.

Tab. 5: Comparison between vocative and question prosody in KJ.

Prosody type / Lexical tonal class	Vocative Prosody	Question Prosody
Type A	Pattern I~ Pattern II	Pattern I
Type B	Pattern I ~Pattern II	Pattern II

One last question about vocative prosody in KJ is whether its two prosodic patterns—Patterns I and II—are phonetically identical to those observed in question prosody. So far, we have contented ourselves by comparing the prosodic patterns in terms of the position of a pitch fall, or the position of H tone in the autosegmental representation. Vocative and question prosody have the same tonal pattern in this regard. Thus, Pattern I in vocative prosody is identical to Pattern I in question prosody: e.g. /na.TU.o!/ ‘Natsuo!’ vs. /na.TU.o?/ ‘Natsuo?’, /BAA.tyan!/ ‘Grandma!’ vs. /BAA.tyan?/ ‘Grandma?’. Likewise, Pattern II in vocative prosody has the same tonal shape as Pattern II in question prosody: e.g. /ha.ru.Oo!/ ‘Haruo!’ vs. /ha.ru.Oo?/ ‘Haruo?’, /o.baa.TYAn!/ ‘Grandma!’ vs. /obaa.TYAn?/ ‘Grandma?’. In the autosegmental framework, these vocative and question patterns can be represented as follows, where vocative intonation is shown by the same boundary marker (*L%*) as question intonation.

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(30) a. Vocative, Pattern I

na.TU.o!

L H L *L%*

b. Question, Pattern I

na.TU.o?

L H L *L%*

(31) a. Vocative, Pattern II

ha.ru.O!

L H *L%*

b. Question, Pattern II

ha.ru.O?

L H *L%*

This autosegmental analysis can be supported by the fact that the outputs are very similar in phonetic terms, too, as shown in Figs. 3 and 4.

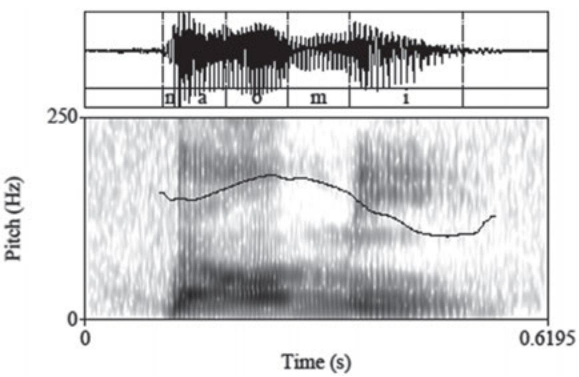

Fig. 3: A typical pitch contour of /na.O.mi!/ 'Naomi!', the vocative form (Pattern I) of /na.O.mi/ 'Naomi' (Type A).

More interestingly, native speakers of KJ cannot hear the difference between the vocative and question forms. When aurally presented with the pairs of words like those in Figs. 3 and 4, they cannot readily tell which one is a vocative form and which one is a question form. Their most typical reaction is that the two prosodic forms sound identical to them and can be interpreted as either a vocative or question form. This suggests that vocative and question prosody yield one and the same phonetic as well as phonological forms in KJ.[23]

23 This situation is similar to the one observed in Bulgarian, where vocative and question prosody have identical prosodic forms. In this language, the two types of postlexical processes yield not only identical morphological forms, e.g. /mamo/ 'mother' (versus the nominative form

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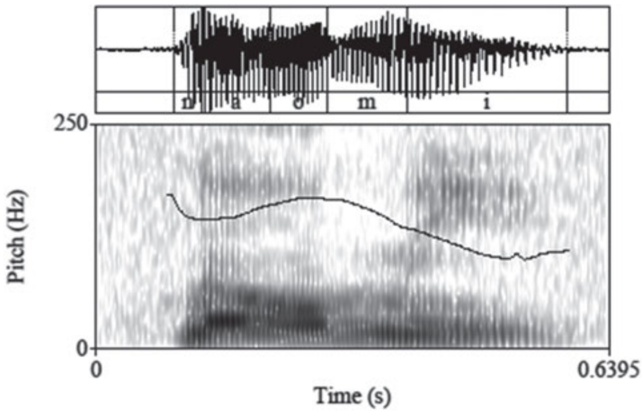

Fig. 4: A typical pitch contour of /na.O.mi?/ 'Naomi?', the question form (Pattern I) of /na.O.mi/ 'Naomi' (Type A).

6 Conclusion

In this article, we analyzed two postlexical processes—question and vocative prosody—in KJ, a language with two lexical tonal classes (Type A and Type B). At the lexical level, these two tonal classes can be distinguished from each other in terms of the position of a High-toned syllable (penultimate vs. final) or the presence or absence of a L tone (or a pitch fall) in word-final position; namely, they are not neutralized at the lexical level, at least in the traditional grammar of the dialect. We examined how the two postlexical processes change the lexical tonal patterns, and discovered that they share two features: (i) they both involve a pitch fall in word-final position, not only in Type A but also Type B words, and (ii) they produce pitch patterns that deviate from those determined at the lexical level. As for the second point, the postlexical processes employ a new strategy of tonal assignment whereby a H-L sequence is associated with the final syllable rather than the final two syllables. This new type of tonal assignment deviates from the tonal assignment at the lexical level, where the H and L tones are usually linked to different syllables.

/mama/), but also an identical pitch pattern, i. e. a rising pitch contour, for vocative and question forms (Emil Tanev, personal communication). Unlike KJ, this language employs a pitch rise rather a pitch fall as a prosodic marker of vocative and question forms, but it is similar to KJ in having an identical pitch pattern for the two postlexical forms.

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Tab. 6: Summary of lexical, question and vocative forms.

Tonal class	Lexical form	Question form	Vocative form	Gloss
A	na.TU.o	na.TU.o?	na.TU.o! ~ na.tu.Oo!	Natsuo
B	ha.ru.O	ha.ru.Oo?	ha.RU.o! ~ ha.ru.Oo!	Haruo
A	na.tu.O-tyan	na.tu.O-tyan?	na.tu.O-tyan! ~ na.tu.o-TYAn!	Natsuo-chan
B	ha.ru.o-TYAN	ha.ru.o-TYAn?	ha.ru.O-tyan! ~ ha.ru.o-TYAn!	Haruo-chan
A	BAA.tyan	BAA.tyan?	BAA.tyan! ~ baa.TYAn!	Grandma
B	o.baa.TYAN	o.baa.TYAn?	o.BAA.tyan! ~ o.baa.TYAn	Grandma
A	kyoo.to-SEN.sei	kyoo.too-SEN.sei?	kyoo.too-SEN.sei! ~ kyoo.too-sen.SEi!	vice principal
B	koo.tyoo-sen.SEI	koo.tyoo-sen.SEi?	koo.tyoo-SEN.sei! ~ koo.tyoo-sen.SEi!	principal

Question and vocative prosody are similar in showing tonal neutralizations, too, but to different degrees. The former process yields tonal neutralizations only in monosyllabic words, while the latter shows the same phenomenon in much more general ways. This difference in the extent of neutralization comes about primarily because the two tonal classes of words (A and B) both admit two prosodic patterns—Pattern I *and* Pattern II—in vocative prosody, whereas they admit only one pattern—Pattern I (Type A words) *or* Pattern II (Type B words)—in question prosody. In vocative prosody, in other words, native speakers permit one and the same prosodic pattern for both Type A and Type B words. This is summarized in Tab. 6.

Finally, this study has uncovered many interesting facts about KJ prosody, as we have seen above, but revealed some new questions at the same time. As for KJ prosody, it is necessary to explore pragmatic and other factors in more detail that are at work behind the choice of the two prosodic forms of vocative intonation (Patterns I and II). A more detailed analysis may show that one prosodic pattern is preferred to the other due to some sociolinguistic factors such as the speaker's age, gender and place of residence. This study may eventually illuminate the historical development by which the two vocative patterns (I and II) and the resultant loss of tonal contrast at the postlexical level emerged in KJ.

Another interesting issue concerns the tonal patterns that vocative prosody displays in other Japanese dialects as well as in other languages. While this is

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an understudied area of research, a detailed cross-linguistic study can provide a typological picture of different tonal patterns used in vocative prosody across languages and dialects. It may also shed new light on the relationship between vocative and question prosody, the two postlexical processes that yield similar prosodic patterns in KJ (and Bulgarian). Finally, the same line of cross-linguistic research may show us a new typological picture regarding the interactions between lexical and postlexical prosodic patterns in language in general.

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Toshio Matsuura

Tonal Neutralization and Lexical Category in Nagasaki Japanese

Abstract: This article reports and analyzes tonal neutralization in Nagasaki Japanese (NJ), with particular reference to morphological conditions. NJ has two contrastive word tonal patterns: Type A (falling) and Type B (non-falling). Previous studies have demonstrated that tonal contrasts are lost in compounds when the first element of a compound contains three or more moras. However, a report on compound tone in Amakusa Japanese, a neighboring dialect to NJ, argues that tonal contrasts are not lost in V-V compounds; that is, tonal neutralization occurs only in N-N compounds. The present article reports on a fieldwork experiment regarding the realization of compound tone in V-V and V-N compounds in NJ, demonstrating that V-V compounds keep the distinction between Type A and Type B tone even if the first element contains three or more moras. On the other hand, tonal contrasts in V-N compounds are partially lost. The morphological asymmetry reported in the current study makes a contribution to the studies on phonological privilege with regard to morphological category.

Keywords: compound, verb-noun compounds, verb-verb compounds, word tone, Nagasaki Japanese

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1 Introduction

One of the characteristic features of Japanese dialects is the diversity of their pitch accent systems. In particular, the Kyushu area shows a rich variety of such systems. Since Hirayama's (1951) descriptive study, a four-way classification of pitch accent systems is accepted for these dialects. First, Northeastern dialects such as Fukuoka and Oita have a multi-pattern accent system, similar to Tokyo Japanese. For example, there are *n* contrastive accent patterns for *n* syllable words in Hakata (Fukuoka) Japanese (Hayata 1985). In other words, these dialects have many more accentual contrasts than other Kyushu dialects. Second, dialects in the central area, such as Kumamoto, Miyazaki, and Eastern Saga, have neither contrastive pitch pattern nor any fixed pitch patterns for a given prosodic unit. Although these dialects have no contrast in lexical pitch, there are some constraints on prosodic phrasing (Maekawa 1997 for Kumamoto Japanese; Igarashi 2014 for review). Third, dialects with a fixed number of contrastive pitch patterns are distributed in the southwestern part of the island, including those of Kagoshima, Nagasaki, Kobayashi and Amakusa. Since Kobayashi dialect has a fixed phrasal pitch, this dialect is distinct from the accentless dialects described above and is referred to as a one-pattern system. The other dialects, that is Kagoshima, Nagasaki, and Amakusa, have two contrastive tonal types: Type A tone (with pitch-fall) and Type B tone (without pitch-fall), and so are referred to as two-pattern dialects. The map in (1) illustrates the geographical distribution of the pitch accent systems on Kyushu Island.

This study reports the results of a fieldwork experiment, investigating tonal neutralization in compounds in Nagasaki Japanese. Its goal is to demonstrate that tonal neutralization in Nagasaki Japanese is sensitive to morphological category. To achieve this goal, this article is organized as follows. Section 2 describes some basic characteristics of the tonal system in Nagasaki Japanese, and reviews previous studies on tonal neutralization in compound nouns and raise some relevant issues. This will be followed by the main discussion of this article. After describing the methodology of the fieldwork experiment in section 3, section 4 demonstrates that the tonal distinction between Type A tone and Type B tone is maintained in verb-verb (V-V) compounds, but not in some verb-noun (V-N) compounds. Section 5 summarizes the discussion and mentions some points for further research.

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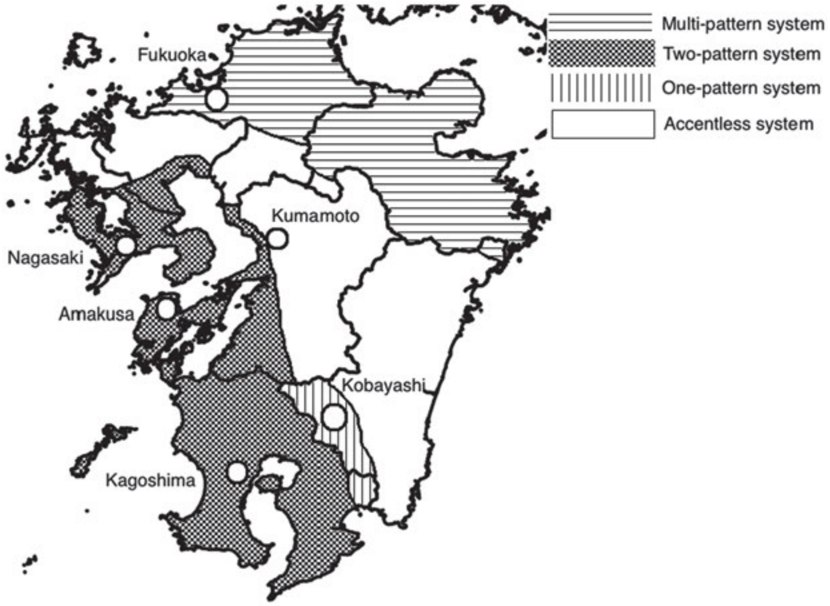
(1) Accent systems on Kyushu Island (based on Hirayama 1951)



2 Background

This section describes some basic facts on tonal phenomena in Nagasaki Japanese (henceforth NJ), focusing especially on compounds. This detailed description of tone will help to clarify the issues discussed in the following sections.

2.1 Basic characteristics of the tonal system in Nagasaki Japanese

NJ is a dialect spoken in and around the central part of Nagasaki city. As shown in (2), Type A tone has a high pitch on the second mora, except in the case of two-mora words, which are high-pitched on the first mora, while Type B tone has no high pitch (Matsuura 2014). In (2) and the rest of this article, capital letters indicate high-pitched moras, and dots denote syllable boundaries.

(2) a. Type A-1: Peak pitch on the second mora
ku.RU.ma 'car', to.MO.da.ti 'friend', baI.o.rin 'violin'
b. Type A-2: Peak pitch on the first mora in the case of two-mora words
A.me 'candy', YU.ki 'snow', SI.ro 'white', BA.su 'bus'

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c. Type B: Flat pitch
a.me 'rain', o.to.ko 'man', mu.ra.sa.ki 'purple', a.su.pi.rin 'aspirin'

Fig. 1 shows the waveforms and F0 contours of Type A and Type B tones in isolation. Although F0 rises on the second mora in both tonal types, the pitch range of Type B tone is significantly smaller than that of Type A tone. Therefore, the F0 rise in Type B should be distinguished from that in Type A both phonologically and phonetically. Moreover, while the F0 falls linearly from the second mora to the final mora in Type A words, F0 is nearly flat in Type B words (Matsuura 2014).

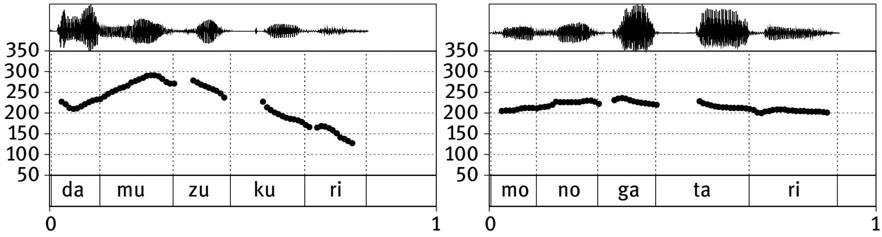
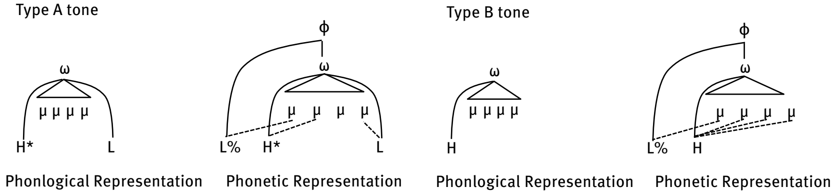


Fig. 1: Waveforms and F0 contours of word tone in NJ.

Based on phonetic realization, both an H* melody and an L melody should be assigned to Type A tone words, and an H melody to Type B words. In Matsuura's (2014) phonetic representation, the L% tone assigned to the accentual phrase is linked to its first mora. In Type A words, the H* tone is associated with the second mora, and the L tone with the final mora. In Type B words, the H tone is linked to the second and the following moras. The simplified representations of tonal melody are shown in (3).[1]

(3) Representation of tonal melody in Nagasaki Japanese



Although NJ is similar to Kagoshima Japanese (henceforth KJ) in having only two contrastive pitch patterns (Hirayama 1951; Kibe 2000; Kubozono 2018), these two dialects differ both in the phonetic realizations of their pitch patterns and in the distribution of these patterns in loanwords. KJ has a high-pitched portion on the penultimate (Type A) or final (Type B) syllable of an accentual phrase,

1 See Matsuura (2014) for other possible phonetic representations of Type B words.

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which corresponds to a minimal syntactic phrase often referred to as a "bunsetsu" in the traditional literature, and consists of a sequence of a word and one or more grammatical particles. For example, Type A words like *A.me* 'candy' take a high pitch on the penultimate syllable of the accentual phrase, so that the high pitch apparently shifts rightwards when case particles are attached, as in *a.ME-mo* 'candy-also' and *a.me-KA.ra* 'candy-from'. In contrast, NJ has a high-pitched portion on the second mora (Type A). Consequently, it does not show high pitch shift when case particles are attached to the word. This is exemplified in (4).

(4) KJ: ku.RU.ma, ku.ru.MA-mo, ku.ru.ma-KA.ra, ku.ru.ma-ka.RA-mo
NJ: ku.RU.ma, ku.RU.ma-mo, ku.RU.ma-ka.ra, ku.RU.ma-ka.ra-mo
Gloss: 'car', 'car-also', 'car-from', 'car-from-also'

From these examples, we can see that the tone assignment rules differ between KJ and NJ. Type A has a falling melody in both dialects. The melody is assigned from right to left in KJ, but from left to right in NJ. Moreover, the tone bearing unit also differs between the two dialects. The tone bearing unit in KJ is the syllable, and consequently, there is no falling tone within a syllable, except in monosyllabic words with Type A tone.[2] In NJ, in contrast, the tone-bearing unit is the mora, so that contour tones are permitted within a syllable, as in the first syllable of *boO.na.su* 'bonus' and the second syllable of *su.TAa.to* 'start'.

Non-syllabic moras, or the second mora of heavy syllables, do not appear as the initial mora of a word or syllable. They fall into four types, i. e., moraic nasals, the second half of long vowels and diphthongs, and the first half of geminates. Non-syllabic moras in NJ are more autonomous than in Tokyo Japanese (TJ). In TJ, non-syllabic moras cannot bear an accent and, therefore, the accent on these non-syllabic moras shifts to the syllabic mora of the same syllable. For example, *-zin* 'people' (bound morpheme), has an accent on the preceding mora in compounds such as *a.me.ri.ka'-zin* 'the American' and *hu.ran.su'-zin* 'the French'.[3] If the preceding word ends in a non-syllabic mora, the accent shifts to the preceding syllabic mora, as in *pe.ru'u-zin* 'Peruvian'[4] and *i.ra'n-zin* 'Iranian'. This kind of accent shift does not occur in NJ, however. In this dialect, the high-pitched portion of a word does not shift even when the second mora is a non-syllabic one, as shown in (5).[5]

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2 See Kubozono (2018) for other cases showing a pitch fall within a syllable.
3 Word accent in TJ is shown by an apostrophe, placed immediately after the accented mora, and unaccentedness is indicated by "⁻" at the end of the word.
4 The second vowel of the second syllable of *peruu-zin* does not constitute an independent syllable by itself. The vowel is a second half of a long vowel, therefore the (broad) phonetic transcription becomes [perúːz̥iɴ].
5 Matsuura (2013) demonstrates the autonomous nature of non-syllabic moras in NJ using acoustic phonetic evidence.

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(5) High pitch on non-syllabic moras in NJ[6]
  a. Moraic nasal: teN.ka 'firing', kyaN.dii 'candy', koN.saa.to 'concert'
  b. Long vowels: biI.ru 'beer', paA.tii 'party', tyuU.rip.pu 'tulip'
  c. Geminates: koP.pu 'cup', niK.ke.ru 'nickel', eS.see 'essay'
  d. Diphthongs: taI.ki 'waiting', saI.daa 'cider', daI.zye.su.to 'digest'

There are also large differences between NJ and KJ in the distribution of loanword tone. According to Umegaki (1944), loanwords in Japanese dialects show a tendency to take falling pitch patterns. In TJ, for example, most loanwords take the accented pattern, which involves a pitch fall, despite the fact that TJ generally permits both accented and unaccented words (Sibata 1994; Kubozono 2006). Similarly, over 90 % of loanwords in KJ take Type A tone (Sibata 1994; Kibe and Hashimoto 2003). In addition, young KJ speakers show a tendency to take Type A tone if a loanword is accented in TJ, and Type B tone if a loanword is unaccented in TJ (Kibe and Hashimoto 2003). In contrast, the ratio of Type A loanwords in NJ is considerably lower than that in KJ; According to Sakimura (2006) and Matsuura (2008, 2014), only about 50 % of NJ loanwords take Type A tone.

What factor is responsible, then, for the relatively high percentage of Type B loanwords in NJ? In order to answer this question, it is necessary to look at the correspondence between tonal types of NJ and the accent pattern in TJ. As is well known, many loanwords in TJ are accented on the antepenultimate mora, as in *na'i.fu* 'knife', *ka'.me.ra* 'camera', *to.ra'.bu.ru* 'trouble', and *a.su.fa'.ru.to* 'asphalt' (Terakawa and Kusaka 1944; McCawley 1968). Most of these loanwords are produced with Type A tone in KJ. In NJ, while *naI.fu*, *ka.ME.ra*, and *to.RA.bu.ru* are produced with Type A tone, *a.su.fa.ru.to* is produced with Type B tone. This is not a lexical exception, as many other loanwords that are accented in TJ, such as *a.ru.ba'i.to* 'arbeit' (German), *tyo.ko.re'e.to* 'chocolate', *na.po.re'.on* 'Napoleon', are also produced with Type B tone in this dialect. Matsuura (2008) pointed out that loanword tone in NJ is sensitive to the accent location in TJ and that loanwords are realized with Type A tone in this dialect if they are accented on either of the first two moras in TJ; otherwise, loanwords are realized with Type B tone. This is exemplified in (6). Sino-Japanese and proper nouns show a similar tendency (Matsuura 2014).

(6) Correspondences between accent pattern in TJ and tonal pattern in KJ and NJ

TJ form	(old) KJ form	(new) KJ form	NJ form	Gloss
te'.ku.nik.ku	te.ku.NIK.ku (A)	te.ku.NIK.ku (A)	te.KU.nik.ku (A)	technic
pu.re'.zen.to	pu.re.ZEN.to (A)	pu.re.ZEN.to (A)	pu.RE.zen.to (A)	present

6 Capitalized *n* (N) denotes a moraic nasal with high pitch.

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o.ru.go'o.ru	o.ru.GOO.ru (A)	o.ru.GOO.ru (A)	o.ru.goo.ru (B)	music box
a.ru.koo.ru¯	a.ru.KOO.ru (A)	a.ru.koo.RU (B)	a.ru.koo.ru (B)	alcohol

The correspondences between tone in NJ and the accent patterns in TJ, however, cannot be found in native (Yamato) Japanese words. Rather, we see a tendency towards an reverse correspondence instead. For example, *a'.me* 'rain', *u'.mi* 'sea', and *sa'.ru* 'monkey' are accented on the first mora in TJ, but take Type B tone in NJ. Similarly, *a.me¯* 'candy', *ku.ti¯* 'mouth', and *mi.zu¯* 'water' are unaccented in TJ, but take Type A tone in NJ. The quantitative results of Matsuura (2014) demonstrate that about 60 % of native words inversely correspond to TJ in tonal pattern.[7]

In sum, although NJ shares some features with KJ as regards their two contrastive pitch patterns, it is different from KJ in the phonetic realization of the two patterns, the presence of high-pitch shift, and their correspondences with TJ accent patterns in loanwords.

2.2 Tonal patterns of compound nouns in NJ

The two sister dialects, NJ and KJ, are strikingly different from each other in the phonology of compounds as well as loanwords. To understand this difference, let us first look at the differences between TJ and NJ/KJ. In TJ, compound accent is determined by the phonological specification of the final element of the compound. Hence, compounds take the same accent pattern if they share the same final element. This is exemplified in (7), where compounds with *-do.ro.boo* 'thief' as the final element take an accent on the first syllable of this element.

(7) Compound accent in TJ
  a. mo.mo¯ → mo.mo-do'.ro.boo 'a peach thief'
  b. u.ma' → u.ma-do'.ro.boo 'a horse thief'
  c. me'.ron → me.ron-do'.ro.boo 'a melon thief'
  d. u.sa.gi¯ → u.sa.gi-do'.ro.boo 'a rabbit thief'

In two-pattern dialects in Kyushu, in contrast, the tonal pattern of compounds is determined by the tonal type of the first element (henceforth E_1). That is, compounds take Type A tone if their first elements take Type A tone (Hirayama 1951). Some KJ examples are given in (8), using the same words in (7). In KJ, compounds with *mo.mo* and *me.ron* in E_1 take Type A tone, while those with *u.sa.gi* and *u.ma* in E_1 take Type B tone. This compound tone rule is called Hirayama's Law, or the general compounding tone rule.

7 It is difficult to account for why only native words show this inverse correlation. One possible factor is the historical development of tone/accent. See Uwano (2006) for an overview.

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(8) Compound tone in KJ
a. MO.mo → mo.mo-do.RO.boo (Type A) ‘a peach thief’
b. u.MA → u.ma-do.ro.BOO (Type B) ‘a horse thief’
c. ME.ron → me.ron-do.RO.boo (Type A) ‘a melon thief’
d. u.sa.GI → u.sa.gi.-do.ro.BOO (Type B) ‘a rabbit thief’

This rule has the effect of neutralizing tonal contrasts in the non-initial elements of compounds. For example, *ma.TU.ri* ‘festival’ and *KI.rai* ‘dislike’ are Type A morphemes, whereas as *do.ro.BOO* ‘thief’ and *su.KI* ‘like’ are Type B morphemes. Their differences are lost in non-initial positions of compounds. Thus, all of them take Type A tone when they are embedded in compounds whose initial member is a Type A morpheme. This is shown in (9), where *MO.mo* ‘peach’ is in E_1.

(9) Neutralization of E_2 tone in compounds in KJ
a. mo.mo + ma.TU.ri (Type A) ‘a peach festival’ (< ma.TU.ri (Type A) ‘festival’)
b. mo.mo + do.RO.boo (Type A) ‘a peach thief’ (< do.ro.BOO (Type B) ‘thief’)
c. mo.mo + GI.rai (Type A) ‘a peach hater’ (< KI.rai (Type A) ‘dislike’)
d. mo.mo + ZU.ki (Type A) ‘a peach lover’ (< su.KI (Type B) ‘like’)

Hirayama’s Law is essentially active in NJ as well. We can find compounds that take the same tonal types of the first element of the compound as is shown in (10).

(10) Hirayama’s Law in NJ
a. MO.mo (Type A) ‘peach’ → mo.MO-do.ro.boo (Type A) ‘a peach thief’
b. u.ma (Type B) ‘horse’ → u.ma-do.ro.boo (Type B) ‘a horse thief’
c. u.sa.gi (Type B) ‘rabbit’ → u.sa.gi-do.ro.boo (Type B) ‘a rabbit thief’

Hirayama’s Law has, however, many exceptions in NJ. For example, despite the fact that *on.na* ‘woman’ is produced with Type A tone in isolation, some compounds which begin with this word such as *on.na-to.mo.da.ti* ‘girl friend’ are produced with Type B tone. Matsuura’s (2008) analysis shows that almost all exceptions to Hirayama’s Law have two common features: (i) they are produced with Type B tone in environments where they would be expected to yield Type A, and (ii) they contain three or more moras in E_1. As a result, *me.ron-do.ro.boo* takes Type B even though the E_1 *me.ron* takes Type A in isolation. This is shown in (11).

(11) Exceptions to Hirayama’s Law in NJ
a. me.ROn → me.ron-do.ro.boo (Type B), *me.ROn-do.ro.boo (Type A) ‘a melon thief’
b. sa.KU.ra → sa.ku.ra-do.ro.boo (Type B), *sa.KU.ra-do.ro.boo (Type A) ‘a blossom thief’

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Quantitative results support this argument. Fig. 2 shows the distribution of tonal patterns in compounds beginning with a Type A, as a function of E_1 length. When E_1 contains one or two moras, about 90 % of compounds which have Type A words in E_1 take Type A tone, as predicted by Hirayama's Law. However, almost all compounds containing three or more moras in E_1 take Type B tone.

It should be noted here that the total length of the compounds does not directly affect the tonal distribution. Although all the compounds in (12a) are four moras long, only *gi.taa-bu* 'guitar circle', which contains a three-mora $E_{1,}$ takes Type B tone. The same can be said for the examples in (12b), which are all six moras long in total.

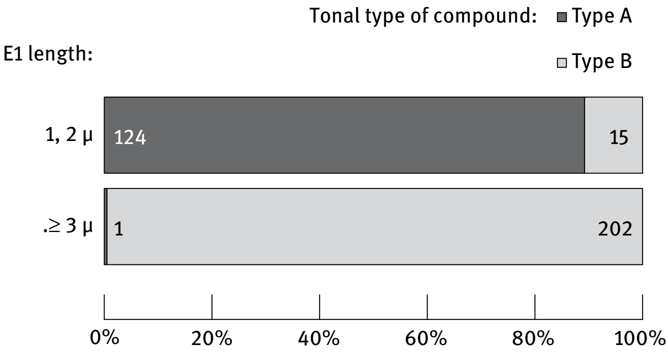

Fig. 2: E_1 length and tonal type (Number = tokens, E_1 = Type A tone).

(12) a. compound = 4 moras
HAa[8] (Type A) + sa.KU.ra (Type A) → ha-ZA.ku.ra (Type A) 'a Japanese cherry tree in leaf'
KO.si (Type A) + ho.ne (Type B) → ko.SI-bo.ne (Type A) 'waist bone'
gi.TAa (Type A) + BUu (Type A) → gi.ta.a-bu (Type B) 'a guitar circle'

b. compound = 6 moras
DA.mu (Type A) + ken.ga.ku (Type B) → da.MU-ken.ga.ku (Type A) 'dam inspection tour'
mu.KA.si (Type A) + ha.na.si (Type B) → mu.ka.si-ba.na.si (Type B) 'folk tales'
uN.tin (Type A) + HYOo (Type A) → un.tin-hyoo (Type B) 'fare chart'

8 Monomoraic nouns with Type A tone are often phonetically lengthened. For example, the monomoraic noun /ke/ 'hair' is lengthened and produced with falling pitch, as in [KEe] 'hair' or [keE-no nagaka] '(someone's) hair is long'.

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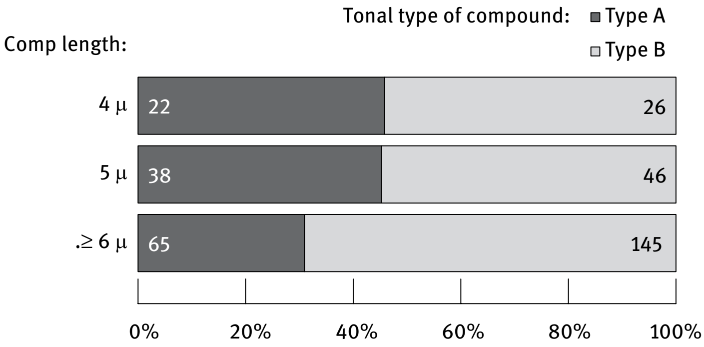

Fig. 3: Total compound length and tonal type.

This can also be quantitatively demonstrated. Fig. 3 shows the distribution of tonal patterns as analyzed by compound length.

Although the rate of Type B tone increases in compounds that contain six or more moras, there is no strong tendency in tonal distribution. This suggests that the total length of the compounds does not account for the emergence of exceptional cases.

What motivates the tonal neutralization in NJ compounds then? One may suspect that the tonal types of compounds in this dialect are affected by the accentuation in the standard dialect of TJ, just as the tonal types of its loanwords are subject to those of the corresponding words in TJ, as we saw in the preceding section. In relation to this, Kubozono (2007) reports ongoing tonal changes in compounds in its sister dialect of KJ. According to this study, young KJ speakers tend to take Type A tone for words which are accented in TJ. Similarly, they tend to show Type B tone if the word is unaccented in TJ. He argues that the tonal change in KJ is due to dialect contact with the socially dominant system of TJ. In other words, young KJ speakers map the presence or absence of an abrupt pitch fall in TJ to their KJ pronunciations. Given this, one might suspect that the neutralization in NJ compounds might also be related to the accentuation of TJ. This idea, however, cannot be empirically supported. I collected compound nouns with Type B words in E_1 which are accented on the second mora in TJ: *uma'-hime* 'princess horse' and *mame'-musi* 'beans insect'. Since *u.ma* and *ma.me* take Type B tone in isolation in NJ, Hirayama's Law predicts that these compounds should take Type B tone. If tonal patterns in NJ are affected by TJ accentuation, on the other hand, these compounds should take Type A tone. Almost all such compounds, however, are produced with Type B tone, as correctly predicted by Hirayama's Law. Hence, unlike loanwords, compound tone in NJ does not appear to be affected by accent patterns in TJ. Rather, tonal neutralization in compound nouns may be attributed

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to some synchronic grammatical property of NJ itself that can be formulated as rules, constraints, lexical specification, etc.

3 Method

3.1 Aims of the experiments

Although Matsuura's (2008) experiment clarifies the phonological, or length, condition on the loss of tonal contrast in compounds, most compounds in his dataset were restricted to noun-noun compounds. According to Kibe's (2012) descriptive study, the two-pattern system of the Hondo dialect of Amakusa Japanese in Kumamoto Prefecture resembles that of NJ, but tonal neutralization in this dialect is determined not only by length and tonal types of E_1 but also by lexical category. While compounds which consist of nouns (N-N compounds) lose tonal contrast when E_1 contains three or more moras, as is shown in (13) and (14), those which consist of verbs (V-V compounds) are never neutralized even if E_1 is long, as is shown in (15) and (16) (taken from Kibe 2012). Note that Japanese verbs end with /(r)u/ in the dictionary form, while the first element of compound verbs end with /i/ or stem-final vowels.

(13) N-N compounds (short E_1)
  a. HAa (Type A) 'leaf' → ha-ZA.ku.ra (Type A) 'a Japanese cherry tree in leaf'
  b. I.se (Type A) 'Ise (person name)' → i.SE-mo.no.ga.ta.ri (Type A) 'tales of Ise'

(14) N-N compounds (long E_1)
  a. o.NA.go (Type A) 'woman' → o.na.go-to.mo.da.ti (Type B) 'a girl friend'
  b. i.SOp.pu (Type A) 'Aesop' → i.sop.pu-mo.no.ga.ta.ri (Type B) 'Aesop's Fables'

(15) V-V compounds (short E_1)
  NA.ku (Type A) 'to cry' → na.KI-ha.zi.me.ru (Type A) 'to begin to cry'

(16) V-V compounds (long E_1)
  a. ha.KO.bu (Type A) 'to carry'→ ha.KO.bi-ha.zi.me.ru (Type A) 'to begin to carry'
  b. na.RA.be.ru (Type A) 'to arrange'→ na.RA.be-ha.zi.me.ru (Type A) 'to begin to arrange'

Kibe's description of compound verbs suggests that lexical category affects the occurrence of tonal neutralization. This raises the question of whether compound tone rules

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in NJ may also be sensitive to differences in lexical category, as in the Hondo dialect of Amakusa Japanese which Kibe analyzed. Moreover, the tone of V-N compounds which contain a verb in E_1 and a noun in E_2, such as *ta.be-ka.ta* 'how to eat', has been little investigated. The current experiment attempts to address these questions.

3.2 Procedure

A fieldwork experiment was conducted with a view to clarifying the presence or absence of tonal neutralization in verb-initial compounds. We chose 28 verbs, the tonal types of which were confirmed either by a dataset taken from other fieldwork or by Sakaguchi (2001). Of these, 14 verbs take Type A when pronounced in isolation, and the rest are produced with Type B (see Appendix I for list of all test words). All these verbs consist of one to four moras when used as part of a compound. We made 158 V-V compounds and 68 V-N compounds, using these verbs as their first elements. While V-V compounds are complex predicates, V-N compounds are not so. These compound types are exemplified in (17) and (18), respectively.

(17) V-V compounds
ha.ko.bi-ha.zi.me.ru 'to begin to carry' (< hakobu 'to carry' + hazimeru 'to begin')
o.yo.gi-ma.wa.ru 'to swim around' (< oyogu 'to swim' + mawaru 'to go around')
ha.ta.ra.ki-su.gi.ru 'to work too much' (< hataraku 'to work' + sugiru 'to do too much')

(18) V-N compounds
ha.ko.bi-ya 'a carrier' (< hakobu 'to carry' + ya 'shop')
o.yo.gi-ka.ta 'how to swim' (< oyogu 'to swim' + kata 'method')
ha.ta.ra.ki-ba.ti 'a worker bee' (< hataraku 'to work' + hati 'bee')

We checked the frequency of the compound verbs by referring to a database of Japanese compound verbs based on web pages (NINJAL 2012).

Three female speakers participated in the experiment. They are the same speakers as in Matsuura (2008). In what follows, they will be referred as Speaker K (born in 1929), Speaker S (born in 1947), and Speaker F (born in 1953). The subjects read each test word twice in isolation. Recordings were made using a TEAC DR-100MKII PCM recorder and an AKG C520 headset microphone. The tonal patterns obtained were analyzed by the author on his auditory impressions as well as the visual inspection of F0 contours in Praat. In total, 474 tokens of V-V compounds (158 words × 3 speakers) and 204 tokens of V-N compounds (68 words × 3 speakers) were obtained.

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4 Results and discussion

4.1 V-V compounds

Analysis of V-V compounds shows that they faithfully inherit the tone of their first member, or E_1. In other words, neutralization does not occur in this type of compound, regardless of the length of E_1. This is exemplified in (19) and (20) for Type A and Type B, respectively.

(19) V-V compounds with one-mora or two-mora E_1

a. KI.ru (Type A) 'to wear'
   + ha.ZI.me.ru (Type A) 'to begin' → ki-HA.zi.me.ru (Type A) 'to begin to wear'
   + su.gi.ru (Type B) 'to do too much' → ki-SU.gi.ru (Type A) 'to wear too much'
   + o.WA.ru (Type A) 'to finish' → ki-O.wa.ru (Type A) 'to finish wearing'
   + ka.E.ru (Type A) 'to change' → ki-GA.e.ru (Type A) 'to change into'

b. NA.ku (Type A) 'to cry'
   + ha.ZI.me.ru (Type A) 'to begin' → na.KI-ha.zi.me.ru (Type A) 'to begin to cry'
   + su.gi.ru (Type B) 'to do too much' → na.KI-su.gi.ru (Type A) 'to cry too much'
   + o.WA.ru (Type A) 'to finish' → na.KI-o.wa.ru (Type A) 'to finish crying'
   + tu.KA.re.ru (Type A) 'to get tired' → na.KI-tu.ka.re.ru (Type A) 'to get tired by crying'[9]

c. no.mu (Type B) 'to drink'
   + ha.ZI.me.ru (Type A) 'to begin' → no.mi-ha.zi.me.ru (Type B) 'to begin to drink'
   + na.o.su (Type B) 'to freshen, again' → no.mi-na.o.su (Type B) 'to start drinking again'
   + a.ru.ku (Type B) → no.mi-a.ru.ku (Type B) 'to go bar-hopping'
   + o.WA.ru (Type A) 'to finish' → no.mi-o.wa.ru (Type B) 'to finish drinking'

9 One speaker (Speaker K) produced *tukareru* with Type B tone as well as its compound verb *naki-tukareru*.

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(20) V-V compounds with three-mora or longer E_1

a. ha.KO.bu (Type A) ‘to carry’
+ ha.ZI.me.ru (Type A) ‘to begin’ → ha.KO.bi-ha.zi.me.ru (Type A) ‘to begin to carry’
+ na.o.su (Type B) ‘to freshen, redo’ → ha.KO.bi-na.o.su (Type A) ‘to start carrying again’
+ a.GE.ru (Type A) ‘to raise’ → ha.KO.bi-a.ge.ru (Type A) ‘to carry up’
+ i.RE.ru (Type A) ‘to put something in’ → ha.KO.bi-i.re.ru (Type A) ‘to carry something in’

b. o.yo.gu (Type B) ‘to swim’
+ ha.ZI.me.ru (Type A) ‘to begin’ → o.yo.gi-ha.zi.me.ru (Type B) ‘to begin to swim’
+ na.o.su (Type B) ‘to freshen, redo’ → o.yo.gi-na.o.su (Type B) ‘to start swimming again’
+ ma.WA.ru (Type A) ‘to go around’ → o.yo.gi-ma.wa.ru (Type B) ‘to swim around’
+ su.gi.ru (Type B) ‘to do too much’ → o.yo.gi-su.gi.ru (Type B) ‘to swim too much’

In other words, the results that Kibe (2012) reported about Amakusa Japanese can be found in NJ, too. The only exception is *hu.RI-ka.ka.ru* ‘befall’ (← *hu.ru* (B) ‘to fall’ + *ka.ka.ru* (B) ‘to hang’), which exhibits Type A tone although its E_1 takes Type B tone in isolation. It is not clear why this particular compound verb shows such exceptional behavior.

4.2 V-N compounds

Fig. 4 shows the distribution of tonal patterns in V-N compounds whose E_1 contains one or two moras. The ratio of exceptions to Hirayama’s Law (gray bar in Fig. 4) differs depending on the tone of E_1. When E_1 takes Type B tone in isolation, all of its compounds are produced with Type B tone. In contrast, when E_1 takes Type A tone, about 20 % of compounds take a different tone from E_1, i. e. Type B tone, thus losing a tonal contrast in this context.

The tonal distribution of V-N compounds also varies depending on the length of E_1. When E_1 is short, i. e. one or two moras long, compounds preserve the tone of E_1 regardless of the tonal type of E_1. This is exemplified in(21). There are only two exceptions to this generalization, *ne-do.ko* (by Speaker K) and *su.te-ze.ri.hu* (by Speaker F), both of which take Type B tone although their E_1’s take Type A tone in isolation.

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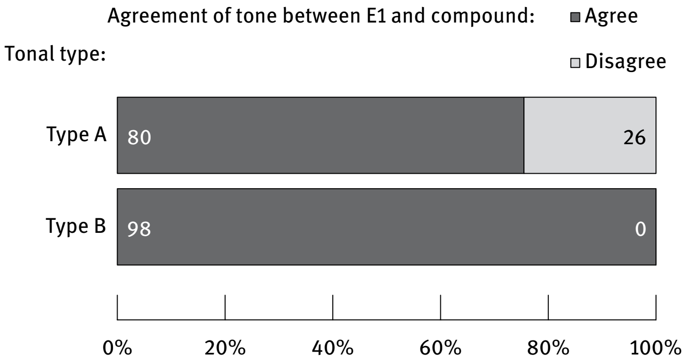

Fig. 4: Tonal agreement between E_1 and the whole compound in V-N compounds.

(21) V-N compounds with short E_1
a. E_1 = Type A → Comp = TypeA
NA.ku (Type A) 'to cry'
→ na.KI-zyoo.go (Type A) 'a sentimental drinker'
→ na.KI-mu.si (Type A) 'a crybaby'
→ na.KI-ma.ne (Type A) 'feigned tears'
b. E_1 = Type B → Comp = Type B
no.mu (Type B) 'to drink'
→ no.mi-ya (Type B) 'a bar'
→ no.mi-gu.su.ri (Type B) 'medicine to be taken internally'
→ no.mi-to.mo.da.ti Type (B) 'a drinking buddy'
c. E_1 = Type A → Comp = Type B (exception)[10]
NE.ru (Type A) 'to sleep' → ne-do.ko (Type B) 'bed'
su.TE.ru (Type A) 'to throw' → su.te-ze.ri.hu (Type B)'a Parthian shot'

On the other hand, many (but not all) compounds lose a tonal contrast when they have a long E_1, i. e. three-mora or longer E_1. (22) exemplifies this type of neutralization. Thus, although the verb *ha.KO.bu* 'to carry' takes Type A tone in isolation, V-N compounds that begin with this verb such as *ha.ko.bi-ya* 'carrier' and *ha.ko.bi-zyoo.zu* 'a better carrier' are produced with Type B tone. When E_1 takes Type B in isolation, however, its compounds also take Type B tone, as noted above, thus obeying Hirayama's Law faithfully.

10 Our database lacks the tonal types of these E_2:*toko* 'bed', *serihu* 'the words'.

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(22) V-N compounds with long E_1
a. E_1 = Type A → Comp = Type A
su.SU.mu (Type A) 'to move through'
→ su.SU.mi-gu.ai (Type A) 'progress',
→ su.SU.mi-ka.ta (Type A) 'the way of progress'
b. E_1 = Type B → Comp = Type B
o.yo.gu (Type B) 'to swim'
→ o.yo.gi-ka.ta (Type B) 'how to swim'
→ o.yo.gi-zyoo.zu (Type B) 'a better swimmer'
→ o.yo.gi-kyoo.si.tu (Type B) 'swimming school'
c. E_1 = Type A → Comp = Type B (exceptions)
ha.KO.bu (Type A) 'to carry'
→ ha.ko.bi-ya (Type B) 'carrier'
→ ha.ko.bi-zyoo.zu (Type B) 'a better carrier'

Fig. 5 shows the tonal patterns of V-N compounds whose E_1 takes Type A tone in isolation. The exceptional pattern (Type B, in this case) increases when E_1 contains three or more moras. The ratio of neutralized pattern in V-N compounds, however, is lower than that in N-N compounds, which we saw in Fig. 2 above.

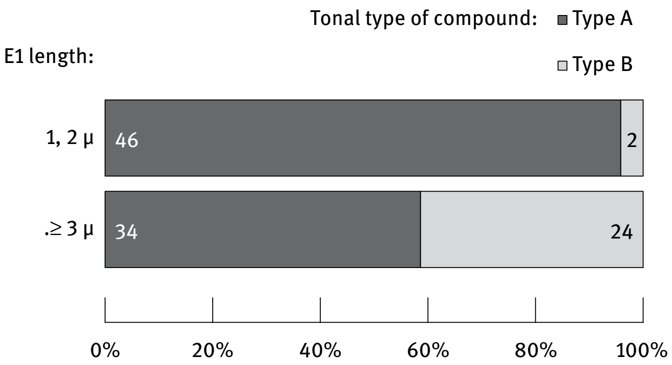

Fig. 5: Result of V-N compounds where E_1 takes Type A tone in isolation.

It is difficult to formulate the exact conditions determining the tonal distribution of V-N compounds. However, there is little doubt that the accent patterns of the standard TJ system are not directly responsible for it, because we cannot account for the tonal distribution in NJ by comparing it with the accent patterns in TJ. In fact, there is no consistent correspondence between the tonal patterns in NJ and the accent patterns in TJ. For example, all the compounds in (23)

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have Type B tone in NJ despite the fact that E_1 of these compounds has Type A tone in isolation. In contrast, the accentuation in TJ varies from one compound to another. This suggests that TJ accentuation does not affect the tone of compounds in NJ (see section 2.2 for a similar discussion).

(23) Comparison of between tone in NJ and accentedness in TJ

	hataraki-bati	hataraki-mono	hakobi-zyoozu	hakobi-ya
	'a worker bee'	'a hard worker'	'a better carrier'	'carrier'
NJ	Type B (E_1 = Type A)			
TJ	accented	unaccented	accented	unaccented

Compounds including so-called 'deaccenting' morphemes in TJ lend further support to this argument. For example, although *-ka.ta* (方, meaning 'direction or method') yields unaccented compounds in TJ when embedded in $E_{2,}$ as in *ne-ka.ta*⁻ 'how to sleep', *kai-ka.ta*⁻ 'how to buy', *na.ra.be-ka.ta*⁻ 'how to arrange', and *si.ra.be-ka.ta*⁻ 'how to search', the tonal pattern of these compounds in NJ varies depending on the tonal type of $E_{1,}$ as shown in (24). In other words, these compounds faithfully obey Hirayama's Law, and not the accent patterns in TJ.

(24) Compounds with *-ka.ta* in E_2
Type A in E_1: ki-KA.ta 'how to wear', ne-KA.ta 'how to sleep', o.SI.e-ka.ta 'how to teach'
Type B in E_1: mi-ka.ta 'how to watch', de-ka.ta 'how to go out', si.ra.be-ka.ta 'how to search'

In summary, tonal neutralization in NJ compounds is sensitive to the lexical category of the elements that make up the compounds. Tonal patterns are not neutralized in V-V compounds in NJ, just as Kibe (2012) demonstrated for the Hondo dialect of Amakusa Japanese. However, tonal contrasts in V-N compounds are partially lost.

5 Conclusion

5.1 Summary and implications

The results in the previous sections reveal that compound tone rules in NJ should take into account the morphological category of each element. Verbs disfavor tonal neutralization relative to nouns. Tonal patterns are neutralized in about 90 % of N-N compounds when E_1 contains three or more moras, as demonstrated

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in Matsuura (2008). However, the ratio of tonal neutralization falls to about 40 % in V-N compounds of the same phonological structure. Moreover, tonal contrasts in V-V compounds are not lost at all. Following Hyman's (2018) parameters defining tonal neutralization, tonal neutralization in NJ can be characterized as in (25).

(25) Parameter settings of tonal neutralization in NJ
  a. properties of the target: Type A tone (H* and L)
  b. properties of the trigger: Word length in E_1 and the lexical categories of compound elements
  c. nature of the process: Melodic change
  d. extent of the process: Total neutralization of Type A tone
  e. domain of the process: Compounds

First, tonal neutralization in NJ compounds occurs as a result of changing Type A tone to Type B tone when E_1 contains more than two moras and (at least) E_2 is a noun. Therefore, the target is Type A tone, or an H* melody and an L melody, and the trigger is the length and the lexical category of the first element (E_1) of compounds. Secondly, compounds take Type B tone, not a novel tonal melody, regardless of the tonal type of E_2. Therefore, the process involves a melodic change in nature or, more specifically, a change from Type A to Type B tone. Thirdly, tonal neutralization does not occur in any phrases, so the domain of the process must be compounds.

Smith (1998, 2011) claims that nouns have a privileged phonological status relative to verbs and adjectives. Taking into consideration over ten languages, she argues that nouns have more contrastive patterns than verbs and adjectives. For example, the accent system of TJ has $n + 1$ contrasts for n syllables in nouns but only two patterns (accented vs. unaccented) for verbs and adjectives. The same situation can be found in other Japanese dialects such as Fukuoka Japanese (Smith 1998), Kyoto Japanese (Nakai 2002), Shizukuishi Japanese (Uwano 1980), and Matsue Japanese (Hiroto and Ohara 1953). Moreover, in Jita, a Bantu language spoken in Tanzania, accent location is contrastive in nouns but not in verbs (Downing 2011). According to Smith's survey, "[m]any, although perhaps not all, cases are consistent with a universal scale of phonological privilege, N > A > V" (Smith 2011: 2459).

The asymmetry of tonal neutralization in NJ compounds presents an exceptional case. In contrast to nouns, which promote tonal neutralization, verbs demote tonal neutralization. This is contra Smith's generalization although she noted that the lexical-categorical scale embodies a strong tendency and not an absolute law. It remains an open question why NJ compounds display this marked behavior.

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5.2 Remaining issues

As we saw above, the tonal neutralization in NJ occurs only in one direction, i. e. from Type A to Type B. Thus, Type A tone words such as *oN.na* 'woman' and *ni.WA.to.ri* 'chicken' take Type B tone in compounds of which they form the first member, as exemplified by *on.na-to.mo.da.ti* 'girl friend' and *ni.wa.to.ri-go.ya* 'coop'. This raises the question of why tonal neutralization is restricted to one direction. It could be argued that the tonal pattern of Type A is articulatorily difficult in long words since it involves a long stretch of low-pitched moras after the two high-pitched moras in word-initial position.[11] This, however, cannot be the case because many long compounds take Type A tone if E_1 contains one or two moras, as in *tyo.KO-man.zyuu* 'a steamed bun filled with chocolate' and *hu.YU-mo.no.ga.ta.ri* 'winter story'. Moreover, tonal neutralization displays asymmetry in lexical category, yielding long Type A words in V-V compounds, as shown in (19) and (20) above. It is difficult to think that differences in morphological category affect difficulties in articulation. The existence of phonological and morphological conditions suggests that tonal neutralizations in NJ should be analyzed as being formally motivated rather than functionally motivated. Although Matsuura (2014) attempts to give a formal account of tonal distribution of compound nouns using a rule-based approach, the results obtained here will require a revision of his analysis.

Another important question for future work concerns the way these results are related to historical tonal change. It should be noted that among the dialects of Japanese, there is an attested example of a diachronic tonal merger in a specific lexical category. Early Notojima Japanese, a dialect group spoken in Ishikawa Prefecture, showed a tonal contrast between a falling-tone class and a nonfalling-tone class. The present-day Bessho dialect, one of the dialects in the Notojima group, preserves this tonal contrast in both nouns and verbs. In contrast, in the present-day Mukōda dialect, another dialect of the same group, the contrastive tones are merged into the falling-tone class only in nouns and not in verbs. In other words, only verbs preserve the tonal contrast (Tatsuya Hirako p.c.). The question, however, remains why only some dialects show a word class asymmetry in tonal neutralizations or mergers. Further investigations are called for based on empirical data from a wider range of dialects. In the case of NJ, of which no historical tonal data is available, it may be difficult to answer the question of when this tonal neutralization first appeared.

11 Sakimura (2006) implies this line of explanation by positing a 'basic accent (rule)'. However, he does not empirically demonstrate the adequacy of such an analysis.

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The tonal neutralization appears to be spreading to compounds in which E_1 contains fewer than three moras. According to Matsuura and Sato's (2016) fieldwork conducted on young NJ speakers, about 60 % of compounds which have one-mora or two-mora take Type B tone. This ratio is much larger than that observed in the middle-aged or older generations, who produced such an irregular compound pattern in only about 11 % of cases (see Fig. 2). This tendency is not found in simplex words, which suggests that tonal neutralization is still limited to compounds. If the tonal change now in progress should continue, the tonal distinction in compounds might eventually disappear in the future.

Finally, many phonological issues surrounding neutralization remain unanalyzed in depth. As introduced in section 2, Matsuura (2014) proposed phonological representations of the tonal patterns in NJ. While words with Type A tone have an H* melody and an L melody, those with Type B tone have an H melody underlyingly. If these representations are correct, the tonal neutralization observed in NJ should be analyzed not as deletion but as tonal change since Type A tone and Type B tone in these representations involve differences not in the presence or absence of a certain tone, but in the shape of the melodies themselves.

It is, however, also possible to analyze the phonetic difference between Type A and Type B tone in NJ as a presence or absence of a pitch fall, as shown in section 2. Hence, the possibility remains that the phonological difference between the two tones concerns accentedness (accented vs. unaccented) as illustrated in (26).

(26) Accentual analysis to NJ tone
  a. Type A tone = Accented
     a'.me 'candy', ku.ru'.ma 'car', to.mo'.da.ti 'friend', bai'.o.rin 'violin'
  b. Type B tone = Unaccented
     a.me^{-} 'rain', o.to.ko^{-} 'man', mu.ra.sa.ki^{-} 'purple', a.su.pi.rin^{-} 'aspirin'

Under the accentual analysis in (26), Hirayama's Law, or the compound tone rule in NJ, is captured as a consequence of faithfulness constraints that require the accentual configuration (accented vs. unaccented) of E_1 match that of its compounds. At the same time, tonal neutralization in N-N compounds can be attributed to constraints that promote deaccenting when E_1 has more than two moras. This is similar to the obligatory deaccenting effect of four-mora light-syllable compounds in TJ (Ito and Mester 2016), in that both processes are motivated by phonological length. Moreover, the resistance of V-V compounds to neutralization into Type B may be a result of higher-ranked constraints that insist on accentual faithfulness of compounds to E_1 in verbs. The idea that constraints on accentedness should refer to both phonological and morphological structures

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is also examined by Ito and Mester (2016).[12] Although we did not discuss these phonological issues in depth in the current article, these similarities indicate that a more detailed phonological analysis may help us to better understand how accent/tone relates to morphology.

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12 Thanks to a reviewer for drawing my attention to this point.

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Appendix: List of test words (tonal types in isolation is in parenthesis)

Frequently-appearing words as E_2: -ha.zi.me.ru (A) ‘to begin to’, -o.wa.ru (A) ‘to finish’, -na.o.su (B) ‘to freshen, redo’, -su.gi.ru (B) ‘to do too much’, -ka.ta (?) ‘how-to, method (bound morpheme)’

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E_1 = Type A tone in isolation

ki.ru ‘to wear’: ki-ha.zi.me.ru (VV), ki-o.wa.ru (VV), ki-na.o.su (VV), ki-su.gi.ru (VV), ki-ga.e.ru ‘to change into’(VV, *kaeru* (A)), ki-ku.ra.be.ru ‘to compare wearing’ (VV, *kuraberu* (A)), ki-ku.zu.su ‘to become disheveled’ (VV, *kuzusu* (?)), ki-ka.ta (VN)

ne.ru ‘to sleep’: ne-ha.zi.me.ru (VV), ne-o.wa.ru (VV), ne-na.o.su (VV), ne-su.gi.ru (VV), ne-ga.e.ru ‘to change sides’ (VV), ne-so.be.ru ‘lie flat’ (VV, *soberu* (?)), ne-si.zu.ma.ru ‘lost in sleep’ (VV, *sizumaru* (A)), ne-gu.se ‘bed hair’ (VN, *kuse*(A)), ne-do.ko ‘bed, rack’ (VN, *toko* (?)), ne-ka.ta (VN),

na.ku ‘to cry’: na.ki-ha.zi.me.ru (VV), na.ki-o.wa.ru (VV), na.ki-su.gi.ru (VV), na.KI-wa.me.ku ‘to cry in tears’ (VV, *wameku* (?)), na.ki-ku.zu.re.ru ‘to break down crying’ (VV, *kuzureru* (?)), na.ki-tu.ka.re.ru ‘to get tired by crying’ (VV, *tukareru* (A)), na.ki-zyoo.go ‘a crying drunk’ (VN, *zyoogo* (?)), na.ki-mu.si ‘crier’ (VN, *musi*(A)), na.ki-ma.ne ‘fake crying’ (VN, *mane* (A))

ma.ke.ru ‘lose’: ma.ke-ha.zi.me.ru (VV), ma.ke-o.wa.ru (VV), ma.ke-su.gi.ru (VV), ma.ke-ko.su ‘to post a losing record’ (VV, *kosu* (?)), ma.ke-ko.mu ‘to increase losing’ (VV, *komu* (?)), ma.ke-si.ra.zu ‘to never lose’ (VN, *sirazu* (?)), ma.ke-gu.se ‘underdog’ (VN), ma.ke-ko.si ‘losing record’ (VN, *kosi* (?)), ma.ke-zi.ai ‘losing game’(VN, *siai* (A))

ka.u ‘to buy’: kai-ha.zi.me.ru (VV), kai-o.wa.ru (VV), kai-na.o.su (VV), kai-su.gi.ru (VV), kai-ka.e.ru (VV, *kaeru* (A)), kai-i.re.ru (VV, *ireru* (A)), kai-si.me.ru (VV, *simeru* (?)), kai-do.ki ‘best time to buy’ (VN, *toki* (B)), kai-ka.ta (VN), kai-gu.su.ri ‘over-the-counter drug’ (VN, *kusuri* (B))

su.te.ru ‘to discard’: su.te-ha.zi.me.ru (VV), su.te-o.wa.ru (VV), su.te-su.gi.ru (VV), su.te-sa.ru ‘to abandon’ (VV, *saru* (?)), su.te-ba.syo ‘a place to discard’ (VN, *basyo* (B)), su.te-ze.ri.hu ‘Parthian shot’ (VN, *serihu* (?))

ha.ko.bu ‘to carry’: ha.ko.bi-ha.zi.me.ru (VV), ha.ko.bi-o.wa.ru (VV), ha.ko.bi-na.o.su (VV), ha.ko.bi-su.gi.ru (VV), ha.ko.bi-a.ge.ru ‘to carry up’ (VV, *ageru* (A)), ha.ko.bi-i.re.ru ‘to carry something in’ (VV, *ireru* (B)), ha.ko.bi-ko.mu ‘to carry something into’ (VV), ha.ko.bi-ya.ku ‘transporter’ (VN, *yaku* (?)), ha.ko.bi-ya ‘carrier’ (VN, *ya* (?)), ha.ko.bi-zyoo.zu ‘a better carrier’ (VN, *zyoozu* (B))

na.ra.be.ru ‘to arrange’: na.ra.be-ha.zi.me.ru (VV), na.ra.be-o.wa.ru (VV), na.ra.be-na.o.su (VV), na.ra.be-su.gi.ru (VV), na.ra.be-i.re.ru ‘to let into in line’ (VV), na.ra.be-ka.e.ru ‘to permutate’ (VV), na.ra.be-o.ku ‘to put in line’ (VV, *oku* (A)), na.ra.be-ma.ku.ra ‘lined-up pillows’ (VN, *makura* (B))

su.su.mu ‘to move through’: su.su.mi-ha.zi.me.ru (VV, *guai* (?)), su.su.mi-o.wa.ru (VV), su.su.mi-na.o.su (VV), su.su.mi-su.gi.ru (VV), su.su.mi-gu.ai ‘progress’ (VN), su.su.mi-ka.ta (VN)

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o.si.e.ru ‘to teach’: o.si.e-ha.zi.me.ru (VV), o.si.e-o.wa.ru (VV), o.si.e-na.o.su (VV), o.si.e-su.gi.ru (VV), o.si.e-ko.mu ‘to clue up’ (VV), o.si.e-so.da.te.ru ‘to bring up with teaching’ (VV, *sodateru* (B)), o.si.e-ka.ta (VN), o.si.e-zu.ki ‘teachy’ (VN, *suki* (B)), o.si.e-go ‘pupil, student’ (VN, *ko* (A))

ha.ta.ra.ku ‘to work’: ha.ta.ra.ki-ha.zi.me.ru (VV), ha.ta.ra.ki-o.wa.ru (VV), ha.ta.ra.ki-na.o.su (VV), ha.ta.ra.ki-su.gi.ru (VV), ha.ta.ra.ki-ba.ti ‘worker bee’ (VN, *hati* (A)), ha.ta.ra.ki-mo.no ‘good worker’ (VN, *mono* (?)), ha.ta.ra.ki-ka.ta (VN)

ka.sa.na.ru ‘to overlap’: ka.sa.na.ri-ha.zi.me.ru (VV), ka.sa.na.ri-o.wa.ru (VV), ka.sa.na.ri-na.o.su (VV), ka.sa.na.ri-su.gi.ru (VV), ka.sa.na.ri-a.u ‘lay on top of each other’ (VV, *au* (B)), ka.sa.na.ri-ka.ta (VN)

bu.ra.sa.ge.ru ‘to dangle’: bu.ra.sa.ge-ha.zi.me.ru (VV), bu.ra.sa.ge-o.wa.ru (VV), bu.ra.sa.ge-na.o.su (VV), bu.ra.sa.ge-su.gi.ru (VV), bu.ra.sa.ge-ka.ta (VN)

E_1 = Type B tone in isolation

mi.ru ‘to watch’: mi-ha.zi.me.ru (VV), mi-o.wa.ru (VV), mi-na.o.su (VV), mi-su.gi.ru (VV), mi-o.ku.ru ‘to pass over’ (VV, *okuru* (A)), mi-ki.wa.me.ru ‘to value’ (VV, *kiwameru* (?)), mi-su.te.ru ‘to abandon’ (VV, *suteru* (A)), mi-do.ko.ro ‘highlight’ (VN, *tokoro* (A))

de.ru ‘to appear before’: de-ha.zi.me.ru (VV), de-o.wa.ru (VV), de-na.o.su (VV), de-su.gi.ru (VV), de-a.ru.ku ‘to go out’ (VV, *aruku* (B)), de-so.ro.u ‘to appear all together’ (VV, *sorou* (?)), de-ka.ta (VN), de-ka.se.gi ‘going away to work’ (VN, *kasegi* (B))

no.mu ‘to drink’: no.mi-ha.zi.me.ru (VV), no.mi-o.wa.ru (VV), no.mi-na.o.su (VV), no.mi-su.gi.ru (VV), no.mi-a.ka.su ‘to drink all night’ (VV, *akasu* (?)), no.mi-a.ru.ku ‘to go bar-hopping’ (VV), no.mi-ya ‘bar’ (VN), no.mi-to.mo.da.ti ‘a drinking buddy’ (VN, *tomodati* (A)), no.mi-gu.su.ri ‘medicine to be taken internally’ (VN), no.mi-ka.ta (VN)

na.ge.ru ‘to throw’: na.ge-ha.zi.me.ru (VV), na.ge-o.wa.ru (VV), na.ge-na.o.su (VV), na.ge-su.gi.ru (VV), na.ge-i.re.ru ‘to throw in’ (VV), na.ge-o.to.su ‘to precipitate’ (VV, *otosu* (B)), na.ge-su.te.ru ‘to chuck off’ (VV), na.ge-kis.su ‘blowing a kiss’ (VN, *kissu* (?)), na.ge-zu.kin ‘(a kind of) cowl’ (VN, *zukin* (?)), na.ge-zu.ri ‘surf fishing’ (VN, *turi* (A))

hu.ru ‘come down’: hu.ri-ha.zi.me.ru (VV), hu.ri-o.wa.ru (VV), hu.ri-na.o.su (VV), hu.ri-su.gi.ru (VV), hu.ri-so.so.gu ‘to beat down’ (VV, *sosogu* (?)), hu.ri-ka.ta (VN)

o.yo.gu ‘to swim’: o.yo.gi-ha.zi.me.ru (VV), o.yo.gi-o.wa.ru (VV), o.yo.gi-na.o.su (VV), o.yo.gi-su.gi.ru (VV), o.yo.gi-zu.ka.re.ru ‘to get tired by swimming’ (VV),

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o.yo.gi-tu.ku 'to swim to somewhere'(VV, *tuku* (?)), o.yo.gi-ma.wa.ru 'to swim around' (VV, *mawaru* (A)), o.yo.gi-kyoo.si.tu 'swimming school' (VN, *kyoositu* (?)), o.yo.gi-ka.ta (VN)

o.bo.e.ru 'to memorize': o.bo.e-ha.zi.me.ru (VV), o.bo.e-o.wa.ru (VV), o.bo.e-na.o.su (VV), o.bo.e-su.gi.ru (VV), o.bo.e-ko.mu 'cram one's mind with' (VV), o.bo.e-ga.ki 'short note'(VN, *kaki* (B)), o.bo.e-zyoo.zu (VN, *zyoozu* (B)), o.bo.e-do.ki 'best time to memorize' (VN)

ha.re.ru 'to burn off': ha.re-ha.zi.me.ru (VV), ha.re-o.wa.ru (VV), ha.re-na.o.su (VV), ha.re-su.gi.ru (VV), ha.re-a.ga.ru 'to burn off' (VV, *agaru* (A)), ha.re-maa.ku 'fine mark' (VN, *maaku* (?)), ha.re-o.to.ko 'fine man'(VN, *otoko* (B)), ha.re-zo.ra 'fine sky' (VN, *sora* (B))

a.ru.ku 'to walk': a.ru.ki-ha.zi.me.ru (VV), a.ru.ki-o.wa.ru (VV), a.ru.ki-na.o.su (VV), a.ru.ki-su.gi.ru (VV), a.ru.ki-zu.ka.re.ru 'to get tired by walking' (VV), a.ru.ki-ma.wa.ru 'to walk around' (VV), a.ru.ki-ka.ta (VN), a.ru.ki-zu.ka.re 'fatigue by walking' (VN)

si.ra.be.ru 'to inquire': si.ra.be-ha.zi.me.ru (VV), si.ra.be-o.wa.ru (VV), si.ra.be-na.o.su (VV), si.ra.be-su.gi.ru (VV), si.ra.be-a.ge.ru 'to check up' (VV), si.ra.be-ma.wa.ru 'to inquire around' (VV), si.ra.be-to.tyuu 'on the way of inquiring' (VN, *totyuu* (?)), si.ra.be-ka.ta (VN)

a.ya.ma.ru 'to apologize': a.ya.ma.ri-ha.zi.me.ru (VV), a.ya.ma.ri-o.wa.ru (VV), a.ya.ma.ri-na.o.su (VV), a.ya.ma.ri-su.gi.ru (VV), a.ya.ma.ri-ka.ta (VN)

a.ki.ra.me.ru 'to give up': a.ki.ra.me-ha.zi.me.ru (VV), a.ki.ra.me-o.wa.ru (VV), a.ki.ra.me-na.o.su (VV), a.ki.ra.me-su.gi.ru (VV), a.ki.ra.me-zyoo.zu 'a person who is good at giving up' (VN), a.ki.ra.me-ka.ta (VN), a.ki.ra.me-do.ki 'best time to give up'

kan.ga.e.ru 'to think': kan.ga.e-ha.zi.me.ru (VV), kan.ga.e-o.wa.ru (VV), kan.ga.e-na.o.su (VV), kan.ga.e-su.gi.ru (VV), kan.ga.e-a.gu.ne.ru 'think and think but get nowhere' (VV, *aguneru* (?)), kan.ga.e-ko.mu 'to get depressed' (VV), kan.ga.e-da.su 'make something up' (VV), kan.ga.e-go.to 'thinking' (VN), kan.ga.e-zyoo.zu 'a person who is good at thinking' (VN), kan.ga.e-mo.no 'not easy at all' (VN), kan.ga.e-ka.ta (VN)

ta.ga.ya.su 'to cultivate': ta.ga.ya.si-ha.zi.me.ru (VV), ta.ga.ya.si-o.wa.ru (VV), ta.ga.ya.si-na.o.su (VV), ta.ga.ya.si-su.gi.ru (VV), ta.ga.ya.si-ka.ta (VN)

ka.ta.zu.ke.ru 'to clean up': ka.ta.zu.ke-ha.zi.me.ru (VV), ka.ta.zu.ke-o.wa.ru (VV), ka.ta.zu.ke-na.o.su (VV), ka.ta.zu.ke-su.gi.ru (VV), ka.ta.zu.ke-ka.ta. (VN), ka.ta.zu.ke-zyoo.zu (VN)

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Tonal Neutralization in the Ikema Dialect of Miyako Ryukyuan

Abstract: The Ikema dialect of Miyako Ryukyuan (henceforth Ikema) has three lexically contrastive tone classes. Ikema exhibits widespread tonal neutralization such that the three-way contrast can only be observed in quite restricted contexts. The goals of this article are to determine the prosodic conditions that bring about tonal neutralization in Ikema and to make generalizations about surface pitch patterning in utterances. Involved in the neutralization is the hierarchical prosodic structure with three prosodic constituents above the mora, that is, the foot, Prosodic Word, and Clitic Group. The three-way tonal contrast in Ikema is fully realized (and hence not neutralized) when the following two conditions are met. Firstly, the utterance as a whole consists of at least three Prosodic Words. Secondly, the Clitic Group consists of at least two Prosodic Words. Moreover, long utterances can exhibit pitch patterns resulting from the Principle of Rhythmic Alternation. The rhythmic alternation can also trigger tonal neutralization in some cases.

Keywords: prosodic word, foot, rhythmic alternation, three-pattern system, Ryukyuan

1 Introduction

The Ikema dialect[1] of Miyako Ryukyuan (Ikema, henceforth) is an endangered dialect spoken by approximately 2000 people in Miyakojima City in Okinawa

1 Our data were all recorded in Nishihara village, Miyakojima City in 2008–2014 from five native speakers; three males and two females, born between 1935 and 1948.

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Prefecture, Japan (Hayashi 2010). The phylogenetic position of Ikema is shown in Fig. 1 (Pellard 2009). The Ryukyuan languages are the only languages that are proven to be genetically related to Japanese (Hattori 1979). They are generally divided into two subgroups, Northern Ryukyuan and Southern Ryukyuan (Shimoji 2010; Pellard 2011), although the existence of the former group is controversial (Pellard 2009). Southern Ryukyuan consists of three mutually unintelligible languages, i. e., Yonaguni, Yaeyama, and Miyako (Shimoji 2010).

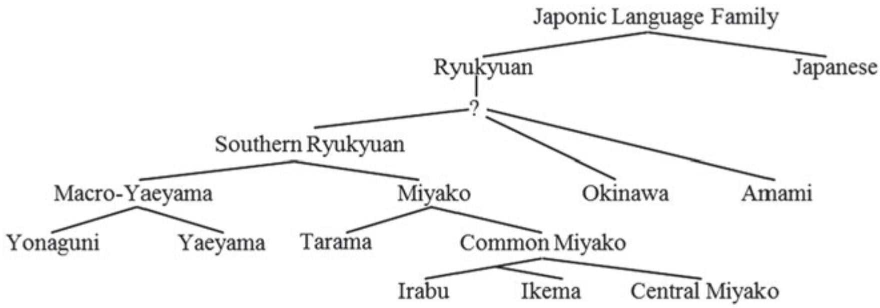

Fig. 1: The phylogenetic position of Ikema adopted from Pellard (2009). Pellard (2009) does not postulate that Okinawa and Amami belong to Northern Ryukyuan.

Some of the Ryukyuan dialects have lexically contrastive tones, while others do not (Uemura 1997). Most of the tone systems in Ryukyuan exhibit similarities to those of the Japanese dialects spoken in southwest Kyushu such as the Kagoshima dialect (Hirayama 1951; Kibe 2000; Kubozono 2012), in that they have a fixed number of tonal contrasts irrespective of word length. Such systems are called *N-pattern systems* in Uwano's (1999) word-prosodic typology, where *N* stands for the number of tonal contrasts in a given dialect. The N-pattern systems in the Ryukyuan dialects with lexically contrastive tones can further be divided into two: a two-pattern system where the number of contrasts is fixed to two, and a three-pattern system where it is fixed to three.

It is generally accepted that the common ancestor of the Ryukyuan languages, or Proto-Ryukyuan, had at least three lexically contrastive tones (Hattori 1958; Matsumori 2000a, 2000b) and that most of the three-pattern systems found in modern Ryukyuan dialects are retention of the tonal distinction that existed in Proto-Ryukyuan. While the dialects with a three-pattern system are frequently found in Northern Ryukyuan (i. e. Okinawa and Amami) (Hirayama, Oshima, and Nakamoto 1966; Uemura 1997), only a few Southern Ryukyuan dialects have thus far been revealed to have three tone classes. These dialects include Yonaguni Ryukyuan (Hirayama and Nakamoto 1964; Uwano 2009), and the Iriomote-Sonai

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dialect of Yaeyama Ryukyuan (Hirayama, Oshima, and Nakamoto 1967). The three-pattern system of the latter emerged as a result of a diachronic innovation, in which phonologically conditioned splits enlarged the inventory of tone classes from two to three. By contrast, the tone system of Yonaguni Ryukyuan is an archaism, preserving the three-way tonal contrast found in Proto-Ryukyuan.

As for Miyako Ryukyuan, it has long been believed that it does not have a three-pattern system. Ikema, one of the dialects of Miyako Ryukyuan, has also been described as having only a two-way tonal contrast (Hirayama, Oshima, and Nakamoto 1967; Hirayama 1983; Matsumori 1998, 2011; Sakimura 2006; Hayashi et al. 2008). Recent research on the tone systems of Miyako Ryukyuan, however, demonstrates that the Tarama dialect (Matsumori 2010) and the Yonaha dialect (Matsumori 2013) in fact retain the three-way tonal contrast that existed in Proto-Ryukyuan. Igarashi et al. (2011) and Igarashi et al. (2012) investigated the realization of tones of Ikema in a wide range of prosodic contexts and revealed that, contrary to previous studies, this dialect also has three tone classes that correspond to those that existed in Proto-Ryukyuan.

In the studies cited above (Igarashi et al. 2011; Igarashi et al. 2012), we also found that Ikema exhibits the widespread neutralization of tone classes, such that the three-way contrast can only be observed in quite restricted contexts. In the majority of prosodic contexts, the distinction between the two tone classes is lost resulting in a two-way tonal contrast on the surface, which presumably accounts for the fact that the tone system of this dialect has mistakenly been described in past studies as having a two-pattern system.

The goal of this article is to determine the prosodic conditions that bring about tonal neutralization in Ikema, and to make some generalizations about surface pitch patterning of utterances. The surface pitch patterns in this dialect are regulated by complex tone realization rules. Due to insufficient data, a comprehensive description of these rules is beyond the scope of this study. This article instead focuses on the description of *neutralization patterns* (either Types A and B or Types A, B, and C are neutralized) as well as on the conditions that determine these neutralization patterns.

Section 2 will describe tonal neutralization of nouns and show that the hierarchical prosodic structure with three prosodic constituents above the mora—the foot, Prosodic Word, and Clitic Group—are all involved in the neutralization. Section 3 will summarize the analysis conducted in section 2, and generalize neutralization patterns and surface pitch patterns. It will also propose tone realization rules that regulate surface pitch patterns in the contexts where the three-way contrast is fully realized. In section 4, tonal neutralization of verbs and adjectives will be analyzed. It will be demonstrated that the same principles found in nouns are also applicable to verbs and adjectives. Section 5 will show that long

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utterances can exhibit pitch patterns resulting from the Principle of Rhythmic Alternation (Selkirk 1984). It will be shown that rhythmic alternation can also trigger tonal neutralization in some cases. Section 6 concludes this study.

2 Nouns

2.1 Basic features

Henceforth, the three tone classes in Ikema will be referred to as Type A, Type B, and Type C. The labels (either A, B, or C) are provided on the basis of correspondences of tone classes between the dialects of Ryukyuan and Japanese.[2] As mentioned in the introduction, proto-Ryukyuan is hypothesized to have had at least three tonal distinctions (Hattori 1958; Matsumori 2000a, 2000b). Each tone class is generally called Class A, Class B, and Class C (Matsumori 2000a, 2000b, 2011, 2012). For example, the words cognate to Japanese *nisi* 'west' and *hito* 'man' (Ikema *nsɨ* 'north', and *hitu*) belong to Class A, those cognate to Japanese *hana* 'flower', *mugi* 'malt', and *ase* 'sweat' (Ikema *hana*, *muzɨ* and *asi*) belong to Class B, and those cognate to Japanese *hone* 'bone', *umi* 'sea', and *nabe* 'pan' (Ikema *huni*, *in*, and *nabi*) belong to Class C.

The tone classes of Ikema nouns with less than five moras are exemplified in Tab. 1.[3] There are no monomoraic lexical words in Ikema, and therefore minimal lexical words are bimoraic, as the consequence of the word minimality constraint (Ito 1990). Type A nouns are few in number as a result of an ongoing diachronic change in this dialect, in which Type A is in the process of merging into Type B (Igarashi et al. 2011; Igarashi et al. 2012).

In what follows, the neutralization patterns of the tone classes will be represented, for example, by "A.B/C", in which the dot between the tone classes (A, B, or C) indicates that these classes are neutralized and the slash indicates that the classes partitioned by it are not neutralized. "A.B/C", thus, represents that Types A and B are neutralized, but Type C is not.

2 The three tone classes (A, B, and C) in Ikema roughly correspond to the two tone classes (A and B) in Nagasaki and Kagoshima Japanese, although their surface pitch patterns are quite different. Specifically, the tone class B in Nagasaki and Kagoshima corresponds to the class B and C in Ikema. Because of the ongoing merger in Ikema (see text), the tone class A in this dialect corresponds to the class A and B in Nagasaki and Kagoshima.

3 The transcription of words is based on a practical orthography in Ikema (*y* [j], *c* [ts], *sy* [ɕ], *cy* [tɕ], *zy* [ʑ ~ dʑ], *si* [ɕi], *ci* [tɕi], *zi* [ʑi ~ dʑi] *hn* [n̥n], *hm* [m̥m]) For detail, see Hayashi (2010).

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Tab. 1: Tone classes of nouns.

	Type A	Type B	Type C
Two-mora	*butu* 'husband', *fuyu* 'winter', *hitu* 'man', *ii* 'west', *nsɨ* 'north', *tibi* 'back', *tin* 'sky', *tuzɨ* 'wife', *ui* 'top', *yui* 'mutual aid in labor'	*adu* 'heel', *asi* 'sweat', *hana* 'flower', *hmu* 'cloud', *ii* 'drill', *kii* 'tree', *mayu* 'cat', *muzɨ* 'malt', *nada* 'tears', *sɨba* 'lips'	*funi* 'ship', *hazɨ* 'leg', *huni* 'bone', *in* 'sea', *nabi* 'pan', *sata* 'sugar', *tida* 'sun', *usɨ* 'mortar', *yui* 'dinner', *zza* 'father'
Three-mora	*agai* 'east', *budui* 'dance', *fudami* 'straw sandals', *hacɨka* 'twenty days', *hiima* 'daytime', *kugani* 'child', *miicɨ* 'three', *nncɨ*'six', *syaaka* 'dawn', *yuucɨ* 'four'	*avva* 'oil', *hanasɨ* 'story', *kaina* 'arm', *kamacɨ* 'cheek', *kuyun* 'calendar', *munui* 'speech', *nta* 'mud', *takara* 'treasure', *uzzya* 'quail', *yunaka* 'midnight'	*gamaku* 'pelvis and hips', *garasa* 'crow', *gusyan* 'cane', *hinzya* 'goat', *hiticɨ* 'one', *kazɨcɨ* 'sea urchin', *mihana* 'face', *mmaga* 'grandchild', *umui* 'thought', *yumunu* 'mouse'
Four-mora	*futaai* 'two persons', *ttaacɨ* 'two'	*kanamai* 'head', *kannai* 'thunder', *maukyaa* 'front'	*akyauda* 'merchant', *biizɨn* 'spring and early summer', *sɨtumuti* 'morning', *taukyaa* 'one person', *utugai* 'jaw'

2.2 Three-way tonal contrast

As will become clearer below, tonal neutralization in Ikema occurs in short utterances, and the full realization of the three-way tonal contrast requires that the utterances consist of a number of morphemes or words. In this respect, Ikema contrasts with most Japanese and Ryukyuan dialects in which the underlying tonal contrasts are fully realized when so-called *bunsetsu* (Hashimoto 1932) is produced in isolation; that is, a prosodic unit consisting of one lexical word followed by any clitic, broadly equivalent to what Nespor and Vogel (1986) refer to as a Clitic Group. In Tokyo Japanese, for example, a part of the underlying contrasts are (almost) neutralized when nouns are produced in isolation, whereas they are completely identifiable by observing pitch patterns of *bunsetsu* produced isolation (Uwano 2018), such as *hana=ni* (nose=DAT), *yama=ga* (mountain=NOM), and *umi=mo* (sea=also).[4] In Ikema, in contrast, tonal neutralization obligatorily

4 Diacritics -, =, and + are used to indicate affix, clitic, and within-compound word boundaries, respectively, when we indicate the morpho-syntactic structure of utterances. The abbreviations are as follows: ACC accusative, CAUS causative, DAT dative, DIM diminutive, GEN genitive, INS

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occurs when simplex nouns are produced in isolation even when they are followed by any clitic. Before discussing neutralization, this subsection provides examples where the three-way contrast is fully realized so as to confirm that Ikema has three lexically contrastive tone classes.

The examples in (1) demonstrate pitch patterns in compound nouns consisting of three polymoraic nominal roots produced in isolation. This is one of the contexts where a three-way contrast is fully realized. In what follows, letters in bold indicate high-pitched moras,[5] and dots stand for mora boundaries.

(1) Three-way tonal contrast in compound nouns in isolation A/B/C
A: *aka+mami+kii* red+bean+tree 'adzuki tree'
a.ka.ma.mi.gi.i
B: *gazɨ+hana+kii* hook+flower+tree 'banyan tree'
ga.zɨ.ha.na.**gi.**i
C: *yui+fau+husɨ* dinner+eating+star 'early evening star'
yu.i.fa.u.bu.sɨ

Here, Type C is distinguished from both Type A and Type B in that the second root is realized with a high pitch. Type A differs from Type B in the pitch of the third root, which is low in Type A but high in Type B, with the final mora in Type B being low-pitched.

The examples in (2) show pitch patterns in compound nouns consisting of two polymoraic roots followed by a bimoraic clitic *=mai* 'also'. (Clitics as well as suffixes in Ikema do not have their own underlying tone specification.) When such compound nouns are produced in isolation, Type A and Type B are neutralized. However, when they are produced with a bimoraic clitic, the three-way contrast is realized on the surface.

(2) Three-way tonal contrast in compound nouns followed by a bimoraic clitic A/B/C
A: *kuusu+hai=mai* pepper+field=also 'pepper field, too'
ku.u.su.ba.i.ma.i
B: cɨmma*+hai=mai* onion+field=also 'onion field, too'
cɨ.m.ma.ba.i.**ma.**i

instrumental, NEG negation, NOM nominative, NPST non-past, PL plural, PASS passive, POT potential, PROG progressive, PST past.

5 The utterance-initial mora is generally realized with low pitch. However, the initial mora can also be realized with high pitch, indicating that the initial lowering is not obligatory. The optional initial lowering is not indicated in this study.

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C: *gaura+hai=mai* bitter.gourd+field=also ‘bitter gourd field, too’
ga.u.ra.ba.i.ma.i

Here again, Type C is distinguished from both Type A and Type B in that the second root is realized with high pitch. The difference between Type A and Type B is found in the pitch of the clitic, which is low in Type A but high in Type B. (The final mora in Type B is low-pitched.)

And finally, the examples in (3) illustrate two-mora simplex nouns with a bimoraic clitic *=mai* followed by a predicate *nyaa-n* (not.exist-NEG, for an animate subject) or *mii-n* (see-NEG, for an inanimate subject). (The tone class of these predicates is Type C.) While simplex nouns exhibit tonal neutralization when they are produced either in isolation or with a clitic, neutralization does not occur when they are followed by a bimoraic clitic and a predicate.

(3) Three-way tonal contrast in two-mora nouns with a bimoraic clitic followed by a predicate A/B/C
A: *butu=mai mii-n.* husband=also see-NEG ‘The husband is also missing.’
bu.tu.ma.i.mi.i.n
B: *mayu=mai mii-n.* cat=also see-NEG ‘The cat is also missing.’
ma.yu.ma.i.**mi.i.n**
C: *nabi=mai nyaa-n.* pan=also not.exist-NEG ‘The pan is also missing.’
na.bi.ma.i.nya.a.n

Type C differs from both Type A and Type B in that the clitic is realized with a high pitch. Type A differs from Type B in the pitch of the predicate (*mii-n* or *nyaa-n*), which is low in Type A but high in Type B.

As the data analyzed thus far suggest, the three tone classes in the contexts where no neutralization occurs are distinguished from each other by a high pitch appearing in the *third* prosodic unit in Type B and by a high pitch appearing in the *second* prosodic unit in Type C. The prosodic unit at issue will be defined as the Prosodic Word in section 2.5, and the pitch patterns of each tone class will be discussed in section 3.2.

It is clear from (2)-(3) that lexical identity of the morpheme at the beginning of the utterances affects pitch patterns of the following morphemes. The effect is not limited to within the noun phrase such as *butu=mai* in (2) but it can extend even to the following verb phrase at the end of the utterance such as a predicate *mii-n* or *nyaa-n* in (3), as if the sentence as a whole functioned as the domain of lexical tone assignment in this dialect. However, it will be proposed in section 3.3 that the domain is as small as the *bunsetsu*, just as in most of the Ryukyuan and Japanese dialects.

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As noted in section 1, the complete description of complex tone realization rules in Ikema is beyond the scope of this article. The definition of the underlying representation of each tone class (Types A, B and C) also requires further investigation into tone realization in a much wider range of utterances. We leave this issue to be resolved in the future. The central issue in this article is to determine the prosodic conditions that bring about tonal neutralization. As such, the tone realization rules will be discussed to such an extent that is necessary to adequately describe neutralization patterns.

2.3 Length of utterances and tonal neutralization

Now we turn to discuss the cotexts where the tonal contrasts are lost. The examples in (4) show surface pitch patterns of two, three and four-mora simplex nouns produced in isolation.

(4) Pitch patterns of the simplex nouns produced in isolation

a. Two-mora nouns A.B/C
A: **bu**.tu ‘husband’
B: **ma**.yu ‘cat’
C: **na**.**bi** ‘pan’

b. Three-mora nouns A.B/C
A: **a**.**ga**.i ‘east’
B: **mu**.**nu**.i ‘speech’
C: **u**.**mu**.**i** ‘thought’

c. Four-mora nouns A.B.C
A: **fu.ta**.a.i ‘two persons’
B: **ma.u**.kya.a ‘front’
C: **ba.kya**.a.i ‘farewell’

In two and three-mora nouns (4a,b), the distinction between Types A and B is lost, while Type C is distinguished from other tone classes. In four-mora nouns (4c), in contrast, the three distinctions are completely lost.

Importantly, two and three-mora nouns behave in the same manner with respect to tonal neutralization, and their behaviors differ from those of four-mora nouns: in the former, Type A and Type B are neutralized, whereas in the latter, the distinctions are completely lost. This suggests firstly that the length of the utterance plays a role in tonal neutralization, and secondly that two and three-mora nouns can be analyzed to have the same phonological length in this dialect.

As shown in (5), when a bimoraic clitic, such as *=mai* ‘also’ and *=kara* ‘from’, is attached, the distinction between Types A and B is lost in two and three-mora

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nouns as in (4).[6] In contrast, in four-mora nouns either no neutralization occurs or Type A and Type B are neutralized. Here again, two and three-mora nouns behave identically with respect to tonal neutralization.

(5) Pitch patterns of the nouns followed by a bimoraic clitic word produced in isolation

a. Two-mora nouns A.B/C
A: *butu=mai* husband=also
bu.tu.ma.i
B: *mayu=mai* cat=also
ma.yu.ma.i
C: *nabi=mai* pan=also
na.bi.ma.i

b. Three-mora nouns A.B/C
A: *agai=mai* east=also
a.ga.i.ma.i
B: *munui=mai* speech=also
mu.nu.i.m.a.i
C: *umui=mai* thought=also
u.mu.i.ma.i

c. Four-mora nouns A/B/C ~ A.B/C
A: *futaai=mai* two.persons=also
fu.ta.a.i.ma.i ~ **fu.ta.**a.i.ma.i
B: *maukyaa=mai* front=also
ma.u.kya.a.ma.i
C: *bakyaai=mai* farewell=also
ba.kya.a.i.**ma**.i

2.4 Foot-based analysis

In order to account for the tonal neutralization patterns in nouns, we propose a prosodic constituent higher than the mora in the prosodic hierarchy: namely the binary (and in special cases ternary) *foot*. The binary foot is postulated for the Irabu-Nagahama dialect (henceforth, Irabu) of Miyako Ryukyuan (Shimoji 2009),

6 A nominative focal clitic *=nudu* behaves identically with bimoraic clitics such as *=mai* and *=kara*, though *=nudu* can be analyzed morphologically as a sequence of two monomoraic clitics, that is, a nominative clitic *=nu* and a focal clitic *=du*. Thus *=nudu* should be considered as an exceptional clitic in Ikema.

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a dialect that has a close genetic relationship to Ikema. As in Irabu, footing in Ikema is proposed to be binary by default, and goes from left to right iteratively. Polymoraic morphemes start their own footing. Footing in Ikema (and also in Irabu) is exhaustive, in the sense that any stray mora is integrated into the preceding foot, forming a ternary foot. These can be couched in the form of the Foot Formation Rules in (6). The domain of footing will be discussed in section 2.4.

(6) Foot formation rules

a. *Edge alignment*: Insert the edge of the foot to the beginning of polymoraic morphemes.

b. *Iterativity*: Incorporate two moras to the foot from left to right iteratively.

c. *Restructuring*: Integrate any stray mora into the preceding foot.

By means of the Foot Formation Rules (6), the feet of the nouns produced in isolation (4) are formed as in (7), where mora is indicated by “μ” and foot boundaries are indicated by angled brackets.

(7) Footing in nouns in isolation

	butu	*agai*	*futaai*
Edge alignment	<μμ	<μμμ	<μμμμ
Iterativity	<μμ>	<μμ>μ	<μμ><μμ>
Restructuring		<μμμ>	

The iterative binary footing results in one stray mora for words with odd-number moras such as *agai*. This brings about foot restructuring (6c), whereby the stray mora is integrated into the preceding foot, yielding a ternary foot <μμμ>.

Footing in nouns followed by a bimoraic clitic *=mai* (5) is shown in (8).

(8) Footing in nouns followed by a bimoraic clitic *=mai* in isolation

	butu=mai	*agai=mai*	*futaai=mai*
Edge alignment	<μμ<μμ	<μμμ<μμ	<μμμμ<μμ
Iterativity	<μμ><μμ>	<μμ>μ<μμ>	<μμ><μμ><μμ>
Restructuring		<μμμ><μμ>	

The foot structures of Types A, B, and C in (4)-(5) can now be represented as in (9) and (10) respectively.

(9) Foot structure for (4)

a. Two-mora nouns A.B/C

A: <**bu**.tu>

B: <**ma**.yu>

C: <**na.bi**>

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b. Three-mora nouns A.B/C
A: <**a.ga**.i>
B: <**mu.nu**.i>
C: <**u.mu.i**>
c. Four-mora nouns A.B.C
A: <**fu.ta**><a.i>
B: <**ma.u**><kya.a>
C: <**ba.kya**><a.i>

(10) Foot structures for (5)
a. Two-mora nouns A.B/C
A: <**bu.tu**><ma.i>
B: <**ma.yu**><ma.i>
C: <**na.bi**><**ma**.i>
b. Three-mora nouns A.B/C
A: <**a.ga.i**><ma.i>
B: <**mu.nu.i**><ma.i>
C: <**u.mu.i**><**ma**.i>
c. Four-mora nouns A/B/C ~ A.B/C
A: <**fu.ta**><**a.i**><ma.i> ~ <**fu.ta**><a.i><ma.i>
B: <**ma.u**><kya.a><ma.i>
C: <**ba.kya**><a.i><**ma**.i>

2.5 Prosodic Word

Although the foot-based analysis can describe the fact that two and three-mora nouns behave identically and that their behaviors differ from those of four-mora nouns with respect to tonal neutralization, it does not appropriately describe patterns of neutralization. For example, although (9c) and (10a,b) share the same foot structures, i. e. those with two feet, their neutralization patterns differ: the former shows the A.B.C pattern, whereas the latter the A.B/C pattern.

Obviously, these utterances differ in their morpho-syntactic structure. The utterances in (9c) consist of a single simplex noun, whereas the utterances (10ab) consist of a simplex noun and a following clitic, with a clitic boundary between the first and second feet. On the basis of this observation, we propose another prosodic constituent, which is larger than the foot in the prosodic hierarchy, and which is the domain of footing; namely, the Prosodic Word (11).

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(11) Prosodic Word (PWd)
  a. The prosodic constituent immediately above the foot in the prosodic hierarchy, which functions as the domain of footing.
  b. The left edge of a PWd coincides with the beginning of polymoraic roots, stems, and clitics.

The morphemes that introduce the left edge of a PWd are polymoraic roots, stems, and clitics as formulated in (11b). This means that polymoraic morphemes forming a compound, such as *hai* 'south' and *kadi* 'wind' in a compound noun *hai+kadi* 'southern wind' introduce the left edge of a PWd, yielding two PWds, *hai* and *kadi*. Since Polymoraic clitics such as *=mai*, *=kara*, and *=nudu* also introduce the left edge of a PWd, a compound with a following bimoraic clitic such as *hai+kadi=mai* is therefore divided into three PWds, *hai, kadi* and *mai*. There are monomoraic morphemes such as a genitive/nominative clitic *=nu*, an accusative clitic *=u*, and a topic clitic *=a*. Such morphemes cannot constitute their own PWd, and pursuantly they are merged into the preceding PWd. Suffixes differ from clitics in that the former cannot form their own PWd irrespective of their length. For example, verbal suffixes such as negative *-n*, passive *-rai*, and past *-tai* are all integrated into the preceding PWd (see section 4.2).

This level of prosodic phrasing is not postulated for Irabu (Shimoji 2009). The cross-dialectal difference may arise mainly because Irabu does not have lexically contrastive tones, while Ikema does.

It must be pointed out that the term 'PWd' in this article is used in a different sense from some of the literature, especially that of Japanese accentology. There, PWd is defined as the domain for lexical tone assignment, which in most cases coincides with *bunsetsu*.[7] The PWd defined in this article is not the domain for lexical tone assignment and, as such, is smaller than *bunsetsu*. The usage of the term PWd in this article is in a similar vein as in Ito and Mester (2007), where individual roots that constitute a compound noun are mapped onto each PWd.[8]

7 In this article, the domain of lexical tone assignment in Ikema will be proposed in section 2.9 to be the Clitic Group, which coincides with the unit traditionally called *bunsetsu*.

8 Ito and Mester (2007) adopt a framework involving recursion of prosodic structure (Ladd 1986), in which members of a compound have PWd status, and these minimal PWd's are prosodically connected to form a maximal PWd consisting of a whole member of the compound. The treatment of clitics in Ito and Mester (2007) is not clear. In the present article, both polymoraic clitics and polymoraic lexical morphemes (roots and stems) are mapped onto the same prosodic unit (i. e. PWd).

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Regarding the terminology, we must also note the following. In the proposed framework, not only polymoraic roots and stems, but also polymoraic clitics constitute their own PWd. Given that roots and stems have their own underlying tone specification in Ikema, the unified treatment of roots, stems, and clitics in our framework may mislead readers into considering that clitics also have underlying tone specification. As stated in section 2.2, clitics (as well as suffixes) do not have any underlying tone.[9]

PWd and foot structures for words in (5) are formed as in (12), where PWd boundaries are indicated by round brackets.

(12) PWd and foot formation in nouns followed by a bimoraic clitic *=mai*

	butu=mai	*agai=mai*	*futaai=mai*
PWd formation	(μμ)(μμ)	(μμμ)(μμ)	(μμμμ)(μμ)
Foot formation (6a)	(<μμ)(<μμ)	(<μμμ)(<μμ)	(<μμμμ)(<μμ)
Foot formation (6b)	(<μμ>)(<μμ>)	(<μμ>μ)(<μμ>)	(<μμ><μμ>)(<μμ>)
Foot formation (6c)		(<μμμ>)(<μμ>)	

Thus, the prosodic structures of (4) and (5) can now be represented as (13) and (14).

(13) Foot and PWd structures for (4)
  a. Two-mora nouns A.B/C
    A: (<**bu**.tu>)
    B: (<**ma**.yu>)
    C: (<**na**.**bi**>)

9 All three reviewers pointed to the potential confusion caused by referring to the prosodic unit at issue as a PWd. In general, the names of prosodic categories notoriously vary from author to author and from theory to theory, and thus confusion over terminology is to some extent unavoidable (for discussion on the confusion regarding the naming of the prosodic categories in Tokyo Japanese, see Ishihara 2015). Some reviewers say that the PWd is the domain of the lexical tone assignment, that is, the prosodic unit where a lexical tone shape appears, for example, the *bunsetsu* where either a falling or rising contour appears in Kagoshima Japanese. Other reviewers argue that the PWd is the unit that has its own underlying tone specification, such as each member of a compound noun in Kagoshima and Tokyo Japanese. The definition of the PWd is not consistently agreed, even across the reviewers. They nevertheless agree that the PWd is the unit that has an underlying or lexical tone. The PWd defined in this article differs from that, firstly because it is not the domain of lexical tone and secondly because it does not always have an underlying tone specification. One reviewer suggested more appropriate names for this prosodic category, such as *superfoot*. While it is tempting to adopt this term, we leave the original terminology in this article. At any rate, there are a number of issues to be resolved before establishing prosodic categories in Ikema. The notion of *superfoot* should be examined in regard to the *foot group* proposed by Shimoji (2009) for describing the rhythmic alternation in Irabu, the similar and more complicated processes to which are also observed in Ikema (see section 5).

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b. Three-mora nouns A.B/C
A: (<**a.ga**.i>)
B: (<**mu.nu**.i>)
C: (<**u.mu.i**>)
c. Four-mora nouns A.B.C
A: (<**fu.ta**><a.i>)
B: (<**ma.u**><kya.a>)
C: (<**ba.kya**><a.i>)

(14) Foot and PWd structures for (5)
a. Two-mora nouns A.B/C
A: (<**bu.tu**>)(<ma.i>)
B: (<**ma.yu**>)(<ma.i>)
C: (<**na.bi**>)(<**ma**.i>)
b. Three-mora nouns A.B/C
A: (<**a.ga.i**>)(<ma.i>)
B: (<**mu.nu.i**>)(<ma.i>)
C: (<**u.mu.i**>)(<**ma**.i>)
c. Four-mora nouns A/B/C ~ A.B/C
A: (<**fu.ta**><**a.i**>)(<ma.i>) ~ (<**fu.ta**><a.i>)(<ma.i>)
B: (<**ma.u**><kya.a>)(<ma.i>)
C: (<**ba.kya**><a.i>)(<**ma**.i>)

Under the proposed framework, the differing neutralization patterns between the utterances in (9c) and those in (10a,b) can be attributed to the differences in their PWd structures. Specifically, the former consists of one PWd (13c), whereas the latter of two PWds (14a,b), although they both have two feet.

In (14c), where the utterances consist of a two-foot PWd followed by a one-foot PWd, a Type A noun can have two successive high-pitched feet within a single PWd, for example, (<**fu.ta**><**a.i**>). This can be observed only when the two-foot PWd contains exclusively a four-moraic Type A simplex noun and that PWd is followed by other PWds. Otherwise, the second foot in a multi-foot PWd is obligatorily low. Only four nouns are attested to exhibit two successive high-pitched feet within a single PWd in Ikema, and they are all numerals, that is, *futaai* ‘two persons’, *ttaacɨ*’two’, *micyaai* ‘three persons’, *yutaai* ‘four persons’. In addition, as mentioned in section 2.3, they can also be realized as a HL pattern, for example, (<**fu.ta**><a.i>). Given their restricted distribution and their variability, two successive high-pitched feet within a single PWd may be considered to be an exceptional prosodic phenomenon optionally observed for four-mora Type A simplex nouns.

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In addition to the prohibition of two successive high-pitched feet within a single PWd, the feet in Ikema have another constraint. Namely, there is no pitch movement from high to low within a foot except the utterance-final one. This implies that the tone bearing unit (TBU) in Ikema is the foot, which is assigned either H or L. However, the utterance-final foot can exhibit a pitch fall from the penultimate mora to the final. On the basis of this utterance-final lowering, we regard the mora as the TBU in this dialect. Lowering in the utterance-final mora is distinctive only for a one-foot PWd produced in isolation. In this case, Type C is distinguished from both Type A and Type B in the absence of the lowering as can be seen in (13a,b). In other contexts, the lowering is not distinctive and its occurrence is largely predictable.[10] We will not discuss the final lowering any further in this article and refer to the foot that has a high pitch as the *high-pitched foot*, regardless of whether the final mora is low or high.

2.6 Behaviors of monomoraic clitics

In section 2.5, it was proposed that monomoraic clitics, such as genitive/nominative *=nu*, topic *=a*, and dative *=n*, cannot constitute their own PWd, and that they are integrated into the preceding PWd. Within this proposed framework, prosodic structures of nouns followed by a monomoraic clitic *=nu* are formed as in (15).

(15) PWd and foot formation in nouns followed by a monomoraic clitic *=nu*

	butu=nu	*agai=nu*	*makugan=nu*
PWd formation	(μμμ)	(μμμμ)	(μμμμμ)
Edge alignment	(<μμμ)	(<μμμμ)	(<μμμμμ)
Iterativity	(<μμ>μ)	(<μμ><μμ>)	(<μμ><μμ>μ)
Restructuring	(<μμμ>)		(<μμ><μμμ>)

10 The pitch movement from H to L in the utterance-final foot never occurs when the foot belongs to the PWd that is the only member of the utterance-final Clitic Group (see section 2.9), and the tone class of the head of the Clitic Group is Type C. Thus, utterances like *nabi* (13a) and *mayu=mai mii-n* (18a) exhibit no final lowering because the tone class of *nabi* and *mii-n* is Type C, and they constitute the utterance-final Clitic Group containing a single PWd. In this respect, a clitic *=hazɨ* exhibits an exceptional behavior by never showing the final lowering, although a clitic never forms a one-PWd Clitic Group. This fact may be most appropriately accounted for by assuming that *=hazɨ* is in fact not a clitic but a nominal root whose tone class is Type C. However, we retain the view that sees *=hazɨ* as a clitic based on Hayashi (2010).

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The examples in (16) show pitch patterns, prosodic structures, and the neutralization patterns of the nouns at issue.

(16) Nouns followed by a monomoraic nominative clitic *=nu* produced in isolation

a. Two-mora nouns A.B/C
A: *butu=nu* husband=NOM
(<**bu.tu**.nu>)
B: *mayu=nu* cat=NOM
(<**ma.yu**.nu>)
C: *nabi=nu* pan=NOM
(<**na.bi.nu**>)

b. Three-mora nouns A.B.C
A: *agai=nu* east=NOM
(<**a.ga**><i.nu>)
B: *munui=nu* speech=NOM
(<**mu.nu**><i.nu>)
C: *umui=nu* thought=NOM
(<**u.mu**><i.nu>)

c. Four-mora nouns A/B.C
A: *futaai*=nu two.persons=NOM
(<**fu.ta**><a.i.nu>)
B: *maukyaa=nu* front=NOM
(<**ma.u**><kya.a.nu>)
C: *bakyaai=nu* farewell=NOM
(<**ba.kya**><a.i.nu>)

Two-mora nouns followed by a monomoraic clitic in (16a) behave identically to three-mora nouns in isolation such as *agai*, *munui*, and *umui* in (13b) with respect to their neutralization patterns (A.B/C) as well as their surface pitch patterns. This can be accounted for properly in the proposed framework, in which the utterances in (16a) and (13b) share the same prosodic structure; namely, a structure consisting of a single one-foot PWd.

Three-mora and four-mora nouns followed by a monomoraic clitic in (16b,c) exhibit identical neutralization patterns (A.B.C) and surface pitch patterns as four-mora nouns produced in isolation such as *futaai*, *maukyaa*, and *bakyaai* in (13c), because these utterance all share a two-foot PWd structure.

The examples in (17) illustrate nouns with a monomoraic nominative clitic *=nu* followed by a predicate *mii-n* or *nyaa-n*, so that the utterances have two PWds. (The tone class of the predicates is Type C.)

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(17) Nouns followed by a monomoraic nominative clitic *=nu* followed by a predicate

a. Two-mora nouns A.B/C

A: *butu=nu mii-n* ‘The husband is missing.’
(<**bu.tu.nu**>)(<mi.i.n>)

B: *mayu=nu mii-n* ‘The cat is missing.’
(<**ma.yu.nu**>)(<mi.i.n>)

C: *nabi=nu nyaa-n* ‘The pan is missing.’
(<**na.bi.nu**>)(<**nya.a.n**>)

b. Three-mora nouns A.B/C

A: *agai=nu nyaa-n* ‘The east is missing.’
(<**a.ga**><i.nu>)(<nya.a.n>)

B: *midun=nu mii-n* ‘The woman is missing.’
(<**mi.du**><n.nu>)(<mi.i.n>)

C: *yarabi=nu mii-n* ‘The child is missing.’
(<**ya.ra**><bi.nu>)(<**mi.i.n**>)

c. Four-mora nouns A.B/C

A: *futaai=nu mii-n* ‘The two persons are missing.’
(<**fu.ta**><a.i.nu>)(<mi.i.n>)

B: *suruban=nu nyaa-n.* ‘The calculator is missing.’
(<**su.ru**><ba.n.nu>)(<nya.a.n>)

C: *myaarabi=nu mii-n* ‘The young girl is missing.’
(<**mya.a**><ra.bi.nu>)(<**mi.i.n**>)

The utterances in (17a) consist of two one-foot PWds. Their neutralization patterns (A.B/C) and surface pitch patterns are the same as the utterances in (14a,b), which also have two one-foot PWds.

The utterances in (17b,c), having a two-foot PWd and a following one-foot PWd, exhibit a somewhat different surface pitch pattern from the utterances in (14c) which have the same prosodic structure as (17b,c). The difference lies in the second foot of the first PWd with a Type A noun. In (14c), the second foot can have either high or low pitch. When it is high-pitched, the first PWd can have two successive high-pitched feet, so that Type A is differentiated from both Type B and Type C, and thus no neutralization occurs. In (17b,c), in contrast, the second foot is always low-pitched, and therefore, Type A and Type B are necessarily neutralized. As noted in section 2.5, two successive high-pitched feet within the same PWd is only observed in an exceptional case where the PWd contains exclusively a Type A simplex noun and that PWd is followed by other PWds. In the case of the utterances in (17b,c), that the two-foot PWd contains not only a Type A noun but also a clitic, and therefore this does not meet

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the condition where two successive high-pitched feet are observed within the same PWd.

2.7 Three-PWd length as the necessary conditions where no neutralization occurs

In the above discussion, we analyzed utterances consisting of one or two PWds. There was only one exceptional context where no neutralization occurs; utterances having a two-foot PWd followed by a PWd (14c). However, in this case also, Type A and Type B can be optionally neutralized. Given that this context is an exception, we can say that when utterances consist of less than three PWds, tone classes are obligatorily neutralized. As will be confirmed below, utterances without tonal neutralization obligatorily have three or more PWds.

In (18), nouns with a bimoraic clitic =*mai* are followed by a predicate *nyaa-n* or *mii-n*, and therefore these utterances have three PWds. In this context, the three-way distinction is fully realized (Igarashi et al. 2011; Igarashi et al. 2012).

(18) Nouns with a bimoraic clitic =*mai* followed by a predicate
  a. Two-mora nouns A/B/C
    A: *butu=mai mii-n.* ‘The husband is also missing.’
      (<**bu.tu**>)(<ma.i>)(<mi.i.n>)
    B: *mayu=mai mii-n.* ‘The cat is also missing.’
      (<**ma.yu**>)(<ma.i>)(<**mi.i.n**>)
    C: *nabi=mai nyaa-n.* ‘The pan is also missing.’
      (<**na.bi**>)(<**ma.i**>)(<nya.a.n>)
  b. Three-mora nouns A/B/C
    A: *agai=mai nyaa-n.* ‘The east is also missing.’
      (<**a.ga.i**>)(<ma.i>)(<nya.a.n>)
    B: *munui=mai nyaa-n.* ‘The speech is also missing.’
      (<**mu.nu.i**>)(<ma.i>)(<**nya.a.n**>)
    C: *umui=mai nyaa-n.* ‘The thought is also missing.’
      (<**u.mu.i**>)(<**ma.i**>)(<nya.a.n>)
  c. Four-mora nouns A/B/C
    A: *futaai=mai mii-n.* ‘The two persons are also missing.’
      (<**fu.ta**><**a.i**>)(<ma.i>)(<mi.i.n>) ~ (<**fu.ta**><a.i>)(<ma.i>)(<mi.i.n>)
    B: *maukyaa=mai mii-n.* ‘The front is also missing.’
      (<**ma.u**><kya.a>)(<ma.i>)(<**mi.i.n**>)
    C: *bakyaai=mai nyaa-n.* ‘The farewell is also missing.’
      (<**ba.kya**><a.i>)(<**ma.i**>)(<nya.a.n>)

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The full realization of a three-way contrast, therefore, requires utterances to consist of three or more PWds. However, while the three-PWd length is necessary, it is not sufficient for the full realization of tonal contrast, meaning that there are cases where neutralization does occur even when the utterances consist of three or more PWds. This will be discussed in section 2.9 below.

2.8 Compound nouns

As stated in section 2.5, a polymoraic root forms an independent PWd. A compound noun consisting of two bimoraic roots such as *hai+kadi* (south+wind) 'southern wind' is, therefore, divided into two PWds, *hai* and *kadi*.

In Ikema, the tone class of compound nouns is determined by that of their initial root, with the other roots in the compound playing no role. This process is frequently observed in most of the Japanese dialects with an N-pattern system, such as the Kagoshima dialect (Hirayama 1951; Kibe 2000; Kubozono 2012, 2018a, 2018b). Here, when the first member X is compounded with the second member Y, the tone class of the resultant compound noun Z coincides with that of X. Thus, the so-called *general compound rule* (Polivanov 1928; Hirayama 1951; Uwano 2012) formulated as "X + Y → X" is also at work in Ikema. The general compound rule will be discussed in more detail when we discuss adjectives in section 4.

The examples in (19) illustrate the pitch patterns of compound nouns with a bimoraic clitic, in which the utterances have three PWds, and the three-way tonal distinction is fully realized. The first members of each of the three compound nouns are Type A *ii* 'east', Type B *min* 'ear', and Type C *basa* 'banana', respectively.

(19) Compound nouns with two polymoraic roots followed by a bimoraic clitic *=mai*

A: *ii+tin=mai* east+sky=also 'eastern sky, too'
(<**i.i**>)(<di.n>)(<ma.i>)

B: *min+kami=mai.* ear+pot=also 'pot with handles, too'
(<**mi.n**>)(<ga.mi>)(<**ma.**i>)

C: *ba.sa+kii=mai* banana+tree=also 'banana tree, too'
(<**ba.sa**>)(<**gi.i**>)(<ma.i>)

The pitch patterns are similar to those in the utterances in (18a,b), which also consist of three one-foot PWds. That is, the foot of the first PWd is high-pitched in all the tone classes, and there is another high-pitched foot in the third PWd in Type B and in the second PWd in Type C.

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When such compound nouns are produced in isolation, the utterances will have two PWds, and therefore, Type A and Type B are neutralized. This is illustrated in (20).

(20) Compound nouns with two polymoraic roots produced in isolation
A: *ii+tin* ‘eastern sky’
(<**i.i**>)(<di.n>)
B: *min+kami* ‘pot with handles’
(<**mi.n**>)(<ga.mi>)
C: *basa+kii* ‘banana tree’
(<**ba.sa**>)(<**gi.**i>)

The pitch patterns are similar to those in the utterances in (14a,b) and (17a), which also consist of two one-foot PWds.

Compound nouns consisting of three polymoraic roots form three PWds as in (21), and therefore, no neutralization occurs. This is the context where the three-way tonal distinction is fully realized when a single lexical word (without any following elements such as clitics) is produced in isolation. The pitch patterns are the same as those in (19), which share the identical prosodic structures.

(21) Compound nouns with three polymoraic roots produced in isolation
A/B/C
A: *aka+mami+kii* red+bean+tree ‘adzuki tree’
(<**a.ka**>)(<ma.mi>)(<gi.i>)
B: *gazɨ+hana+kii* hook+flower+tree ‘banyan tree’
(<**ga.zɨ**>)(<ha.na>)(<**gi.i**>)
C: *yui+fau+husɨ* dinner+eating+star ‘early evening star’
(<**yu.i**>)(<**fa.u**>)(<bu.sɨ>)

2.9 Clitic Group

As already mentioned in section 2.7, there are cases when tonal distinction is lost even when the utterances have three or more PWds. In (22), nouns with a monomoraic accusative clitic *=u* is followed by a Type C compound verb *mii+ur* (see+PROG) ‘be seeing’, forming two PWds. Two-mora nouns with a clitic form a single PWd as shown in (22a), while compound nouns with a clitic form two PWds as in (22b). As a whole, therefore, the utterances in (21a) consist of three PWds, while those in (21b) consist of four PWds.

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(22) Simplex and compound nouns with a monomoraic accusative clitic =*u* followedby a compound verb *mii+ur*.

a. Two-mora simple nouns A.B/C

A: *butu=u mii+ur.*
husband=ACC see+PROG 'I am looking at the husband.'
(<**bu.tu.u**>)(<mi.i>)(<**u**.i>)

B: *mayu=u mii+ur.*
cat=ACC see+PROG 'I am looking at the cat.'
(<**ma.yu.u**>)(<mi.i>)(<**u**.i>)

C: *nabi=u mii+ur.*
pan=ACC see+PROG 'I am looking at the pan.'
(<**na.byu.u**>)(<**mi.i**>)(<**u**.i>)

b. Compound nouns A/B/C

A: *yarau+kii=u mii+ur.*
yarau+tree=ACC see+PROG 'I am looking at the yarau tree.'
(<**ya.ra.u**>)(<gi.i.yu>)(<mi.i>)(<**u**.i>)

B: *mami+kii=u mii+ur.*
bean+tree=ACC see+PROG 'I am looking at the bean tree.'
(<**ma.mi**>)(<gi.i.yu>)(<**mi.i**>)(<**u**.i>)

C: *adan+kii=u mii+ur.*
adan+tree=ACC see+PROG 'I am looking at the adan tree.'
(<**a.da.n**>)(<**gi.i.yu**>)(<mi.i>)(<**u**.i>)

The utterances in (22a) differ from those in (22b) in whether or not neutralization occurs: in (22a), Type A and Type B are neutralized, whereas in (22b), no neutralization occurs. This difference does not arise from the fact that there are more PWds in (22b) than in (22a). As shown in (23), even though the noun phrases in (22a) (such as *butu=u*) are followed by a compound verb with a bimoraic clitic *mii+ur=hazɨ* (see-PROG=may.be) 'may be seeing', so that the number of PWds in the utterances as a whole increases from three to four, Type A and Type B are nevertheless neutralized.

(23) Two-mora nouns with a monomoraic accusative clitic =*u* followed by a compound verb *mii+ur* with a bimoraic clitic =*hazɨ* A.B/C

A: *butu=u mii+ur=hazɨ.*
husband=ACC see+PROG=may.be '(He) may be looking at the husband.'
(<**bu.tu.u**>)(<mi.i>)(<**u.i**>)(<ha.zɨ>)

B: *mayu=u mii+ur=hazɨ.*
cat=ACC see+PROG=may.be '(He) may be looking at the cat.'
(<**ma.yu.u**>)(<mi.i>)(<**u.i**>)(<ha.zɨ>)

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C: *nabi=u mii+ur=hazɨ.*
pan=ACC see+PROG=may.be ‘(He) may be looking at the pan.’
(<**na.byu.u**>)(<**mi.i**>)(<**u.i**>)(<ha.zɨ>)

In contrast, when the noun phrase in (21b) (such as *yarau+gii=nu*) is followed by a Type C verb *tumi-n* so that the number of PWds in the utterances decreases from four to three, no neutralization occurs.

(24) Compound nouns with a monomoraic accusative clitic =*u* followed by a verb *tumi-n* A/B/C
A: *yarau+kii=u tumi-n.*
yarau+tree=ACC look.for-NEG ‘(We) do not look for yarau trees.’
(<**ya.ra.u**>)(<gi.i.yu>)(<tu.mi.n>)
B: *mami+kii=u tumi-n.*
bean+tree=ACC look.for-NEG ‘(We) do not look for bean trees.’
(<**ma.mi**>)(<gi.i.yu>)(<**tu.mi.n**>)
C: *adan+kii=u tumi-n.*
adan+tree=ACC look.for-NEG ‘(We) do not look for adan trees.’
(<**a.da.n**>)(<**gi.i.yu**>)(<tu.mi.n>)

Obviously, not only the number of PWds in the utterance as a whole, but the number of PWds in a specific prosodic constituent smaller than the utterance also has relevance to tonal neutralization. It is clear from (22)-(24) that the difference between the contexts with and without neutralization lies not in the number of PWds in the predicates but in the number of PWds in the unit containing a noun (either simplex or compound) with any following clitics, such as *butu=u* and *yarau+kii=u*. As mentioned in section 2.2, this unit is traditionally called *bunsetsu* in Japanese linguistics, and referred to here as the Clitic Group (25).

(25) Clitic Group (CG)
a. The prosodic constituent immediately above the PWd in the prosodic hierarchy, which serves as the domain of lexical tone assignment.
b. The tone class of the CG is determined exclusively by that of the head of the CG, which is the leftmost root or stem in the CG.
c. The left edge of a CG coincides with the beginning of lexical words (nouns, adjectives, verbs, and adverbs).

We consider the CG as the domain of the lexical tone assignment (25a). The evidence supporting this claim will be discussed in section 3.3. (25c) accounts for the ‘general compound rule’ discussed in section 2.8, whereby the tone class of the initial root in the CG determines that of the compound with other roots having no relevance to its tone class.

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Thus, the CG structure of the utterances in (22) can be shown as (26), where a square bracket indicates the CG boundaries.

(26) CG structures in (22)

a. Two-mora simple nouns A.B/C

A: *butu=u mii+ur.* ‘I am looking at the husband.’
[(<**bu.tu.u**>)][(<mi.i>)(<**u**.i>)]

B: *mayu=u mii+ur.* ‘I am looking at the cat.’
[(<**ma.yu.u**>)][(<mi.i>)(<**u**.i>)]

C: *nabi=u mii+ur.* ‘I am looking at the pan.’
[(<**na.byu.u**>)][(<**mi.i**>)(<**u**.i>)]

b. Compound nouns A/B/C

A: *yarau+kii=u mii+ur.* ‘I am looking at the yarau tree.’
[(<**ya.ra.u**>)(<gi.i.yu>)][(<mi.i>)(<**u**.i>)]

B: *mami+kii=u mii+ur.* ‘I am looking at the bean tree.’
[(<**ma.mi**>)(<gi.i.yu>)][(<**mi.i**>)(<**u**.i>)]

C: *adan+kii=u mii+ur.* ‘I am looking at the adan tree.’
[(<**a.da.n**>)(<**gi.i.yu**>)][(<mi.i>)(<**u**.i>)]

In (26a), the preceding CGs have one PWd, and in this context, Type A and Type B are neutralized, even though the utterances as a whole have three PWds. In (26b), in which no neutralization occurs, the preceding CGs have two PWds, and the utterances as a whole have more than two PWds.

Thus, the framework involving the prosodic phrasing at the level of CG makes it possible to predict whether or not neutralization occurs in the utterance with more than two PWds. It is clear from the above discussion that the full realization of the three-way tonal contrast not only requires the utterance to have three or more PWds but also requires the CG to have two or more PWds.

3 Generalizing neutralization and surface pitch patterns

3.1 Generalization of neutralization patterns in section 2

On the basis of the data analyzed, we can now generalize the conditions where neutralization occurs as in (27). We regard the PWd containing exclusively a Type A four-mora simplex noun such as *futaai* and *micyaai* as an exception, and this case is excluded from (27).

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(27) Generalization of neutralization patterns
  a. When the utterance consists of less than three PWds, or the CG consists of less than two PWds, tonal neutralization occurs.
  b. When the utterances consist of only two PWds, Type A and Type B are neutralized (A.B/C).
  c. When the utterances consist of only one one-foot PWd, Type A and Type B are neutralized (A.B/C).
  d. When the utterances consist of only one multi-foot PWd, the tonal contrasts are completely lost (A.B.C).

The conditions where no neutralization occurs can, on the other hand, be generalized as follows.

(28) The condition where no neutralization occurs
  The three-way tonal contrast in Ikema is fully realized when the following two conditions are met.
  a. The utterance consists of three or more PWds.
  b. The CG consists of two or more PWds.

Tab. 2 summarizes neutralization patterns in all contexts examined in this article. The utterances (c, d, h, i, l, m, n) will be analyzed in the following sections. Only one context (that in (m) showing the A.B/C pattern) does not fit into the generalization (27)-(28). This neutralization is brought about by the *rhythmic alternation* discussed in section 5.

Tab. 2: Summary of neutralization patterns and surface pitch patterns.[11]

	#PWds per CG	**#PWds per Utt**	**Neutral-ization**	**Type A**	**Type B**	**Type C**
a	1	1	A.B/C	[(<HL>)]	[(<HL>)]	[(<H>)]
b	1	1	A.B.C	[(<H><L>)]	[(<H><L>)]	[(<H><L>)]
c	1	1	A.C	[(<H><L><L>)]	—	[(<H><L><L>)]
d	1	1	A.C	[(<H><L><H><L>)]	—	[(<H><L><H><L>)]

11 "#PWds per CG" and "#PWds per Utt" stand respectively for the number of PWds in a CG and the number of PWds in an utterance. "<H>" and "<L>" indicate a high-pitched foot and a low-pitched foot, respectively. The lowering of the utterance-final mora is ignored in the table. As mentioned above, the final lowering is distinctive only in one-foot PWds produced in insolation. Specifically, Type A and B words exhibit the final lowering, while Type C words do not. This is represented in a somewhat *ad hoc* manner as Type A and Type B words having "<HL>", and

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Tab. 2: (continued)

	#PWds per CG	#PWds per Utt	Neutral-ization	Type A	Type B	Type C
e	1	≥2	A.B/C	[(<H>)][(<L>)…	[(<H>)][(<L>)…	[(<H>)][(<**H**>)…
f	2	2	A.B/C	[(<H>)(<L>)]	[(<H>)(<L>)]	[(<H>)(<**H**>)]
g	2	2	A.B/C	[(<H><L>)(<L>)] *	[(<H><L>)(<L>)]	[(<H><L>)(<**H**>)]
h	2	2	A/C	[(<H><L><H>)(<L>)]	—	[(<H><L><L>)(<**H**>)]
i	2	2	A/C	[(<H><L><H><L>)(<L>)]	—	[(<H><L><H><L>)(<**H**>)]
j	2	≥3	A/B/C	[(<H>)(<L>)][(<L>)…	[(<H>)(<L>)][(<**H**>)…	[(<H>)(<**H**>)][(<L>)…
k	3	3	A/B/C	[(<H>)(<L>)(<L>)]	[(<H>)(<L>)(<**H**>)]	[(<H>)(<**H**>)(<L>)]
l	3	≥4	A/B/C	[(<H>)(<L>)(<L>)][(<H>)…	[(<H>)(<L>)(<**H**>)][(<L>)…	[(<H>)(<**H**>)(<L>)][(<L>)…
m	3	≥4	A.B/C	[(<H>)(<L><L>)(<H>)][(<L>)…	[(<H>)(<L><L>)(<**H**>)][(<L>)…	[(<H>)(<**H**><L>)(<L>)][(<L>)…
n	4	≥5	A/B/C	[(<H>)(<L>)(<L><L>)(<H>)][(<L>)…	[(<H>)(<L>) (<**H**><L>)(<L>)][(<L>)…	[(<H>)(<**H**>)(<L><L>)(<H>)][(<L>)…

3.2 Generalization of pitch patterns in the utterances without neutralization

The above discussion also enables us to generalize surface pitch patterns of the utterances in the condition where no neutralization occurs, as in (29).

(29) Generalization of pitch patterns in the utterances without neutralization
   a. The first foot of the utterance-initial PWd is obligatorily high.
   b. Type B has a high-pitched foot in the third PWd.
   c. Type C has a high-pitched foot in the second PWd.

Type C words having “<H>”. “≥X” (where X stands for number) indicate that the number of PWds are X or more. Three dots after each PWd indicate that other PWds can follow that PWd. The tones assigned by the Lexical Tone Assignment Rule (33) are bold. The underlined high-pitch foot “<H>” stands for the pitch assigned by the *rhythmic alternation* (see section 5). A two-foot Type A noun followed by another PWd in the same CG (g), denoted by an asterisk in the table, can also show [(<H><H>)(<L>)], and in this case no neutralization occurs (A/B/C).

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The first foot of the utterance-initial CG is necessarily high irrespective of the lexical identity of the head of the CG (29a). The high pitch is, therefore, not a part of the lexical tone specification. We consider the high-pitch not as the property of the CG but as that of the utterance on the basis of the following observations. Firstly, in two successive CGs, the first foot of the preceding (and thus the utterance-initial) CG is always high, while that of the following (and thus utterance-medial) CG can be either high or low. Secondly, the pitch of the first foot of the preceding CG is predictable from the lexical identity of the head of the *preceding* CG.

Take, for example, the utterances consisting of a one-PWd CG and a two-PWd CG as in (26a). The first foot of the following CG is low when the head of the preceding CG is Type A or Type B, whereas it is high when the head of the preceding CG is Type C. Take for another example the utterances with two successive two-PWd CGs as in (26b). The first foot of the following CG is low when the head of the preceding CG is Type A or Type C, whereas it is high when the head of the preceding CG is Type B. These observations indicate that the pitch of the initial foot of the initial PWd of the utterance-medial CGs is derived by a rule that refers to the lexical tone specification of the head of the preceding CG.

The pitch of the second and third PWds, in contrast, depends on the lexical identity of the head of the CG (29b), and therefore, it is a part of the lexical specification; the third PWd is high for Type B, whereas the second PWd is high for Type C. Interestingly, the high-pitched foot in question is not necessarily inside the CG. In the case of Type B nouns, for example, the high-pitch appears in the first foot of the following CG when the preceding CG has two PWds, as shown in (30a), whereas it appears in the foot of the final PWdk of the preceding CG when the preceding CG has three PWds, as in (30b).

(30) Location of the high-pitch foot (underlined) in Type B nouns
a. Two-PWd CG
mayu=mai mii-n. ‘The cat is also missing.’
[(<**ma.yu**>)(<ma.i>)][(<**mi.i.n**>)]
b. Three-PWd CG
mami+kii=mai nyaa-n. ‘The bean tree is also missing.’
[(<**ma.mi**>)(<gi.i>)(<**ma.i**>)][(<nya.a.n>)]

Lexical tone assignment in a three-PWd window in (29) can be displayed in the form of (31), where three dots after each foot indicate that other feet can follow that foot. The right boundaries of the CGs can be either after the third or second PWd, meaning that the third PWd can be either inside or outside the CG.

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```
(31) Lexical tone assignment in a three-PWd window
     a. Type A:  [(< >...)(< >...)(< >...)  ~  [(< >...)(< >...)][(< >...)
     b. Type B:  [(< >...)(< >...)(< >...)  ~  [(< >...)(< >...)][(< >...)
                                  H                               H
     c. Type C:  [(< >...)(< >...)(< >...)  ~  [(< >...)(< >...)][(< >...)
                          H                               H
```

In Type A, no tone is assigned, shown in (31a), whereas in Type B and Type C, H is assigned to the initinal foot of the third and second PWd, respectively, as shown in (31b) and (31c). This H is in bold in Tab. 2.

In can be seen from Tab. 2 that the distribution of the high-pitched foot in a three-PWd window in the utterances without neutralization is consistent throughout all the utterances examined in this article. There is a case, however, where a pitch pattern due to the *rhythmic alternation* overwrites the tones in (31) so that neutralization of tone classes occurs. This is illustrated in Tab. 2(m), where the foot of the third PWd in Type A is assigned H. The rhythmic alternation will be discussed in section 5.

Tonal neutralization in Ikema occurs when the PWd that a lexical tone is assigned to is absent. In order for the lexical H to be realized on the surface, Type B requires the third PWd to be located inside the CG or at the beginning of the following CG. When such a PWd is lacking, the H is truncated and thus not realized on the surface. The surface pitch pattern in that context, therefore, becomes the same as that in Type A, with the distinction between Type A and Type B neutralized (Tab. 2(b)-(i)). In the same way, Type C requires the second PWd to be located inside the CG or at the beginning of the following CG. When such a PWd is absent, the surface pitch pattern becomes identical to that in both Type A and Type B, and thus the distinction is completely lost. The exception is a one-foot PWd produced in isolation (Tab. 2(a)). It is predicted that no tonal contrast is realized on the surface, because there is no second and third foot in this context. In this particular case, however, the distinction between Type A and Type B is preserved.

Hyman (2005) distinguishes several relevant parameters of tonal neutralization, such as properties of its trigger, like tone, a domain boundary, grammatical construction, and intonation. In Ikema, since the phonological length of prosodic units is relevant to neutralization, the trigger for neutralization must be a domain boundary.

Hyman's (2005) typology of tonal neutralization also distinguishes recoverable vs. unrecoverable neutralization. Recoverable neutralization occurs when the underlying contrast can be contextually recovered, whereas unrecoverable neutralization occurs when the underlying contrast cannot be contextually

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determined. In Ikema, in the utterance where a CG has two PWds and that CG is followed by another CG as in Tab. 2(j), the underlying tonal contrast is not determined solely by observing the (preceding) CG. It is determined by looking at the pitch of the following CG. In that case, the tonal contrast in Ikema is contextually recoverable. However, if such a CG is followed by no CG as in Tab. 2(f), then the underlying tonal contrast is not recoverable.

3.3 The domain of lexical tone assignment in Ikema

The two prosodic processes just discussed in section 3.2, that is, 1) that the tone class of the head of the preceding CG decides the pitch of the beginning of the *following* CG, and 2) that lexically specified tones can be realized in the *following* CG, may lead to speculation that the domain of lexical tone assignment in Ikema is larger than the CG. However, when we examine the pitch patterns of the utterance-medial CGs, we notice that the domain of lexical tone assignment is nevertheless the CG, as formulated in (25a).

In (32), the first CGs contain a head noun, Type A *butu* 'husband', Type B *mayu* 'cat', or Type C *yarabi* 'child'. The second CGs contain a compound verb, Type A *nii+ur=hazɨ* (boil+PROG=may.be) or Type C *mii+ur=hazɨ* (see+PROG=may.be). The number of PWds is two in the first CGs but three in the second. The high-pitched feet which are due to lexically contrastive tones are underlined.

(32) Pitch patterns of two successive CGs

a. Type A noun followed by Type A verb
butu=mai nii+ur=hazɨ.
husband=also boil+PROG=may.be 'The husband may be boiling, too.'
[(<**bu.tu**>)(<ma.i>)][(<ni.i>)(<u.i>)(<ha.zɨ>)]

b. Type B noun followed by Type A verb
midun=mai nii+ur=hazɨ.
woman=also boil+PROG=may.be 'The woman may be boiling, too.'
[(<**mi.du.n**>)(<ma.i>)][(<**ni.i**>)(<u.i>)(<ha.zɨ>)]

c. Type C noun followed by Type A verb
yarabi=mai nii+ur=hazɨ.
child=also boil+PROG=may.be 'The child may be boiling, too.'
[(<**ya.ra.bi**>)(<**ma.i**>)][(<ni.i>)(<u.i>)(<ha.zɨ>)]

d. Type A noun followed by Type C verb
butu=mai mii+ur=hazɨ.
husband=also see+PROG=may.be 'The husband may be seeing, too.'
[(<**bu.tu**>)(<ma.i>)][(<mi.i>)(<**u.i**>)(<ha.zɨ>)]

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e. Type B noun followed by Type C verb
midun=mai mii+ur=hazɨ.
woman=also see+PROG=may.be ‘The woman may be seeing, too.’
[(<**mi.du.n**>)(<ma.i>)][(<**mi.i**>)(<**u.i**>)(<ha.zɨ>)]

f. Type C noun followed by Type C verb
yarabi=mai mii+ur=hazɨ.
child=also see+PROG=may.be ‘The child may be seeing, too.’
[(<**ya.ra.bi**>)(<**ma.i**>)][(<mi.i>)(<**u.i**>)(<ha.zɨ>)]

Type B nouns in (32a,e) assign a high pitch to the foot of the third PWd, which is the first PWd of the second CG. Type C nouns in (32c,f) assign a high pitch to the foot of the second PWd, which is inside the first PWd. As stated above, the pitch of the first PWd of the second CGs is decided by the tone class of the head of the first CGs, that is, that of the nouns. In (32) it is low when the tone class of the noun is Type A or Type C, whereas it is high when the tone class of the noun is Type B. Importantly, the pitch of the non-initial PWds in the second CG is determined by the tone class of the verbal stem, Type A *nii-* or Type B *mii-*, which is the head of the second CG. When the verbal stem is Type C, a high pitch is assigned to the second PWd (32d,e,f). When the verb is Type A, no high pitch is assigned to non-initial PWds. In short, the pitch of the non-initial PWds of each CG depends on the tone class of the head of that CG, indicating that the domain of the lexical tone assignment in Ikema is the CG.

3.4 Tone realization rules

Although a comprehensive description of the tone realization rules that determine surface pitch patterns of utterances goes beyond the scope of this article, this subsection proposes tone realization rules applicable only to the utterances without neutralization.

First, the Lexical Tone Assignment Rule (33) assigns H to a specific foot according to the lexical identity of the head of the CG.

(33) Lexical Tone Assignment Rule
a. Assign H to the first foot of the third PWd when the tone class of the head of the CG is Type B.
b. Assign H to the first foot of the second PWd when the tone class of the head of the CG is Type C.

Second, the Utterance-Initial Raising Rule assigns H to the utterance-initial foot, which accounts for the utterance-initial foot always having a high pitch regardless of the lexical tone specification of the head.

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(34) Utterance Initial Raising Rule
Assign H to the utterance initial foot.

Finally, the Default Lowering Rule assigns L to all the toneless feet.

(35) Default Lowering Rule
Assign L to toneless feet.

The three tone realization rules—the Lexical Tone Assignment Rule, Utterance-Initial Raising Rule, and Default Lowering Rule—are applied in this order, so that surface pitch patterns of the utterances in (18), for example, are derived as shown in (36).

(36) Tone realization rules applied to the utterances (18)
a. Lexical Tone Assignment Rule
Type A [(<bu.tu>)(<ma.i>)][(<mi.i.n>)]
Type B [(<ma.yu>)(<ma.i>)][(<**mi.i.n**>)]
H
Type C [(<na.bi>)(<**ma.i**>)][(<nya.a.n>)]
H
b. Utterance-Initial Raising
Type A [(<**bu.tu**>)(<ma.i>)][(<mi.i.n>)]
H
Type B [(<**ma.yu**>)(<ma.i>)][(<**mi.i.n**>)]
H H
Type C [(<**na.bi**>)(<**ma.i**>)][(<nya.a.n>)]
H H
c. Default Lowering
Type A [(<**bu.tu**>)(<ma.i>)][(<mi.i.n>)]
H **L** **L**
Type B [(<**ma.yu**>)(<ma.i>)][(<**mi.i.n**>)]
H **L** H
Type C [(<**na.bi**>)(<**ma.i**>)][(<nya.a.n>)]
H H **L**

4 Adjectives and verbs

4.1 Adjectives

In Ikema, adjectives are largely bound morp hemes, in that they do not stand as a word. The adjective stems are combined with suffixes or other lexical morphemes

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to function as nouns, verbs, or adverbials (Hayashi 2010). The adjective stem *taka-* ‘high’, for example, is followed by a nominal root *+munu* ‘thing’, a verbalizing suffix *-kai*, or an adverbializing suffix *-fu*, and it functions respectively as a noun *taka+munu* ‘a high thing’, a verb *taka-kai* ‘be high’, or an adverbial *taka-fu* ‘highly’.

As with nouns, adjectives have three tonal distinctions, Type A, Type B, and Type C. The vast majority of Ryukyuan (and also of Japanese dialects) has at most two distinctions in adjectives, and therefore the three-way contrasts in adjectives in Ikema should be considered an exceptional case. Examples of adjectives belonging to each tone class are shown in Tab. 3. Type C adjectives are few in number, arguably because they were developed as a result of the diachronic innovation that occurred in Ikema.

Tab. 3: Tone classes of adjectives.

	Type A	Type B	Type C
Two-mora	*aka-* ‘red’, *ama-* ‘light-tasting’, *bida-* ‘low’, *ffa-* ‘dark’, *garu* ‘light’, *kyuu-*, ‘smoky’, *mii-* ‘new’, *nbu-* ‘heavy’, *uda-* ‘fat’, *yai-* ‘slim’	*au-* ‘blue’, *bai-* ‘bad’, *baka-* ‘young’, *fuka-* ‘deep’, *kara-* ‘spicy’, *kupa-* ‘hard’, *mma-* ‘good-tasting’, *naga-* ‘long’, *ngya-* ‘bitter’, *ssu-* ‘white’, *taka-* ‘high’	*taya-* ‘strong’, *mai-* ‘close’
Three-mora	*haasa-* ‘many’, *hiicya-* ‘few, *hinna-* ‘strange’, *hyaa-* ‘fast’, *kaama-* ‘far’, *kanasɨ-* ‘dear’, *kyuusɨ-* ‘smoky’, *maara-* ‘rounded’	*bakasɨ-* ‘ashamed’, *daizɨ-* ‘horrible’, *higuru-* ‘cold’, *higyau-* ‘spooky’, *kicɨgi-* ‘beautiful’, *manai-* ‘gentle’, *miffa-* ‘hateful’, *sɨdasɨ-* ‘cool’, *ssyana-* ‘dirty’, *yaasɨ-* ‘hungry’	*gabaa-* ‘large’

In (37), adjective stems are followed by a bimoraic nominal root *+munu* and a bimoraic inferential clitic *=hazɨ* ‘may be’. Here, the utterances as a whole have three PWds, and the CGs containing the adjective stems have more than one PWd, and therefore no neutralization occurs.

(37) Adjective stems followed by a nominal root *+munu* and a bimoraic inferential clitic *=hazɨ*

a. Two-mora adjectives A/B/C

A: *aka+munu=hazɨ* red+thing=may.be ‘(It) may be red.’
[(<**a.ka**>)(<mu.nu>)(<ha.zɨ>)]

B: *taka+munu=hazɨ.* high+thing=may.be ‘(It) may be high.’
[(<**ta.ka**>)(<mu.nu>)(<**ha.zɨ**>)]

C: *taya+munu=hazɨ* strong+thing=may.be ‘(It) may be strong.’
[(<**ta.ya**>)(<**mu.nu**>)(<ha.zɨ>)]

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b. Three-mora adjectives A/B/C
A: *sabisɨ+munu=hazɨ.* lonely+thing=may.be '(He) may be lonely.'
[(<**sa.bi.sɨ**>)(<mu.nu>)(<ha.zɨ>)]
B: *higuru+munu=hazɨ.* cold+thing=may.be '(It) may be cold.'
[(<**hi.gu.ru**>)(<mu.nu>)(<**ha.zɨ**>)]
C: *gabaa+munu=hazɨ* large+thing=may.be '(It) may be large.'
[(<**ga.ba.a**>)(<**mu.nu**>)(<ha.zɨ>)]

Type A has no high-pitched foot in a three-PWd window except in the first PWd. Type B and Type C have a high-pitch foot in the third and second PWds, respectively. These pitch patterns are the same as those in nouns.

The pitch patterns of adjective stems followed by a nominal root *+munu* are shown in (38). Since the utterances consist of less than three PWds, Type A and Type B are neutralized (A.B/C).

(38) Adjective stems followed by a bimoraic nominal root *+munu*
a. Two-mora adjectives A.B/C
A: *aka+munu* red+thing '(It) is red.'
[(<**a.ka**>)(<mu.nu>)]
B: *taka+munu* high+thing '(It) is high.'
[(<**ta.ka**>)(<mu.nu>)]
C: *taya+munu* strong+thing '(It) is strong.'
[(<**ta.ya**>)(<**mu**.nu>)]
b. Three-mora adjectives A.B/C
A: *sabisɨ+munu* lonely+thing '(He) is lonely.'
[(<**sa.bi.sɨ**>)(<mu.nu>)]
B: *higuru+munu* cold+thing '(It) is cold.'
[(<**hi.gu.ru**>)(<mu.nu>)]
C: *gabaa+munu* large+thing '(It) is large.'
[(<**ga.ba.a**>)(<**mu**.nu>)]

When an adjective modifies a noun, the adjective stem is directly attached to the noun resulting in an adjective-noun compound. Prosodic behaviors of adjective-noun compounds are exactly the same as those of compound nouns, in the sense that the "general compound principle" (Polivanov 1928; Hirayama 1951; Uwano 2012) is at work: the tone class of adjective-noun compounds is determined by that of the adjective stem, while the other elements, that is, nouns, play no role.

The examples in (39) illustrate the pitch patterns of adjective-noun compounds followed by a bimoraic clitic *=mai*, forming a three-PWd CG. Here, X + Y → Z means that a Type X adjective stem precedes a Type Y noun, and the tone

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class of the resultant compound is Type Z. The tone classes of the adjectives *uda* ‘fat’, *bai* ‘bad’, and *taya* ‘strong’ are Type A, B, and C, respectively, and the classes of the modified nouns *tuzɨ* ‘wife’, *mayu* ‘cat’, and *waa* ‘pig’ are Type A, B, and C, respectively.

(39) Adjective-noun compounds followed by a bimoraic clitic *=mai* A/B/C

a. A + A → A: *uda+tuzɨ = mai* fat+wife=also ‘fat wife, too.’
[(<**u.da**>)(<tu.zɨ>)(<ma.i>)]
A + B → A: *uda+mayu=mai* fat+cat=also ‘fat cat, too’
[(<**u.da**>)(<ma.yu>)(<ma.i>)]
A + C → A: *uda+waa=mai* fat+pig=also ‘fat pig, too’
[(<**u.da**>)(<wa.a>)(<ma.i>)]

b. B + A → B: *bai+tuzɨ=mai* bad+wife=also ‘bad wife, too’
[(<**ba.i**>)(<tu.zɨ>)(<**ma**.i>)]
B + B → B: *bai+mayu=mai* bad+cat=also ‘bad cat, too’
[(<**ba.i**>)(<ma.yu>)(<**ma**.i>)]
B + C → B: *bai+waa=mai* bad+pig=also ‘bad pig, too’
[(<**ba.i**>)(<wa.a>)(<**ma**.i>)]

c. C + A → C: *taya+tuzɨ=mai* strong+wife=also ‘strong wife, too’
[(<**ta.ya**>)(<**tu.zɨ**>)(<ma.i>)]
C + B → C: *taya+mayu=mai* strong+cat=also ‘strong cat, too’
[(<**ta.ya**>)(<**ma.yu**>)(<ma.i>)]
C + C → C: *taya+waa=mai* strong+pig=also ‘strong pig, too’
[(<**ta.ya**>)(<**wa.a**>)(<ma.i>)]

The distinctions of tone classes of nouns are completely lost in (39), confirming that the “general compound principle” is applicable not only to compound nouns but also to adjective-noun compounds. Pitch patterns of these adjective-noun compounds are the same as those of three-PWd CGs containing nouns.

4.2 Verbs

Verbs in Ikema have a rich and complex morphology, and they ordinarily accompany one or more derivational and/or inflectional suffixes. As in the majority of dialects of Ryukyuan and Japanese, verbs in Ikema exhibit only a two-way tonal contrast as the examples in (39) show. Here, a verbal stem *ibi* ‘plant’ or *idi* ‘exit’ is compounded with another verbal stem *ur* ‘be’ to constitute a progressive form of the verbs, such as *ibi+ur* ‘be planting’ and *idi+ur* ‘be coming out’. These compound verbs are further followed by an inferential clitic *=hazɨ*. The CGs as a whole consist of three PWds, yielding a context where no neutralization occurs.

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(40) Compound verbs with an inferential clitic =*hazɨ* A/C
A: *ibi+ur=hazɨ* plant+PROG=may.be ‘(He) may be planting.’
[(<**i.byu**>)(<u.i>)(<ha.zɨ>)]
C: *idi+ur=hazɨ* come.out+PROG=may.be ‘(He) may be coming out.’
[(<**i.zyu**>)(<**u.i**>)(<ha.zɨ>)]

Given that the pitch patterns of *ibi+ur* and of *idi+ur* are the same as those in the case of Type A nouns and Type C nouns, respectively, we regard the tone classes of the former verb as Type A and that of the latter as Type C (with Type B missing). These verbs are exemplified in Tab. 4.

Tab. 4: Tone classes of verbs.

	Type A	**Type C**
Two-mora	*agi*- ‘raise’, *fii*- ‘give’, *ibi*- ‘plant’, *nii*- ‘boil’,*sɨti*- ‘throw away’, *ik*- ‘go’, *kam*- ‘smell at’, *sɨn*- ‘die’, *tub*- ‘fly’, *us*- ‘push’	*idi*- ‘come out’, *mii*- ‘see’, *tumi*- ‘look for, find’, *uti*- ‘fall’, *zzi*- ‘receive’, *ar*- ‘exist’, *kak*- ‘write’, *kug*- ‘row (a boat)’, *tur*- ‘take’, *yum*- ‘read’
Three-mora	*bassi*- ‘forget’, *bugari*- ‘get tired’, *itaki*- ‘spill’, *usagi*- ‘see (someone) off’, *yuddi*- ‘get close to’, *asub*- ‘play’, *budur*- ‘dance’, *kuras*- ‘kill’, *nuzɨk*- ‘peep’, *yurab*- ‘call’	*byuui*- ‘get drunk’, *cɨmudi*- ‘get angry’, *nauki*- ‘repair’, *tasɨki*- ‘help’, *irab*- ‘choose’, *misɨri*- ‘wake up’, *nusɨm*- ‘steal’, *suvv*- ‘run’, *ttak*- ‘punch’, *uug*- ‘swim’
Four-mora	*kangai*- ‘think’, *buuvv*- ‘swing around’, *ffamik*- ‘crowded’, *nuudd*- ‘groan’, *ssabik*- ‘give a jerk’, *uuff*- ‘be drowned’, *yaunk*- ‘dive’	*bappai*- ‘make a mistake’, *baaff*- ‘jeer’, *buraff*- ‘fell down’, *cɨmmur*- ‘pinch’, *cyuffur*- ‘darn’, *icyamas*- ‘hurt’, *kammur*- ‘bite’, *kattak*- ‘hold (in one’s arm)’, *ssagar*- ‘hang down’

The examples in (41) show negative forms of verbs which are followed by a monomoraic negative suffix -*n*.

(41) Verbal stems followed by a negative suffix -*n*
a. Two-mora verbs A/C
A: *ibi-n.* plant-NEG
[(<**i.bi**.n>)]
C: *idi-n.* come.out-NEG
[(<**i.di.n**>)]
b. Three-mora verbs A.C
A: *itaki-n.* spill-NEG
[(<**i.ta**><ki.n>)]
C: *tasɨki-n.* help-NEG
[(<**ta.sɨ**><ki-n>)]

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c. Four-mora verbs A.C
A: *kangai-n.* think-NEG
[(<**ka.n**><ga.i.n>)]
C: *bappai-n.* make.a.mistake-NEG
[(<**ba.p**><pa.i.n>)]

In this context, all but (41a) show neutralization between Types A and C. The neutralization process follows the same principles observed in nouns and adjectives. Specifically, in utterances consisting of solely a one-foot PWd as in (41a), a distinction between Types A and C is retained (A.B/C), whereas in utterances consisting of solely a multi-foot PWd as in (41b,c), tonal distinction is completely lost (A.B.C).

When followed by a by-moraic past suffix *-tai*, verbs show the pitch patterns in (42).

(42) Verbal stems followed by a by-moraic suffix *-tai*
a. Two-mora verbs A.C
A: *ibi-tai.* plant-PST '(He) planted.'
[(<**i.bi**><ta.i>)]
C: *idi-tai.* come.out-PST '(He) came out.'
[(<**i.di**><ta.i>)]
b. Three-mora verbs A.C
A: *itaki-tai.* spill-PST '(He) spilled.'
[(<**i.ta.ki**><ta.i>)]
C: *tasɨki-tai.* help-PST '(He) helped.'
[(<**ta.sɨ.ki**><ta.i>)]
c. Four-mora verbs A.C
A: *kangai-tai.* think-PST '(He) thought.'
[(<**ka.n**><ga.i><ta.i>)]
C: *bappai-tai.* make.a.mistake-PST '(He) made a mistake.'
[(<**ba.p**><pa.i><ta.i>)]

Here no tonal contrast is observed. This is consistent with the cases of nouns shown in (13c), in that a tonal distinction is completely lost when the utterance consists of only a multi-foot PWd (A.B.C).

The examples in (42) above also confirm that suffixes behave differently from clitics. That is, suffixes do not constitute an independent PWd, whereas clitics do if they are polymoraic. If the suffix *-tai* formed a PWd, then the utterances in (42) would have two PWds and thus a distinction between Type A and Type C would be preserved.

Pitch patterns of a verb with a bimoraic suffix *-tai* followed by a bimoraic clitic *=hazɨ* are shown in (43).

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(43) Verbal roots followed by a bimoraic suffix *-tai* and a bimoraic clitic *=hazɨ*

a. Two-mora verbs A/C

A: *ibi-tai=hazɨ.* plant-PST=may.be '(He) may have planted.'
[(<**i.bi**><ta.i>)(<hazɨ>)]

C: *idi-tai=hazɨ.* come.out-PST=maybe '(He) may have come out.'
[(<**i.di**><ta.i>)(<**ha.zɨ**>)]

b. Three-mora verbs A/C

A: *itaki-tai=hazɨ.* spill-PST=maybe '(He) may have spilled.'
[(<**i.ta.ki**><ta.i>)(<ha.zɨ>)]

C: *tasɨki-tai=hazɨ.* help-PST=maybe '(He) may have helped.'
[(<**ta.sɨ.ki**><ta.i>)(<**ha.zɨ**>)]

c. Four-mora verbs A/C

A: *kangai-tai=hazɨ.* think-PST=maybe '(He) may have thought.'
[(<**ka.n**><ga.i><**ta.i**>)(<ha.zɨ>)]

C: *bappai-tai=hazɨ.* make.a.mistake-PST=maybe '(He) may have made a mistake.'
[(<**ba.p**><pa.i><ta.i>)(<**ha.zɨ**>)]

The utterances in (43a,b), which consist of a CG with a two-foot PWd and a one-foot PWd, retain a distinction between Types A and C. This neutralization pattern is consistent with noun cases with the same prosodic structure (A.B/C) illustrated in (17a,b). The utterances in (43c) consist of a CG with a three-foot PWd followed by a one-foot PWd, and in this case, too, a distinction between Types A and C is retained. It must be pointed out that the Type A verb in (43c) has an additional high pitch in the third foot. This is proposed to be a consequence of the *rhythmic alternation*, which will be discussed in section 5.

5 Rhythmic alternation

5.1 Overview

Even in contexts where no neutralization occurs, there are cases where the pitch patterns of the utterances cannot be accounted for by the three tone realization rules (33)-(35). Specifically, a long CG can exhibit an additional high-pitched foot, which is not due to either the Lexical Tone Assignment Rule or Initial Raising Rule.

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In this section, we will demonstrate that the additional high pitch is a consequence of *rhythmic alternation*, whereby successive low-pitch feet are avoided by assigning a high pitch to a certain foot. There appears to be two different sorts of rhythmic alternation, which we refer to as RA-I and RA-II, respectively. While the mechanism of the rhythmic alternation in Ikema, especially that of the RA-II, is not fully understood, it is reasonable to discuss it here, because the rhythmic alternation (specifically the RA-II) can bring about neutralization in some contexts.

5.2 RA-I: HL alternation

We begin with the RA-I. It was already shown in (43c) that an additional high-pitched foot can be observed in the CGs containing a four-mora verbal stem with a suffix and a clitic. The examples in (44) illustrate equivalent utterances, in which two-mora verbal stems with a passive suffix *-rai*, and a past suffix *-tai*, are followed by a clitic *=hazɨ*.

(44) Verbal stems with suffixes *-rai* and *-tai*, followed by a clitic *=hazɨ*.
A: *nii-rai-tai=hazɨ*. boil-PASS-PST=also 'It may have been boiled.'
[(<**ni.i**><ra.i><**ta.i**>)(<ha.zɨ>)]
C: *mii-rai-tai=hazɨ*. see-PASS-PST=also 'It may have been seen.'
[(<**mi.i**><ra.i><ta.i>)(<**ha.zɨ**>)]

The Type A verb has an additional high-pitch in the third foot, which is underlined in (44). The occurrence of a high-pitched foot is not limited to Type A verbs as shown in (45), which demonstrates the pitch patterns of two-mora verbal stems with a causative suffix *-ssas*, a passive suffix *-rai*,[12] and a past suffix *-tai*, followed by a clitic *=hazɨ*.

(45) Verb stems with suffixes *-ssas*, *-rai*, and *-tai*, followed by a clitic *=hazɨ*.
A: *nii-ssas-rai-tai=hazɨ*.
boil-CAUS-PASS-PST=also '(He) may have been made to boil.'
[(<**ni.i**><s.sa><**ha.i**><ta.i>)(<ha.zɨ>)]
C: *mii-ssas-rai-tai=hazɨ*
see-CAUS-PASS-PST=also '(He) may have been made to see.'
[(<**mi.i**><s.sa><**ha.i**><ta.i>)(<**ha.zɨ**>)]

12 A string of the two suffixes *-ssas* and *-rai* changes into /ssahai/ as a result of a morphophonological rule.

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Both Type A and Type C verbs have an additional high-pitched foot in the third foot. This sort of high-pitched foot is observed, as far as possible from the data available, only in the CGs containing a PWd with at least three feet. It is not clear whether the RA-I is observed also in nouns and adjectives. In order to make an inquiry into this issue, we need more data for nominal roots or adjective stems followed by more than one bimoraic suffix, so that the PWd has more than two feet.

What is the principle behind the occurrence of the high-pitched foot at issue? The examples in (44)-(45) reveal that there are neither three successive low-pitched feet, nor two successive high-pitched feet. This suggests that Ikema prohibits three or more successive low-pitched feet, and that H is assigned to avoid such successive low-pitched feet, yielding a regularly alternating string of a high-pitched foot and a low-pitched foot.

The prohibition of three or more successive low-pitched feet can be couched in the form of the HL Alternation Rule (47), a terminology adopted from Shimoji's (2009) analysis of Irabu, a dialect closely related to Ikema. Although further research is required, we tentatively assume that the CG is the domain of the HL Alternation Rule in Ikema.

(46) HL Alternation Rule
[<H><L><L><L>…] → [<H><L><H><L>…]

The surface pitch patterns of the utterance in (44)-(45), for example, are derived as in (47)-(48), where the tones in question are in bold.

(47) Tone assignment for (45)

a. Lexical Tone Assignment
[(<ni.i><ra.i><ta.i>)(<ha.zɨ>)]   [(<mi.i><ra.i><ta.i>)(<**ha.zɨ**>)]
                                                        H

b. Utterance-Initial Raising
[(<**ni.i**><ra.i><ta.i>)(<ha.zɨ>)]   [(<**mi.i**><ra.i><ta.i>)(<**ha.zɨ**>)]
H   **H**   H

c. Default Lowering
[(<**ni.i**><ra.i><ta.i>)(<ha.zɨ>)]   [(<**mi.i**><ra.i><ta.i>)(<**ha.zɨ**>)]
H **L** **L** **L**   H **L** **L** H

d. HL Alternation
[(<**ni.i**><ra.i><**ta.i**>)(<ha.zɨ>)]   [(<**mi.i**><ra.i><ta.i>)(<**ha.zɨ**>)]
H L **H** L   H L L H

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(48) Tone assignment for (46)

a. Lexical Tone Assignment

[(<ni.i><s.sa><ha.i><ta.i>)(<ha.zɨ>)] [(<mi.i><s.sa><ha.i><ta.i>)(<**ha.zɨ**>)]

H

b. Utterance-Initial Raising

[(<**ni.i**><s.sa><ha.i><ta.i>)(<ha.zɨ>)] [(<**mi.i**><s.sa><ha.i><ta.i>)(<**ha.zɨ**>)]

H **H** H

c. Default Lowering

[(<**ni.i**><s.sa><ha.i><ta.i>)(<ha.zɨ>)] [(<**mi.i**><s.sa><ha.i><ta.i>)(<**ha.zɨ**>)]

H **L** **L** **L** **L** H **L** **L** **L** H

d. HL Alternation

[(<**ni.i**><s.sa><**ha.i**><ta.i>)(<ha.zɨ>)] [(<**mi.i**><s.sa><**ha.i**><ta.i>)(<**ha.zɨ**>)]

H L **H** L L H L **H** L H

A tone assignment rule similar to the HL Alternation in Ikema is observed in its sister dialect Irabu (Shimoji 2009). Unlike Ikema, Irabu has no lexical tonal contrast, and the pitch patterns are completely predictable by the rules. The domain of the HL alternation is the CG ("Word plus" in Shimoji's terminology). As mentioned in section 2.5, Irabu has no level of phrasing corresponding to the PWd in Ikema. Consequently, the pitch patterns in Irabu are determined by much simpler principles than those in Ikema.

The examples in (49) show the HL Alternation in Irabu (Shimoji 2009), where a noun *kan* 'crab' is followed by a diminutive *-gama*, plural *-mmi*, *-nagi* 'so-on', *=kara* 'from', and *=mai* 'also'. Note that, since Irabu does not have prosodic phrasing at the PWd level, the distinction between clitics and suffixes plays no role in organizing the prosodic structres.

(49) The HL alternation in Irabu (Shimoji 2009)

a. *kan-gama* crab-DIM

[<**ka.n**><ga.ma>]

H L

b. *kan-gama-mmi* crab-DIM-PL

[<**ka.n**><ga.ma><m.mi>]

H L L

c. *kan-gama-mmi-nagi* crab-DIM-PL-so.on

[<**ka.n**><ga.ma><**m.mi**><na.gi>]

H L H L

d. *kan-gama-mmi-nagi=kara* crab-DIM-PL-so.on=from

[<**ka.n**><ga.ma><**m.mi**><na.gi><ka.ra>]

H L H L L

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e. *kan-gama-mmi-nagi=kara=mai* crab-DIM-PL-so.on=from=too
[<**ka.n**><ga.ma><**m.mi**><na.gi><**ka.ra**><ma.i>]
H L H L H L

As in Ikema, Irabu does not have three successive low-pitched feet, resulting in a regularly alternating string of a high-pitched foot and a low-pitched foot.

Shimoji (2009) argues that the tone assignment of Irabu is most naturally explained by the Principle of Rhythmic Alternation (Selkirk 1984), which states that “between two successive strong beats there intervenes at least one, and at most two weak beats” (Selkirk 1984: 12). Representing a strong beat as “S” and a weak beat as “w”, the Principle of Rhythmic Alternation requires linguistic rhythm be organized as “SwSw…” or “SwwS…”, but not as “SS…”, or “SwwwS…”. Shimoji (2009) regards high-pitched and low-pitched feet in Irabu as strong and weak beats, respectively in Selkirk’s (1984) framework. In order to account for pitch patterns in Irabu, he further proposes that the initial foot is assigned H, while the remaining feet are assigned L by default in this dialect. The feet are further grouped into *foot group* (indicated by “{}” here, such as {<H><L><L>…}). The foot group is formed following the Principle of Rhythmic Alternation that requires a foot group consisting of four successive feet be divided into two groups and the second group start with H: {<H><L><L><L>} → {<H><L>}{<H><L>}, resulting in the alternating HL patterns observed in (49). As in Ikema, Irabu allows two successive low-toned feet, and hence a foot group can be either {<H><L>} or {<H><L><L>}; the latter arises when there is one stray foot within the domain of the HL Alternation.

The HL Alternation Rule proposed for Ikema (46) can also be seen as a consequence of the Principle of Rhythmic Alternation. Not in accordance with the Principle of Rhythmic Alternation, however, does Ikema allow two successive high-pitched feet (“strong beats” as per Selkirk (1984)) especially across PWd boundaries. This arises from the fact that, unlike Irabu, Ikema has a lexical tonal contrast, which causes a complex interplay between lexical tones and rhythmic alternation. While it is not introduced in the framework for Ikema, it may be possible that the notion of the foot group accounts for the pitch patterning in this dialect in a more simplified and unified manner. This issue needs to be further examined in future studies.

5.3 RA-II

The other sort of rhythmic alternation, the RA-II, is found in a CG with at least three PWds. Here too, we can observe additional high-pitched feet in some

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contexts, while the rule that assigns such a high pitch appears to differ from the HL Alternation Rule formulated in (46). In the examples in (50), the same compound nouns in (20) are followed by a bimoraic clitic and a predicate.

(50) Compound nouns with a clitic *=mai* followed by a predicate *nyaa-n*. A/B/C
A: *ii+tin=mai nyaa-n.* ‘The eastern sky is also missing.’
[(<**i.i**>)(<di.n>)(<ma.i>)][(<**nya.a.n**>)]
B: *min+kami=mai nyaa-n.* ‘The pot with a handle is also missing.’
[(<**mi.n**>)(<ga.mi>)(<**ma.i**>)][(<nya.a.n>)]
C: *ba.sa+kii=mai nyaa-n.* ‘The banana tree is also missing.’
[(<**ba.sa**>)(<**gi.i**>)(<ma.i>)][(<nya.a.n>)]

The distribution of a high-pitch foot within a three-PWd window is the same as that in (19). Unlike (19), however, Type A has another high-pitched foot (underlined) outside the window, that is, in the fourth PWd.

The high-pitched foot is distributed differently from that assigned by the HL Alternation Rule. The HL Alternation Rule would assign H to the third foot, yielding a HLHL pattern, instead of providing H to the fourth foot so that the pitch pattern becomes HLLH. At the same time, similarity can also be found between RA-I and RA-II. That is, arguably the additional H is assigned in order to avoid three successive low-pitched feet.

The examples in (51) illustrate compound nouns consisting of three polymoraic roots (the same nouns as (21)) that are followed by a bimoraic clitic and a predicate.

(51) Compound nouns with a clitic *=mai* followed by a predicate A/B/C
A: *aka+mami+kii=mai nyaa-n* ‘The adzuki tree is also missing.’
[(<**a.ka**>)(<ma.mi>)(<gi.i>)(<**ma.i**>)][(<nya.a.n>)]
B: *gazɨ+hana+kii=mai nyaa-n.* ‘The banyan tree is also missing.’
[(<**ga.zɨ**>)(<ha.na>)(<**gi.i**>)(<ma.i>)][(<nya.a.n>)]
C: *yui+fau+husɨ=mai nyaa-n.* ‘The early evening star is also missing.’
[(<**yu.i**>)(<**fa.u**>)(<bu.sɨ>)(<ma.i>)][(<**nya.a.n**>)]

Here again, the pitch patterns in a three-PWd window coincide with those in (31). However, just as in (50), Type A has an additional high-pitched foot (underlined) in the fourth PWd. Moreover, Type C also has an additional high-pitched foot (underlined) in the fifth PWd. The HL Alternation Rule would assign H to the third foot for Type A and to the fourth foot for Type C, yielding a HLHL pattern. But the pattern we observe in (51) is HLLH. The high-pitched feet in (51), therefore, does not result from the HL Alternation Rule.

Similar to (50), H in (51) seems to be provided to avoid three successive low-pitched feet, since there is no stretch of three low-pitched feet in the surface pitch

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patterns in (50)-(51). Therefore, the occurrence of these high-pitched feet, just as with RA-I, can be seen as the result of the Principle of Rhythmic Alternation (Selkirk 1984). Unlike RA-I, where a HLHL pattern is chosen in order to avoid a HLLL pattern, RA-II brings about a HLLH pattern. Based on Selkirk's terminology, one weak beat intervenes in the RA-I between two successive strong beats, whereas two weak beats intervene in the RA-II.

Further research is required to make it clear what factor causes the difference between the RA-I and RA-II. It is at least possible to point out that prosodic structures differ between the utterances where the RA-I and RA-II are observed. The RA-II occurs in the utterances with at least four PWds, whereas the RA-I can occur in the utterances with only one PWd.

Lastly, we examine the CGs containing a four-mora clitic that form a two-foot PWd. In (52), nouns are accompanied by a four-mora clitic *=bakaai* 'only', a bimoraic instrumental clitic *=hii*, and a monomoraic topic clitic *=a*. These noun phrases are produced with the following two phrases *nau=mai hi-rai-n* (what=also do-POT-NEG) 'nothing is possible to do'. (The tone classes of the head noun *nau* 'what' and the head verb stem *hi-* 'do' are Type C and Type A, respectively.) A sequence of two clitics *=hii* and *=a* forms a three-mora PWd, since monomoraic morphemes are merged into the preceding PWd to form a single PWd.

(52) Nouns followed by a four-moraic clitic *=bakaai*, a bimoraic clitic *=hii*, and a monomoraic clitic *=a*.
a. Two or three-mora simple nouns A.B/C
A: *butu=bakaai=hii=a nau=mai hi-rai-n.*
husband=only=INS=TOP what=also do-POT-NEG
'Nothing is possible to do only by husbands'
[(<**bu.tu**>)(<ba.ka><a.i>)(<**hi.i.ya**>)][(<na.u>)(<**ma.i**>)][(<hi.ra><i.n>)]
B: *nn=bakaai=hii=a nau=mai hi-rai-n.*
potato=only=INS=TOP what=also do-POT-NEG
'Nothing is possible to do only by potatoes.'
[(<**n.n**>)(<ba.ka><a.i>)(<**hi.i.ya**>)][(<na.u>)(<**ma.i**>)][(<hi.ra><i.n>)]
C: *yarabi=bakaai=hii=a nau=mai hi-rai-n.*
child=only=INS=TOP what=also do-POT-NEG
'Nothing is possible to do only by children.'
[(<**ya.ra.bi**>)(<**ba.ka**><a.i>)(<hi.i.ya>)][(<na.u>)(<**ma.i**>)][(<hi.ra><i.n>)]
b. Compound nouns A/B/C
A: *yarau+kii=bakaai=hii=a nau=mai hi-rai-n.*
yarau+tree=only=INS=TOP what=also do-POT-NEG
'Nothing is possible to do only by yarau trees.'
[(<**ya.ra.u**>)(<gi.i>)(<ba.ka><a.i>)(<**hi.i.ya**>)][(<na.u>)(<**ma.i**>)][(<hi.ra><i.n>)]

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B: *mami+kii=bakaai=hii=a nau=mai hi-rai-n.*
bean+tree=only=INS=TOP what=also do-POT-NEG
'Nothing is possible to do only by bean trees.'
[(<**ma.mi**>)(<gi.i>)(<**ba.ka**><a.i>)(<hi.i.ya>)][(<na.u>)(<**ma.i**>)][(<hi.ra><i.n>)]

C: *adan+kii=bakaai=hii=a nau=mai hi-rai-n.*
adan+tree=only=INS=TOP what=also do-POT-NEG
'Nothing is possible to do only by adan trees.'
[(<**a.da.n**>)(<**gi.i**>)(<ba.ka><a.i>)(<**hi.i.ya**>)][(<na.u>)(<**ma.i**>)][(<hi.ra><i.n>)]

In (52a), RA-II is observed for Type A, where the fourth foot is assigned an additional high pitch. This should result from the avoidance of three successive low-pitched feet, that is, <ba.ka><a.i> and <hi.i.ya>. As a result, the pitch patterns in Type A and Type B converge so that the contrast between Type A and Type B is lost. Here, therefore, the underlying tonal contrasts are lost because of the H tone assigned by the postlexical process of the rhythmic alternation. This may be seen as an instance of "melodic overwriting" in Ikema, in which an intonational melody overwrites the lexical tones (see Hyman, this volume). It is obvious that this sort of neutralization differs in its nature from "ordinal" neutralization in this dialect, which is triggered by a shortage of the length of prosodic units.

RA-II is also found for Type A and Type C in (52b), where an additional high pitch is observed in the fifth foot in both types. Noteworthy is that in Type A, between high-pitched feet, three low-pitched feet (<ba.ka><a.i> and <hi.i.ya>) intervene; this apparently violates the Principle of Rhythmic Alternation that prohibits three successive weak beats. A possible account of this violation would be that it results from a competing prosodic constraint Ikema may have to prohibit a pitch movement from low to high across the first two feet in the same PWd, such as (<ba.ka><**a.i**>). Because of this putative constraint, the H due to the RH-II is shifted to the next foot, yielding three successive low-pitched feet. In any case, further data are necessary to investigate the distribution of an additional high-pitched foot in the RA-II.

6 Conclusion

We have analyzed the wide spread neutralization of lexical tonal contrast in Ikema and proposed that the observed patterns of neutralization can be described by postulating a prosodic hierarachy involving the foot, Prosodic Word (PWd), and Clitic Group (CG). It was shown that the three-way tonal contrast in Ikema is

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fully realized (and hence not neutralized) when the following two conditions are both met: (i) the utterance as a whole consists of at least three PWds, and (ii) the CG consists of at least two PWds. In addition, we have explored tone realization rules regulating the surface pitch patterns of utterances to propose that the pitch patterns are determined primarily by lexical tones and the rhythmic alternation.

We have demonstrated that tonal distinctions in Ikema are lost in a wide range of contexts. It is true that the distinctions are completely lost in limited contexts, but in a majority of contexts, neutralization occurs exclusively between Type A and Type B. In other words, the underlying contrast between Type A and Type B is realized on the surface under quite restricted contexts, while the contrasts between Type C and other tone classes are realized in most prosodic contexts. This synchronic process, that is, the widespread neutralization between Type A and Type B, is probably responsible for an ongoing diachronic change in the tone system of Ikema, where Type A is, at least for nouns, in the process of merging into Type B (Igarashi et al. 2011; Igarashi et al. 2012).

In the absence of sufficient data, the generalizations made in this study are by no means conclusive. A comprehensive description of the realization of the tone classes in Ikema requires further investigation of the relevant words in exhaustive contexts. Firstly, more data are required for PWds with varying number of feet. Nouns with more than one suffix such as *hitu-gama-mmi* (man-DIM-PL) 'people' and loan words such as *firaderufia* 'Philadelphia' and *kariforunia* 'California' will provide useful materials for advancing the proposed framework. Secondly, the realization of lexical tones should be examined in wider perspectives involving various syntactic structures. There may be complex interactive effects of tone classes on the surface pitch pattern of the sentence, including the effects of rhythmic alternation. A large-scale study is therefore required to reveal how tones are realized in a sentence perspective.

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Zendo Uwano

Accentual Neutralization in Japanese Dialects

Abstract: Accent neutralization in Japanese dialects is a synchronic phenomenon where the phonological opposition of accentual units in one environment is lost in another environment. Accentual neutralization in Japanese dialects can be classified into narrow and broad types of neutralization. In both types, accentual units have the same phonetic pitch pattern in one environment but different patterns in another environment. The narrow type is where the pitch progression immediately before and after the accentual unit is also considered, and according to my dynamic point of view, is the typical (or strict) type of neutralization. The broad type, on the other hand, is characterized by pitch patterns which are same in isolation but which become differentiated in non-isolation situations by the preceding or subsequent environment, and this I refer to as non-typical neutralization. Based on this idea, six types of neutralization in the narrow sense and four types of neutralization in the broad sense are analyzed. The prehistory of these cases of typical neutralization is also reconstructed on the basis of internal alternations. The concept of neutralization is important not only for synchronic description, but also for the diachronic perspective.

Keywords: neutralization, dynamic view, accentual unit, internal reconstruction

1 Introduction

Neutralization can be viewed as a synchronic phenomenon where opposition in one environment is lost in another. I do not accept “absolute neutralization” (Kiparsky 1968; Lass 1984), where no trace of synchronic opposition is found,

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even though it occurs as a diachronic change (complete merger). In short, neutralization presupposes synchronic alternations.

This article, which is concerned with accentual/tonal neutralizations in Japanese dialects, is based on a dynamic view (Uwano 2012c; Kawakami 1995). Accentual phenomena are captured dynamically, that is, as a pitch progression *between* successive prosodic units such as morae and syllables (McCawley 1968: 134): a rise in pitch (represented by "["), a fall in pitch ("]"), and level progression without rise or fall (no mark).[1] A non-dynamic view is that specifications of H(igh) and L(ow), even F(alling) and R(ising), on each prosodic unit are static, since they are given without reference to what immediately precedes or follows.[2] The opinion in this article is that static representations, such as LH and HLL, are secondary percepts caused by pitch progression and are not fundamental to the description.

As for accentual neutralization, it is determined by pitch progression including the environments both *immediately before* and *after* the accentual unit itself. An accentual unit is a unit where an accentual pattern, or a prosodeme (Hattori 1973, 1978), occurs. It is usually an autonomous or free word with/without particle(s), depending on the dialect.[3] Neutralization in this article is defined as a synchronic phenomenon where the dynamic opposition of accentual units in one environment is lost in another. Based on this standpoint, a number of distinctions are made with regard to what constitutes accentual neutralization. The data in this article are all based on my own observations, unless otherwise indicated.

The concept of neutralization is important not only for synchronic description, but also for the diachronic perspective.[4] Thus, I have reconstructed the prehistory of typical (strict) neutralization on the basis of internal alternations, sometimes with the help of comparisons with related dialects.

1 Rising and falling pitch within the prosodic unit are represented by "[[" and "]]", respectively. A low level pitch pattern is explicitly marked by "_" on the right side. "]" and "[" are also used as accent kernels in the phonological notations, a lowering kernel (a distinctive feature which lowers what follows it) and an ascending kernel (a distinctive feature which is characterized by a rise in pitch on the prosodic unit), respectively. Phonetic accentual representations are given in bare forms without square brackets [ ] in this article. On the other hand, phonological representations are always put between slashes / / in the text.

2 Notice that "dynamic/static" means neither "contour/level" tones nor "with/without an accent kernel".

3 Sometimes a word consists of more than one accentual unit: for example, /o]bama-daito]oryoo/ 'President Obama' consists of two accentual units, /o]bama/ and /daito]oryoo/, and /sa]do-to]ki-hogose]Ntaa/ 'conservation center for the Japanese crested ibis in Sado', three accentual units. The term "accentual unit" has a long tradition in Japanese accentology. It may be called a "prosodic word", but this is ambiguous. See, for example, the article by Igarashi et al. in this volume. "Accentual phrase" is far more ambiguous, but I will not go into detail in this article.

4 Needless to say, diachronic perspective is not a prerequisite for the identification of neutralization.

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This article is organized as follows. To clarify the point of arguments, section 2 discusses some cases of non-neutralization. Examples are from three dialects with N-pattern accent systems, two in Mainland Japanese and one in Ryukyuan. Section 3 deals with six types of neutralization in the narrow sense. One type is taken from a Mainland Japanese dialect with an N-pattern accent system: neutralization by progressive domination. The other five types are from the Ryukyuan dialects: neutralization after kernel-final nouns, neutralization followed by monomoraic particles, neutralization related to connectivity, neutralization of three oppositions, and neutralization with reference to noun modifiers. Finally, four cases of neutralization in the broad sense are discussed in section 4. Neutralization in the broad sense is triggered by the environment, but the underlying forms are distinguished in successive environments, that is, immediately before or after the accentual unit. From my dynamic viewpoint, these are non-typical. Some pieces of supporting evidence for this view are given in section 4.1.

2 Cases of non-neutralization

2.1 Cases without synchronic opposition after diachronically complete merger

There are cases where there is no opposition even when another word follows or precedes. Needless to say, this is not neutralization, since to identify neutralization, it is necessary that the original opposition of the accentual unit appear synchronically in at least one environment. When the different patterns have completely merged through historical changes and leave no trace of the original opposition in any environment, it can no longer be referred to as neutralization.

2.1.1 One-mora nouns in the Yaku-shima dialects

In the Yaku-shima dialects with two-pattern accent systems (Kagoshima Prefecture),[5] many dialects (especially those in old Yaku town) have only pattern A, and lack

5 A two-pattern accent system is a system which has (at most) two oppositions, however long the accentual unit may be. We also have one-pattern accent systems and three-pattern accent systems, and so on, all of which are grouped into my "N-pattern accent system", where only "N" oppositions exist irrespective of the length of the accentual unit. They stand in contrast to my "multi-pattern accent system", where accentual oppositions increase in proportion to the length of the accentual unit. See Uwano (1984a, 2012a, 2012c).

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pattern B in monomoraic words. The data in (1) are taken from the Anbo dialect, where *kara* means ‘from’. In B, there is a rise in pitch on the last mora of the accentual unit. In A, on the other hand, the second mora of the accentual unit is raised in pitch, except for one and two mora units, where pitch rises on the initial mora because of the restricted length (lack of second mora) and the opposition with B.[6]

(1)	A: [ha ‘leaf; tooth’	[ha]ga	ha[ka]ra	
		[ha]na ‘nose’	ha[na]ga	ha[na]kara
			ta[ta]mi ‘mat’	ta[ta]miga
				u[me]bosi ‘dried plum’
	B: ——	ha[na ‘flower’	hana[ga	hanaka[ra
			oto[ko ‘man’	otoko[ga
				asaga[o ‘morning glory’

We find “serialization” phenomena in (1). In A, [ha]ga and [ha]na, ha[ka]ra and ha[na]ga and ta[ta]mi, and so on have the same pitch patterns. The same relation is observed also in B: hana[ga = oto[ko, hanaka[ra = otoko[ga = asaga[o. If a p-mora noun is followed by a q-mora particle, the output is equal to that of a $(p + q)$-mora noun, where p and q represent the number of morae, respectively.

Based on the correspondence between the Kagoshima dialect (Uwano 2007), where [ha]] ‘leaf’ is A, and [ha ‘tooth’ is B, there is no doubt that monomoraic words had an opposition between A and B in the proto-system of the two-pattern accent system, and later the words in B completely merged into A. Indeed, some dialects in Yaku-shima, such as Haruo in old Yaku town, Nagata, Isso and so on in old Kami-Yaku town, still preserve the distinction in monomoraic words (see also Kibe 2000: 291; Kamimura 1966). Synchronically, however, pattern B is lacking in monomoraic words in Anbo (1). There is no distinction between A and B even when particles are added to one-mora words. Both ‘leaf’ and ‘tooth’ behave as pattern A in serialization. This is not neutralization, but merely lack of pattern B in monomoraic words.

2.1.2 One-mora nouns in the Oki dialects

Three-pattern accent systems are distributed in the Oki Islands (Shimane Prefecture), except for Chiburi Island, where a two-pattern accent system exists (Hiroto and Ohara 1953; Kindaichi [1969] 1975; Uwano 1984b). In the three-pattern accent

6 Historically speaking, I assume the proto-forms *[ha! ‘leaf’, *[ha!na ‘nose’, *[aku!bi ‘yawn’ and so on in A (‘!’: half-fall in pitch), *[ha ‘tooth’, *ha[na ‘flower’ and so on in B. *[ha! and [ha were similar in the shortest words and merged first. After the changes *[ha!na > [ha]na, *[hana!-ga > *[hana]ga, once again *[hana]ga changed to ha[na]ga, but [ha]na remained as it was, due to the opposition with ha[na in B.

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systems of these dialects, no monomoraic word has pattern A. Examples of the Nakamura dialect are shown in (2), where "v" denotes a fall-rise pitch pattern in one prosodic unit. Indeed, there is an alternation between non-connective (.) and connective (…) forms in pattern C, but only non-connective forms are given in (2) for simplicity (Uwano 1989 for details). "ci" represents [ʧi].

(2)	A: ——	ka[ze 'wind'	[sa]ka[na 'fish'	[ka]nemo[ci 'the rich'
	B: [e]] 'handle'	[ja]ma 'mountain'	ko[ko]ro 'heart'	a[saga]o 'morning glory'
	C: ᵛe. 'picture'	[soᵛra. 'sky'	[usaᵛgi. 'rabbit'	[niwatoᵛri. 'chicken'

We find serialization in (2), too, such as [ka]ze[ga = [sa]ka[na, [ka]zeka[ra = [ka] nemo[ci, and so on. The same holds true for patterns B and C. Here, *e* 'handle', *ka* 'mosquito' (class 1 in proto-Japanese, see Kindaichi 1974 for the proto-categories) and *ha* 'leaf' and *hi* 'day' (class 2) have completely merged into B. We have no synchronic indication of the original distinction, and all of these behave as B, as is shown in (3). Even if we add particles to monomoraic words, we find no examples showing serialization in pattern A.

(3) Serialization of B
[e]ga = [ha]ga = [ja]ma
e[ka]ra = ha[ka]ra = ja[ma]ga = ko[ko]ro
e[kara]mo = ha[kara]mo = ja[maka]ra = ko[koro]ga = a[saga]o

This also is a simple lack of A, and not neutralization. This holds true for the other dialects in Oki Island. It is considered that pattern A in monomoraic words has already merged into pattern B in the three-pattern accent system of proto-Oki.

Generally speaking, many dialects have N-pattern accent systems with the number of oppositions smaller than N in shorter accentual units, especially in one-mora words. This is attributable to the short length of the word. It is more difficult to distinguish the same number "N" in shorter accentual units than in longer ones. It is likely that merger occurs first in monomoraic words in isolation, and then expands to the forms with particles.

To supplement the explanation, N-pattern accent systems themselves, at least in Mainland Japanese, are derived from the proto-multi-pattern accent system through several steps of merger in longer accentual units, where a larger number of oppositions existed. N-pattern accent systems cannot be formed without such merger, because it is mandatory for the identification of N-pattern systems that the number of oppositions does not exceed "N" even in longer accentual units, while it is not essential that the number is lower than "N" in shorter accentual units.

In sum, it seems that merger in shorter units usually occurs as a secondary change after the establishment of N-pattern systems, as is the case of Yaku-shima dialects (section 2.1.1). In the case of Oki, however, merger of A into B in monomoraic

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words is considered to have occurred at the stage of the pre-Oki system, and then three-pattern accent system was formed at the stage of the proto-Oki system (Uwano 2012a).

2.2 A case where a new accent pattern is diachronically derived: the Wan dialect

In the two-pattern accent systems in Kikai Island (Kagoshima Prefecture), monomoraic words have only one pattern α, such as in the Wan dialect in (4). The alternation between connective ("…") forms and non-connective (".") forms[7] is observed only in pattern β. There is no such alternation in α. This alternation is closely related to the ascending kernel (for details of the ascending kernel, see Uwano 2012c). *nga* ([ŋa]) is a subject case marker, *Kara* means 'from', *Karamu* 'also from'. Capital "T" and "K" represent glottalized [t] and [k] respectively. Incidentally, monomoraic words in Standard Japanese are pronounced as bimoraic words with a long vowel in this dialect. For details of this dialect, see Uwano (2012b).

(4)	α: [sa 'grass'	sa[nga	[sa]Ka[ra	[saKa]ra[mu	
		mi[du 'water'	[mi]du[nga	[midu]Ka[ra	
			[ta]Ta[mi 'mat'	[taTa]mi[nga	
	β: ——	[na]bi. 'pot'	[nabi]nga.	[nabiKa]ra.	
		[nabi…	[nabinga…	[nabiKara…	
			ha[Ta]na. 'sword'	ha[Tana]nga.	ha[TanaKa]ra.
			ha[Tana…	ha[Tananga…	ha[TanaKara…

This is not a matter of neutralization, either. Monomoraic words in the Kikai dialects are not original. They were derived from bimoraic words with a close vowel (i/u) in the first mora and an open vowel (a/o) in the second mora by fusing the initial mora into the second mora. The changes are shown in (5), where hypothetical older forms are marked with "*".

(5) a. [sa < *ku̥[sa 'grass'
[sa < *pi̥[sa 'foot'
[sa < *sji̥[sa ? < *sji̥[ta 'under'
[su < *ku̥[su < *ku̥[so 'shit'

7 Non-connective (or, phrase-final) forms are forms pronounced with the intention of ending the phrase with that form, while connective (or, phrase-nonfinal) forms are pronounced with the intention of continuing after the phrase. Another word does not necessarily follow after connective forms. This phenomenon is called "connectivity", and will be referred to again in section 3.4.

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[Cju < *pi̥Tu < *pi̥[to ‘man’ (Capital “C” represents glottalized [ʧ])
[Ta < *pu̥[Ta < *pu̥[ta ‘lid’
[Ka < *[Kwa < *ku̥[r̥a < *ko[ra ? ‘child(ren)’
b. [ja < *’i[ja ‘arrow’
[ju < *’i[ju < *’i[jo ‘fish’
[ma < *’u[ma ‘horse’
[da < *’u[ra ‘you’

The examples in (5a) had a “C̥VC̥V” structure (“C̥” means a voiceless obstruent) and went through intermediate vowel devoicing.[8] The words in (5b) had sonorants in the second mora. These fusions occurred only when the initial morae were low-pitched, that is, in pattern α. The initial mora of bimoraic words in β was high-pitched, and blocked fusion. As a result, we have no monomoraic words in pattern β (Uwano 2002, 2012b). The other source of monomoraic words is recent borrowings from Standard Japanese, such as [’i ‘stomach’ (α).

3 Cases of neutralization in the narrow sense

In this section we deal with the cases of neutralization in the narrow sense. From my dynamic viewpoint, these types of neutralization are typical neutralizations.

3.1 Neutralization by progressive domination: the Nakamura dialect in Oki

In the Nakamura dialect in Oki (section 2.1.2), we find a sort of “tone sandhi”, as in (6) and (7). Glosses are: [a]cu[i ‘thick’ (A), a[cu]i ‘hot’ (B), [i]ː... (cf. [iᵛː.) ‘good’ (C), [sa]ka[na ‘fish’ (A), ko[ko]ro ‘heart’ (B), [usaᵛgi. ‘rabbit’ (C), [ki]] ‘mind, care’ (B), ᵛte. ‘hand’ (C), cu[ke]ru ‘attach, touch’ (B), and *o* is the object particle. Semantic naturalness is not considered here.

8 A number of Kikai dialects have *s·a* and *s·u* for the first four words in (5a), but they are regarded as monomoraic. This [s·] is pronounced only a little longer than simple [s], and is not geminate. There is no syllable break in [s·]. Their accent pattern, such as [s·a, s·a[nga, [s·a]Ka[ra, also demonstrates this. The other forms in (5a) have glottalized consonants. It might be better to use the transcription *Sa* and *Su*, that is [s’a] and [s’u], respectively, although the degree of glottalization is extremely weak. Native speakers report that they feel something like a small checked sound (*sokuon*) there. On the other hand, there is no glottalization in the words in (5b). Sonorants are not glottalized in Kikai.

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(6) A + A [a]cu[i sa]kana B + A a[cu]i sa]kana C + A [i]: saka[na
A + B [a]cu[i ko]koro B + B a[cu]i ko]koro C + B [i]: koko[ro
A + C [a]cu[i u]sagi B + C a[cu]i u]sagi C + C [i]: usa[gi

(7) B + B [ki]o cu]keru
C + B [te]o cuke[ru

As is observed in (6), all the patterns (A, B, C) of the second units are neutralized as O]OO after A or B, and as OO[O after C. Neither O]OO nor OO[O exists in isolation. The pitch patterns of the phrases in (6) and (7) are different from those of compounds, too. This is a typical case of neutralization. The pattern of the first accentual unit determines that of the following units. The first unit is not limited to adjectives. In (7), while both B and the connective form of C in monomoraic words with a particle have the same pitch pattern, a distinction appears in the second units. In this case the original patterns of the first units (B and C) are "recoverable" from the different patterns of the second units. In (6), on the other hand, the patterns of the second units are "unrecoverable" (cf. Hyman 2018). Focus is also involved with the realizations in (6) and (7). For details, see Uwano (1989).

3.2 Neutralization after a kernel-final noun: the Higashi-ku dialect in Yoron

Before discussing neutralization in the Yoron dialects (Kagoshima Prefecture), I review the accent system of the Higashi-ku dialect (Higashi, hereafter) in Yoron Island, Amami. This dialect has a multi-pattern accent system[9] consisting of Pn = n + 1,[10] distinguished by an ascending kernel /[/. This is shown in (8), where accents are phonologically represented, and the numbers with minus indicate the location of the accent kernel counted from the end of the word. '0' means kernelless with a low-flat pattern. Note that special morae, namely moraic phonemes (long vowel "ː", diphthong-final "i", moraic nasal "N") can bear an accent kernel in the word-final position (-1). In (9), forms with particles are given. *nu* is a subject particle. The kernelless (low-flat) pattern is denoted by "=" placed immediately after the word.

9 See the latter part of footnote 5.
10 This formula, after Ivić (1970), means that there are *n + 1* prosodic oppositions (or, the number of prosodemes) for the accentual unit consisting of *n* prosodic units (mora, in this dialect). By this formula, a two-pattern accent system can be represented as Pn = 2.

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(8)

0	pa:= ‘leaf’	mizji= ‘water’	tatami= ‘mat’
–1	pa[: ‘tooth’	ja[ma ‘mountain’	pasa[N ‘scissors’
–2	[pa: ‘outside’	[nabi ‘pot’	ha[tana ‘sword’
–3			[macjigi ‘pine tree’

0	mucjigumi= ‘glutinous rice’
–1	haNmja[i ‘thunder’
–2	puru[sjiki ‘wrapping cloth’
–3	hu[baNka ‘aunt’
–4	[masjujaki ‘grilled with salt’

(9)

	subj.	‘also’	‘from’	‘about, degree’
0	mizjinu=	mizjiN=	mizjikara=	mizjigure:=
–1	ja[manu	ja[maN	jama[kara	jama[gure:
–2	[nabinu	[nabiN	[nabikara	[nabigure:
0	tataminu=	tatamiN=	tatamikara=	tatamigure:=
–1	pasaN[nu	pasaN[jiN	pasaN[kara	pasaN[gure:
–2	ha[tananu	ha[tanaN	ha[tanakara	ha[tanagure:
–3	[macjiginu	[macjigiN	[macjigikara	[macjigigure:

In this dialect there is an alternation rule to the effect that: [1] when a word (including a particle) of more than one mora follows a word with the accent kernel on the ultimate mora, the kernel shifts to the initial mora of following word; [2] when the kernel-final noun ends in a special mora (/N/ in (9)), the shift occurs even in the case of a monomoraic particle. Unless the noun ends in a special mora, the kernel does not shift with a monomoraic particle. In this case, too, delay of rise in pitch is prominent, and /ja[manu/ is usually realized as ja%ma[nu (%: mid-rise in pitch) with the peak on the final mora. See Uwano (1999) for details.

Here we find an interesting alternation. In this dialect, verbs have a two-way distinction: /micjaN=/ ‘boiled’ vs. /mi[cjaN/ ‘saw’. By rule [1], however, the distinction is lost, as is shown in (10).

(10) /pana[micjaN/ ‘boiled a flower’, /pana[micjaN/ ‘saw a flower’
Cf. /pa[nanu sacjaN=/ ‘A flower bloomed’, /pa[nanu izji[taN/ ‘A flower came out’

This also is a case of strict accentual neutralization, where the distinction between /micjaN=/ and /mi[cjaN/ is lost in the environment after /pa[na/.[11]

11 This case will be classified as “incidental” by Hyman (2018).

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3.3 Neutralization followed by monomoraic particles: the Yoron dialects

The Kano, Nama, and Asato dialects, next to Higashi, in Yoron appear to have a multi-pattern accent system consisting of Pn = n. Investigation of nouns in isolation and those followed by monomoraic particles shows a merger of the kernel-final pattern (-1) and kernelless pattern (0) in the Higashi dialect. This change must have occurred through the following processes: delay of pitch-rise in Higashi became salient, and after the stage of *ja[ma, *jama[nu, the final pitch-rise shifted one mora to the right and disappeared, resulting in low-flat jama_, jamanu_, the same pitch patterns as mizji_, mizjinu_ (0). As a result, these dialects appear to have the system shown in (11).

(11)	0 pa:= 'leaf'	mizji= 'water'	tatami= 'mat'
	0 pa:= 'tooth'	jama= 'mountain'	pasaN= 'scissors'
	–2 [pa: 'outside'	[nabi 'pot'	ha[tana 'sword'
	–3		[macjigi 'pine tree'

0 mucjigumi= 'glutinous rice'
0 haNmjai= 'thunder'
–2 puru[sjiki 'wrapping cloth'
–3 wu[baNka 'aunt'
–4 [masjujaki 'grilled with salt'

However, when bimoraic particles, such as *kara* 'from', follow the original kernel-final nouns, we have such patterns as (12). This also holds true for the trimoraic particles.

(12)	pa:[kara 'tooth'	jama[kara	pasaN[kara
	Cf. pa:kara= 'leaf'	mizjikara=	tatamikara=

Although kernel-final nouns have merged into kernelless nouns when they were in isolation or followed by monomoraic particles, the original opposition is preserved when a general particle of two or more morae follows them. Traces of an older system are preserved in these environments. Ultimately, these dialects still have a Pn = n + 1 system, where the kernelless pattern and kernel-final pattern have the same pitch patterns, and are neutralized, even when followed by monomoraic particles. They are distinguished dynamically when particles of more than one mora are attached.[12] See Uwano (2016) for details.

12 Compare this with the case of the Shizukuishi dialect (section 4.2), where the forms in isolation are distinguished when particles, monomoraic or not, follow them; that is, in *all* dynamic environments.

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This also is a case of accentual neutralization. From a dynamic viewpoint, opposition in one environment is lost in another. Neutralization in Yoron is a synchronic reflex of historical changes, whereby merger has occurred in some environments, but not in others.

3.4 Neutralization related to connectivity: the Sadeku dialect in Kikai

The Sadeku dialect in Kikai Island (Kagoshima Prefecture) has a three-pattern accent system, consisting of α, β, γ. Here, too, monomoraic words exist only in α (cf. section 2.2). Moreover, pattern β lacks bimoraic words and exists only in words of three or more morae, and as such, is a defective system (Uwano 2013).[13]

Trimoraic and quadrimoraic words in pattern β show a peculiarity in Sadeku, as in (13), where the symbol "I" represents centralized [ɪ], and "ng" [ŋ]. Connectivity, that is, a distinction between the non-connective form (.) and the connective form (…) is seen here (see also footnote 7).

(13)	in isolation	subj.
3α:	[taTa]mI.'mat'	[taTamI]nga.
	[taTamI…	[taTamInga…
3β:	ka[ga]mi.'mirror'	[ka]ga[mi]nga.
	[ka]ga[mi…	[ka]ga[minga…
3γ:	[ha]Ta[na. 'sword'	[ha]Ta[na]nga.
	[ha]Ta[na…	[ha]Ta[nanga…
4α:	[panaCji]ː. 'nosebleed'	[panaCjiː]nga.
	[panaCjiː…	[panaCjiːnga…
4β:	[hu]mI[ba]Ku. 'rice box'	[hu]mIba[Ku]nga.
	[hu]mI[baKu…	[hu]mIba[Kunga…
4γ:	[mu]Cjigu[mI.'glutinous rice'	[mu]Cjigu[mI]nga.
	[mu]Cjigu[mI…	[mu]Cjigu[mInga…

The three-mora word ka[ga]mi in pattern β is in opposition with [ha]Ta[na in γ only when it is used in non-connective situations without particles. Otherwise, *kagami* neutralizes to *haTana*. To clarify whether the accent pattern is pattern β or γ in this dialect, we must investigate the word not only in isolation, but also in phrase-final environments. If we elicit data in the sentence forms of *kagami(o)*

13 This is based on my survey of 35 years ago. Instead of the former late consultant, I am now surveying with a new consultant, one generation younger. The new data are a little different, and will be published in the near future.

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kau ‘to buy a mirror’ (accusative is usually marked by zero), or *kagaminga aru* ‘there is a mirror’, we cannot differentiate them from *katana(o) kau* ‘to buy a sword’ and *katananga aru* ‘there is a sword’.

In the case of four-mora words, e.g. [hu]mI[ba]Ku. and [hu]mI[baKu… in pattern β in (13), we can identify them in isolation, with no reference to connectivity. When followed by a particle, however, β is neutralized into γ. Thus, neutralization in Sadeku is dependent on the length of nouns.

It is probable that Sadeku patterns in (13) are derived from the following patterns (14), where α is irrelevant. β had an accent kernel on the penult, and γ on the ultimate mora.

(14)	3β:	*ka[ga]mi.	*ka[gami]nga.
		*ka[gami…	*ka[gaminga…
	3γ:	*[ha]Ta[na.	*[ha]Ta[na]nga.
		*[ha]Ta[na…	*[ha]Ta[nanga…
	4β:	*[hu]mI[ba]Ku.	*[hu]mI[baKu]nga.
		*[hu]mI[baKu…	*[hu]mI[baKunga…
	4γ:	*[mu]Cjigu[mI.	*[mu]Cjigu[mI]nga.
		*[mu]Cjigu[mI…	*[mu]Cjigu[mInga…

A delay in the pitch-rise is considered to have occurred in the underlined forms in (14β), as is shown in (15) and (16). In (15), an initial rise in pitch also occurred simultaneously, because this dialect had already a double-peaked pattern and did not permit an *LL- pattern.

(15)	*ka[gami…	>	[ka]ga[mi…
	*ka[gami]nga.	>	[ka]ga[mi]nga.
	*ka[gaminga…	>	[ka]ga[minga…

(16) *[hu]mI[baKu]nga. > [hu]mIba[Ku]nga.
*[hu]mI[baKunga… > [hu]mIba[Kunga…

These changes may seem to be not so common, in that *ka[gami… also transformed to *[ka]ga[mi…, but they are interpreted as changes toward a word-final kernel in an environment where a particle follows. We also find essentially the same changes in the two-pattern accent systems of the Sakamine and Araki dialects in Kikai Island (Uwano 2012b). The changes in Sadeku are on the way to the absorption of β into γ.

To summarize, the Sadeku dialect has a restricted three-pattern accent system: β shows patterns in a very limited environment, and has neutralized into γ elsewhere. This dialect is in the middle of a change to a two-pattern accent system.

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3.5 Neutralization of three patterns: the Kakinohana dialect in Okinawa

Accentual neutralization usually occurs between two patterns, rarely among three patterns. However, for the Kakinohana dialect in Naha city, Okinawa Prefecture, bimoraic nouns with only one pattern in isolation split into three when followed by particles, as shown in (17) (Uwano 2001: 630).

(17)	in isolation	subj.	'from'
a.	[hana 'nose'	[hananu	[hanakara
b.	[hana 'flower'	hana[nu	hana[kara
c.	[numi 'flea'	[nu]minu	[numi]kara

Unlike (17a), the cases of (17b) and (17c) cannot be explained as pitch progression in the surface structure (cf. the case of Standard Japanese of section 4.1). The latter two are cases of typical (strict) neutralization.

Since neutralization is defined at the surface level, this account does not invalidate the idea that these three words have different underlying forms.

Historically speaking, the following patterns (18) are assumed for each of these words.

(18) a.	*[hana	*[hananu	*[hanakara
b.	*ha[na	*ha[nanu	*ha[nakara
c.	*[numi	*[numi]nu	*[numi]kara

As for the forms in isolation, when (18a) and (18c) had the same pattern, the shift *ha[na > [hana occurred in (18b), and all merged into the single pattern [CVCV. This type of change, a leftward shift of pitch-rise, is quite rare, at least in Japanese (Uwano 2012c: 1432–1435), but it became possible because of the merger into the existing [CVCV pattern. On the other hand, forms with particles are considered to have gone through the following changes (19), where the forms in (18a) are omitted because they remain unchanged.

(19) b.	*ha[nanu > hana[nu	*ha[nakara > hana[kara
c.	*[numi]nu > [nu]minu[14]	*[numi]kara = [numi]kara

14 Kindaichi ([1960] 1975: 142) states that the Ryukyu dialects have a peculiar tendency to avoid the last-low pitch pattern in three-mora units (HHL, LHL). This tendency seems to be pertinent in this case. The same holds true for the changes from another hypothesis (20), where *[nu]mikara changed to [numi]kara, but *[nu]minu remained as it was. Indeed, we find the following peculiar synchronic alternation in the Kakinohana dialect: gama[Ku 'waist', <u>ga[ma]Kunu</u> (not

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Another possibility is shown in (20). Notice that the reconstructed forms in (20c) are different from those in (18c).

(20) a.	*[hana	*[hananu	*[hanakara
b.	*ha[na	*ha[nanu	*ha[nakara
c.	*[nu]mi	*[nu]minu	*[nu]mikara

In this way of thinking, three patterns in isolation—*[hana, *ha[na, and *[nu]mi—merged into one pattern [CVCV. However, these changes seem to be too drastic: consequently, the reconstruction in (18) seems to be more plausible than that in (20). Further research, including the dialects around Naha city, is needed.

3.6 Neutralization with reference to noun modifier: the Tokunoshima dialects

In a number of dialects of Tokunoshima, Amami (Kagoshima Prefecture), we find alternations depending on the presence or absence of a modifier before nouns.

3.6.1 The Asama dialect

In the Asama dialect, Amagi Town of Tokunoshima, noun modifiers such as *kuN* 'this', *'uN* 'its', *'aN* 'that', and *'ja:* 'your' (' represents a glottal stop) neutralize the oppositions (α and β) of the accent patterns of nouns (Uwano 1977, 2000). The data are shown in (21). The oppositions do not reappear even when a particle follows them.

(21)	in isolation	subj.	'this'	'this'~subj.
α:	[ha: 'leaf'	[ha:]nu	[kuNha:	[kuNha:]nu
β:	ha[: 'tooth'	ha:[nu	[kuNha:	[kuNha:]nu
α:	[hana: 'nose'	[hana:]nu	[kuNhana:	[kuNhana:]nu
β:	hana[: 'flower'	hana:[nu	[kuNhana:	[kuNhana:]nu
α:	['u:]sI 'mortar'	['u:]sInu	[kuN'u:]sI	[kuN'u:]sInu
β:	hu:[nI 'ship'	hu:[nI]nu	[kuNhu:]nI	[kuNhu:]nInu

gama[Ku]nu), gama[Ku]nudu (*nudu* is a sequence of *nu* and an emphatic particle *du*), gama[Ku]kara; ma:[Cji 'pine tree', <u>[ma:]Cjinu</u> (not ma:[Cji]nu), ma:[Cji]nudu, ma:[Cji]kara. Cf. ku[sui 'medicine', ku[sui]nu, ku[sui]nudu, ku[sui]kara.

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α: [hacIka: ‘20 days’	[hacIka:]nu	[kuNhacIka:	[kuNhacIka:]nu
β: kagami[: ‘mirror’	kagami:[nu	[kuNkagami:	[kuNkagami:]nu
α: [hana:]zI ‘nosebleed’	[hana:]zInu	[kuNhana:]zI	[kuNhana:]zInu
β: kata:[na ‘sword’	kata:[na]nu	[kuNkata:]na	[kuNkata:]nanu

To be specific, when a modifier ending in a high pitch precedes nouns in pattern β, the high pitch lasts until the end of the last heavy syllable of the noun, and the following particle is lowered, as is shown in (22). The modifier [kuN functions to assimilate the initial low pitch part of subsequent nouns. The Asama dialect has a constraint that an autonomous word must have at least one heavy syllable (a syllable containing a long vowel, diphthong, moraic nasal, or moraic checked sound).

(22)	in isolation	subj.	‘this’
	hanasI[gui ‘speaking voice’	hanasI[gui]nu	[kuNhanasIgui
	ta:ku[buN ‘tobacco tray’	ta:ku[buN]nu	[kuNta:kubuN
	cjaba:[sI]ra ‘auspicious sign’	cjaba:[sI]ranu	[kuNcjaba:]sIra
	hu:cI[muccI: ‘mugwort rice cake’	hu:cI[muccI:]nu	[kuNhu:cImuccI:

‘this’∼subj.
[kuNhanasIgui]nu
[kuNta:kubuN]nu
[kuNcjaba:]sIranu
[kuNhu:cImuccI:]nu

3.6.2 The Nishi-Inutabu dialect

The almost opposite case of the Asama dialect is found in the Nishi-Inutabu dialect, Isen Town of Tokunoshima (Uwano 2000). The data are shown in (23) and (24), where “ˑ” indicates half-long.

(23)	a. [hana ‘nose’	[hana]nu	[kuNhana	[kuNhana]nu
	b. hana[ˑ ‘flower’	hana[nu	[kuNhana	[kuNhana]nu
	c. [’i]ki ‘breath’	[’i]kinu	[kuN’i]ki	[kuN’i]kinu

(24)	a. [tumari ‘cove’	[tumari]nu	[kuNtumari	[kuNtumari]nu
	b. kaga[mi ‘mirror’	kaga[mi]nu	[kuNkagami	[kuNkagami]nu
	c. kata[na ‘sword’	kata[na]nu	[kuNkata]na	[kuNkata]nanu
	d. [tata]mI ‘mat’	[tata]mInu	[kuNtata]mI	[kuNtata]mInu

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In (23) and (24), the oppositions between (a) [hana 'nose' and (b) hana[˙ 'flower', (a) [tumari and (b) kaga[mi are neutralized after [kuN 'this', respectively, as in Asama. In (24), however, (b) kaga[mi and (c) kata[na, which have the same pitch pattern both in isolation and with particles, are differentiated after [kuN, such as [kuNkagami and [kuNkata]na, [kuNkagami]nu and [kuNkata]nanu, while neutralizing in turn the opposition between (c) kata[na and (d) [tata]mI into [kuNkata]na and [kuNtata]mI.

This puzzle can be resolved by assuming that the original pattern of *katana* was *ka[ta]na(nu), which is preserved in [kuNkata]na(nu), and then *ka[ta]na(nu) changed to kata[na(]nu). The other patterns in (24) remain unchanged.

The history is represented as in (25). Three-mora words had a four-way distinction at this stage.

(25)	a.	*[hana 'nose'	*[hana]nu
	b.	*ha[na 'flower' > hana[˙	*ha[na]nu > hana[nu
	c.	*['i]ki 'breath'	*['i]kinu
	a.	*[tumari 'cove'	*[tumari]nu
	b.	*kaga[mi 'mirror'	*kaga[mi]nu
	c.	*ka[ta]na 'sword' > kata[na	*ka[ta]nanu > kata[na]nu
	d.	*[tata]mI 'mat'	*[tata]mInu
	a.	*[kuNhana	*[kuNhana]nu
	b.	*[kuNhana	*[kuNhana]nu
	c.	*[kuN'i]ki	*[kuN'i]kinu
	a.	*[kuNtumari	*[kuNtumari]nu
	b.	*[kuNkagami	*[kuNkagami]nu
	c.	*[kuNkata]na	*[kuNkata]nanu
	d.	*[kuNtata]mI	*[kuNtata]mInu

With this in mind, the accent history of Asama (21) can be depicted as in (26).[15] The data are simplified for space. Vowel elongation after the second syllable is a secondary development in the Asama dialect. It seems that it was induced by the changes *ha[na > *hana[˙ and *kaga[mi > kagami[˙. After it was established, it probably developed into a long vowel for the rhythmic reason that an autonomous word must have at least one heavy syllable.

15 In (26), *tumari* and *tatamI* are replaced by *hacIka:* and *hana:zI*, respectively, because they are [tumai and [tatE: in Asama. They already contain a heavy syllable and so vowel elongation is irrelevant. The pair of ['u:]sI α and hu:[nI β may be derived another way. A low-beginning pattern ('u:[sI, hu:[nI, β) was original, and a glottal stop (or glottalized sound) was relevant to the high-beginning pattern of α in this case (Hattori 1979: 107).

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(26) α: *[hana ‘nose’ > [hanaː
β: *ha[na ‘flower’ > *hana[ˑ > hana[ː
α: *[hacIka ‘20 days’ > [hacIkaː
β: *kaga[mi ‘mirror’ > *kagami[ˑ > kagami[ː
α: *[hana]zI ‘nosebleed’ > [hanaː]zI
β: *ka[ta]na ‘sword’ > *kataˑ[na > kataː[na
α: *[hana]nu > [hanaː]nu
β: *ha[na]nu > *hana[ˑ]nu > hanaː[nu
α: *[hacIka]nu > [hacIkaː]nu
β: *kaga[mi]nu > *kagami[ˑ]nu > kagamiː[nu
α: *[hana]zInu > [hanaː]zInu
β: *ka[ta]nanu > *kataˑ[na]nu > kataː[na]nu

α:	*[kuNhana > [kuNhanaː		*[kuNhana]nu	> [kuNhanaː]nu
β:	*[kuNhana > [kuNhanaː		*[kuNhana]nu	> [kuNhanaː]nu
α:	*[kuNhacIka > [kuNhacIkaː		*[kuNhacika]nu	> [kuNhacikaː]nu
β:	*[kuNkagami > [kuNkagamiː		*[kuNkagami]nu	> [kuNkagamiː]nu
α:	*[kuNkata]na > [kuNkataː]na		*[kuNkata]nanu	> [kuNkataː]nanu
β:	*[kuNhana]zI > [kuNhanaː]zI		*[kuNhana]zInu	> [kuNhanaː]zInu

4 Cases of neutralization in the broad sense

Neutralization in the broad sense, or non-typical neutralization, concerns the cases where pitch patterns which are identical in isolation are differentiated in the preceding or subsequent environments.

4.1 Standard Japanese

In Standard Japanese (Tokyo dialect), the kernelless (flat) pattern and the kernel-final (final-accented) patterns usually have the same pitch patterns in isolation, as in (27).

(27) a. ha[na ‘nose’
b. ha[na ‘flower’

Often, since the difference between them is not perceptible, they are judged to be neutralized. However, what follows them is what distinguishes them, as in (28),

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where *ga* is a subject particle. In ha[na]ta]kasi (28b), a pitch-fall occurs once after *na* and again after *ta*.

(28)	in isolation	subj.	*da* 'to be'	*miru* 'to see'	*takasi* '(to be) tall' (archaic)
a.	ha[na 'nose'	ha[naga	ha[nada	ha[nami]ru	ha[nata]kasi
b.	ha[na 'flower'	ha[na]ga	ha[na]da	ha[na]mi]ru	ha[na]ta]kasi

Not only particles but also autonomous words (verbs and adjectives) without particles can follow. The differences in the resulting surface pitch patterns are attributed to the pitch patterns of the preceding nouns, that is, /hana=/ 'nose' and /hana]/ 'flower'. *hana* 'nose' does not have a fall at all (it is kernelless),[16] and *hana* 'flower' has a consistent fall after *na* (reflex of a lowering kernel, Uwano 2012c). They appear to be phonetically neutralized in isolation, but according to my dynamic definition, are not phonologically neutralized.[17]

This argument is supported by the fact that the pitch patterns of /hana=/ and /hana]/ are sometimes not entirely the same in isolation. Often there are small phonetic differences, as in the degree of pitch-rise (e.g., low to mid rise for 'nose' (/hana=/) vs. low to high rise for 'flower') and/or the intensity of the final mora (e.g., *na* is louder in *hana* 'flower'(/hana]/). Also, some people end 'nose' gradually, while they end 'flower' abruptly with a glottal stop. These phenomena may well be perceived to anticipate the presence or absence of the following fall. Such situations lend further credence to a dynamic account of pitch accents in Japanese as against a static L or H account.

Concerning the sameness/difference in isolation between the kernelless pattern and the kernel-final pattern, experimental studies show different results. Sugito ([1968] 1998: 38–45) reports no difference between them, but in Sugito ([1979] 1998: 23–37), she reports individual variation: some people distinguish

16 This is often referred to as "unaccented". However, I define accent as the pattern of the accentual unit, and not as an accent kernel. /hana=/ has the definite accent pattern that there must be no fall (lowering kernel) at all in the form. This is one of the reasons why I use "kernelless", instead of "unaccented".

17 In fact, one hundred years ago Yamada (1914) already stated that they had different accentual patterns, and Sakuma (1917) named them *heiban-gata* (literally, flat pattern) and *odaka-gata* (final-high pattern). Since then, both patterns have been regarded as phonologically distinct. This fact is the basis of interpretation in my article as a whole. Hattori ([1954]1960) reinterpreted the two patterns as kernelless and kernel-final, respectively. This idea has basically been accepted by modern phonologists, including McCawley (1968). I also follow them, and have progressed the idea one step further in my dynamic framework, revising, for example, Hattori's accent kernel (or McCawley's equivalent) from "HL" to "lowering", by excluding the static elements of "H" and "L" (Uwano 2012c). As a result, not only the pitch pattern of an accentual unit, but also the prosodic patterns of a sentence as a whole, are easily described.

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them in production, but may fail in perception. In perceiving the difference, the degree of pitch-rise to the second mora is salient. Warner (1997), on the other hand, claims that the contrast is consistently preserved, based on experiments with the frame sentence "X *da*" (it is X), where X is a noun phrase of four or five morae.[18] Results of other instrumental and experimental research are also described in these studies.

It is very difficult to judge whether the forms in (27) are entirely the same or not in isolation, that is, whether they are "neutralized" or not. For this reason strict neutralization cannot be determined solely on the basis of how the forms are pronounced in isolation. Moreover, although sameness in isolation is necessary for the identification of strict neutralization, it is not by itself sufficient. More importantly what matters is the pitch progression immediately after (or before) the accentual unit. If two forms are identical in isolation as in (27) but are distinguishable by the pitch progression on what follows them, as shown in (28), they are not phonologically neutralized.

Moreover, there are sociolinguistically-determined phonetic differences in the realizations of the opposition between kernelless patterns and kernel-final patterns, as in (29), which are based on speakers' introspection as well as interviewers' judgment (Uwano 1975: 49–52).

(29) We have the following variations:
- i) Those who always distinguish the two patterns in various ways as mentioned above.
- ii) Those who usually do not distinguish them, but do so when they are put in contrastive situations.
- iii) Those who do not distinguish the patterns themselves except when segmental homonyms exist, such as /hi=/ 'day' and /hi]/ 'fire', /hasi=/ 'side' and /hasi]/ 'bridge', and so on.
- iv) Those who distinguish the patterns in monomoraic or bimoraic words (often intertwined with the case of iii), but not in words of three or more morae, where the segmental homonyms are quite rare.
- v) Those who distinguish the patterns only in monomoraic words.

Here I would like to add a few remarks on segmental/phonemic neutralization. In segmental neutralization, such as German *Rat* [raːt], pl. *Räte* [rɛːtə] 'advice' vs. *Rad* [raːt], pl. *Räder* [rɛːdər] 'bicycle', *Rat* [raːt] and *Rad* [raːt] are identified as having the same shape without reference to the surrounding environment (Uwano 1975: 51), and the dynamic view may be irrelevant here. Dinnsen (1983),

18 However, I wonder if the experiment was under the condition "in isolation".

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however, cites experimental phonetic studies showing word-final devoicing in German as incomplete, since pre-obstruent vowel length increased by approximately 10% before the underlyingly voiced obstruent, the underlying voiced obstruents had more voicing into the consonant closure than did underlying voiceless obstruents, and aspiration duration of the underlyingly voiceless-final consonant compared to the voiced one increased by approximately 15 ms. Citing many other experimental studies, Dinnsen insists that German devoicing with differences in production and perception is non-neutralizing, and moreover, in no language are there any empirically defensible cases of alleged segmental neutralizations without differences in production and perception (incomplete neutralization). Dinnsen's argument regarding segmental phenomena is compatible with the dynamic view to the extent that it is not localized solely on the particular segment concerned. And for describing non-segmental phenomena such as accentual/tonal neutralizations, the dynamic view may be even more necessary.

4.2 The Shizukuishi dialect, Iwate Prefecture

The data of adjectives in Shizukuishi (native dialect of the author) are given in (30). In my idiolect, the accentual patterns of (a/b) are identical in isolation, and as such are neutralized.

(30) a. ka[de 'hard', N[me 'delicious'
b. su[re 'white', N[me 'skillful'

However, some idiolects distinguish the forms in (30) as kade_ and su[re (or su[re]]), some fluctuate between kade_ and ka[de in (30a), and others are uncertain whether the pairs in (30) are identical or not. However, when followed by another word, a clear distinction consistently appears, as shown in (31).

(31)	*do* hearsay	*ga* question	*mozu_* 'rice cake'	go[do]] 'things'
	a. kade[do	kade[ga	kademozu_	Nmego[do]] 'how delicious!'
	b. su[re]do	su[re]ga	su[re]mozu	N[me]godo 'how skillful!'

Just like the cases of *hana* 'nose' and *hana* 'flower' in (27) and (28) in the Tokyo dialect, *kade* and *sure*, *Nme* 'delicious' and *Nme* 'skillful' in Shizukuishi are interpreted to be phonologically distinct at the surface level, as in (32), where /[/ is an ascending kernel.

(32) a. /kade=/ 'hard', /Nme=/ 'delicious'
b. /su[re/ 'white', /N[me/ 'skillful'

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The same holds true for the verbs in (33). Such pairs as in (30) and (33) are found only when they involve kernelless and kernel-final patterns.

(33)		in isolation	*do* hearsay	*ga* question	go[do]] ‘things’
	a.	[su	su[do	su[ga	sugo[do]] ‘things to do’
	b.	[ku	[ku]do	[ku]ga	[ku]godo ‘things to eat’
		interpretation	gloss		
		/su=/	‘to do’		
		/[ku/	‘to eat’		

Patterns of nouns in Shizukuishi are distinguished from each other in isolation, as is shown in (34). However, when a particle *˜da* (prenasalized *da*) meaning ‘to be’ follows the nouns, the distinction between the kernelless pattern and the kernel-final pattern disappears, as in (35). The kernel shifts to *˜da* in the kernel-final pattern /ha[na/.

(34) a. hana_ /hana=/ ‘nose’
b. ha[na]] /ha[na/ ‘flower’
c. [sa]ru /[saru/ ‘monkey’

(35) a. hana[˜da. ‘It is a nose.’
b. hana[˜da. ‘It is a flower.’
c. [sa]ru˜da. ‘It is a monkey.’

Here again, there are individual variations as to the judgment of whether the pitch patterns in (35a) and (35b) are identical or not. When we add *do* ‘hearsay’ and *ga* ‘question’ to (35), however, every speaker distinguishes them as in (36).

(36) a. hana˜da[do. ‘I hear it is a nose.’ hana˜da[ga. ‘Is it a nose?’
b. hana[˜da]do. ‘I hear it is a flower.’ hana[˜da]ga. ‘Is it a flower?’

Therefore, hana[˜da (35a) and hana[˜da (35b) are not neutralized dynamically, even when both have the same phonetic pitch pattern by themselves. They are interpreted as in (37).[19]

(37) a. /hana˜da=/ ‘It is a nose.’
b. /hana[˜da/ ‘It is a flower.’

19 The rise in pitch of ka[de (30), [su (33) and hana[˜da in (35a) is caused by declarative intonation, which is inseparably connected with adjectives, verbs, and the copula in actual use in this dialect (Uwano 1980: 120–131). Historically, hana[˜da. ‘It is a flower.’(35b) is derived from *ha[na]˜da. Although I exclude the cases of Shizukuishi from strict neutralization, they appear to be similar to intentional neutralization by Hyman (2018).

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4.3 The Sanagi-jima dialect, Kagawa Prefecture

The dialect of Sanagi Island in the Seto Inland Sea shows the accentual patterns in (38), where '.' expresses phrase-final (or non-connective) forms, '…' phrase-non-final (or connective) forms,[20] and '%' mid-rise in pitch. *ni* is a dative particle, shown here with a close vowel, and *ga* is a subject particle, shown here with an open vowel. The degree of openness of vowels affects the accentual patterns in this dialect. *ano* means 'that'. The data are taken from Nakai (1982, 1984).

(38)	in isolation	'to, in'	subj.
a.	ni[[wa. 'garden' ni[wa…	ni[[wa]ni. ni[[wa]ni…	niwa[ga. niwa[ga]]…
b.	ka[[ta. 'shoulder' kata…	kata[[ni. katani…	kata[[ga. kataga…
	'that'		
	%a[no]ni[[wa.		
	%a[no]ka([[)ta.		

In (38), *niwa* and *kata* have the same pattern in isolation, and to the extent they are heard as identical by native speakers, they are neutralized. However, note that there are idiosyncratic differences also in this respect. Phonologically speaking, *niwa* has a lowering kernel (/]/) on the second mora, and *kata* is kernelless; however, both have a low-rising register (/˩/), as in (39).

(39) a. /˩niwa]/
b. /˩kata=/

4.4 The Kito dialect, Tokushima Prefecture

(40) shows data of the Kito dialect in Naka Town (simplified from Ueno 1994).

(40)	in isolation	subj.	*kono* 'this'
a.	to[ri 'bird'	to[riga	ko[notori (~ ko[no]to[ri)
b.	so[ra 'sky'	so[raga	ko[no]so[ra
a.	ki[mono 'dress'	ki[monoga	ko[nokimono (~ ko[no]ki[mono ?)
b.	u[sagi 'rabbit'	u[sagiga	ko[no]u[sagi
a.	ka[ta]na 'sword'	ka[ta]naga	ko[nokata]na (~ ko[no]ka[ta]na)
b.	ha[ta]ke 'field'	ha[ta]kega	ko[no]ha[ta]ke

20 It is possible that both forms in isolation and forms with particle(s) have non-connective forms and connective forms, as is shown in (38). Incidentally, the forms in (34) in Shizukuishi are non-connective forms, that is, hana_., ha[na]]., and [sa]ru. Their connective forms are: hana_… (the same as hana_.), ha[na…, and [saru…, respectively.

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No pitch distinction occurs in pairs (a/b), even when a particle follows, and as such, are neutralized in this environment. But when *kono* 'this' precedes them, they are usually differentiated, and distinguished by the pitch progression *just before* the accentual units. The pairs of nouns in (40) can be differentiated when preceded by *kono*. This difference can be attributed to a property of the nouns themselves. Although there is some fluctuation in (40a), the forms in (40b) are phonologically distinguished from those in (40a) by the presence of a low-rising register (/˩/). Both *katana* and *hatake* have a lowering kernel on the second mora, and all the others in (40) are kernelless, as shown in (41). *kono* is /kono=/. The contrast between registers is in the process of merger, but this also is not a case of strict neutralization.[21]

(41) a. /tori=/ a. /kimono=/ a. /kata]na/
b. /˩sora=/ b. /˩usagi=/ b. /˩hata]ke/

5 Conclusion

Based on the dynamic view of pitch progression which includes the environment immediately preceding and following the accentual unit, the so-called accentual neutralization phenomena are classified into neutralization in a narrow sense and neutralization in a broad sense. The former type is regarded as typical, and six types of typical neutralizations have been presented, together with their historical origins. The types are: (a) neutralization by progressive domination, (b) neutralization after kernel-final nouns, (c) neutralization followed by monomoraic particles, (d) neutralization related to connectivity, (e) neutralization of three oppositions, and (f) neutralization with reference to noun modifiers. Type (a) is taken from a Mainland dialect with an N-pattern accent system, and all the other types are from Ryukyuan dialects. Four cases of neutralization in the broad sense are also given from Mainland dialects with multi-pattern accent systems.

Indeed, we find some examples of strict neutralization in Mainland Japanese dialects with multi-pattern accent systems, but they are, on the whole, scarce. For example, in the Tsuruoka dialect, Yamagata Prefecture, neutralization such as (42) occurs. i[nu 'dog' and ne[go 'cat' have the same pitch pattern in isolation, but are in contrast when particles follow them. However, when an

21 Historically, these forms are derived from the following forms: *[tori, *so[ra, *[kimono, *u[sagi, *[kata]na, *ha[ta]ke, and *[kono. Initial rise in pitch is delayed by one mora, resulting in to[ri, and so on.

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autonomous word, such as *ida* (past tense form of *iru* ‘to exist’) follows them directly, they are neutralized. For details, see Uwano (1975: 41–42, 78–79) and Nitta (1994: 85–91, 109).

(42)	in isolation	‘there is/was ~’	cf. ‘to’	‘and’	‘from’	‘also from’
a.	i[nu ‘dog’	i[nu]ida	inu[sa	inu[do	inu[ga]ra	inu[ga]ramo
b.	ne[go ‘cat’	ne[go]ida	ne[go]sa	ne[go]do	ne[go]gara	ne[go]garamo

If most cases of typical neutralization are indeed found in Ryukyuan or N-pattern Mainland dialects, it implies that these dialects have undergone drastic accentual changes. Further research is necessary concerning accentual neutralization in Mainland Japanese dialects.

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Ray Iwata

Chinese Tonal Neutralization across Dialects: From Typological, Geographical, and Diachronic Perspectives

Abstract: This study attempts to establish a typology of Chinese tone sandhi based on the theory of neutralization. It supposes two dichotomies, final-accented vs. initial-accented and context-free vs. context-dependent, which function as the triggers of tonal neutralization. The former dichotomy contributes to differentiating the domain of neutralization: lexical vs. postlexical, compound vs. phrase. As regards the dichotomy "context-free vs. context-dependent", three levels of parameter extension are distinguished for both types: single, multiple, and extensive (or maximum). Concerning the output of neutralization, it is relevant to distinguish two types: categorical and non-categorical. The production of non-categorical output results in building up a system of level tones. The typology thus established is exhibited by mapping each type of tonal neutralization. Particularly salient is the emergence of seemingly the most innovative types in the intermediate zone between the northern and southern dialects. They are characterized by symmetrical contrast reduction of tones as regards the dichotomy of final-accented vs. initial-accented structures.

Keywords: tonal neutralization, Chinese dialects, structural condition, contextual condition, categorical alternation

1 Introduction

Chinese is a tone language in which one lexical tone is assigned to each syllable. While this status has been federally inherited by such southern

Note: This is a fully revised version of the article ("On the context dependent/independent tonal neutralization in Chinese dialects") presented at the International Conference on Phonetics and Phonology (ICPP 2013), which was held at the National Institute for Japanese Language and Linguistics (NINJAL). The revision of the manuscript owes much to the two anonymous reviewers.

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dialects as Yue (popularly known as Cantonese), the most innovative tonal system has emerged in the northern Wu dialects, where the tonal feature of the initial syllable spreads rightward over the whole polysyllabic compound (see Hyman 2018). This implies historical conversion from a monosyllabic tone system to a polysyllabic word tone system, in which invariable numbers of tones are realized regardless of the length of a word (Hayata 1998). Besides these two extremes, Chinese dialects observe various kinds of postlexical tonal phenomena, which are generally referred to as "tone sandhi." These phenomena have attracted broad attention of theoretical linguists, especially in the generative field. They sought for a common or independent mechanism working to produce various tone sandhi patterns (Bao 1999; Chen 2000; Yip 2002, among others).

This article, independent of former studies, attempts to establish a typology of Chinese tone sandhi based on the theory of neutralization. This approach has never been challenged systematically in spite of the fact that tone sandhi phenomena are generally the product of historical merger of tones that occurred under any phonological or phonetic condition, and that the neutralization phenomena are their synchronic manifestations. It is expected that this approach desirably can also integrate synchronic and diachronic events. Hence, the term "neutralization" is exclusively used for referring to synchronic phenomena, and the term "merger" for referring to diachronic events.

A point of view missing in theorists' analyses is to observe the spatial variation of various types of tone sandhi and to study how they are related or unrelated. In this regard, we recall a research trend of typological studies in Chinese dialectology (Yue-Hashimoto 1987; Ballard 1988; Wei 2000). Based upon the data available from descriptive fieldwork, including those from the author's own fieldwork, this article demonstrates the geographical diversity of tonal neutralizations.

This article mostly concerns postlexical neutralization, but it also refers to interactions of lexical and postlexical ones. It describes various types of Chinese tonal neutralizations using the following parameters, which are a modified version of those appearing in Hyman (2018).

(1) Relevant parameters of Chinese tonal neutralization
  a. properties of the target (input): tone category/feature
  b. properties of the trigger: position (left or right edge), context (adjacent tone)
  c. nature of the process: reduction, assimilation/dissimilation
  d. properties of the output: categorical or non-categorical
  e. extent of the process: the number and members of targets and triggers
  f. domain of the process: compound, phrase

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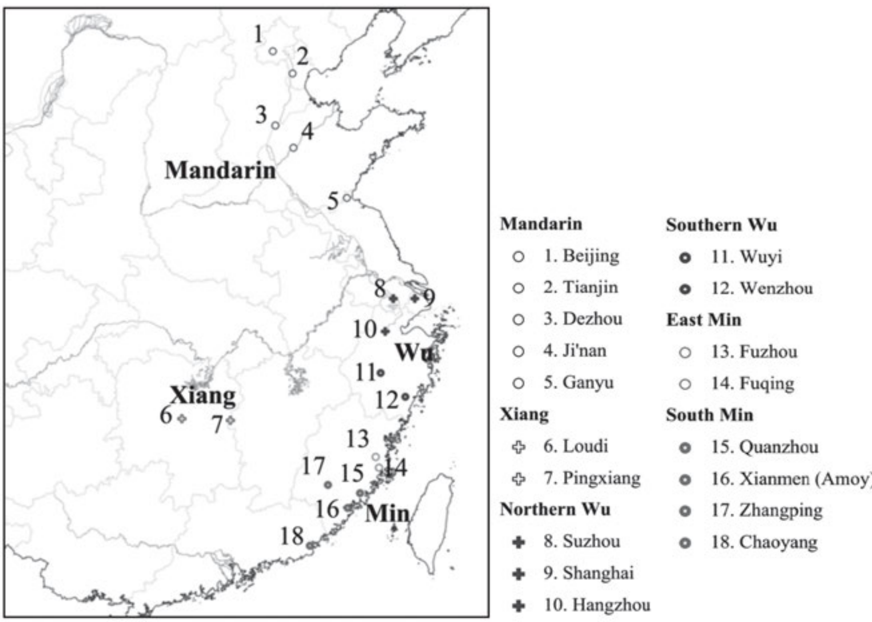
The following sections are devoted to examining each of these parameters with illustrations. Map 1 indicates the locations of dialects which will be discussed in this article. *Mandarin*, *Xiang*, *Wu* and *Min* refer to major dialect groups, and the latter two are further divided into two subgroups.



Map 1: Target dialects under analysis.

2 Properties of the target (input)

2.1 Phonetic and phonological representations

Unlike the tones in African languages, which are specified in terms of the difference in pitch register, namely H(high), M(mid), L(low), Chinese tone is embodied with various kinds of syllabic melody. Theoretical studies in the generative field usually adopt a moraic analysis which decomposes a given tone into two or three units, e.g., HH, MH, HL, MLH. We do not adopt this analysis but use Chao's phonetic notation instead, unless phonological representation is necessary. The phonetic values of tones are presented in a five-point system: simple level, rising and falling tones are indicated by a combination of two numbers

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(e.g., [55], [35], [31]); concave and convex tones by three numbers (e.g., [213], [354]). Besides, single numbers (e.g., [5], [2]) as well as two numbers with an underline (e.g., [55], [23]) indicate that the syllables are phonetically short. These notations are used largely in two cases: one is the case of *Ru* tone which is associated with the checked syllable ending in a consonantal coda (see sections 2.2 and 2.3); another is the case of tonal reduction appearing in an unstressed syllable (see sections 4.3 and 4.4). In any case, the term "short" used herein uniquely refers to phonetic entity.

Wherever phonological representation is required, a simplified version of the distinctive feature analysis by Wang (1967) is presented. Namely, one tone is composed of both a register feature and a contour feature. As for the register feature, three levels of pitch height, High, Mid, Low, are sufficient. The contour feature refers to the pitch change, such as Level, Rising, Falling, Convex, and Concave.

As for segments, vowels and consonants are represented in Pinyin Romanization for simplicity, except when IPA transcriptions are required.

2.2 Tone category

Since the phonetic values of Chinese tones are historically changeable and are spatially diversified, it is generally not feasible to describe the sandhi rules in terms of phonetics. Instead, we need to explain the synchronic rules in terms of tone category, which considers the correspondence between the tones of modern dialects and the four tones (referred to as *Ping*, *Shang*, *Qu*, *Ru*[1]) of Middle Chinese (MC, a canonical language which existed around 5–9 century A.D.). A typical instance is given in the next section.

2.3 Interdependency of tonal features and non-tonal features

Like the tone languages in southeastern Asia, Chinese tone observes an interaction between tonal features and non-tonal features. Non-tonal features refer to those related to initial consonants, final coda, vowel length or quality, and, these are associated with tonal features. This status is fully retained in many of the Wu dialects. The following example is from Wuyi, one of the Southern Wu dialects (Fu 1984).

1 *Ping*, *Shang*, *Qu*, and *Ru* literally mean "flat," "rising" (or "upper"), "departing," and "entering," respectively.

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(2) Eight-tone system in Wuyi

	Yin tones	Yang tones
Ping tone	T1 [24]	T2 [213]
Shang tone	T3 [55]	T4 [13]
Qu tone	T5 [53]	T6 [31]
Ru tone	T7 [5]	T8 [212]

Reflecting the tonal split conditioned by a voiced/voiceless distinction of initial consonants, each MC tone corresponds to two modern tones. Tones with odd numbers (T1, T3, T5, T7) correspond to *Yin* tones, which are associated with voiceless consonants, while tones with even numbers (T2, T4, T6, T8) correspond to *Yang* tones, which are associated with voiced consonants. As can be seen, the pitch register for each Yin tone is higher than its corresponding Yang tone. T7 and T8 (MC Ru tones) are associated with checked short syllables ending in the coda [ʔ], e.g., [tʰiaʔ] 'iron.'[2] Thus, they are complementary with other tones which are associated with unchecked (and phonetically longer) syllables.[3]

While the interdependency between tonal features and non-tonal features is rigidly maintained in Wu dialects, other dialects in southeast China, such as Min, Yue, Hakka, Gan, have lost a voiced/voiceless distinction of the initial consonants, while retaining the properties associated with Ru tones. In north China, on the other hand, a relative majority of dialects has lost these non-tonal features altogether, as seen in Beijing Mandarin. Regional differences of such prosodic characteristics must be related with those of tonal neutralization, as we will see later.

Concerning the notation of tone categories, conventional notations in the literature are adopted for the dialects with less than eight tones. In Shanghai, for

2 It is known that MC Ru tones are associated with syllables ending in [p, t, k], and this status has been inherited by such southern dialects as Yue, Hakka and South Min. It is noted for T8 [212] in Wuyi that the coda [ʔ] has become weakened so that its value comes close to T2 [213] (Fu 1984: 110).

3 Phonologically, such an eight–tone system as found in Wuyi could be interpreted as a three tone–system: the difference between four Yin tones and four Yang tones can be attributed to the absence or presence of voicing in initial consonants (or phonation types); the difference between Ru tones (T7, T8) and other tones is attributed to the presence or absence of a coda (checked vs. unchecked). In Shanghai, the number of phonological tones has further decreased to two, due to the merger of all unchecked Yang tones and the merger of two Yin tones (T3 and T5). Then, eventually a mono-tonal system is expected to emerge. Within the area of Northern Wu, we find such a dialect in Cixi (Cixi County record 1992). Here, "long" and "short" are equivalent to "unchecked" and "checked," respectively.

Long Yin tone [445]	Long Yang tone [223]
Short Yin tone [5]	Short Yang tone [2]

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example, the number of lexical tones has decreased to five due to the merger of T3 and T5 and that of all unchecked Yang tones (T2, T4, T6). By adopting the system presented in Xu and Tang (1988), the former is noted as T5 and the latter as T6. As for Beijing Mandarin (Standard Putonghua), we conventionally note its four tones as T1, T2, T3 and T4, which may be familiar to readers. We also apply this convention to the other Mandarin dialects with a four-tone system.

2.4 Input: citation monosyllabic form

As a working hypothesis, this article posits citation forms of monosyllables as the input of the neutralization process, assuming that they bear a full tone as opposed to a reduced tone. This hypothesis is valid for a majority of dialects which observe the maximum contrast of tones in monosyllabic citation forms. However, there is also counter-evidence. For example, in Quanzhou (one of the South Min dialects), the underlying tonal opposition of T5 and T6 surfaces in non-final positions, while this opposition neutralizes in the final position as well as in the citation monosyllabic form (see section 4.1 for details). Similar neutralization is found in Mandarin dialects, especially those in the eastern zone (Hebei, Shangdong, and He'nan Provinces). The most prevailing phenomenon, which was first reported by Giet (1946), is that the underlying opposition of T5 and T6 (both corresponding to T4 in Beijing) surfaces in the initial stressed syllable which is followed by an unstressed syllable with a neutral tone, but this opposition neutralizes in the final position as well as in the citation form. The following is a minimal pair from Chen (1988: 106). "Ø" represents neutral tone (see section 4.4).

(3) Neutralization of T5 and T6 in Mancheng (Hebei Province)
bao zi T5 [51] + Ø → [44 + 3] 'panther'
bao zi T6 [51] + Ø → [21 + 3] 'plane (as a tool)'

3 Properties of the trigger

3.1 Definition

In defining the trigger of tonal neutralizations in Chinese, Trubetzkoy's dichotomy, "contextually conditioned type" vs. "structurally conditioned type," is still effective (Trubetzkoy 1939: ch. 5).

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The contextual condition refers to tonal categories or their tonal features that surround a specific tone. As regards the presence or absence of this condition, neutralization types are divided into "context-free type" and "context-dependent type." The term "context-free type" means a loss of contrast *before or after any tone* within one domain, and "context-dependent type" means a loss of contrast *before or after particular tone(s)*.

The structural condition refers to the position where tonal contrasts are maximally realized—either initial (left edge) or final (right edge) syllable, with contrast reductions occurring in non-edge syllable(s). For a descriptive purpose, we introduce the dichotomy, "final-accented structure" vs. "initial-accented structure," which refers to the occurrence of a full tone at either the right or left edge within a given domain. Here, the term "accent" is not equivalent to the term "stress," which in Chinese is not necessarily identified in terms of phonetic correlates such as syllable duration (see section 8 for the details). Therefore, this dichotomy may better be understood as an equivalence of the term "positional condition." However, this term "positional condition" is reserved in this article for the case of some southern dialects where the degree of contrast reduction varies depending on the position: penultimate, antepenultimate and its preceding syllables. This issue will be discussed in section 7.3.

Thus, in terms of Trubetzkoy's typology, Chinese tonal neutralization mostly falls under the category of "reductive, bound" type. The term "bound" means that the position of the accented syllable is not free, but is limited by a boundary.[4] As pointed out above, an exception to this is the case of Quanzhou, where the underlying tonal opposition surfaces in non-final positions.

The two prosodic structures, final- and initial-accented ones, coexist in every dialect, but there is a tendency across dialects for their usage to be differentiated: initial-accented one for a compound word and final-accented one for a phrase. This issue will be discussed in section 8. In the sections prior to it, our considerations are confined to disyllabic compounds, which are usually deemed a fundamental unit of Chinese tone sandhi.

4 Trubetzkoy (1939) mentioned, "By *reductive* neutralization, we mean the neutralization of a phonological opposition in all syllables of the word except in the syllable that forms the phonological peak. This culminative syllable is generally marked by "accent" (i.e., by an expiratory increase in force or by a musical rise in pitch)." (English translation by Baltaxe 1969: 236) We refrain from using the term "culminativity" because in Chinese its location is not necessarily identified in phonetic terms. In this connection, it is worthy referring to Egerod and Hashimoto (1982) and Endo (1983), who mentioned that the occurrence of the non-sandhi tone marks a boundary (open juncture) and that of the sandhi tone marks a close juncture.

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3.2 Basic neutralization types

The combination of structural and contextual conditions could produce four possible types of neutralization, as schematized in (4).

(4) Basic neutralization types

	Final-accented structure	Initial-accented structure
Context-free	$T_{1,}T_2$ (.....T_n) → X / ______σ	$T_{1,}T_2$ (..... T_n) → X / σ______
Context-dependent	$T_{1,}T_2$ (....T_n) → X / ______P	$T_{1,}T_2$ (..... T_n) →X / P______

Here, "$T_{1,}T_2$ (.....T_n)" represents inputs (targets), where the maximum number "n" varies from one dialect to another; "X" represents any one neutralization output, which can be identical to any one of the citation forms. "σ" and "P" represent triggers, which stand either at the right edge or left edge within a domain: the former represents any accented syllable which bears the full tone, while the latter represents any particular tone (tone category or feature).

Positing the basic types as above, we will observe various subtypes or extended types in the following sections. There is a considerable degree of regional difference in terms of the use of neutralization type as well as its application domains. One dialect usually observes at least one type of neutralization in both final- and initial-accented structures.

4 Context-free neutralization

This section illustrates the varieties of context-free types of neutralization, that is, neutralization of two or more tones that takes place before or after any tone.

4.1 Single type in South Min

South Min is well known for its circular tonal chain shift, which has been labeled in the literature as "tone clock" or "Min circle." While this image is striking for linguists, one should also be aware of the fact that neutralization is coexistent with the chain shift. From a diachronic point of view, these two actually reflect the opposite trend of change; chain shift is an outcome of avoiding phonological merger, and neutralization is a result of merger. Both processes affect all non-final tones in a context-free fashion, i. e. before any tone, while tones in final syllables remain unchanged. The examples in (4) and (5) are from two representative dialects, Xiamen (also known as Amoy) in Fujian Province (Luo 1930) and

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Quanzhou in the same province (Lin 1993). These two dialects distinguish seven lexical tones.

In both (5) and (6), the rule of chain shift and neutralization is illustrated with disyllabic tone combinations. Arrows indicate the direction of chain shift, and right-sided braces indicate neutralization. The tone values with an underline, e.g., [<u>32</u>], as well as those noted by a single number, e.g., [4], represent the checked short syllable associated with Ru tone. As for the examples of tone combinations, the tone category of the second tone is arbitrarily selected for each example for the sake of showing that the final tone uniquely is unaffected.

(5) Tonal neutralization and chain shift in non-final syllables in Xiamen

$$\left.\begin{array}{l}\text{T1 [55]}\\ \\ \text{T2 [24]}\end{array}\right]\rightarrow \text{T6 [33]} \rightarrow \text{T5 [11]} \rightarrow \text{T3 [51]} \rightarrow \text{T1[55]}$$

$$\text{T7 [}\underline{32}\text{]} \leftrightarrows \text{T8 [4]}$$

$$\begin{array}{lll} \text{e.g.,} & \text{xian sheng `Sir'} & \left.\begin{array}{l}\text{T1 + T1} \rightarrow \text{T6 + T1}\\ \text{T2 + T3} \rightarrow \text{T6 + T3}\end{array}\right\}\text{neutralization} \\ & \text{men kou `door, gate'} & \\ & \text{dian hua `telephone'} & \text{T6 + T5} \rightarrow \text{T5 + T5} \\ & \text{xin feng `envelope'} & \text{T5 + T1} \rightarrow \text{T3 + T1} \\ & \text{zi mei `sisters'} & \text{T3 + T6} \rightarrow \text{T1 + T6} \\ & \text{hu ran `suddently'} & \text{T7 + T2} \rightarrow \text{T8 + T2} \\ & \text{mu lu `inventory'} & \text{T8 + T8} \rightarrow \text{T7 + T8} \end{array}$$

In this dialect, neutralization only occurs between T1 and T2, and its output [33] is identical with T6, thus joining a tone circle. T7 and T8 alternate reciprocally.

(6) Tonal neutralization and chain shift in non-final syllables in Quanzhou

$$\left.\begin{array}{r}\text{T5 [41]} \rightarrow \text{T3 [55]}\\ \\ \text{T7 [5]}\end{array}\right]\rightarrow \left.\begin{array}{l}\text{T2 [24]}\\ \text{T8 [}\underline{24}\text{]}\\ \text{T4 [22]}\\ \text{T6 [41]}\end{array}\right\}\rightarrow \text{T4 [22]}$$

e.g.,	shan ding 'mountain top'	T1 + T3 → T1 + T3	(unchanged)
	kan ming 'fortune telling'	T5 + T5 → T3 + T5	
	huo xing 'Mars'	T3 + T1 → T2 + T1	neutralization (a)
	ri zhou 'noon'	T7 + T5 → T2 + T5	
	tu dou 'peanut'	T2 + T6 → T4 + T6	neutralization (b)
	pao cha 'make tea'	T8 + T2 → T4 + T2	
	da shi 'big stone'	T6 + T8 → T4 + T8	
	hou bei 'thick quilt'	T4 + T4 → T4 + T4	

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In this dialect, T1 does not participate either in chain shift or neutralization, i. e. does not change. Both T5 and T6 are realized as [41] in the citation form, but since T5 only participate in chain shift, and T6 is involved in neutralization (b), distinction between these two tones surfaces (T5 → T3, T6 → T4). The other five tones participate both in neutralization and chain shift. The output of neutralization (a), i. e. [24], is identical with T2. And then, T2 is involved in neutralization (b), in which all even number of tones (Yang tones), i. e. T2, T4, T6, T8, participate as targets.[5] The output of this neutralization, i. e. [22], is identical with T4. Notably, the two neutralization processes, (a) and (b), result in a decrease in the number of tones, from 7 to 4 (T1, T2, T3, T4).

In Quanzhou, the output of neutralization (b) is the same as one particular member of the inputs, "T2, T4, T6, T8 → T4." This is the reason why the chain shift in this dialect eventually has not ended in forming a tone circle. In Xiamen, on the other hand, the output of neutralization is different from any member of the input, "T1, T2 → T6." This difference may be termed "transparent" (Quanzhou) vs. "non-transparent." (Xiamen).

Xiamen and Quanzhou are also distinguished in terms of the number of the process: "single type" and "multiple type." Xiamen belongs to the former since it shows only one process of neutralization. Quanzhou appears to be multiple since it shows two processes of neutralization, (a) and (b). However, it is still single phonologically. The difference between T3 [55] and T7 [5], along with T2 [24] and T8 [<u>24</u>], can be attributed to the absence and presence of a coda (unchecked vs. checked), so that the process (a) can be deemed the neutralization of the non-tonal feature, instead of tonal neutralization. Through the process of non-tonal neutralization, T7 and T8 (Ru tones) are incorporated into the tone alternation for unchecked syllables. Xiamen lacks this process, and T7 and T8 alternates reciprocally.

Within the domain of South Min, the dialect group called Chao-Shan (Chaozhou and Shantou) looks peculiar since neutralization occurs both in final-accented and initial-accented structures. The following picture is based on a description by Zhang (1979, 1980) for the Chaoyang dialect. Here only the rules of chain shift and neutralization are illustrated with no examples given.

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5 Remember that Yang tones were associated with voiced initials in Middle Chinese. As a matter of fact, neutralization of all unchecked Yang tones is shared by some Northern Wu dialects such as Shanghai, in which the voiceless/voiced opposition of initial consonants has been retained (see note 3).

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(7) Tonal neutralization and chain shift in Chaoyang (Guangdong Province)
Final-accented structure

$$\left.\begin{array}{r}\text{T3 [53]} \rightarrow \text{T5 [31]} \rightarrow \text{T2 [55]} \rightarrow \text{T6 [11]}\\ \text{T4 [313]}\\ \text{T1 [33]}\end{array}\right\} \rightarrow \text{T1 [33]}$$

$$\text{T8 [}\underline{55}\text{]} \leftrightarrows \text{T7 [}\underline{11}\text{]}$$

Initial-accented structure

$$\left.\begin{array}{r}\text{T3 [53]} \rightarrow \text{T5 [31]}\\ \text{T1 [33]}\\ \text{T2 [55]}\\ \text{T4 [313]}\\ \text{T6 [11]}\end{array}\right\} \rightarrow \text{T6 [11]}$$

$$\text{T8 [}\underline{55}\text{]} \rightarrow \text{T7 [}\underline{11}\text{]}$$

The output of neutralization and chain shift is four tones, i. e. [31], [55], [11] and [33], in the final accented structure, and it is two tones, i. e. [31] and [11], in the initial accented one. The difference between long [11] (T6) and short [$\underline{11}$] (T7) can be attributed to that of the non-tonal feature, i. e. the absence and presence of a coda.

4.2 Multiple type in southern dialects

In the outer area of South Min, we find many dialects in which the target of the multiple type of neutralization extends to all tones (namely "n"), i. e. all tones participate in neutralization, and the output observes more than one tone.[6] The following example (8) illustrates a typical example from Wuyi, whose citation tones were given in (2) above.

(8) Extension of the target in Wuyi (Zhejiang Province)
a. T1 [24], T2 [213], T5 [53], T7 [5], T8 [212] → "High" [55] or [$\underline{55}$]
b. T3 [55], T4 [13], T6 [31] → "Low" [11]

e.g.,	tɕʰye tsəŋ	T1 [24] + T1 [24]	→ [55 + 24]	'to thread a needle'
	doŋ ʔi	T2 [213] + T5 [53]	→ [55 + 53]	'to agree'
	pɑu tɕi	T5 [53] + T3 [55]	→ [55 + 55]	'newspaper'
	tsoʔ vuo	T7 [5] + T6 [31]	→ [55 + 31]	'rice gruel'
	zæʔ ɦiəu	T8 [$\underline{212}$] + T2 [213]	→ [$\underline{55}$ + 213]	'petroleum'

6 Geographical distribution of this type spreads over a broad area, including southwest-central Zhejiang, northeast Fujian (the administrative border with Zhejiang), west-central Fujian, and Guangxi. For Guangxi, refer to Liang (2006) and Hou (2011).

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huo tɕʰia	T3 [55] + T1 [24]	→ [11 + 24]	'train'
vu ɦmu	T4 [13] + T4 [13]	→ [11 + 13]	'parents'
ɦmiŋ ɦliŋ	T6 [31] + T6 [31]	→ [11 + 31]	'to order'

The two neutralizations, (8a) and (8b), that take place here result in two level tones, "High" [55] and "Low" [11].

In (8), word forms are shown with IPA symbols for the purpose of illustrating the interactions between tonal and non-tonal features. In this respect, it is important to note two facts. First, unlike the case of Quanzhou described in (6), the syllables with T7 and T8, [tsoʔ] and [zæʔ], retain the coda [ʔ] with the output value of [<u>55</u>]. Second, the voicing feature of initial consonants is reversed in the syllables having T2, T8 (Yang tones) and T3 (Yin tone), i. e. [doŋ]→[toŋ], [zæʔ]→[sæʔ], [huo]→[ɦuo], as the pitch range of these tones are converted by virtue of tonal neutralization, i. e. T2 [213] →[55], T8 [<u>212</u>] → [<u>55</u>], T3 [55] →[11].[7]

The neutralization shown in (8) occurs in the final-accented structure. Meanwhile, the same dialect, Wuyi, also shows a context-dependent type of neutralization, which comes to existence in the initial-accented structure under certain phonological and morphosyntactic conditions. This phenomenon will be described in section 5.3.

4.3 Symmetrical contrast reduction

On the southern bank of the middle Yangtze basin, one finds many dialects in which the single or multiple type of neutralization is also produced in the initial-accented structure. These dialects are referred to as Xiang, which is the traditional name of Hu'nan Province. A peculiarity of this dialect group is the stress-sensitive nature of tonal behavior, which makes syllables shortened.[8] In a relative majority of Xiang dialects, this reduction only takes place only in the initial-accented structure, whereas in some dialects syllable shortening takes place both in the initial-accented and final-accented structures. As a result, a symmetrical pattern of contrast reduction emerges.[9] This symmetrical neutralization

7 As regards this conversion, refer to the analysis by Bao (1999: 164–173).
8 The stress-sensitive tonal feature in Xiang is evidenced by Zhong (2010), who reports acoustic measurements for the Changsha dialect.
9 These dialects include Loudi (Yan and Liu 1994), Yiyang (Cui 1998), Lianyuan (Chen 1999), Changsha (Zhong 2003) in Hunan Province, Pingxiang (Wei 1990, 1998) in Jiangxi Province, and Susong (Tang 2005) in Anhui Province. Note that not all these dialects are classified as Xiang in Chinese dialectology.

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is illustrated in (9) with the data from the dialect of Pingxiang, which has four lexical tones, T1 [13], T2 [44], T3 [35], and T5 [11] (Wei 1990, 1998).[10]

(9) Symmetrical contrast reduction in Pingxiang (Jiangxi Province)
Final-accented structure
chuan zhen T1 [13] + T1 [13] → [**4** + 13] 'to thread a needle'
tong nian T2 [44] + T2 [44] → [**4** + 44] 'of the same age'
Initial-accented structure
guan si T1 [13] + T1 [13] → [13 + **4**] 'lawsuit'
cai feng T2 [44] + T2 [44] → [44 + **4**] 'tailor'

In this dialect, the opposition of T1 and T2 neutralizes unconditionally, while the other two tones, T3 [35] and T5 [11], do not participate in neutralization; hence, this represents the case of the "single type." As highlighted in bold, the output of neutralization is a short tone, i. e. [4], in both structures, final-accented and initial-accented. A salient fact here is that syllable shortening occurs in T3 and T5 as well, i. e. T3[35] → [5], T5[11] → [1]. As a result, the outputs of the neutralizations constitute a well arranged three-way contrast, "High," "Mid," "Low," which are mutually distinguished solely by pitch register, with a loss of the contour feature. Notably, each output retains the terminal tonal value of the input: [13]&[44] → [4], [35] → [5], [11] → [1].

As exemplified in (9), the distinction between initial-accented and final-accented structures in Pingxiang tends to correlate with the morphological distinction between phrases and compounds: namely, the final-accented structure is found typically in phrasal expressions and the initial-accented one in compounds. This correlation will be further discussed in section 8 below.

It is also worth pointing out here that the tonal neutralization described in (9) is similar to that of the Chao-Shan type, which was described in (7) in section 4.1 above; namely, in both cases, a single type of neutralization occurs both in final-accented and initial-accented structures. However, they crucially differ from each other in two respects. First, the Chao-Shan type is actually asymmetrical in terms of the number and members of the output. Moreover, stress seems to play little or no role in Chao-Shan, whereas it plays a critical role in Xiang.

10 As mentioned above (section 2.3), the notation of tone category follows a conventional one appearing in the literature except for Mandarin dialects having four tones. This non-Mandarin dialect, Pingxiang, occasionally has a four-tone system along with Beijing Mandarin, but here we follow the notation by Wei (1990, 1998). T5 in Pingxiang corresponds to T5 and T6 in Loudi, another Xiang dialect described in (10).

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Among the Xiang dialects, there are also dialects which exhibit the multiple type of neutralization. One typical example is the dialect of Loudi described by Wei (2000: 21–22). Here, only neutralization rules are sketched.

(10) Symmetrical contrast reduction in Loudi (Hu'nan Province)
Final-accented structure
T1 [44], T2 [13], T5 [35] → [33]
T3 [42], T6 [11] → [1]
Initial-accented structure
T1 [44], T2 [13] → [33]
T3 [42], T6 [11] → [1]
T5 [35] → [5]

In the final-accented structure, the target of neutralization extends to all tones, which neutralize into two tonal values, [33] and [1]. Unlike Pingxiang, the symmetrical pattern has collapsed here because T5 is not involved in neutralization in the initial-accented structure. Nevertheless, Loudi (10) is parallel with Pingxiang (9) in terms of the output of neutralization. It constitutes a three-way contrast, "High," "Mid," and "Low", which are mutually distinguished solely by pitch register, with a loss of the contour feature. Also, each output tends to retain the terminal tonal value of the input, with the exception of T5 [35], which is realized as [33] in the final-accented structure. It seems that the syllable with mid-level tone [33] is not shortened.

4.4 Maximum contrast reduction

In the preceding sections, we distinguished two types of neutralization in terms of the number of process or output that neutralization involves: "single type" and "multiple type." For each type, two subtypes are distinguished in terms of the number of the target tones participating in neutralization: all members or a limited number of members. This section analyzes the type of neutralization in which all tones in the tonal inventory participate in the single type of neutralization. It is formulated as follows. The subscript "n" represents the maximum number of citation tones existent in a given dialect.

(11) $T_{1,}T_{2\,.....}T_n \rightarrow X \,/\, \sigma\_\_\_\_\_ \quad X = \varnothing$

According to the Prague School theory (Trubetzkoy 1939), this is the neutralization of all tonemes into one architoneme, which is referred to as "zero tone" in this study and is notated as "Ø." This type of neutralization is labeled as "maximum type," implying a maximum contrast reduction. There are two well-known cases

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of this type. One is a postlexical neutralization in Northern Wu dialects, and another is a lexical neutralization which is widely found in Mandarin, as well as other dialects. Shanghai and Beijing Chinese are discussed here as the representative dialects of Northern Wu and Mandarin, respectively.

Shanghai has five lexical tones, T1 [53], T5 [34], T6 [23], T7 [55], T8 [12], all of which lose their original tonal values and are assigned a zero tone in non-initial syllables. This is illustrated in (12), where the tone categories and the tonal value of each tone given by Xu and Tang (1988) are presented. The examples of T7 and T8 are omitted.

(12) Maximum type in Shanghai

fei ji	T1 [53] + T1 [53] → T1 + Ø → [55 + 21]	'airplane'
chao fan	T5 [34] + T6 [23] → T5 + Ø → [33 + 44]	'fried rice'
tou fa	T6 [23] + T7 [55] → T6 + Ø → [22 + 44]	'head hair'

Here, the tonal feature in the first syllable spreads rightward and envelops the whole domain. Metrical phonology accounts for this phenomenon in terms of the assignment of initial stress, which results in the deletion of non-initial tone(s) (Yip 1980 and others; see an extensive summary by Chen 2000: 306–319). In longer expressions of Shanghai, while tonal spreading could go beyond the second syllable, the default tone occurs on rightward syllables exceeding the range of spreading.[11]

As a matter of fact, the zero tone in Shanghai Chinese and other Northern Wu dialects is identical in nature to the so-called neutral tone (light tone) in Mandarin sketched in (13) below as far as the neutralization pattern is concerned. Moreover, rightward spreading of the initial tone is also found in Beijing Mandarin (Lin 1962: 302–303; Yip 1980: 82–83; Shi 1988: 100–103). This can be seen from (13), which gives experimental data reported by Lin and Yan (1980). Here, the acoustically measured pitch values are converted into a five-point scale, and durations of the first and second syllables are equalized in order to exhibit the pitch contour of neutral tone. The actual duration of the second syllable (neutral tone) is approximately half as long as that of the first syllable.

(13) Maximum type in Beijing Mandarin

xiong di	T1 [55] + Ø	→ [55 + 41]	'younger brother'
luo guo	T2 [35] + Ø	→ [35 + 51]	'bend down'
bai she	T3 [314] + Ø	→ [31 + 44]	'furnishings'[12]
da yi	T4 [51] + Ø	→ [51 + 21]	'careless'

11 The default tone usually has the feature "Low" (refer to Hyman 2018). It is specified as [-upper] in Yip (1980).

12 Concerning "T3+Ø," Lin and Yan (1980) observed some other individual variations besides [31+44]: [322+44] for a male speaker and [31+33] and [312+33] for a female speaker.

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"T3+Ø" is the typical case of rightward spreading, where the terminal pitch of T3, i. e. [4], is realized in the second syllable with a low-falling contour [31] in the first syllable. For combinations other than "T3+Ø," the terminal pitches of the initial tones spread rightward, assimilating the first half of the neutral tone.

A fundamental difference between Shanghai and Beijing is that the zero tone in Shanghai emerges as a result of postlexical neutralization, while in Beijing it is specified in the lexicon.

Lexical neutral tones are found in some southern dialects such as Min, too, but their occurrences are mainly limited to proclitics. Feng (1993) gives the following description of the Fuqing dialect (a variety of East Min). In (14), the neutral tone is indicated in bold and the relevant proclitics are underlined.

(14) Neutral tone in Fuqing (Fujian Province)

wo <u>qi</u>	T3 [33] + Ø → [33 + **3**] 'mine'
xiao hong <u>qi</u> shu	T3 [33] + T2 [55] + Ø + T1 [53] → [21 + 55 + **3** + 53] 'Xiaohong's book'
shi fan <u>le</u>	T1 [53] + T6 [41] + Ø → [55 + 41 + **3**] 'have eaten a meal'[13]

Unlike the neutral tone in Beijing, the neutral tone in this dialect is invariably realized as a mid-short tone, with its preceding tone being unchanged. The actual frequency (token frequency) of particles such as *qi* (possessive particle) and *le* (perfective aspect particle) is equally high as their lexical correspondents, *de* and *le* in Mandarin. However, in Mandarin, the use of neutral tone extends to various colloquial words as seen in (13). This tendency is also confirmed by a comparison of lexical inventories which are shared by the two dialects. For example, the second syllables of *yi shang* 'clothes,' *dou fu* 'soybean curd' and *shi tou* 'stone' are pronounced with the neutral tone in Beijing, while they are pronounced without tonal reduction in Fuqing.

4.5 Summary of context-free neutralization

The neutralization types discussed in this section can be summarized as follows. First, there are two possibilities as regards the extent of neutralization. The single type of neutralization involves one single process or output (X), whereas the

13 Regarding the neutralization type, Fuqing belongs to the context-dependent type along with Fuzhou, which will be presented in (28) below. Due to this, T3 changes from [33] to [21], and T1 changes from [53] to [55] in (14). Meanwhile, tones preceding the neutral tone remain unchanged.

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multiple type involves more than one process or output (X, Y). Second, there are also two possibilities as regards the target of neutralization. In some cases, all members in the tonal inventory participate in neutralization, while other cases involve a limited number of members in the process.

The combination of these two factors yields the four patterns as indicated as A-1, A-2, B-1, B-2 in (15). The numbers of examples, such as (5), (6), correspond to those cited in preceding sections.

(15) Tonal neutralization of context-free type
A. Single type (single output corresponding to a single process)
A-1 Target = limited members
T_1, T_2 → X /______σ Examples (5), (6), (7), (9)
T_1, T_2 → X / σ______ Eamples (7), (9)
A-2 Target = all members, X = Ø (maximum type)
T_1, $T_{2.....}$ T_n → Ø / σ______ Examples (12), (13), (14)
B. Multiple type (plural outputs corresponding to multiple processes)
B-1 Target = limited members
T_1, T_2 → X / σ______ T_3, $T_{4.}$ → Y/ σ______ Example (10)
B-2 Target = all members
T_1, T_2 → X /______σ T_3, $T_{4....}T_n$ → Y/______σ Examples (8), (10)

The output "X" in examples (5), (6) and (7), as found in South Min, is the individual tone of the citation form, such as T_1 and T_2. On the other hand, "X" as well as "Y" in (8), (12), (13) and (14) is "a sound intermediate between the normal realization of the two phonemes" (Yu 2011: 1893). This bears on the issue of "properties of outputs," which will be discussed in more detail in section 6.

As mentioned above, Type A-2 (all members of tones undergo maximum contrast reduction) is especially referred to as "maximum type." At this moment of observation, this type is not observed in the final-accented structure. This issue will be discussed further in section 8 below, where the domain of neutralization is analyzed.

5 Context-dependent neutralization

As defined in section 3.1 above, context-dependent type refers to a loss of tonal contrast before or after *particular tone(s)*. This type of neutralization falls into various subtypes in terms of the number and members of the target, the trigger, and the output. This section mainly illustrates relatively simpler varieties of context-dependent neutralization found in Mandarin dialects.

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5.1 Single and multiple types

The following two examples illustrate a single type of context-dependent neutralization, i. e. a neutralization with one trigger and one output, both describing so-called T3 sandhi. The example in (16) is a well-known case found in Beijing, whereas (17) is a variety of T3 sandhi that was reported by Iwata (1989).

(16) Transparent type in Beijing
T2 [35], T3 [214] → T2 [35] /______T3 [214]
e.g., qi ma T2 + T3 'to ride a horse'
qi ma T3 + T3 'at least' } T2 + T3 [35 + 214]

(17) Non-transparent type in Ganyu (Jiangsu Province)
T2 [55], T3 [35] → T4 [51] / ______ T3 [35]
e.g., yang huo T2 + T3 'a match'
xi zao T3 + T3 'to take a bath' } T4 + T3 [51 + 35]

The neutralization in (16) is "transparent" since the output of neutralization, i. e. T2, is the same as one of the input tones. The case in (17), in contrast, is a non-transparent one since the output, i. e. T4, takes a different tone from either of the inputs, i. e. T2 or T3, even though the members of the input and trigger are identical with those in (16).

(16) and (17) both represent the "single" type of neutralization, which involves only one process of neutralization. While this is the most frequent type appearing in Mandarin dialects, some dialects exhibit the "multiple" type of neutralization, which involves plural processes of neutralization. The latter type can be illustrated with the data from Dezhou, a Mandarin dialect which has four lexical tones: T1 [213], T2 [42], T3 [55], T4 [21] (Cao 1991).

(18) Multiple type in Dezhou (Shandong Province)
a. T2 [42], T3 [55] → T2 [42] /______T1 [213] & T3 [55]
e.g., chang gui T2 + T1 'conventional rule'
chang gui T3 + T1 'factory rule' } T2 + T1 [42 213]
tang shui T2 + T3 'candy water'
tang shui T3 + T3 'pouring water' } T2 + T3 [42 55]

b. T2 [42], T3 [55] → T3 [55] /______T4 [21]
e.g., tu hua T2 + T4 'picture'
tu hua T3 + T4 'local dialect' } T3 + T4 [55 21]

Note here that the target (input) must be invariable members, i. e. T2 and T3. This neutralization consists of the two processes, i. e. (18a) and (18b); hence, "multiple" type. As for (18a), more than one tone, i. e. T1 and T3, trigger the neutralization.

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The neutralization types introduced in this section are summarized in (19). Here, the trigger is denoted as P_1, P_2, and so forth, with each subscript representing the tone category corresponding to that of the target (T_1, T_2, and so forth).

(19) Context-dependent neutralization in Mandarin

A. Single type (a single output corresponding to a single process)

transparent: $T_1, T_2 \rightarrow T_1$ / ______ P_1 (& P_2) Example (16)

non-transparent: $T_1, T_2 \rightarrow T_3$ / ______ P_1 (& P_2) Example (17)

B. Multiple type (plural outputs corresponding to multiple processes)

$$\left.\begin{array}{l} T_1, T_2 \rightarrow T_1 \ / \ \_\_\_\_\_\_ \ P_1 \ (\&\ P_2) \\ T_1, T_2 \rightarrow T_2 \ / \ \_\_\_\_\_\_ \ P_3 \ (\&\ P_4) \end{array}\right\} \text{Example (18)}$$

As far as Mandarin dialects are concerned, a further extension of the target and trigger cannot be found. In contrast, some southeastern coastal dialects display a maximum extension of the target and trigger, as will be illustrated in section 7 below.

5.2 Dissimilation as a cause of context-dependent neutralization

Context-dependent neutralizations may generally be a product of assimilation and dissimilation. A quantitative study by Cheng (1966) pointed out the tendency of dissimilative change for the successive "low" or "low-concave" tones in Mandarin dialects. The following instance is from Tianjin (Shi 1986).

(20) Dissimilation in Tianjin

T1 [21], T3 [13] → T3 [13] / ______ T1 [21]

In (20), a succession of two low tones, T1–T1, triggers dissimilation, converting the first tone in the sequence into T3, which is a rising tone. Similarly, the T3 sandhi in Beijing Mandarin described in (16) can be explained synchronically as a result of dissimilating two "low-concave" tones.

It should be noted, however, that the T3 sandhi is shared by a number of Mandarin dialects where the tonal value of T3 is known to vary greatly from one dialect to another (Shi 1999). In the Ji'nan dialect (Shandong Province), for example, T3 has the phonetic value of [55] (Qian 1997: 8), and it is difficult to explain phonetically why this tone changes into a high-falling tone (T2) before another high-level tone (T3). This suggests that dissimilation theory is insufficient as a synchronic account. A diachronic point of view, which considers the historical change of tonal values, is necessary in understanding the nature of Mandarin T3 sandhi. In this respect, it is relevant to refer to Hirayama (1999, 2005), who argued for a

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circular phonetic change of Mandarin tones. The following discussion is basically built upon Hirayama's theory (see Iwata 2012: 239–245).

To begin with, the T3 sandhi appearing in three Mandarin dialects are compared in (21). Beijng and Ganyu are recitations of (16) and (17).

(21) T3 sandhi in three Mandarin dialects

Beijing	T2 [35], T3 [214] → T2 [35] / ______T3 [214]
Ganyu	T2 [55], T3 [35] → T4 [51] / ______T3 [35]
Ji'nan	T2 [51], T3 [55] → T2 [51] / ______T3 [55]

An observation of input values of tones leads us to suppose the occurrence of the historical changes sketched in (22). Here the tonal values of T4 are also noted.

(22) A hypothesized change of tonal values (citation form) across three Stages (I, II, III)

	I		II		III
T3:	[214]	>	[35]	>	[55]
T2:	[35]	>	[55]	>	[51]
T4:	[55]	>	[51]	>	[21]

This hypothesis implies that, as far as T2 and T3 are concerned, Beijing reflects the oldest tonal values while Ji'nan reflects the newest ones among the three dialects.

At Stage I, T3 and T2 possessed similar phonetic values to those in modern Beijing, so that T3 [214] merged with T2 [35] before another T3 due to dissimilation. Once this merger was completed and the T3 sandhi was established as a morphophonological rule, it has been maintained irrespective of the changes in tonal values that took place in later stages.

Stage II corresponds to the status observed in Ganyu, where T3 and T2 changed their values to [35] and [55], respectively. Significantly, the transparent nature of neutralization may have been maintained at this stage.

(23) Previous stage of the non-transparent type in Ganyu (reconstruction)

T2 [55], T3 [35] → T2 [55] / ______T3 [35]

At Stage III, T3 changed its value from [35] to [55], while T2 changed from [55] to [51], as seen in Ji'nan. This latter change of T2, i. e. from high-level to high-falling, took place in Ganyu as well, but it only occurred under a particular contextual condition, as stated as follows.

(24) Changes of T2 and T4 in Ganyu

T2 [55] → T4 [51] / ______T2 [55] & T3 [35]

T4 [51] → [21] /______σ

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Neutralization in Ganyu became non-transparent due to the change of T2 from [55] to [51], which happened to be identical to the citation form of T4. Here, the merger of T2 and T4 is avoided since T4 assumes a low-falling value [21] before any tone.

5.3 Context-dependent neutralization in the initial-accented structure

In a majority of Chinese dialects, context-dependent neutralizations occur only in non-final positions of the final-accented structure, while it rarely occurs in non-initial positions of the initial-accented structure. This may be due to a more intense degree of tonal reduction occurring in non-initial positions than in non-final positions; a declined target has the least capacity of undergoing the effect of its preceding trigger. It is noted, however, that some dialects observe context-dependent neutralizations in the initial-accented structure.

The Wuyi dialect discussed in (8), for example, exhibits the neutralization in the initial-accented structure, too. The occurrence of this neutralization is limited to compounds taking constructions other than "verb + object," most typically, "modifier + modified" construction. Moreover, the target of the neutralization is confined to T1, T2, T5 and T6 among the eight tones (Fu 1984).

(25) Context-dependent type of neutralization in Wuyi
  a. T1 [24], T5 [53] → T5[53] / T1[24], T2[213]______
  b. T2 [213], T6 [31] → T5[53] / T1[24]______
     T2 [213], T6 [31] → T6[31] / T2[213]______

Both (25a) and (25b) involve "rising" tones as triggers, i. e. T1 [24] and T2 [213], which neutralize the "rising" contour tones (T1, T2) and "falling" contour tones (T5, T6), into "falling" tones (refer to the analysis by Bao 1999: 141–142).

6 Properties of outputs

Let us now analyze tonal neutralizations in terms of their outputs. Here, it is essential to distinguish the two types of neutralization, "categorical" and "non-categorical." The term "categorical" comes from the categorical perception of sounds, which is widely acknowledged in the experimental field. If the output of a given tonal neutralization take any one of the tones existing in the inventory of citation forms, it is referred to as "categorical."

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The context-dependent neutralization tends to assume a categorical tone as its output, and all examples introduced in the preceding two sections, (16)–(18), (20), (21), (25), belong to this type, including transparent and non-transparent types. However, a non-categorical tone can also be attested, as in the following case from Dezhou (cf. (18)).

(26) Non-categorical output in Dezhou (Shandong Province)
T1 [213], T4 [21] → [23] /______T4 [21]
e.g., san bu T1[213]+T4[21] → [23 21] 'three steps'
san bu T4[21] +T4[21] → [23 21] 'to take a walk'

Here, the output of neutralization, [23], finds no correspondence in the tonal inventory of this dialect, that is, in the citation forms of tones.

As a matter of fact, there have been disputes among researchers even as to the homophony of sandhied T3 and T2 in Beijing, cf. Hockett (1947), Wang and Li (1967), Kratochvil (1987), and Peng (2000). In this sense, the terms "categorical" and "non-categorical" relates with the issue whether the particular neutralization is "complete" or "incomplete" (Yu 2011). As for Beijing, we are in favor of Wang and Li (1967), who found no significant perceptual difference between sandhied T3 and T2. As for the T3 sandhi found in the other Mandarin dialects, such as Ganyu (17), Dezhou (18) and Ji'nan (21), we tentatively treat them as cases of categorical alternation.

The context-free type of neutralization is likely to produce non-categorical outputs. The case of Xiang dialects, as described in (9) and (10), is still categorical in the sense that each output retains the terminal tonal value of its corresponding inputs. However, what is salient here is that these outputs as a whole constitute a two- or three-level tone system in which tones are distinguished purely by means of pitch register, thus eventually approaching a non-categorical three-way or two-way contrast as found in Wuyi (8). Such a system as Wuyi is observed over some southeastern areas, including southwest Zhejiang, northeast Fujian, and west-central Fujian.[14] Undoubtedly the trend of tonal change has been directed to

14 The following is the list of the dialects exhibiting the non-categorical tone system as the outputs of neutralization.
(i) Two-way contrast
Mid and Low: Longyou (Zhejiang), Shouchang (Zhejiang), Yushan (Jiangxi)
High and Mid: Youxi (Fujian)
(ii) Three-way contrast
High, Mid, and Low: Zherong, Xiapu, Yong'an, Mingxi, Shouning (all belonging to Fujian)
In addition, exactly the same two-way contrast as Wuyi emerges within the Mandarin area, that is, the dialect of Lianyungang in northeast Jiangsu (Iwata 1982).

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produce the level tones. Note here that the non-categorical output defined herein also corresponds to the "structure-building" type of neutralization (Yu 2011: 1893).

The context-free neutralization and the chain shift observed in South Min dialects is basically characterized by categorical alternation: "T1, T2 → T6" for Xiamen (5); "T2, T4, T6, T8 → T4" for Quanzhou (6).[15] Note, however, that these neutralizations result in three-level tones, in addition to one falling or rising tone: [55], [33], [11] and [51] for Xiamen; [55], [33], [22] and [24] for Quanzhou.

7 Extent of the neutralization process

This section introduces the "extensive type" of tonal neutralization in which the parameters, i. e. targets and triggers, extend to all tones. Some southern dialects in the Coastal area exhibit this type.

7.1 Extension of targets and triggers

The context-free type of neutralization is only structurally conditioned by a binary trigger, final-accented vs. initial-accented. Hence, the neutralization type can be defined by two parameters: extent of inputs (all or limited) and the number of outputs (single or plural). As summarized in (15), any one neutralization process results in only one output as long as its input members are the same.

In the context-dependent type of neutralization, plural outputs can be produced from the same input members if a given neutralization process occurs in plural contextual conditions. This is the case which is referred to as "multiple type" in (18) and (19). Note here that the number of triggers may be plural, as indicated in the parentheses in (27).

(27) $T_1, T_2 \rightarrow T_1$ / ______ P_1 (& P_2)
$T_1, T_2 \rightarrow T_2$ / ______ P_3 (& P_4)

Logically this neutralization can extend its scope as the number of inputs and triggers increases. As a matter of fact, there emerges a maximum extension in east Fujian, the area known as East Min. For example, the Fuzhou dialect distinguishes seven lexical tones, and as far as disyllabic expressions are concerned, all tones participate in neutralization, both as inputs and triggers (Liang 1986).

15 Concerning the homophony of South Min tone sandhi, refer to Myers and Tsay (2008).

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This type is referred to as “extensive” type. This is illustrated in (28), where the left-side vertical columns represent the first (initial) tone, i. e., target (input), the upper horizontal rows represent the second (final) tone, i. e., trigger, and the remaining boxes show the output values of the neutralized tone classes, A, B, C, whose realizations are dependent on the second tone. In each box, tone categories and tonal values are indicated. The symbol ≒ means that the output value is similar to but not identical with the specific tone.

(28) “Extensive” type in Fuzhou (Fujian Province)[16]

<table>
<tr><th colspan="2">2nd Syl.
1st Syl.</th><th>/High/
T1 [44], T2 [53], T8 [5]</th><th>/Mid/
T3 [31]</th><th>/Low/
T5 [213], T6 [242], T7 [23]</th></tr>
<tr><td>A</td><td>T1 [44]
T5 [213]
T6 [242]
T7b [23]</td><td>44 (T1)</td><td colspan="2">53 (T2)</td></tr>
<tr><td>B</td><td>T3 [31]
T7a [23][17]</td><td>21 (≒T5)</td><td>24 (≒T6)</td><td>44 (T1)</td></tr>
<tr><td>C</td><td>T2 [53]
T8 [5]</td><td colspan="2">31 (T3)</td><td>21 (≒T5)</td></tr>
</table>

According to the Prague School theory (Trubetzkoy 1939), tones A, B and C are referred to as “morphophonological tone classes” or “architonemes.” Tone classes are also constructed for the trigger, and they are definable in terms of phonological features, namely, “High”, “Mid”, or “Low.” The situation illustrated in (28) can be stated as a set of rules, as in (29).

(29) Rules of neutralization for Fuzhou disyllables
A. T1 [44], T5 [213], T6 [242], T7b [22] → [44] (T1) /______ High
→ [53] (T2) /______ Mid, Low
B. T3 [31], T7a [23] → [21] (≒T5) /______ High
→ [24] (≒T6) /______ Mid
→ [44] (T1) /______ Low

16 For this dialect, there are actually quite a few descriptions that are mutually incongruent for some details. The description by Feng (1998) is nearly identical with (28), i.e., Liang (1986), but T2 and T8 (Tone class C) change to T1 according to Feng.
17 Tone T7 splits into two, indicated as T7a and T7b, at the penultimate position of a polysyllabic expression. This split seems to be lexically conditioned, where T7b only emerges in a small number of colloquial words (Chen 1998: 18).

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C. T2[53], T8[5] → [31] (T3) /______ High, Mid
→ [21] (≒T5) /______ Low

A critical issue here is that the tones constituting the class A ([44], [213], [242], [22]) are so diversified in their tonal values that it is inexplicable how these tones pattern together in neutralization. Moreover, the tonal values in the outputs are not necessarily well accounted for in terms of assimilation and dissimilation. Diachronic considerations are indispensable for elucidating the reason (see Hirayama (1974: 227–236) for a full discussion of this).

It is noteworthy that this type of neutralization strongly tends to assume citation forms as its outputs. As indicated in the parentheses in (28) and (29), three outputs, i. e. [44], [53] and [31], are identical with T1, T2 and T3; the other two, i. e. [21] and [24], may probably be conditional variants of T5 [213] and T6 [242]. This means that the tonal neutralization in this dialect is in essence a categorical alternation.

The neutralization pattern of the "extensive type" can be formulated as follows. Here, P, Q, and R represent the tone classes functioning as triggers, the number of which can be plural.[18]

(30) "Extensive type" in East Min
$T_{1,}T_2$ → T_1 / ______ P (& R)
$T_{1,}T_2$ → T_2 / ______ Q
$T_{3,..}T_n$ → T_3 / ______ P (& Q)
$T_{3,..}T_n$ → T_4 / ______ R

It is worth pointing out here that East Min dialects also show numerous segmental neutralizations of consonants in intervocalic positions. For example, in Fuzhou, the distinction of the aspirated and unaspirated bilabial stops neutralizes into voiced fricatives in the intervocalic position (Liang 1986).

(31) Segmental neutralization in Fuzhou
/a p̲a/ → [a ß̲a] 'jaw'
/ts^{h}ieu p̲^{h}a/ → [ts^{h}ieu ß̲a] 'handkerchief'

This means that East Min dialects are susceptible to the contextual effect both at segmental and suprasegmental levels.

18 This maximally extended type of neutralization concentrates in East Min, including Fuzhou city and the counties of its suburbs: Fuqing, Lianjiang, Minhou, and Minqing.

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7.2 "Extensive, mixed" type (context-free + context-dependent)

Some southern dialects exhibit the coexistence of context-free and context-dependent types of neutralization in the final-accented structure. This type falls under the same category with Fuzhou in the sense that all tones participate in neutralization as triggers. But it is different from Fuzhou in that only certain members of tones are involved in context-dependent neutralization as targets (inputs), while the other members undergo context-free neutralization. This type may be called "extensive, mixed type." It contrasts with the Fuzhou type shown in (28), which can be labeled simply as "extensive type." This mixed type is popular in the area of Southern Wu (Wenzhou and its adjacent area) but can also be found in the outer area of South Min. It is illustrated in (32), which shows the case of Zhangping (Zhang 1983, 1992), a dialect classified as a variety of South Min in Chinese dialectology.

(32) "Extensive, mixed" type in Zhangping (Fujian Province)

<table>
<tr><td colspan="2">2nd syl.
1st syl.</td><td>T1 [24], T2 [11], T6 [53], T7 [55], T8 [53]</td><td>T3 [31], T5 [21]</td></tr>
<tr><td>A</td><td>T1 [24]
T2 [11]
T5 [21]
T7 [55]</td><td>Mid [33] [33]</td><td>High [55] [55]</td></tr>
<tr><td>B</td><td>T3 [31]
T6 [53]
T8 [53]</td><td colspan="2">Low [21] [21]</td></tr>
</table>

This dialect distinguishes seven lexical tones in citation forms. T7 and T8 (Ru tones) are associated with the checked short syllable, as indicated by the underlines.

As is the case of the tone class A in Fuzhou shown in (28) and (29), the tones constituting the class A ([24], [11], [21], [55]) in Zhangping lack a common property in terms of tonal features, while tones constituting the class B ([31], [53], [53]) share the common feature of "Falling."

As a result of this neutralization, three outputs, "High," "Mid" and "Low," surface in the first syllable, thus approaching the formation of a non-categorical tone system. This is a characteristic shared by Wuyi (see (8) cited in section 4.2),

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but is absent in Fuzhou. Meanwhile, the dialects of southeast Zhejiang, typically Wenzhou, exhibit the same "extensive, mixed type" as Zhangping, but the outputs of neutralization tend to assume categorical ones as they do in Fuzhou. (Zhengzhang1964; Pan 1998).

Along with (30), "extensive, mixed type" of neutralization can be formulated as follows. Non-categorical outputs as found in Zhangping are indicated by X, Y and Z.

(33) "Extensive, mixed" type

$T_{1,}T_2 \rightarrow T_1$ or X / _______ P (& R)
$T_{1,}T_2 \rightarrow T_2$ or Y / _______ Q
$T_{3,..}T_n \rightarrow T_3$ or Z / _______ σ

7.3 Positional neutralization

In the preceding two sections, we were only concerned with tonal behaviors appearing in the first syllable, i. e. penultimate syllable, of disyllabic compounds. In the majority of Chinese dialects, including Mandarin, South Min and Xiang, the rules applied to the penultimate syllable in the final-accented structure could also be applied to its preceding syllables (as for Mandarin, see section 8.2 below). In this respect, Fuzhou/Zhangping neutralization is peculiar in that tones become free from the contextual constraint as the syllable becomes distant from the end, thus approaching the status of context-free neutralization. In Fuzhou, the contextual constraint still remains partially effective in the antepenult, and can be stipulated by the following two rules.

(34) Antepenult neutralization in Fuzhou

a. If the penultimate tone belongs to either class A or class B in (28), the antepenult tone is unconditionally realized as [21] (T5).
   e.g., you zheng ju T2[53]+T5[212]+T8[5] 'post office'
   C+A+/High/ → [**21**+44+5] (T5+T1+T8)

b. If the penultimate tone belongs to class C in (28), the rule for disyllables is applied from right to left, and the antepenultimate syllable anticipates the alternative category (or the phonological feature) of the following tone "C," whose realization depends on the final tone.
   e.g., qing ming jie T1[55]+T2[53]+T7a[<u>23</u>] 'the Qingming festival'
   A+C+/Low/ → [**53**+21+<u>23</u>] (T2+T5+T7a)

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It is worth pointing out here that the initial tone in the example *qing ming jie*, [53], is predicted only if we suppose the leftward application of the rule from the end:[19]

1) Second tone C → [21] (T5) / ______ [23] (T7) /Low/
2) Initial tone A → [53] (T2) / ______ [21] (T5) /Low/

In the fourth and fifth syllables from the end, the neutralization process finds its sole output [21], which is identical with that appearing at the antepenult under the condition (34a). This status belongs to the context-free neutralization of "maximum type" in the sense that all tones participate in the single type of neutralization; accordingly, this output [21] can be deemed a default "zero tone." Note that this zero tone is actually the variant of T5; hence, categorical, and it is different from the non-categorical "zero tone" (neutral tone) appearing in Mandarin and Northern Wu (see note 21).

Zhangping shares the feature "antepenult neutralization" with Fuzhou, but in different manners. In Fuzhou, contextual constraints are still partially at work in the antepenult, while the opposition of the three tone classes tends to be neutralized. The reverse situation emerges in Zhangping, where the contextual constraints are not at work, but the distinction between "A" and "B" is retained. Unlike the penultimate tones, the antepenultimate tones coincide with either T2 or T5, and thus, exhibit categorical alternation. Some examples are given in (35).

(35) Antepenult neutralization in Zhangping
A. T1, T2 T5, T7 → [11] (=T2)
e.g., bi kong mao T5 [21] + T1 [24] + T1 [24] 'nostril hairs'
A + A + [24] → [**11** + 33 + 24]
B. T3, T6, T8 → [21] (=T5)
e.g., shou zhi gong T3 [31] + T3 [31] + T1 [24] 'thumb'
B + B + [24] → [**21** + 21 + 24]

7.4 Neutralization in longer expressions

As sketched in the preceding two sections, Fuzhou and Zhangping are characterized by a context-dependent type of neutralization. However, it is quite different from that of Mandarin dialects.

The neutralization patterns found in Fuzhou and Zhangping are summarized as below. Here, "T" represents the full tone; "Ø" represents the zero tone; "X" and

19 If the rule application goes from left to right, the incorrect value [44] would be predicted for the initial tone: * A → [44] (T1) /______[53] (T2) /High/.

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"Y" represent the outputs of context-dependent and context-free types of neutralization, respectively.

(36) Neutralization patterns in Fuzhou and Zhangping
Fuzhou
{ØØXT} penult tone class: A or B
{ØXXT} penult tone class: C
Zhangping
{YYXT} penult tone class: A
{YYYT} penult tone class: B

As mentioned above, Fuzhou observes the sole output [21] in the third or fourth syllable from the end, and here it is indicated as Ø, i. e. zero tone. As is clear from (36), both dialects are characterized by fixed patterns of neutralization, in which the tones become free from contextual constraint as the syllable becomes remote from the end. This fact implies that the phonological context is scanned regressively from the final syllable in these southern dialects. Significantly, this is exactly the opposite of Mandarin dialects, where scanning of the context usually goes progressively from left to right, i. e. from the initial to the final syllable. This can be clearly seen in the case of T3 tone sandhi in Beijing (see Chen 2000: 383–384).

(37) Progressive scanning of context in Beijing Mandarin
Zhan lan guan zhang 'exhibition hall director'
(T3–T3)–T3–T3 > T2–(T3–T3)–T3 > T2–T2–(T3–T3) > T2–T2–T2–T3

In a right-branching structure, the T3 sandhi rule can be applied to the penultimate tone first. For example, the succession of three T3's, [Xiao [mu gou]] 'small female dog,' is usually realized as T3–T2–T3, though T2–T2–T3 is also permitted (see Chen 2000: 98–110; Bao 2011: 2577–2578 for the controversial issues regarding the directionality in rule application). Thus, Mandarin also allows a bi-directional scanning of the context. However, this type of context scanning is different from the fixed regressive scanning shown in (36) for Fuzhou and Zhangping.

8 Domain of the neutralization process: postlexical neutralization in phrases

As overviewed in the last section, the neutralization phenomena classified as the same context-dependent category reveal a congruity between Mandarin and some Min dialects with regard to the manner of anticipatory tonal behavior. This

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section, focusing on those of context-free types, observes dialectal variations appearing in phrases. Particularly significant is the role of stress, which contributes to the formation of neutralization patterns, but with a varying degree across dialects.

8.1 Role of stress in lexical and postlexical neutralization

As defined in section 3, the term "accent" used in this article is not necessarily equivalent to the term "stress" since Chinese, as a tone language, is generally illusive in phonetic stress (refer to Chen 2000: 286–291 for prior studies of Chinese stress). The most reliable parameter for phonetic stress is syllable duration. It is significantly meaningful in Mandarin lexical neutralization, in which the neutral-tone syllable is approximately half as long as the preceding stressed one, thus proving it trochaic, see (13). However, in Shanghai along with many other Northern Wu dialects, no reliable phonetic evidence is available to verify the existence of trochaic stress. As for Suzhou, one of Northern Wu dialects, an acoustic study by Liao (1988) revealed that the duration of each syllable within one sandhi domain remains almost constant. As for Shanghai, acoustic data by Zhu (1994: 206–210) seem to indicate a trade-off relationship between the first tone and the second tone: if the first tone is a non-Ru tone associated with an unchecked long syllable, the second tone is significantly shortened; if the first tone is a Ru tone (T7 and T8) associated with a checked short syllable, the second tone is remarkably elongated; thus the duration of the whole disyllabic tone is kept nearly constant irrespective of the difference of tones. Therefore, stress has no obvious phonetic substance in Northern Wu.

Yet, the tonal behaviors of Northern Wu dialects can well be accounted for in terms of trochaic stress (see the explanation mentioned about the example (12)). This may suggest the historical background of Northern Wu prosody. Hirayama (1992) hypothesized that the neutral tone in Mandarin and the tonal rightward spreading in Northern Wu may trace back to the trochaic compound stress existent in a common ancestor. He also argued for the contribution of "modifier + modified" vs. "verb + object" contrast in building up the stress contrast.[20] This hypothesis may lead us to assume that the trochaic stress once existent in Northern Wu became obsolete at the surface phonetic level, leaving its trace in the rightward spreading of initial tone. Note here that pitch is generally more

20 More generally, this contrast can be interpreted as that of "non-head + head" vs. "head + non-head," along with the discussions in Hyman (2018) included in the volume.

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feasible for perception than stress, which is unstable in its phonetic realization especially in Chinese. As the word tone uniquely utilizes pitch, irrespective of domain length, stress has no raison d'être as a phonological feature, and eventually syllable durations have been regularized within a domain.[21]

It is noteworthy that a new innovation seems ongoing in some Northern Wu dialects, especially in such big cities as Shanghai and Hangzhou as well as their suburbs. It is an emergence of a "pitch accent" system, in which the distinction of word tones seems to be predicted by the location of a pitch fall. The following is the case for Hangzhou trisyllabic compounds (Akitani 1988). For each tone, the phonetic value of the citation form is presented to the left of the arrows, and those values appearing in trisyllables are presented on the right. The location of a pitch fall is indicated by the symbol "˥".

(38) "Pitch accent" system in Hangzhou

	Yin tones	Yang tones
	T3 [53] → [55˥ + 22 + 21]	
	T5 [45] → [34 + 55˥ + 21]	T6 [113] → [11 + 55˥ + 21]
	T1 [334] → [33 + 34 + 53˥]	T2 [23] → [22 + 34 + 53˥]

This dialect has seven lexical tones phonetically, but the two Ru tones (T7, T8) are omitted here for simplicity. Among the five tones presented here, three Yin tones (T1, T3, T5) are associated with voiceless initials, so that they are initiated in higher pitch registers than the two Yang tones (T2, T6) which are associated with voiced initials. Therefore, the differences between T1 and T2, and T5 and T6 are ascribable to the voiceless/voiced contrast of initial consonants; hence, this dialect can interpreted as having three phonological tones. In polysyllabic compounds, while tonal realizations of these three phonological tones are explained in terms of right spreading as well as the default tone specification, the distinction is also predictable from the location of pitch fall. The pitch fall appears in the final syllable for T1 and T2, but it appears in the position of syllable boundary, i. e. in between 1st and 2nd syllables for T3, and in between 2nd and 3rd syllable for T5 and T6.

The emergence of such a "pitch accent" system in Northern Wu may relate with the tendency of domain expansion; namely, as the number of syllables

21 From the neutralization perspective, there is no logical reason for the *neutral tone* to be inevitably associated with a short syllable. There are some Mandarin dialects, in which the neutral tone has acquired the feature of a particular full tone existent in a specific dialect; hence, pronounced as long, see Iwata (1982, 2001). For Beijing Mandarin, Wang (1992) reported on the existence of a high-falling melody, which is similar to T4, in the final syllable of disyllabic words which are usually registered in the dictionary as the words with neutral tones.

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which can be accommodated in one domain increases, the language has come to utilize the location of a pitch fall as a perceptual cue for distinguishing the tone patterns. At present, however, it is undeniable that these Chinese dialects still maintain the status of tone language.

8.2 Phrasal stress in Mandarin

An important prosodic event appearing in Mandarin is the formation of phrasal stress. In Beijing, it takes an iambic pattern [M(W)(W)S], where "S", "M" and "W" represent the level of stress: Strong, Mid and Weak (Chao 1968: 147, 206; Hoa 1983: 79). This pattern is not necessarily identified in terms of syllable duration, but according to the acoustic studies by Yan and Lin (1988) and Lin (2012), the pitch range in trisyllabic expressions inclines to be enlarged towards the final syllable, where the tonal shape most resembles the citation form. Also, the recent EMA (Electromagnetic Articulograph) experiments suggest that phrasal stress may be characterized by increased jaw opening (Erickson et al. 2015; Erickson, Iwata, and Suemitsu 2016; Iwata et al. 2015).

The effect of phrasal stress is so serious that it even can suspend the lexical specification of the neutral tone by reviving the original tone. The following examples typically indicate the predominance of the iambic phrasal stress over the trochaic lexical stress in Beijing.

(39) Stress conversion in Beijing
xue sheng T2 + Ø 'student' → da xue sheng T4 + T2 + T1 'university student'
zhi dao T1 + Ø 'to know' → bu zhi dao T4 + T1 + T4 'not know'
kan jian T4 + Ø 'to see' → kan bu jian T4 + Ø + T4 'unable to see'
huang zhang T1 + Ø 'hurried' → huang huang zhang zhang T1 + Ø + Ø + T1 'panicked'
di dao T4 + Ø 'genuine' → di di dao dao T4 + Ø + Ø + T4 'really genuine'

Those aligned on the left-side are disyllabic words with a neutral tone, and they are extended to trisyllabic or quadrisyllabic compounds by affixation (*da* is an adjective meaning 'big' and *bu* is a negative marker) or reduplication. In this extension, the stress pattern is converted from the trochee, [SW], to the iamb, [MWS] or [MWWS]. Due to this, the neutralization at lexical level is suspended, and the morphemes in final position (*sheng, dao, jian, zhang, dao*) recover their original tones. Remarkably, this iambic stress tends to make medial syllable(s) assume a neutral tone, as seen in the last three examples of (39).

Although the iambic stress in Mandarin is in essence phrasal, it is applied to compound words as well. As a consequence, Mandarin dialects have produced a

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number of trisyllabic words of an iambic stress [MWS], while those with a trochaic stress [SWW] are lexically infrequent. This contrast is exemplified below.

(40) Iambic vs. trochaic contrast in Beijing trisyllables
Iamb
ge bo T1 + Ø 'arm' + zhou T3 'elbow' → ge bo zhou T1 + Ø + T3 'elbow'
ga zhi T1 + Ø 'to tickle' + 'wo T1 'hole' → ga zhi wo T1 + Ø + T1 'armpit'
Trochee
zhan T4 'stand' + qilai 'get up' → zhanqilai T4 + Ø + Ø 'stand up'
xuesheng T2 + Ø 'student' + men 'plural marker'→ xueshengmen T2 + Ø + Ø 'students'

The occurrence of successive neutral tones is limited to those taking proclitics; hence, its lexical frequency (type frequency) is low although it actually shows a high frequency of actual usage (token frequency). Meanwhile, Xiang dialects exhibit the opposite tendency of Mandarin in terms of the usage of stress, as will be discussed in the next section

8.3 Phrasal stress in Xiang and prefixed neutral tone in Northern Wu

In the dialects of the Xiang group, phrasal stress seems to play a role as in Mandarin dialects. The examples below indicate the existence of the iambic stress patterns [MWS] and [MWWS] in the Pingxiang dialect. Shortened tones as affected by weak stress are highlighted in bold.

(41) Iambic pattern in Pingxiang
nanjing dou T2 [44] + T1 [13] + T5 [11] → [44 + **4** + 11] 'Nanjing bean'
di di dao dao T5 [11] + T5 [11] + T5 [11] + T5 [11] → [11 + **1** + **1** + 11]
'really genuine'

However, lexical frequency of iamb is actually lower than that of trochee in Pingxiang, though one finds examples of the former in the dialect dictionary (Wei 1998).

(42) Iambic vs. trochaic contrast in Pingxiang trisyllables
Iamb
hi bu xiao T1 [13] + T1 [13] + T1 [13] → [**4** + **4** + 13] 'unable to endure'
luo yi ri T5 [11] + T1 [13] + T1 [13] → [**1** + **4** + 13] '(rain) falls one day'
Trochee
luo si gu T2 [44] + T1 [13] + T1 [13] → [44 + **4** + **4**] 'ankle'
xi mi shui T3 [35] + T3 [35] + T3 [35]→ [35 + **5** + **5**] 'water used for rinsing rice'

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Unlike Mandarin and Xiang, Northern Wu has the least indication of phonetic stress, as mentioned above in section 8.1. Instead, the initial- and final-accented contrast in Northern Wu manifests itself in the zero tone (neutralization of "maximum type") appearing both in non-final and non-initial positions. The zero tone appearing in non-final position can be referred to as "prefixed neutral tone," contrasting with a more frequent one appearing in non-initial position, which, if necessary, may be labelled as "suffixed neutral tone." Thus, these two exhibit a symmetrical pattern of neutralization along with the case appearing in Xiang shown in (9) and (10). The occurrence of prefixed neutral tone is confined to phrasal expressions, while all compounds are uttered with the suffixed neutral tone. Compare the following pair of homonymic expressions which involve a difference in internal structure, "verb + object" vs. "modifier + modified."

(43) Symmetrical pattern of neutralization in Shanghai
   a. chao fan   T5 [34] + T6 [23]→ Ø + T6 → [**44** + 23] (to fry rice)
   b. chao fan   T5 [34] + T6 [23]→ T5 + Ø → [33 + 44] (fried rice)

For 'to fry rice', the prefixed neutral tone is highlighted in bold. It assumes a level contour [44], while the second tone remains unchanged. This level tone, which Kennedy (1953) called "suspense tone" for Tangxi, one of the Northern Wu dialects, generally assumes a mid register. In Shanghai it has four phonetic variants: [44], [33], [44], and [22] (Xu and Tang 1988), but their occurrences are complementary with respect to the voicing of the initial consonants and the presence or absence of the coda [ʔ]; hence, it is only one neutral tone phonologically.

The prefixed neutral tone in Northern Wu has not attracted a broad attention of linguists. This may be because its use is optional, and it can surface as a full tone as well (Takahashi 2011). Wang (1996: 56) remarked for the Suzhou dialect (see section 8.1) that it only appears in natural and rapid speech, otherwise the given tone assumes the citation form.[22]

At any event, the use of prefixed neutral tone in Northern Wu is lower in frequency than that of suffixed one. For example, *chao fan* 'to fry rice' in (43a) can alternatively be pronounced with [33 44]. Dominance of initial tones as well as structure-sensitive behavior of tones in Shanghai is exemplified by the following example (quoted from the dictionary by Xu and Tang 1988: 249).

22 As for Shanghai, while Xu and Tang (1988) affirmatively marked the prefixed neutral tone, the Dialect Dictionary of Shanghai (Xu and Tao 1997) did not mark it, leaving the given tone unchanged.

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(44) Conversion of neutralization pattern in Shanghai
a. chi su T7 [55] + T5 [34] → Ø + T5 → [**44** + 34] 'to live on vegetables'
b. chi su ren T7 [55] + T5 [34] + T6 [23] → T7 + Ø + Ø→ [33 + 55 + 21] 'vegetarian'[23]

The expression *chi su* in (44a), which takes the "verb + object" construction, can be pronounced with a prefixed neutral tone, but once it comes to be nominalized by taking the head *ren* 'person' as in (44b), the whole expression (*literally*, a person who lives on vegetables) is pronounced with an initial-accented pattern. This should be compared with the stress conversion in Beijing presented in (39) above. These two actually exhibit the opposite tendency: the conversion in Beijing results in the replacement of lexical neutralization by phrasal neutralization, and the one in Shanghai results in the replacement of phrasal neutralization by compound neutralization.

9 Summary of Chinese tonal neutralization

9.1 Typology

This article has discussed various types of tonal neutralizations in Chinese dialects, which can be summarized as in (45). The neutralization patterns are presented basically in the order of presentation: (15), (19), (27), (30). The symbols or formula shown in parentheses mean their optional participations in neutralization. As for targets, the subscript "n" represents the maximum number of citation tones existent in a given dialect. As for triggers, "P" with a subscript, such as "P_1" and "P_2," represents an individual tone, whereas "P," "Q," "R" represent tone classes. As for outputs, the symbols "X," "Y" and "Z" as well as "Ø" represent non-categorical outputs, and "T" represents a categorical one. In addition to these parameters, the domain of neutralization is noted for each column.

23 As readers may notice, the initial tone T7 in *chi su ren* is realized as [33] instead of [55], even though this latter value is expected according to tonal rightward spreading. This is because T7, together with T8, associates with the checked syllable, in which tones do not obey the rules applied to those in unchecked syllables.

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(45) Patterns of neutralization and domains of their applications

<table>
<tr><th></th><th>Final-accented</th><th>Initial-accented</th></tr>
<tr><td>Mandarin</td><td>$T_1,T_2 \rightarrow T_1 / \underline{\qquad} P_1\ (\& P_2)$
$(T_1,T_2 \rightarrow T_2 / \underline{\qquad} P_3\ (\& P_4))$
Single or Multiple
Compound &phrase</td><td rowspan="4">$T_1,T_{2\ldots}T_n \rightarrow Ø / \sigma\underline{\qquad}$
Maximum
Lexical neutralization</td></tr>
<tr><td>East Min</td><td>$T_1,T_2 \rightarrow T_1 / \underline{\qquad} P\ (\& R)$
$T_1,T_2 \rightarrow T_2 / \underline{\qquad} Q$
$T_3,{}_{..}T_n \rightarrow T_3 / \underline{\qquad} P\ (\& Q)$
$T_3,{}_{..}T_n \rightarrow T_4 / \underline{\qquad} R$
Extensive
Compound & phrase</td></tr>
<tr><td>Southern
Wu
South Min
(inland
area)</td><td>$T_1,T_2 \rightarrow T_1$ or $X / \underline{\qquad} P\ (\& R)$
$T_1,T_2 \rightarrow T_2$ or $Y / \underline{\qquad} Q$
$T_3,{}_{..}T_n \rightarrow T_3$ or $Z / \underline{\qquad}\sigma$
Extensive, mixed
(Context-dependent + -free)
Compound & phrase</td></tr>
<tr><td>South Min
(coastal
area)</td><td>$T_1,T_2 \rightarrow T_1$ or $T_3 / \underline{\qquad}\sigma$
Single + Chain shift
Compound & phrase</td></tr>
<tr><td>Xiang
Southern
Wu
Guangxi[24]</td><td>$T_1,T_2 \rightarrow X / \underline{\qquad}\sigma$
$(T_3,T_4,({}_{\ldots}T_n) \rightarrow Y / \underline{\qquad}\sigma)$
Single or Multiple
Phrasal expression</td><td>$T_1,T_2 \rightarrow X / \sigma\underline{\qquad}$
$(T_3,T_4,({}_{\ldots}T_n) \rightarrow Y / \sigma\underline{\qquad})$
Single or Multiple
Compound</td></tr>
<tr><td>Northern
Wu</td><td>$T_1,T_{2\ldots}T_n \rightarrow Ø / \underline{\qquad}\sigma$
Maximum
Phrase</td><td>$T_1,T_{2\ldots}T_n \rightarrow Ø / \sigma\underline{\qquad}$
Maximum
Compound</td></tr>
</table>

24 As pointed out in note 6 above, in Guangxi there are quite a few dialects which exhibit the multiple type of neutralization in a context-free fashion.

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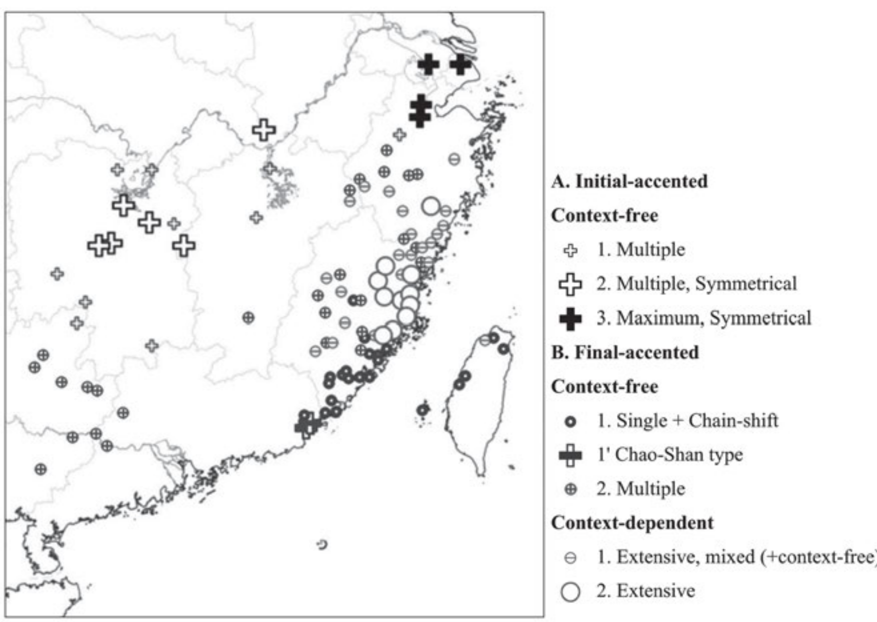
9.2 Geographical distribution

Map 2 shows the geographical distribution of the neutralization types presented in (45). It focuses on the situation in south China, without reference to a broad Mandarin speaking area in north China, where "context-dependent, single/ multiple type" is distributed. In this map, symbols are not assigned to the dialects which lack neutralization phenomena. The mapping of the "context-free, maximum, symmetrical type" in Northern Wu (indicated by a black cross symbol) is confined to those dialects for which we confirm the existence of prefixed neutral tone: Shanghai (Xu and Tang 1988), Suzhou (Wang 1996), Tangxi (Kennedy 1953), and Xiaoshan (Onishi 1999).



Map 2: Geographical distribution of neutralization types.

This map needs a further refinement. In particular, some Northern Wu dialects observe the context-dependent type of neutralization in the initial-accented structure, as described in (25). Further analyses are needed for this type.

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9.3 Final remarks

One of our original concerns in this article was whether the synchronically induced parameter expansion reflects historical change. In this respect, it is worth emphasizing two main pieces of evidence: one concerning symmetrical contrast reduction, and the other regarding parameter expansion in the context-dependent type. The former feature is shared by Xiang and Northern Wu, and the latter is shared by Mandarin and East Min. Geographically, both Xiang and Northern Wu situate in the Yangtze River Basin, whereas Mandarin and East Min are separated by intermediate dialects, especially Wu and Xiang. This situation is roughly sketched in Fig. 1.

Fig. 1: Simplified sketch of the dialect distribution.

Regarding the symmetrical contrast reduction, one may assume the possibility that the multiple type in Xiang developed into the maximum type in Northern Wu through the merger of "X" and "Y", as schematically shown in (46).

(46) Hypothesized change for the symmetrical contrast reduction

	Final accented	Initial accented
Multiple type	$T_1,T_2 \rightarrow X$ / ___σ	$T_1,T_2 \rightarrow X$ /σ___
	$T_3,T_4,(_{\dots}T_n) \rightarrow Y$ / ___σ	$T_3,T_4,(_{\dots}T_n) \rightarrow Y$ /σ___
	$\Downarrow$	$\Downarrow$
Maximum type	$T_1,T_{2\dots\dots}T_n \rightarrow Ø$ / ___σ	$T_1,T_{2\dots\dots}T_n \rightarrow Ø$ /σ___

However, this hypothesis is invalid since geographically these two types are actually isolated, as seen in Map 2, and there is no reliable evidence for attesting the change from the multiple type to the maximum type. An alternative account for the symmetrical contrast reduction may be that the symmetrical contrast reduction was an outcome of parallel innovation which was externally motivated by the influence of Mandarin which developed the stress accent in north China.

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Regarding the parameter extension in the context-dependent type, a probable change is schematized in (47). It is only concerned with the extension of the trigger, from limited members of tones (multiple type) to all tones (extensive type); the extension of the target (input) is omitted for simplicity.

(47) Hypothesized parameter extension in the context-dependent type

Multiple type T_1, $T_2 \rightarrow T_1$ / ______ P_1
T_1, $T_2 \rightarrow T_2$ / ______ P_3 & P_4

$\Downarrow$

Extensive type T_1,$T_2 \rightarrow T_1$ / ______ Tone class "P" (P_1 & P_2)
T_1,$T_2 \rightarrow T_2$ / ______ Tone class "Q" (P_3 & P_4...& P_n)

As a matter of fact, this hypothesis lacks empirical proof. Namely, either the single or the multiple type is not observed in and nearby East Min, and in contrast there is no extensive type existing within the Madanrin speaking area. Instead, more realistic is a change from the context-dependent type to the context-free type as well as its reverse.

(48) Change from the context-dependent type to the context-free type and its reverse

a. Context-dependent, extensive type
T_1,$T_2 \rightarrow T_1$ / ______ Tone class "P" (P_1 & P_2)
T_1,$T_2 \rightarrow T_2$ / ______ Tone class "Q" (P_3 & P_4...& P_n)

$\Updownarrow$

b. Context-free, single type
T_1,$T_2 \rightarrow T_1$ / ______ Tone classes "P" & "Q" (P_1 & P_2...& P_n)

Here, the sum of the members constituting the two tone classes "P" and "Q" is equal to all members of tones in the specific dialect, so that the status (48b) actually means "the neutralization *before any tone*." Both directions of change would be possible; the change from the status (48a) to (48b) is the removal of contextual constraints, and the reverse change is the setting of contextual constraints.

One may notice on Map 2 that the "extensive type" in East Min tends to be surrounded by the "extensive, mixed type." This may suggest a transition from context-dependent to context-free type or its reverse. One may also observe on Map 2 that four types of neutralization patterns concentrate in a relatively narrow domain of the southeastern coastal area (East-, South-Min and Southern Wu): two context-dependent types, including "extensive" and "extensive, mixed" types; two context-free types, including "multiple" and "single + chain shift." This evidence would suggest the occurrence of changes in both directions:

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(A) extensive type > extensive, mixed type > context-free type, and (B) context-free > extensive, mixed type > extensive type.

Refinement of typological framework and more detailed dialect surveys are required in order to ensure the reliability of our diachronic approach.

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Part II: **Tonal Change**

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Larry M. Hyman

Towards a Typology of Tone System Changes

Abstract: Most general discussions of tonal change are concerned with the issues of tonogenesis and tonal splits, i. e. the questions of how non-tonal languages become tonal and how these tones later split to produce more tones. In this article I am concerned with two issues: (i) how tone systems acquire more tonal contrasts; (ii) how tone systems lose tonal contrasts. The first issue concerns both laryngeal factors as well as the natural pitch effects that tones have on each other. The second concerns both tonal mergers as well as the restriction of tonal contrasts to certain positions of the word or phrase, which may ultimately lead to tonoexodus, the complete loss of tone.

Keywords: tone, typology, phonation, contours, mergers

1 The Sinosphere vs. the world

Most of the well-known work on diachronic tonology has focused on two issues: (i) tonogenesis, whereby non-tonal languages acquire tone; (ii) tonal splits, whereby languages with tone acquire more tones. Concerning the first, it is widely accepted that tonal contrasts most commonly derive either from the loss of earlier laryngeal segments, e.g. glottal stop or **h*, or from phonation, e.g. voicing, breathiness, creakiness. Occasionally it is proposed that tones compensate for changes in the number of syllables, e.g. syncope in Korean (Ramsey 2001). Tonal splits may also derive from earlier laryngeal segments, e.g. Mixtec final glottal stop (Longacre 1957; Dürr 1987) and phonation (but also from interactions between the tones themselves—see below). Most scholars thus follow some version of the Haudricourt (1961) model schematized in (1) (see also Matisoff 1973, Svantesson 1989, Thurgood 2002, and Kingston 2011, among many others):

(1)		*pre-tonal*		*H vs. L*		*register split*	*multiple heights*	*contours*		*obscure*
	a.	*pa̰ʔ	>	pá̰	>	↑pá	pa^4	pá	[H]	I
	b.	*ba̰ʔ	>	bá̰	>	↓pá	pa^3	pǎ	[L͡H]	II
	c.	*pa̤h	>	pà̤	>	↑pà	pa^2	pâ	[H͡L]	III
	d.	*ba̤h	>	bà̤	>	↓pà	pa^1	pà	[L]	IV

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In (1) I start with glottalization accompanying the final glottal stop and breathiness accompanying final **h*. In (1a,b) the loss of final glottal stop produces a H(igh) tone (marked by an acute accent), while in (1c,d) the loss of final *h produces a L(ow) tone (marked by a grave accent). In the next development the contrast between voiced and voiceless onset consonants produces a register split (slight raising or lowering of pitch following the release of the consonant, marked by arrows), which becomes contrastive when obstruents are devoiced. This may ultimately produce multiple tone heights (where 4 = highest pitch and 1 = lowest), or contour tones. Another possibility is that the four-way contrast may ultimately cease to be transparent or consistent, as indicated by the arbitrary Roman numeral designations in the last column.

Although there are other cases, most of the documentation of tonogenesis and tonal splits due to laryngeal consonants and phonation have been studied in East and Southeast Asian languages, e.g. Chinese and Vietnamese. Three relevant properties are common in Southeast Asian tone or, as I like to put it, adopting Matisoff's (1999) term, in the Sinosphere (vs. the world): First, contour tones abound, often without the beginning/end points occurring independently (cf. K. Pike's 1948 typological distinction between "contour tone languages" vs. "register tone languages"). Second, tones are often restricted in "stopped syllables" (syllables closed by an oral stop). Finally, while tones typically correspond in closely related languages, it is often hard to describe the variations in terms of tones becoming other tones (instead, the differences may result from independent tonogenesis (cf. Matisoff 1974)). As Evans' (2009: 214–215) puts it,

> For groups such as TGTM [Tamangic] and Lolo-Burmese, tonal splits can be detected, but the origin of tones at the proto-subgroup level are obscure. In other subgroups, such as Qiangic, there does not appear to be any tonal correspondence between languages.

While the developments in (1) and the three properties just mentioned are most closely associated with the Sinosphere, there are hints of one or another of the above properties in other parts of the world, e.g. breathy or creaky tones in Otomanguean (Mexico). However, even when there is monosyllabicity and multiple contours, these latter are easily decomposable, e.g. low rising = $\widehat{\mathrm{LM}}$, high rising = $\widehat{\mathrm{MH}}$. The differences one finds in one vs. another part of the world are largely due not only to the nature of the tonogenetic processes, but also to the relative maturity (time-depth) of the tone system (and ultimate independence from the laryngeal origins): with time, pitch takes over from phonation and acquires a life of its own, both building up and breaking down, as it has in African languages (see below).

Consider for example the differences observed between the Kuki-Chin tone systems of NE India and Myanmar vs. the typical African situation (represented

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below by Eastern Grassfields Bantu). The table in (2) provides a comparison of underlying tones in seven Kuki-Chin languages (t1-t4 = the reconstructions of VanBik 2006; T = stop or glottalized sonorant consonant, smooth syllables are either open or closed by a non-glottalized sonorant consonant):

(2)

	Falam	*Hakha Lai*	*Thlantlang Lai*	*Kuki-Thaadow*	*Tedim*	*Mizo*	*Sizang*	*Smooth σ's*	*CVT*	*CVVT*
*t1	H	H͡L	H͡L	H͡L	L͡H	L͡H	H	√	*	*
*t2	H͡L	L	L	H͡L	L͡H	H͡L	L͡H	√	*	√
*t3	L	LH	H	L	H͡L	L	H͡L/H	√	√	*
*t4	L͡H	H͡L	H͡L	H	L	H	L	√	*	*

As seen, VanBik was not able to give phonetic values to the four proto tones: Even though the corresponding reflexes from one language to another are quite regular, it is hard, if not impossible to provide tonal values for the four-way contrast from which the different realizations can be derived. Instead, it is as if Proto-Kuki-Chin started with a four-way contrast in laryngeal features which the different languages reinterpreted as tone in different ways. It is thus the pre-tonal laryngeal values which correspond, but which gave rise to different tones in different languages. (Since only Falam, Mizo and perhaps Sizang contrast four distinct tones, it is of course possible that the other languages once had four tones, but merged two of them to produce their current three-way contrast.)

Compare this now to the regular reflexes of the four-way contrast in Proto-Eastern Grassfields Bantu (PEG) tones in Cameroon (Hyman & Tadadjeu 1976: 66), where L° = a level L tone (which contrasts with a falling L tone before pause), (H), (L) = floating tones, and the initial *L is a prefixal tone (e.g. noun class 5 **lì-* in the proto language):

(3)

Language↓ / PEG →	*L-L-L	*L-L-H	*L-H-L	*L-H-H	*e.g. *lì-sòŋá* 'tooth'
Mankon	L-L-L	L-L-H	L-H-L	L-L-H	*nɨ̀-sɔ̀ŋə́*
Mundum I	L-L-L	L-L-H	L-H-L	L-L-H	*nɨ̀-sɔ̀ŋə́*
Nkwen	L-L-L	L-L-L°	L-H-L	L-L-H	*nɨ̀-sɔ̀ŋə̀°*
Pinyin	L-L-L	L-L-L°	L-H-L	L-L-H ?	*nɨ̀-sɔ̀ŋə̀°*
Mbui	L-L	L-L°	L-H (L)	L-H	*nì-sɔ̀ŋ°*
Bamenyan	L-L	L-L͡H	L-H͡L	L-H	*nə̀-sǔo*
Babadjou	L-L	L-L°	L-H͡L	L-L͡H	*lə̀-sɔ̀ŋ°*
Babete	L-L	L-L°	L-H	L-H	*nə̀-sɔ̀ŋ°*
Bati	L	L	H	H	*sìɔŋ*
Bagam	L	L°	H	H	*sɔ̀ŋ°*
Batcham	L-L	L-L°	L-H	L-L͡H	*lə̀-sɔ̀ŋ°*
Dschang/Ngwe	L-L	L-L°	L-ꜜH	L-H	*lì-sɔ̀ŋ°*

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Baloum	L-L	L-L°	L-H (L)	L-L͡H ?	*nə̀-sɔ̀°*
Fomopea	L-L	L-L°	L-H (L) ?	L-H	*è-sɔ̀ŋ°*
Bamendjou	L-L	L-L°	L-ꜜH	L-H	*nə̀-sɔ̀ŋ°*
Baleng	(L) L	(L) L°	(L) H	(L) H	*nə̀-sũ̀°*
Bandjoun	L	L°	L͡H	H	*sùŋ°*
Batie	(L) L	(L) L°	(L) H	(L) H	*è-sɔ̃̀°*
Bangou	L	L (H)	M	H	*sɔ̀ŋ*
Batoufam	L	L (H)	M ?	H	*sùɔk*
Fotouni	(L) L	(L) L°	(L) H	(L) H	*è-sɔ̃̀°*
Fondjomekwet	L	L (H)	H	H	*sɔ̀ŋ*
Feʔfeʔ	L	L°	L͡M	M	*sɛ̀ʔ*
Bangangte	L	L°	H (L)	H	*sɔ̀°*
Bamoun	L	L	H	H	*sù*

As can be seen from the different realizations, the development of new tonal contrasts in the different Eastern Grassfields languages directly results from the loss of the final stem (and ultimately prefix) syllable: In Bamenyan, where the bisyllabic stem was *L-H the single remaining stem syllable has a L͡H rising tone; similarly, PEG bisyllabic *H-L stems are realized with a monosyllabic H͡L falling tone. Not only do these languages/dialects directly correspond, but their derivation from a common tonal source is transparent. The difference between Proto EGB and Proto-Kuku-Chin is that the former language was tonal, while the latter was not necessarily tonal, rather more likely phonational. In what follows I will be less concerned with tonogenesis and more interested in how tones can change into other tones.

2 Two-height tone systems

In this section I address the following question: If a tone system contrasts two pitch heights, H and L, what can happen next? And by what means? First, the two-height system can develop more tones. Thus the reflexes of *H and *L in (3) result in cases of M, rising, falling and a contrastive level low (L°) tone. Two other possibilities is that the system can change from one "type": to another, e.g. an original contrast between "bivalent" *H vs. *L can become reinterpreted as a privative /H/ vs. Ø contrast (and vice-versa). A final outcome would be for the language to restrict the tonal contrasts to certain positions of the word or phrase and perhaps ultimately become non-tonal (cf. Ratliff 2015). In order to determine the nature of these changes, one has to first come to an understanding of what the

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relevant typological properties of tone systems are and agree on how they should be interpreted.

Much of the previous work on the typology of tone systems has focused on defining what a tone system is (K. Pike 1948; Welmers 1959, 1973), often concerned with contrasting the notions of tone vs. "pitch-accent" systems (McCawley 1970, 1978; Hyman 1977, 2006, 2009; Beckman 1986; van der Hulst and Smith 1988; Gussenhoven 2004, 2006, etc.). Such studies are concerned primarily with determining what should be considered to be "tone" vs. something else. In what follows I will consider tonal any language where pitch is a contrastive property of morphemes. Such a general definition masks considerable typological differences between tone systems. Previous surveys have shown that tone systems can differ in (i) their inventories, e.g. the number of tone heights, the presence vs. absence of contours, tonal downstep, phonations (Maddieson 1978, 2005); (ii) the distributional restrictions they place on tones and their domains, leading to proposals to distinguish syllable tone, word tone, and "pitch-accent" (Donohue 1997; Matisoff 1999; Mazaudon 2005); (iii) lexical vs. grammatical functions of tone (Welmers 1973; Ratliff 1992a, 1992b; Hyman 2001); (iv) presence vs. absence of phonological alternations (sandhi): assimilations, dissimilations, contour simplification, reductions (Chen 1992, 2000; Hyman and Schuh 1974; Hyman 2007; Schuh 1978). However, characterizing the above properties, is not always straightforward (and can be subject to different interpretations).

Consider for example the question of determining how many tone heights a language distinguishes. Let us take a traditional "Praguian" perspective and ask, first, what counts as a two-height tone system, and second, whether a two-height system should be analyzed as bivalent (H vs. L), privative (H vs. Ø or L vs. Ø), or perhaps a combinaton of H vs. L vs. Ø. The first question runs into the problem of discrepancies between levels of representation: Some languages have a binary contrast underlyingly, but derive up to five surface-contrasting tone heights, which may be surface contrastive. Some of the ways to derive a third tone height from the interaction of H and L are shown in (4).

(4)	a. lowering of H after L,	e.g. Kom	(Hyman 2005)	L-H	>	L-M	>	M
	b. raising of L before H,	e.g. Ik	(Heine 1993)	L-H	>	M-H	>	M
	c. raising of H before L,	e.g. Engenni	(Thomas 1978)	H-L	>	↑H-L	>	↑H

As indicated, the development proceeds in two steps: First a tone is raised or lowered in the context of another tone. Then, when the latter loses its tone-bearing unit (TBU), the conditioned raised or lower tone becomes contrastive on the surface. As an example, consider how Heine (1993: 18) characterizes the M tone in Ik (Eastern Sudanic; Uganda):

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> A low tone is realized as mid if followed by a high tone in the same word. The mid tone is retained even when the high tone is deleted due to word-final devoicing.

As a result, although the contrast is underlyingly two-height, derivations such as the following produce a three-height contrast H, M, L on the surface:

(5)	/cèkí/ → cēkí → [cēk]	'woman'	*cf.*	/bòsì/	→	[bòs]	'ear'
				/tsútsá/	→	[tsúts]	'fly'

In terms of typology, the question is whether Ik has a two-height or three-height tone system? What is clearly needed is a typological approach which encodes both underlying and surface contrasts. Thus, Ik might be considered to have a 2T3 height system: two input vs. three output tone heights.

Even if the system is 2T2, i. e. with two heights in both input and output, the main question is whether the contrast is bivalent (H vs. L) or privative (H vs. Ø or L vs. Ø). As Stevick (1969: 330) points out:

> Whenever a system consists of two contrasting entities, the analyst may suggest an alternative interpretation whereby one of the entities is 'zeroed out' and the contrast is regarded as presence vs. absence of some one positive entity.

This is of course a matter of interpretation and analysis, which may vary according to the theoretical framework or working assumptions of individual researchers. Still, two-height systems do differ in just this way. The following four different tone systems have been proposed in the literature:

(6) a. /H, L/ e.g. Baule, Bole, Mende, Nara, Falam, Kuki-Thaadow, Siane, Sko, Tanacross, Barasana
b. /H, Ø/ e.g. Afar, Chichewa, Kirundi, Kiwai, Tinputz, Una, Blackfoot, Navajo, Seneca, Slave
c. /L, Ø/ e.g. Malinke (Kita), Ruund, E. Cham, Galo, Kham, Dogrib, Tahltan, Bora, Miraña
d. /H, L, Ø/ e.g. Ga, Kinande, Margi, Sukuma, Tiriki, Munduruku, Puinave, Yagua

The most familiar situation is (6a), where the underlying contrast is between /H/ and /L/. However, there are good reasons to recognize the privative systems in (6b,c), where one member of the tonal opposition is Ø (absence of tone), and even (6d), which requires /H/, /L/ and toneless TBUs. The guiding principle is to posit the one vs. two tones which are "phonologically active", i. e. invoked by the language's constraints/rules. This is what Clements' (2001, 2003) calls "representational economy":

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> … features are specified in a given language only to the extent that they are needed in order to express generalizations about the phonological system. (Clements 2001: 2).

So the question in each case becomes: What is the evidence that H and/or L need to be specified? Or that one or the other "needs" to be absent?

Let us start with the first case: A two-height contrast should be analyzed /H, L/ if both features are phonologically activated. The following three properties have generally provided the most compelling arguments that both /H/ and /L/ are activated:

(i) *Contour tones*. The presence of H͡L and/or L͡H tonal contours on a single TBU requires both features, as Ø can't form a contour.

(ii) *Floating tones*. The presence of both floating H and floating L would require that both features be activated, since Ø cannot float. Examples can be seen from Eastern Grassfields Bantu in (3) above. To illustrate the need for both floating tones consider the following data from Babanki (Kejom) [Western Grassfields Bantu; Cameroon] (Hyman 1979b):

(7)	a. *kə̀-kə́m*	[L-H]	'crab'	*kə̀-kə́m*	*kə́ ñàm*	'crab of animal'	/-kə́m/
	b. *kə̀-fó*	[L-H]	'thing'	*kə̀-fó*	*ꜜkə́ ñàm*	'thing of animal'	/-fó ˋ/
	c. *kə̀-mbò°*	[L-L°]	'bag'	*kə̀-mbò*	*kə́ ñàm*	'bag of animal'	/-mbò ˊ/
	d. *kə̀-ndɔ̏ŋ*	[L-L]	'throat'	*kə̀-ndɔ̏ŋ*	*kə́ ñàm*	'throat of animal'	/-ndɔ̀ŋ/

The nouns in (7a,b) are both pronounced L-H in isolation. However, as seen in the phrases to the right, 'thing' conditions a downstep on the connective (genitive) marker *ꜜkə́* which is lacking in 'crab of animal'. The reason can be seen in the underlying forms to the right: /-fóˋ/ has a final floating L tone (left behind when the second stem syllable fell out historically), which conditions the downstep; /-kə́m/ does not have a floating tone, and hence no downstep occurs. While (7b) demonstrates that Babanki therefore needs a floating L tone feature, the contrast in (7c,d) shows the need for a floating H: The noun kə̀-ndɔ̏ŋ ends in a L tone which undergoes final downgliding. The noun *kə̀-mbò°*, on the other hand, ends in a level L tone (transcribed as L°) which is prevented from downgliding by the final floating H. For this and other reasons, both H and L are phonologically activated in Babanki.

(iii) *Tone rules*. Languages in which tone rules need to refer to both H and L require both features to be activated. This is seen most clearly in languages which have both H tone spreading (HTS) and L tone spreading (LTS), especially if the result is a contour tone: /H-L/ → H-H͡L, /L-H/ → L-L͡H.

In short, any evidence that both H and L "must" be referenced in the tonal phonology or morphology. (I put "must" in quotes since abstract analytic devices

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can sometimes do a similar job, e.g. a floating empty tonal node instead of a floating L tone.)

Privative systems are quite different from bivalent /H, L/. In a privative /H/ vs. Ø system, since [L] is underspecified (Ø), the H in principle: (i) cannot form H͡L and L͡H contours on a single tone-bearing unit (TBU); (ii) can be a floating tone, whereas L cannot; (iii) can be subject to an obligatory contour principle (OCP) constraint (*H-H), whereas L cannot; (iv) can shift over long distances, since there are no specified L tones to block the shift; (v) can interact with ("see") another H tone at long distance, since there is no L between them; (vi) is a pitch target, whereas Ø may not be. Property (iv) is illustrated from Giryama [Bantu; Kenya] in (8), where a H may be displaced one or more words to the right (Volk 2011: 1):

(8) a. *ni-na-mal-a ku-gul-a ŋguuwo* 'I want to buy clothes'
b. *a-na-mal-a ku-gul-a ŋguúwo* 's/he wants to buy clothes'
H

In (8a) the utterance is underlyingly toneless, with all TBUs being realized with default L pitch. In (8b), the only difference is that the subject prefix /á-/ 's/he' has an underlying H tone. As seen, this H shifts to the penultimate mora of the phonological phrase, here realized on the underlyingly toneless noun object 'clothes'. This shift would not be possible if the intervening TBUs had specified L tones. Although less common, privative /L/ vs. Ø systems have the same but inverted properties as /H/ vs. Ø. Thus, Bora-Miraña [Witotoan; Peru] has floating L (but not floating H) and an OCP constraint against *L-L (but not H-H) (Weber and Thiesen 2000; Seifart 2005).

Long-distance effects such as in (8) require low tonal density, defined as a calculation of TBUs with vs. without tone (Gussenhoven 2001: 152967). Systems requiring a tonal specification on every syllable or mora will have greater tonal density than those which restrict tone to a subset of syllables/moras. Equipollent /H, L/ systems will thus be more dense than privative /H/ vs. Ø (or /L/ vs. Ø) systems. Systems which contrast /H/, /L/ and Ø will be in between: The TBUs marked by /L/ will have a stable or recognizable L tone with potential blocking effects, while those which are unmarked (Ø) will not. In addition, three-, four- and five-height systems will tend to have greater tonal density than two-height systems. Finally, systems with tonal contours will generally have greater tonal density than those which have the restriction "one tone per TBU".

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3 How do two-height tone systems acquire more tones?

Having established that there are the four different types of two-height systems in (6), we now turn to the question of change. Which way do such systems change? In both directions in (9)? In one direction more than in another?

(9)	a.	tonogenesis	>	*H, *L	>	H, Ø
	b.	tonogenesis	>	*H, *Ø	>	H, L

The brief answer is: It depends! If tonogenesis creates sparse tone, the contrast should be privative, as in Somali, where H is limited to last two moras of the word, also Mohawk, and Athabaskan tone systems, where most TBUs are toneless. If, on the other hand, tonogenesis creates dense, "omnisyllabic tone" (Matisoff 1999), the contrast should be bivalent (H vs. L). It also may depend on whether the language in question has long vs. short words: The Southeast Asian tonogenesis schematized in (1) generally produced monosyllabic words, which therefore will produce high tonal density (reduction processes whereby a tone is deleted, as in the Chinese "neutral tone" phenomenon, are generally later developments). Note that the schemas in (9) show tonogenesis directly producing two level tone heights, whereas it may also directly create contours; it may presumably also directly create a L, Ø privative system.

The following are suspected correlations: (i) As a system changes from dense to sparse tone, we expect *H, *L > H, Ø. (ii) As a system changes from sparse to dense tone, we expect *H, *Ø > H, L. (iii) Some tone systems are more syntagmatic than others in the sense that they place tones, e.g. H, on specific positions defined with respect to a stem or word boundary (initial, final, penultimate etc.). The more syntagmatic the tone system, the more likely that the language has privative tone. (iv) Languages which are poly-agglutinative, like canonical Bantu, don't develop true M tones; a /H/ vs. /M/ vs. /L/ system would be highly paradigmatic, at odds with the syntagmaticity of the language. To appreciate this, consider a word with six agglutinated monosyllabic morphemes, each contrasting /H, M, L/. This would produce 729 (3^6) tone combinations. Such a system thus has to be syntagmatic, i. e. with severe restrictions on where the tones can contrast. Whether Proto-Bantu reconstructs with *H/*Ø or *H/*L depends on how agglutinative the original system was. Tone was inherited from pre-Proto-Bantu, however, and is quite old. On the other hand, Bantu languages which shorten their words through maximum size conditions or final erosion are definitely /H, L/, e.g. Grassfields Bantu in (3) and (7).

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Another generalization is that languages which develop a third pitch height will tend to have dense tone. Where occurring, the languages will tend to have shorter words, developing the extra tone height from three sources: phonation, tonal assimilations, contour simplifications. We have already discussed the first, phonation/consonant-induced in (1). An African case of tone splitting occurs in Masa [Chadic; Chad], where /H/ appears after all consonants, but the two allophones of the non-H tone have become marginally contrastive (Caïtucoli 1978: 77):

(10)	*initial root segments*	*non-H tone:*
	b, d, g, v, z, ʒ, ɮ, ɦ	L
	p, t, k, f, s, tʃ, ɬ, h, ɓ, ɗ, l, r, w, y, a, e, i, o, u	M
	m, n, ŋ	L, M

As seen, the non-H tone is realized [L] after "depressor" voiced obstruents and mid tone after voiceless, implosive and oral sonorants consonants, as well as on vowels which have no preceding onset. It is after nasal consonants that there is a contrast. The contrast results from the merger caused by the simplification of prenasalized consonants: *mb, *nd, * ŋg > m, n, ŋ. This can be verified in closely related Musey, where the retained prenasalized consonants pattern with voiced obstruents as depressors (Shryock 1993: 2).

The second source of third pitch heights is from tonally induced "vertical adjustments" triggered by adjacent tones:

(11)	*Assimilation*				*Dissimilation*			
	L-H	→	M-H	(Ik)	H-L	→	ꜛH-L	(raising)
	L-H	→	L-M	(Kom)	H-L	→	H-ꜜL	(lowering)

As schematized in (11), /L-H/ frequently undergoes anticipatory raising or perseverative lowering, while /H-L rarely undergoes anticipatory lowering or perseverative raising. As seen a /L-H/ interval is subject to compression: L-H → M-H, L-M. A /H-L/ interval is instead subject to expansion: H-L → ꜛH-L, H-ꜜL. As an example of the latter, the following examples from Engenni [Edoid; Nigeria] show that a H becomes superhigh (˝) before either a linked or floating L (Thomas 1978):

(12) a. /únwónì/ 'mouth' b. /únwónì + ólíló/ 'mouth of a bottle'

↓ ↓

[únwőnì] [únwőn ólíló]

(12a) shows the second H of 'mouth' becoming raised before the final L, while (12b) shows that the new superhigh tone becomes surface-contrastive when the vowel /ì/ is deleted. (The L of the syllable /nì/ can be represented as floating in the output of (12b).)

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The third source for developing a third tone height is from contour simplification. By the Principle of Ups and Downs (Hyman 1978: 261) tone systems tend to modify tonal changes between syllables, but especially contour tones, where tone heights change on a single TBU. In this case a former contour tone is compensated by the creation of an additional tone height. Compare the different ways of simplifying /L-HL-H/ to reduce its three ups and downs in Grassfields Bantu:

(13)	*Language*	*Output*	*Process*	*Reference*
a.	Mankon	L-H-↑H	H-upstep	Leroy (1979)
b.	Babanki	L-M-H	HL-fusion	Hyman (1979a)
c.	Babadjou	L-H-↓H	H-downstep	(personal notes)
d.	Dschang	L-↓H-H	HL-fusion+downstep	Hyman and Tadadjeu (1976)
e.	Kom	L-M-M	H-lowering	Hyman (2005)
f.	Aghem	L-H-H	L-deletion	Hyman (1986b)

As indicated in (13), an alternative to developing a M tone is “downstep” (↓H), which is a syntagmatic phenomenon, since it lowers the register of all of the following tones occurring within the downstep span. This can be seen in the following illustrations of the non-phonemic vs. phonemic downstep in (14), where 1 = the highest pitch:

(14) a. automatic or non-phonemic downstep (“downdrift”), e.g. Hausa [Chadic; Nigeria] (Welmers 1973: 94)
í:yà tá: dáfà dànkálì: dà ná:mà: ‘the teacher didn’t come’
1 3 2 2 4 4 3 5 5 4 6

b. non-automatic or “phonemic” downstep, e.g. Igbo [Benue-Congo; Nigeria] (Welmers 1973: 84)
ŋwá ń↓né ḿ nà ónyé ŋ́kúzí ↓yá byàrà ʊ́↓lɔ́ ↓ányí
1 1 2 2 4 3 3 3 3 3 4 6 6 5 6 7 7
‘my brother and his teacher came to our house’

Since H-M and H-↓H sequences may be phonetically identical, care must be taken to determine if a third tone height is a M or downstepped H tone. The following three criteria characterize “canonical” downstep tone systems (Hyman 1979a: 11): (i) If the tone is ↓H, it will contrast with H only after a H (or another ↓H); (ii) If the tone is ↓H, a following H tone will necessarily be realized on the same pitch level. (iii) If the tone is ↓H, the language should theoretically permit an unlimited number of non-low tone levels (i. e. H-↓H-↓H-↓H), as in Igbo example in (14b). The following summarizes the expected differences in creating a third height from an earlier *H, *L system (Hyman 1986a: 128):

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(15)		*Creation of M*	*Creation of ꜜH*
	a.	often occurs utterance-initially	rarely occurs utterance-initially
	b.	is expected not to establish a ceiling	is expected to establish a ceiling
	c.	may affect one tone-bearing unit	usually affects a sequences of TBUs
	d.	is expected not to be "recursive"	is expected to be "recursive" (H-ꜜH-ꜜH)
	e.	may cooccur with fourth tone height	rarely cooccurs with fourth tone height

However, other systems diverge from what I have termed "canonical" downstep. Whereas canonical systems limit the contrast to H-H vs. H-ꜜH, systems such as Bamileke-Dschang [Eastern Grassfields Bantu; Cameroon] have the following additional contrasts (Hyman and Tadadjeu 1976):

(16)	a. H vs. ꜜH after L						
	i.	*àpá*	*'lid'*	*àpá séŋ*	'lid of the bird'	/àpá/	'lid'
	ii.	*àꜜpá*	*'taro'*	*àꜜpá séŋ*	'taro of the bird'	/àpá ˋ/	'taro'
	b. L vs. ꜜL after L						
	i.	*èfɔ̀*	*'chief'*	*èfɔ̀ nà*	'chief of the animal'	/èfɔ̀/	'chief'
	ii.	*ǹdzà°*	*'axe'*	*ǹdzà ꜜnà*	'axe of the animal'	/ǹdzà ˊ/	'axe'
	c. L vs. ꜜL after H						
	i.	*à kè tɔ́ŋɔ́ nà*		'if he called an animal' [yesterday past]			
	ii.	*à kè tɔ̀ŋɔ́ ꜜnà*		'he called an animal'			
	d. ꜜH vs. ꜜꜜH after H						
	i.	*à kè tɔ́ŋɔ́ ꜜmɔ́*		'if he called a child' [yesterday past]	/ˋ mɔ́ ˋ/	'child'	
	ii.	*à kè tɔ̀ŋɔ́ ꜜꜜmɔ́*		'he called a child'	[mɔ́] ~ [ꜜmɔ́]		

As seen, H and ꜜH contrast after L in (16a), while L and ꜜL contrast in (16b,c). In addition, (16d) shows that a double-downstep is also possible. This produces a fourth contrastive pitch height as there are now four different possible tones following H: H-H, H-ꜜH, H-ꜜꜜH, H-L(°). However, in this case, H-ꜜꜜH and H-L° (non-falling L) represent the same phonetic interval. Note also that the word /ˋ mɔ́ ˋ/ 'child', which has both a preceding and following floating L tone, can be pronounced either [mɔ́] or [ꜜmɔ́] at the beginning of an utterance. Finally, before leaving the topic of downstep, note that downstepped M also exists, illustrated below from Yoruba [Benue-Congo; Nigeria] (Pulleyblank 2004: 412) and Gokana [Cross-River; Nigeria] (Hyman 1985: 115):

(17)	a. Yoruba	*/kọ́ + ẹ̀kọ́/*	→	*kẹ́ kọ̌*	'learn a lesson'
		/rí + àpò/	→	*rá pò*	'see a bag'
		/rí + ọ̀bẹ̄/	→	*rọ́ ꜜbẹ̄*	'see a knife'
	b. Gokana	*/àɛ́ mɔ̄n gɛ̀/*	→	*àɛ́ mɔ̄n gɛ̀*	'he will see a knife'
		/àɛ́ mɔ̄n gɛ̀ ˊ nīʔēí/	→	*àɛ́ mɔ̄n ꜜgɛ̄ nīʔēí*	'he will see a knife today'

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In the Yoruba examples, when the H tone of the verb combines with the initial L of the following noun, the latter delinks and produces a LH rising tone in the first example, but a downstepped ꜜM in the last. In the second Gokana example the floating H tone oblique marker combines with a preceding L, the result is a M-ꜜM sequence.

4 How do multiple height tone systems lose tones?

As seen in the previous sections, we have a pretty good idea of where new tone heights come from. In this sections I will briefly consider cases where an inherited tone height is lost. Mergers of tone heights can be recovered by the comparative method and often by internal reconstruction. Kagwe (Dida) [Kru; Ivory Coast] has three surface tone heights, but two kinds of /M/: /M_a/ (class A) alternates between M and H, while /M_b/ (class B) remains M (Koopman & Sportiche 1982). The relevant rule (18a) is that a M_a becomes H after another M_a:

(18)	a. M_a	→	H	/	M_a __		
	b. M_a	:	*lē*	‘spear’	*mànā <u>lé</u>*	‘this spear’	
			jō	‘child’	*mànā <u>jó</u>*	‘this child’	
	c. M_b	:	*kpʌ̄*	‘bench’	*mànā kpʌ̄*	‘this bench’	
			lɔ̄	‘elephants’	*mànā lɔ̄*	‘these elephants’	

In all other contexts /M_a/ is realized phonetically M, hence identical to /M_b/. In (18b) the demonstrative màna# ‘this/these’ is underlying /L-M_a, hence conditioning the change of the M_a of ‘spear’ and ‘child’ to H. As seen in (18c), the /M_b/ of ‘bench’ and ‘elephants’ does not change in this environment. The reason for the two Ms is that pre-Kagwe used to have four tone heights, as in other Dida dialects: M_a was an upper M tone, while M_b a lower-mid tone. The two have merged as M except in the one environment in (18a).

A second example comes from Villa Alta Yatzachi Zapotec [Zapotecan; Mexico] (E. Pike 1948) which has three surface tones, H, M, L, but two kinds of L tones (Pike’s class A vs. B, respectively): L_a, which remains L vs. L_b which becomes M before another M or H:

(19)	a. L_b	→	M	/	__ {M, H}		
	b. L_a	:	bìa	‘cactus’	bìa gōlī	‘old cactus’	
	L_b	:	bìa	‘animal’	bīa gōlī	‘old animal’	

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A minimal pair is given in (19b). The reason for this differential behavior is again that a previous stage of the language contrasted four tone heights: L_b was once a tone between L and M, while L_a was simply /L/.

Another case of simplifying tone heights occurs when languages lose their downsteps. The widespread Eastern Bantu tone rule known as Meeussen's Rule by which /H-H/ becomes [H-L] (or [H-Ø], depending on the language) is the synchronic product of an earlier change H-ꜜH > H-L and is thus a telescoped version of two separate changes: *H-H > H-ꜜH > H-L. First, a sequence of Hs is realized with downsteps, as Odden (1982) originally documented in Shambala [Bantu; Tanzania], followed by the change of ꜜH to L (or Ø). On the other hand, Aghem [Western Grassfields Bantu; Cameroon] changed in the opposite direction. It once had M tone like Kom (recall (4a), (11), (13e)), which it reinterpreted as ꜜH (Hyman 1986b):

(20) a. *H-M > H-ꜜH
b. *H-M-M > H-ꜜH-H

Recall that because H-M and H-H usually represent the same tonal interval, the change in (20a) is not a phonetic change, rather a structural one: What started out as a paradigmatic contrast between H and M is now a syntagmatic contrast between H and ꜜH. However, given the differences between M and ꜜH outlined in (15), there are consequences. Thus, when the change in (20b) affects *H-M-M, this sequence merges with *H-M-H.

The above examples represent some of the ways in which tone systems can change, in some case leading to a loss of certain tonal contrasts. In fact, the change of multiple tonal contrasts to few contrasts to none can occur in stages. First, there are the different ways in which relatively dense tonal contrasts can become sparse: (i) four heights > three heights > two heights; (ii) H, L > H, Ø; (iii) omnisylabic distributions become restricted, such that only certain TBUs contrast tone. A consequence of this is that tone, a paradigmatic exponent of morphemes, can come to be realized syntagmatically at the phrase level, as in the Giryama long-distance H tone shift in (8). This in turn can lead to loss of tone entirely, as happened in Swahili.

5 From lexical to phrasal tone

I will now conclude with examples showing how lexical tone comes to have a phrasal character. The first case comes from Kalabari [Ijoid; Nigeria], which assigns tonal schemas by specific syntactic constructions (Harry 2004; Harry and Hyman 2014). Whenever the noun is non-initial in its noun phrase, it loses its

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tones and receives one of four "melodies" depending on the word class of the preceding modifier. Thus the /H-H/ tone of /námá/ 'animal, meat' has four different realizations after the all L words in (21).

(21)	*construction*	*phrasal tones*	*example*	
a.	N_{poss} + N	HL	*tʊ̀ɓɔ̀ námà*	'the child's animal'
b.	PRO_{poss} + N	HLH (→ H-↓H)	*ìnà ná↓má*	'their animal'
c.	Det + N	LH	*tɔ̀ nàmá*	'which animal?'
d.	Quant + N	L	*jà nàmà*	'some meat'

As seen in (21a), a possessive noun (N_{poss}) will assign a HL tone pattern to the possessed noun, while a possessive pronoun (PRO_{poss}) will assign a HLH melody, as in (21b), where the HLH sequence is simplified to H followed by downstepped ↓H. Similarly, (21c) shows that a determiner (Det) will assign a LH melody, while quantifiers (including most numerals) will assign a L melody, as in (21d). The following shows the mapping of the N_{poss} HL and PRO_{poss} HLH melodies over the sequence of possessed nouns féní 'bird' + námá 'meat':

(22)									
a.	*tʊ̀ɓɔ̀*	+	*féní*	+	*námá*	→	*tʊ̀ɓɔ̀*	*fènì nàmà*	'the child's bird's meat'
	L-L		H-H		H-H		L-L	H L	
b.	*ì*	+	*féní*	+	*námá*	→	*ì*	*fènì nàmá*	'my bird's meat'
	L		H-H		H-H		L	H L H	

The diachronic analysis accounting for the N_{poss} HL melody starts with the reconstruction of a H tone connective (genitive) particle which occurred between the two nouns: N_{poss} + CONNECTIVE + Noun. Three steps are involved: (i) reduction: all but the first word of a noun phrase was reduced to L after a connective; (ii) the segments of the connective marker fell out, with its H tone being assigned to the following all L word; (iii) the resulting patterns were generalized to the entire construction, thus assigned to the NP as a whole. In support of this analysis, Kalabari maintains two connectives, *ná* and *ɓɛ́,* used in specific constructions only: *ná* is used to mean 'associated with' a particular people or language, and *ɓɛ́* is used to indicate something associated with a place (whether a proper or common noun). As seen in the following examples, both have H tone and both make the following noun all L:

(23)		
a.	*Káláɓàrì ná fènì*	'Kalabari bird, a bird that the Kalabaris have'
	HH L L H L	(cf. féní 'bird')
b.	*Dégémà ɓɛ́ fìè*	'Degema food' (cf. fíé 'food')
	H H L H L	
c.	*wá↓rí ɓɛ́ nùmè*	'the house song' (cf. númé 'song')
	HLH H L	

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The underlined HL melody of the connective + following noun presumably also occurred in other N_{Poss} + N constructions where the connective has since been lost. A similar story can be told about the PRO_{Poss} + N HLH melody, where the final H is from a lost final determiner morpheme (see Harry and Hyman 2014 for more discussion).

The second case of phrasal tonology comes from Chimwiini [Bantu; Somalia], which has evolved into an extremely restricted privative H vs. Ø tone system (Kisseberth 2009). First, there is only grammatical tone in Chimwiini. Second, the H tone is limited to one of the last two syllables, i. e. final H vs. penultimate H. (It is tempting to attribute this pattern to the areal influence of Somali, which however assigns a H to final vs. penultimate moras, not syllables; cf. *túug* 'thief', *tuúg* 'thieves'). As seen in (24), first and second person subjects condition final H vs. third person which conditions penultimate H:

(24)		singular			plural		
1st pers. }	final H:	*n-*	*ji:lé*	'I ate'	*chi-*	*chi-ji:lé*	'we ate'
2nd pers. }		≠ {	*ji:lé*	'you sg. ate'	*ni-*	*ni-ji:lé*	'you pl. ate'
3rd pers.	penult H:		*jí:le*	's/he ate'	*wa-*	*wa-jí:le*	'they ate'

As indicated, the only difference between the 2nd and 3rd person singular (noun class 1) is tonal. The first/second person final H vs. third person penultimate H tone in Chimwiini is actually a property of the phonological phrase (Kisseberth 2009). Thus, the tonal difference attributable to the subject of the verb is realized on the object noun in (25).

(25) a. *jile: n̪amá* 'you sg. ate meat' *jile ma-tu:ndá* 'you sg. ate fruit'
b. *jile: n̪áma* 's/he ate meat' *jile ma-tú:nda* 's/he ate fruit'

Such a long distance effect is reminiscent of the example in (8) from Giryama which, however, has a fuller tone system (see Volk 2011). Although a single final or penultimate H is possible on the sentences in (26), Kisseberth also shows that depending on the information structure, the phonological phrases may be nested. In this case more than one H tone is realized:

(26) a. *Ø-wa-t̪ind̪il̪il̪e w-a:ná] n̪amá] ka: chi-sú]* 'you sg. cut for the children meat with a knife'
b. *Ø-wa-t̪ind̪il̪il̪e w-á:na] n̪áma] ka: chí-su]* 's/he cut for the children meat with a knife'

That the subject prefixes should have such a phrasal effect raises the question of what exactly the H tone contrast is: Is it still "tone"? It clearly has morphological properties, as the first/second vs. third person distinction is responsible for the contrast. It is also phonological, as Kisseberth (2009: 6) argues that the

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phonological phrase is a "phonological construct", which however is defined by syntactic configuration (time adverbials like 'the day before yesterday' would fall outside the phonological phrase). Finally, since the nested realizations in (26) are intimately tied to the expression of information structure, should the H tones be considered "intonational"? The major argument against this is functional: It would be strange for there to be an intonation that expressed first/second vs. third person subjects.

6 Summary

In the preceding sections I first considered the different factors that may determine not only tonogenesis, but also tonal splits. It was suggested that it is not always possible to reconstruct a proto-tone system, rather a system of earlier laryngeal contrasts that subsequently develop into different tonal contrasts in the various daughter languages. This appears to be the case, for example, in Kuki-Chin vs. Proto-Bantu (or even earlier in Proto-Bantoid) where two tones *H and *L are safely reconstructed with direct reflexes in the present day offspring languages. While emphasis in studying tonal splits has focused either on voicing distinctions on onsets or on phonation contrasts, I showed that multiple tone height systems can derive by simple interaction between two tones *H and *L, especially if certain TBUs are lost. I then considered the reverse situation whereby a multiple tone height system may lose a contrast to change from four to three or from three to two contrasting tone heights. Finally, the contrasts in a two-height tone system can change from being primarily paradigmatic (with lexical minimal pairs etc.) to phrasally syntagmatic. The last stage is the complete loss of tone, or "tonoexodus" (Lea 1973; Green 2010; Ratliff 2015).

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Jonathan P. Evans

Common Tone Sandhi Processes across Sino-Tibetan Languages

Abstract: The present study aims to uncover similar patterns in tone sandhi processes that recur across prosodically diverse languages of the Sino-Tibetan family. On the one hand, the Sinitic branch of the family, comprised of Chinese "dialects," has lexical tone specified on almost all syllables. On the other hand, western Tibeto-Burman languages typically exhibit sparse tone specification. In spite of these differences, it is argued herein that across both groups of languages, dominant spreading tones are aligned with the left edge of the prosodic unit, and spread rightward. On the other hand, while dominant non-spreading tones in Sinitic are aligned with the right edge of their domain, Tibeto-Burman languages display variable placement of such tones. Support for this typology comes from both previously published work, as well as recent fieldwork by the author. In addition to previously mentioned explanatory principles that could contribute to the observed typology, it is proposed that the accent-like properties of dominant tones play a role, as well as typical word length and the language-specific historical path of tonogenesis. After presenting evidence from Sino-Tibetan languages, additional support for the typology is drawn from geographically distant, unrelated languages.

Keywords: dominant tones, tone spreading, accent, typology, Tibeto-Burman languages

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1 Introduction

East Asian tone systems are known for their larger tonal inventories (3 to 11 contrastive tones), for specifying tone on nearly every syllable, for contour tones that function as units, for a lack of floating tones, etc. (cf. Yip 2002; Chen 2007; Brunelle and Kirby 2015; among others). These features tend to be found among Sinitic languages (Chinese "dialects"), Tai-Kadai, Vietnamese, the Yi-Burmese branch of Tibeto-Burman,[1] etc. Most languages in the large Sino-Tibetan family are tonal, and "all branches of the family have at least some tonal members" (Matisoff 1999). For languages of Mainland Southeast Asia, "monosyllabic languages tend to have more tones than sesquisyllabic or polysyllabic languages," while 20 % of languages surveyed do not display tonal distinctions (Brunelle and Kirby 2015).

In spite of the ubiquity of tone systems, there is no agreed-upon reconstruction of tones at the level of Proto-Sino-Tibetan despite several attempts (Benedict 1972; Weidert 1987). Although tone systems have been reconstructed for some subfamilies, evidence for an even earlier tone system is inconclusive (Mazaudon 1985, 1988; Matisoff 1994). On the Sinitic side, it is widely held that Old ("Archaic") Chinese did not have tones (Pulleyblank 1962; Mei 1970; Baxter 1992). The first description of a tonal system in Chinese dates to the early 6th century AD.

Recent documentation of Sino-Tibetan languages spoken in the Himalayan mountains, to the west of the abovementioned languages, yields descriptions of languages with tonal inventories and properties quite different from those found in Sinitic, Tai languages, etc. Among these languages one finds patterns that are common among Bantu languages and Japanese dialects, such as: smaller inventories of just one to two underlying tones, toneless lexical syllables, floating tones, contours consisting of a sequence of level tones, morphological tones, etc. (Matisoff 1999; Evans 2008; Hyman 2010). Within this article, these are termed western Tibeto-Burman languages in order to differentiate them from the more monosyllabic "Sino-spheric" Tibeto-Burman languages (Matisoff 1994, 1999).

In spite of these phonological differences, there are commonalities in the patterns of tone reduction that occur due to tone sandhi. That is, across this large group of languages, there is a tendency for certain tones or tone bearing units (TBU) in a prosodic unit to be privileged and keep their underlying tonal values, while other syllables undergo tonal changes. For the purposes of this

1 I do not assume that the Sino-Tibetan language family was historically bifurcated into a Sinitic branch and a Tibeto-Burman branch. However, given the typological differences between Sinitic languages and the rest of the family, the term "Tibeto-Burman" is used herein as a shorthand notation for "the non-Sinitic languages of the Sino-Tibetan family."

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study, “tone sandhi” refers to this kind of change. Privileged or dominant tones (Zhang 2007) affect the larger prosodic word or phrase in characteristic ways, depending on whether they are located with reference to the left or right edge of the prosodic unit.

This study begins with Zhang’s (2007) observations on the tone sandhi asymmetries found in Chinese dialects, and asks whether those asymmetries are also found in western Tibeto-Burman languages. Zhang observes that left-dominant and right-dominant tone sandhi systems have different tendencies. Namely, in left-dominant tone sandhi, the tone of the initial syllable typically extends rightward to assign pitch to additional syllable(s) in the prosodic domain. On the other hand, the tendency for right-dominant sandhi is for earlier tones to be replaced by paradigmatic insertion. Zhang expresses the tendencies as typological universals, which he summarizes roughly as follows:

In a Sinitic language with both left-dominant and right-dominant tone sandhis:

– If the left-dominant sandhi involves paradigmatic insertion, then the right-dominant sandhi also involves paradigmatic insertion;
– If the right-dominant sandhi involves tone extension, then the left-dominant also involves tone extension.

For many tonal languages in this family, within a prosodic unit, a particular location, tone, or tone-bearing unit (TBU) is privileged for the realization of its specified pitch, while other locations/tones undergo changes. This privileged status has been called prosodic headedness (Yip 2002: 176), dominance (Zhang 2007), etc. It is the claim of this present study that among Sino-Tibetan languages, there are two principal ways in which the dominant tone is expressed, with different word-level properties ensuing. First, some tone systems align the privileged tone with regard to the left edge, in which case, tonal influence tends to spread rightward (section 2). There do not appear to be any uncontroversial cases within Sino-Tibetan of spreading tones associating with the right edge and spreading leftward. Second, within Sinitic languages, non-spreading dominant tones display a strong tendency to be located at the right edge; however, within Tibeto-Burman languages, these tones can be located anywhere within the word (section 3). In this kind of sandhi, pitch is assigned to non-dominant syllables paradigmatically.

I want to be explicit about the claim that similar processes are at work in spite of the fact that in Sinitic, tone is specified on nearly every syllable, while many western Tibeto-Burman languages have very low lexical “tonal density” (Gussenhoven 2001; Hyman 2018), in which tone may be specified as seldom as once per polysyllabic prosodic word. The types of dominant tone sandhi observed in Sinitic can cause Sinitic tone patterns at the phonetic level to resemble the

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sparsely specified tone systems of western Tibeto-Burman. Because this surface resemblance exists in spite of vastly differing lexical inputs and language histories, this study seeks shared phonetic and phonological explanatory principles.

Among the Sino-Tibetan languages, tone systems arose at diverse times and places, within multiple sub-families. In spite of divergent language histories, and despite more sparsely specified tone systems among western Tibeto-Burman languages, similar tone reduction processes are found in both Tibeto-Burman and Sinitic.

This finding suggests that the tone sandhi processes that are common to both language groups should reflect general phonetic and phonological principles, as well as common historical trends (section 4). These principles can be seen to also affect tone sandhi in languages elsewhere in the world (section 5).

2 Spreading dominant tones

Although there is a strong preference for rightward spreading of tones, Zhang (2007) discusses two Sinitic cases in which tones appear to spread leftward. First, in the Southern Wu dialect Wenzhou, in disyllables with a falling tone on the second (final) syllable, the word is sometimes pronounced with a contour that falls over both syllables, suggesting leftward spread of the tone (analysis based on Zheng-Zhang 1964). However, based on his own fieldwork corpus, M. Chen (2007: 476–490) argues that Wenzhou surface tones on disyllables result from interaction between both the initial and final syllable. Thus, whether Wenzhou has leftward spreading is inconclusive.

Second, tone sandhi in Danyang, a Wu dialect of Jiangsu, is typified by rightward spreading of the leftmost tone (Lü 1980, cited in Zhang 2007 and M. Chen 2007: 325–341 and also in references in both later publications). However, for Danyang words ending in a final Mid tone, all preceding syllables are also Mid-toned. As this is the only example cited of leftward spreading in this language, it is difficult to rule out a contrary analysis of paradigmatic replacement by a mid tone, which may turn out to be a default specification. With the acknowledgment that the two documented cases of leftward tone spreading are problematic, we make the following claim for Sino-Tibetan tone sandhi:

Claim 1: If a tone spreads, then it is aligned with the left edge of its prosodic domain, and spreads rightward.

One reviewer asked if the underlying form is /Ø-L/ and the surface form is [L-L], how would one decide whether the tone had aligned left and spread rightward,

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or if it had simply spread leftward from its original position. For the languages examined in this study, unambiguous cases, such as those of Shixing, are used to resolve the ambiguous ones.

Claim 1 allows for non-spreading dominant tones also to be aligned at the left edge of their prosodic domains.

Left-dominant spreading tone systems are found among the Northern Wu dialects of Chinese and among Tibeto-Burman. Shanghai, a dialect of Northern Wu, presents a well-documented case of left-edge dominant tone, operating at the lexical level (cf. Zee and Maddieson 1979; Duanmu 1999; Yip 2002: 187; M. Chen 2007: 307; Y. Chen 2008; Zhu 1999, 2006, among others). Table 1 presents Zee and Maddieson's (1979) analysis of Shanghai tone spreading (Some phonetic details related to the effect of [ʔ] on pitch have been left out of the table):

Tab. 1: Shanghai lexical tone spreading (Zee and Maddieson 1979: 116–117).

T	**σ**	**σ σ**	**σ σ σ**	**σ σ σ σ**
/HL/	[HL]	[H.L]	[H.M.L]	[H.M.L↑.L]
/MH/	[MM↑]	[M.M↑]	[M.H.L]	[M.H.M.L]
/LH/	[LM↑]	[L.M↑]	[L.H.L]	[L.H.M.L]
/Hʔ/	[H]	[H.H]	[H↓.H.L]	[H↓.H.M.L]
/LHʔ/	[LM↑]	[L.LM↑]	[L.L.LM↑]	[L.H.M.L]

According to Zee and Maddieson (1979), Duanmu (1999) and Y. Chen (2008), for words of three or more syllables, all syllables after the second receive default tone assignments, moving toward L. That is, the tone of the initial syllable in Shanghai spreads over one disyllabic foot, and underlying tones on later syllables in the word are not expressed. Zhu (2006) calls this left-aligned dominant tone spreading "Type A" sandhi in Shanghai (also cf. Xu, Tang, and Qian 1981–3; Xu and Tang 1988). Zhu (2006) also documents a right-edge based tonal reduction ("Type B") which occurs at the phrasal level, and is presented in section 3.

Although N. Wu appears to be the only documented left-dominant Sinitic language, left-dominant tone reduction is common among non-Sinitic languages. Among these languages, the distance that a spreading tone can travel is a variable that ranges from a single syllable, to spreading all the way to the right edge of the word. In Shixing (or Xumi, Qiangic, Sichuan, China; ISO 69-3: sxg), lexical tones (H, L, HL) spread rightward from the leftmost syllable all the way to the right edge of the prosodic word, as in Tab. 2. Tones /L, HL/ merge to /L/ in polysyllables, and an all /L/-toned word has postlexical /H/ added to the rightmost syllable. In this respect, Shixing resembles the N. Wu dialect Wuxi, in which an initial HHL tone is replaced by LLH, which then spreads rightward (Chan and Ren 1988).

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Tab. 2a: Schematic of Shixing tone spread.

$σ_1$ \ $σ_2$ ($σ_3$)	/H/	/L/	/HL/
/H/		/H/	
/L/		/L/	
/HL/		[L(L)H]	

Tab. 2b: Examples of tone spread in Shixing trisyllables (Chirkova and Michaud 2009, tone transcription slightly modified).

$σ_1$ \ $σ_2σ_3$	/kʰa^{H}-miæ/ 'footprint'	/m̥iæ^{L}-tsũ/ 'tail'	/ɲɜ^{HL}-mi/ 'heart'
/ʔɛ̃^{H}/ 'sheep'	[ʔɛ̃^{H} kʰa^{H} miæ^{H}]	[ʔɛ̃^{H} m̥iæ^{H} tsũ^{H}]	[ʔɛ̃^{H} ɲɜ^{H} mi^{H}]
/rõ^{L}/ 'horse'	[rõ^{L} kʰa^{L} miæ^{H}]	[rõ^{L} m̥iæ^{L} tsũ^{H}]	[rõ^{L} ɲɜ^{L} mi^{H}]
/bõ^{HL}/ 'yak'	[bõ^{L} kʰa^{L} miæ^{H}]	[bõ^{L} m̥iæ^{L} tsũ^{H}]	[bõ^{L} ɲɜ^{L} mi^{H}]

Although spreading as far as the third syllable is reported, Chirkova and Michaud state that Shixing demonstrates a tendency toward no more than two units in a prosodic word, with disyllables greatly prevailing in number over longer words. The left-edge alignment of tone is a strong enough constraint in Shixing that if the first syllable is a toneless prefix, then the tone of the second syllable is relocated to the left edge and spreads rightward, in the same way as an initial tone in a compound (Tab. 3).

Tab. 3: Left edge alignment and spreading of tone following prefix in Shixing.

prefix		verb root		tone shift	tone spread	
/miæ-/	+	/ɕĩ^{H}/	→	/miæ^{H}-ɕĩ/	[miæ^{H} ɕĩ^{H}]	'look downward'
/kʰu-/	+	/dzõ^{L}-dzõ/[dzõ^{L}-dzõ^{H}]	→	/kʰu^{L}-dzõ-dzõ/	[kʰu^{L}-dzõ^{L}-dzõ^{H}]	'run inward'
/miæ-/	+	/khɹ^{HL}/	→	/miæ^{L}-xɹ/	[miæ^{L} xɹ^{H}]	'throw downward'

Evidence that the tone relocates to the first syllable, rather than spreading leftward, comes from the behavior of HL. The H does not spread leftward resulting in a *HLL sequence. Rather, the entire /HL/ tone is linked to the first syllable, causing its tonal pattern to merge with that of L.

In the Muka dialect of Southern Qiang (Qiangic, Sichuan, China: ISO qxs), the tone of the first morpheme spreads rightward to the right edge of the prosodic word, which never exceeds four syllables (author fieldwork). Possible tones include L, H, HL, and LHL. Like Shixing, words receive a postlexical H tone on the

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rightmost syllable. In Tab. 4, /sé.ŋ̥i/ [sé-ŋ̥í] 'liver' occurs as the second element in compounds whose pitch patterns are determined by the tonal specification of the first morpheme.

Tab. 4: Left edge alignment and spreading of tone onto /sé.ŋ̥i/ [sé-ŋ̥í] 'liver' (Muka Qiang).

H	/ŋu^{H}-se^{H}.ŋ̥i/	→	/ŋu^{H}-se.ŋ̥i/	[ŋu^{H} se^{H} ŋ̥i^{H}]	cow liver
L	/i^{L}-se^{H}.ŋ̥i/	→	/i^{L}-se.ŋ̥i/	[i^{L} se^{L} ŋ̥i^{H}]	chicken liver
H.L	/ʐu^{HL}-se^{H}.ŋ̥i/	→	/ʐu^{H}-se^{L}.ŋ̥i/	[ʐu^{H} se^{L} ŋ̥i^{L}]	horse liver
L.H.L	/ksə^{L}.zə^{HL}-se^{H}.ŋ̥i/	→	/ksə^{L}.zə^{H}-se^{L}.ŋ̥i/	[ksə^{L} zə^{H} se^{L} ŋ̥i^{L}]	musk deer liver

For the Wadu Dayang dialect of Pumi (Qiangic, Sichuan and Yunnan, China: ISO pmi), Daudey (2014) presents a tone system in which H, L, HL or LH spread rightward from the first morpheme of a noun or a verb to the rest of the prosodic domain, which can include disyllabic clitics. Table 5 illustrates tone spreading of mono- and disyllabic nouns and verbs. Illustrations of these forms as well as trisyllabic tone patterns may be found in Daudey (2014: 71–79).

Tab. 5: Rightward tone spreading of Pumi mono- and disyllables.

/σ^{H}/	→	[$\sigma^{H}\sigma^{H}\sigma^{L}$]	/$\sigma^{H}\sigma$/	→	[$\sigma^{H}\sigma^{H}\sigma^{L}\sigma^{L}$]
			/$\sigma\sigma^{H}$/	→	[$\sigma^{L}\sigma^{H}\sigma^{H}\sigma^{L}$]
/σ^{L}/	→	[$\sigma^{L}\sigma^{L}\sigma^{H}$] ~ [$\sigma^{L}\sigma^{H}\sigma^{H}$]	–		
/σ^{HL}/	→	[$\sigma^{H}\sigma^{L}\sigma^{L}$]	/$\sigma^{HL}\sigma$/	→	[$\sigma^{H}\sigma^{L}\sigma^{L}\sigma^{L}$]
			/$\sigma\sigma^{HL}$/	→	[$\sigma^{L}\sigma^{H}\sigma^{L}\sigma^{L}$]
/σ^{LH}/	→	[$\sigma^{L}\sigma^{H}\sigma^{H}$]	/$\sigma\sigma^{LH}$/	→	[$\sigma^{L}\sigma^{L}\sigma^{H}\sigma^{H}$]

Varying analyses for different dialects of Pumi tone are found in Matisoff (1997), Ding (2006), Greif (2010), and Jacques (2011). However, all studies of polymorphemic forms in Pumi show some kind of tonal alignment with the left edge of the prosodic unit, with rightward spreading of that tone which overrides other underlying tones.

Rightward tone spreading is also the norm in the Tamangic group (Bodish, Nepal), where tones also spread onto suffixes. Table 6 shows Manange (ISO nmm) tone spreading in disyllabic compounds; similar sandhi patterns are found in the other Tamangic languages (Tamang, Thakali, Gurung). Tamangic words can be longer than two syllables, especially when Nepali loan words are considered (Mazaudon 1973).

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Tab. 6: Manange tone spreading (Hildebrandt 2005, tone marks adjusted).

L	[tʃʰi^{22}] 'lard'	[kju^{33}] 'water'	→	[tʃʰu^{22} ku^{21}] 'cooking oil'
HM	[nɑ^{53}] 'jungle'	[huŋ^{33}] 'copse'	→	[nɑ^{54}huŋ^{33}] 'forest'
ML	[mʷi^{42}] 'silver'	[ʃʌ^{22}] 'flesh' (?)	→	[mʷi^{32} ʃʌ^{21}] 'money'

Closely related to the Tamangic languages are the Tibetic languages. In Kami, a dialect of Khams Tibetan (Tibetic, Sichuan, China; ISO khg), the tone of an initial syllable spreads over a noun compound (K. Chirkova 2014); cf. Tab. 7

Tab. 7: Kami Tibetan tone spreading.

/kɔ̃^{H}/	'foot'	/ʑ̥i^{H}/	'trace'	→	[kɔ̃^{H}-ʑ̥i^{H}]	'footprint'
/kɔ̃^{H}/	'foot'	/Ndzui^{L}/	'finger'	→	[kɔ̃^{H}-Ndzui^{H}]	'toe'
/jɔ^{L}/	'hand'	/ʑ̥i^{H}/	'trace'	→	[ja^{L}-ʑ̥i^{L}]	'hand print, finger print'
/ʒa^{L}/	'yak'	/χɔ^{H}/	'meat'	→	[ʒa^{L}-χɔ^{L}]	'yak meat'

A similar process has been observed in Meithei (Manipur, India; ISO mni), where the tone of the first syllable root spreads rightward over toneless syllables (Chelliah 1997: 25–48). It is not clear from the published analysis whether root tones are relocated to prefixes and spread rightward, or whether they also spread leftward onto a toneless prefix.

In Lizu (Ersuish, Sichuan, China; ISO ers) compounds, the tone of the first word is "realized over the whole compound domain" (Chirkova and Chen 2013; see also Yu 2009). Combining the phonological analyses of these two reports, we see that Lizu monosyllables may be analyzed as occurring with HL or LH tones, but longer words with HL, LH, or M (or toneless). Contour tones spread over two syllables, becoming L-H and H-L. In compounds, the tone of the first morpheme spreads over the entire word. Due to complexities in the tone spreading that go beyond the scope of this article, tones are only marked on the first syllable in this study (Tab. 8). For details on tone realization, see Chirkova and Chen (2013). Table 8 shows that in compounds, only the first morpheme's tone is realized.

Tab. 8: Left aligned tone spreading in Lizu.

M	/sə^{M} Nge/	'lion'	+	/me^{HL} Ntʃʰo/	'tail'	→	/sə^{M} Nge me Ntʃʰo/	'lion's tail'
HL	/to^{HL} Nbu/	'nose'	+	/wu^{HL} li/	'head'	→	/to^{HL} Nbu wu li/	'tip of the nose'
LH	/mu^{LH} tsə/	'cat'	+	/Ndo^{HL} qo/	'eye'	→	/mu^{LH} tsə Ndo qo/	'cat's eye'

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Alignment with the left edge can exclude prefixes. In Yongning Na (Naic, Yunnan and Sichuan, China; ISO nxq), tones on verbs align with the root and spread rightward; prefixes always occur with default M tone (Tab. 9).

Tab. 9: Yongning Na verb tonal patterns (Michaud 2008).

	/H/	/M/	/L/	/MH/
Negative	M.<u>H</u> [mɤ^{33} dzɯ^{55}]	M.<u>M</u> [mɤ^{33} li^{33}]	M.<u>L</u> [mɤ^{33} dzi^{11}]	M.<u>MH</u> [mɤ^{33} tʰæ^{35}]
Perfect	M.<u>H</u>.L [lə^{33} dzɯ^{55} zə^{11}] 'to eat'	M.<u>M</u>.M [lə^{33} li^{33} zə^{33}] 'to look'	M.<u>L</u>.L [lə^{33} dzi^{11} zə^{11}] 'to strike'	M.<u>M</u>.<u>H</u> [lə^{33} tʰæ^{33} zə^{55}] 'to bite'

In Nungish languages, such as Dulong and Rawang, words tend to have a "sesquisyllabic" (Matisoff 1999) structure, in which the initial CV sequence (presyllable) of a word is prosodically light, with a neutral vowel. The nuclear syllable has one of three tones: H, M, or L in Mvtwang (Morse 1963; Nathan Straub, p.c.) or H, HM, ML in Central Dulong (H. Sun 1982). Central Dulong tones have also been analyzed as level, falling, and reduced (LaPolla 2001). In longer words and phrases, the first nuclear syllable tends to be stressed, with its tone spreading rightward. Thus, in the Rvmøl dialect of Rawang, the falling tone on the second syllable of /kəlɯm^{HL}gəmzisi/ separates into H and L tones, with rightward spreading: [kʰə.løm^{H}gəm^{L}zi^{L}si^{L}] (Nathan Straub, p.c.). Similarly, "in rapid speech, the phonological word becomes longer, expanding from one or two syllables to include an entire phrase, and the tones of stressed nuclear syllables spread rightward over the entire word." (Straub, p.c.).

In conclusion, in western Tibeto-Burman languages, as in Sinitic, dominant tones that spread are located at the left edge of their domain and spread rightward. Even though western Tibeto-Burman languages often allow longer morphological and phonological words than are common within Sinitic, there is still a strong preference for the left edge as the location of dominant tones that spread.

3 Non-spreading dominant tones

Zhang (2007) points out that in Sinitic, dominant tones on the right edge are accompanied by paradigmatically inserted tones earlier in the word. For example, Shanghai, which has been documented above with left-dominant spreading tones, also has a less frequently documented pattern in which the rightmost tone

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is retained, with neutralization of non-final tones. Specifically, in this “Type B” sandhi, which applies to phrasal disyllables, the final syllable keeps its citation tone, while the penultimate syllable receives a mid level tone (Zhu 2006: 46–47). For the following forms, they can be treated as words, with left-aligned tone, or as noun-phrases, with right edge tone dominance (Tab. 10).

Tab. 10: Type A vs. Type B tone sandhi in Shanghai (Zhu 2006: 36).

		Type A (left edge)	**Type B (right edge)**
/pao^{MH} tao^{HL}/	‘treasure knife’	[pao^{M}tao^{H}]	[pao^{M}tao^{HL}]
/chieu^{HL} seu^{HL}/	‘autumn harvest’	[chieu^{H} seu^{H}]	[chieu^{M} seu^{HL}]

Within Sinitic, right-dominant tone patterns are found in “most of Min, Southern Wu, and Mandarin” (Zhang 2007). The most well-documented case of Chinese tone sandhi is probably the rule by which the Standard Mandarin Low-Falling-Rising tone (a.k.a. Tone 3) becomes Rising (Tone 2) before another Low syllable. That is, while there are four tonal possibilities on lexical monosyllables, there are only three possibilities on a syllable preceding a Low tone. Both the trigger and target syllables must be within the same phonological grouping, so that the dominant tone occurs on the right edge of its foot, and the reduced possibilities are located on the preceding syllable.

A more sweeping example of right edge dominance with paradigmatic tone insertion occurs in the Southern Wu dialect Wuyi (Zhang 2007; Fu 1984). Non-final syllables become H or L, while final syllables retain their citation form, called T# in Tab. 11.

Tab. 11: Right edge tone dominance in Wuyi Chinese disyllables.

σ1 \ σ2	**24**	**213**	**53**	**31**	**55**	**13**
24						
213			H-T#			
53						
31						
55			L-T#			
13						

One other case of right-tone dominance exists in the tone circles found in Min dialects. In Taiwanese (Southern Min), citation tone is only retained in final position. In non-final position, each sonorant-final citation tone changes according to the

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sequence shown in Fig. 1 (M. Chen 2007, among others). A key difference between the patterns of Min and those of other examples in this study is that almost all of the Southern Min tonal distinctions are maintained in non-dominant position, but they are preserved with sandhi tones, such that the underlying tonal category is expressed, but only within that context.

$$\begin{tikzcd}
 & & 21 \arrow[dr] & \\
24 \arrow[r] & 22 \arrow[ur] & & 53 \arrow[dl] \\
 & & 44 \arrow[ul] &
\end{tikzcd}$$

Fig. 1: Taiwanese S. Min tone circle.

Because Sinitic paradigmatic tone sandhi processes are well-documented, this present study does not go into more detail about non-spreading dominant tones in those languages. For Tibeto-Burman languages, such tones can be located anywhere, as stated in Claim 2:

Claim 2: Non-spreading dominant tones in Tibeto-Burman languages can be located on any syllable in their prosodic domain.

From the perspective of formal logic, if the only claim made in the article were Claim 1 (left-edge alignment of spreading tones), then Claim 2 would follow by inference. However, for the purpose of organizing and discussing the data, it seems helpful to make the second claim explicit.

As observed among Sinitic languages, non-spreading dominant tones in Tibeto-Burman can be located relative to the right edge of a word or stem, as is common in Jiarongic (or Rgyalrongic) languages. For example, in the Zhuokeji (or Cogtse) variety of Situ, (Sichuan, China: ISO jya), contrastive H (underlying Ø), HL and L are pronounced on the last syllable in the prosodic word (Lin 2012). Tonal assignments on earlier syllables occur paradigmatically, as can be inferred from Tab. 12, excerpted from Lin (2012).

Tab. 12: Right edge tone assignment in Zhuokeji Jiarong (Lin 2012).

σ	**σσ**	**σσσ**
H	L.$\underline{H}$	L.H.$\underline{H}$
HL	L.$\underline{HL}$	L.H.$\underline{HL}$
L	H.$\underline{L}$	L.H.$\underline{L}$

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Alignment with regard to the right edge does not infer that only the rightmost syllable receives a lexical tone specification. In the Caodeng (or Tshobdun) language (Sichuan, China: ISO jya), lexical tone falls on the stem-penultimate syllable. The counting requirement assigns tone to the prefix of a monosyllabic verb root, as in “roll” (Tab. 13).

Tab. 13: Caodeng Jiarong penultimate tone location (Sun 2008).

kɐ́d-^{n}dʒev	to roll’	kɐ-qɐ́se	to look for’
kɐ-sɘ́-^{n}dʒev	to cause to roll’	kɐ-qɐsɘ́se	to look for each other’

In Mianchi Qiang (Sichuan, China: ISO qxs) only the leftmost H tone in a prosodic word is pronounced; toneless syllables receive a default L: /ti^{H}/ ‘bear’ + /χua^{H}/ ‘thin’ à /ti^{H}-χua/ à [ti^{H}-χua^{L}] “thin bear” (Evans 2008). Thus, the dominant, non-spreading H can be assigned to the initial syllable of a Mianchi Qiang prosodic word. In other words, the leftmost H is dominant, and no other H can occur in the same domain.

Tawrã (Arunachal Pradesh, India and Tibet, China: ISO mhu) has the tones H, HL, LH, and Ø, which surfaces as M tone (author fieldwork). Tone is only specified once in a word; L tone on the first syllable spreads (‘horse’), but other tonal specifications do not (Tab. 14).

Tab. 14: Tawrã tone placement.

	H	**HL**	**M**	**L**
	/ha^{H}/ ‘thigh’	/nja^{HL}/ ‘wool strip’	/nja/ ‘face’	/nja^{L}/ ‘feel pain’
Syll 1	/ga^{H}.ʔa/ [ga^{H}.ʔa^{M}] ‘nearby’	/ts^{h}ũ^{HL}daŋ/ [ts^{h}ũ^{HL}daŋ^{M}] ‘pole star’	/halo/ [ha^{M}lo^{M}] ‘moon’	/ga^{L}wri/ [ga^{L}wri^{L}] ‘horse’
Syll 2	/haza^{H}/ [ha^{M}za^{H}] ‘king’	/tamjum^{HL}/ [ta^{M}mjum^{HL}] ‘monkey’		/tatʃ^{h}oŋ^{L}/ [ta^{M} tʃ^{h}oŋ^{L}] ‘furniture’

Tawrã trisyllabic morphemes (which are rare and may all be borrowed from Indo-Aryan languages) also have tone specified on just one syllable. The possibilities seem to be limited to H on the first or second syllable, or HL on the second syllable: /tha^{H}kala/ ‘shadow’, /katsab^{H}ba/ ‘tortoise’, /adaj^{HL}tjang/ ‘scorpion’.

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Non-spreading tones can be assigned exclusively to the left-most position, as in Lhasa Tibetan, where initial syllables are lexically specified L or H (/ka^{L}/ 'saddle', /ka^{H}/ 'order'), and all non-initial syllables bear H tone (Sun 1997, 2003). Lhasa final syllables can have a falling pitch that is historically conditioned by a glottal coda; e.g., [k^{h}am(ʔ)^{HL}] from Written Tibetan *khams*, 'the Khams region'.

In conclusion, a subtle distinction must be drawn between the attested sandhi systems of Sinitic versus western Tibeto-Burman languages. For both groups of languages, dominant spreading tones are aligned with the left edge of their domain. However, for dominant tones that cause paradigmatic tone assignment to other syllables, Sinitic languages as a whole show a strong preference for the right edge of the word, while Tibeto-Burman languages do not.

The next two sections delve into synchronic and historical factors that play a role in the patterns of tone sandhi observed in Sino-Tibetan languages.

4 Underlying factors

There are two factors mentioned in Zhang (2007) that play a role in the observed tone sandhi patterns. Zhang comments on the "universal preference for rightward tonal coarticulation." Putting this into articulatory terms, we state the following principle:

Principle 1: Speakers tend to reach pitch targets late in the prosodic domain.

Measurements of fundamental frequency in Igbo and Yoruba show that within a string of same-toned syllables, the pitch target is realized at or near the right edge of the string (Akinlabi and Liberman 2000). Xu and Wang (2001) express this tendency in Mandarin Chinese as: "Throughout the duration of its host, the approximation of the pitch target is continuous and asymptotic." On the phonological level, the lateness tendency has been noted to affect tone behavior across a large group of languages (Hyman and Schuh 1974; Hyman 2007).

This observation that pitch targets are realized or approximated near the end of their host prosodic unit accounts for a tendency for tones to spread rightward, that is, to be articulated gradually. It also suggests a trend for tones to be articulated at the right edge of their prosodic domain, from where there are no further tone bearing units on which to spread. One reviewer pointed out that it has been noted in various studies that rises take more time to articulate than do falls (cf. Zhang 2013). Moreover, if the tone in question is a phonological contour, then it is not clear whether there are several targets, or whether the pitch curve itself is

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a target. For these two reasons, Zhang (2007) states this principle as the "preference for progressive tonal coarticulation." In this study, I have given the principle in terms of pitch targets because in western Tibeto-Burman languages, there is often only one underlying tone that is being articulated, thus there does not seem to be any "tonal coarticulation."

Regardless of wording, this principle predicts that tones aligned at the left edge of a prosodic domain will tend to be pronounced over a period of time that may be longer than one syllable.

Zhang's (2007) second property is that of domain-final lengthening. This principle, which contributes to right-edge alignment of dominant tones, can be expanded and reworded as:

Principle 2: Syllables in domain-final position tend to be phonetically longer than other syllables in the same domain. This greater duration allows more time for tonal targets to be reached.

For many tone languages, the final syllable is special, in that it is the only one that can bear (certain) contour tones (Zhang 2009, 2013), especially those that rise. Zhang (2007) treats this generalization as a way of summarizing the cross-linguistic tendency for final syllables to have longer duration than earlier syllables, hence to permit more contours than are found elsewhere in the word. In the Southern Min tone sandhi, the rising tone is outside of the circle; that is, it only occurs on final syllables (Fig. 1). In both the tone spreading and the tone insertion examples cited in this study, the sandhi process reduces contours on non-final syllables. Outside of Sino-Tibetan, similar examples abound. For example, in San Juan Copala Trique (ISO trc), only the last syllable can contrast all eight tones (Hollenbach 1977, 2005).

In addition to the principles based on Zhang (2007), there are phonological and word-structure principles that play a role in Sino-Tibetan tone sandhi. Phonologically, dominant tones bear some resemblance to stress, which is encoded in the third principle:

Principle 3: Like prototypical stress accent, dominant tones are culminative (no more than one occurrence per prosodic unit).

In the WALS database, out of 282 languages with fixed stress, the attestation of stress placement is approximately as follows: penultimate (50 %), initial (42 %), final (23 %), second syllable (7 %), antepenultimate (5.5 %), third syllable (0.5 %) (Goedemans and van der Hulst 2013). For more on the attraction of stress to edges, cf. Hyman (1977) and Gordon (2002). Following Zhang (2007) we are careful not to equate dominant tones with lexical stress; moreover, many

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Tibeto-Burman languages are under-documented with regard to stress placement, further necessitating caution. Nevertheless, fixed culminative tone placement performs a similar function to stress in demarcating prosodic units. Therefore, we expect to find shared placement properties between stress and dominant tone. Within Sinitic, dominant tone alignment appears to correspond closely with the left and right edges of the word (partly due to shorter words, as mentioned above). However, in western Tibeto-Burman languages, alignment at the left edge is a stronger typological tendency for spreading tones than alignment at the right edge is for non-spreading dominant tones.

While stress and culminative tone share these important properties, there are important differences. Like stress, culminative tones can relocate, as seen in Caodeng Jiarong and Shixing. Unlike stress, tones can spread rightward from a host syllable to one or more others. Stress often occurs in feet, such that secondary stress occurs at regular intervals from the stressed syllable. However, we do not observe regular secondary assignments of tones on alternating syllables. While the spreading of tones onto adjacent syllables is widely documented, grammars often avoid sequences of stressed syllables (stress clash reduction). Thus, while culminative tones appear to serve a demarcative function, they do not perform a rhythmic function, even though the tones may be hosted on stressed syllables.[2]

For tonal languages where stress has been studied more closely, it is sometimes found that stress and dominant tone position are located on the same syllable. Duanmu (1995) claims that Type A Shanghai tonal domains are left-headed, and that left edge prosodic heads are stressed, retain their tonal specifications, and other syllables lose their tones. Conversely, Southern Min forms right-headed tonal domains that correspond to right edge stress. This headedness is expressed by retention of citation tone on right edge syllables. In Southern Qiang (e.g., Mianchi), tone arose from a reinterpretation of stress, due to contact with Chinese. Thus, within these dialects, H tone has stress-like properties, such as culminative H and/or obligatory H (Evans 2001). Within the Mianchi dialect, only the leftmost H in a word is pronounced; all other syllables surface with default L pitch assignment. Caplow (2009) makes a strong case for the role of stress in Tibetan tonogenesis. In the non-tonal dialects of Tibetan that she surveyed, pitch was a significant correlate of stress.

Among other languages in this study, it may be seen that, as Cahill (2007) predicts, "sequences of all Low tones are dispreferred." Cahill's observation is based on findings in languages of Africa, Oceania, North Asia, etc., but hold for the present set of data. In fact, most of the non-Sinitic languages surveyed require at least one

2 One reviewer asked about the case of the Ryukyuan language Irabu, which has rhythmic pitch assignment (Shimoji 2009). We note that in this language the alternating HH and LL pattern is non-distinctive, as the possible patterns are determined solely by word length in morae.

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H in polysyllables. In Shixing and Muka Qiang, the grammars require postlexical H on the last syllable if all the other syllables are L or toneless. The insertion of H on the right edge when there is no tone on the left edge (Shixing, Muka Qiang, possibly Lizu) closely resembles Hayes' (1995) Default-to-Opposite stress patterns.

In conclusion, dominant tones may be expected to share some properties with stress accent.

The fourth principle states that:

Principle 4: Typical word length affects the number of fixed positions available for tone alignment.

Western Sino-Tibetan languages commonly have agglutinative morphology; it is common for a word to consist of one lexical morpheme combined with one or more affixes. Polysyllabic morphemes are also common in some Western Sino-Tibetan languages. For example, in a Swadesh list of about 200 words in Mongsen Ao, 62 % were disyllables, and 17 % were trisyllables (Coupe 2007). On the other hand, Lolo-Burmese, many Sinitic, and other easterly Sino-Tibetan languages are more isolating with predominantly monosyllabic lexemes, and fall into the category of "omnisyllabic" (Matisoff 1999), a term which reflects minimal tone reduction at the word level.

Among western Sino-Tibetan languages, grammars tend to be asymmetric in the number of prefix/suffix slots. For example, Tamangic languages, which favor suffixes, have tones that anchor to the lexical morpheme on the left and spread rightward, onto the grammatical morphemes. On the other hand, verbs in Jiarongic languages display up to 14 pre-stem slots, with only three suffix slots (Jacques 2013). Thus, it is not surprising that the Jiarong tone reduction processes observed in this study favor tone specifications on the right edge, further from the bulk of grammatical affixes.

On the other hand, across Sinitic, due to shorter words, most syllables are located at an edge. This may account for the observation that dominant non-spreading tones show a more consistent attraction to the right edge of the prosodic domain in Sinitic than they do in Tibeto-Burman. Longer words allow specifications like that of Caodeng Jiarong, in which tone always falls on the stem-penultimate syllable.

Principle 5: Phonological tone contrasts often arise from segmental changes at word edges.

For some western Tibeto-Burman languages, historical factors may play a role in the location of tones near edges. Written Tibetan, the oldest alphabetic

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Sino-Tibetan writing system, was standardized between the 7th and early 9th centuries AD, at which time the writing system did not encode tonality. Rather, tones in modern Tibetic languages can be traced to segmental properties of Written Tibetan. Loss of initial voicing contrasts has been rephonologized as pitch height on initial syllables (a similar process occurred in the closely related Tamangic languages), while final glottalization lead in many cases to a falling tone on final syllables (Sun 1997, 2003; Hyman 2018). Phonological stress appears to have played a role in Tibetan tonogenesis as well (Caplow 2009). Similarly, loss of obstruent codas in Khaling (klr, Kiranti, Nepal) led to a split between level and falling tones (Jacques 2016). Having thus been located at the left or right edge of a prosodic unit, tones are then subject to the aforementioned principles. Similar tonogenetic processes are traceable in Tamangic languages (Mazaudon 1973, 1985). For more on tonal distinctions arising from loss of consonantal distinctions, cf. Haudricourt (1954), Thurgood (2002).

In conclusion, there are at least five factors that play a role in the placement and behavior of dominant tones: pitch targets tend to be reached late, final syllables are lengthened, dominant tones share some properties with stress accent, typical word length affects the possible locations for fixed tone assignment, and tonogenesis often specifies tones at edges.

5 Dominant tones and tone sandhi in other languages

Assuming that the underlying principles behind the phonological behavior are not language specific, it is to be expected that languages from other families and regions would exhibit tone sandhi patterns similar to what has been observed above.

Looking further afield, Bantu languages, Japanese dialects, and other languages display phonological behaviors reminiscent of the two claims summarized above. A well-documented case of culminative left edge tone spreading occurs on Mende nouns (Tab. 15).

Tokyo Japanese appears to have both a predictable spreading tone aligned with the left edge, and a lexical non-spreading dominant tone. In this language, one lexical tone surfaces per prosodic unit; one of the main areas of controversy concerns the density of tonal specification (spreading or not). Analyses such as those of Haraguchi (1977, 1999) assign H or L to each mora, the TBU in Japanese dialects. Pierrehumbert and Beckman (1988) assign tone markings at F0 maxima and minima and at clause edges, allowing the intervening pitches

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to be interpolated, rather than directly assigned H or L. In either analysis (or in McCawley 1978), only one lexically assigned tone (accent) surfaces per prosodic phrase. In this present discussion, only the tone patterns of nouns will be considered, and these in a fashion which ignores the special tonal properties of certain tonally special morphemes (e.g., the deletion of final tone by the genitive marker /no/). Proponents of an accentual analysis of pitch patterns in Japanese assign some mark (usually ’ or *) after a mora that marks the boundary between /H/ and /L/. However, a marking that requires less interpretation merely indicates the tone sequence /H.L/ in the lexical representation. Table 16 shows the tonal possibilities on monomorphemic nouns:

Tab. 15: Tone spread in Mende (Leben 1978; Zoll 2003).

	σ	σσ	σσσ(σ)
H	H	H.H	H.H.H
L	L	L.L	L.L.L
HL	HL	H.L	H.L.L.
LH	LH	L.H	L.L.H (Zoll)
			L.H.H (Leben)
LHL	LHL	L.HL	L.H.L
HLH		H.LH	H.L.H
HLHL			H.L.HL
			H.L.H.L

Tab. 16: Realizations of Tokyo noun tone locations (Haraguchi 1999).

Toneless	Tone on 1st μ	2nd μ	3rd μ	4th μ
e-ga L H “handle”-Nom	e^{HL}-ga H L “picture”-Nom			
hasi (-ga) L H H “edge”-Nom	ha^{HL}si (-ga) H L L “chopstick”-Nom	hasi^{HL} (-ga) L H L “bridge”-Nom		
sakura (-ga) L H H H “cherry”-Nom	ka^{HL}rasu (-ga) H L L L “crow”-Nom	koko^{HL}ro (-ga) L H L L “heart”-Nom	otoko^{HL} (-ga) L H H L “man”-Nom	
kamigata (-ga) L HHH H “hair style”-NOM	se^{HL}kitan (-ga) H LLL L “coal”-Nom	asa^{HL}gao (-ga) L H LL L “morning glory”-NOM	aozo^{HL}ra (-ga) LHH L L “blue sky”-Nom	kaminari^{HL} (-ga) L HHH L “thunder”-Nom

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This author's analysis of the data is that nouns are assigned a default L.H tone that aligns to the first mora and spreads rightward until it reaches H.L or prosodic boundary, and that the default tone assignment is blocked by H.L on the initial mora. Thus, there is both a spreading tone aligned with the left edge, and optionally, a non-spreading tone somewhere in the word. The following forms show that only the leftmost /H.L/ tone gets pronounced in a Tokyo Japanese accentual phrase (Tab. 17):

Tab. 17: Tokyo Japanese culminativity in phrases (Haraguchi 1999).

HL on 1st μ	**HL on 2nd μ**	**HL on 3rd μ**	**HL in 2nd word**
/ka^{HL}rasu-ma^{HL}de/ H LL LL 'crow'-even	/koko^{HL}ro-ma^{HL}de/ LH L LL 'heart'-even	/otoko^{HL}-ma^{HL}de/ LH H LL 'man'-even	/sakura-ma^{HL}de/ L HH HL 'cherry'-even

However, in noun compounds, it is the final member of the compound that determines accent placement (Tab. 18).

Tab. 18: Tokyo Japanese culminativity in noun compounds (Kubozono 2012).

pe^{HL}ru.sya	+	ne^{HL}.ko	→	peru.sya-ne^{HL}.ko	"Persian cat"
tyoo.kyo^{HL}.ri	+	ba^{HL}.su	→	tyoo.kyo.ri. ba^{HL}.su	"long-distance coach"
sak^{HL}.kaa	+	ku^{HL}.ra.bu	→	sak.kaa-ku^{HL}.ra.bu	"soccer club"
ya^{HL}.ma.to	+	na.de^{HL}.si.ko	→	ya.ma.to.na.de^{HL}.si.ko	"Japanese lady"

If the final member of the compound is toneless, then the compound receives paradigmatic tone insertion based on the length of the final member (Kubozono 2012).

The western Tibeto-Burman languages surveyed in this study did not display an overall preference for alignment of dominant tones with the right edge of the domain, although Sinitic languages did show this tendency. As mentioned above, because dominant tones bear some similarity to lexical stress, and because of the preference for stress to be located near word edges (especially penultimate syllables), it is expected that there will be languages in other areas that exhibit this preference. In fact, there are unrelated languages where, like Caodeng Jiarong, tone can only fall on the penultimate syllable. For example, in Chizigula (Bantu, Tanzania), if a verb has a tone, then that tone appears on the penultimate (Tab. 19).

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Tab. 19: Chizigula verbs (Kenstowicz and Kisseberth 1990; Yip 2006).

Toneless verbs		Toned verbs	
ku-damaɲ-a	to do'	ku-lombéz-a	to request'
ku-damaɲ-iz-a	to do for'	ku-lombez-éz-a	to request for'
ku-damaɲ-iz-an-a	to do for each o.'	ku-lombez-ez-án-a	to request for each o.'

In some languages, the dominant tone is constrained to fall not more than a certain distance from the right edge. In Attic Greek there were two lexical tones, marked with an acute or a circumflex diacritic. Both tones represent a rise in pitch over a mora, followed by a return to a neutral pitch (Mastronarde 1993: 16–20. The tone marked with a circumflex only occurred on heavy (bimoraic) syllables, and the return to normal pitch occurred during the toned syllable. On the other hand, the acute mark could fall on either monomoraic or bimoraic syllables, with the return to neutral pitch occurring during the subsequent syllable (whether long or short). No more than one mora in the word could follow the return to normal pitch, whether that return occurred during a circumflex tone or following an acute tone. Similarly, in Kagoshima and Koshikijima dialects of Japanese, and in the Bantu language Chimwiini, lexical tone falls on either the ultimate or penultimate mora; all other morae have paradigmatic pitch assignment (Kubozono 2012; Hyman 2018). In the Bantu language Giryama, H tones are displaced rightward to locate on penultimate syllables (Hyman 2018).

The languages used for comparison in this section have tended, like western Tibeto-Burman, to have longer monomorphemic words, agglutinative morphology, and low lexical tone density. Nevertheless, it has been demonstrated that the tone sandhi processes are similar to those active in both western Tibeto-Burman and Sinitic languages, even though the latter tend to have short morphemes and words, isolating morphology, and high tonal density.

In spite of the existence of hundreds of Tibeto-Burman languages, only a few have been cited in this study, as many languages are under-described. In addition, tone categories and processes can be difficult to elucidate in many western Tibeto-Burman languages. For example, among the Tani languages, monosyllabic words are scarce. Post (2014) observes that in four of the Tani languages, there are only about ten to twenty monosyllabic words to be found within lexica ranging from 1,000 to 5,000 entries. Further complicating the analysis, many lexical morphemes never occur in isolation. Moreover, different sets of rules seem to apply to words with more than two syllables, and each rule seems to be quite limited in its application. Mongsen Ao (Nagaland, India; njo) also presents a particularly

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complicated set of tone interactions, which may turn out to be the norm for languages of Northeast India (Coupe 2007).

6 Conclusions

The present study compares common tone sandhi patterns found among Sinitic and western Tibeto-Burman languages. Sinitic languages lexically specify a tone on almost every syllable, while western Tibeto-Burman languages tend to have much sparser tone specification. Nevertheless, there are similarities between the two groups of languages in the ways that dominant tones affect other tones in the prosodic unit. Namely, we find the following two principles at work, which were first identified as operating within Sinitic (Zhang 2007), but the present study shows to also be active among Tibeto-Burman languages, albeit with minor modification:

(1) a. If a tone spreads, then it is aligned with the left edge of its prosodic domain, and spreads rightward.
  b. Non-spreading dominant tones in Tibeto-Burman languages can be located on any syllable in their prosodic domain.

These two phonological claims are driven by the following five principles, which are assumed to be language-independent, with the exception of the fifth principle:

(2) a. Speakers tend to reach pitch targets late in the prosodic domain.
  b. Syllables in domain-final position tend to be phonetically longer than other syllables in the same domain. This greater duration allows more time for tonal targets to be reached.
  c. Like prototypical stress accent, dominant tones are culminative (no more than one occurrence per prosodic unit).
  d. Typical word length affects the number of fixed positions available for tone alignment.
  e. The process of tonogenesis often results in tone specification at left or right word edges.

Examination of well-documented cases of tone sandhi in languages that are both nonrelated and geographically diverse suggests that these principles do in fact play an important role in tonal phonology.

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Appendix: Cited Sino-Tibetan languages and sandhi patterns

Language	Grouping	Sandhi type(s)	Location
Standard Chinese	Sinitic, Mandarin	Right edge w/ replacement	Beijing, China
Southern Min	Sinitic, Mandarin	Right edge w/ replacement	Taiwan and Fujian, China
Shanghai	Sinitic, N. Wu	Left edge spread (word)	
		Right edge w/ replace (phrase)	Shanghai, China
Wuyi	Sinitic, S. Wu	Right edge w/ replacement	Zhejiang, China
Na	Tibeto-Burman, Na-ic	Left edge spread	Sichuan, China
Manange	Tibeto-Burman, Bodish	Left edge spread	Nepal
Caodeng Jiarong	Tibeto-Burman, Qiangic	Right edge w/ replacement	Sichuan, China
Zhuokeji Jiarong	Tibeto-Burman, Qiangic	Right edge w/ replacement	Sichuan, China
Lizu	Tibeto-Burman, Qiangic	Left edge spread	Sichuan, China
Shixing	Tibeto-Burman, Qiangic	Left edge spread	Sichuan, China
Pumi	Tibeto-Burman, Qiangic	Left edge spread	Sichuan, China
Muka Qiang	Tibeto-Burman, Qiangic	Left edge spread	Sichuan, China
Kami Tibetan	Tibeto-Burman, Tibetic	Left edge spread	Sichuan, China
Lhasa Tibetan	Tibeto-Burman, Tibetic	Left edge w/ replacement	Tibet, China
Tawrã	Tibeto-Burman, Digarish	Left edge spread of L	Arunachal Pradesh, India; Tibet, China

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Pittayawat Pittayaporn

Phonetic and Systemic Biases in Tonal Contour Changes in Bangkok Thai

Abstract: Understanding phonetic and systemic motivation is a crucial element in the study of sound change. However, our understanding is largely limited to segmental changes. Working within the phonetically-based approach to sound change, this article accounts for the tonal contour changes in Bangkok Thai during the 20th century in terms of biases that exist in human speech. It proposes that the changes are explicable by known patterns of phonetic variation and systemic constraints that introduce biases into the process of phonologization. In this account, the tonal contour changes, like most cases of segmental changes, can be regarded as linguistically-motivated.

Keywords: contour change, tone, sound change, Thai, biases

1 Introduction

Our understanding of sound change has advanced tremendously due largely to the typology of recurrent patterns of sound changes. A key element in this typology is the observation that recurrent sound changes have a phonetic base (Ohala 1993, 2003; Blust 2005; Solé 2012; Garrett and Johnson 2013). For example, palatalization is explained in terms of the misperception of fronted velar before front vowels (Guion 1998). Similarly, r-aspiration, i. e. [Cr] > [Ch], is motivated by the large volume of air needed to produce trills (Guion and Wayland 2004; Wayland and Guion 2005; Kirby 2013). These sound changes are considered to be natural. On the other hand, phonetically anomalous sound changes are said to be unnatural and are less frequent across language families. Two examples are the change

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*b > -k- in Barawan and the change *dr > k^h in Drehet (Blust 2005). In between the two extremes are sound changes that do not seem to have a phonetic motivation but are driven by systemic forces. For example, Russian post-velar fronting [kɨ] > [k^ji] is argued to have come about because [k^ji] is more distinctive from [ku] than [kɨ] (Padgett 2003). Therefore, understanding phonetic and systemic motivations is a crucial element in the study of sound change.

Unfortunately, the typology of sound changes has focused primarily on segmental changes. In the case of lexical tones, our knowledge is limited mainly to tonogenesis (Haudricourt 1954; Matisoff 1973; Svantesson 1991; Svantesson and House 2006), and how tonal systems acquire more tones or lose tonal categories (Hyman 2018). However, it is a mystery how pitch contours of established tonal categories change over time. This limitation is clearly seen in Strecker's (1979) attempt to reconstruct the contour of the *A tone for a subgroup of Tai languages. He proposes that lower tones tend to develop marked rises while higher tones tend to acquire sharp falls. While this proposal is appealing, it is difficult to evaluate without a clear understanding of the typology of tonal contour change. In particular, it is currently impossible to tell whether the proposed changes have a linguistic basis or not.

The root of the problem is the lack of empirical data upon which to build a typology of tonal contour changes. Firstly, early descriptions of lexical tones are rather opaque and often inadequate. For example, Francisco Varo's *Arte de la lengua Mandarina*, first published in 1703, describes Mandarin Chinese tones in terms of how the Spanish word *no* is pronounced in different situations (Varo and Coblin 2006). Secondly, most tonal languages do not have long writing traditions. When they do, their tones are often not explicitly marked in the orthography. For example, before the 17th century, Vietnamese was written in a Chinese-based script called *chữ nôm*. It was only after Alexandre de Rhodes invented his Roman-based script that Vietnamese lexical tones started to be explicitly marked by diacritics (Jacques 2002). Moreover, tone marking rarely reflects how the tones are actually pronounced. For instance, the shapes of two tone marks used in Thai inscriptions from the 13th and 14th centuries are simply a vertical line and a cross (Danvivathana 1987).

Among the tonal languages of the world, Bangkok Thai is one of the few languages whose lexical tones have been instrumentally studied since the dawn of experimental phonetics. The strong and continuous line of acoustic research on Thai since the beginning of the 20th century reveals that its five lexical tones have changed gradually to become markedly different from what they were when they were first measured by Bradley (1911, 1916). Although the contour changes have been relatively well described by various researchers (Anivan 1988; Teeranon 2002a, 2002c, 2007; Zsiga 2007; Teeranon and Rungrojsuwan 2009; Thepboriruk 2010), our present knowledge of tonal contour changes still does not allow us to answer whether or not they are linguistically motivated.

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Working within the phonetically-based approach to sound change, this article builds upon a preliminary study by Pittayaporn (2007) which shows that the tonal contour changes in Bangkok Thai during the 20th century can be predicted by known phonetic and systemic phenomena. This article accounts for the contour changes in terms of biases that exist in human speech. Firstly, it describes how the citation forms of the five lexical tones in Bangkok Thai have changed since the beginning of the 20th century (section 2). Secondly, it outlines the phonetically-based approach to sound change (section 3) and identifies phonetic and systemic biases that seem to have been the motivations for the changes (sections 4–5). Next, it considers how the two types of biases interact to give rise to the observed tonal contour changes (section 6). In addition, it discusses the patterns of phonetic variation whereby two of the tones have changed over time (section 7). Finally, it concludes that the tonal contour changes are linguistically-motivated (section 8).

2 Bangkok Thai tones in the past century

Since the early 20th century, the tone system of Bangkok Thai has been the subject of numerous instrumental studies. Earlier works comparing the five tones in citation forms from different periods (e.g. Teeranon 2002a, 2007; Thepboriruk 2010) have shown that Thai tones have undergone many contour changes. Although these studies have adequately described what changes have occurred, none has discussed how the changes are related to each other. This section traces the contour changes that have occurred in Bangkok Thai by comparing acoustic measurements made at four points in time.

Bangkok Thai has five lexical tones that contrast with each other in terms of pitch height and contour.[1] They are often referred to as Mid, Low, Falling, High and Rising. However, these descriptive labels may cause confusion since the actual tonal contours may not match the labels. For example, the so-called "High" tone in contemporary speech is a mid rising tone rather than a high tone. Therefore, in this article the tones are labeled numerically from 1 to 5, as shown in Tab. 1. The tonal values are based on Morén and Zsiga (2006) and Thepboriruk (2010), two of the most recent instrumental studies on Bangkok Thai tones.

1 Only non-checked syllables, i. e. open syllables and syllables ending with sonorants, show this full five-way contrast, as checked syllables, i. e. obstruent-final syllables, allow only three. This article investigates lexical tones in the non-checked syllables only.

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Tab. 1: Bangkok Thai tones with their present-day values in Chao's notation.

Numerical labels	Descriptive labels	Tonal values	Examples
Tone 1	Mid	[33]	[law^1] 'clf. for flute'
Tone 2	Low	[21]	[law^2] 'kind, group'
Tone 3	Falling	[42]	[law^3] 'liquor'
Tone 4	High	[334]	[law^4] 'animal pen'
Tone 5	Rising	[213]	[law^5] 'to sharpen'

Among the five tones, three have changed since the early 20th century as reported by earlier studies. First of all, Tone 3 has changed from a mid falling tone to a high falling one. Furthermore, Tone 5 is now losing its characteristic final rise (Zsiga 2007; Thepboriruk 2010). However, the most spectacular is the change of Tone 4 from a convex tone to a rising tone. These tones with their dramatic changes are in contrast with Tone 1 and Tone 2, which have remained remarkably stable. When comparing Thai tones in citation forms from different periods, special attention must be paid to Tones 3, 4, and 5. It will be seen that, like other kinds of sound changes, tonal changes proceed gradually in spite of their dramatic outcomes.

The early 20th century saw a number of phonetic descriptions of Bangkok Thai tones including notes by Cartwright (1907), Jones (1918, cited in Henderson 1976) and Taylor (1920). However, the most prominent is the oldest instrumental study conducted in 1908 by Bradley (1911, 1916) on his own speech.[2] Unlike later studies, the measurements were made by calculating the frequency values based on wavelengths recorded using the Rousselot apparatus. The values were then transformed into values on a musical scale and plotted on the vertical axis against time on the horizontal axis. Fig. 1 shows the f0 contours of each lexical tone.

Tone 1 and Tone 2 were both quite static but differed with respect to pitch height. While the former was in the mid range, the latter had a lower pitch. Tone 3 was a falling tone similar to present-day Thai, but its onset was in the mid range rather than the high range. More interesting is Tone 4, which had a radically different shape compared to its present-day counterpart. It was a high tone with an

2 Though an American citizen, he was most likely a native speaker of Thai. As a son of American missionaries in Siam, he was born in Bangkok and spent his childhood there. His family was settled in an old Thai Christian community and was attended by at least one Thai servant. He also spent a number of years on an evangelical mission in Thailand starting in his late twenties. In addition, he is the author of a number of research articles on the Thai language during his professorship at UC Berkeley (Lord 1968; Griswold and na Nagara 1971; Michuthon 2004).

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early pitch plateau followed by a sharp fall, strikingly similar to the present-day Tone 3. Furthermore, Tone 5 was a true rising tone that started in the lower middle pitch range and rose rather steadily. The contour shapes are consistent with tonal descriptions by other authors of the same period as summarized in Tab. 2.

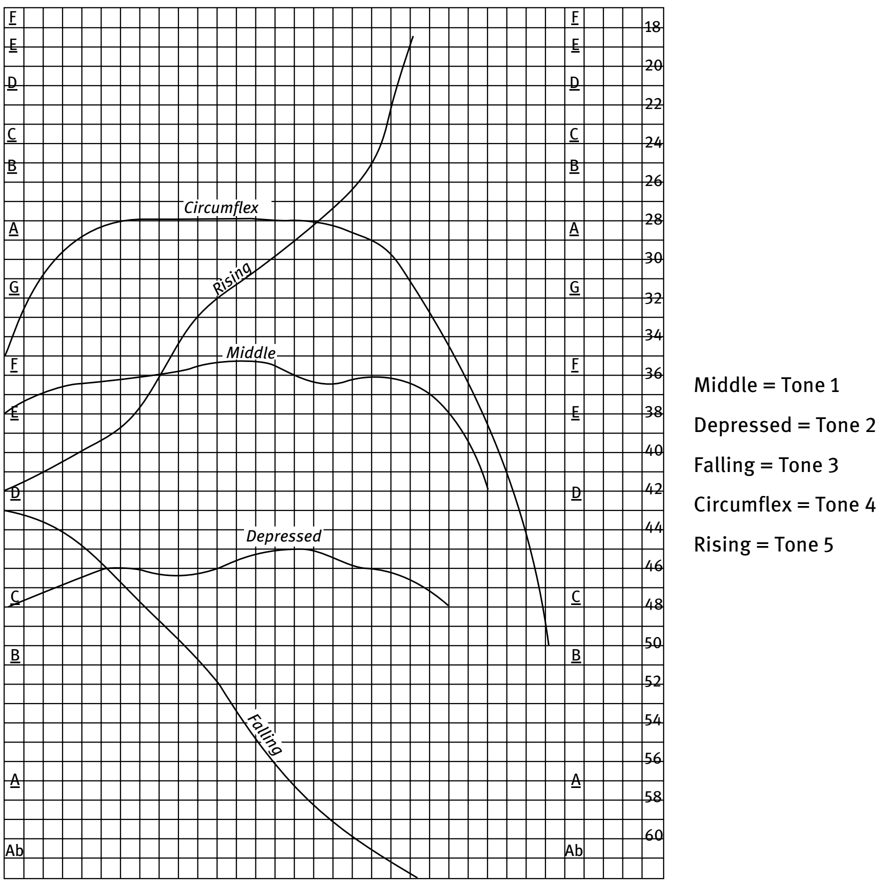

Fig. 1: Thai tones in the early 20th century (from Bradley 1911: 286).

Tab. 2: Description of Thai tones in the early 20th century.

	Cartwright (1907)	Jones (1918)	Taylor (1920)
Tone 1	Mid level	Mid-low level	Mid level
Tone 2	Low level	Low level	Low level
Tone 3	Mid falling	Mid falling	Mid falling
Tone 4	High level with sharp fall	High plateau with sharp fall	High level with sharp fall
Tone 5	Mid-low and curved rising	Low rising	Mid rising

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The second time point to be examined is from the mid 20th century, when the Thai language began to catch the scientific interests of western researchers such as Noss (1964), Brown (1965), Henderson (1949) and Haas (1956). The tones in this period are represented by the work of Abramson (1962). His principle consultants were two male speakers in their early thirties.[3] Their speech was recorded using professional magnetic recorders and analyzed based on sound spectographs generated by the Kay sonograph. The f0 values were given in cycles per seconds (cps), which is equivalent to Hertz (Hz). The pitch track in Fig. 2 shows that two tones had changed quite noticeably from the time when Bradley made his measurements.

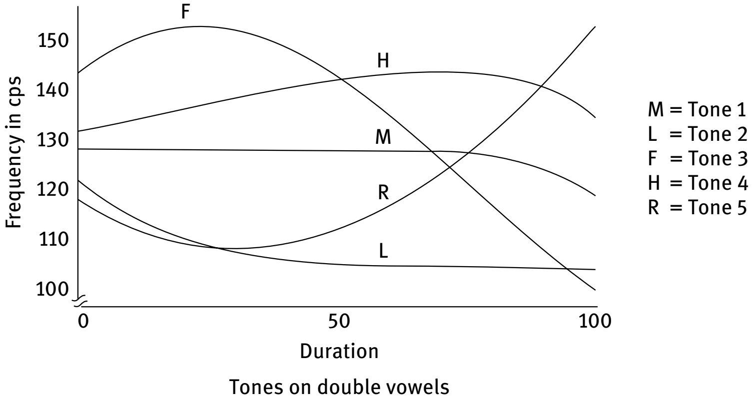

Fig. 2: Thai tones in the mid 20th century (from Abramson 1962: 127).

Firstly, Tone 3 was no longer a mid falling tone but had shifted its onset upward to become a high falling tone similar to present-day Bangkok Thai. Notice that the new contour shape is very similar to that of Tone 4 in the early 20th century. Secondly, Tone 4 was no longer a convex tone but had been flattened and had shifted its f0 peak considerably rightwards. That is, it had become a mid rising tone with a final fall in the last quarter of the contour. This change is a complex one because it involves both flattening and peak sliding. Moreover, it seems to be causally linked to the raising of Tone 3 that had occurred previously. Note that no change occurred with Tones 1, 2 and 5. Again, the contour shapes agree closely with descriptions from the mid 20th century sources, as summarized in Tab. 3.

3 Abramson does not provide the age of the native speakers but does provide their full names. The older of the two was born in 1930, which means he was 32 at the time of Abramson's study.

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Tab. 3: Description of Thai tones in the mid 20th century.

	Noss (1964)[4]	Brown (1965)	Haas (1956)
Tone 1	Mid level	Mid-low level	Mid level
Tone 2	Low level	Low level	Low level
Tone 3	High falling	High falling	High falling
Tone 4	High and slightly rising with a final fall	High and slightly rising with a final fall	High level with a final fall
Tone 5	Low rising	Low trough with sharp rise	Low rising

The third time point is from the late 20th century and is represented by another study by Abramson (1979). By this time, acoustic study of Thai tones had become common thanks not only to works by Abramson (1978, 1979), but also to studies by Gandour (1974), Erickson (1974, 1976), and Luksaneeyanawin (1983), among many others. The measurements in Abramson (1979) were based on the speech of four speakers in their early twenties:[5] three female and one male. The pitch tracks were made using Lukatela's correlation method. The f0 value was given in Hertz. Fig. 3 reveals that Tone 4 has changed further compared to the mid 20th century.

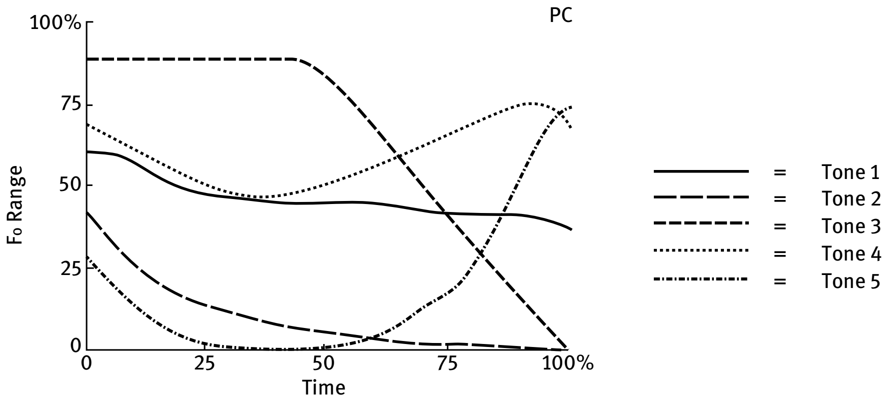

Fig. 3: Thai tones in the late 20th century (from Abramson 1979: 3).

4 Noss (1964) describes Tones 3 and 4 as constricted throughout. He also includes a sixth tone, which other authors view as an emphatic tone.

5 Abramson did not explicitly indicate the age but describe the speakers as university graduates.

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Its initial rise has become curved and prolonged, pushing the f0 peak to the edge of the rime. In other words, the tone has changed into a mid rising tone with a slight fall at the very end. In addition, Tone 5 also went through a small change. Its rise no longer started early but was delayed to the mid point of the contour. Though minor, this change kept Tone 5 and the encroaching Tone 4 apart. Note that Tones 1, 2, and 3 stayed very close to the earlier period, even though Tones 1 and 2 appear to be gradually falling slightly. Not coincidentally, the tonal contours in the plot match quite closely those of other studies in the the 20th century, as summarized in Tab. 4.

Tab. 4: Description of Thai tones in the late 20th century.

	Gandour (1974)	Erickson (1974)	Luksaneeyanawin (1983)
Tone 1	Mid-low level	Mid slightly falling	Mid slightly falling
Tone 2	Low level	Low level slightly falling	Low level slightly falling
Tone 3	High falling	High falling	High falling
Tone 4	Mid rising	High level	Mid-high rising with a slight final fall
Tone 5	Low and curved rising	Low and curved rising	Low and curved rising

The latest time point to be examined is the first decade of the 21st century, which represents today's tonal system of Bangkok Thai. Acoustic studies of Thai tones in this period abound, e.g. Teeranon (2002b), Laphasradakul (2010), and Thepboriruk (2010), but the representative record to be looked at in this article is from the work of Morén and Zsiga (2006). The measurements were made in 2006 from the speech of two female speakers in their late twenties using the Praat signal analysis program. The f0 value on the vertical axis is in Hertz.

Fig. 4 reveals the two most recent contour changes that have occurred in the Thai tonal system. Firstly, Tone 4 still continues to shift its peak rightwards so that the f0 now starts to rise only in the second half of the contour. As a result, the final fall has now become optional and is completely lost in one of the speakers. Secondly, Tone 5 is no longer a true low rising tone. It now starts to rise only towards the end of the contour and barely reaches the middle pitch range. Because of these two changes, Tone 4 and Tone 5 are now both rising tones. The salient difference between Tone 4 and Tone 5 is no longer their shape but their height. Note that Tones 1, 2 and 3 have not changed significantly since the late 20th century. The tonal contours displayed in this pitch track are not inconsistent with those in other studies, as summarized in Tab. 5.

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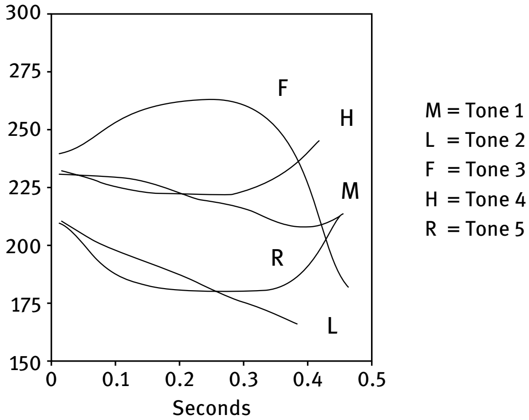

Fig. 4: Thai tones in the early 21st century (from Zsiga 2007: 399).[6]

Tab. 5: Description of Thai tones in the early 21th century.

	Teeranon (2002b)	Thepboriruk (2010)[7]	Laphasradakul (2010)
Tone 1	Mid gradually and slightly falling	Mid gradually and slightly falling	Mid lightly falling
Tone 2	Low gradually and slightly falling	Low gradually and slightly falling	Low gradually and slightly falling
Tone 3	High falling	High level with final fall	High plateau with sharp final fall
Tone 4	Mid level with final rise	Mid level with final rise	Mid slightly rising
Tone 5	Low and curved rising	Low and curved rising	Low and curved rising

An important question is whether these differences represent true diachronic changes or tonal variation that existed among speakers of the same period. This article takes the former stance for several reasons. Firstly, the tonal contours given in the four representative plots agree very well with descriptions given in other sources in their respective periods. That the authors independently arrive at their description strongly suggests that the pitch tracks are representative of the prototypical pronunciation of the periods when they were made. The differences among the pitch tracks therefore represent diachronic changes in pronunciation norms.

6 This pitch track represents averages across speakers. The variation in Tone 4 with respect to the final fall is illustrated in Morén and Zsiga (2006).

7 Thepboriruk (2010) studies production of Thai tones by three age groups. This description is based on her results for the younger speakers.

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Secondly, the tonal perception by Thai speakers seems to have shifted in an expected way. Comparing tonal identification during the late 20th century (Abramson 1975) and in the early 21st century (Onsuwan et al. 2012), one sees that Tone 4 has changed from the least to the most confusable of the five tones. In an apparent-time study, Teeranon (2007) also shows that Tone 4 is perceived as level by older speakers but as rising by younger ones. Similarly, Zsiga (2007) shows that low pitch at the tone mid point replaces sharp rise as the main cue to Tone 5. These changes in the perceptual space confirm that differences among the plots indeed represent changes in tonal contour over time.

However, this is not to say that the tonal system of Bangkok Thai in earlier periods did not have any variation. On the contrary, various authors, e.g. Taylor (1920), Jones (1918, cited in Henderson 1976), Henderson (1964), Panroj (1990), and Arunreung (1990), wrote explicitly about variation in the realization of the tones. Revealingly, most records of variation in tonal contours involve Tone 4, which has gone though the most dramatic series of changes of the five tones. As will be seen in section 7, the variation recorded is entirely consistent with the account of diachronic changes as phonologization of synchronic patterns of phonetic variation, providing support for the phonetically-based account of sound change.

Intriguingly, in spite of the spectacular outcome, the lexical tones have gone through a number of intermediate steps. Therefore, the transformation of these tones suggests that, like other kinds of sound change, tonal contour changes are phonetically gradual and may potentially form chain shifts. Having identified the individual changes that the tones of Bangkok Thai have undergone, it is now possible to examine how they are related to each other. The changes that have been identified are summarized chronologically in Fig. 5.

The first sequence seems to have started with the onset raising of Tone 3. As its onset shifted upwards, Tone 3 changed from a mid falling to a high falling tone. In consequence, Tone 3 thus became dangerously similar to Tone 4, which was also a high falling tone at the time. To keep the distinction between the two tones, Tone 4 shifted its f0 peak rightwards and became a flat rising-falling tone. An alternative scenario would be for Tone 4 to first slide rightwards followed by the raising of Tone 3. The new realization of Tone 3 filled in the tonal space formerly occupied by Tone 4. Whatever the actual chronological order was, the two contour changes formed a tonal chain shift since one seems to have triggered the other.

The second sequence seems to have started with the curving of Tone 4, which then became a mid rising tone with a final fall. Around the same time that the curving happened, Tone 5 also slid its inflection point rightwards to the mid point of the contour. This second change was then followed by the variable loss of final fall, which turned Tone 4 into a mid rising tone. The encroaching Tone 4 may have impacted Tone 5, whose f0 contour now only started to rise toward the end

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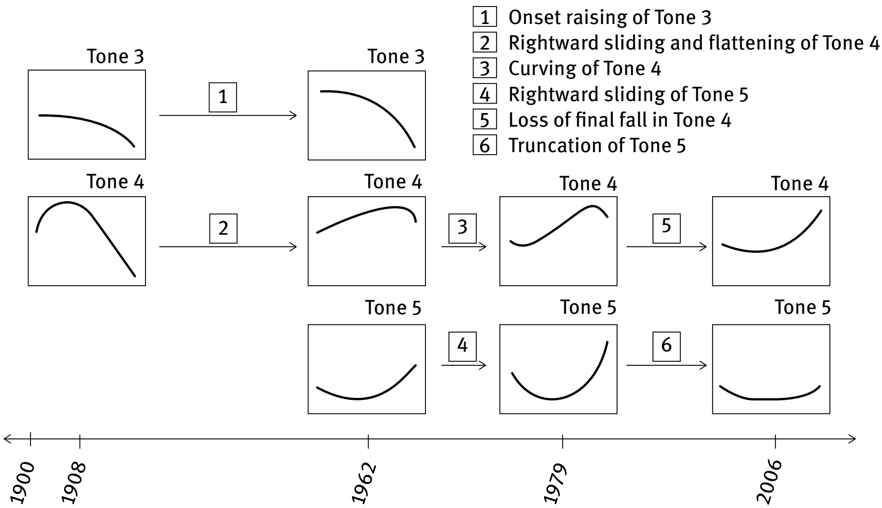

Fig. 5: Timeline of tonal contour changes.

and only had time to reach the middle pitch range. Like the former sequence, this series of contour changes can also be considered a tonal chain shift, an even more complex one.

Note that only three of the five tones went through significant changes in contour shapes in the 20th century. However, it is not the case that the other two tones have never been affected by any changes. In fact, Tone 2 was not a low but a high tone as recently as the 19th century (Pallegoix 1850). Moreover, Tone 1 is a result of a phonemic merger between two mid tones that had occurred before the 17th century (Pittayaporn 2016). Unfortunately, it is not possible to examine these changes here because they predated modern acoustic analysis. Moreover, Tones 1 and 2 also appear to have recently become slightly and gradually falling. These two possible changes however will not be discussed here.

In summary, three of the five tones in Bangkok Thai have changed quite remarkably since the beginning of the 20th century. Tone 3 has had its onset shifted upwards, while Tone 5 has had its rising trajectory truncated. Most dramatic is Tone 4, which has changed from a convex, to a rising-falling, and to a rising tone. With a simplistic functional approach, some of them seem to be unmotivated as they led to closer phonetic similarities among certain tones. From a purely phonetic point of view, some are puzzling as no obvious articulatory or perceptual explanation exists. This article will propose that the tonal contour changes may have either phonetic or systemic motivations, or both.

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3 Phonetically-based approach to sound change

Some of the contour changes that Bangkok Thai underwent in the 20th century appear to be unexplainable from a simplistic functional or a purely phonetic point of view. The phonetically-based approach, one of the most prominent and most promising approaches in current historical phonology, takes into account both phonetic and phonological motivations. Pioneered by Ohala (1989, 1993) and supported by a large body of research (e.g. Beddor 2009, 2012; Guion 1998; Hombert, Ohala, and Ewan 1979; Yu 2004), its basic tenet is that sound change is a phonological reanalysis of structured phonetic variation arising in speech production and perception. This section gives a brief overview of how patterns of phonetic variation lead to sound changes.

In the phonetically-based approach, sound change is viewed as "phonologization" of phonetic variation, the process by which an intrinsic phonetic pattern becomes a language-specific phonological pattern (Hyman 1976, 2013; Garrett and Johnson 2013). For example, vowel nasalization is said to arise first as non-distinctive phonetic variation conditioned by the ensuing nasal consonant. If the nasality is phonologized and becomes a contrastive property of the vowel, a diachronic change of vowel nasalization occurs (Chen and Wang 1975; Ohala 1993). In other words, diachronic sound changes are the result of phonologization of synchronic patterns of phonetic variation. The directional asymmetry in sound changes is therefore a reflection of the conditions in which their phonetic precursors occurred (Ohala 2003; Blevins 2004, 2006; Garrett and Johnson 2013). The approach neatly accounts for the parallelism between diachronic sound change and synchronic variation without postulating innate rules or the constraints assumed by early generative grammar (King 1969; Kiparsky 1988).

Since not all synchronic patterns lead to sound change, phonetic variation alone is not sufficient in explaining the directionality of sound change. According to Kiparsky (1995) and Lindblom et al. (1995), variants generated by phonetic processes are selected according to system-dependent constraints. Garrett and Johnson (2013) adopt this view and explain phonologization in terms of phonetic and systemic biases. The path to sound change starts when phonetic biases in speech production and perception generate variants in the pool of orderly variation. Although phonetic variation due to pure chance does exist, most variability in speech is not random but biased because of how human speech works. The variations go through a selection process in which systemic biases in the linguistic system favor or disfavor certain variants in the pool. The selected variant is thus phonologized and becomes an innovation that may be taken up by individuals who initiate and propagate it. It is when they become established as new norms in the speech community that the patterns

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of synchronic variation give rise to completed sound changes. This model is summarized in Fig. 6.

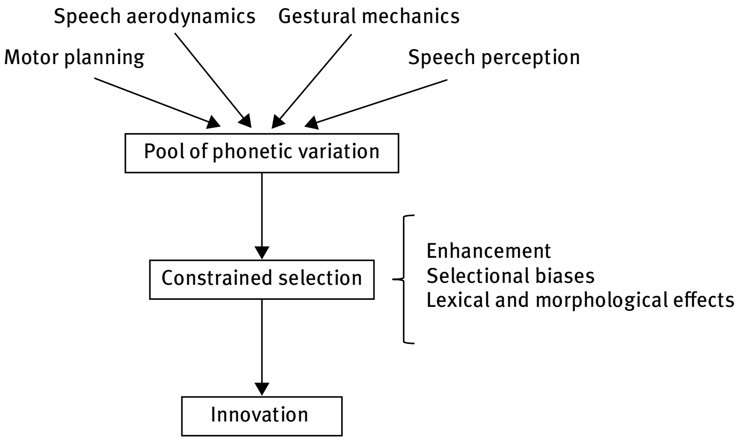

Fig. 6: Elements of sound change (based on Garrett and Johnson 2013).

Crucially, what makes certain sound changes more likely than others is the phonetic biases that shape the pool of phonetic variation and the systemic biases that constrain the selection of variants. Velar fricative labialization, i. e. [x] > [f]/ [+round]__, is a good example of natural sound changes that are explicable by the two types of bias. Articulatorily speaking, it is common for the labial gestures of the rounded vowels also to be realized on the ensuing consonants. This gestural overlap is thus the phonetic bias that introduces velar consonants with varying degrees of labialization, i. e. [x], [x^w], [^wx], [f], etc., into the pool of variation. Among the variants of [x], the labiodental fricative [f] is one of the most favored candidates to be phonologized, presumably because it enhances the perceptual distinctness of the labialization. This systemic bias also contributes to the likelihood of velar labialization occurring in languages (Garrett and Johnson 2013: 71–72, 80).

In this model of tonal contour change, phonetic and systemic biases are, crucially, in different orders of operation. The phonetic biases are first-order in the sense that they produce inputs into the pool of structured variation, which is the starting point of the phonologization process. In contrast, the systemic biases can be considered second-order, as they only operate on phonetic variants that have previously been introduced into the pool. Assuming that segmental and supra-segmental changes work alike, contour changes must also be explicable in terms of the phonetic and systemic biases. Pittayaporn (2007) claims that a lexical tone undergoes a contour change when its phonetic variants found in different environments are reorganized so that an innovative variant becomes

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phonologized. To understand contour changes, it is therefore necessary to discuss phonetic processes and systemic constraints that may give rise to biases that potentially determine the directionality of contour changes.

4 Phonetic biases in contour changes in Bangkok Thai

Phonetic biases refer to biases that arise in speech production and perception. Because variability in speech is non-random and directional, this type of biases produces the pool of variants, which are inputs to sound change, such that some outcomes are more likely than others. It is this non-randomness and the directionality that explain the typological patterns of sound change. However, less is known about the phonetics of tones compared to segments. Similar to segmental changes, Pittayaporn (2007) proposes that gestural mechanics involved in the production of lexical tones enrich the pool of phonetic variation by generating tonal variants that differ from the ideal shapes of their respective tonal categories. These “distorted” variants may become generalized and be taken as the best approximation of the underlying representation. When this happens, a tonal contour change is said to have occurred. This section therefore focuses on three articulatory effects that, in the literature, have been amply reported as giving rise to variability in tonal contour shapes.

The first gestural effect that may introduce a bias in sound change is peak delay. Articulatorily speaking, sharp pitch rises take a relatively long time to terminate. This limitation means that the f0 peak often occurs later than targeted (Xu 2001, 2004). For example, the pitch peak of the rising tone in Mandarin Chinese may occur somewhat after the syllable boundary in certain prosodic environments and in fast speech (Xu 2001). Similarly, in Japanese the f0 peak is often realized after the mora that the pitch accent is associated with (Hasegawa and Hata 1988; Sugiyama 2012). The peak delay enriches the pool of phonetic variation with variants having delayed f0 peaks and introduces a bias that favors a sliding of f0 peaks to the right. Because f0 peaks tend to be delayed rather than early, tone peaks have a greater tendency to shift rightwards rather than leftwards. For instance, a change from a falling tone to a convex tone is more likely than one in the opposite direction.

The predicted rightward sliding of the f0 peak is exactly what happened early on to Tone 4. As shown in section 2, the citation form of the tone clearly had a convex shape at the beginning of the 20th century but had become a rising tone with a clear fall by the middle part of the century. Peak delay explains the change

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since shifting the peak rightwards would not leave enough time for the entire convex to be realized. The resulting rising-falling contour can be thought of as an incomplete convex. Note that the rightward sliding probably happened concomitantly with the flattening of the same tone. If it had occurred alone, the resulting contour would have had a more dramatic rise than that attested in Abramson (1962).

The second change attributable to peak delay is the loss of the final fall in Tone 4. This change took place in the latter half of the 20th century and can be viewed as a continuation of the rightward sliding of the same tone. As the f0 peak of the tonal contour kept moving rightwards, the final fall started progressively later and became progressively shorter. The final result was the total loss of the final fall, leaving Tone 4 as a rising tone. This development clearly points to peak delay as its origin.

Another change that seems to have been motivated by this phonetic effect is the rightward sliding of Tone 5 that occurred at the end of the 20th century. As can be seen in section 2, the citation form of Tone 5 used to show a steady rise that started quite early to the high pitch range. Currently, however, its contour stays low for a long time before starting to rise towards the end of the contour only reaching the middle pitch range. Again, this points to the effect of peak delay. The three changes that are attributable to peak delay are schematized in the Appendix.

The second gestural effect that may introduce bias in sound change is contour reduction. Synchronically, contour tones are often phonetically realized with reduced contours when the vowel is short or the relevant syllables are unstressed. The reduced contour is characterized by smaller amounts of f0 excursion, and a less extreme f0 value at the tonal offset. For example, the realization of tones /13/ and /53/ in Pingyao Chinese on checked syllables are [23] and [54] respectively (Hou 1980 cited in Zhang 2001). Similarly, the average pitch fall of the Hausa falling tone /H͡L/ on obstruent-final syllables is only approximately 50% of that on open syllables with long vowels (Zhang 2001). This phonetic effect generates variants with relatively slight f0 excursion into the pool of structured variation. Because the f0 contour tends to be reduced rather than amplified, this bias predicts that tonal contours tend to become less pronounced. For example, a change from a high falling tone to a high level tone is more likely than a change in the opposite direction.

The flattening of Bangkok Thai Tone 4 that happened some time during the first half of the century is exactly what contour reduction predicted. This change affected the tone so that its convex became flattened to a rising-falling contour. Note that the flattening must have been part of the same complex change as the rightward sliding of Tone 4 discussed earlier. If it had occurred alone, the

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resulting tone would have been a flat convex tone rather than the rising-falling tone attested in Abramson (1962). This change is schematized in the Appendix.

Another phonetic effect that produces systematic variation in the production of lexical tones is the effect of syllable onset, widely recognized to account for tonogenesis in previously non-tonal languages. Similarly, it is well established that segments may cause variations in the f0 trajectory of tones, especially when they occur syllable-initially. Being a local effect, the magnitude of f0 is the largest at the beginning of the f0 contour (Haudricourt 1954; Hombert, Ohala, and Ewan 1979; Ohala 1993; Svantesson and House 2006; Kingston 2011; Erickson and Abramson 2013; Kirby 2013). For example, initial voiced consonants typically have a lowering effect on the initial portion of the f0 contour of the syllable in Kammu (Svantesson and House 2006). Similarly, initial aspirated consonants have been reported to depress the f0 onset in Mandarin Chinese (Xu and Xu 2003). In languages that are already tonal, the effect enriches the pool of phonetic variation with tonal variants that have varying pitch heights at the onset of the contour. In other words, the phonetic bias introduced by this effect is predicted to shift only the tonal onset leaving the offset unaffected. For example, in a case where aspiration in the onset induces pitch lowering, a mid level tone would be more likely to yield a low rising tone than a low level one.

The change in Bangkok Thai that seems to be related to the effect of syllable onset is the onset raising of Tone 3, which occurred during the first half of the 20th century. Tone 3 was a mid falling tone at the beginning of the century. However, it had become a high falling tone by the 1960's. This change in the pitch height at the beginning of the tonal contour resembles closely the local effect of syllable onset on the f0 contour. This suggests that the raising may have occurred through phonologization of a tonal variant with a relatively high pitch at the onset conditioned by laryngeal properties of the initial consonant. Notice that the onset raising affected all types of consonants, unlike cases of tonogenesis whereby only some particular types of onset consonant underwent pitch raising or lowering (see section 7 for discussion).

In summary, contour reduction, peak delay, and influence of syllable onset are three articulatory effects known to give rise to variability in tonal contour shapes. They are potential sources of phonetic biases that determine the direction of contour changes. These effects predicted a number of changes in Bangkok Thai during the 20th century. In addition to these three, other phonetic effects not discussed here such as declination, co-articulation, etc. may also potentially lead to sound changes. Like the effect of syllable onset, peak delay and contour reduction may introduce bias into the phonologization process. It is important to note that variation due to pure chance also exists and can potentially be selected as the primary variant through phonologization.

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5 Systemic bias in tonal contour changes

In addition to phonetic biases, systemic biases also play a crucial role in the actuation of sound changes. In particular, the variation generated by the phonetic effects is further subject to systemic constraints that favor or disfavor certain tonal variants. This section discusses three systemic biases that explain the tonal contour changes in Bangkok Thai, namely, contour maximization, contour accentuation and the avoidance of similar tones. The current account holds that they are second-order biases that operate on variants generated under the influence of phonetic biases. While the first two are enhancement biases, the last one belongs to the class of selectional biases.

The first systematic bias that introduces bias into the phonologization of tonal variation is contour maximization, which favors variants of dynamic tones with a more dramatic f0 excursion. With respect to tones, Yip (2001) argues that the existence of dynamic tones allows a great number of contrasts without placing static tones tightly together in the perceptual space (Xu and Xu 2003). In addition, t'Hart, Collier, and Cohen (1990) argue that the size of pitch change must exceed a certain threshold to play a part in communicative functions. Therefore, dramatic pitch excursion helps enhance the distinctness of the rise or fall in dynamic tones (Yip 2001). As an enhancement bias, contour maximization favors tonal variants with greater f0 excursions for dynamic tones. For example, the low-to-high variant of a rising tone is more likely to become phonologized. Therefore, contour maximization predicts that a mid rising tone is more likely to become low rising than the opposite.

With respect to the contour changes in Bangkok Thai, contour maximization seems to be the factor motivating the onset raising of Tone 3. The change from a mid falling to a high falling tone that took place early in the 20th century is exactly what this particular systemic bias predicts. Compared to the original mid falling contour, the high falling contour clearly had a greater f0 excursion. This more dramatic contour exaggerated the distinctness of the pitch fall characteristic of Tone 3. In other words, the high falling variant of Tone 3 must have been phonologized as the primary variant because it was favored by contour maximization as schematized in the Appendix.

The second systemic bias is contour accentuation. Like contour maximization, it favors tonal variants with a more dramatic f0 excursion. However, it does so by introducing a new feature to enhance the auditory distinctness of the tone. For segments, contrastive sounds are often enhanced by redundant features that help listeners to perceive the distinctions, e.g. lip rounding on the back vowels (also see Hombert 1977). As for tones, it is possible that some phonetic characteristics may be enhanced by some other redundant characteristics. For example,

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a sudden pitch drop and a curved rise may serve as enhancement features in a falling tone and a rising tone, respectively.

Among the changes that occurred in Bangkok Thai, the curving of Tone 4 in the second half of the 20th century is the clearest example of a contour change motivated by contour accentuation. Tone 4 was a rising-falling tone in the middle of the century but became a rising tone with a final fall in the latter half of the century. While the older form had a straight rise, the rising contour became curved in the newer variant. Compared to a straight rise, a curved rising involves a greater f0 excursion in the same amount of time. The variant with a curved rise is more dramatic and thus more favorable than one with a straight rise. Interestingly, the f0 contour of the curved rise starts with a pitch drop before dramatically rising to reach the high pitch range. This initial pitch drop does not have a clear phonetic motivation but can be accounted for in terms of enhancement. The curving of Tone 4 as schematized in the Appendix was thus predicted by contour accentuation.

Another systemic bias is the avoidance of similar tones. Perceptual difficulties are not derived from the properties of particular sounds but from constraints on the categorization of speech sounds. Therefore, many scholars (e.g. Garrett and Johnson 2013; Liljencrants and Lindblom 1972; Lindblom and Engstrand 1989; Lindblom 1990; Flemming 2004) advocate that the distinctive sounds in a system of contrasts tend to be dispersed in phonetic space so as to maximize perceptual contrast. For example, languages with three vowels tend to have /i/, /u/, /a/, compared to those with five vowels, which often have /i/, /u/, /e/, /o/ and /a/. These systems of vocalic contrast are regarded as optimal because the vowels are positioned so that maximal perceptual contrast is maintained. This bias favors tonal variants that are distinct from similar tones in the tonal inventory of the same language. For example, the high falling variant of a high-mid falling tone is favorable if there is also a mid falling tone in the system. This predicts that the high-mid falling tone is likely to become a high falling tone if there is another falling tone in the system.

A number of contour changes in Bangkok Thai seem to have been motivated by this constraint. The earliest one is the rightward sliding and flattening of Tone 4, which was a high convex tone at the beginning of the 20th century. This complex change seems to have been either a consequence or a trigger of the onset raising of Tone 3 (see section 2). In both analyses, the new flat rising-falling contour kept Tone 4 distinct from Tone 3, which was becoming a high falling tone. The same systemic bias also seems to have been responsible for the rightward sliding and the subsequent truncation of Tone 5. Both changes helped magnify the perceptual distance between Tone 5, which had previously been a low rising tone, and Tone 4, which was becoming a true mid rising tone. Crucially, it is this systemic

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bias that explains how the chains of contour changes were triggered. The three changes are schematized in the Appendix.

In summary, the three systemic biases offer a coherent explanation for the changes that took place in Bangkok Thai in the 20th century. Not only do they account for contour changes that do not have clear phonetic motivation but they also offer an explanation for the tonal chain shifts. It must be emphasized again that these three systemic biases are typically second-order in the sense that they do not contribute to the pool of orderly variation. They only favor or disfavor certain variants generated by the phonetic variation. It is the candidate favored by these systemic biases that is phonologized and selected as the output of the sound change.

6 Phonetically-based account of tonal contour changes

The contour changes that took place in Bangkok Thai during the 20th century present a challenging case study for the phonetically-based approach to sound change. Not only do they form causally-linked chain shifts but they also involve multiple motivating factors. While a few of the changes seem to be phonetically-motivated, most seem to involve both phonetic and systemic biases. To fully understand the contour changes, it is necessary to examine the interaction between the two types of biases. This section discusses how phonetic and systemic biases interact to give rise to the observed tonal contour changes.

Phonologization involves both phonetic and systemic biases in a sequential relationship. In particular, the phonetic biases in speech provide a starting point by generating variants in the pool of structured variation. The systemic biases then select from the candidates in the pool the variants that will be reanalyzed as the primary variant through the process of phonologization (Garrett and Johnson 2013; Kiparsky 1995; Lindblom et al. 1995). Tab. 6 summarizes the biases proposed as the motivations for each contour change.

As can be seen above, most changes involve both phonetic and systemic biases. A clear example is the onset raising of Tone 3, which occurred in the first half of the century. Due to this change, Tone 3 changed from a mid falling tone to a high falling one. According to the phonetically-based approach to sound change, the tone must have been enriched with a certain degree of variation at the beginning of the century. In particular, it may have been realized with varying degrees of initial pitch height due to effects of syllable onset. In other words, Tone 3 may have had a few variants including [31], [32] and [42] conditioned by the initial

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consonant. In addition to the effect of syllable onset, the onset raising of Tone 3 also seems to have been motivated primarily by contour maximization. Among the variants of Tone 3 at the beginning of the century, [42] was the preferred variant with respect to contour maximization that is characterized by the greatest f0 excursion among the candidate variants. This article proposes that [42] eventually won out as the primary variant by the middle of the century because the dramatic fall enhanced its distinctiveness as a falling tone. The phonologization of the high falling contour is schematized in Fig. 7.

Tab. 6: Summary of biases motivating contour changes in Bangkok Thai.

Changes	Phonetic biases	Systemic biases
Onset raising of Tone 3	Effect of syllable onset	Contour maximization
Rightward sliding and flattening of Tone 4	Peak delay Contour reduction	Avoidance of similar tones
Curving of Tone 4	-	Contour accentuation
Rightward sliding of Tone 5	Peak delay	Avoidance of similar tones
Loss of final fall in Tone 4	Peak delay	-
Truncation of Tone 5	Peak delay	Avoidance of similar tones

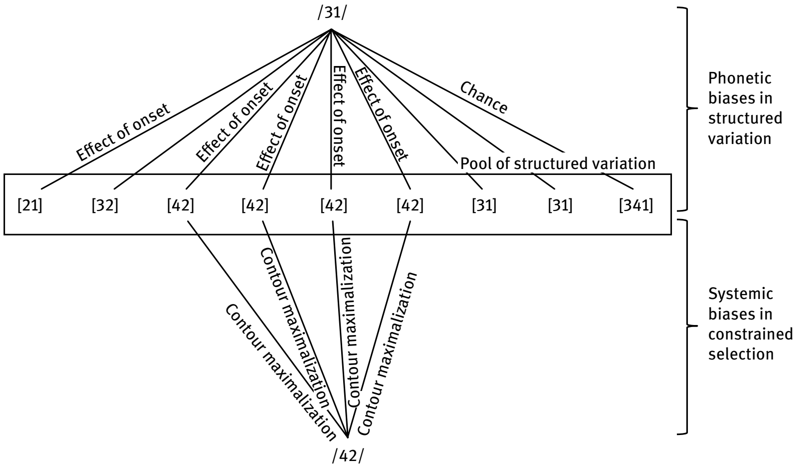

Fig. 7: Phonologization of the high falling contour of Tone 3.

Another example of contour change that involves both phonetic and systemic biases is the rightward sliding and flattening of Tone 4. At the beginning of the century, the primary citation form of Tone 4 was still the convex variant [452] but this must have been realized with a certain degree of variation. While contour reduction must have generated flattened convex variants, peak delay must have

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produced rising-falling variants with a late f0 followed by a short fall. However, the two biases combined must have generated a flat rising-falling variant [453] as well. This variant eventually won out in the phonologization process because of the avoidance of similar tones. More specifically, [453] was favored by the systemic bias because it kept Tone 4 distinct from the encroaching Tone 3. In this case, the dominance of the anti-neutralization bias led to the series of tonal chain shifts discussed in section 2.

While many changes seem to be motivated by both phonetic and systemic biases, a few may involve only one type of bias. The loss of final fall in Tone 4 is an example of a contour change that has no clear systemic basis. While it is clear that truncation is phonetically motivated by peak delay, the change does not seem to lead to contrast enhancement or neutralization avoidance. This article thus proposes that among the variants of Tone 4 in the latter half of the century the truncated variant [34] must have been acutely prevalent due to the bias introduced by peak delay. As time passed, it became progressively more frequent until finally it became phonologized as the primary form in citation. In this case, the process of constrained selection was driven by frequency rather than systemic bias.

In contrast to the loss of final fall, the curving of Tone 4 is an instance of a contour change without an identifiable phonetic motivation. In the current account, the curving of the rising contour is motivated by contour accentuation, which strives to enhance the magnitude of the rise by adding an initial pitch drop to the tonal contour. However, it is not clear what phonetic bias would generate the curved variant [435] in the pool of structured variation. The lack of known phonetic motivation suggests that [435] may have been the result of chance. In any case, the curved variant was selected in the phonologization process due to the enhancement bias.

Considering the inventory of proposed biases, some biases at first glance seem to be in conflict with each other. Particularly, contour reduction and contour accentuation appear to exert opposite effects. However, the two in fact do not contradict for two reasons. First, they target different aspects of the tonal contour. Contour reduction alters the overall contour shape and may affect the pitch offset. For example, a dramatic fall may flatten to a gradual fall due to contour reduction. In contrast, contour maximization only shifts the pitch onset, only changing the overall contour shape as a by-product. For example, a mid falling tone may become high falling to maximize the distinctness of the fall. Crucially, the difference between contour reduction and contour maximization predicts different directions of change. More specifically, a mid falling tone tends to become high falling, but a high falling tone tends to lose its characteristic fall. The former is clearly attested by the early onset raising of Tone 3 discussed in section 2; the latter appears to be in progress at the moment (Arunreung 1990; Morén and Zsiga 2006).

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Second, contour reduction and contour maximization are different types of biases and thus operate in different orders. Because the inputs into the pool of variation are produced with phonetic biases, the effect of systemic biases is limited only to choosing between potential changes given the variation. In other words, systemic biases are likely to take effect when phonetic biases first pave the way. Therefore, a tonal change based solely on contour maximization is predicted to be unlikely. Perhaps not coincidentally, the onset raising of Tone 3, which is the only change motivated by contour maximization in Bangkok Thai, also involves the effect of syllable onset. This case of apparent conflict is a good case study of the relationship between phonetic and systemic biases.

In summary, the current proposal holds that the phonetic and systemic biases identified as the motivation for tonal contour changes relate to each other in a linear feed-forward way. More specifically, the phonetic bias provides the starting point by enriching the pool of structured variation from which the systemic bias selects the optimal variant. While, in most cases, both types of bias are involved, some contour changes may only have one. Not only does the proposed sequential model of phonologization identify the motivations for the observed tonal contour changes but it also provides an elegant account of how multiple biases interact with each other.

7 Contour changes as restructuring of synchronic variation

In addition to the phonetic and systemic biases, one crucial element of phonologization in the proposed model is restructuring of synchronic phonetic variation. For lexical tones, the restructuring that leads to a contour change can be roughly characterized as reorganization of tonal variants that occur in different phonetic, phonological, stylistic, or sociolinguistic environments (Pittayaporn 2007). A contour change is thus said to have occurred when tonal variants previously found in other positions have taken over as the primary variant, especially in the citation form, which is assumed to be the environment in which a lexical tone is realized in its ideal contour shape. In support of the proposed model, this section discusses how the patterns of phonetic variation in Tone 3 and Tone 4 have changed over time.

For more recent changes, the restructuring of phonetic variation is best illustrated using apparent-time data. For Tone 4, Panroj (1990) shows that older speakers (aged 30–40 and 50–60) and younger speakers (aged 10–20) at the time differed with respect to phonetic realization of Tone 4. While the former

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pronounced the tone as curved rising with a slight fall at the end, the latter realized it without the fall. The variable absence of the fall in the late 20th century is consistent with the eventual loss in the prototypical pronunciation of Tone 4 in the early 21st century (see section 2 for details). This phonetic variation across age groups shows that rise-only contour was becoming the primary variants of Tone 4. Unfortunately, Panroj only presents f0 contours obtained from averaging across all speakers in each age group without looking at the frequency with which the different variants occurred.

More revealing is the case of Tone 3. Two variationist studies conducted during the first years of the 1990's reveal that the high falling contour was gradually gaining ground during the second half of the 20th century. According to Arunreung (1990), speakers from three age groups show different patterns of variation. In the oldest and the middle groups, the mid falling variant was the most prevalent in connected speech. However, the middle group shows a significantly higher frequency of the high falling variant than the oldest group. Fig. 8 shows how the patterns of phonetic variation in the realization of Tone 3 in connected speech drifted over time.

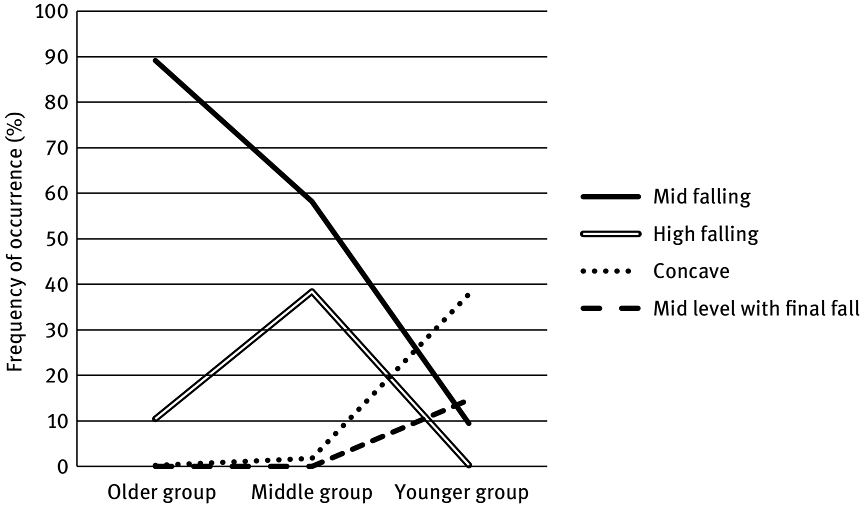

Fig. 8: Restructuring of the variation in the realization of Tone 3 (based on Arunreung 1990: 46, 52).

Crucially, the increase in prevalence of the innovative high falling variant confirms that the onset raising of Tone 3 that occurred in the second half of the century (see section 2 for detail) came about through the restructuring of phonetic variation.

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For the youngest age group, however, the most common variant was a concave one.[8] It is interesting that neither of the variants has replaced the high falling as the primary variant of Tone 3 in citation forms. Because citation forms tend to be more conservative, it is possible that the rising-falling contour has become the primary variant in connected speech but has not replaced the high falling contour in citation forms. The result on the citation form of Tone 3 from Panroj (1990) is also consistent with this finding.

For changes that occurred in the first half of the 20th century, no apparent time study is available to confirm whether they are results of restructuring of phonetic variation. Fortunately, a number of contemporary writers provide explicit information about variation in the realization of Tone 4. In particular, Jones (1918, cited in Henderson 1976), Taylor (1920), and even Bradley (1911) mention a high level or slightly rising variant that lacked the strong fall at the end. The description is reminiscent of the contour of Tone 4 recorded in Abramson (1962). Revealingly, Henderson (1964) remarks that the variant was gaining ground among younger speakers and was being generalized to positions other than the checked syllables with a short vowel. Put together, these sources suggest that a reorganization of tonal variants took place in the first half of the 20th century resulting in the flattened variant taking over as the primary variant of Tone 4. The fact that this innovative variant first arose in short checked syllables also points to influence of contour reduction in determining the direction of change (see section 2).

Although the three examples just discussed show that the tonal contour changes are results of restructuring, it is not the case that restructuring of phonetic variation necessarily leads to tonal contour change. Firstly, if the variation is phonogically determined, restructuring may be triggered by loss of the conditioning environment and result in a phonemic split. In such cases, the restructuring would increase the number of tones in the system, cf. Hyman (2018). For example, the transphonologization of onset voicing into tones in Vietnamese belongs precisely to this type of restructuring (Haudricourt 1954). On the other hand, if the phonetic variants do not generalize but become categorically predictable by phonological or morphological environments, the restructuring would result in tone-sandhi alternations. Mandarin third tone sandhi, I claim, may have arisen in this manner.

In summary, the changing patterns of phonetic variation in Tone 3 and Tone 4 provide a clear picture of how structured variation brings about tonal contour changes. This in turn lends further support for the view that contour changes are results of restructuring of synchronic tonal variation. However, more cases of

8 Arunreung (1990) considers [341] and [343] as two variants, but for presentational purposes this article treats them as one.

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tonal contour changes from other languages should also be examined to validate the proposed phonetically-based model.

8 Conclusion

Although change in tonal contour is a largely unknown territory within historical phonology, a predictive theory of sound change can lead us towards an understanding of contour changes. This article has provided a phonetically-based account of the contour changes that the lexical tones in Bangkok Thai have undergone since the beginning of the 20th century. It has shown that, in spite of the spectacular outcome, the lexical tones have gone through a number of intermediate steps. This phonetic gradualness is identical to what is known for segmental changes. It has also argued that some of the changes are causally linked to form two chain shifts, a phenomenon widely reported in segments.

Most importantly, the article has proposed that, like segmental changes, the contour changes in Bangkok Thai have a linguistic motivation. It characterizes these motivations in terms of phonetic and systemic biases in phonologization. Some changes were due to phonetic biases, namely, peak delay, contour reduction and the effect of syllable onset. Some were attributed to systemic ones, namely, contour maximization, contour accentuation and avoidance of similar tones. Again, these biases resemble very closely the biases that are responsible for the directionality of segmental changes. However, most contour changes seem to involve both types of bias. In such cases, the phonetic bias determined what tonal variants were generated into the pool of variation. As time passed, the variation was restructured so that one of the variants was selected as the primary form of the tones. It is through this constrained selection that systemic bias came to determine the direction of change. According to the proposed account, the tonal contour changes in Bangkok Thai are not very different from the better understood segmental changes. Therefore, they can be considered to be linguistically-motivated.

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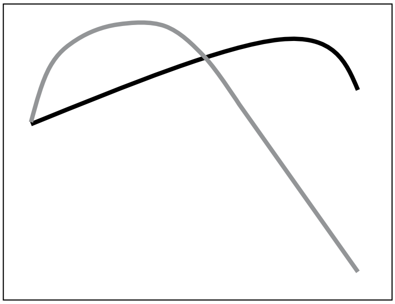
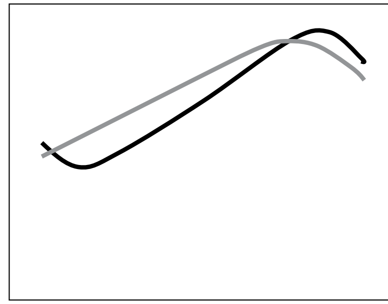
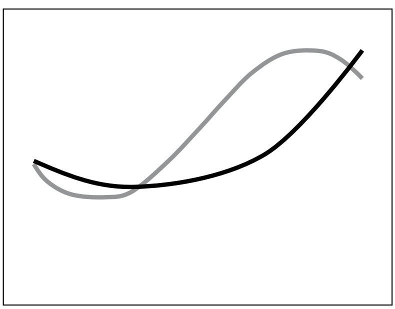
Appendix



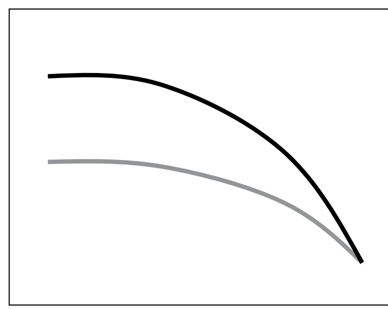
Rightward sliding and flattening of Tone 4



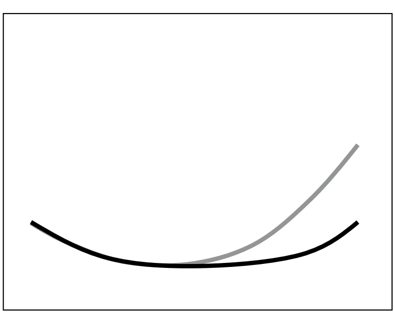
Curving of Tone 4



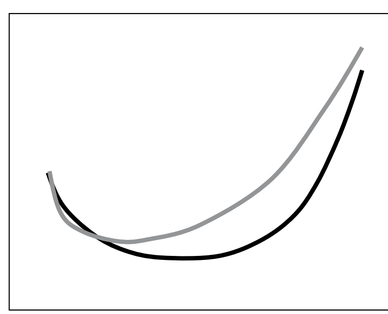
Loss of final fall in Tone 4



Onset raising of Tone 3



Truncation of Tone 5



Rightward sliding of Tone 5

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Haruo Kubozono

Bilingualism and Accent Changes in Kagoshima Japanese

Abstract: This article analyzes ongoing accent changes in Kagoshima Japanese to show that the young speakers' accent patterns are heavily influenced by the pitch patterns of standard Tokyo Japanese. Specifically, they are sensitive to the presence or absence of a pitch fall in Tokyo forms and copy this feature into the accent patterns of their native dialect. In addition, young native speakers of Kagoshima Japanese have phonological knowledge not only about the accented/unaccented distinction in individual words in Tokyo but also about accent rules in this standard dialect. This shows the extent to which young Kagoshima speakers know about the phonology of Tokyo Japanese as well as the extent to which bilingualism can change the accent system of a particular dialect. This article also demonstrates that pitch accent patterns in other Japanese dialects are also heavily influenced by the accent patterns of the standard dialect, on the one hand, and loanword prosody is also governed by the same mechanism, on the other.

Keywords: bilingualism, accent changes, Kagoshima Japanese, loanword prosody

1 Introduction

Japanese is witnessing rapid and radical changes in the prosodic systems of its regional dialects. This is true not only of regional dialects such as Osaka Japanese (Shimizu 2006; Tanaka 2013) and Tottori Japanese (Giriko and Kuwamoto 2013), but also the standard variety of Japanese spoken in Tokyo (Akinaga 1999). Kagoshima Japanese (henceforth 'KJ' for short), which is spoken in the south of

Note: An earlier version of this article was presented at the 3rd International Conference on Phonetics and Phonology (ICPP 3) held at the National Institute for Japanese Language and Linguistics (NINJAL) in Tokyo on December 21-22, 2013. I would like to thank the audience of this conference for their insightful comments and questions. The work reported in this article was supported by the NINJAL collaborative research project 'Phonological characteristics of the Japanese lexicon' and the JSPS Grants-in-Aid for Scientific Research (Grant no. 25580098 and 26244022).

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Japan, is no exception to this. According to Kubozono (2007a), young speakers of the dialect exhibit radical differences from their parents and grandparents in the pitch accent patterns of individual words, while one finds no noticeable difference between middle-aged and older generations. In fact, young speakers of the dialect exhibit different accent patterns in many words from those listed in Hirayama's accent dictionary published about sixty years ago (Hirayama 1960), while speakers in the older generations do not deviate from the patterns specified in the dictionary in a noticeable manner. This suggests that the pitch-accent system of the dialect has changed considerably over the past few decades. This can be demonstrated by the words in (1), which are pronounced with different pitch patterns by young and middle-aged (and older) native speakers of KJ (Kubozono 2007a). In (1) and the rest of this article, high-pitched portions are denoted by capital letters and syllable boundaries are indicated by dots (.) wherever necessary.

(1)	Older generation (traditional pattern)	Younger generation (new pattern)	gloss
	ka.E.de	ka.e.DE	a maple tree
	mo.mi.ZI	mo.MI.zi	a Japanese maple
	doo.na.TU	doo.NA.tu	donut
	bu.ra.ZI.ru	bu.ra.zi.RU	Brazil
	a.o.sin.GOO	a.o.SIN.goo	green signal

Some words in (1) have shifted the H(igh) tone from the penultimate syllable to the final syllable, while others have shown a change in the opposite direction. On the other hand, some words like /o.nin.GYOO/ 'doll' and /a.ka.SIN.goo/ 'red signal' have not undergone any change. This raises the following interrelated questions: (i) what type of word is prone to accent change?, (ii) what triggers such a change, and (iii) what are the constraints which allow persistence of a tonal pattern? The purpose of this article is to answer these interrelated questions.

To achieve this goal, this article will be organized as follows. In the next section (section 2), we will briefly describe the basic features of the KJ accent system in comparison with those of the standard dialect known as Tokyo Japanese (TJ). Section 3 reviews some previous studies on the accent changes in this dialect and the questions that these studies have raised. Section 4 is the core section of this article where new evidence is presented about the accent changes in KJ. It is in this section that the three questions mentioned above are mainly addressed. This is followed by section 5, where we will consider the evidence for KJ accent changes in a wider context, by looking at the accent changes in progress in other dialects of Japanese and by considering the implications for the prosodic system of KJ itself as well as for loanword phonology.

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Section 6 concludes the article by giving a summary of our new findings and some questions that remain for future work.

2 Basic features of KJ

The prosodic system of KJ is strikingly different from that of TJ in many respects. Here we would like to describe three features that are directly relevant to our discussion. The first major difference is that KJ has a two-pattern system which permits only two distinctive pitch patterns or classes irrespective of the length of the word (Hirayama 1951; Uwano 1999; Kibe 2000; Kubozono 2007b, 2011, 2013a). Following Hirayama (1951), we call these classes Type A and Type B. In citation form, they have a high pitch/tone on the penultimate syllable of the word (Type A) and on the final syllable (Type B). Thus, in the traditional system, /ka.E.de/, /bu.ra.ZI.ru/, and /a.ka.SIN.goo/ are Type A words, whereas /mo.mi.ZI/, /o.nin.GYOO/, and /a.o.sin.GOO/ are Type B words. This system is qualitatively different from that of TJ, where the number of distinctive patterns increases in proportion to the length of the word: bisyllabic nouns have three pitch patterns, trisyllabic nouns have four patterns, etc. (Uwano 1999, 2012; Kubozono 2012)

A second major difference between the two pitch-accent systems concerns the unit that is used to measure phonological distances and to assign high pitch/tone. KJ has a 'syllabeme' system (Sibata 1962) where the position of the high pitch is determined by counting the number of syllables, not moras. This can be understood by the words given above, where /ka.E.de/ and /a.ka.SIN.goo/ are high-toned on the penultimate syllables, whereas /mo.mi.ZI/ and /a.o.sin.GOO/ are high-toned on the final syllables. In contrast, the mora serves as the basic unit of phonological distances in TJ. In (2), for example, the high pitch appears basically on the antepenultimate mora, or the third mora from the end of the word: e.g. the trimoraic words in (2a-c) have a high pitch on their initial moras.

(2) Loanwords in TJ
- a. KA.na.da 'Canada'
- b. HA.wai 'Hawaii'
- c. In.do 'India'
- d. ROn.don 'London'
- e. wa.SIn.ton 'Washington'
- f. a.SE.an 'ASEAN'
- g. i.E.men 'Yemen'

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A major exception to this rule is the case like /ron.don/ and /wa.sin.ton/ in (2d, e), where the antepenultimate mora is the second mora of a heavy syllable.[1] In such a case, the high pitch shifts one mora to the left, that is, onto the head mora of the relevant syllable. In this system, an abrupt pitch fall is assumed to be the phonetic correlate of the phonological notion of 'accent' and the syllable either immediately preceding or involving an abrupt pitch fall is the docking site of the accent. Using this phonological notion, the default position of word accent in this system is the 'syllable containing the antepenultimate mora' (McCawley 1968).[2] This generalization has led McCawley (1978) to call TJ a 'mora-counting, syllable language'. (3) gives the phonological representation of the words in (2), using an apostrophe as an accent mark.[3] Surface pitch patterns in (2) are added in brackets to show the relationship between phonetic and phonological representations.

(3) Loanwords in TJ (accentual analysis)
- a. ka'.na.da [KA.na.da] 'Canada'
- b. ha'.wai [HA.wai] 'Hawaii'
- c. i'n.do [In.do] 'India'
- d. ro'n.don [ROn.don] 'London'
- e. wa.si'n.ton [wa.SIn.ton] 'Washington'
- f. a.se'.an [a.SE.an] 'ASEAN'
- g. i. e'.men [i.E.men] 'Yemen'

The crucial difference between KJ and TJ can be seen more clearly by comparing the surface pitch patterns in (2) with those of the corresponding words in KJ, given in (4) below.[4]

(4) Loanwords in KJ
- a ka.NA.da
- b. HA.wai
- c. IN.do

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1 In Japanese, heavy syllables are bimoraic syllables consisting of a head mora and another mora dependent on it. Dependent moras fall into four kinds: the second half of long vowels, the second half of diphthongs (/ai/, /oi/, or /ui/) (Kubozono 2004, 2015), the moraic nasal (N), and the first half of geminate obstruents (Q).

2 This rule is different from the famous accent rule of Latin which places an accent on the penult if it is heavy and on the antepenult otherwise: see (2f, g).

3 In TJ, citation forms generally begin with a low pitch on the first mora and a high pitch on the second. This redundancy rule is violated when the word is initially-accented, as in (3a-d), in which case the first mora is high and the second is low. It is also violated when the word begins with a heavy (bimoraic) syllable, in which case the word begins with a high pitch.

4 Across dialects, loanwords usually exhibit a pitch pattern that involves a pitch fall. Hence, most loanwords take the accented (vs. unaccented) pattern in TJ and Type A in KJ (Kubozono 2006a).

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d. RON.don
e. wa.SIN.ton
f. a.SE.an
g. i.E.men

The difference between the basically mora-based TJ system and the syllable-based KJ system shows up clearly in the vowel coalescence process, too. In TJ, diphthongs undergo this process to become long vowels, whereas they often turn into short vowels in KJ, as exemplified in (5).[5] Both dialects preserve the input structure in the output, but in different ways: The TJ forms preserve the number of moras of the source words, whereas the KJ forms preserve the number of syllables.[6] Moreover, the originally long vowels tend to be long in TJ, whereas they tend to be shortened in KJ as exemplified by /kyo.de/ in (5b). It is the word length as measured by the number of syllables that is preserved in the latter dialect.

(5) a. vowel coalescence in TJ
dai.kon → dee.kon 'white radish'
tai.gai → tee.gee 'generally speaking, probably'
o.mo.si.roi → o.mo.si.ree 'interesting, funny'
b. vowel coalescence in KJ
dai.kon → de.kon 'white radish'
tai.gai → te.ge 'generally speaking, fairly'
kyoo.dai → kyo.de 'brother'

In addition to the two major differences, KJ and TJ also differ with respect to the compound rule governing the accent structure of compounds. In fact, they have mirror-image rules of compound accent: a left-dominant rule (KJ) and a right dominant rule (TJ). In KJ, the initial member of compounds determines the accent type of the entire compound: if the initial member is a Type A morpheme, the entire compound expression takes Type A pattern, whereas if it is a Type B morpheme, the compound takes Type B pattern. Thus, the tonal pattern of the initial member spreads over the entire domain of compounds (Hirayama 1951). This rule, often called 'Hirayama's Law' (Kubozono 2006b), can be illustrated by /a.ka.SIN.goo/ 'red signal' (Type A) and /a.o.sin.GOO/ 'green signal' (Type B), both of which are compound nouns consisting of two words. The first compound takes Type A pattern because its initial element, /A.ka/, is a Type A morpheme. On the

5 In both dialects, vowel coalescence occurs in casual speech.
6 This does not mean that vowel length is not contrastive in KJ. Vowel length is distinctive in this dialect, too, distinguishing many pairs of words: e.g. /to.ru/ 'to take' vs. /too.ru/ 'to pass', /bi.ru/ 'building' vs. /bii.ru/ 'beer'.

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other hand, the second compound takes Type B pattern since its initial member, /a.O/ 'blue, green', is a Type B morpheme.

In contrast, compound accent in TJ is determined by the final member of the compound. The default rule is to preserve the lexical accent of this final member as a compound accent: e.g. /pe'.ru.sya/ 'Persia' + /ne'.ko/ 'cat' → /pe.ru.sya-ne'ko/ 'Persian cat'; /ya'.ma.to/ 'Japan' + /na.de'.si.ko/ 'lady' → /ya.ma.to-na.de'.si.ko/ 'Japanese lady'. This rule is often overridden by the NonFinality constraint (i. e. avoid placing an accent on the final syllable),[7] but it remains the basic rule of compounds in TJ. A major exception of this is due to the so-called 'deaccenting morphenemes' (McCawley 1968; Kubozono 2008), a limited number of morphemes that yield unaccented compounds when they form the final member of the compounds. The finally-accented morpheme /i.ro'/ 'color', for example, deaccents the entire compound no matter what it may be attached to: /o.ren.zi-iro/ 'orange, color; orange', /ne.zu.mi-iro/ 'rat, color; grey', /ra.ku.da-iro/ 'camel, color; camel color'.[8] Together with the default rule mentioned just above, this deaccenting rule yields a right-dominant effect whereby the final member determines the prosodic structure of the entire compound word.

Before considering ongoing accent changes in KJ, let us compare the two dialects with respect to the presence or absence of a pitch fall. The two accent types in KJ, i. e., Type A and Type B, contrast with each other not only in the position of the high pitch/tone, but also in the presence or absence of a sudden pitch fall. Thus, Type A involves a sudden pitch fall between the final two syllables of the word, whereas Type B does not exhibit any such feature. This difference, in fact, reflects the real difference between the two accent classes since monosyllabic words exhibit a contrast in [±pitch fall], not in the position of high pitch/tone. Thus, Type A monosyllables contain a pitch fall within the sole syllable, whereas their Type B counterparts exhibit a flat pitch, as shown in (6). This is true of monosyllabic words made up of only one mora, too, e.g., /hì/ 'sun, sunshine' vs. /hī/ 'fire', /hà/ 'leaf' vs. /hā/ 'tooth'.[9] We will come back to this issue in section 5.2 below, where we discuss the distinctive phonetic feature of word accent in KJ.

7 For example, the lexical accent of /i.nu'/ 'dog' cannot be preserved in compounds: /a'.ki.ta/ 'Akita' + /i.nu'/ 'dog' → /a.ki.ta'-i.nu/ 'Akita dog'.

8 Most deaccenting morphemes are lexically finally-accented like /iro'/ 'color', although not all finally-accented nouns show the deaccenting behavior in compounds (Poser 1984; Kubozono 1997).

9 Phonetically, these monomoraic monosyllables are shorter than bimoraic monosyllables. Monomoraic words are transcribed by lower case letters with a diacritic showing a falling or level pitch: e.g. Type A /hì/ vs. Type B /hī/.

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(6) Contrast in pitch pattern in KJ monosyllables

Type A	Type B
TOo ‘ten’	TOO ‘tower’
TAi ‘Thailand’	TAI ‘sea bream’
hì ‘sun, sunshine’	hī ‘fire’
hà ‘leaf’	hā ‘tooth’

Just like KJ, TJ also exhibits a contrast in the presence or absence of a pitch fall. This dialect shows a contrast in the position of a pitch fall, too, but this is a secondary feature of word accent as compared with the presence or absence of a pitch fall. In the first place, a majority of words in TJ are unaccented (Kubozono 2006a).[10] Moreover, accented words tend to have an accent on the syllable containing the antepenultimate mora, with other accented patterns accounting for only a small portion of the vocabulary (see Kubozono 2008 for a detailed discussion). Because of these lexical biases, most segmentally homophonous pairs are distinguished by [±pitch fall], not by the position of the pitch fall, if they are distinguished at all.[11] This is exemplified in (7), where the surface pitch patterns are given in brackets.[12,13]

(7) Segmentally homophonous but accentually distinguished pairs of words in TJ

Accented	gloss	Unaccented	gloss
a’.me	rain	a.me	candy
[A.me]		[a.ME]	
ha.na’	flower	ha.na	nose
[ha.NA]		[ha.NA][14]	
i’.on	ion	i.on	allophone
[I.on]		[i.ON]	
na.ri.ta’-san	Mt. Narita	na.ri.ta-san	produce of Narita
[na.RI.TA.san]		[na.RI.TA.SAN]	
a.ki.ta’-ken	Akita Prefecture	a.ki.ta-ken	Akita Dog
[a.KI.TA.ken]		[a.KI.TA.KEN]	

10 The unaccented pattern is not popular in loanwords, though. See section 4.2 for details.
11 There are many pairs of segmentally homophonous words that are homophonous tonally, too: e.g., /ku’.mo/ ‘cloud’, ‘spider’; /ka.mi’/ ‘hair’, ‘paper’.
12 Words without an apostrophe are ‘unaccented’ words, or words that are pronounced without a sudden pitch fall even when they are followed by a grammatical particle.
13 Only a handful of pairs contrast in the position of a pitch fall: e.g., /a’.ki/ ‘autumn’ vs. /aki’/ ‘tiresomeness’, /ha’.si/ ‘chopsticks’ vs. /ha.si’/ ‘bridge’. Most of these words also contrast in [±pitch fall]: e.g., /a.ki/ ‘vacancy’, /ha.si/ ‘edge’.
14 Finally-accented and unaccented words are difficult to distinguish from each other when they are produced in isolation (Vance 1995). However, they can be distinguished easily in phrases by the pitch (low or high) of the grammatical particle immediately following them.

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From the foregoing discussion, it can be understood that both KJ and TJ have two tonal types of words, those that involve a sudden pitch fall and those that do not: Type A in KJ and the accented class in TJ involve a pitch fall, whereas Type B in KJ and the unaccented class in TJ lack this phonetic feature. Since there is no direct correspondence between the binary typology of KJ (Type A vs. Type B) and that of TJ (accented vs. unaccented), this leads to a four-way classification of the pitch accent patterns in KJ and TJ. This is illustrated in Tab. 1, where [±FALL] stands for the presence or absence of a pitch fall. Surface pitch patterns are not given here since they differ between the two dialects.

Tab. 1: Four-way correspondences between KJ and TJ accent classes.

TJ / KJ	'Accented' [+FALL]	'Unaccented' [–FALL]
Type A [+FALL]	tai 'Thailand' a.ka-sin.goo 'red signal'	ka.e.de 'a maple tree' bu.ra.zi.ru 'Brazil' ra.ku.da-iro 'camel color'
Type B [–FALL]	tai 'sea bream' mo.mi.zi 'a Japanese maple' o.te.ga.mi 'a letter' a.o-sin.goo 'green signal'	o.nin.gyoo 'a doll' ne.zu.mi-iro 'grey'

This four-way classification is very important when understanding the nature of accent changes in KJ, as we will see shortly below. Specifically, if there were no influence of TJ on the ongoing accent changes in KJ, Type A words would turn into Type B no matter how they are pronounced in TJ. Type B words should also turn into Type A regardless of whether they are accented or unaccented in TJ. This null hypothesis is schematically shown in Tab. 2, where the expected ratios of accent changes in Type A words, i. e. 'X %', are roughly identical whether they belong to the accented or unaccented class in TJ. The same is true of Type B words, which should show roughly identical degrees of change, i. e. 'Y %', irrespective of whether they are accented or unaccented in TJ.

Tab. 2: Expected ratios of accent changes in KJ under the null hypothesis.

TJ / KJ	'Accented' [+FALL]	'Unaccented' [–FALL]
Type A [+FALL] → [–FALL]	X%	X%
Type B [–FALL] → [+FALL]	Y%	Y%

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3 Previous studies

While the pitch-accent system of KJ has been widely studied in the literature, the ongoing accent changes therein have attracted relatively little attention. We will introduce two previous studies here, which are directly relevant to this article. Kubozono (2007a) looked at the accent changes in simplex words as well as frequently-used compounds produced by three generations, while Kubozono (2007b) examined the productivity of Hirayama's Law in novel compound expressions.

3.1 Kubozono (2007a)

The first substantial work on accent changes in KJ is Kubozono (2007a), who looked at three generations—twenty teenagers and ten people each in their parents' and grandparents' generations—and pointed out that the teenage group of informants exhibit a much higher degree of accentual change in both basic and compound nouns (Tab. 2). In this study, the change in basic nouns was measured in reference to Hirayama's (1960) accent dictionary. For example, the accent patterns /no.mi.MO.no/ and /no.MI.mo.no/ 'drink' are considered innovative since they deviate from the pattern listed in the 57-year-old dictionary, i. e., /no.mi.mo.NO/. On the other hand, the informants' accent patterns of compounds were evaluated in light of the compound accent rule (Hirayama's Law) so that any deviations from this left-dominant rule were considered 'new patterns'. Thus, the Type A output /a.o-SIN.goo/ for 'green signal' was judged as a deviation from the traditional rule if the speaker produced its first element as Type B, i. e. /a.O/ 'blue, green'.

Tab. 3: Degrees of change according to age group and word type (%) (Kubozono 2007a).

Word type / Age group	Basic nouns	Compound nouns
Old (70 years-)	3%	6%
Middle-aged (40–60)	7%	8%
Young (13–15)	21%	25%

Kubozono (2007a) examined the data in Tab. 3 more carefully to analyze where and how the young generation produced non-traditional patterns in basic nouns and compounds, respectively. As for the prosodic shape of the new pitch patterns, he discovered that almost all innovative forms involve a change in accent class: Type A words turn into Type B, and vice versa. In other words, words do not turn

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into a third accent type other than Type A and Type B, nor do they violate the principle of syllable-based pitch assignment. For example, the originally Type B word /a.o-sin.GOO/ 'green signal' is now pronounced by many young speakers as /a.o-SIN.goo/ (Type A) instead of other logically possible pitch patterns such as the TJ form /a.O-SIn.goo/ and other patterns, e.g. /a.o-SIn.goo/, /a.o-sin.GOo/.

Confirming that the ongoing accent changes in KJ are thus constrained by the traditional accent system, Kubozono (2007a) went on to examine where the changes took place, or, more precisely, what type of word is prone to change. He was principally interested in knowing whether the young speakers' deviations from the traditional patterns are due to the influence of TJ to which they are heavily exposed through mass media in their daily life.[15] To see this point, he reanalyzed his data in the form of Tab. 2. The results of this analysis are summarized in Tab. 4 (basic nouns) and Tab. 5 (compound nouns).

Tab. 4: Degree of change in basic nouns produced by young speakers (Kubozono 2007a).

TJ / KJ	'Accented' [+FALL]	'Unaccented' [−FALL]
Type A [+FALL] → [−FALL]	7%	43%
Type B [−FALL] → [+FALL]	25%	11%

Tab. 5: Degree of change in compound nouns produced by young speakers (Kubozono 2007a).

TJ / KJ	'Accented' [+FALL]	'Unaccented' [−FALL]
Type A [+FALL] → [−FALL]	7%	27%
Type B [−FALL] → [+FALL]	60%	4%

These results reveal that the changes in KJ are not free from the influence of TJ accent patterns. On the contrary, both tables indicate a clear influence of the standard dialect. In both basic and compound nouns, Type A words turned into Type B in KJ at a much higher rate if they are unaccented in TJ than if they are accented: 43 % vs. 7 % in Tab. 4 and 27 % vs. 7 % in Tab. 5. Likewise,

15 According to Kubozono's (2007a) additional comment, teenage speakers of KJ watch TV or listen to the radio for four to five hours on average every day. Most TV and radio programs are broadcast in the standard dialect of TJ.

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Type B words in KJ changed their accent category into Type A at a higher rate if they are accented than if they are unaccented in TJ: 25 % vs. 11 % in Tab. 4 and 60 % vs. 4 % in Tab. 5. These large discrepancies indicate that the accent changes in young speakers' speech in KJ are biased by how the words are pronounced in the standard dialect of TJ.

This raises a new question of why the accent changes occur in the phonological contexts where they occur. Why, for example, are Type A words likely to change their accent patterns if they are pronounced as unaccented words, and not as accented words in TJ? A closer examination of the data in Tab. 4 and 5 revealed that words in KJ are changing their accent patterns in such a way that their new patterns agree with the accent patterns of TJ with respect to the presence or absence of a pitch fall, i. e. [±pitch fall]. This explains the fact, for example, that words like /a.o-sin.goo/ 'green signal' (traditionally Type B in KJ and accented in TJ) tend to change their tonal class in KJ, while words like /a.ka.sin.goo/ 'red signal' (traditionally Type A in KJ and accented in TJ) are not prone to change.

In sum, Kubozono (2007a) showed that young native speakers of KJ are sensitive to the presence or absence of a pitch fall in TJ forms and incorporate this feature into the pronunciations of their own dialect. This does not mean, however, that they are consciously imitating TJ when they speak their native dialect. They believe that they speak KJ just as their parents do and, moreover, they are not conscious of their new pronunciations, much less the agreement in [±pitch fall] between their own pitch patterns and the corresponding TJ forms. This heavy influence of TJ on young KJ speakers can probably be attributed to the fact that they have been exposed to the standard variety for many hours every day since their childhood. As noted above, teenage speakers of KJ hear TJ on TV or radio for four to five hours on average every day. This suggests that they are brought up as bilingual speakers between their native dialect and the standard dialect although they are not educated in TJ at school.[16] This is the crucial difference between the teenage generation and the generations of their parents/grandparents, who were not as heavily exposed to the standard dialect in their childhood. In this sense, the ongoing accent changes shown by young native speakers of KJ embody linguistic changes that occur as a result of bilingualism, or those that occur as their first language (L1) is exposed to a second language (L2).

16 Using the standard dialect of TJ is not mandatory at local schools or public meetings in Japan. Many of the young informants actually stated that they had not spoken TJ in public in their life. This suggests that they are trained as bilingual listeners through media if not as bilingual speakers.

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3.2 Kubozono (2007b)

While Kubozono's (2007a) analysis revealed the basic nature of the ongoing accent changes in KJ, it did not show explicitly whether the traditional compound accent rule known as Hirayama's Law has been affected. The data in Tab. 5 suggests a change of this sort, but they do not compellingly show that the compound rule does not work any longer. The main reason for this is that most compound expressions used in this study, e.g., /a.ka-singoo/ 'red signal' and /a.o-sin.goo/ 'green signal', are so familiar to the native speakers that they may be stored as such in the speakers' mental lexicon. A different approach will be needed if one is seriously interested in the productivity of the compound accent rule per se.

In an attempt to answer this question, Kubozono (2007b) conducted a new experiment using novel compound expressions to see how native speakers of KJ produced them. He looked at male given names ending in /o/ and /ki/ as well as female given names ending in /ko/. Instead of using real names such as /ha.na-ko/ 'Hanako', /ha.ru-o/ 'Haruo' and /ha.ru-ya/ 'Haruya', he coined new names by attaching bimoraic nouns that are seldom used in personal names: e.g., /bu.ta/ 'pig', /u.si/ 'cow', /u.ma/ 'horse', /zoo/ 'elephant', /kin/ 'gold', /gin/ 'silver' and /doo/ 'bronze'. Selecting 50 such morphemes and combining them with the three suffixes—/o/, /ki/ and /ko/—, he coined a total of 150 novel compound names as test words.

These test words fall into the four groups in Tab. 6, where the numbers of test words are given in parentheses. They fall into two accent classes in KJ: one half belongs to Type A and the other half to Type B in the traditional KJ accent patterns in reference to Hirayama's (1960) accent dictionary and Hirayama's Law. They fall into two accent classes in TJ, too, since /-o/ is a deaccenting morpheme that yields unaccented compounds, while /-ko/ and /-ya/ are not deaccenting morphemes and, hence, produce accented compounds in TJ: e.g., /bu.TA-O/ vs. /BU.ta-ko/, /BU.ta-ya/.

Tab. 6: Test words and their numbers in Kubozono's (2007b) experiment.

KJ \ TJ	'Accented' [+FALL]	'Unaccented' [–FALL]
Type A [+FALL]	kin-ko, buta-ko (25 words) kin-ya, buta-ya (25 words)	kin-o, buta-o (25 words)
Type B [–FALL]	doo-ko, uma-ko (25 words) doo-ya, uma-ya (25 words)	doo-o, uma-o (25 words)

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Kubozono (2007b) compared three middle-aged or older speakers aged between 50 and 71 with six young speakers aged between 19 and 24. This produced 450 tokens for the older generation (150 test words x 3 subjects) and 900 tokens for the younger generation (150 x 6). This comparison revealed the difference shown in Tab. 7, which confirmed that young speakers violate the left-dominant compound rule at a much higher rate than speakers in the older generations.

Tab. 7: Violation of the compound rule: old vs. new generations.

	...ko	...ya	...o	Total
Old	7 %	8 %	5 %	6 %
Young	20 %	26 %	41 %	29 %

A more careful analysis of the young speakers' data showed a similar bias to the one reported by Kubozono (2007a). Namely, young native speakers of KJ violate the compound accent rule in the same phonological contexts and manner as previously reported: Type A words tend to change their accent category to Type B if they are unaccented in TJ (56 %, or 108 tokens out of 194), whereas Type B words are prone to change if they are accented in TJ (60 %, or 127 tokens out of 212). This is shown in Tab. 8, where the actual numbers of responses are given in parentheses. On the other hand, Type A and Type B words do not change their accent patterns if they are accented and unaccented in TJ, respectively (3 % and 13 %). Consequently, the new accent patterns come to agree with the accent patterns in TJ with respect to [±pitch fall]. As a whole, 83 % of the young speakers' output forms (704 out of 900) agree with TJ forms in this respect. This is an extremely high rate of agreement as compared with what would be expected if there were no influence of TJ on KJ, i. e. 50 %. Some examples showing such changes are given in (8), where surface pitch patterns in TJ are also shown for comparison.

Tab. 8: Violation of the compound rule in young speakers.

KJ \ TJ	'Accented' [+FALL]	'Unaccented' [–FALL]
Type A [+FALL] → [–FALL]	3 % (11/388)	56 % (108/194)
Type B [–FALL] → [+FALL]	60 % (127/212)	13 % (14/106)

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(8) Accent changes in novel compounds

a. Type A → Type B

Old KJ	New KJ	TJ
KIN.o	kin-O	KIN-O[17]
bu.TA.o	bu.ta-O	bu.TA-O

b. Type B → Type A

Old KJ	New KJ	TJ
doo-KO	DOO-ko	DOo-ko
u.ma-KO	u.MA-ko	U.ma-ko
doo-YA	DOO-ya	DOo-ya
u.ma-YA	u.MA-ya	U.ma-ya

Three points are worth emphasizing here. First, those words that agreed between KJ and TJ with respect to [±pitch fall] do not show any tendency to change their accent patterns. For example, /KIN-ko/ and /bu.TA-ko/ remain unchanged, and so do /doo-O/ and /u.ma-O/. Second, the new pitch patterns that result from the changes in (8) are not identical to the pitch patterns of TJ except in [±pitch fall]. For example, the output forms in (8a), /kin-O/ and /bu.ta-O/, have different pitch shapes from the same words in TJ, i. e., /KIN-O/ and /bu.TA-O/. Similarly, the outputs in (8b) are different from the TJ forms. All these output patterns show that it is only the presence or absence of a pitch fall that young native speakers of KJ copy from the pronunciations of TJ. That is, the changes in (8) represent changes in accent categories between Type A and Type B: the other major phonological properties of the system remain intact, such as the two-pattern system and the syllable-based H tone assignment.

Finally, and most importantly, the accent changes in (8) indicate that the left-dominant compound accent rule does not work as much as before. The new patterns in KJ are computed with reference to the final members of the novel compounds such that /-ko/ and /-ya/ yield Type A compounds and /-o/ produces Type B compounds. In fact, a reexamination of Kubozono's (2007b) data reveals that 83 % of the young speakers' output forms (704 tokens out of 900) follow this new TJ-type rule, whereas only 71 % of them (640 out of 900) obey the traditional left-dominant rule.[18] While the latter ratio is still well above the chance level of 50 %,[19] it is considerably lower than the ratio that is accounted

17 Words in TJ including unaccented ones begin with a high pitch if they begin with a heavy syllable: e.g. /TOO.KYOO/ 'Tokyo' (vs. /a.ME.RI.KA/ 'America').

18 These figures include output forms like /bu.TA-ko/ and /u.ma-O/, which obey both the left-dominant and right-dominant rules.

19 This is based upon the assumption that the speakers can only choose between Type A or Type B pattern.

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for by the new right-dominant rule. This suggests that young native speakers of KJ are aware of the accentual behavior of the three suffixes in TJ and attempt to incorporate this right-dominant rule into the pronunciations of their native dialect.

4 Present study

In the foregoing discussion, we have seen that the accent changes in KJ are heavily constrained by both the pitch patterns of TJ and the traditional prosodic system of KJ itself. As for the first constraint, new accent patterns in KJ only copy the presence or absence of a pitch fall in TJ forms or the accentual behavior of some suffixes in TJ. The actual pitch forms of the new accent patterns in KJ are still constrained by its traditional system with respect to the number of contrastive patterns permitted (two-pattern system) and the phonological unit that is used to assign H tones (syllable-based system). Moreover, this change seriously affected the traditional compound rule, or Hirayama's Law, so that compound nouns no longer obey the traditional left-dominant rule, at least not as faithfully as before.

This raises some new questions about the ongoing accent changes in KJ. First, how much do young native speakers of this dialect know about the distinction between accented and unaccented in individual words in TJ? In TJ, most morphologically simplex words, especially those of native and Sino-Japanese origins, do not follow any accent rule, so that their accentedness is largely determined lexically or, equivalently, it is supposedly learned by its native speakers for each lexical entry. Secondly, how much do young speakers of KJ know about the phonological rules and their exceptions? Kubozono's (2007b) data revealed that young KJ speakers know that /-o/, but not /-ko/ or /ya/, yields unaccented compounds, or those that involve no abrupt pitch fall in TJ. While this is one example showing that young KJ speakers know an accent rule of TJ, TJ has many more accent rules some of which are quite complicated. Given this, one may naturally wonder how much young native speakers of KJ know about the accent rules of TJ and their lexical exceptions.

With a view to solving these two questions, we conducted a series of accent experiments in Kagoshima during 2010–2012. The results of these experiments were evaluated by the experimenter, a native speaker of KJ, based on his auditory judgments. All these experiments turn out to show profound effects of TJ accent on the accent patterns of young KJ speakers. We will describe four of them in what follows.

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4.1 /o/-nouns

Let us first consider nouns with an honorific prefix /o-/ as a case where the accented/unaccented distinction is lexically determined in TJ. In this standard dialect, the accentual behavior of the honorific prefix /o-/ is hard to formalize so that some nouns with this prefix are accented and others are unaccented according to the accent dictionaries of Japanese (Hirayama 1960; NHK 1998; Kindaichi 2001). This is exemplified in (9). On the other hand, /o-/ is a Type B morpheme which, subject to the left-dominant compound rule, produces Type B words in KJ. All the words in (9) thus take Type B pattern in the old, i. e., traditional, KJ phonology.

(9) a. Accented words in TJ

TJ form	Old KJ form	gloss
o-mu'.tu [o.MU.tu]	o-mu.TU	diaper
o-ge'n.ki [o.GEN.ki]	o-gen.KI	being well
o-ne'.syo [o.NE.syo]	o-ne.SYO	bed wetting

b. Unaccented words in TJ

TJ form	Old KJ form	gloss
o-su.moo [o.SU.MOO]	o-su.MOO	Sumo wrestling
o-syoo.ga.tu [o.SYOO.GA.TU]	o-syoo.ga.TU	New Year's Day
o-rei [o.REI]	o-REI	thanks, reward

This experiment used sixteen test words with /o-/, including those in (9). Eight of them belong to the type in (9a) and the other eight to the type in (9b). Two groups of informants were asked to produce these test words in isolation: three senior speakers over the age of 50, and eight young speakers aged between 18 and 29. This yielded 176 tokens altogether: 48 tokens (16 words x 3 subjects) for the older group and 128 token (16 words x 8 subjects) for the younger group.

As in the experiments reported by Kubozono (2007a, 2007b), the two groups of words in (9) should exhibit the same degree of deviation from the traditional accent pattern if there were not influence of TJ on KJ. An analysis of our data has shown that this is indeed the case with the group of older speakers: none of the three subjects showed a deviation from the traditional accent pattern in any of the 16 test words (Tab. 9). That is, their output forms are identical to the patterns listed in Hirayama's (1960) dictionary or those that are predicted by the traditional compound accent rule.

On the other hand, the young speakers of KJ displayed a strong influence of TJ, as summarized in Tab. 10. Most of the deviations from the traditional patterns are observed in words that are accented in TJ and these deviant forms all take Type A pattern. In fact, the young speakers employed Type A pattern instead of Type B

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in nearly 40 % of tokens of ‘accented’ test words. Some typical examples are given in (10), where old and new KJ forms are compared with TJ forms. In contrast, words classified as unaccented in TJ are not prone to change (only 5 %) although their output forms are not entirely identical to those of TJ: e.g. /o-su.MOO/ and /o-syoo.ga.TU/ in KJ as opposed to /o-SU.MOO/ and /o-SYOO.GA.TU/ in TJ. A statistical test (Yate’s-corrected Chi-square test) shows that the difference between the two conditions is statistically significant: $\chi^2 = 20.16$, df = 1, $p < .001$.

Tab. 9: Deviation from the traditional accent pattern (older generation).

TJ / KJ	‘Accented’ [+FALL]	‘Unaccented’ [−FALL]
Type B [−FALL] → [+FALL]	0 % (0/24)	0 % (0/24)

Tab. 10: Deviation from the traditional accent pattern (younger generation).

TJ / KJ	‘Accented’ [+FALL]	‘Unaccented’ [−FALL]
Type B [−FALL] → [+FALL]	39 % (25/64)	5 % (3/64)

(10)	Old KJ	New KJ	TJ	gloss
	o-gen.KI	o-GEN.ki	o-GEn.ki	being well
	o-ne.SYO	o-NE.syo	o-NE.syo	bed-wetting

Note that some of the new accent patterns, e.g. /o-NE.syo/ in (10), are identical to the surface forms in TJ, but these are the cases where Type A forms in KJ happened to be the same as the TJ forms. All the innovative pitch forms take Type A pattern, as mentioned above. This confirms that young KJ speakers are attentive to [±pitch fall] in the TJ forms and attempt to incorporate this feature into the pronunciations of their native dialect.

However, it does not follow from this that the left-dominant compound rule is totally inactive in the young speakers’ data. Since 61 % of the tokens for accented test words still take Type B pattern, the traditional compound rule respecting the accentual behavior of the prefix /o-/ still accounts for 78 % of the data (100 tokens out of 128), while the tokens that show an agreement with TJ forms in [±pitch fall] account for 67 % (86 tokens out of 128). Nevertheless, the influence of TJ on the young speakers’ speech cannot be overlooked, as Tab. 10 shows.

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A supplementary experiment was conducted to further confirm the results in Tab. 10. This experiment looked at sixteen young KJ speakers aged between 19 and 22, with a completely different set of test words from the previous experiment. It used five accented words in TJ and the same number of unaccented words, all beginning with the prefix /o-/: e.g., /o-te'.ga.mi/ 'letter', /o-si'.go.to/ 'work' (accented) and /o-ma.tu.ri/ 'festival' and /o-ben.kyoo/ 'study' (unaccented). This supplementary experiment analyzed a total of 190 tokens (10 words x 19 speakers), which replicated the results of the previous experiment, as summarized in Tab. 11. Again, Type B words in KJ are more likely to change to Type A if they are accented in TJ than if they are unaccented ($\chi^2 = 34.503$, df = 1, p<.001), although the new pitch patterns are not entirely identical to those of the corresponding TJ words. This is exemplified in (11), where old and new KJ forms are compared with the corresponding TJ forms.

Tab. 11: Deviation from the traditional accent pattern (younger generation).

TJ / KJ	'Accented' [+FALL]	'Unaccented' [−FALL]
Type B [−FALL] → [+FALL]	38 % (30/80)	0 % (0/80)

(11)	Old KJ	New KJ	TJ	gloss
	o-te.ga.MI	o-te.GA.mi	o-TE.ga.mi	letter
	o-si.go.TO	o-si.GO.to	o-SI.go.to	work
	o-su.ga.TA	o-su.GA.ta	o-SU.ga.ta	figure, form

4.2 Loanwords

Loanwords can also be an important source of data for the current study since their accentedness in TJ is largely rule-governed although they are morphologically simplex. In this standard dialect, 90 % of loanwords are accented, while the remaining 10 % are unaccented (Sibata 1994). While this suggests that the unaccented pattern itself is an exception to the general rule, this marked accent pattern is nevertheless largely rule-governed, too, in the sense that it typically appears in certain phonological contexts. To be more precise, the unaccented pattern is typically observed in four-mora loanwords that end in a sequence of light (monomoraic) syllables (Kubozono 1996, 1999, 2006a). In other words, the

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phonological length of the word and its structure in final position play a pivotal role in deciding whether it is pronounced as an accented or unaccented word. According to Kubozono's (2006a) quantitative study, the unaccented pattern is found in 19 % of four-mora loanwords and the unaccented ratio goes further up to roughly 50 % in four-mora loans ending in a sequence of two light syllables. These points can be seen from Tab. 12 and 13, both taken from Kubozono (2006a: 1157): 'L' and 'H' stand for light and heavy syllables, respectively.

Tab. 12: Word length and the ratio of the unaccented pattern in loanwords in TJ (N = 1,863 words, NHK 1985).

Word length	**3 moras**	**4 moras**	**5 moras**	**Average (3-5moras)**
Unaccentedness ratio	5 %	19 %	8 %	13 %

Tab. 13: The ratio of the unaccented pattern in four-mora loanwords as a function of word structure in TJ (N = 963 words, NHK 1998).

Word structure	**LLLL**	**HLL**	**LHL**	**LLH**	**HH**
Unaccentedness ratio	54 %	45 %	24 %	19 %	7 %

While the data in Tabs. 12 and 13 suggest that the accented/unaccented distinction in TJ is more or less rule-governed, the same rule does not work in the traditional grammar of KJ. In the latter dialect, four-mora loanwords that are unaccented in TJ can be either Type A or Type B, as shown in Tab. 14.

Tab. 14: Examples of test words used in the loanword experiment.

TJ / **KJ**	**'Unaccented' [–FALL]**
Type A [+FALL]	mo.na.ri.za 'Mona Lisa' mai.na.su 'minus'
Type B [–FALL]	a.me.ri.ka 'America' i.ta.ri.a 'Italy'

With the two-way classification in Tab. 14 in mind, a new experiment was conducted where 32 unaccented four-mora loanwords in TJ were read by the same two groups of KJ speakers that participated in the first experiment discussed

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in section 4.1 above. This produced 352 tokens in all (32 words x 11 speakers): 96 tokens for the older generation and 256 tokens for the younger one. The analysis of their responses is summarized in Tab. 15.

Tab. 15: Deviation from the traditional accent pattern.

a. older generation

KJ \ TJ	**'Unaccented' [−FALL]**
Type A [+FALL]	5 %
→ [−FALL]	(4/81)
Type B [−FALL]	0 %
→ [+FALL]	(0/15)

b. younger generation

KJ \ TJ	**'Unaccented' [−FALL]**
Type A [+FALL]	52 %
→ [−FALL]	(113/216)
Type B [−FALL]	8 %
→ [+FALL]	(3/40)

Again, the difference between the two groups of speakers is evident: while middle-aged and older speakers hardly show a change, the younger group of speakers displays a considerable degree of deviation from the traditional accent patterns. Moreover, the deviations by the latter group of speakers are largely confined to words that are traditionally pronounced as Type A words. In fact, more than a majority (52 %) of Type A test words are now pronounced as Type B by the young KJ speakers, while only a few Type B words undergo such a change: the difference between the two conditions is statistically significant ($\chi^2 = 25.575$, df = 1, $p < .001$). Some typical examples are given in (12) where, again, the corresponding TJ forms are also given for comparison.

(12)

Old KJ	New KJ	TJ	gloss
mo.na.RI.za	mo.na.ri.ZA	mo.NA.RI.ZA	Mona Lisa
su.te.RE.o	su.te.re.O	su.TE.RE.O	stereo
mai.NA.su	mai.na.SU	MAI.NA.SU	minus

On the other hand, the test words that are traditionally pronounced as Type B remain unchanged although their pitch patterns are not entirely identical to those of TJ, as exemplified in (13).

(13)

Old KJ	New KJ	TJ	gloss
a.me.ri.KA	a.me.ri.KA	a.ME.RI.KA	America
i.ta.ri.A	i.ta.ri.A	i.TA.RI.A	Italy
ai.RON	ai.RON	AI.RON	iron
ka.su.te.RA	ka.su.te.RA	ka.SU.TE.RA	sponge cake

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These results suggest that young native speakers of KJ are subconsciously aware of the rules or tendencies that are responsible for the emergence of the unaccented pattern in loanwords in TJ. They unintentionally use this phonological knowledge about TJ when speaking their own dialect.

4.3 Personal names

In TJ, the accentuation of some personal names is determined by an accent rule that is sensitive to their morphosyntactic structure. For example, the male given names /ta.ke.si/ 'Takeshi' and /ta.ke.ru/ 'Takeru' take the accented and unaccented patterns, respectively, since the former name derives from an adjective and the latter from a verb. This morphosyntactically-defined rule is a relatively minor rule in the accent system of TJ since it only accounts for the accentuation of a certain group of personal names. However, it is nevertheless very productive and permits very few exceptions, if any (Tanaka and Kubozono 1999; Kubozono 2006b). Some examples are given in (14).

(14) a. names derived from adjectives → accented
sa'.to.si 'Satoshi', a'.tu.si 'Atsushi', ki'.yo.si 'Kiyoshi', yu'.ta.ka 'Yutaka', si'.zu.ka 'Shizuka'
b. names derived from verbs → unaccented
sa.to.ru 'Satoru', ma.sa.ru 'Masaru', me.gu.mi 'Megumi', me.gu.mu 'Megumu', si.ge.ru 'Shigeru', ha.ge.mu 'Hagemu'

In KJ, these names fall into two accent types, Type A and Type B. Unlike TJ, their accentuation is not determined by morphosyntactic factors in this dialect, but basically by the accentuation of the verbs and adjectives from which they are derived. Thus, /me.GU.mi/ 'Megumi' and /me.GU.mu/ 'Megumu' both exhibit Type A pattern since they are derived from the Type A verb /me.GU.mu/ 'to bless'. Similarly, /si.ge.RU/ 'Shigeru' takes Type B pattern because it comes from the Type B verb /si.ge.RU/ 'to grow'. In this way, personal names generally inherit the accent property of their source words in the traditional grammar of KJ.

20 native speakers of KJ participated in this experiment involving these personal names: three middle-aged or older speakers and 17 young speakers aged between 19 and 22. They were asked to pronounce a total of 72 test words including those in (14), which produced 1,440 tokens altogether. Tab. 16 and 17 summarize the results of this experiment for the older and younger generations, respectively.

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Tab. 16: Results of the experiment involving personal names (older generation).

KJ \ TJ	'Accented' [+FALL]	'Unaccented' [–FALL]
Type A [+FALL]	7 %	5 %
→ [–FALL]	(2/30)	(5/96)
Type B [–FALL]	13 %	29 %
→ [+FALL]	(6/48)	(10/42)

Tab. 17: Results of the experiment involving personal names (younger generation).

KJ \ TJ	'Accented' [+FALL]	'Unaccented' [–FALL]
Type A [+FALL]	6 %	73 %
→ [–FALL]	(10/170)	(399/544)
Type B [–FALL]	78 %	16 %
→ [+FALL]	(212/272)	(37/238)

Unlike the other experiments we have so far seen, this experiment showed a fairly high percentage of deviations in the group of older speakers, too. These deviations represent cases where the personal names are pronounced with a different accent type from the verb or adjective they are derived from. For example, the senior speakers generally pronounce /o.SA.mu/ 'Osamu' as a Type A word although they produce the corresponding verb form with Type B pattern as listed in Hirayama's (1960) dictionary, i. e. /o.sa.me.RU/ 'to manage, to pursue'. The reason for these deviations is not clear, but they do not seem to obey any rule. In particular, they do not show any significant correlation with the accent patterns in TJ: $\chi^2 = 0.023$, $df = 1$, $p = 0.879$ (Type A); $\chi^2 = 1.263$, $df = 1$, $p = 0.261$(Type B). What is crucial here is that despite these deviations, the older speakers' outputs basically obey the traditional rule whereby derived nouns inherit the accent type of their source words: this rule accounts for 89 % of the data (193 tokens out of 216). In contrast, the TJ-type morphosyntactically-based rule accounts for only 33 % of the data (71 tokens out of 216). This suggests that senior speakers are still faithful to the traditional accent rule that refers to the accent pattern of the source words from which personal names come.

On the other hand, the young speakers' output patterns are not faithful to the traditional rule, which only accounts for 46 % of the data (566 tokens out of 1,224). Instead, they are heavily dependent on the accent patterns of TJ. Originally Type A names are much more likely to take Type B pattern now if they are

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pronounced as unaccented words in TJ than if they are pronounced as accented: 73 % vs. 6 % (χ^2 = 238.162, df = 1, p<.001). Likewise, Type B names in the traditional KJ grammar are much more prone to change their accent pattern if they are accented than if they are unaccented in TJ: 78 % vs. 16 % (χ^2 = 195.287, df = 1, p<.001). In this way, we find a robust effect of TJ accent patterns on the accent changes in the young KJ speakers' speech. Some typical changes are illustrated in (15).

(15) a. Type A → Type B

Old KJ	New KJ	TJ	gloss
sa.To.ru	sa.to.RU	sa.TO.RU	Satoru
ma.NA.bu	ma.na.BU	ma.NA.BU	Manabu

b. Type B → Type A

Old KJ	New KJ	TJ	gloss
si.zu.KA	si.ZU.ka	SI.zu.ka	Shizuka
ta.da.SI	ta.DA.si	TA.da.si	Tadashi

A closer examination of the data reveals that young KJ speakers are more faithful to the TJ-type morphosyntactic rule than the traditional rule of their own dialect. In fact, this new 'rule' accounts for 1,072 tokens out of 1,224, or 88 % of the young speakers' data. This suggests that the young KJ speakers know the morphosyntactically-defined accent rule of TJ illustrated in (14) and apply it to the pronunciations of their own dialect.

4.4 /X-taroo/ and /X-ziroo/ compounds

Finally, we consider the accentuation of personal names involving boys' names /taroo/ 'Taro' and /ziroo/ 'Jiro' such as /momo-taroo/ 'peach-taro' and /kin-ziroo/ 'gold-jiro'. These compound names, which we call /X-taroo/ and /X-ziroo/ compounds here, exhibit rather complicated, but still regular accent patterns in TJ (Kubozono 1998, 1999). Unlike other compound nouns in the same dialect, /X-taroo/ and /X-ziroo/ determine their accent patterns by the phonological length of their *first* member, i. e. /X/. In this sense, they are exceptionally subject to a left-dominant compound rule rather than the regular right-dominant one. Since the traditional compound accent rule in KJ is also left-dominant, /X-taroo/ and /X-ziroo/ can be an interesting test case for the study of L2 influence on L1 phonology of KJ.

Let us first look at the accentuation of /X-ziroo/ in TJ which is a little less complicated than that of /X-taroo/. /X-ziroo/ exhibits three accent patterns depending on the number of moras in /X/: they take the unaccented pattern if /X/ is monomoraic; they attract a compound accent on the final syllable of /X/ if /X/

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is bimoraic; and they preserve the accent of their second member /zi'roo/ as the compound accent if /X/ is more than two moras long.[20] These three patterns are illustrated below.

(16) a. X = monomoraic → unaccented
ko-zi.roo 'little-jiro', ga-zi.roo 'moth-jiro'
b. X = bimoraic → accent on the final syllable of X
ko'o-zi.roo 'high-jiro', ki'n-zi.roo 'gold-jiro', mo.mo'-zi.roo 'peach-jiro', ki.ku'-zi.roo 'chrysanthemum-jiro'
c. X = trimoraic or longer → accent on the initial syllable of /ziroo/
ti.ka.ra-zi'.roo 'power-jiro', u.ru.to.ra.man-zi'.roo 'Ultraman-jiro'

/X-taroo/ compounds also display three different accent patterns, but they are sensitive to the number of *syllables* in /X/ in addition to the number of moras. Namely, they yield unaccented compounds if /X/ is *monosyllabic*; they take an accent on the final syllable of /X/ if this element is *bisyllabic and bimoraic*; and they preserve the accent of their second member /ta'roo/ if /X/ is three moras long or longer.

(17) a. X = monomoraic, monosyllabic → unaccented
ko-ta.roo 'little-taro', ki-ta.roo 'demon-taro' ne-ta.roo 'sleeping-taro'
a'. X = bimoraic but monosyllabic → unaccented
koo-ta.roo 'high-taro', kin-ta.roo 'gold-taro'
b. X = bimoraic and bisyllabic → accent on the final syllable of X
mo.mo'-ta.roo 'peach-taro', kiku'-ta.roo 'chrysanthemum-taro'
c. X = trimoraic or longer → accent on the initial syllable of /taroo/
ti.ka.ra-ta'.roo 'power-taro', u.ru.to.ra.man-ta'.roo 'Ultraman-taro'

The crucial difference between /X-ziroo/ and /X-taroo/ lies in the accent patterns they exhibit when /X/ is bimoraic but monosyllabic. In this case, /X-ziroo/ takes the accented pattern as in (16b), whereas /X-taroo/ takes the unaccented pattern as in (17a'). This difference is shown in (18).

(18) a. ki'n-zi.roo, ko'o-zi.roo
b. kin-ta.roo, koo-ta.roo

Note, moreover, that the category boundary between (16b) and (16c) or between (17b) and (17c) should be defined by the mora, not by the syllable. This can be shown by those compound names in (19). If /X/ is bisyllabic but trimoraic as in these compounds, it patterns with trisyllabic, trimoraic nouns shown in (16c/17c),

20 This third pattern resembles the regular compound rule of TJ whereby the lexical accent of the final member survives as the compound accent: e.g. /bi'i.ti/ + /ba'.ree/ → /bii.ti-ba'.ree/ 'beach volleyball'.

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not with bisyllabic, bimoraic nouns, in both types of compound names. These names may be pseudo-names, but native speakers of TJ can invariably assign the accent patterns in (16c/17c) to them (Kubozono 1998, 1999).[21]

(19) a. ba.ree-zi'.roo 'volleyball jiro', ka.ree-zi'.roo 'curry jiro'
     b. ba.ree-ta'.roo 'volleyball taro', ka.ree-ta'.roo 'curry taro'

While TJ determines the accentuation of /X-taroo/ and /X-ziroo/ by the phonological length of /X/, KJ applies the traditional compound accent rule, or Hirayama's Law, whereby the accent pattern of /X/ spreads over the entire compound. Thus, the names in (20) are expected to take Type A pattern since their initial members—/kin/ 'gold', /mo.mo/ 'peach', and /u.ru.to.ra.man/ 'Ultra-man'—are Type A morphemes in KJ. Likewise, those in (21) are expected to exhibit Type B pattern because their initial members—/koo/ 'high, devotion' and /ki.ku/ 'chrysanthemum'—are Type B morphemes in KJ.

(20) a. KIn: kin-TA.roo, kin-ZI.roo
     b. MO.mo: mo.mo-TA.roo, mo.mo-ZI.roo
     c. u.ru.to.RA.man: u.ru.to.ra.man-TA.roo, u.ru.to.ra.man-ZI.roo

(21) a. KOO: koo-ta.ROO, koo-zi.ROO
     b. ki.KU: ki.ku-ta.ROO, ki.ku-zi.ROO

It should be noted here that the accent rules responsible for the accentuation of /X-taroo/ and /X-ziroo/ compounds are sensitive to the phonological property of /X/ in both TJ and KJ, but in different ways. The compound rules in TJ are sensitive to the phonological length—the number of moras and/or syllables in /X/—as seen in (16)-(19). In contrast, the traditional compound rule in KJ refers, as seen in (20)-(21), to the lexical accent property of /X/ rather than its phonological length. This difference presents a potentially interesting case when we consider the extent of the influence of one dialect on another.

On the basis of this observation, 50 frequently-used nouns were chosen for /X/, which fall into the following five groups according to their phonological length. Each group consists of five words that are Type A morphemes and five words that are Type B morphemes in KJ, according to Hirayama's (1960) dictionary.

(22) a. monosyllabic and monomoraic nouns: e.g. /ko/ 'child' (Type A), /e/ 'picture' (Type B)
     b. monosyllabic but bimoraic nouns: e.g. /kin/ 'gold' (Type A), /doo/ 'bronze' (Type B)

21 This is the default accent pattern for compound nouns whose final member is three or more moras long in TJ (Kubozono 2008).

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c. bisyllabic and bimoraic nouns: e.g. /ha.na/ ‘nose’ (Type A), /ha.na/ ‘flower’ (Type B)
d. bisyllabic and trimoraic nouns: e.g. /ba.ree/ ‘volleyball’ (Type A), /ka.ree/ ‘curry’ (Type B)
e. trisyllabic or longer nouns: e.g. /to.ma.to/ ‘tomato’ (Type A), /wa.sa.bi/ ‘wasabi Japanese horse radish’ (Type B)

Combining these nouns with /taroo/ and /ziroo/ yields 50 /X-taroo/ names and the same number of /X-ziroo/ names for the current dataset. Many of these compound nouns are novel nouns like those in (19). Again, these test words fall into four categories, depending on whether they are pronounced with a pitch fall (accented in TJ and Type A in KJ) or without (unaccented and Type B). This is exemplified in Tab. 18 and 19. Recall that /X-taroo/ and /X-ziroo/ crucially differ from each other when the nouns in (22b) are attached: In TJ, /X-taroo/ belongs to the unaccented group, while /X-ziroo/ shows the accented pattern.

Tab. 18: Four-way classification of /X-taroo/ names.

TJ **KJ**	**‘Accented’** **[+FALL]**	**‘Unaccented’** **[–FALL]**
Type A [+FALL]	(22c) hana-taroo ‘nose-taro’ (22d) baree-taroo ‘volleyball-taro’ (22e) tomato-taroo ‘tomato-taro’	(22a) ko-taroo ‘child-taro’ (22b) kin-taroo ‘gold-taro’
Type B [–FALL]	(22c) hana-taroo ‘flower-taro’ (22d) karee-taroo ‘curry-taro’ (22e) wasabi-taroo ‘wasabi-taro’	(22a) e-taroo ‘picture-taro’ (22b) doo-taroo ‘bronze-taro’

Tab. 19: Four-way classification of /X-ziroo/ names.

TJ **KJ**	**‘Accented’** **[+FALL]**	**‘Unaccented’** **[–FALL]**
Type A [+FALL]	(22b) kin-ziroo ‘gold-jiro’ (22c) hana-ziroo ‘nose-jiro’ (22d) baree-ziroo ‘volleyball-jiro’ (22e) tomato-ziroo ‘tomato-jiro’	(22a) ko-ziroo ‘child-jiro’
Type B [–FALL]	(22b) doo-ziroo ‘bronze-jiro’ (22c) hana-ziroo ‘flower-jiro’ (22d) karee-ziroo ‘curry-jiro’ (22e) wasabi-ziroo ‘wasabi-jiro’	(22a) e-ziroo ‘picture-jiro’

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This experiment employed 20 KJ speakers: six middle-aged or older speakers aged between 49 and 79, and 14 young speakers aged between 18 and 28. Each of them was asked to pronounce the total of 100 compound names in a semi-random order. This yielded 600 tokens (100 words x 6 subjects) for the senior group of subjects and 1,400 tokens (100 x 14 subjects) for the younger group. Tab. 20 and 21 summarize the degree of deviations shown by these two groups, respectively, with the deviations measured in terms of the traditional left-dominant compound accent rule.

Tab. 20: Deviation shown by the senior group of subjects.

TJ / KJ	'Accented' [+FALL]	'Unaccented' [–FALL]
Type A [+FALL] → [–FALL]	1 % (3/210)	10 % (9/90)
Type B [–FALL] → [+FALL]	10 % (21/210)	27 % (24/90)

Tab. 21: Deviation shown by the young group of subjects.

TJ / KJ	'Accented' [+FALL]	'Unaccented' [–FALL]
Type A [+FALL] → [–FALL]	3 % (14/490)	75 % (158/210)
Type B [–FALL] → [+FALL]	53 % (260/490)	12 % (26/210)

Again, the difference between the two groups of subjects is evident. The senior group produced deviant accent patterns in only 10 % of the data (57 tokens out of 600), while the younger group yielded deviant patterns in 33 % of the data (458 tokens out of 1,400). Although the difference between the two groups is smaller in this experiment than in the other experiments, the young group of speakers produced more than three times as many deviations as their senior counterpart.

Moreover, the senior group's deviation patterns are difficult to explain in terms of the influence of TJ accent patterns. They show considerably higher degrees of deviation in Type B words (10 % and 27 %) than in Type A words (1 % and 10 %), but these cannot be correlated with the accented/unaccented distinction in TJ.[22]

22 The discrepancy between Type A and Type B here can be partly attributed to the fact that monomoraic nouns in (22a) tend to be neutralized into Type B when pronounced in isolation.

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Moreover, in both Type A and Type B words, they exhibit statistically higher degrees of deviation in words that are unaccented in TJ than words that are accented (Type A: $\chi^2 = 9.925$, df = 1, p<.002; Type B: $\chi^2 = 12.449$, df = 1, p<.001), which is a tendency that cannot be explained in a straightforward manner.

On the other hand, the deviant accent patterns found in young speakers' data can be attributed to the TJ accent patterns. The deviations are highly constrained by the TJ patterns so that they are largely confined to the two classes of words which disagree between KJ and TJ with respect to the presence or absence of a pitch fall (75 % and 53 %). Some typical examples are given in (23) and (24).The difference between the two conditions (accented vs. unaccented) is statistically significant both in Type A ($\chi^2 = 411.631$, df = 1, p<.001) and Type B ($\chi^2 = 98.997$, df = 1, p<.001).

(23) a. Type A → Type B

Old KJ	New KJ	TJ	gloss
ne-TA.roo	ne-ta.ROO	ne-TA.ROO	sleeping-taro
kyuu-TA.roo	kyuu-ta.ROO	KYUU-TAROO	Q-taro

b. Type B → Type A

Old KJ	New KJ	TJ	gloss
ha.na-ta.ROO	ha.na-TA.roo	ha.NA-taroo	flower-taro
wa.sa.bi-ta.ROO	wa.sa.bi-TA.roo	wa.SA.BI-TA.roo	*wasabi*-taro

(24) a. Type A → Type B

Old KJ	New KJ	TJ	gloss
ko-ZI.roo	ko-zi.ROO	ko-ZI.ROO	child-jiro
ha-ZI.roo	ha-zi.ROO	ha-ZI.ROO	leaf-jiro

b. Type B → Type A

Old KJ	New KJ	TJ	gloss
ha.na-zi.ROO	ha.na-ZI.roo	ha.NA-zi.roo	flower-jiro
ka.ree-zi.ROO	ka.ree-ZI.roo	ka.REE-ZI.roo	curry-jiro

A closer examination of the young speakers' deviation ratios shows the results in Tab. 22 and 23 for /X-taroo/ and /X-ziroo/ compounds, respectively, with the actual numbers of responses added in parentheses. As can be seen, the deviations are virtually confined to the phonologically-defined contexts that have been mentioned and, moreover, this is true of all five structures in (22).

Yet, these pseudo-Type B elements exhibit their original accent property in compounds, thus producing Type A compounds as output forms.

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Tab. 22: Degrees of deviation in young speakers' pronunciations of /X-taroo/ names.

KJ \ TJ	'Accented' [+FALL]	'Unaccented' [–FALL]
Type A [+FALL] → [–FALL]	(22c) 1 % (1/70) (22d) 0 % (0/70) (22e) 0 % (0/70)	(22a) 87 % (61/70) (22b) 71 % (50/70)
Type B [–FALL] → [+FALL]	(22c) 51 % (36/70) (22d) 50 % (35/70) (22e) 47 % (33/70)	(22a) 4 % (3/70) (22b) 7 % (5/70)

Tab. 23: Degrees of deviation in young speakers' pronunciations of /X-ziroo/ names.

KJ \ TJ	'Accented' [+FALL]	'Unaccented' [–FALL]
Type A [+FALL] → [–FALL]	(22b) 4 % (3/70) (22c) 6 % (4/70) (22d) 3 % (2/70) (22e) 6 % (4/70)	(22a) 69 % (48/70)
Type B [–FALL] → [+FALL]	(22b) 74 % (52/70) (22c) 50 % (35/70) (22d) 59 % (41/70) (22e) 49 % (34/70)	(22a) 27 % (19/70)

The most striking fact about these results concerns the nouns in (22b). In TJ, these nouns behave differently between the two types of compound names. Specifically, they yield unaccented patterns in /X-taroo/ but accented patterns in /X-ziroo/, as shown in (18), and are accordingly located in different slots in the two tables (shaded). Very interestingly, they exhibit contrastive behaviors between the two compound names in young KJ speakers' data. /kin/ 'gold' (Type A), for example, still produces Type A pattern in /kin-zi.roo/, which is accented in TJ, while it yields Type B pattern in /kin-ta.roo/, which is unaccented in TJ. Likewise, /doo/ 'bronze', which is traditionally a Type B morpheme in KJ, now produces Type A pattern in /doo-zi.roo/ (accented in TJ), while it still retains its Type B pattern in /doo-ta.roo/ (unaccented in TJ). This is illustrated in (25) and (26).

	Old KJ	New KJ	TJ	gloss
(25)	kin-TA.roo	kin-ta.ROO	KIN-TA.ROO	gold-taro
	kyuu-TA.roo	kyuu-ta.ROO	KYUU-TA.ROO	Q-taro

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	ken-ta.ROO	ken-ta.ROO	KEN-TA.ROO	healthy-taro
	doo-ta.ROO	doo-ta.ROO	DOO-TA.ROO	bronze-taro

(26)	Old KJ	New KJ	TJ	gloss
	kin-ZI.roo	kin-ZI.roo	KIn-zi.roo	gold-jiro
	kyuu-ZI.roo	kyuu-ZI.roo	KYUu-zi.roo	Q-jiro
	ken-zi.ROO	ken-ZI.roo	KEn-zi.roo	healthy-jiro
	doo-zi.ROO	doo-ZI.roo	DOo-zi.roo	bronze-zi.roo

As a consequence of these changes, both /kin/ and /doo/ now tend to yield Type B pattern in /X-taroo/ and Type A pattern in /X-ziroo/. In young speakers' speech, in other words, the choice between Type A and Type B in these compounds is dependent on the final member (/-taroo/ vs. /-zi.roo/) in such a way that Type A is preferred in compound nouns that take the accented pattern in TJ, while Type B is favored in compounds that are unaccented in TJ.

In sum, young native speakers of KJ are aware of the complicated accent patterns of /X-taroo/ and /X-ziroo/ compounds in TJ and use this phonological knowledge in determining the output accent patterns of individual expressions in their native dialect. In fact, a more detailed analysis of the data in Tab. 22 and 23 reveals that the young KJ speakers follow the traditional left-dominant compound rule of their own dialect only in 67 % of the data (934 tokens out of 1,400), while they obey the new TJ-type rule in 77 % of the data (1,084 tokens out of 1,400).[23]

The data about /X-taroo/ and /X-ziroo/ are particularly interesting in that unlike other compound nouns in TJ, their accentuation is determined by the phonological property of /X/, just like the traditional compound rule of KJ. The results of this experiment show that young native speakers of KJ are now more sensitive to the TJ type rule, which is sensitive to the phonological length of /X/, than the traditional KJ rule, which refers to the lexical accent property of /X/. Moreover, it is truly amazing to find that the young KJ speakers know the subtle difference that the two types of compound nouns exhibit in TJ when /X/ consists of only one heavy syllable as in (18): e.g., /kin-taroo/ is unaccented, while /kin-ziroo/ is accented.

The fact that young KJ speakers know the complicated rules underlying the accentuation of /X-taroo/ and /X-ziroo/ in TJ also has a significant implication for the roles of the syllable and the mora in KJ. As mentioned in section 2, the traditional accent system of KJ relies solely on the syllable, and not the mora, when computing the position of H tones. However, the data from the current experiment show that the young KJ speakers are now aware of the difference

23 The two figures do not add up to 100 % since some data can be explained by both rules.

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between the two phonological units in TJ, or at least the different behaviors that /X-taroo/ and /X-ziroo/ compounds exhibit depending on the number of moras /X/ involved. For example, they tend to produce Type B pattern in /X-ziroo/ if /X/ is monomoraic, and Type A pattern if /X/ is two moras long or longer. This suggests that the young KJ speakers now implicitly have phonological knowledge about the concept of the mora in Japanese.[24]

This said, it is necessary to emphasize here that these speakers' system does not rely heavily on the mora yet. Although the young speakers are now sensitive to the mora-sensitive accent rule of TJ, they still predominantly use the syllable when determining the pitch patterns in their native dialect. As shown in (23)-(26), for example, they assign an H tone to the final syllable in their new Type B forms, and to the penultimate syllable in their new Type A forms. Thus, they still compute the position of the H tone by counting the number of *syllables* from the end and assign the tone to the relevant *syllables*, not moras.

4.5 Summary

We have so far seen many pieces of evidence showing that young KJ speakers' accent patterns are heavily influenced by those of TJ and that their new pitch accent patterns can be accounted for in a principled way if the presence or absence of a pitch fall in the TJ forms is taken into consideration. Due to a limitation on space, we cannot describe more accent phenomena in KJ here, but the influence of TJ can be seen quite extensively in the accent changes in KJ.

For example, monosyllabic words in KJ tend to lose their accentual contrast in imitation of the accent patterns of monosyllabic words in TJ: bimoraic monosyllables tend to involve a pitch fall (accented in TJ and Type A in KJ), while monomoraic monosyllables are generally pronounced without a pitch fall (unaccented in TJ and Type B in KJ) (see Kubozono 2018 for more details). Moreover, young native speakers of KJ tend to replace Type A pattern with Type B in many types of words that are deaccented in TJ: e.g., foreign place names ending in /ia/ such as /ma.ke.do.ni.a/ 'Macedonia' and /tan.za.ni.a/ 'Tanzania'; names of medicine ending in /in/ such as /pe.ni.si.rin/ 'penicillin' and /ro.ki.so.nin/ 'loxonin'; deverbal nouns ending in /ingu/ such as /re.koo.din.gu/ 'recording' and /ai.do.rin.gu/ 'idling'; four-mora truncated loanwords such as /ma.za.kon/ 'mother complex' and

24 In the absence of other processes sensitive to mora counts in KJ, it is difficult to tell what has given young KJ speakers this implicit knowledge of the mora (apart from the compound accent rule in question). The mora-based kana orthography may be one possibility, but it cannot be a major factor since it has been used by KJ speakers for many generations.

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/de.zi.ka.me/ 'digital camera'; alphabetic acronyms such as /e.fu.e.mu/ 'FM' and /oo.e.su/ 'OS, operation system' (Kubozono 2017). Furthermore, young KJ speakers produce Type A and Type B accent patterns for personal names like /koo-i.ti/ 'Koichi', /koo-zi/ 'Koji', and /koo-zoo/ 'Kozo' in correspondence to the accented/unaccented distinctions that a complex set of accent rules in TJ predict (Kubozono 2013b).

In all these phenomena, young KJ speakers display sensitivity to the presence or absence of a pitch fall in TJ forms and tend to replace the original accent rule of their dialect with various accent rules of TJ responsible for the accented/unaccented distinctions in this standard dialect. They unconsciously use this phonological knowledge when producing accent patterns in their own dialect.

While the strong influence of TJ is thus overwhelming in a wide range of accent phenomena in KJ, one may naturally wonder why the young speakers' data cannot be generalized entirely by the TJ pitch patterns or why they do not rely entirely on the accent rules of TJ. Tab. 24 describes a hypothetical situation that would emerge if the influence of TJ on KJ accent patterns were pervasive. The experiments discussed in the foregoing sections do not show such a clear-cut picture about the influence of TJ.

Tab. 24: A hypothetical table showing the completion of ongoing accent changes.

TJ / KJ	'Accented' [+FALL]	'Unaccented' [−FALL]
Type A [+FALL] → [−FALL]	0 %	100 %
Type B [−FALL] → [+FALL]	100 %	0 %

The fact that the influence of TJ accent on KJ has not been pervasive suggests that the changes are still in progress in the accent system of KJ. A closer examination of the data suggests that this is due largely to the different degrees of deviation among the KJ speakers. To see this point, we looked at the fourteen young speakers of KJ in the /X-taroo/-/X-ziroo/ experiment more carefully. This analysis has shown that different speakers exhibit considerably different degrees of deviations from the traditional patterns. Tab. 25 summarizes the results of the most 'radical' speaker among the 14 speakers we looked at, i. e., a nineteen-year-old male speaker who showed the largest degree of accent changes from the traditional patterns. This should be compared with Tab. 26, which analyzed the ratios

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of change in the most ‘conservative speaker’, a nineteen-year-old female speaker, who exhibited the smallest degree of change.

Tab. 25: The results of the most ‘radical’ speaker in the /X-taroo/-/X-ziroo/ experiment.

KJ \ TJ	‘Accented’ [+FALL]	‘Unaccented’ [–FALL]
Type A [+FALL] → [–FALL]	0 % (0/35)	100 % (15/15)
Type B [–FALL] → [+FALL]	100 % (35/35)	7 % (1/15)

Tab. 26: The results of the most ‘conservative’ speaker in the /X-taroo/-/X-ziroo/ experiment.

KJ \ TJ	‘Accented’ [+FALL]	‘Unaccented’ [–FALL]
Type A [+FALL] → [–FALL]	0 % (0/35)	13 % (2/15)
Type B [–FALL] → [+FALL]	11 % (4/35)	7 % (1/15)

As can be seen from these two tables, the two young speakers show a tremendous difference. The most ‘radical’ speaker’s results are very close to the hypothetical situation described in Tab. 24, where the influence of TJ is pervasive. In fact, they can be accounted for almost perfectly by the new TJ-type rule, which accounts for 99 % of the data (99 tokens out of 100). In contrast, the traditional compound accent rule of KJ accounts for only 49 % of the data (49 tokens out of 100), which approximates the chance level. This suggests that this particular speaker has phonological knowledge about the complicated set of accent rules underlying /X-taroo/ and /X-ziroo/ in TJ and fully uses this knowledge when speaking his own dialect.

On the other hand, the most ‘conservative’ speaker in Tab. 26 resembles senior speakers whose results are given in Tab. 20. In fact, 93 % of her data (93 tokens out of 100) can be accounted for by the traditional KJ rule, whereas only 55 % (55 tokens out of 100) are compatible with the predictions of the new TJ-type rule. This suggests that this particular speaker still employs the traditional compound accent rule for the most part, while partially influenced by the accent patterns or rules of TJ.

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Two points need to be emphasized here. First, while the two speakers thus exhibit a huge difference in the degree of accent changes, they nevertheless resemble each other in the overall patterns of change. Namely, they both show new accent patterns in two specific contexts: in Type A words that are unaccented in TJ and in Type B words that are accented in TJ. Moreover, they share the overall direction of change: accent changes take place in such a way that the new patterns agree with the accent patterns of corresponding TJ words with respect to the presence or absence or a pitch fall.

Secondly, the new accent patterns in KJ are not identical to the surface pitch patterns of TJ words. As shown in (23)-(26) above, for example, the output forms in KJ still exhibit the traditional pitch features of the dialect. For one thing, the output forms fall into two pitch patterns, Type A and Type B, preserving the traditional two-pattern pitch-accent system. Second, they have H tones on the positions that are permitted in the traditional system: i. e., on the penultimate syllable in Type A pattern and on the final syllable in Type B pattern. These facts suggest that the young speakers' grammar is still constrained by the traditional accent system of the dialect with respect to the number of permitted accent patterns and the syllable-based assignment of pitch accent (or H tone).

In sum, the traditional system remains unchanged with respect to the two-pattern system and the syllable-based nature of pitch assignment. On the other hand, the left-dominant compound accent rule has lost or weakened its power as many words have undergone bidirectional changes in accent types, from Type A to Type B and vice versa.

5 General discussion

Having understood the nature and degree of accent changes in progress in KJ, let us now consider the implications of these changes. A first question that naturally arises from the foregoing discussion is whether the changes in KJ represent an isolated phenomenon in Japanese. This question can be tackled from two perspectives. First, one can ask if other pitch-accent systems of Japanese are influenced by the accent patterns of the standard TJ system in the same or similar ways. Specifically, accent changes in other regional dialects might be sensitive to the presence or absence of a pitch fall in TJ words. Secondly, one can also ask if there may be other phenomena in Japanese that are constrained in the same way as the ongoing accent changes in KJ. These two questions are closely related to the question of why young KJ speakers are so sensitive to the presence or absence of a pitch fall when listening to Tokyo Japanese. This fundamental question is

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intimately linked to another major question: what implications does the present study have for the pitch-accent system of KJ itself. In this section, we will examine these interrelated questions in depth.

5.1 Other dialects

While word accent is a popular research topic for many regional pitch-accent systems of Japanese, how they change their word accent patterns has attracted relatively little attention in the literature. However, we can find at least three dialects whose accent patterns/changes have been analyzed with reference to the pitch accent patterns of the standard Tokyo dialect.

5.1.1 Nagasaki Japanese

The first dialect we consider here is Nagasaki Japanese, or 'NJ' for short, a sister dialect of KJ spoken in the west of Kyushu. Like its sister dialect, this dialect permits only two accent classes, also called Type A and Type B, which generally agree with the two accent classes of KJ with respect to which word belongs to which class. However, the two accent classes in NJ exhibit different pitch patterns from those in KJ. The most crucial difference lies in whether the overall pitch patterns are computed from the right edge of the word (KJ) or from the left edge (NJ). Thus, Type A in NJ has an H tone on the second mora of the word,[25] while Type B shows a rather flat, mid-toned pitch shape throughout the word (Sakaguchi 2001; Matsuura 2008, 2018). Moreover, NJ is different from KJ in counting the number of *moras* and not the number of *syllables*. The H tone in Type A is thus associated with the second *mora* from the beginning of the word. This is illustrated in (27), where corresponding KJ forms are also given for comparison. Type B melody is shown with small letters throughout the word for the sake of simplicity.

(27) a. Type A

NJ	KJ	gloss
A.me	A.me	candy
NA.tu	NA.tu	summer
o.NA.go	o.NA.go	woman
paA.tii	PAA.tii	party
koN.saa.to	kon.SAA.to	concert

25 H tone appears on the initial mora in bimoraic words: /A.me/ 'candy' vs. /o.NA.go/ 'woman'.

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b. Type B

NJ	KJ	gloss
a.me	a.ME	rain
ha.ru	ha.RU	spring
o.to.ko	o.to.KO	man
mu.ra.sa.ki	mu.ra.sa.KI	purple
a.su.pi.rin	a.s.pi.RIN	aspirin

In terms of distinctiveness, the two accent classes in NJ are distinguished from each other in the same way as the two accent classes in KJ: In citation form, Type A has a pitch fall, while Type B does not. In addition, since Type A words usually display a pitch fall immediately after their second mora, it can be distinguished from the other accent type by the presence or absence of a pitch fall in the domain of the first three moras. Namely, if the word has a pitch fall within the initial three-mora window, it is a Type A word; if it does not, it is a Type B word. In this way, one need not look at the entire word to know its accent class/type. This additional property, which is not shared by KJ,[26] turns out to be very important when understanding the strange but regular accent deviations in NJ, as we will see shortly below.

Another noticeable difference between NJ and KJ can be found in the distribution of the two accent types in loanwords. Although NJ and KJ resemble each other in terms of the accent type that their vocabulary items take, as mentioned above, this correspondence does not hold in loanwords. In KJ, 95 % of loanwords take Type A (Kibe and Hashimoto 2003), whereas only about 50 % of loanwords belong to Type A in NJ (Matsuura 2008). The main reason for this is that NJ is constrained by TJ accent patterns in such a way that loanwords exceptionally take Type B in NJ if they are accented on the third or subsequent moras in TJ or, in phonetic terms, if TJ forms do not involve a pitch fall within their initial three moras (Matsuura 2018). This is illustrated in (28), where TJ forms are given in parentheses. The three-mora windows are added in the TJ forms.

(28) a. Type A

NJ	TJ	gloss
ka.ME.ra	$\boxed{\text{KA.me.ra}}$	camera
to.RA.bu.ru	$\boxed{\text{to.RA.bu}}$.ru	trouble
pu.RE.zen.to	$\boxed{\text{pu.RE.ze}}$n.to	present

26 In KJ, one has to look through the word to tell whether a word exhibits Type A or Type B pattern. The three-mora window is irrelevant in distinguishing between the two accent classes/patterns in this system.

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b. Type B

NJ	TJ	gloss
a.ru.bai.to	$\boxed{\text{a.RU.BA}}$i.to	Arbeit (German), part-time work
a.su.fa.ru.to	$\boxed{\text{a.SU.FA}}$.ru.to	asphalt
tyo.ko.ree.to	$\boxed{\text{tyo.KO.RE}}$e.to	chocolate
o.ru.goo.ru	$\boxed{\text{o.RU.GO}}$o.ru	music box

It is not clear why loanwords, but not native or Sino-Japanese words, are subject to this three-mora constraint. It may be because five-mora or longer native and Sino-Japanese words are morphologically complex and are subject to a neutralization rule that specifically applies to compounds (Matsuura 2018). It also remains unclear when loanwords in NJ began to be influenced by TJ.[27] However, the fact remains that the exceptional accent behavior of loanwords in NJ can be generalized by referring to the accent patterns in the standard dialect. More crucially, loanwords in NJ are subject to the three-mora window in TJ forms. This means that NJ speakers are sensitive to both the presence or absence of a pitch fall and its position in TJ loanwords and use this knowledge about L2 in deciding on the accent type of loanwords in their L1 phonology.[28]

A comparison between NJ speakers' accent patterns and the young KJ speakers' new patterns that we saw in the preceding sections reveals some crucial similarities and difference. They are both sensitive to the presence or absence of a pitch fall in TJ forms and incorporate this feature into their L1 pronunciations. Moreover, their surface pitch patterns nevertheless differ from those of TJ, as can be seen from the examples in (28) as well as those of KJ which we saw in the preceding sections. Yet, NJ speakers exhibit one crucial difference from young KJ speakers: they are sensitive to the position of a pitch fall as well as its presence or absence. In other words, they display sensitivity to a pitch fall within the initial three moras, not in the domain of the entire word. In this sense, NJ speakers' grammar is constrained more severely by TJ than what we saw for young KJ speakers.

This interesting difference can be explained in a straightforward manner if we understand the difference between the two dialects with respect to the distinctive

27 The fact that the influence of TJ is quite pervasive in the speech of elderly NJ speakers suggests that the influence started at least some generations ago. This means that NJ is more 'advanced' than its sister dialect of KJ by some generations with respect to accent changes.

28 Note that this fact does not speak against the claim we made in section 2 above, i. e., that accent position plays only a secondary role in TJ phonology as opposed to the presence or absence of an accent. What our data shows here is that NJ speakers are sensitive to a feature that is only secondary in the accent system of TJ. This sensitivity comes from NJ phonology itself and not from TJ phonology, as we argue immediately below.

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feature they employ to distinguish between the two accent types. In KJ, Type A and Type B can be differentiated from each other by the prosody in word-final position, i. e., by the presence or absence of a pitch fall at or near the end of the word. Native speakers of this dialect must therefore hear almost the entire word to tell its accent type. On the other hand, the two accent types in NJ can be distinguished from each other by the prosody in word-initial position: Type A has a pitch fall between the initial and second moras in bimoraic words and between the second and third moras in longer words, whereas Type B simply lacks such a phonetic feature. This difference seems responsible for the crucial difference that the two dialects exhibit with respect to the domains to which they are sensitive when they are influenced by standard TJ.

5.1.2 Kurayoshi Japanese

Kurayoshi Japanese (KuJ, for short) is a dialect spoken in the central region of Tottori Prefecture in the north-western part of the mainland Honshu. Accent changes in this dialect present additional evidence for the idea that Japanese dialects display sensitivity to the pitch fall in TJ forms (Giriko and Kuwamoto 2013). This dialect belongs to the same prosodic group as TJ and shares many basic features of pitch accent with this standard dialect. However, it exhibits some minor differences from TJ including the following two points. First, unaccented words in this dialect involve a high pitch only on their final mora, whereas in TJ they are realized with a high pitch on all moras except the very initial mora. This is exemplified in (29).

(29)	Old KuJ	TJ	gloss
	sa.ka.NA	sa.KA.NA	fish
	ne.zu.MI	ne.ZU.MI	rat
	sa.ku.RA	sa.KU.RA	cherry tree
	u.sa.GI	u.SA.GI	rabbit

Secondly, KuJ permits medial accent in many trimoraic words, whereas TJ generally disfavors this accent pattern. Some examples are given in (30).

(30)	Old KuJ	TJ	gloss
	o.YA.zi	o.YA.ZI	(my) father
	o.TO.na	o.TO.NA	adult
	i.NO.ti	I.no.ti	life
	mi.KAn	MI.kan	orange

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In fact, the medial accent in trimoraic words is so popular in this dialect that many given names that are initially accented or unaccented in TJ take this accent pattern. This includes names in (31): those in (31a) are initially accented in TJ because they end in the suffix /ko/ or derive from adjectives, whereas those in (31b) are unaccented in TJ because they end in the deaccenting suffix /o/, etc. (recall the discussion in sections 3.2 and 4.3 above).

(31)	a.	Old KuJ	TJ	gloss
		ha.NA-ko	HA.na-ko	Hanako
		hi.RO-ko	HI.ro-ko	Hiroko
		hi.RO.si	HI.ro.si	Hiroshi
		si.ZU.ka	SI.zu.ka	Shizuka
	b.	Old KuJ	TJ	gloss
		ta.KA.o	ta.KA.O	Takao
		ha.RU.o	ha.RU.O	Haruo

Giriko and Kuwamoto (2013) used these medially-accented names to examine the effects of TJ accent on the accent changes in KuJ. They looked at speakers in three generations: the old-age group aged between 65 and 72, the middle-age group aged between 43 and 48, and the young group aged between 17 and 25. This study has shown several interesting results. First, the traditional medial accent pattern becomes less popular as the informants become younger: the old-age group uses the traditional pattern in 80 % of test words, while the middle-age group and young group display the same pattern only in 44 % and 20 %, respectively, of the data. The traditional pattern has been replaced by the initial-accent and unaccented patterns in the younger generations.

A second interesting result from Giriko and Kuwamoto's study concerns the direction of change. They found that the medial accent has been replaced by initial accent in words that are initially accented in TJ, whereas the change from the medial accent to the unaccented pattern typically occurs in unaccented names in TJ. In fact, 90 % of test words that are initially accented in TJ are now pronounced as initially-accented words by the young group of speakers. Similarly, 70 % of names that are pronounced as unaccented words in TJ are now produced as unaccented words by the young Kurayoshi speakers. This shows a profound effect of TJ accent on the accent patterns in KuJ. Some typical examples are given in (32).

(32) a. medial accent → initial accent

Old KuJ	New KuJ	TJ	gloss
ha.NA.ko	HA.na.ko	HA.na.ko	Hanako
hi.RO.ko	HI.ro.ko	HI.ro.ko	Hiroko
hi.RO.si	HI.ro.si	HI.ro.si	Hiroshi
si.ZU.ka	SI.zu.ka	SI.zu.ka	Shizuka

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b. medial accent → unaccented

Old KuJ	New KuJ	TJ	gloss
ta.KA.o	ta.ka.O	ta.KA.O	Takao
ha.RU.o	ha.ru.O	ha.RU.O	Haruo

These changes resemble the accent changes we saw for young KJ speakers in sections 3 and 4. In particular, the change in (32b) is similar in nature to the accent change from Type A to Type B in KJ which characteristically occurs in words that are unaccented in TJ. Here, too, we see profound effects of TJ accent on the accent patterns of regional dialects. In summary, just like KJ and NJ, young native speakers of KuJ display sensitivity to the presence or absence of a pitch fall in TJ forms and copy this feature in the pronunciations of their own dialect. Moreover, this change is severely constrained by the traditional accent system of the dialect as can be seen from the fact that their output forms are not necessarily identical to the surface pitch patterns of the standard dialect. This is another feature that the accent changes in Kurayoshi share with those observed in KJ and NJ.

5.1.3 Osaka Japanese

Another regional dialect clearly influenced by TJ is Osaka Japanese (henceforth OJ), spoken in Osaka area about 500km west of Tokyo. It is a sister dialect of Kyoto Japanese, which was a standard dialect of the language for many decades until about four hundred years ago, and is generally assumed to have a relatively stable pitch-accent system which is relatively free from the effect of the modern standard dialect of TJ. However, a close examination of its accent rules and patterns reveals a noticeable influence, just like other regional dialects. We describe one example here which concerns the accentuation of alphabetic acronyms or initialisms such as *PTA* and *NHK*. These acronyms are popularly used in modern Japanese and apparently exhibit considerable differences in accent patterns among Japanese dialects (Kubozono 2010). However, their accent patterns show one common feature across dialects: they obey the compound accent rule of the respective dialects. This is true of OJ, too.

The compound accent rule of OJ looks similar to that of TJ but is slightly more complicated. The complication comes from the fact that OJ exhibits a contrast not only in the presence or absence of an accent and its position just as in TJ, but also in word-initial tone (Wada 1942; Hirayama 1960; Uwano 1997; Hayata 1999). This is illustrated with simplex words in (33).

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(33) a. High-beginning words
NA.tu 'summer'
KYA.be.tu 'cabbage'
b. Low-beginning words
ha.RU 'spring'
ya.saI 'vegetable'

This additional contrast in word-initial tone manifests clearly in compounds since compound words inherit the relevant feature of their initial member. Thus, /NA.TU-YA.su.mi/ 'summer holiday' and /KYA.BE.TU-BA.ta.ke/ 'cabbage field' begin with an H tone since their initial members are High-beginning morphemes. Likewise, /ha.ru-YA.su.mi/ 'spring holiday' and /ya.sai-BA.ta.ke/ 'vegetable field' begin with a Low tone because their initial morphemes begin with a Low tone when pronounced in isolation. This rule, which is traditional called 'Shiki-hozon no hoosoku' (Wada 1942) or register-preservation law, is illustrated in (34).[29] Note that this additional contrast is not found in TJ, where /na.tu-ya.su.mi/ and /ha.ru-ya.su.mi/, for example, become tonally homophonous. This is shown in parentheses in (34).

(34) a. NA.tu + YA.su.mi → NA.TU-YA.su.mi 'summer holiday' (na.TU-YA.su.mi)
KYA.be.tu + ha.TA.ke → KYA.BE.TU-BA.ta.ke 'cabbage field' (kya.BE.TU-BA.ta.ke)
b. ha.RU + YA.su.mi → ha.ru-YA.su.mi 'spring holiday' (ha.RU-YA.su.mi)
ya.sa.I + ha.TA.ke → ya.sai-BA.ta.ke 'vegetable field' (ya.SAI-BA.ta.ke)

Returning to alphabetic acronyms, the first important fact about OJ is that all alphabetic letters are pronounced as High-beginning morphemes in this dialect: e.g /Ee/ 'A', /E.mu/ 'M'. This predicts that all alphabetic acronyms will begin with an H tone due to the compound accent rule illustrated in (34). The fact is, however, that some acronyms tend to begin with a Low tone. According to the fieldwork and experimental studies by Shimizu (2006) and Tanaka (2013), this exceptional pattern can be related to the structure of the initial syllable: Acronyms tend to exhibit the deviant Low-beginning pattern if their initial member begins with a light, i. e., monomoraic, syllable as in /e.fu/ 'F' and /e.mu/ 'M'. On the other hand, they faithfully preserve the tone of their initial morpheme if they begin with a heavy syllable. Some examples are given in (35a,b).[30]

29 Not surprisingly, this rule is historically related with the compound accent rule of KJ and NJ, whereby compounds inherit the accent pattern of their initial members (Uwano 1984).
30 OJ follows the TJ-type rule about the accentedness of loanwords including alphabetic acronyms (Shimizu 2006). Thus, acronyms tend to be pronounced without a pitch fall if they are four moras long and end in a sequence of two light syllables (Kubozono 2003, 2010).

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(35) a. High-beginning acronyms (regular)

Expected pattern	Observed pattern	TJ form	gloss
PII.TII.Ee	PII.TII.Ee	PII.TII.Ee	PTA
EE.BII.SIi	EE.BII.SIi	EE.BII.SIi	ABC
EE.E.MU	EE.E.MU	EE.E.MU	AM
EE.PIi	EE.PIi	EE.PIi	AP

b. Low-beginning acronyms (exceptional)

Expected pattern	Observed pattern	TJ form	gloss
E.FU.E.MU	e.fu.e.MU	e.FU.E.MU	FM
E.RU.PIi	e.ru.PIi	e.RU.PIi	LP

One question that naturally arises here is why the traditional tone preservation rule permits exceptions depending on the weight of the initial syllable. This question can be answered in a straightforward manner if we consider the pitch patterns of the corresponding acronyms in TJ. As can be seen from the pitch patterns in (35) (see also footnote 3), the pitch of the word-initial mora in TJ is determined by the weight of the initial syllable in such a way that word-initial light syllables begin with a low pitch, whereas their heavy counterparts begin with a high pitch. This regularity embodies a redundant rule in TJ since the initial high and low pitches are complementarily distributed. On the other hand, word-initial tones are distinctive in OJ. What the deviant pattern in (35b) suggests is that native speakers of OJ display sensitivity to the word-initial pitch of the corresponding acronyms in TJ when producing acronyms in their own dialect. When listening to TJ, in other words, OJ speakers are sensitive to a pitch feature that is distinctive in their L1 grammar although it is a redundant feature in the standard dialect itself.

5.1.4 Summary

In the foregoing subsections, we saw accent patterns and changes in three regional pitch-accent systems, i. e., NJ, KuJ, and OJ. What these dialects commonly show is the sensitivity to the pitch features in TJ. NJ displays sensitivity to the presence or absence of a pitch fall in the domain of word-initial three moras in TJ, KuJ exhibits sensitivity to the presence or absence of a pitch fall in TJ, and OS is sensitive to the pitch of word-initial syllable in TJ. These dialects are sensitive to TJ forms in different ways, but they are all sensitive to the pitch feature that is distinctive in their L1 dialect: the presence or absence of a pitch fall in NJ and KuJ and the word-initial pitch in OJ. They copy a relevant pitch feature of TJ into their own pronunciations. This suggests that how native speakers of these regional dialects perceive TJ is constrained by their L1 phonology.

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L1 phonology plays another important role in the L1-L2 interaction. As we mentioned repeatedly, the actual output patterns reflecting the influence of TJ are nevertheless not identical to those of TJ. Namely, the new or affected patterns in the three dialects are different from the pitch forms of corresponding TJ words, as illustrated in (36). This shows how much the accent changes are constrained by L1 phonology.

(36) a. NJ: a.ru.bai.to (flat, mid pitch) TJ: a.RU.BAi.to
b. KuJ: ta.ka.O TJ: ta.KA.O
c. OJ: e.fu.e.MU TJ: e.FU.E.MU

5.2 Implications

5.2.1 Loanword phonology

Having seen the constraints that L1 phonology imposes on the L1-L2 interactions in Japanese dialects, it is important to emphasize here that the same constraints can be observed in loanword phonology of the language, i. e., in the process of borrowing foreign words into Japanese.

One long-standing mystery about loanword accent in Japanese was that loanwords exhibit different accent patterns from native or Sino-Japanese words. In TJ, for example, a majority of native words take the unaccented pattern, whereas 90 % of loanwords are accented (Sibata 1994). Similarly, in KJ, native words are equally distributed between the two accent classes, Type A and Type B, but 95 % of loanwords belong to Type A class (Kibe and Hashimoto 2003). Many other dialects show a similar asymmetry between native words and loanwords (Umegaki 1944). What these dialects have in common is that loanwords favor an accent pattern involving a pitch fall: e.g. accented pattern in TJ, Type A in KJ, etc. This raises the question of why loanwords prefer a pitch pattern with a pitch fall across dialects.

Kubozono (2006a) proposed to explain this common tendency in terms of the influence of pronunciations in English from which 84 % of loanwords in modern Japanese come (Sibata 1994).[31] English words, when pronounced in isolation, involve a pitch fall, usually between the accented (stressed) syllable and the next syllable. Kubozono (2006a) claimed that native speakers of Japanese

31 This suggests that the basic structure and principles of loanword phonology in Japanese are formed primarily by the ways English words are borrowed into the language. Influence of other languages, if any, is probably secondary.

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display sensitivity to this pitch feature when perceiving English words: they are sensitive to the presence or absence of a pitch fall in English words and use this sensitivity when deciding the major accent category for loanwords in their native language (see Kubozono 2007a for more evidence). This naturally explains why the accented (vs. unaccented) pattern and Type A (vs. Type B) are predominantly chosen by loanwords in TJ and KJ, respectively. In this way, loanword prosody of Japanese is dependent on how its native (L1) speakers perceive words in the source language, i. e. L2. Note that this perceptual factor is exactly the same as the strategy that young speakers of KJ unconsciously employ in their new accent patterns (sections 3 and 4) as well as the factor that is found in the influence of TJ on the accent patterns in NJ, KuJ, and OJ (section 5.1).

Loanword accent is strikingly similar to the accent changes in Japanese dialects in two more ways. First, the actual output forms are heavily constrained by the L1 grammar in both types of phenomena. In loanword phonology, surface pitch patterns including the position of the pitch fall is determined by the grammar of individual dialects. This is illustrated in (37). Similarly, the new accent patterns found in KJ (sections 3 and 4), NJ, NuJ, and OJ (section 5.1) exhibit different pitch patterns from those of TJ forms which served as the target of the new patterns. Thus, loanword prosody (L1 = Japanese, L2 = English) and accent changes in Japanese dialects (L1 = each dialect, L2 = TJ) are heavily constrained by the L1 grammar.

(37)	English	TJ	KJ	NJ	OJ
	ba.NA.na ‘banana’	BA.na.na	ba.NA.na	ba.NA.na	ba.NA.na
	WA.sin.ton ‘Washinton’	wa.SIn.ton	wa.SIN.ton	wa.SIn.ton	wa.SIn.ton

The two types of phenomena exhibit another type of L1 constraint. In pursuit of a perceptual similarity between the L1 and L2 forms, they both show sensitivity to the pitch features that are distinctive in the L1 grammar. In loanword phonology, native speakers of Japanese are generally sensitive to the pitch fall that exists in the pronunciations of English words. In accent changes in regional dialects, native speakers of these dialects are generally sensitive to the presence or absence of a pitch fall in the L2, i. e., TJ, forms (in KJ, NJ and KuJ) or to the word-initial pitch (in OJ). What they have in common is that the speakers display sensitivity to a particular pitch feature that is distinctive in their L1 grammar even if the pitch feature may not be distinctive in the L2 grammar. Stated conversely, they are generally insensitive to pitch features and phonetic cues that are not important in their L1 phonology, when listening to a different language/dialect. In this way, how native speakers perceive L2 speech is itself constrained by their L1 phonology.

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In a wider context, this L1 constraint on the perception of L2 words can be understood very easily if we consider the general interactions between L1 and L2 in second language acquisition. For example, Japanese speakers are poor at hearing [r] and [l] in learning a foreign language since these two sounds are not distinctive in their L1 phonology (Iverson et al. 2003). Similarly, native speakers of Korean and Chinese learning Japanese show poor performance in perceiving the difference between voiced and voiceless obstruents (e.g., [t] vs. [d]), especially in word initial position, since these two categories are not distinctive in their first languages. Likewise, native speakers of English studying Japanese are generally insensitive to the difference between single and geminate consonants, e.g., /kata/ 'shoulder' vs. /katta/ 'bought', since their native language lacks this distinction. All these facts indicate that in second language acquisition, speech perception is highly constrained by the phonological structure of the listener's native language (e.g. Cutler 2012). The accent changes in regional Japanese dialects and the loanword prosody of Japanese are subject to the same kind of L1 constraint that is commonly found in L2 acquisition. In all these processes, native speakers are perceptually very sensitive to a phonetic feature that is distinctive in their L1 phonology and generally insensitive to other phonetic features that are not distinctive.

5.2.2 L1 phonology

Finally, let us consider our final question, i. e., what the accent changes in KJ tell us about the pitch-accent system of the dialect itself. We saw in sections 3 and 4 that young native speakers of this dialect display strong sensitivity to the presence or absence of a pitch fall in TJ words. This observation suggests that [±pitch fall] is distinctive in this pitch-accent system, that is, that Type A and Type B are distinguished from each other in terms of the presence or absence of a pitch fall.

While this interpretation sounds quite reasonable, it is not a standard view of the accent system of KJ, however. The view that is popularly taken in the literature is that the two accent types differ in the position of H tone: Type A and Type B have an H tone on the penultimate and final syllables, respectively (Hirayama 1951; Uwano 1999; Kibe 2000, to mention just a few). The only exceptions to traditional 'tonal analysis' are Haraguchi's (1977) and Shibatani's (1990) new analysis whereby Type A and Type B are assumed to differ in the presence or absence of a pitch fall, just as accented and unaccented words in TJ. This analysis led the two scholars to call the two accent types 'accented' and 'unaccented', respectively.

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This ‘accentual’ analysis is compared with the traditional ‘tonal’ analysis in (38): accents are marked by apostrophes as in the description of TJ and lack of an apostrophe means that it is an unaccented word.

(38)	(a) Traditional tonal analysis	(b) Haraguchi-Shibatani’s accentual analysis	gloss
Type A	a.ka-SIN.goo	a.ka-sin’.goo	red signal
Type B	a.o-sin.GOO	a.o-sin.goo	green signal

There are several independent observations that support the accentual analysis in preference to the traditional tonal one. One observation concerns the pitch pattern of monosyllabic words in KJ. As mentioned in section 2 above, the contrast between the two accent classes is well preserved in monosyllabic words, both heavy and light. Specifically, monosyllabic Type A words have a pitch fall, whereas their Type B counterparts do not (see (6) above). This fact is more compatible with the accentual analysis in (38b) than the tonal analysis in (38a).

Another important observation in support of the accentual analysis comes from an acoustic analysis of KJ in comparison with that of TJ. In TJ, accented words exhibit two different acoustic features from unaccented words (Poser 1984; Pierrehumbert and Beckman 1988; Kubozono 1988). First, they have a higher pitch peak than unaccented words. Second, accented words trigger downstep or catathesis which lowers the pitch level or range of the following words and phrases. For example, the word /nomi’mono/ ‘drink’ is realized at a considerably lower pitch level if it follows accented elements like /uma’i/ ‘tasty’ than if it follows unaccented elements like /amai/ ‘sweet’.

Stimulated by these observations in TJ, Ishihara (2004) conducted a series of acoustic experiments with native speakers of KJ as subjects. This study has shown that Type A and Type B words in KJ behave like accented and unaccented words in TJ, respectively. Namely, Type A words receive higher pitch than Type B words, and they exert a pitch lowering effect on the following words, whereas Type B words do not.[32] These findings indicate that the H tone in Type A words is fundamentally different from that in Type B words. This, in turn, supports the accentual analysis in (38b), where the two types of accent patterns crucially differ in the presence or absence of one phonological feature, rather than the traditional tonal analysis in (38a), where the two accent types only differ in the position of the H tone (Kubozono 2005).

32 Ishihara (2004) carefully controlled for the effect of declination, another intonational process whereby pitch mechanically declines as the utterance proceeds.

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Returning to the main discussion of this article, the accentual analysis proposed by Haraguchi (1977) and Shibatani (1990) is in perfect harmony with our observation that young KJ speakers display sensitivity to the presence or absence of a pitch fall in TJ forms. In other words, our analysis of the ongoing accent changes supports the accentual analysis rather than the traditional tonal one.

6 Conclusion

6.1 Summary

In this article, we analyzed the ongoing accent changes in KJ to know how and why young native speakers of the dialect produce new accent patterns. Our analysis has shown that the young speakers' accent patterns are heavily influenced by the pitch patterns of TJ words. Specifically, they are sensitive to the presence or absence of a pitch fall in TJ forms and copy this feature into the accent patterns of their native dialect: Originally Type A words tend to take Type B accent pattern if they are pronounced as unaccented (pronounced without a pitch fall) in TJ, whereas Type B pattern tends to turn into Type A pattern in words that are accented in TJ. In addition, young native speakers of KJ have phonological knowledge not only about the accented/unaccented distinction in individual words in TJ but also about accent rules in this standard dialect. This includes the complicated set of accent rules underlying /X-taroo/ and /X-ziroo/ compounds (section 4.4) as well as the morphosyntactically-defined accent rule responsible for the accentuation of a certain class of personal names (section 4.3). This shows the extent to which young KJ speakers know about TJ phonology as well as the extent to which bilingualism can change the accent system of a particular dialect.

We have also shown that this influence of TJ on KJ word accent is not an isolated phenomenon in Japanese phonology (section 5). Pitch accent patterns in other regional dialects are also heavily influenced by the accent patterns of the standard dialect, on the one hand, and loanword prosody is also governed by the same mechanism, on the other. What the accent changes in KJ and these processes share is that they are subject to a perceptual force to copy a certain pitch feature of L2 into the accent system of L1, on the one hand, and to a phonological constraint by which the other aspects of L1 prosody are preserved as faithfully as possible, on the other. Moreover, the perceptual force itself is constrained by the prosodic system of L1 in such a way that L1 speakers are sensitive (only) to a pitch feature that is distinctive in their own system even though the feature may be redundant in the L2 system.

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As for the accent changes in KJ, knowledge of TJ phonology affected the accent system of the dialect in two crucial ways. First, it has changed the accent category of words in such a way that some words that belong to Type A in older speakers' grammar now belong to Type B in younger speakers' grammar, while a certain class of words that are pronounced with Type B pattern in the traditional grammar are now produced with Type A pattern. A second and more significant effect is that the traditional compound accent rule known as Hirayama's Law has been made more or less inactive or, at least, much less productive than before. This rule is now being replaced by TJ-type accent rules that do not refer to the accent property of the leftmost element of compounds. Many of them refer to the phonological property of the final member of compounds (section 3.2), while some others look at the morphosyntactic origin of the words (section 4.3), and the phonological length of the initial members (section 4.4). Young native speakers of KJ have phonological knowledge about these complicated rules of TJ and began to apply them to the pronunciations of their own dialect.

While the accent category of individual words and the traditional compound accent rule have been seriously affected by TJ, other major features of the traditional accent system of KJ remain largely intact. Thus, the young speakers still have a pitch-accent system that only permits two accent patterns and a syllable-based accent assignment. This confirms the findings of the previous studies sketched in section 3. It may take some more time before these basic features are also affected by the accent system of TJ, but if they were affected, the accent system of KJ would be qualitatively different from what we see today and would look very much like that of TJ.

6.2 Remaining questions

Our present study has answered the questions that we raised at the beginning of this article. We now know, for example, what type of word is prone to change and what type is not in KJ. We also know how accent patterns change if they change at all in this dialect. We have also seen a tremendous difference among young native speakers in the degree of deviation from the traditional accent patterns, which accounts, at least in part, for the current intermediate stage of accent changes in these speakers' data. On the other hand, our study has not clarified what underlies this inter-personal difference, or the question of why some young speakers show more deviation from the traditional accent patterns and the left-dominant compound rule than others. It is also unclear why certain words in one accent group actually change and other words in the same group do not. Future research is expected to answer these and other related questions.

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Shigeki Kaji

From Nyoro to Tooro: Historical and Phonetic Accounts of Tone Merger

Abstract: In the southwestern region of Uganda, some closely related Bantu languages such as Nkore, Kiga, Tooro, and Nyoro are spoken. Although they look alike as a whole, their tone systems are different from one another. In Nkore, for example, high tone can come on any syllable of a word (but in isolation on one syllable only). Therefore, the number of tone patterns in Nkore is in function of the number of the syllables of a word (the prefixes normally do not take high tone). In Nyoro and Tooro, however, appearance of high tone is very restricted; in Nyoro high tone comes either on the penultimate or the ultimate (final) syllables of words, and in Tooro, high tone comes only on the penultimate syllable of words. In this article, we will examine Nyoro tone closely from historical and phonetic angles in order to trace historical developments from the two-tone system of Nyoro to the one-tone system of Tooro. We see that in Nyoro, the underlying ultimate high tone is anticipated to the left by one syllable, leaving its trace as falling tone on the original ultimate syllable. But this ultimate falling tone is very subtle, and prone to be taken as low. Also, the underlying penultimate high tone is realized as falling in isolation, but this falling tone is easy to be misperceived as high especially when the vowel is short. In this way, seeds of merger are found in the nature of Nyoro tone itself.

Keywords: Nyoro, Tooro, Bantu, tone pattern, tone merger

1 Introduction

Nyoro is a Bantu language spoken by about 667,000 people (Lewis 2009) in southwest Uganda. It is a relatively big language in Uganda. Its southern neighbor Tooro, also with its numerous speakers (488,000 by Lewis 2009), is genealogically very close to it. These two languages are so close and similar to each other that members of each language community think it unnecessary to speak the

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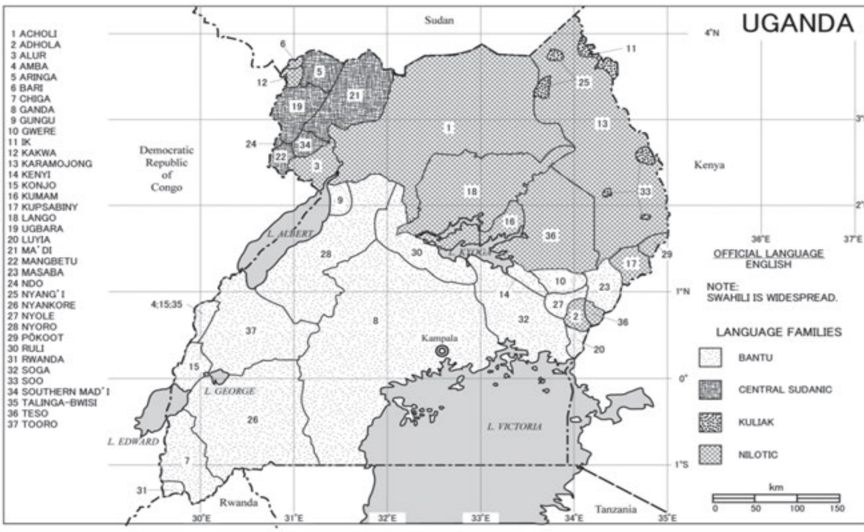
others' language; just speaking one's own language will suffice to make oneself understood by the others (see Map 1).[1]



Map 1: Language distribution in Uganda (source: Grimes 2000). Cf. 28: Nyoro, 37: Tooro, 26: Nkore, 7: Kiga. Haya is spoken in Tanzania, south of Nkore.

Still, there are lexical and grammatical differences between Nyoro and Tooro, and people discern them, even very subtle ones. My main informant of Nyoro expresses the similarities and differences by saying that the Tooro call a banana [ekitóːke] whereas the Nyoro call it [ekitôːke].

Indeed, tone is one good index to differentiate the two languages. It plays lexical and grammatical roles in Nyoro whereas in Tooro its lexical function has been lost.[2] In (1) and (2), minimal pairs by tone are given for Nyoro; those in (1) involve nouns and those in (2) are grammatical forms. In what follows, high tone

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1 Authors of these languages usually treat them together. For example, Rubongoya (1999) calls his grammar *Modern Runyoro-Rutooro Grammar* and Ndoleriire et al. (2009) entitle their dictionary *Runyoro-Rutooro–English Dictionary*. These two languages plus some other neighboring languages such as Nkore and Kiga are often referred to as Kitara after the name of the ancient kingdom of this region, implying that they are dialects of the same language.

2 It is a pity that Ndoleriire et al. (2009) characterize Nyoro as having no lexical tone, supposedly on the basis that Tooro has no lexical tone, even though they notice its grammatical tone, which they call intonation. This kind of miscomprehension seems due to their dealing with Tooro and Nyoro together. (The first author of this dictionary is a Tooro speaker.)

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(H) is marked by an acute accent (´), falling tone (F) by a circumflex accent (ˆ), rising tone (R) by a reverted circumflex accent (wedge) (ˇ), and low tone (L) by no mark.

(1)	a.	ê:nda 9,10	'abdomen'
		é:ndâ 9,10	'louse, lice'
	b.	ekitêbe 7, ebitêbe 8	'class (of school)'
		ekitébê 7, ebitébê 8	'big chair'
	c.	ê:ngo 9,10	'leopard'
		é:ngô 10	'fence (pl.)' [3]
	d.	ekyê:nda 7, ebyê:nda 8	'intestine'
		ekyé:ndâ 7, ebyé:ndâ 8	'ninety'
	e.	endʒûma 9	'abuse'
		endʒúmâ 10	'pip'

(2)	a.	age·nzêre	'he who has gone'
		age·nzérê	'he has gone'
	b.	tu:kugê:nda	'we are going'
		tu:kugé:ndâ	'we may go'
	c.	ekitábu kyâ:nge 7	'my book'
		ekitábu kyá:ngê 7	'the book is mine'

Nyoro, like most other Bantu languages, is a noun class language (the classes are numbered from 1 to 18) and nouns are usually singular-plural paired. Thus for example, class 2 nouns are plurals of class 1 nouns, and class 4 nouns are plurals of class 3 nouns, and so forth. In singular-plural pairs, the singular is listed on the left and the plural on the right, separated by a comma. For some nouns the singular and the plural have the same form, like the class 9 nouns and the class 10 nouns, in which case only one form is given with the two class numbers 9 and 10.

Nouns are usually composed of three elements, i. e. the augment (AUG),[4] the nominal prefix (NPR) and the stem, in this order. The class of a noun is shown morphologically by the nominal prefix, and the nominal prefix often connotes a meaning (classes 1 and 2 denoting humans, classes 7 and 8 indicating an augmentative meaning, etc.).[5]

3 This is the plural form; its singular is [orúgô] 11.

4 The augment has an article-like function. It does not show up in some syntactic environments, e.g., when a noun is used predicatively or a noun is used as an indefinite direct object of a negative transitive sentence, etc.

5 The morphological structures (without tone) of the singular forms of (1a) and (1b) are as follows.

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Tooro, in contrast with Nyoro, is not a tone language in the true sense of the word. Tooro nouns have only one tonal pattern. As is seen from (3), the penultimate syllable of words is always high-pitched in Tooro. Still, tone plays a grammatical function in Tooro, as illustrated in (4).[6]

(3)	a.	é:nda 9,10	'abdomen'
		é:nda 9,10	'louse, lice'
	b.	ekitébe 7, ebitébe 8	'class (of school)'
		ekitébe 7, ebitébe 8	'big chair'
	c.	é:ngo 9,10	'leopard'
		é:ngo 10	'fence (pl.)'
	d.	ekyé:nda 7, ebyé:nda 8	'intestine'
		ekyé:nda 7, ebyé:nda 8	'ninety'
	e.	endʒúma 9	'abuse'
		endʒúma 10	'pip'

(4)	a.	ekitábu kyá:nge	'the book is mine'
	b.	ekitabu kyá:nge	'my book'

This article, with a view to tracing the historical developments of these differences, focuses on the transition from the two-tone pattern system of Nyoro to the one-tone pattern system of Tooro by exploring the phonetic characteristics of Nyoro tone. It is organized as follows. After this introduction, Tooro tone is reviewed in section 2, where Tooro is found to have only one tone pattern for nouns regardless of the length of words. In section 3, Nyoro tone is analyzed and we see that nouns have two underlying tone patterns, namely penultimate high (pattern A) and ultimate high (pattern B). Phonetic realizations of these two patterns are not straightforward, with the effects of High Tone Anticipation and the subtleness of falling tone, which make the distinction of the two patterns not immediately obvious, especially in the case of nouns with penultimate light syllables, confusing them both as having penultimate high followed by ultimate low. Section 4 discusses the phonetic characteristics of Nyoro tone. Pitch tracings reveal that the two patterns are kept fairly distinct for nouns with penultimate

(1)	a.	e-n-da 9	(2)	a.	e-ki-tebe
		AUG9-NPR9-abdomen			AUG7-NPR7-class
		'abdomen'			'class (of school)'
	b.	e-n-da 9		b.	e-ki-tebe
		AUG9-NPR9-louse			AUG7-NPR7-chair
		'louse'			'big chair'

6 See also Kaji (2007, 2009).

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heavy syllables because pattern B nouns have a slightly rising pitch on the penultimate syllable, not falling like pattern A nouns. However, for nouns with penultimate light syllables the two patterns have the same pitch configuration, i. e. penultimate falling followed by ultimate low. The difference is only that pattern A nouns' penultimate falling is sharper than that of pattern B nouns. Finally in section 5, we conclude that a path has been paved in Nyoro tone itself for the two patterns to merge, but that they are kept distinct in Nyoro at the present stage of development.

2 Tooro tone

Before discussing Nyoro tone in detail, we will briefly look at Tooro tone. As is seen from (3), H appears in only one location of words in isolation in Tooro, regardless of the number of the syllables which constitute words. Some longer nouns are given in (5). In all cases H appears on the penultimate syllable, whose vowel can be either short (5a), long[7] (5b,c,d), or a diphthong (5e). This observation leads to the conclusion that Tooro is a one-tone pattern language.

(5)	a.	orukuráto 11, enkuráto 10	'meeting'
	b.	omudʒuga·ntá:ra 3, emidʒuga·ntá:ra 4	'species of tall tree'
	c.	akaɲaswí:swi 12, obuɲaswí:wi 14	'wagtail'
	d.	ekimiró:nko 7, ebimiró:nko 8	'bronchia'
	e.	ekiko·ngóídʒo 7, ebiko·ngóídʒo 8	'heel'

With that said, we see that H in [ekitábu] 'book' becomes L in (4b). [ekitabu kyá:nge] (4b) is a noun phrase composed of the noun /ekitábu/ 'book' immediately followed by the possessive adjective [kyá:nge] (</ki-ánge/)[8] 'my', meaning 'my book' (i. e. [book my]$_{NP}$). From this we can say that H appears on one syllable in a whole phonological phrase in Tooro.[9] [ekitábu] in (4a) keeps its H because

7 Long vowels are either phonemic or phonetic. In this case, [a:] in (5b) is phonemically long and [i:] in (5c) and [o:] in (5d) are phonetically long. The phonemically short /i/ in (5c) becomes phonetically long because of glide formation and compensatory lengthening, and the phonemically short /o/ in (5d) is phonetically lengthened due to the nasal cluster which follows it. The quantity by phonetic causes does not become full (i. e. realized as half-long) when the vowel is not in the penultimate syllable in Tooro, as shown in (5b) and (5e).
8 Ki- of /ki-ánge/ is a prefix in agreement with the cl. 7 noun /ekitábu/ 'book'.
9 We might say that Tooro's H is a phrasal tone inserted automatically in a phrase rather than that Tooro has a one-pattern tone system, implying that its words have high tone on their penultimate syllable.

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it is the subject of the sentence and it alone constitutes a noun phrase, hence a phonological phrase (i. e. $[\text{book}]_{NP}$ $[\text{my(= mine)}]_{VP}$, in which no copula verb is necessary).

In passing, we note falling tone rather than high tone in some Tooro forms (6). This is the case where the ultimate syllable of a word has the liquid [r] as an onset consonant; in this case the tone of the penultimate syllable becomes clearly falling. This is just a phonetic feature of Tooro tone and bears no phonemic significance.

(6)	a.	ekikêre 7, ebikêre 8	'frog'
	b.	embôro 9,10	'penis'
	c.	ekiha·ngâra 7, ebiha·ngâra 8	'palate'
	d.	okubâra	'to count, counting'

3 Nyoro tone

In this section we will examine Nyoro tone closely. As said earlier, Nyoro nouns have two underlying tone patterns; they are either penultimate high or ultimate high, regardless of the number of syllables which constitute words (...sśs, ...sś).[10] There are no entirely low words (...sss). The tone bearing unit is the syllable, as in Tooro; short vowels and long vowels behave in the same way in principle. For the sake of convenience, we will call nouns with penultimate high tone the pattern A nouns, and nouns with ultimate high tone the pattern B nouns. The phonetic realization of H is different according to the pattern, i. e. the underlying location of H in the word. We will first look at pattern A nouns.

3.1 Pattern A nouns

In pattern A nouns H is realized as falling in isolation. However, this falling is quite subtle on short vowels and it is often difficult to discern; we may easily take it for H, especially on short vowels (we will be back to this point later). When it is realized on long vowels or diphthongs, however, we never fail to hear it correctly. In (7) we have penultimate H-toned nouns with H on short vowels. Prefixes and stems are separated by a hyphen in the underlying representations.

10 Conjugated verb forms have other tone patterns because some grammatical morphemes have their own tone. In this article we will deal with nominal forms only.

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(7)	a. /obú-ne/ 14	→	obûne	'liver'
	b. /ama-zíga/ 6	→	amazîga	'tears'
	c. /eki-ragíro/ 7	→	ekiragîro	'law'
	d. /oru-kanakána/ 11	→	orukanakâna	'dewdrop'
	e. /eki-tabudʒugúta/ 7	→	ekitabudʒugûta	'species of civet'

In (8) and (9), examples of H on long vowels and diphthongs are given, (8) for two-syllable stem nouns and (9) for three-syllable stem nouns. Long vowels are phonemic in (8a) and (9a), and phonetic in (8b,c) and (9b,c).[11] The glides [w] in (8b) and (9b) derive from underlying full vowels, either /u/ or /o/, but we leave them as they are because, inside morphemes, we cannot tell which vowel they are from.

(8)	a. /ama-ɲáːre/ 6	→	amaɲâːle	'sperm'
	b. /omu-tʃwézi/ 3	→	omutʃwêːzi	'traditional god'
	c. /omu-kúndi/ 3	→	omukûːndi	'navel'
	d. /eki-kóíkyo/ 7	→	ekikóikyo	'riddle'

(9)	a. /eki-sinzíːro/ 7	→	ekisiˑnzîːro	'heel'
	b. /en-kuhwáhwa/ 9,10	→	enkuhwâːhwa	'armpit'
	c. /en-tadʒúmba/ 9,10	→	entadʒûːmba	'guinea fowl'
	d. /eki-karáíga/ 7	→	ekikaráiga	'worn out cloth'

In order to know the underlying tone of these nouns, a good way is to remove the pause after the noun. When nouns are immediately followed by qualifying adjectives[12] to form noun phrases, the falling tone in isolation gets restored to H. Pause has an intonational effect to lower a high tone. In (10), (11) and (12) nouns are followed by the possessive adjective /-ánge/ 'my', and they have a penultimate H tone, not a falling tone any more.

(10)	a. /obú-ne bu-ánge/ 14	→	obúne bwâːnge	'my liver'
	b. /ama-zíga ga-ánge/ 6	→	amazíga gâːnge	'my tears'
	c. /eki-ragíro ki-ánge/ 7	→	ekiragíro kyâːnge	'my law'
	d. /oru-kanakána ru-ánge/ 11	→	orukanakána rwâːnge	'my dewdrop'
	e. /eki-tabudʒugúta ki-ánge/ 7	→	ekitabudʒugúta kyâːnge	'my civet'

(11)	a. /ama-ɲáːre ga-ánge/ 6	→	amaɲáːle gâːnge	'my sperm'
	b. /omu-tʃwézi gu-ánge/ 3	→	omutʃwéːzi gwâːnge	'my traditional god'
	c. /omu-kúndi gu-ánge/ 3	→	omukúːndi gwâːnge	'my navel'
	d. /eki-kóíkyo ki-ánge/ 7	→	ekikóíkyo kyâːnge	'my riddle'

11 For the causes of phonetic long vowels, see footnote 7. The same rules apply to Nyoro, too.
12 As said in footnote 8, the adjective also takes a prefix (and an augment depending on the syntactic environment) which is in agreement with the noun it qualifies.

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(12) a. /eki-sinzíːro ki-ánge/ 7 → ekisiˑnzíːro kyâːnge 'my heel'
b. /en-kuhwáhwa i-ánge/ 9 → enkuhwáːhwa yâːnge 'my armpit'
c. /en-tadʒúmba i-ánge/ 9 → entadʒúːmba yâːnge 'my guinea fowl'
d. /eki-karáíga ki-ánge / 7 → ekikaráíga kyâːnge 'my worn out cloth'

In spite of its simplicity as a system, Nyoro tone is not always clear-cut, and causes problems. There are two reasons for that concerning pattern A nouns. One is that H tone is often anticipated, and the other is that the phonetic falling tone is not always discernable; it is very often heard as H.

First, we will consider H tone anticipation. The three forms listed in (13), all pronounced in isolation, mean the same thing 'a Nyoro person'. (13a) is an orthodox pronunciation in which the underlying H on the penultimate syllable is realized as F in isolation. In (13b), H is realized as F, but at the same time this H is copied to the left by one syllable. And in (13c) the original H is not seen any more on the penultimate syllable; it is only seen on the antepenultimate syllable, realized as H. We note that (13c) is a casual pronunciation.[13] When we query about it, it is usual that informants correct it, pronouncing (13a) or (13b) as a good pronunciation. The historical tendency is (13a) > (13b) > (13c).[14]

(13) a. omuɲôro 1, abaɲôro 2 'a Nyoro person'
b. omúɲôro 1, abáɲôro 2 'a Nyoro person'
c. omúɲoro 1, abáɲoro 2 'a Nyoro person'

We can formulate H tone anticipation as in (14), in which the symbol ↓ means historical developments and the symbol → indicates phonetic realizations. It is to be noted that the transitions from (14a) to (14b) and also from (14b) to (14c) are optional, and each form has a phonetic realization. We will also mention H tone anticipation regarding pattern B nouns, but with pattern B nouns, it is obligatory and not optional as with pattern A nouns.

(14) a. ...LHL# → ...LFL (13a)
↓
b. ...HHL# → ...HFL (13b)
↓
c. ...HLL# → ...HLL (13c)

13 This is true at least in Hoima, where research is done. Data from other dialects are needed, especially from the Masindi area. My main informant customarily says: "It is a Masindi pronunciation." when he is queried about the (13c) type pronunciation. Hoima District is located in the central part of Nyoroland, where the royal palace is. Masindi District is to the north of Hoima and to the south of Hoima lies Kibaale District.

14 Tone anticipation is a leftward movement of tone, and we see no rightward movement of tone in Nyoro.

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(15) gives more examples of H tone anticipation, focused on pronunciations which keep H on the original syllable.

(15) a. ekimûli 7, ebimûli 8 ~ ekímûli 7, ebímûli 8 ‘flower’
b. akalêdʒu 12, obulêdʒu 14 ~ akálêdʒu 12, obúlêdʒu 14 ‘chin’
c. enkokôra 9,10 ~ enkókôra 9,10 ‘elbow’
d. enziramîra 9,10 ~ enzirámîra 9,10 ‘python’

We should note, however, that H tone anticipation does not occur when either the penultimate syllable or the antepenultimate syllable or both are heavy, with a long vowel or diphthong, as in (16). Nor does it usually take place when the noun is followed by something in a phrase. In (17) are given examples of noun phrases in which the nouns are qualified by the possessive adjective /-ánge/ ‘my’.

(16) a. omurû:ndi 3, emirû:ndi 4 ‘shin’
(*omúrû:ndi 3, *emírû:ndi 4)
b. ekiso·ngêzo 7, ebiso·ngêzo 8 ‘dogtooth’
(*ekisó·ngêzo 7, *ebisó·ngêzo 8)
c. akahu:mîzi 12, obuhu:mîzi 14 ‘hawk, kite’
(*akahú:mîzi 12, *obuhú:mîzi 14)
d. omukaikûru 1, abakaikûru 2 ‘old woman’
(*omukáíkûru 1, abakáíkûru 2)

(17) a. ekimúli kyâ:nge 7 (*ekímúli kyâ:nge 7) ‘my flower’
b. akalédʒu kâ:nge 12 (*akálédʒu kâ:nge 12) ‘my chin’
c. enkokóra yâ:nge 9 (*enkókóra yâ:nge 9) ‘my elbow’
d. enziramíra yâ:nge 9 (*enzirámíra yâ:nge 9) ‘my python’

H tone anticipation with pattern A nouns is a process by which H tone makes itself salient. Anticipation is a one way for this purpose. If a syllable has an enough space for H to be manifest sufficiently with a long vowel or diphthong, anticipation is not necessary (16a). We see also that H tone anticipation does not have an almighty power; it is not so powerful as to raise the low tone of a preceding heavy syllable (16b,c,d). Also, H tone anticipation does not apply when pause is removed by qualification with a word in a phrase (17). H tone anticipation is seen to apply only to forms in isolation, but its application is not on a massive scale; in a majority of words it does not occur even in environments other than those described in (16) and (17). This is exemplified in (18).

(18) a. ekinâga 7, ebinâga 8 ‘cooking pot’
b. omugûha 3, emigûha 4 ‘rope’

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c.	ekisisâni 7, ebisisâni 8	'picture'
d.	nyamagôya 1*a*, baːnyamagôya 2*a*	'albino'

The second point which causes problems to identify pattern A nouns resides in the auditory subtleness of the Nyoro falling tone. This is more serious than the issue of H tone anticipation for it has to do with the distinction between pattern A nouns and pattern B nouns. Apart from nouns with a long vowel or a diphthong on the penultimate syllable, in which case F is easy to hear, F is quite unperceivable on short vowels. For example, /orulími/ 11 'tongue' (19a) is heard in isolation not only as [orulîmi] (realization 1 as expected) but also as [orulími] (realization 2). In that case, it is only by testing with a qualifying adjective that we confirm that it is a pattern A noun. In pattern A nouns, the ultimate syllable of the noun remains L when followed by a qualifying adjective in a phrase (20), not like pattern B nouns whose ultimate syllable of the noun is H when followed by a qualifying adjective in a phrase.

		underlying	realization 1	realization 2	
(19)	a.	/oru-límí/ 11	[orulîmi]	[orulími]	'tongue'
	b.	/oru-tége/ 11	[entêge]	[entége]	'back of the knee'
	c.	/eki-dʒúdʒu/ 7	[ekidʒûdʒu]	[ekidʒúdʒu]	'tsetse fly'
	d.	/omu-ɲankómo/ 1	[omuɲaˑnkômo]	[omuɲaˑnkómo]	'prisoner'

(20)	a.	orulími rwâːnge 11 (*orulímí rwâːnge 11)[15]	'my tongue'
	b.	orutége rwâːnge 11 (*orutégé rwâːnge 11)	'my back of the knee'
	c.	ekidʒúdʒu kyâːnge 7 (*ekidʒúdʒú kyâːnge 7)	'my tsetse fly'
	d.	omuɲaˑnkómo wâːnge 1 (*omuɲaˑnkómó wâːnge 1)	'my prisoner'

3.2 Pattern B nouns

As said above, pattern B nouns have an underlying H on the ultimate syllable. Differently from pattern A nouns, H tone anticipation obligatorily applies to pattern B nouns. So, the underlying H of pattern B nouns is realized in the following way, i. e. H is copied to the left adjacent syllable, and leaves its trace as falling tone on the original ultimate syllable. (21) and (22) illustrate this for nouns with a light and heavy penultimate syllable, respectively.

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15 Starred here are forms if they were pattern B nouns.

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(21) a. /en-gegé/ 9,10 → engégê 'tilapia'
b. /oru-birá/ 11 → orubírâ 'inner waist belt'
c. /eki-tagatá/ 7 → ekitagátâ 'hot spring'
d. /omu-somesá/ 1 → omusomésâ 'teacher'

(22) a. /aka-ibeːbé/ 12 → akaibéːbê 'falcon'
b. /eki-endʒú/ 7 → ekyéːndʒû 'ripe banana'
c. /omu-dʒungú/ 1 → omudʒúːngû 'white person'
d. /em-baizí/ 9,10 → embáízî 'axe'

As (23) indicates, the original form /...LH#/ (23a) has no direct phonetic realization; it is necessary that H tone anticipation applies to it to have [...HF] (23b). We do not see a development from (23b) to (23c), which would make pattern B nouns pattern A, confusing the two patterns.

(23) a. ...LH# [16]
↓
b. ...HH# → ...HF
↓
(*c. ...HL# → ...FL)

As with pattern A nouns, we are faced with complications here. The phonetic realizations in (21) and (22) are regularly expected ones. In reality, however, we often hear slightly deviated pronunciations. First, the falling tone on the ultimate syllable is hardly heard, especially in casual pronunciation. We actually hear two pronunciations in the case of nouns with penultimate light syllable in isolation. Examples are given in (24). This auditory subtleness, or even imperceptibility, of falling tone on the ultimate syllable is also observed in nouns with a heavy penultimate syllable, as illustrated in (25).

(24). a. /en-gegé/ 9,10 → engégê ~ engége 'tilapia'
b. /oru-birá/ 11 → orubírâ ~ orubíra 'inner waist belt'
c. /eki-tagatá/ 7 → ekitagátâ ~ ekitagáta 'hot spring'
d. /omu-somesá/ 1 → omusomésâ ~ omusomésa 'teacher'

As for words with penultimate heavy syllables, the anticipated H is not necessarily realized as H on the penultimate syllable but very often realized as R. Also, the trace of the original H as F on the ultimate syllable is not often heard, especially when H is realized as R on the penultimate heavy syllable. Therefore, in reality, the forms in (22) show fluctuations as in (25).

16 The difference between (14) and (23) is that in (14) we have L after H in the underlying forms.

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(25) a. /aka-ibeːbé/ 12 → akaibéːbê ~ akaibéːbe ~ akaiběːbe
'falcon'
b. /eki-endʒú/ 7 → ekyéːndʒû ~ ekyéːndʒu ~ ekyěːndʒu
'ripe banana'
c. /omu-dʒungú/ 1 → omudʒúːngû ~ omudʒúːngu ~ omudʒǔːngu
'white person'
d. /em-baizí/ 9,10 → embáízî ~ embáízi ~ embaízi
'axe'

However, these fluctuations are usually absent when the noun is followed by another word in a phrase, the qualifying adjective /-ánge/ 'my', for example. This is illustrated in (26) and (27). We see here that the effect of H tone anticipation remains, i. e. the penultimate syllable of the noun remains H in the noun phrase. This is another difference between pattern A nouns and patter B nouns regarding the application of H tone anticipation.

(26) a. /en-gegé i-ánge / 9 → engégé yâːnge 'my tilapia'
b. /oru-birá ru-ánge / 11 → orubírá rwâːnge 'my inner waist belt'
c. /eki-tagatá ki-ánge / 7 → ekitagátá kyâːnge 'my hot spring'
d. /omu-somesá u-ánge / 1 → omusomésá wâːnge 'my teacher'

(27) a. /aka-ibeːbé ka-ánge / 12 → akaibéːbé kâːnge 'my falcon'
b. /eki-endʒú ki-ánge / 7 → ekyéːndʒú kyâːnge 'my ripe banana'
c. /omu-dʒungú u-ánge / 1 → omudʒúːngú wâːnge 'my white person'
d. /em-baizí i-ánge / 9 → embáízí yâːnge 'my axe'

With one-syllable stem nouns, however, although H tone anticipation applies in isolation as in (28), its application is often blocked when nouns are followed by another word in a phrase as in (29), in which case the underlying tone pattern emerges.

(28) a. /oku-dʒú/ 15 → okúdʒû 'knee'
b. /oru-gó/ 11 → orúgô 'fence'
c. /obu-tá/ 14 → obútâ 'spleen'

(29) a. /oku-dʒú ku-ánge / 15 → okúdʒú kwâːnge ~ okujú kwâːnge
'my knee'
b. /oru-gó ru-ánge / 11 → orúgó rwâːnge ~ orugó rwâːnge
'my fence'
c. /obu-tá bu-ánge / 14 → obútá bwâːnge ~ obutá bwâːnge
'my spleen'

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4 Discussions

Although simple as a system with only two tonal patterns for nouns, Nyoro tone presents complications. The most problematic one is about forms with a penultimate light syllable. For pattern A forms, the underlying H on the penultimate light syllable is often heard in isolation as H instead of F, and for pattern B forms, the trace of the original H, i. e. F on the ultimate syllable, tends to disappear in isolation, with the underlying H anticipated to the penultimate syllable. If all these happen, pattern A nouns and pattern B nouns will have the same tonal shape, i. e. the penultimate H followed by the ultimate L. This is illustrated in (30), where the pattern A noun [amazíga] 'tears' and the pattern B noun [orubíra] 'inner waist belt' have the same tonal shape.

(30) a. pattern A: /ama-zíga/ 6 → amazîga ~ amazíga 'tears'
b. pattern B: /oru-birá/ 11 → orubírâ ~ orubíra 'inner waist belt'

We should note that these changes have phonetic grounds. First, we know that contour tones are difficult, if not impossible, to show up on short vowels. Second, the ultimate syllable of a word has a tendency to avoid some phonetic traits. H tone is one example. H tone anticipation is, first of all, a mechanism to avoid H on the ultimate syllable of words. This is the reason why it regularly applies to pattern B nouns, shifting H tone from the ultimate syllable to the penultimate syllable of words. It is a wide-spread rule in the languages of this area, and we find no language in this area which has phonetic H on the ultimate syllable of words in isolation. As H tone anticipation, from a general point of view, is a mechanism to shift H to the left, it also applies to H of pattern A nouns. But there its application is optional and not regular nor extensive.

The changes indicated in (30) have not occurred extensively in Nyoro; it occurs only occasionally and casually. We need to acknowledge that even though non-native speakers of Nyoro may think that pattern A nouns and pattern B nouns have the same tonal shape, native speakers do not pronounce them in the same way, and are conscious of the difference. They pronounce H of pattern A nouns with more strength than the anticipated H of pattern B nouns. This is because in pattern A nouns, H is followed by L on the following syllable, thereby causing H to fall sharply. For pattern B nouns, by contrast, they pronounce the anticipated H with less strength, or even though they may pronounce it with strength, they know at the same time that there is another (original) H which follows it. We can perceive this difference if we attentively listen to people pronounce those sounds.

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Fig. 1 and Fig. 2 are pitch tracings of the tonal pair of (1b): the pattern A noun [ekitêbe] 7 'class (of school)' vs. the pattern B noun [ekitébê] 7 'big chair'.[17] In examining them, we first notice that these two words as a whole have a similar pitch contour. It is surprising to notice that not only the falling tone of the pattern A noun [ekitêbe] but also the high tone of the pattern B noun [ekitébê] have a falling pitch on the penultimate syllable. But we see at the same time that the pitch falls sharply from a higher point in [ekitêbe] than in [ekitébê]. We do not see a noticeable difference of pitch on the ultimate syllable of both words. As for the high tone of the penultimate heavy syllable of the pattern B noun [ekyéːndâ] 7 'ninety', it is worth noting that it actually has a slightly rising pitch, in contrast with a falling pitch of the pattern A noun [ekyêːnda] 7 'intestine'. These are shown in Fig. 3 and Fig. 4.

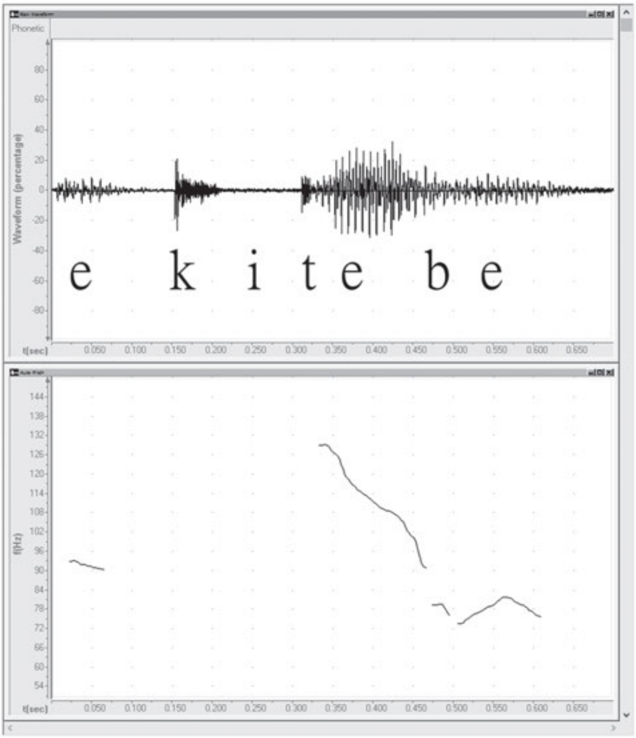

Fig. 1: Pitch tracing of **ekitêbe** 'class (of school)'.

17 The tracings are made from what I think are typical pronunciations.

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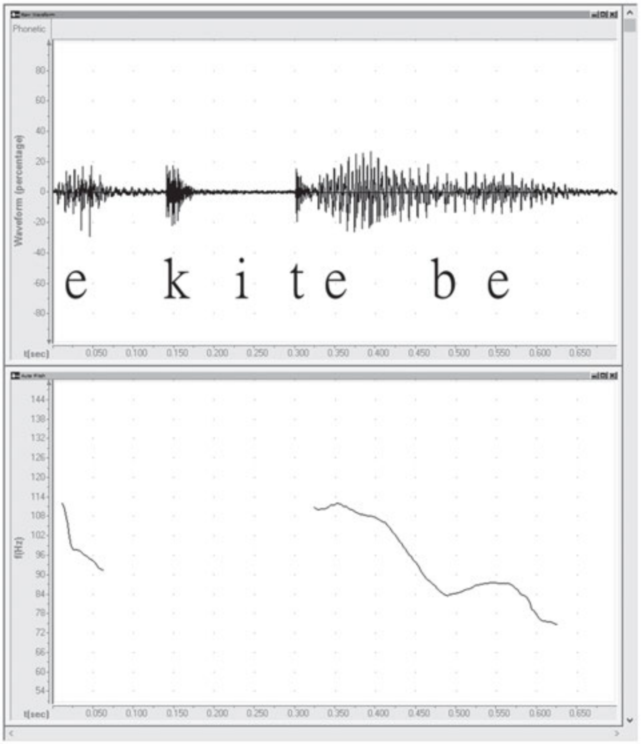

Fig. 2: Pitch tracing of **ekitébê** ‘big chair’.

In Haya of Tanzania (one of the group members of “Kitara”),[18] which can have only one H-toned syllable in a word in isolation, the original H of the penultimate light syllable in isolation is realized as F exactly in the same way as in Nyoro, and this F is also difficult to hear; it is often confused, at least by non-native speakers, with the anticipated H from the ultimate syllable, which is realized as H on the penultimate syllable with no trace on the ultimate syllable, as shown in (31). So, the difference between these two patterns is very slight. But the difference comes up to the surface clearly when the noun is followed by a qualifying adjective in a phrase. This is illustrated in (32), where we see that the underlying H appears in the original location in non-prepausal position.

(31) a. /eki-síge/ 7 → ekisîge ‘eyebrow’ (Kaji 2000: 14)
b. /eki-zilá/ 7 → ekizíla ‘prohibition’

18 See footnote 1 for Kitara.

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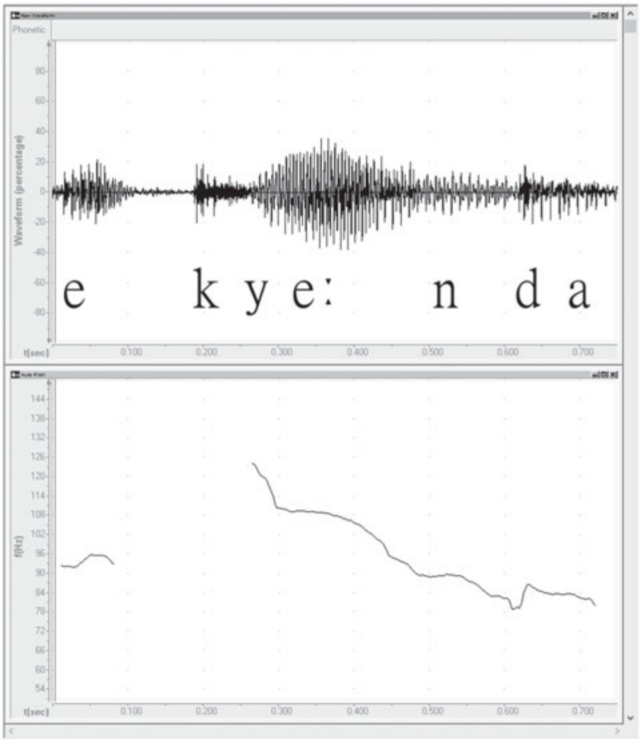

Fig. 3: Pitch tracing of **ekyê:nda** 'intestine'.

(32) a. /eki-síge ki-ange/ 7 → ekisíge kya·nge 'my eyebrow'
b. /eki-zilá ki-ange / 7 → ekizilá kya·nge 'my prohibition'

In Nkore (which is also considered to be a member of "Kitara", spoken south of Tooro in Uganda and just north of Haya of Tanzania), the original H of the penultimate light syllable is realized not as F but H in isolation, thus having totally merged with the anticipated H on the penultimate syllable from the ultimate syllable, since no trace at all is left on the ultimate syllable in isolation. This is illustrated in (33). But as with Haya and other sister languages, the difference of these two patterns becomes apparent when the noun is followed by a qualifying adjective in a phrase, as shown in (34).[19]

(33) a. /eki-síge/ 7 → ecisíɟe 'eyelid' (Kaji 2004: xix-xx)
b. /eki-tugú/ 7 → ecitúgu 'liver'

19 For more detail, see Kaji (2010).

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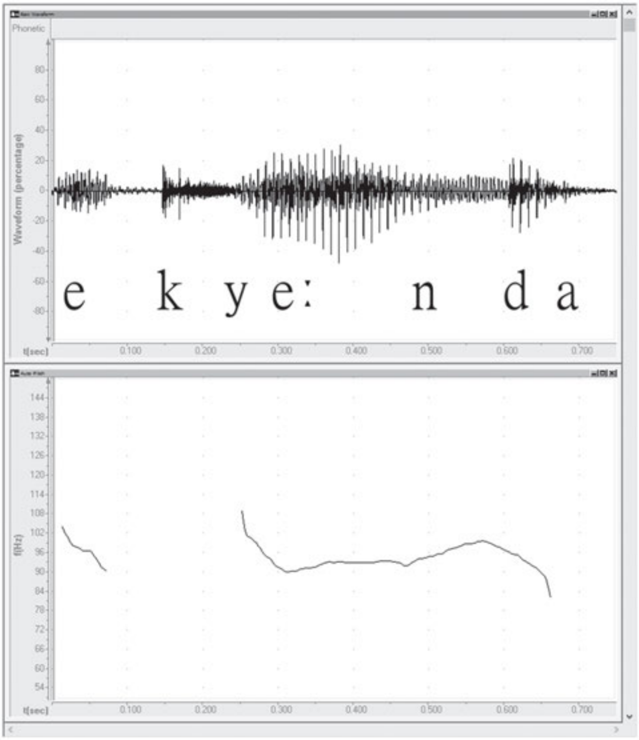

Fig. 4: Pitch tracing of **ekyé:ndâ** ‘ninety’.

(34) a. /eki-síge ki-ange/ 7 → ecisíɟe ca·nɟe ‘my eyelid’
b. /eki-tugú ki-ange / 7 → ecitugú ca·nɟe ‘my liver’

In sum, all these things seem to point to one direction of tone change, i. e. merger or simplification of tone contrasts. This trend becomes gradually salient as we proceed from south to north (Haya>Nkore>Nyoro>Tooro).[20]

20 This is a general trend and may relate to the fact the Nyoro-Tooro area is the northern-most area of the Bantu zone, adjacent to Nilotic languages of the Nilo-Saharan phylum such as Acholi and Alur. I have no clear explanation about the fact that the simplest Tooro is spoken south of Nyoro. According to Beattie (1960), the Tooro kingdom was formed by one Nyoro prince of the Nyoro kingdom, who fled from his father in the 1830’s. This is a historical fact and has no direct relevance to linguistic matters.

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5 Conclusions

In this article we have examined phonetic characteristics of the two-tone patterns of Nyoro nouns in search of a path toward the one-tone pattern system of Tooro. The seeds are conceived of in Nyoro itself and also to some extent in Haya and Nkore.

The orthodox phonetic realizations of Nyoro tone are recapitulated in (35) for pattern A nouns and in (36) for pattern B nouns. Typical examples are given in (35a,b) and (36a,b), for respective patterns.

(35) for pattern A nouns: the penultimate H is realized as F in isolation.
  a. when the penultimate syllable is light: /oru-límí/ 11 → orulîmi 'tongue'
  b. when the penultimate syllable is heavy: /omu-rúndi/ 3 → omurûːndi 'shin'

(36) for pattern B nouns: the ultimate H is anticipated by one syllable to the left, and the original H leaves a trace as F on the ultimate syllable in isolation.
  a. when the penultimate syllable is light: /oru-birá/ 11 → orubírâ 'inner waist belt'
  b. when the penultimate syllable is heavy: /eki-endʒú/ 7 → ekyéːndʒû 'ripe banana'

In reality, phonetic realizations of Nyoro tone are not so straightforward except for nouns with a heavy penultimate syllable, where tone is given enough space to manifest itself. For nouns of other syllable structures, complications emerge. Particularly noteworthy is the phonetic subtleness of falling tone on light penultimate syllables of pattern A nouns and also of falling tone on the ultimate syllable of pattern B nouns. These two tendencies, when combined, can be seen as a step toward tone simplification merging two patterns into one in spite of the fact that the phonetic turbulences are dismissed at the present stage of development in Nyoro by putting the word in non-prepausal position, thus removing pause, the cause of turbulence.

(37) sums up what happens in Nyoro and indicates a path from this language to Tooro. In Nyoro two types of isolation forms are given: the orthodox type and the casual type, named realization 1 and realization 2, respectively. The transition from the underlying forms to realization 2 type forms through realization 1 type forms can be characterized partially as a case of incidental neutralization under the effect of pause, to use Hyman's (2018) term, as opposed to

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intentional neutralization. We say "partially" because the neutralizations are not perfectly realized in Nyoro. They are recoverable because the distinction is kept in non-prepausal position. It is our understanding that complete diachronic changes in this direction may lead to creation of a one-tone pattern system, as exemplified in present-day Tooro.

(37) a. words with a penultimate light syllable (-CVCV)

	underlying	non-prepausal position	realization 1		realization 2		Tooro
pattern A	-HL	-HL	-FL	>	-HL	>	-HL
pattern B	-LH	-HH	-HF	>	-HL	>	-HL

b. words with a penultimate heavy syllable (-CV:CV, -CSV:CV, -CV:NCV)

	underlying	non-prepausal position	realization 1		realization 2		Tooro
pattern A	-HL	-HL	-FL	>	-FL	>	-HL
pattern B	-LH	-HH	-HF	>	-HL, -RL	>	-HL

In this article, we tried to explain the path from the two-tone pattern system of Nyoro to the one-tone pattern system of Tooro. We demonstrated at the same time that Nyoro is not Tooro and keeps the two tone patterns of nouns which this latter has lost.[21]

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21 One may wonder if H tone anticipation occurs in depth in pattern A nouns in Nyoro, the contrast of the underlying penultimate H vs. ultimate H might be transferred to the underlying antepenultimate H vs. penultimate H and the two patterns will be kept distinct. But such is not the case in Nyoro (as far as the Hoima dialect is concerned).

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Carlos Gussenhoven

In Defense of a Dialect-contact Scenario of the Central Franconian Tonogenesis

Abstract: The tonogenesis in Central Franconian German has been attributed to 13th century immigrant dialect speakers in Cologne with lengthened vowels in nouns, like [daːx] 'day' (cf. the conservative Cologne form [dax]). Because Cologne plurals had lost the final unstressed vowel, as in [daːx] 'days' (cf. [daːɣə] in the immigrant dialects), a compromise stretched pronunciation of the vowels in singulars by Cologne speakers arose, which was subsequently interpreted as tonally distinct from original long vowels, giving [dáːx] (Accent 2) as the singular of [dâːx] (Accent 1). These events followed the lengthening of vowels in open syllables (OSL): the scenario correctly predicts that vowels lengthened by OSL have the same tone (Accent 1) as originally long vowels. However, earlier dialectological research revealed an isogloss separating OSL long vowels with Accent 2 along the western periphery and Accent 1 in Cologne, which suggests that the tone propagated west faster than OSL, creating an isogloss where the tone caught up with OSL. This goes against Boersma's (2013) suggestion that the western periphery is a relic area that missed out on a number of tone mergers in Cologne. It is additionally proposed that the immigrants came in as craftsmen in 1248, when construction work on the Cologne cathedral began.

Keywords: tonogenesis, Limburgish, Limburgian, Central Franconian, tone neutralization, sound change, dialect contact

1 Introduction

One of the most intriguing phenomena in the phonology of continental West Germanic occurs, or in some cases occurred until recently, in a group of Central

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Franconian dialects, which include Limburgish as spoken in Belgium and the Netherlands as well as Luxembourgish. This is the lexical tone opposition known as Accent 1 vs. Accent 2.[1] There have been suggestions that its origin lies in a tonal reinterpretation of allophonic pitch variation as conditioned by consonants or vowels. Against these purely phonetically motivated segmental accounts, Gussenhoven (2000), henceforth G2000, proposed a morphological origin due to dialect contact. This contribution defends that account against a number of objections that have been raised against it. In section 2, we restate it and add a paragraph on the probable sociolinguistic context of the dialect contact. Section 3 lists five objections that have been raised against it and attempts to show that their validity is low or non-existent. Next, section 4 addresses a potentially lethal objection raised by Paul Boersma (2013). In a critical evaluation, his alternative account is argued to have four implausible implications for the sound changes that need to be assumed. Section 5 then argues that the Boersma data can be explained by assuming different expansion rates of two phonological innovations emanating from Cologne. Finally, section 6 concludes that G2000 remains a plausible reconstruction of the tonogenesis and that the solution to Boersma's data additionally explains the well-known distribution of the tone contrast given by Wiesinger (1975), including the existence of his *Regel A2* isogloss.

2 G2000

Section 2.1 presents the sound changes assumed by G2000 in 13th-century Cologne before and after the tonogenesis. Following an observation about the lack of social perspective in G2000 by Schmidt (2002), it addresses the hypothesized sociolinguistic setting of the dialect contact. Section 2.3 outlines the two ways, one phonetic and one morphological, in which the the tone distributed itself over the lexicons of the dialects to which it spread.

2.1 A linguistic predicament created by dialect contact

The crucial circumstance triggering the tonogenesis was the simultaneous presence of two systematic forms in the linguistic environment in 13th-century Cologne. One

1 See for instance Jongen (1972), Schmidt (1986), Hermans (1994), Gilles (1999), de Vaan (1999), Gussenhoven and van der Vliet (1999), de Vaan (2006), Peters (2008), Werth (2011), Köhnlein (2011). I am ignoring alternative terminology as well as alternative conceptions of what this phonological contrast consists of.

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was provided in the local dialect by a set of apocopated monosyllabic plural forms of words like 'way','path' and 'day', masculine *a*-stems, which had arisen after their vowels had been lengthened through Open Syllable Lengthening (OSL; Lahiri and Dresher 1999) at a time when they were followed by an unstressed word-final vowel. The long-voweled monosyllabic form is the plural (Tab. 1(a)). The other was the existence of long-voweled monosyllabic forms for the *singulars* of those same nouns in a different dialect. These forms had arisen as a result of a regularization of the nominal number paradigm after the lengthening of vowels in plural forms due to OSL, as illustrated by the current standard German forms /veek/ SG - /veegə/ PL 'road—roads', originally /weɣ(ə)/. This development is referred to an Analogical Lengthening (AL) (Tab. 1(b)). A confrontation between these two dialects would focus on the conspicuous use of phonetic forms like /wɛɛx/, i. e. [wɛːx], for the singular by one local group and for the plural by the immigrants. Adjustments in speaker behaviour that would avoid the conflict could either lead to the reinstatement of the short-voweled singular form /wɛx/ in the immigrant dialect or to the adoption of novel lengthened singular forms in the local dialect. Neither development is without its problems. If short-voweled singulars were to be reinstated, the immigrant speakers may well have felt that they were adopting old-fashioned, non-prestige forms, still in use perhaps by older speakers of their dialect. The problem for the second scenario, whereby the local population adopts a lengthened singular form, is that this monosyllabic form was in use as the plural of those same nouns.

Tab. 1: The development of a monosyllabic long-voweled form for the plural in Cologne (a) and the singular in the immigrant group (b). OSL: Open Syllable Lengthening; AL: Analogical Lengthening.

	Pre-OSL	OSL	**Apocope**
a. Cologne	/wɛx/ SG - /wɛɣə/ PL	/wɛx/ - /wɛɛɣə/	/wɛx/ - /wɛɛx/
	Pre-OSL	OSL	**AL**
b. Immigrants	/wɛx/ SG - /wɛɣə/ PL	/wɛx/ - /wɛɛɣə/	/wɛɛx/ - /wɛɛɣə/

It was the local population that gave way. The escape amounted to a *phonetic lengthening* of short-voweled singulars, which in that pronunciation would no longer deviate from the long-voweled singulars of the immigrant group. The phonetic stretching of the short vowels must have created long high-pitched vowels, which retained the truncated pitch fall.[2] These stretched, high-pitched

2 For such truncation of falls on short vowels in German, see Grabe (1998).

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syllables were distinct from long-voweled plurals. Phonologically, they still had short vowels during the earliest stages of the new phonetic behaviour, which were subsequently interpreted in terms of a tone on a bimoraic vowel. On the surface, a sequence of two H-tones came to contrast with a single H-tone. In final pitch accented syllables of the intonational phrase, the most salient position, these were followed by the boundary L% of declarative intonation. The earlier short-long contrast was thus reinterpreted as a privative tone contrast on long vowels, H on the singulars and no tone on the plurals, once the intonational tones are abstracted away, as shown in Fig. 1.[3] Later changes led to final rises for Accent 2 and rising-falling contours for Accent 1 in the interrogative intonation (G2000: 241, 245).

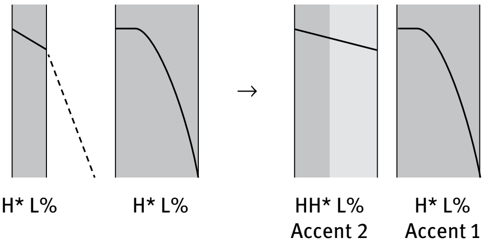

Fig. 1: The pre-tonogenesis contrast between short-voweled singular and long-voweled plural monosyllabic forms in final position in the intonational phrase (to the left of arrow) and the post-tonogenesis contrast between long syllables with and without a privative lexical H-tone (to the right of the arrow). The phonological change occurred as a result of a phonetic lengthening of singular noun stems, indicated by the light grey portion of the box on the left.

2.2 A sociolinguistic setting

The account in section 2.1 implies that, at the time of the tonogenesis, there was sustained contact between the local Cologne population and a group of speakers whose dialects had undergone Analogical Lengthening. This group must moreover at least in part have consisted of prestigeous individuals, such that local short-voweled singular forms for words like ‘way’ and ‘day’ were competing with long-voweled forms in the pronunciation of their social superiors. At the same time, there would

3 The analysis of the tone strings assigns the first H to the lexical tone, which leaves the intonational melody intact. *Contra* this, G2000 provisionally assumed that the second of the two H-tones was the lexical tone, i. e. H*H. This choice was based on the analysis of the current situation in the Roermond and Venlo dialects. However, Gussenhoven and Peters (2004) and Peters (2008) show that in Hasselt and Cologne the lexical tone *precedes* the intonational tone. Gussenhoven (2013) argues that the initial state was as in Fig. 1 , and that the reversal of the tone sequence occurred in dialects that developed a final rise for Accent 2, like Roermond Dutch.

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have to be some pressure on monosyllabic plural forms like /wεεx/ in favour of disyllabic /wεεɣə/. This predicts variation in the Cologne dialect between /wεεx/ and /wεεɣə/ for the plurals and between stretched and unstretched forms for the singulars. This phonetic variation for the singular forms might have been particularly likely if exposure to the prestige immigrant dialect were to be restricted to part of the population, such that these speakers were caught between short-voweled singulars in conversations with members of the local community and more stretched vowels in their contacts with their immigrant superiors. Since the stretched singulars remained distinct from the long-voweled monosyllabic plurals, a tonal interpretation was virtually inevitable. The only conceivable rival development was a reinterpretation of the stretched vowels in the singular as trimoraic, which would have implied a reversal of the quantity relation between the vowels in singular and plural forms from shorter-longer to longer-shorter, an implausible development.

A social situation of exactly this kind is likely to have arisen as a result of the construction of the Cologne cathedral, which was started in 1248. It was to be the largest structure in Europe north of the Alps, and the initial work will easily have involved more than a thousand men, among whom there were strict hierarchical relations. Many of them are likely to have been master craftsmen recruited from outside the city supervising local apprentice crafstmen (Davis 2006: ch. 2).[4] Since this date is a fairly uncontroversial estimate of the time of the tonogenesis, it is reasonable to see the building of the Cologne cathedral as its sociolinguistic context.

2.3 Two ways in which the tone contrast spread

From its limited distribution in a number of morphological forms, the lexical tone contrast became a more general feature of the Central Franconian dialects. There are two paths that this propagation took. The first is segmentally motivated: the H-tone got to be placed in syllables that naturally had high pitch in the location of the most salient contrast, the end of the sonorant portion of the syllable with primary stress. The second is as a marker of the number contrast.

2.3.1 Propagation to phonetically natural locations

In the segmental structure, high vowels and voiceless obstuents are the prime causes of increased vocal fold vibration. The explanation of raised f0 in high

4 The medieval archives of the cathedral were taken to Paris by the French in 1794, where they have since been lost.

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vowels ('intrinsic f0') is not uncontroversial, but is plausibly attributed to tensing of the vocal folds due to the raised and forward hyoid and tongue. Accordingly, Accent 2 would be expected to find its way to stressed syllables with high monophthongs and closing diphthongs (Hombert 1978; Ohala 1978; Laver 1994: 45; Kingston 2007). The explanation of raised f0 immediately before and after voiceless obstruents relative to voiced obstruents and sonorants is the tensing of the vocal folds required for their opening, which ensures a voiceless escape of the airstream (Löfqvist et al. 1989). For present-day German, the perceptual effect of raised f0 before voiceless obstruents was demonstrated by Kohler (1990). We might therefore expect Accent 2 to show up in stressed syllables with high vowels before voiceless obstruents. Both expectations are in part met by the distributional patterns that have been reported, starting with Nörrenberg (1884) for the dialect of Dormagen.[5] The distribution given by Wiesinger (1975) for the central area is that Accent 1 is found (i) in stressed syllables with non-high long vowels ([aː æː eː øː oː]) and centring diphthongs ([iə yə uə]); (ii) in stressed syllables with high long vowels ([iː yː uː]), closing diphthongs ([ei øy ou] (all IPA translations of Wiesinger's symbols) and any vowels arising from Open Syllable Lengthening (OSL), *if a voiced obstruent followed*. This distribution was referred to as *Regel A* by Wiesinger (1970: 65). In a peripheral area, Accent 1 fails to appear in words in which schwa was preserved, termed *Regel A2* by Schmidt (1986). I will return to this distributional issue at various points in the remainder of this article.

The clearest effect of the segmental factors is found in the assignment of Accent 2 to syllables which combine both conditions, long high vowels and closing diphthongs followed by voiceless obstruent in the coda, as in Limburgish /liist^2/ 'list', /lyy^{2}stər/ 'splendour', /knɔup^2/ 'button', quite in line with the expected segmental effects on f0. The same high-ending vowels attracted Accent 2 before sonorants, but less consistently. This joint action by the two segmental factors is reminiscent of the rather complex series of changes in the Mon-Khmer language U (Svantesson 1989). Tones originally arose on vowels as a result of a merger of following nasals, which denasalized, and voiceless stops. Depending on vowel length, this led to high or rising tone before original voiceless stops and low or falling tone before original nasals. In a later development, high tones in open syllables were lowered if the vowel was non-high. These segmental effects may in part still be active in the Franconian dialects, as suggested by data in Hermans (2012), who observes that trochaic loans in the dialect of Maasbracht (Netherlands) have Accent 2 if the word ends in /i/, as in /'ɔː^{2}li/ 'oil', /'dæn^{2}di/ 'dandy', /ko'loː^{2}ni/

5 Engelmann (1910) mentions Hardt (1843) as the first author to write about the tone contrast.

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'colony', but Accent 1 if they end in /a/, as in /ˈdraː¹ma/ 'drama', /ˈsoː¹fa/ 'sofa', /aˈɣæn¹da/ 'agenda'. Strikingly, if the penult is closed and the final syllable begins with a voiceless obstruent, Accent 2 occurs even if the word ends in /a/, as in /ˈal²fa/ 'alpha' /ˈsɪr²ka/ 'circa', /ˈɪŋ²ka/ 'Inca'. Hermans (2012) uses these and similar facts to argue that the tonal distinction is underlyingly represented as a difference in foot structure, but more plausibly these facts indicate the correctness of the view that 'once the tone contrast had arisen, it acquired a natural distribution as determined by the microprosody' (G2000: 226).[6]

2.3.2 Propagation as a number marker

The second way in which the tone contrast spread was as a number marker. Monosyllabic syllables with Accent 2 came to be used to mark singular forms that contrasted with monosyllabic plurals, regardless of the phonological history of the words involved. Today, this can be seen in the sets of tonal minimal pairs for the number distinction in the dialects. For instance, the dialect of Maastricht has hundreds of minimal word pairs, including inflected forms, of which nineteen are SG- PL pairs. These show that the analogical process was to a considerable extent driven by an identity of the segmental rime structure, as pointed out by Roger Weijenberg, who identified these forms (starred items have alternative plural forms with suffix [-ə]): [ærm] 'arm', [bɛin] 'leg', [bærx] 'mountain', [bærm] 'verge', [dærm] 'intestines', [dwærx] 'dwarf', [ærf] 'yard', [kærf] 'basket', [peːrt] 'horse', *[slœrf] 'elephant's trunk', [stœrm] 'storm', *[ʃærm] 'screen' [stɛin] 'stone', [vœrm] 'form', *[wœrf] 'shipyard', [weːx] 'road', [wœrm] 'worm', [zwærm] 'flight of e.g. birds', *[zweert] 'sword'. Only the word for 'road' here is an original masculine *a*-stem.

Central Franconian is not the only German dialect group to develop a novel phonological feature to combat a potential neutralization of the number distinction. In Dingeldein's (1983) list of 'secondary differentiations' that took over the number marking after the loss of final schwa, the Franconian tone is listed first (as '*Schärfung*'). Other types are generalized umlauted plurals (*tag* - *täg* 'day'), reverse umlauted singulars (*fuš vs. fiš* 'fish'), frication (*berg* vs *berx* 'mountain' and postnasal stop deletion (*hoŋ* vs. *hoŋk* 'dog'). We know of no reports on dialects that neutralized the distinction across the board, even though individual words may end up without plural marker, as noted by Dingeldein (1983) for parts of Central Hessian. Neither is the Cologne tone contrast the only example

6 There is no implication that laryngeal specification of consonant *cannot* be the source of a tonogenesis (see e.g. Kingston 2011). Vowel height as the source of tonogenesis is either rare or non-existent.

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of morphologically induced tonogenesis in Europe. Another case concerns a number marker which developed in a dialect of Occitan, where word-final [s] was debuccalized to [h]. The low pitch associated with breathy voice led to the development of a L-tone suffix for the plural forms with simultaneous loss of [h], which L-tone contrasts with H-toned singulars (Sauzet 2012).

3 Five objections

The first of five objections to G2000 amounts to a claim that the scenario inappropriately presupposes speaker awareness. The second concerns claims that specific forms are counterexamples to the account. The third and fourth objections are that G2000 failed to observe the correct chronology of events, while the fifth concerns a lacuna in the account.

3.1 The role of speaker awareness

In a review of Lahiri (2000), Angus (2002) characterized the G2000 account as implausible on the grounds that it presupposes conscious pronunciation tactics.

> This explanation [*sc.* of the tonogenesis] is far-fetched at best. Even if the supposition of prestige association with the speech feature in question is so, conscious imitation of a feature perceived as prestige produces at best stylistic variation [ ]'.

G2000 was couched in terms of speaker control (Kingston and Diehl 1994) and thus assumed non-automatic phonetic implementation, whereby speakers bring social factors and considerations of contrast maintenance to bear on their performance, much in the way a dolphin is in control of its actions when jumping through a hoop (cf. Gussenhoven 2004: 60). Awareness was never intended as an ingredient. A marginal role of awareness in language variation arises from prescriptive impositions of language forms, as happens in schools, which famously fail to have much of an effect on language development.

Rather, 'Neo-grammarian' phonological change was seen as driven by phonetic adjustments that are subsequently interpreted representationally by a new generation of speakers. The linguist's task is to determine the motivation for the phonetic adjustments and to justify the phonological interpretation of the new language forms. In addition, some account of the social motivation behind the novel speaker behaviour is called for. Neither the phonetic adjustment nor their

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phonological interpretation either excludes or presupposes speaker awareness. The description in G2000 was perhaps unfortunately graphic in places, and characterized the crucial process as ‘fake analogical lengthening’, which may well have caused the misinterpretation of a conscious procedure.

3.2 Two putative counterexamples

Two types of counterexamples have been presented. They are deal with in separate subsections.

3.2.1 Plural /vaːt^2/

Roos (2009: 88) observes that

> ‘[G2000] not only predicts singulars with Accent 2 and plurals with Accent 1 for orginal short *a*-stems like [daːx^2] - [daːx^1] with an underlying voiced final consonant (/daːɣ/), but also [vaːt^2] ‘cask’ - [vaːt^1] ‘casks’ with an underlying voiceless segment (/vaːt/). This is not borne out by the facts. From the GTRP database [the morphological dialect atlas of the Meertens Instituut (van den Berg 2003) (CG)], it appears that all Limburgian dialects in which *vat* ‘cask’ has a suffixless plural (i. e Grote Brogel L356p, Bree L360p and Opglabbeek L416p) have [daːx^2] - [daːx^1] but [vaːt^2] [vaːt^2] (G2000).

Two further cases of plural /vaːt^2/ for the Netherlands can be added (Epen Q207p and Brunssum Q035p). For the record, a claim that monosyllabic plural forms always have Accent 1 was never in fact made. The inspiration for G2000 was the observation in Grootaers and Grauls (1930) that all Hasselt Limburgish cognates of the approximately 30 Dutch nouns with short vowels in the singular and long vowels in the plural (e.g. /wɛx/ - /weeɣə/ (Lahiri and Dresher 1999)), have Accent 2 in long-voweled singulars.[7] G2000 showed that the correspondence is exceptionless for two further dialects, Roermond in the Netherlands and Tongeren in Belgium. However, the plural forms vary widely.

> The plural forms have by and large lost their uninflected forms, and only ‘day’ and ‘way’ are now unadulterated minimal pairs [in Roermond and Tongeren]. For the rest, a wide variety of largely a-historical forms have arisen [...] In almost all [of these cases], Accent 2 has been generalized to the plural in one of the two dialects; in seven [of these 31] instances, the dialects diverge here, with one of them retaining the older Accent 1 (G2000).

7 All of the 57 entries for the singular have Accent 2. For one location, Eijsden, one of the two transcribers gives both Accent 1 and Accent 2.

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Roos's observation that the tones in the plural forms /daa.x^1/ and /vaa.t^2/ are rather determined by the voicing of the following obstruent and not by the hypothetical process depicted in Fig. 1 points to a generalization which does require an explanation. Why do monosyllabic plural forms with Accent 1 with monosyllabic singular forms with Accent 2 (i. e. the Grootaers-Grauls set) have an etymologically voiced final consonant? The explanation may lie in the fact that in the dialect spoken by the German immigrants of 1248, OSL never applied to vowels in words that had a post-vocalic voiceless plosive in the Cologne cognates, thus bleeding out any singular forms with AL, the relevant context for the tonogenesis. In the immigrant dialects, OSL had been pre-empted by the High German Consonant Shift (HGCS), which had turned post-vocalic voiceless plosives into affricates or fricatives, crucially closing the stressed syllable, as in the case of /wa.tər/ → /was.sər/, cf. Limburgish/Dutch /waa.tər/; German *Affen, machen* 'monkeys, make', Limburgish/Dutch *apen, maken* /aa.pə(n), maa.kə(n)/). Roos' generalization may thus be seen as a tell-tale address label of the immigrant dialects involved in the tonogenesis: Middle High German (henceforth MHG). This explanation would appear to predict that the regularity is more consistent in Cologne than in the peripheral areas. On the tonal discrepancy between the Cologne forms and the Limburgish cognates, see section 5.

3.2.2 Central Franconian as a model for Limburgish

Goossens (2009) observes that the number of forms that underwent AL in German and Central Franconian is smaller than the number of Limburgish long-voweled singular forms that are presumably attributable to AL. As explained in section 2.3.2, the tone spread in part as a nominal number marker, as evidenced by the nouns with this pattern to which AL could never have applied, a view echoed in Roos (2009: 87). Goossens observes that also adjectives may show the pattern, such as /laam^2/ 'lame' (earlier */lam/), with unapocopated inflected /laa^{1}mə/. While the tonogenesis account centered on the nominal number distinction, G2000 in fact noted that the same development caused singular dative forms, which had a final schwa that was presumably apocopated just as in plurals, to have Accent 1. The tone of the non-dative singular forms (Accent 2) has now been extended to the dative forms in Cologne, but Wiesinger (1970) indicates the presence of Accent 1 in datives in related dialects. These additional alternations, where they exist, cannot be seen as counterexamples to the G2000 account, but rather show that the process depicted in Fig. 1 was not restricted to short-voweled nominative singular forms.

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3.3 The order of the sound changes

Schmidt (2002) observes that the order of the sound changes assumed in G2000 is not supported by what is known about the historical phonology of German.

> The scenario itself is however not readily compatible with informed chronological conjectures of historical phonology. It takes Open Syllable Lengthening in Low Franconian as its starting point and places it early, in any event before Apocope. The reverse order of events assumed by G2000 for Analogical Lengthening after Apocope ("coming in from the German heartland" (G2000: 232)) has so far not been attested.[8]

Tab. 2: Order of events in 13th c. Cologne for two groups of speakers with the moment of dialect contact indicated by the upward arrow. OSL = Open Syllable Lengthening, AL = Analogical Lengthening, lengthened SG = phonetically lengthened singular forms, /H/ = interpretation as lexical H-tone.

Local population:	OSL	Apocope	[lengthened SG]	/H/
			↑	
Immigrant population:	OSL		AL	(Apocope)

Schmidt's (2002) observation that Apocope applied after AL in MHG is in full agreement with our scenario in Fig. 1. My claim was that in Cologne Apocope applied *without* a follow-up application of AL, and that what looks like the result of AL in fact resulted from dialect contact with speakers of MHG, which occurrence is indicated by the up-arrow in Tab. 2. As noted in section 3.2, Standard Dutch lacks AL entirely, retaining some 30 now exceptional SG-PL pairs in which the singular has a short vowel and the affixed plural a long one. For Ripuarian and Moselle Franconian dialects, Goossens (2009: 104) reports apocopated as well as non-apocopated plural forms with Accent 1 whose monosyllabic long-voweled singulars have Accent 2.

3.4 The tone contrast on short vowels before obstruents

Goossens (2009) claims that the tonogenesis cannot have preceded AL, because dialects in Belgium have it on word-final stressed rhymes with a short vowel and

8 Das Szenario selbst ist allerdings nicht ganz einfach mit den Zeitansätzen der historischen Grammatik in Einklang zu bringen. Hiernach dürfte die Dehnung in offener Tonsilbe im Niederfränkischen ihren Ausgangspunkt haben und gerade im fraglichen Raum früh, jedenfalls deutlich vor der Apokope erfolgt sein. Die von Gussenhoven vorausgesezte gegenläufige Ausbreitung der Analogiedehnung nach der Apokope "coming in from the Geman heartland" (2000: 232) ist bisher nicht belegt.

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a voiceless obstruent, as in the Hasselt Limburgish pair /bɔs[1]/ 'forest' vs. /bɔs[2]/ 'wallet' (cf. Grootaers and Grauls 1930; Peters 2008). Similar contrasts occur in Moresnet (Jongen 1972), Tongeren (Stevens 1986) and Borgloon (Peters 2007). For this to be a problem for G2000, Goossens assumes, following Grootaers & Grauls (1930: 94), that these forms had tone *before* innovative long vowels arose through AL, at the same time renouncing an earlier assumption that involved a generalization of the tone contrast from long vowels to short vowels before obstruents (Goossens and Cajot 2009). The Grootaers-Grauls assumption implies that the medieval Cologne dialect had the tone contrast on all segmental syllable types, which propagated in that form so as to reach Hasselt and Moresnet in the west and Arzbach in the east. An argument against this scenario is that the present-day dialects have moraic associations in the area where the tone contrast is confined to long syllables, while the dialects in Belgium have syllabic associations, as argued by Peters (2007, 2008), quite independently of the tonogenesis issue. If those dialects are relic areas, the core area must have developed moraic associations after the tone contrast had established itself on all syllable types, which robs the shift from syllabic to moraic association of its motivation. The alternative scenario is that moraic association, a uniquely Central Franconian feature within West Germanic, arose *as a result of the tone contrast on long sonorant rhymes*. The most common realizations for Accent 1 and Accent 2 are falling vs high pitch (in declaratives) and rising vs low pitch (in interrogatives), whereby the tone on the first mora could be the same and that on the second different (HL vs HH in declaratives and LH vs LL in interrogatives), representations that strongly suggest moraic association. A motivation for the West Limburgish expansion of the tone contrast to short vowels before obstruents can be found in the extreme rightward displacement of the pitch configurations for Accent 1 and 2 in the dialects in that area, which moved it phonetically to post-stressed syllables.[9]

3.5 The tone contrast on short vowels before sonorants

In his *Additional Material*, Köhnlein (2015) points out that G2000 has no explanation for the distribution of Accent 1 and Accent 2 in stressed syllables containing a short vowel followed by a sonorant consonant. There are in fact two

9 A shift from moraic to syllabic association occurred in the periphery without an expansion of the distribution of the contrast to short rimes in the eastern peripheral dialect of Arzbach (Köhnlein 2011) as a result of extreme truncation in sentence-final position (Gussenhoven 2013).

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generalizations. They were not included in Wiesinger (1970, 1975), but have been widely discussed (Nörrenberg 1884; Engelmann 1910; Hermans 1994; de Vaan 1999; Schmidt 2002; Werth 2011: 69; Köhnlein 2011). They can be stated as follows (V = short vowel; R = sonorant consonant; T = voiceless obstruent; D = voiced obstruent).

1 VRT vs VRD: Short vowels followed by a sonorant consonant have Accent 2 before a voiceless obstruent and Accent 1 before a voiced obstruent in the same or a following syllable.
2 VR# vs VRV: Short vowels have Accent 2 when followed by a tautosyllabic sonorant consonant and Accent 1 when followed by a heterosyllabic sonorant consonant.

The first generalization puts VR on a par with long high vowels, closing diphthongs, and long vowels arising from OSL (see Wiesinger's generalization (ii) in section 2.3.1): Accent 1 when followed by a voiced obstruent, Accent 2 when followed by a voiceless one. So why is vowel height is no longer a condition for Accent 2 to appear when a short vowel combines with a sonorant consonant? If the promotion of high f0 is due to pre-obstruent tongue raising for high vowels and diphthongs (see section 2.3.1), it is conceivable that the tongue body raising for coronal sonorants has a similar effect, just enough to cause VR to join high vowels and closing diphthongs. An argument for this tentative explanation may be found in feature analyses that collapse coronal articulation with high vowel articulation, like Government Phonology (Kaye et al. 1985, 1990; Lahiri and Evers 1991). For this explanation to go through, the tongue-articulated sonorants /n ŋ r l/ must have been the driving force behind the effect, which should have generalized to short vowels followed by labial /m/.

G2000 also ignored the second generalization, the more direct object of the criticism in Köhnlein (2015), who gives /fal^2/ *Fall* 'fall' and /falə/ *Falle* 'trap' as an example, currently /fal^2/ vs. /fal^1/, respectively, in the Cologne dialect (Bhatt and Herrwegen 2005). Under our assumptions, the second word would not be eligible for the tone contrast in the core area (see section 3.4). Once Apocope applies to it, the assignment to Accent 1 follows, which could be motivated both on the basis of the open vowel, the absence of voiceless consonant, or the retention of the falling pattern of the disyllable. The existence of Accent 2 in the VR# cases must have predated the development of Accent 1 in the VRV-cases. To explain it, another appeal could be made to the presumed effect of tongue raising tentatively proposed for the VRT-cases above.

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4 Boersma's objection

Boersma (2013) observes that in the dialect of Geleen (Netherlands), long vowels that arose from OSL have Accent 2, regardless of the voicing of the post-vocalic vowel, while original non-high long vowels have Accent 1. Therefore, any theory that assumes that the lexical tone contrast arose after OSL had taken place, like G2000, will need to explain how the two historical sets of [–high] long vowels systematically came to have different lexical tones. If, by contrast, it is assumed that the tone arose *before* OSL, or arose, as assumed by Boersma (2013), while OSL was taking place, the distribution of Accent 1 in original long vowels and Accent 2 in the new long vowels is easy to understand. To quote Boersma (2013):

> The fundamental insight of the present paper can be told in a couple of sentences. Around the year 1100, Franconian had no tone contrast, but it did have a short-long vowel contrast in open syllables: /**.ma.kən.**/ 'make' versus /**.slɑɑ.pən.**/ 'sleep' (where '.' stands for a syllable boundary). In sentence-internal focus position, these words were all accented on their first mora, i. e. realized as [mákə̀n, sláɑ̀pə̀n] in declarative sentences or [màkə́n, slɑ̀ɑ́pə́n] in interrogative sentences. Subsequently, the common process of *open syllable lengthening* lengthened the vowel, ***and lengthened the tone with it***, yielding the present-day contrast, which is [máákə̀n] versus [slɑ́ɑ̀pə́n] in declarative sentences and [mààkə́n] versus [slɑ̀ɑ́pə̀n] in interrogative sentences.

Short vowels that were lengthened before voiceless obstruents, as in the above examples, are distinct from originally long vowels in the entire tonal area. In Geleen (see Fig. 2), the distinction also applies to vowels before voiced consonants. Thus, /waa².ɣə/ 'waggon', earlier /wa.ɣə/ is distinct from /waa¹.ɣə/ 'dare' in Geleen, while these words are homophones in Cologne, /vaa¹.ʁə/ Bhatt and Herrwegen 2005). Boersma's account, which has been included in a discussion of the Central Franconian tonogenesis in Kingston (2011), has four implications that call for critical consideration. First, there is the assumption of a tonogenesis based on the lengthening of a short vowel in IP-penultimate position. Second, there is the implication of a tone merger in a salient position in the Franconian heartland. Third, there is the implication that the merger was towards Accent 1. Fourth, there is the implication of a tone merger in monosyllables in the entire tonal area.

4.1 IP-medial vowel lengthening as a tonogenesis mechanism?

The creation of a high-pitched vowel from a lengthened short vowel in penultimate position, unlike that in final position as assumed in Fig. 1, is not an obviously natural process. In the present-day toneless varieties of German and Dutch, the

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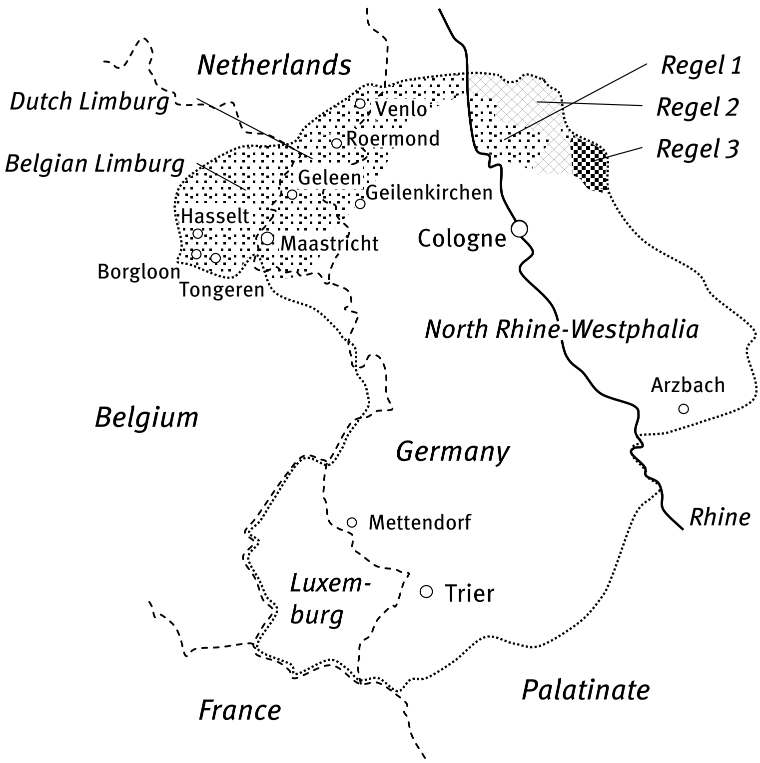

Fig. 2: Map with the tonal area (dotted line) and Wiesinger's *Regel 1, 2* and *3* areas. The unshaded central area is known as *Regel A*. The *Regel 1* area is part of a wider peripheral zone termed *Regel A2*. Geilenkirchen lies on the isogloss between *Regel A* and *Regel A2*.

falling section of a word-medial (rising-)falling declarative pitch accent is located partly after the accented syllable, even when the vowel is long. Lengthening the high target would not lead to a clearly different pitch contour from that which is present by default on long vowels.[10] The timing of the accented fall may admittedly have been earlier at the time of the tonogenesis. Peters et al. (2015) show that the fall is significantly later in the west and north of the Netherlands than in the south-west and north-western Germany. Since the west is a high-prestige area, it is reasonable to infer that there has been a rightward shift of the f0 peak of declarative pitch accents. Still, the earliest alignment in their data, that for Low Saxon, is around 50 % of the

10 The well-known description of Dutch by 't Hart *et al* (1990) may suggest that the standard location of the falling section of a 'pointed hat' is early in the syllable, but this is not in fact the most common variant.

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sonorant rime, with the end of the fall coming after the accented syllable. To get the distinguishing phonetic effect of the early, intrasyllabic fall in original long vowels, Boersma (2013) assumes that the tones of the pre-OSL fall associated to moras, as opposed to syllables, an unprecedented assumption for non-tonal West Germanic. That is, Accent 2 might well be the better choice for OSL vowels if the contrast with Accent 1 already existed in the language. OSL is less likely to have caused the tone contrast.

4.2 A merger in a salient position?

As was seen in section 2.3.1, in the heartland there is no tonal distinction between long vowels from OSL and original long vowels before voiced consonants, both having Accent 1, while in Geleen these are distinct, with Accent 1 only occurring in original long vowels. Boersma (2013) therefore needs to explain how somehow a merger of Accent 1 and Accent 2 occurred in the case of [–high] vowels before voiced consonants in the more central area. In Tab. 3, the panel on the left gives the Geleen distribution, while the righthand panel is the Central Franconian distribution (*Regel A*). An initially plausible scenario here is that the merger took place in the prestige area and that the western edge is a relic area, for which reason Boersma refers to the Geleen dialect as conservative, a view he shares with de Vaan (1999).[11] The problem with this specific merger is that the pitch contours at issue distinguish words in focus position in declarative sentences. In this position, the contrast is very salient and unlikely to be lost, as established for the dialects of Venlo by Fournier and Gussenhoven (2012) and Roermond by Fournier et al. (2006). In these dialects, the contrast is in fact neutralized in *non-focus positions* in non-final syllables in the intonational phrase. The dialect of Cologne, where the merger must have taken place under this scenario, will have a similar salience profile for the different sentence-prosodic contexts, but here the contrast is maintained even in non-final, non-focus positions, in both interrogative and declarative sentences. It would seem improbable therefore that, at some earlier stage, the Cologne dialect merged the tone contrast in a salient position before voiced obstruents, while leaving it intact in less salient positions.

4.3 A merger to Accent 1?

A second reason why this specific merger is improbable is that attested neutralizations around the periphery are consistently towards Accent 2 ('non-distinctive

11 De Vaan's (1999) account of the tonogenesis differs both from Boersma (2013) and G2000.

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accent’). For the western edge, Peters (2010) reports intonation contours in a non-tonal dialect which resemble the Accent 2 contours of neighbouring Hasselt and Borgloon. The toneless *Kleverländisch* dialect to the north-west of the area has been widely associated with a default Accent-2 type of accentuation since Ramisch (1908). Schmidt and Künzel (2006) describe that contour as a slow fall with the duration of Accent 2, as opposed to the sharply falling short contour of Accent 1. To lay observers, this pronunciation sounds like the Accent 2 of the tonal dialects. de Vaan (1999) cites descriptions of 20th-century Luxembourgisch showing that Accent 1 only ever occurred on word-final stressed syllables, effectively monosyllabic words, meaning that phrase-internal contrasts merged to Accent 2. Brunssum, an area in the Netherlands just east of Geleen, would appear to be a toneless enclave where Accent 2 has been generalized across the lexicon. For the southern isogloss, Schmidt (1986) reports non-distinctive accent along the entire stretch in Germany (see Fig. 3). Therefore, neutralizations in salient positions show up as Accent 2.

Tab. 3: Segmentally determined distribution of Accent 1 and Accent 2 in the western periphery including Geleen and the (putatively innovative) distribution in Central Franconian (*Regel A*), with circled ‘1’ indicating the innovative merger with original long vowels according to Boersma. VV = long vowel, V: = short vowel lengthened by Open Syllable Lengthening, t = voiceless obstruent, d = voiced obstruent or sonorant consonant, +high = high vowel or closing diphthong, –high = non-high vowel or centring diphthong. NB. There are no high vowels from OSL in Geleen.

Geleen	**+high**	**–high**
VVdə	1, 2	1
VVtə	2	1
V:də	Ø	2
V:tə	Ø	2

Regel A	**+high**	**–high**
VVdə	1	1
VVtə	2	1
V:də	1	1
V:tə	2	2

There are two cases which may appear to run counter to this generalization. First, Westphalia, on the eastern periphery, has been singled out as exceptional in this respect. To quote Wiesinger (1975):

> While Low Franconian only has the phonologically non-distinctive ‘drawling’ accent (*Trägheitsakzent*) as a special intonational feature of long vowels and diphthongs, Westphalian has no such accentual feature.[12]

12 Während das Niederrheinische nur den phonologisch nicht relevanten Trägheitsakzent als besondere Intonationseigenheit der Langvokale und Diphthonge aufweist, verfügt das Westphälische über keine derartige Akzentuierung.

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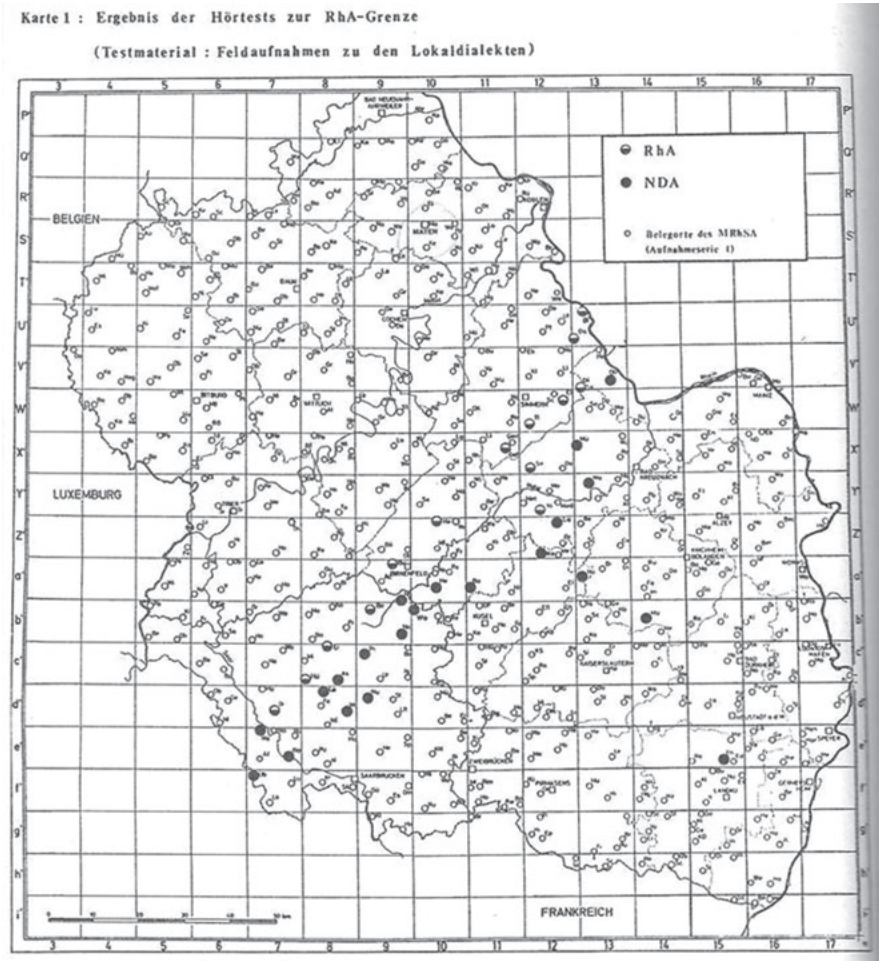

Fig. 3: Locations with the tone contrast (black-white dots) and non-distinctive Accent 2 (black dots) along the southern tonal isogloss. From Schmidt (1986).

The exception made by Wiesinger for peripheral Westphalia may be due to a phonological change which caused Accent 2 to resemble the typical contour for Accent 1 phonetically. There have been reports from the eastern periphery that the distribution of Accent 1 and Accent 2 was reversed, most famously Bach (1921) for the Franconian dialect of Arzbach. Köhnlein (2011) has shown that the 'reversal' applies to the declarative intonation contour, thus leaving the interrogative contour unchanged, and argues convincingly that it was due to a straightforward phonological change. When Accent 2 came to resemble the pitch contour of

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Accent 1 of the central area, the declarative contour of Arzbach Accent 1 seemed to be more similar to that of Accent 2 of the central area. Areas with this feature were said to have *Regel B* by Wiesinger (1970). Gussenhoven (2013) argues that the change resulted from extreme truncation, more drastic than already occurred in a larger group of dialects in the central area. Bayer (2008) reports this type of change for a western location, Mettendorf.

Another potential counterexample is referred to by Boersma (2013) when he observes that '[w]e know that there are neighbouring non-tonal dialects [i. e., near Geleen, CG] that invariably have an acute in all long vowels'. The observation most probably concerns the dialect of Weert, which has in part reinterpreted the tonal contrast as a quantity contrast and which indeed has falling intonational pitch accents in bimoraic short-voweled syllables which resemble Accent 1 (Heijmans 2003). However, long-voweled reflexes, which go back to words with Accent 2, resemble Accent 2 more than Accent 1. In fact, the local community considers the two durations to be equivalent to the tone contrast of dialects in the neighbouring tonal area. Ignoring this case, therefore, it can be maintained that neutralizations are in the direction of Accent 2.

4.4 A shift from Accent 2 to Accent 1 in monosyllables?

On Boersma's (2013) account, OSL lengthened all short vowels in open syllables, regardless of the voicing of the post-vocalic consonant, creating contrastive Accent 2. In present-day versions of these words, we find Accent 2 before a voiceless consonant in the central area as well as in Geleen (cf section 2.3.1), while before a voiced consonant we have Accent 2 in Geleen, but Accent 1 in the central area. In the previous subsection, we have seen how this motivated Boersma (2013) to postulate a change of Accent 2 to Accent 1 in the central area in these non-apocopated words before voiced consonants. Now, in present-day *apocopated* words which had a voiced consonant after the lengthened vowel, Accent 1 occurs *throughout the area*. For instance, etymons of Geleen /wɛɛk^{2}/ 'week' (from earlier */wɛ.kə/) have Accent 2 everywhere, while /nɔɔm^{1}/ 'name' (from earlier */na.mə/), /maax^{1}/ 'stomach' (*/ma.ɣə/) and /bɔɔɣ^{1}/ 'bow (Noun)' (*/bɔ.ɣə/) have Accent 1 everywhere, just like original long vowels (e.g. /piin^{1}/ 'pain', */piin/; /ɣrɔɔf^{1}/, */ɣrɑɑ.və/). A final issue therefore concerns Boersma's (2013) assumption that a replacement of Accent 2 with Accent 1 in penultimate syllables with long vowels from OSL before voiced consonants in the central area was accompanied by the same change in final syllables in the central area *as well as in the periphery*. Boersma (2013) writes:

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> The change from circumflex (*sc.* Accent 2) to acute (*sc.* Accent 1) in voiced environments […] was conditioned by a drop of schwa in the next syllable. In the larger part of the present tone area, however, this change was not conditioned by schwa drop: it occurred as well in words that stayed disyllabic, such as **lέɛvən**'to live' and **káamər** 'room'. In this area, then, all disyllabic forms with voiced intervocalic consonants have an acute, and **bəlɔ́ɔvən** 'to promise', from ***bəlɔvən**, rhymes with **ʃtrɔ́ɔvən** 'to punish', from ***strɑɑvən**.

The putative change must under this scenario have begun in the central area and been extended to the periphery in apocopated cases only, leaving the distinction in the periphery just in case a schwa followed. Tab. 4 gives these presumed innovations. Understandably, Boersma places the phonological change in words like [maax[1]] 'stomach' as beginning before the devoicing of final [ɣ] to [x], since the voiced obstruent is the distinguishing context for the change of Accent 2 to Accent 1, but after the disappearance of schwa, so as to keep the geographical distribution of apocopated forms (Accent 1 everywhere) distinct from the non-apocopated ones (Accent 2 in the periphery, Accent 1 in the central area). The form in which the general change from Accent 2 to Accent 1 must have occurred is therefore something like [maːɣə̥], a form between [maːx] and [maːɣə].

Tab. 4: Phonological mergers of Accent 1 with Accent 2 in the north-western periphery including Geleen and the central area according to Boersma 2013. See Tab. 3 for legends.

Geleen	**+high**	**–high**
VVdə	1, 2	1
VVtə	2	1
V:də	Ø	2
V:tə	Ø	2
VVdə̸	1	1
VVtə̸	2	1
V:də̸	Ø	①
V:tə̸	Ø	2

Regel A	**+high**	**–high**
VVdə	1	1
VVtə	2	1
V:də	1	①
V:tə	2	2
VVdə̸	1	1
VVtə̸	2	1
V:də̸	1	①
V:tə̸	2	2

There is no doubt that German dialects interpreted such forms phonologically in a number of dialects, like Prussian, Yiddish and North Low Saxon (Wiesinger 1983: 829; Prehn 2012). In fact, Gress-Wright (2010) argues on the basis of 14th-century and 15th-century manuscripts that Apocope caused Final Devoicing to be suspended more generally, being reinstated later, leaving only some dialects without it. That is, the postulation of forms like [maːɣ̥] (from [maːɣə̥], earlier [maːɣə], [maɣə]), whose final consonant contrasted with voiceless obstruents (/maaɣ/ vs. a hypothetical /maax/), is in itself quite plausible. However, the assumption that all of these words started out with Accent 2 and changed over to Accent 1

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throughout the tonal area is less plausible. The motivation for words with final schwa to make the same change from Accent 2 to Accent 1 is rather different from the motivation that caused forms that had undergone Apocope to make that change. Inevitably, the question arises if all these words might not have had Accent 1 to begin with, and that in the western periphery Accent 2 was assigned to long vowels arising form OSL. This view of events is explored in the next section.

5 An alternative account of the Boersma data

Let's begin our alternative account with the observation that as one approaches a tonal isogloss from within an area with lexical tone, there will be an expectation of contrast erosion. The neutralizations in non-salient positions in the sentence (see section 4.2) justify this expectation: it is given up in phonologically weak positions near the isogloss. Equally, we might expect a similar gradual disappearance of the contrast from other positions, smoothing out the difference with the toneless areas. Wiesinger (1975: 23) gives detailed information on this point for the north-eastern corner of the tonal area.

> Like all peripheral zones of the Rhenish tonal area, also the Bergisches Land is characterized by a progressive diminuition in the distribution of Accent 1 in three steps towards the north and east and thus to a gradual transition to the (non-contrastive) dialects of Low Franconian and Westphalian.[13]

Again, the neutralizations are towards Accent 2, never to Accent 1. In Tab. 5, the four tables are arranged by geographical distance from the isogloss. The bottom right table represents the non-distinctive accent on the non-tonal side of the isogloss, while the top right table represents the *Regel A*, the heartland. Top right and bottom left are intermediate dialects. Innovations are circled. The Geleen dialect represents a stage between *Regel 1* and *Regel 2*, because it has both Accent 1 and Accent 2 on originally long [+high] vowels in unapocopated words, as shown in the lefthand table of Tab. 3.

Evidently, these facts do not show a periphery lagging behind in the implementation of tone mergers, as assumed by the 'relic area' hypothesis. We will see how the contribution of the Boersma data to the gradual increase in the distribution of Accent 2 towards the tonal isogloss is not in fact explained by any mergers

13 Wie in allen Randgebieten der rheinischen Akzentuierung so beobachtet man auch im Bergischen ein kontinuierliches Nachlassen des Stoßtones in 3 Stufen nach Norden und Osten und damit den allmählichen akzentuellen Übergang zum Niederrheinischen und Westphälischen.

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or splits. To see this, we will consider the question posed by Boersma under two subquestions:

1. How did Geleen, like so many areas along the north-western section of the isogloss, come to have a distinction between original long vowels (Accent 1) and long vowels arising from OSL (Accent 2) before voiced consonants (see /kee¹.zə/ 'choose' vs. /lɛɛ².zə/ 'read')?
2. How did the central area as well as the north-western periphery come to have a distinction between original long vowels (Accent 1) and long vowels arising from OSL in positions before a voiceless obstruent (cf /slaa¹.pə/ 'sleep' vs. /maa².kə/ 'make')?

Tab. 5: Gradual mergers towards Accent 2 in the north-east corner of the tonal area (the Bergisches Land) according to Wiesinger (1975). *Regel 1* is closest to the Franconian heartland (for which see Tab. 3, righthand table (*Regel A*)) and *Regel 3* is closest to the isogloss. VVC = long vowel with coda C; see also Tab. 3.

Regel 1	**+high**	**–high**
VVC	2	1
VVdə	1	1
VVtə	2	1
V:də	2	2
V:tə	2	2
V:də̸	1	1
V:tə̸	2	2

Regel 2	**+high**	**–high**
VVC	2	1
VVdə	2	1
VVtə	2	1
V:də	2	2
V:tə	2	2
V:də̸	1	1
V:tə̸	2	2

Regel 3	**+high**	**–high**
VVC	2	2
VVdə	2	2
VVtə	2	2
V:də	2	2
V:tə	2	2
V:də̸	1	1
V:tə̸	2	2

Atonal	**+high**	**–high**
VVC	2	2
VVdə	2	2
VVtə	2	2
V:də	2	2
V:tə	2	2
V:də̸	2	2
V:tə̸	2	2

As for the first question, observe that this distribution would arise if the tone contrast were already present in Geleen by the time that OSL took place. Boersma's (2013) account of a sharp fall in original long vowels with Accent 1 would immediately make sense, because by and large those vowels would at that time already

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have *had* Accent 1. The new long vowels in *penultimate stressed syllables* arising from OSL would naturally be assigned to the existing category of Accent 2, since the lengthening could lead to a retention of the high pitch late in the syllable (see section 4.1) in a situation in which there already were syllable rimes containing contrastive high level pitch, i. e., Accent 2.

Then how could OSL have preceded the tonogenesis in Cologne, as assumed by G2000, but followed the arrival of the tone contrast in Geleen? It must be because the tone contrast spread faster from Cologne to the surrounding areas than OSL.[14] Fig. 4 shows this assumption graphically. The different propagation rates predict that from the location where the tone contrast caught up with OSL, given as Geilenkirchen, all long vowels from OSL in non-apocopated words have Accent 2. Before that point, long vowels by OSL have Accent 1 when followed by a voiced obstruent or sonorant consonant, just like original long vowels, ultimately causing 'waggon' and 'dare' to be homophones in Cologne (/vaa¹.ʁə/), but a tonal minimal pair in Geleen (/waa².ɣə/ versus /waa¹.ɣə/, respectively).

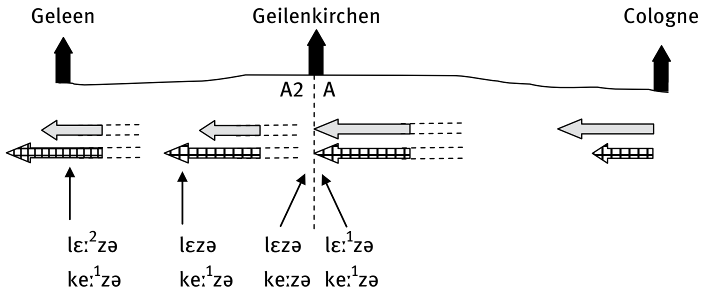

Fig. 4: Furthest extents of the geographical propagation of Open Syllable Lengthening (light-grey arrows) and the tone contrast (chequered arrows) at four moments in time. First shortly after the tonogenesis in Cologne, next at the moment of Open Syllable Lengthening and the tone contrast have travelled equal distances from Cologne, the 'catch-up point', next at a later point at which tone has been assigned to long vowels, and latest their arrival in Geleen, with hypothetical transcriptions of present-day Geleen [lɛː²zə] 'read' and [keː¹zə] 'choose'. The 'catch-up point' (labelled 'Geilenkirchen', a town on the line Cologne-Geleen near that isogloss) is the boundary between the areas for *Regel A* and *Regel A2*.

14 A reasonable estimate of the time of arrival of OSL and Apocope in the province of Limburg is 1320. In general, OSL, AL and Apocope will have been active over longer time spans. Morphemic schwa will have been more resistant to Apocope than non-suffixal schwas. Limburgish dialects were affected by OSL and Apocope sooner than more western dialects. There were two prestige centres from which Apocope spread, Cologne and Holland in the west (van Reenen and Mulder 2003). The whole of the province of Limburg and parts of eastern Brabant had apocopated forms for *zoon* 'son' (from *[zo:nə], earlier *[sunə]) as a result of the innovation from the east (Cologne)

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The second question concerns the occurrence of Accent 2 in long vowels followed by voiceless obstruents, which are distinct from original long vowels, which have Accent 1 *on both sides of the A2 isogloss*. This could be because OSL generally lagged behind in the case of vowels before voiceless obstruents, compared to vowels before voiced consonants. Before voiceless consonants, vowels tend to be shorter, even when the consonant is heterosyllabic (cf. Maddieson 1985). That is, OSL may have applied in pre-voiced contexts before the tonogenesis and in pre-voiceless contexts after, creating the situation before voiceless consonants in the *Regel A* area which obtained before all consonants in the *Regel A2* area. At this point, the answer to a third question may be clear, which concerns the Geleen-like behaviour of Cologne in monosyllabic forms.

3. Why is do original long vowels and vowels lengthened by OSL have Accent 1 on both sides of the A2 isogloss in the case of apocopated words with a voiced consonant after the vowel?

Disyllabic words like /maɣə/ ‘stomach’ must have been the earliest targets of OSL, which can be explained by the voiced nature of post-stress consonant, the status of the final schwa as part of the stem, and to the absence of a consonant after schwa, all three of the OSL-promoting conditions. Quite probably, OSL and Apocope applied as a package deal, as described for English by Minkova (1982), creating forms like /maːɣ̥/, as described by Boersma (2013). These early targets of OSL differed from non-apocopated words, which often had a consonant after schwa, as in Geleen /kaa^2.mər/ ‘chamber’ or an infinitive ending, as in /lɛɛ^2.zən/ ‘read’, in which final /n/ was arguably still maintained. Minkove-OSL next occurred in words like /daɣ+ə/ ‘days’, mininally different from

by 1330, based on municipal archives. Apocope in the spoken language must have existed before that, say 1320. Against this, however, Jürgen Erich Schmidt points out in a personal communication (16 November 2015) that Birkenes (2014), which I have not consulted, puts Apocope at a much later date, 1550 (p. 136) on the basis of written sources. As for OSL, there are similar indications that Limburg was earlier than the area to the west. Boersma (2013) notes that OSL must have been present in Limburg (Venlo) by 1320, with reference to van der Meer (1949). OSL in Brabantine Dutch (probably Antwerp) must have been complete by 1375 on the basis of work by Sytsema and Lahiri (2013) on a manuscript of *Coninc Saladijn* produced around that date. Unlike a manuscript of the *Life of St Lutgart*, which is probably from the same area and dates from 1275-1300, it rhymes original long vowels and vowels in the context for OSL, and does not systematically distinguish the two classes of vowels in the spelling (Fikkert 2000). OSL in Brabantine Dutch therefore occurred somewhere between 1300 and 1375, while in Limburg it must have occurred by 1320. This suggests that OSL and Apocope were around in the same period in the province of Limburg.

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/maɣə/ in the status of the final schwa, and just a little less likely to undergo OSL. Words with a voiceless consonant after the stressed vowel lagged behind the tonogenesis, just as they occurred later than the introduction of the tone contrast in the *Regel A2* area, and so have Accent 2 in both areas (/saa.kə/ 'case', /aa.pən/ 'monkeys'). It is the intermediate group, Geleen /kaa^{2}.mər/ 'chamber' and /lɛɛ^{2}.zən/ 'read', which preceded the tonogenesis in Cologne and lagged the introduction of the tonal contrast in the area west of Geilenkirchen, giving the different tones as documented in Fig. 4.[15] Tab. 6 attempts to summarize this hypothesis by showing comparative chronologies for the *Regel A* and *Regel A2* areas.

Tab. 6: Chronology of sound changes in *Regel* A and A2 areas. The dot indicates a syllable boundary in /ma.ɣə/ 'stomach', /da.ɣə/ 'stomach', /lɛ.zə/ 'read', /kee.zən/ 'choose', /sa.kə/ 'property, case', /ʃɔɔp/ 'sheep', /a.pən/ 'monkeys', /slɑɑ.pən/'sleep'.

	Regel A	***Regel A2***
Minkova-OSL voiced	/ma.ɣə/ → /maaɣ/ /da.ɣə/ → /daaɣ/	
OSL voiced	/lɛ.zɛn/ → /lɛɛ.zɛn/ (cf. /kee.zɛn/)	
Tonogenesis (A) Tone (A2)	Acc1 versus Acc2 /lɛɛ^{1}.zən, kee^{1}.zən/ /maaɣ^{1}, daaɣ^{1}/	Acc1 versus Acc2 /kee^{1}.zən/ /maaɣ^{1}, daaɣ^{1}/
OSL voiced		/lɛ.zən/ → /lɛɛ^{2}.zən/ (cf. /kee^{1}.zən/)
Minkova-OSL voiceless	/sa.kə/ → /saak^{2}/ (cf. /ʃɔɔp^{1}/)	
OSL voiceless	/a.pən/ → /aa^{2}.pən/ (cf. /slaa^{1}.pən/)	

15 There may be more effects of such interacting sound changes. The timing of OSL before voiceless consonants relative to HGCS must have been after HGCS affected /t/, but before it affected /p/, while in the case of /k/ a simultaneous application must be assumed, as shown by /aa^{2}.pə/ 'monkeys', /was.sər/ 'water' and /maa^{2}.xə/ 'make', all with original short /a/ before heterosyllabic /p t k/ (Bhatt and Herrwegen 2005). There will therefore most probably be an intermediate area between Cologne and Geilenkirchen where OSL additionally affected short vowels before /t/, and /waa^{2}.tər/ is found alongside /waa^{1}.ʁə/ 'waggon'.

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6 Conclusions

This article evaluated a number of objections that have been raised against the scenario of the Central Franconian tonogenesis proposed in Gussenhoven (2000) (G2000). All except one of these could be neutralized by arguing that they do not present crucially negative evidence against it. One objection was dealt with more extensively, because at first sight it represents a definitive argument against G2000. It was raised by Boersma (2013), who pointed out that in Limburgish, a dialect spoken along the north-western periphery of the tonal area, long vowels that arose from Open Syllable Lengthening (OSL) have Accent 2 before all types of consonant (e.g. /waa^2.ɣən/'waggon', /aa^2.pən/ 'monkeys'), while original long vowels in the same context have Accent 1 (e.g. /wɑɑ^1.ɣən/ 'dare', /slɑɑ^1.pən/ 'sleep', with transcriptions following Boersma's (2013) reconstructed forms; the modern Geleen forms lost final /n/ and merged /ɑɑ/ and /aa/. Crucially, Boersma (2013) argued, the fact that the two classes of long vowels have different tones implies that OSL cannot have preceded the tonogenesis, one of the assumptions in G2000. Boersma presents an alternative tonogenesis account on the basis of the assumption that the lengthening of vowels in open syllables caused them to have high pitch throughout, thus *creating* an Accent 2 that contrasted with Accent 1, a high fall in the syllable containing a long vowel. Since the new contour corresponds phonetically with that for Accent 2 in the phonological position concerned (IP-medial, focused position), Boersma takes OSL to be the source of the tone contrast.

A consideration of Boersma's proposal led to the identification of four implications which were characterized as questionable in a critical discussion. In defence of the original account, this article proposed that OSL and the tone contrast both emanated from Cologne, and that OSL started its expansion earlier, before the tonogenesis had occurred there. However, when the tone contrast arose, it propagated from Cologne at a faster speed than OSL, at some point overtaking it. The geographical frontier at which this happened is reflected in the isogloss known as the boundary between *Regel A*, the core area which includes Cologne, and *Regel A2*, the area to its west and north. This isogloss and the tonal distributions on either side of it have been widely discussed, but never been explained as resulting from a single factor, in our case the staggered application of OSL as a function of segmental conditions. Our response to Boersma's challenge, therefore, not only answers his objection, but offers an explanation of the distributions of the tone contrast in the two areas as a welcome by-product.

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Index

accent
– change 279–326 *see also* contour change; sound change; tonal change
– rule 293–294, 299–303, 310–312 *see also* compound accent
– systems *see* accentless system; multi-pattern accent system; N-pattern accent system
– *see also* compound accent; pitch accent; tone; word tone
accentless system 59
accentual unit 129–133, 146–147
alignment 92, 97, 228–238, 364
Amakusa Japanese *see* Japanese
Analogical Lengthening 352–353, 358, 360
antepenult neutralization *see* neutralization
apocope 352, 360–362, 369–373
assimilation 7–10, 15, 23, 43, 157, 174, 180, 207, 212 *see also* tonal assimilation
Athabaskan 10, 211
Autosegmental Phonology 37
avoidance of similar tones 265–269, 273

Bamileke 214
Bantu 11–12, 75, 205, 210–211, 216–219, 239–242, 330
– Grassfields 205, 209, 211–216
Barasana 14, 22, 208
Basque 13, 23
biases 48–49, 249, 251, 267–270, 285
– phonetic 262–264
– systemic 265–267
bilingualism 44, 279, 289, 325
boundary marker *see* boundary tone
boundary tone 8–10, 37–38, 43, 51 *see also* tone
Bulgarian 45, 52

Central Franconian 350–375
categorical alternation 177–180, 183
chain shift 163–166, 178, 194, 258–259, 267–269
Chimwiini 218, 242
Chinese 13, 156–195, 211, 223–227, 232, 235, 262–264 *see also* Mandarin Chinese; Shanghai Chinese
Chinese dialects *see* Chinese
compounds 14, 23, 32–36, 58–77, 88, 101–105, 114–116, 123–124, 157, 176, 186–191, 228–230, 241, 283–284, 287–295, 301–312, 318–319
compound
– accent 32–35, 58, 64–67, 77, 283–284, 290–294, 301–305, 311–312, 318–319 *see also* Hirayama's Law
– rule 32, 101, 104, 283, 290–295, 301–303, 326
– tone rule *see* compound accent
connectivity 131, 134, 139–140, 151
constraint 77, 86, 143, 183–184, 210, 260, 266, 284, 315, 322–325
– Nonfinality 284
contextual condition 162–163, 178, 182–184, 194
contextual constraint *see* contextual condition
contours 203–204, 207–211, 236, 250–252, 256–258, 365–366
contour
– accentuation 265–269, 273
– change 249–273
– maximization 265, 268–270, 273
– reduction 263–264, 268–273
contrast *see* tonal contrast
Coreguaje 8

deaccenting 22–23, 33, 74, 77, 284, 290, 317
declarative intonation *see* intonation
dialect contact 44, 67, 350–375
dissimilation 8, 43, 157, 174–175, 207, 212
dominant tone 223, 225–243 *see also* left-dominant rule; right-dominant rule
downstep 15, 207, 209, 213–216
Dutch 353, 358–360, 363–364, 373
dynamic view 130–152

effect of syllable onset *see* syllable onset effect
English 22, 45–46, 321–323

floating tones 20, 205, 209–210, 224
foot 33, 91–102, 106–114, 117–125, 227, 356

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Gokana 214–215
grammatical tone 218, 331
Grassfields Bantu *see* Bantu

Hakha Lai 8–10, 205
Hakka 160
Haya 12–13, 22, 331, 344–346
heavy syllable 39, 62, 143–144, 282, 292, 334, 348
high tone anticipation 333
Hirayama's Law 32–35, 64–67, 71–74, 283, 287, 290, 303, 326 *see also* compound accent

Ikema Ryukyuan *see* Ryukyuan
internal reconstruction 215
interrogative intonation *see* question intonation
intonation 8, 27–55, 109, 125, 219, 336, 353, 365–368
– declarative 8, 149, 353, 367
– question 8, 36–44, 50–55
– vocative 45–55
intonational effect 336
Irabu Ryukyuan *see* Ryukyuan
Izon, Bumo 18, 20

Japanese dialects *see* Japanese
Japanese
– Amakusa 58–59, 68–74
– Kagoshima 27–55, 61, 86, 279–326
– Koshikijima 30–33, 242
– Kurayoshi 316–318
– Nagasaki 33–34, 58–78, 86, 313–316
– Osaka 279, 318–320
– Tokyo 23, 28–29, 32–38, 45–46, 62, 87, 239–241, 312
Jiarong 233–234, 237–238, 244

Kagoshima Japanese *see* Japanese
Kagwe (Dida) 215
Kalabari 11, 14–24, 216–217
Kiga 330–331
Kitara 331, 344–345
Korean 45, 203, 323
Kuki-Chin 204–205, 219
Kuki-Thaadow 9–10, 208
Kurayoshi Japanese *see* Japanese

language contact *see* dialect contact
L2 acquisition 323
Latin 45, 282
left-dominant (rule) 225, 227, 283, 291–294, 301, 312
level tone 130, 156, 167, 177–178, 211, 232, 263–264
lexical tone 8, 12, 89, 94–95, 104, 107–112, 120–122, 125–126, 161, 168, 181, 216, 227, 242, 250–252, 270, 331, 353–354
light syllable 39, 77, 297, 319–320, 333, 348
Limburgian 358
Limburgish 351, 355, 358–361, 375
Lizu 230, 244
loanwords 29, 61, 63–64, 281–282, 296–299, 314–315, 321–323
loanword phonology *see* loanword prosody
loanword prosody 321–323, 325
Lulubo 12

Mandarin Chinese 12, 158, 160–161, 170–177, 182–193, 232, 244, 262, 272 *see also* Chinese
Mao, Northern 21–24
Meeussen's Rule 216
mergers 9, 43, 76, 130–134, 151, 157, 160–163, 175–176, 203, 212, 215, 259, 330–348, 363–366, 369–371
Middle High German (MHG) 359–360
Min 158, 160–166, 171–172, 178–182, 191–194, 232–233, 236–237, 244
minimality constraint *see* word minimality
Mixtec 12, 203
Miyako Ryukyuan *see* Ryukyuan
mora 29–30, 36, 39–40, 60–63, 85, 158, 239, 281–283, 308–309, 313–315, 361, 365
mora-counting 282
multi-pattern accent system 28, 59, 131, 133, 136–138, 151
multilingualism *see* bilingualism

Nagasaki Japanese *see* Japanese
neutralization
– antepenult 182–183
– non-typical 129, 145–151

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– positional 182–183
– tonal *see* tonal neutralization
– typical 129, 135, 151–152
– *see also* tonal neutralization
Nkore 330–331, 345–347
non-typical neutralization *see* neutralization
noun-noun (N-N) compounds 68, 73–74, 77
see also compounds
noun modifier 131, 142, 151
N-pattern accent system 28, 84, 101, 131–133, 151–152 *see also* one-pattern accent system; three-pattern accent system; two-pattern accent system
Nyoro 330–342, 346–348

Occitan 357
OCP (obligatory contour principle) 20, 210
one-pattern accent system 59, 131, 334
see also N-pattern accent system
one-tone pattern system 330, 333, 347–348
see also one-pattern accent system
Open Syllable Lengthening 352, 355, 360, 366, 372, 375
Osaka Japanese *see* Japanese

parameter extension 194
pause 205, 336, 338, 347
peak
– delay 262–264, 268–269, 273
– sliding 254
phonation 160, 203–207, 212, 219
phonetic biases *see* biases
phonological privilege 75
phonological reinterpretation *see* reinterpretation
phrasal
– stress 187–188
– tone 16, 216–219, 334 *see also* boundary tone
pitch accent 18–19, 59, 146, 186, 207, 262, 279–281, 287, 312–313, 316–320, 353, 368 *see also* accent; compound accent
polymoraic
– clitic 94–95
– root 88, 94–95, 101–102, 123
positional neutralization *see* neutralization
postlexical
– neutralization 7–24, 27–55, 157, 170–171, 184–185
– processes 27–28, 36, 45, 51–53, 125
see also intonation
progressive domination 131, 135–136, 151
propagation rate (of sound change) 372
prosodic word 93–97, 125, 130, 225–228, 234
Pumi 229, 244

Qiang 204, 228–229, 234, 237–238, 244
question intonation *see* intonation
question prosody *see* question intonation

recoverability 11
reduction 7–8, 12–17, 22–24, 156–157, 207, 217, 237 *see also* contour reduction; symmetrical contrast reduction; tonal reduction
reinterpretation 237, 351, 354
representational economy 208
rhythmic alternation 83, 106–109, 118–126
right-dominant (rule) 225, 232, 284, 292–293, 301
Ryukyuan
– Ikema 83–126
– Irabu 91–94, 120–122, 237
– Miyako 83–85, 91

Shanghai Chinese 13, 22, 160, 170–171, 185–186, 189–192, 227, 231–232, 244
Shixing 227–228, 237–238, 244
Somali 13, 211
sound change 249–252, 260–267, 351, 360, 374 *see also* contour change; accent change; tonal change
speaker awareness 357–358
statement intonation *see* declarative intonation
structural condition 162
syllabeme dialect 29, 281
syllable 29–30, 40, 62, 204–205, 224, 281–283, 292–293, 309 *see also* heavy syllable; light syllable
syllable onset effect 264, 267–270, 273
syllable tone 207 *see also* tone; word tone

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syllable weight 20 *see also* heavy syllable; light syllable
symmetrical contrast reduction 156, 167–169, 193
systemic biases *see* biases

Taiwanese 45, 232–233
Tawrã 234, 244
Thai 249–273
three-pattern accent system 84–85, 131–134, 139–140 *see also* N-pattern accent system
three-pattern system *see* three-pattern accent system
Tibetan 223–244
Tibeto-Burman languages 8, 223–227, 233–238, 241–244
Tokyo Japanese *see* Japanese
Tommo So (Dogon) 17–18, 20–22
tonal
– assimilation 7, 10, 15, 23, 43, 212 *see also* assimilation
– change 1, 3–4, 28, 35–36, 43–44, 203–375 *see also* accent change
– classes *see* tone classes
– contrast 7–8, 27–28, 30–32, 40–44, 58, 71–76, 83–90, 105–106, 162, 203, 206, 216, 238, 346, 354–368
– melodies 11–12, 20, 61, 75
– merger *see* mergers
– neutralization 1–3, 7–199
  – in question prosody 36–44
  – in vocative prosody 45–50
– reduction 7, 20, 159, 171, 176, 227
– pattern *see* tone pattern
– spreading *see* tone spreading
tone
– assimilation *see* tonal assimilation
– change *see* tonal change
– classes 18–20, 27–34, 42–54, 76, 83–90, 100–101, 109–116, 179–181, 289
– contrast *see* tonal contrast
– merger *see* mergers
– neutralization *see* tonal neutralization
– pattern 12, 18–20, 27–55, 58, 63–77, 187, 217, 330, 333, 335, 342 *see also* lexical tone; compound accent; compound rule
– rules 9, 23, 209, 216 *see also* accent rule; compound accent; tonal neutralization; tone sandhi; tone spreading
– sandhi 135, 156–157, 184, 223–244, 272
– spreading 9–11, 15, 170, 209, 226–231, 239
– systems 7, 19, 24, 84–85, 157, 203–219, 224–229, 251, 330
tonogenesis 10, 203–206, 211, 237, 243, 250, 264, 350–375
Tooro 330–335, 346–348
two-pattern accent system 46, 59, 64, 68, 84–85, 131–136, 281, 312 *see also* N-pattern accent system
two-tone pattern system 333, 347–348 *see also* two-pattern accent system
typical neutralization *see* neutralization
typology 7–24, 84, 109, 156–157, 190–191, 203–219, 223, 249–250

Uganda 22, 207, 330–331
unaccented words 13, 29, 33, 46, 62–64, 74–77, 146, 279, 284–312, 316–318, 321–325
Urarina 19, 21–23

verb-noun (V-N) compounds 58, 69, 71–75 *see also* compounds
verb-verb (V-V) compounds 59, 68–71, 74–77 *see also* compounds
vocative intonation *see* intonation
vocative prosody *see* vocative intonation
vowel coalescence 283

word accent *see* accent; compound accent; pitch accent; word tone
word minimality 86
word tone 61, 157, 186, 207 *see also* pitch accent; tone
Wu 157–160, 170, 185–194, 226–227, 232, 244

Xiang 158, 167–169, 182, 188–191, 193

Yagaria 19, 21–22
Yaka 11
Yoruba 214–215, 235

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