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PHONOLOGICAL PHRASE AND PHONOLOGICAL REDUCTION

Shinsho Miyara

0. Introduction

The purpose of this paper is to substantiate the domain of the phonological phrase in a phonological theory with special attention to phonological reduction in Japanese casual speech. We will first define the phonological phrase and try to show that there are independent motivations for it (sec. 1). We will then see many kinds of examples of reduction in the final position of phonological phrase (sec 2.1). Reducible phrases are morphologically characterized within the domain of the phonological phrase. In other words, phonological phrases with this morphological characterization undergo reduction in final position (sec 2.2). We will make an account based on syllable structure for reduction in phrase-final position, and introduce a few phonological rules operative within the domain of the phonological phrase (sec 2.3). The final section is devoted to summary (sec. 3).

1.0 Phonological Phrase

In her 1978 paper, Selkirk proposed a prosodic theory that significantly departs from Chomsky and Halle (1968). The 'phonological phrase' in C & H (1968) is a maximal string to which phonological rules can apply and it is not related to the intonational structure of an utterance. In Selkirk's prosodic theory, the phonological phrase is one of the prosodic categories with a hierarchical organization. We will first define the phonological phrase in Japanese along the lines proposed by Selkirk and then give evidence from tonology and segmental phonology, and see some correspondences to a phonetic fact of stress, a syntactic phenomenon, and a linguistic performance.

1.1 Definition of Phonological Phrase

Consider an example of reducible phrases in Japanese.¹ (1b) has three reduced phrases.

- (1) a. $\left[\begin{array}{c} \text{S} \\ \text{S} \end{array} \left[\begin{array}{c} \text{NP} \\ \text{NP} \end{array} \text{ kore wa} \right] \left[\begin{array}{c} \text{V} \\ \text{V} \end{array} \text{ nakusi} \right] \left[\begin{array}{c} \text{COMP} \\ \text{COMP} \end{array} \text{ -te} \right] \text{ -wa} \left[\begin{array}{c} \text{Adj} \\ \text{Adj} \end{array} \text{ waru} \right] \text{ -i} \left[\begin{array}{c} \text{Conj} \\ \text{Conj} \end{array} \text{ no de} \right]$
 this lose Top improper since
 b. koryaa nakusityaa waru-i nde

'Since (I) shouldn't lose this, ...'

The output nakusityaa² in (1b) is clearly derived from /nakusi-te-wa/ (Verb-Complementizer-Particle) in (1a). The string -- made up of a verb nakusi, which is part of the embedded clause, the complementizer te, and the particle wa — will by no means constitute a syntactically-motivated structure. Later in this paper, we shall see that each reduced form occurs in a separate phonological phrase. Thus, in principle, we see no isomorphism between the syntactic structure and the domain in which this phonological reduction occurs.

We shall define the phonological phrase (ϕ) in Japanese at the outset. is represented by the following formula:

(2) Phonological Phrase (ϕ)

X (Particle) (Quantifier) (Particle)

where X is any string that does not contain a particle.

Provided that we establish a principle that phrasing goes from left to right, it will be unnecessary to characterize any sentence-final phonological phrase that takes the form Verb+(Negative)+Tense+(Sentence Particle). Observe (3).

- (3) (ϕ John wa ϕ) (ϕ yari-tai toki ni sika ϕ) (ϕ sigoto ni wa ϕ) (ϕ te o ϕ)
 Top do - want when only work Goal hand Obj
 (take-na-i sooda)
 touch-not-Tense I hear
 'John puts his hand to the work only (=no other than) when he wants to, I hear.'

In (3), the Sentence Particle (SP) is soo da. Note that most SP's are categorially particles, e.g., ka, ne, sa, yo, etc. and convey various moods, although the SP in (3) is not categorially a particle. In any event, our principle of the phrasing of ϕ 's need not refer to the categorial composition or the optionality of SP's.

It naturally follows from this principle that conjunctions composed of simple or complex particles belong to the preceding string, while other conjunctions are part of the immediately following string. Accordingly, the coordinate conjunctions ga and sosite behave differently in phrasing.

- (4) a. John wa Mary ni ai ni ik-u ga, nakanaka ae-na-i.
 see go but hardly can-see-not
 'John goes to see Mary, but he hardly can see her.'

- (4) b. John wa Mary ni ai ni it-ta; sosite kyuukon sita
 see went and proposed
 'John went to see Mary and proposed to her.'

In (4a), ga and the preceding ai ni ik-u 'go to see' constitute a ϕ ; ³ but in (4b) sosite never belongs to the preceding part but rather to the following. Between sosite and the preceding sentence, a sentence-final (or utterance-final) intonational fall is recognized, but in (4a) the intonational fall occurs only after ga. Notice that in (1), the conjunction no de with a particle de is joined together with the preceding waru-i 'is improper' to form a ϕ , reducing to waru-i nde.⁴ This suggests that phrasing does not refer to hierarchical syntactic configurations, but to linear categorial compositions. The representation of ϕ in (2) correctly reflects this principle.

One final thing worth mentioning is that a limited number of adverbials in Japanese optionally take affixes like ni and to, and these, with or without the affixes, can be followed by the particle wa to constitute ϕ 's, as in column B of (5). Since there are homophonous particles, one might claim that the affixes are particles. In most cases, however, whether an adverb takes to or ni is lexically determined. This is a vital difference between affixes and particles.⁵

(5)	A	B
a.	sugu(ni)	sugu(ni) wa 'soon'
b.	sikkari(to)	sikkari(to) wa 'tightly'
c.	hakkiri(to)	hakkiri(to) wa 'clearly'
d.	gussuri(to)	gussuri(to) wa 'soundly'

Whether the monosyllabic formatives are affixes or particles is essential in our definition of the phonological phrase, characterized by the phrase-final categorial composition; and only particles are legitimate categories in ϕ -final position. The definition of ϕ in (2) predicts that the adverbs in column A will not form independent ϕ 's but only part of ϕ , while those with the particle wa in column B are legitimate ϕ 's. We won't pursue the adequacy of this prediction any further in this paper.

1.2 Evidence from Tonology

In this section, we will be concerned with three major cases where we can provide reasonable accounts of tonal phenomena only when we consider the domain of ϕ . We first discuss why ϕ is a necessary domain for tone assignment on general grounds. Then we discuss some tone-shifting rules operative in the domain of ϕ and finally we examine an interplay of ϕ 's and the next larger prosodic category.

1.2.1. Surface tone melody or pitch on the particle is predictable from whether the preceding word is underlyingly accented or non-accented. The particle has a L(ow) tone or a low pitch after the accented word and a H(igh) tone or a high pitch after the unaccented word. (For the sake of

clarity, we use pitch as the surface realization of the H or L tone here.) Haraguchi (1976) observed this, but he did not explicitly state the domain of tone assignment and how it is related to this observation. In the same paper, Haraguchi claims that the Tokyo dialect has a basic HL melody.

Following Haraguchi (1976), the accentuation of three-mora words in the Tokyo dialect is accompanied by the Tone Association Rule and the Initial Lowering Rule. The Tone Association Rule associates the H tone of the basic HL melody with 'the leftmost $\check{V}$ ', if the string is accented, and associates the H tone with 'the rightmost V', if unaccented. The Initial Lowering Rule lowers 'the initial mora' if it has no accent on it. V is a lexically assigned abstract accent marker. Observe (6), in which each string forms a ϕ and (6d) is an unaccented case.

The Tone Simplification Rule (Haraguchi 1976, Goldsmith 1976:39) deletes the final L in (6d). The pitch on the particle in each case is derived by the same rules as Haraguchi employed to assign the pitch to each noun, without adding any extra rule or convention.

In fact, in his account of the Tone Association Rule, 'the leftmost $\check{V}$ ' and 'the rightmost V' can correspond to the leftmost and rightmost V in ϕ 's of (6); and in the Initial Lowering Rule, 'the initial mora' corresponds to the initial mora of ϕ 's in (6). In no way is the initial mora of the particle or that of the quantifier, consisting of one or more morae, taken as corresponding to 'the leftmost $\check{V}$ ' or 'the initial mora' in the account of these two rules, although 'the rightmost V' of ϕ 's happens to be identical to the final vowel of the particle or the quantifier. The employment of ϕ 's will make possible a more explicit statement of these two rules.

The same thing is applicable to cases when nouns are followed by accented or unaccented particles with two morae. The sequence of the Tone Association Rule, the Initial Lowering Rule, and the Tone Simplification Rule suffices to supply the correct surface tone melody for all the cases in (7). The line above the mora or a sequence of morae is high-pitched and the underlined mora is low-pitched. The basic observation is that a pitch fall signals the location of the accent marker, occurring immediately after the accented mora, and that the phrase-initial mora is low-pitched unless accented.

(7) the life	a. <u>ino</u> ti kara	e. <u>ino</u> ti <u>ma</u> de
the heart	b. <u>ko</u> ko <u>ro</u> kara	f. <u>ko</u> ko <u>ro</u> <u>ma</u> de
the head	c. <u>ata</u> ma kara	g. <u>ata</u> ma <u>ma</u> de
the fish	d. <u>saka</u> na kara	h. <u>saka</u> na <u>ma</u> de

In (7h), since made is preceded by the unaccented word, 'the leftmost $\check{V}$ ' is on the first mora of the accented particle made. Accordingly, the mora ma is the accent of the entire string of ϕ in (7h).

It will be particularly interesting if we examine cases where discrepancies between the domain of ϕ and the syntactic structure are evident. One of the cases corresponds to verb or adjective stem-tense and noun and particle or verb-stem-tense and the Conditional as in (9). Either case constitutes a ϕ and therefore follows the above sequence of rules without any modification to assign the correct surface melody.

- (8) a. (ϕ Hanako ga ϕ) (ϕ kat-ta kaban o ϕ)
 Nom bought suitcase Acc
- b. (ϕ Hanako no ϕ) (ϕ aka-i kaban o ϕ)
 Gen red suitcase Acc
- (9) a. (ϕ tabe-ta no o ϕ)
 eat past Comp Acc
- b. (ϕ ake - tara ϕ)

A complete parallelism is seen in (8)-(9) regardless of their syntactic configurations. The parallelism becomes possible only when we follow the definition of ϕ is (2).

There are exceptions to Haraguchi's tone association rule. When ϕ 's contain the quantifiers dake and bakari 'only', the Tentative yoo 'let's', etc. (cf. McCawley 1977: 267), the rightmost $\check{V}$ (not the leftmost $\check{V}$) is associated with the H tone of the basic HL. Consequently, whether the preceding word is accented or unaccented, or whichever mora is accented, the strings with dake or (y)oo show the same pitch pattern owing to the basic melody HL. (11) are McCawley's (19c).⁶

(10) a. <u>ino</u> ti <u>dake</u> ga	'only the life'
b. <u>ko</u> ko <u>ro</u> <u>dake</u> ga	'only the heart'
c. <u>ata</u> ma <u>dake</u> ga	'only the head'
d. <u>saka</u> na <u>dake</u> ga	'only the fish'

- (11) a. tabe-yop^{*} 'let's eat'
 b. ake-yop^{*} 'let's open'
 c. tanom-op^{*} 'let's ask'
 d. susum-op^{*} 'let's advance'

(10a) and (11a) clearly show that once the rightmost $\bar{V}$ is associated with the H tone by the Tone Association Rule, all the remaining $\bar{V}$, excluding the rightmost $\bar{V}$ in this ϕ , must be treated as de-accented. This is why the initial mora in (10a) or (11a) undergoes the Initial Lowering Rule in exactly the same way as do the initial unaccented moras in the other cases.

Let us now consider how the above two different tone association rules provide the surface melody at the level of an utterance. The accent of dake or yoo predominates over that of the 'preceding' word(s) while the accent of atama predominates over that of the 'following' morpheme(s) or word(s). The interpretation as to how far the 'preceding' or 'following' extends will be crucial. When the domains of these two different tone associations correspond to the defined domain of ϕ , the two tone associations supply the correct surface melody. The surface melody in deliberate speech is represented in (12a) and that in natural speech in (12b). Out of many possible phrasings, our definition of ϕ in (2) takes only the following as well-formed ϕ 's, which provide the correct surface melodies.

- (12) a. (sakana dake^{*}wa _{ϕ}) (atama^{*}ma^{*}de _{ϕ}) (tabe-yop^{*} _{ϕ})
 fish only head up to eat let's
 b. (sakana dake^{*}wa _{ϕ}) ((atama^{*}ma^{*}de _{ϕ}) (tabe-yoo^{*} _{ϕ}))

'Let's eat only the fishes up to the heads'

(12b) shows that the last two ϕ 's constitute a larger prosodic category, in which we observe the 'downdrift' phenomenon (Haraguchi 1976). We will postpone discussion of this matter until section 1.2.3.

In this section we have seen that tone association rules of two types operate within the domain of ϕ 's. In other words, the basic tone melody HL in the Tokyo dialect is assigned to every ϕ . Whenever the Initial Lowering Rule can be applied in a ϕ , 'the initial mora' corresponds to the initial position of the ϕ . Thus, without the device of providing the correct specification of ϕ 's, the two tonal rules cannot supply adequate surface melodies.

1.2.2 Other rules whose domain must be ϕ are seen in the Matsue dialect, which, according to Haraguchi, has the same basic melody H: as that of the Tokyo dialect.

Consider the data of the Matsue dialect. No pitch fall is observed

in column B (= ϕ 's) of (13a-c), where the nouns are unaccented. As evident from column C of (13e), a pitch fall occurs immediately after the nominative particle *ga*, in spite of the fact that *ga* is underlyingly unaccented. Accordingly, we suspect that there should be an accent shifting rule to the next vowel. A further investigation by Okuda (1971) and Haraguchi (1976) shows that a rule operative in (13e) moves the accent marker in word-final position to the unaccented vowel in the following particle (Star Shift Rule).

	A	B	C
(13) a.	<u>hana</u> 'nose'	<u>hana</u> ga 'nose' Nom	<u>hana</u> ga siro [*] -i 'nose' Nom white
b.	<u>?iwa</u> 'rock'	<u>?iwa</u> ga	<u>?iwa</u> ga siro [*] -i
c.	<u>kami</u> 'paper'	<u>kami</u> ga	<u>kami</u> ga siro [*] -i
d.	<u>hana</u> [*] 'flower'	<u>hana</u> [*] ga	<u>hana</u> [*] ga siro [*] -i
e.	<u>kami</u> [*] 'hair'	<u>kami</u> [*] ga	<u>kami</u> [*] ga siro [*] -i
f.	<u>turu</u> [*] 'crane'	<u>turu</u> [*] ga	<u>turu</u> [*] ga siro [*] -i

In Haraguchi (1976: 62), his Star Shift Rule is represented by his (10), using a boundary relevant between the noun and the particle, as in the following:

(10) Star Shift Rule (Matsue):

$$\left[\begin{array}{c} \bar{V}^* \\ +\text{high} \end{array} \right] + C_o V \rightarrow \left[\begin{array}{c} V \\ +\text{high} \end{array} \right] + C_o \bar{V}^*$$

In our framework, we can use a ϕ as the relevant domain of this rule instead of the plus boundary marker, as in (14).

$$(14) \left[\begin{array}{c} \bar{V}^* \\ +\text{high} \end{array} \right] C_o V \rightarrow \left[\begin{array}{c} V \\ +\text{high} \end{array} \right] C_o \bar{V}^* / \dots \text{---}\phi$$

Whatever form the rule may take, the domain of ϕ will be crucial in the representation of this rule. Notice that no such syntactic information as the boundary is necessary in our rule (14), in spite of the fact that

in the structural description of (16) appear within the domain of ϕ , either word-internally (as in (17b)) or word-finally (as in (17a)), sliding of the initial low pitch to the high vowel of the next mora takes place.

Rule (16) follows the Initial Lowering Rule: that is to say, only when this lowering rule applies does rule (16) apply. This predicts that when 'downdrift' occurs in the string

((ϕ otoko no) (ϕ harisigoto o))

'man's needlework', rule (16) never applies to the second ϕ , but only to the first if the condition of the rule is satisfied. For the Initial Lowering Rule applies only to the next larger domain than ϕ . In an extended version of the Initial Lowering Rule (Haraguchi 1976), an ad hoc feature [+ pause] or an accrual of the Q variable would be needed to preclude sliding of the low pitch on the initial mora to the second and the third mora within the second ϕ in the above string.

We can now add the Star Shift Rule and the Initial-Low Sliding Rule to a set of tonal rules operative within the domain of ϕ .

1.2.3 Selkirk (1978) proposed that in the prosodic theory intonational phrase (I), the next larger prosodic category than ϕ , consists of one or more ϕ 's. The 'downdrift' phenomenon we observe in natural speech, illustrated in (12b) and column C (13), is seen in every I. For the sake of accuracy, they are more explicitly represented below. For glosses of (18) and (19), see (12) and (13).

(18) (ϕ sakana dake wa) (ϕ atama made) (ϕ tabe-yoo)_I

- (19) a. (ϕ hana ga) (ϕ siro-i)_I
 b. (ϕ ?iwa ga) (ϕ siro-i)_I
 c. (ϕ kami ga) (ϕ siro-i)_I
 d. (ϕ hana ga) (ϕ siro-i)_I
 e. (ϕ kami ga) (ϕ siro-i)_I
 f. (ϕ turu ga) (ϕ siro-i)_I

Downdrift is stated in our terms as follows: when two ϕ 's constitute an I, the surface melody of the second ϕ is affected by that of the first and gets a relative value, so that the high pitch in final position of the first ϕ , when unaccented, is retained as the high pitch in the second ϕ ; otherwise, the high pitch in initial position of the second ϕ is identical to the low pitch of the first ϕ , and then the low pitch of the second ϕ

becomes even lower.

It would be appropriate at this point to discuss the Initial Lowering Rule we have so far refrained from stating explicitly. When downdrift occurs in an I, the second ϕ does not undergo the Initial Lowering Rule, as clearly shown in (18) and (19). It is therefore reasonable to say that the Initial Lowering Rule occurs only in every I. This generalization renders superfluous the addition of the ad hoc feature [+pause] in the revised formulation of Haraguchi's (1976:33) rule (39). Each ϕ can be an I.⁸ To be consistent, the first ϕ of (18) should be an I since it as a whole undergoes the lowering rule. The hierarchical representation of the prosodic categories in (18) is shown in (20):

(20)

From the above discussion, we conclude that downdrift and the Initial Lowering Rule are properties of I's. As the hierarchical structure of (20) shows, the explicit specification of I's is based on the unique determination of ϕ by such a principle of phrasing of ϕ as in (2). Thus ϕ is an indispensable domain for an adequate account of tonal phenomena.

1.3 Evidence from Segmental Rules

In this section, we discuss a few segmental rules whose domain must be a ϕ .

There is a large set of verbs whose stems end in r. In the negative forms of those verbs, a, part of the negative ana, is deleted only after verbs with a vowel-final stem by the application of a general rule (cf. discussion following (31)), as in column B in (21d-e), while the morpheme-initial a cannot be deleted after verbs with a consonant-final stem, as in column B of (21a-c). Nevertheless, in relaxed or casual speech, as shown in column C, it is possible to delete the morpheme initial a after consonant stem verbs and a stem-final i or e of vowel stem verbs, as observed in Alfonso (1966: 1192), and the vowel deletion feeds the subsequent change of the stem-final r to a mora nasal n, as in column D.

(21)	A	B	C	D
a.	/ir-ana-i/	ir-ana-i	ir-na-i	innai
	need Neg			
b.	/or-ana-i/	or-ana-i	or-na-i	onnai
	stay			

(21) (cont.)

A	B	C	D
c. /kaer-ana-i/ → return	kaer-ana-i →	kaer-na-i →	kaennai
d. /kure-ana-i/ → give	kure-na-i →	kur-na-i →	kunnai
e. /tari-ana-i/ → lack	tari-na-i →	tar-na-i →	tannai

The exact formulation of vowel deletion, as observed from the step in column B to the next step, is not easy, but the relevant domain of this rule must be a ϕ . This would be one of the casual speech rules. The last step in (21) is called Voiced Consonant Nasalization (VCN), which changes voiced consonants into the homorganic nasals.

There is another rule, namely a progressive voicing rule (VOIG) that would apply within the domain of ϕ 's. This rule feeds the above VCN or a regressive assimilation rule (ASSM), as shown in (22).

(22)	a. (ϕ yob ta ϕ) call past	b. (ϕ yom ta ϕ) read Comp	c. (ϕ sakin su-ru ϕ) advance Present
VOIG	yob da	yom de	sakin zu-ru
VCN	yom da	---	---
ASSM	yon da	yon de	----
Output	yonda	yonde	sakin zuru

The VOIG does not apply between two ϕ 's.⁹ In (23), the initial h in a ϕ does not undergo VOIG although the immediately preceding segment n satisfies the condition of VOIG (cf. (22c)).

(23)	(ϕ taihen ϕ) (ϕ hagesi-i undoo o ϕ) ...
	extremely intensive exercise Acc

It is therefore not surprising to know that the stem-initial /h/ of adjectives and adverbs in Japanese does not alternate with h by VOIG, because the h always takes the initial position of ϕ .

1.4 Other Evidence

Now let us see how meaning-emphasis, attachment of wa and mo, and linguistic performance are related to ϕ 's.

Meaning emphasis can be made on the basis of ϕ 's. In Japanese, can be emphasized either by placing heavy stress on the particle within that particular ϕ or by assigning heavy stress to the head noun or verb.

It would sound rather strange or be hard to pronounce if we assigned stress to both the particle and the head. This mutually exclusive character of the constituents of ϕ 's may lend support to the reality of these ϕ 's. For example, either one of the ϕ 's in (24) can be emphasized by placing heavy stress on the particles to (Comitative), ga (Nominative), made (Terminus) and ni (Goal).

- (24) (ϕ kaisya-gawa to ϕ) (ϕ kumiai-gawa ga ϕ) (ϕ koko made ϕ)
 company side Com union side Nom there Trm

(ϕ dakyoo ni ϕ) (ϕ kogituderu hazu ga ϕ) (ϕ na-kat-ta ϕ)
 compromise goal reach possibility Nom not-Past

'There was no possibility that the company and the union would reach the compromise up to this point'

Phrasing with respect to ϕ 's in (24) has a syntactic correspondence if the multiple application of so-called wa-attachment is permitted. Any two of the ϕ 's except the last ϕ in (24), can be attached by wa to constitute maximal ϕ 's (e.g., compare the fourth and fifth ϕ of (24) with those of (25)), where one ϕ will be a topicalized phrase and the other will be a contrastive phrase. Likewise, the particle mo (also, even, as many (much, long, far) as') can be attached to ϕ 's as long as meaning is permitted. Combination of the wa-phrases and mo-phrases is perfectly possible.

- (25) (ϕ kaisya-gawa mo ϕ) (ϕ kumiai-gawa mo ϕ) (ϕ koko made mo ϕ)
 company-side also union-side also here Trm even

(ϕ dakyoo ni wa ϕ) (ϕ kogitukeru hazu wa ϕ) (ϕ na-kat-ta ϕ)
 compromise Goal reach possibility not-Past

'There was no such possibility that both the company and the union would reach the compromise even to this point'

In fact, the maximal ϕ 's, with the topic or the contrastive wa, are reducible phrases -- the major concern in this paper. What the maximal ϕ means is that: (i) wa has been attached outside the basic ϕ ; and (ii) once wa is attached, quantifiers or any other elements are not allowed to come outside it, as in (26):

- (26) a. (ϕ watasi dake ni wa ϕ) sotto sore o osie-te kudasai
 I only Goal secretly it Acc tell please

b. (ϕ watasi ni dake wa ϕ) sotto sore o osie-te kudasai
 I Goal only secretly it Acc tell please

c. *watasi ni wa dake sotto sore o osie-te kudasai
 I Goal only secretly it Acc tell please
 'Please, tell it to me at least secretly.'

and (iii) whenever wa is attachable,¹⁰ the ϕ is reducible. Observe (27) and (28):

- (27) a. kare wa sugu tatu desyoo
 he immediately start will
 'He will start right away'
- b. kare wa { sugu ni wa } wakara-nai desyoo
 { sugu nyaa }
 he notice-not will
 'He won't notice it instantly.'
- (28) a. kanozyo wa ima ni wakar-u
 she soon know
 'She will know it soon.'
- b. kanozyo wa { *ima ni wa } wakara-nai
 { *ima nyaa }
 she know not

It is a natural fact of Japanese that pauses can be assigned to every ϕ by way of lengthening the last vowel of the ϕ 's or the particles, or by attaching a semantically empty particle ne or sa to the end of each ϕ . Out of the many possibilities, one example is shown below. In (29), the diacritic (:) means prolongation.

- (29) (ϕ John to: ϕ) (ϕ Mary ga ne ϕ) (ϕ kekkonsi-ta-tte hanasi sa ϕ)
 Com ϕ Ncm married Comp story
- (ϕ dare kara ϕ) (ϕ kii-ta no ϕ)
 who -Sre heard Ques
 'Who did you hear from the news that John and Mary got married?'

2.0 Reduction in Casual Speech

We shall now sketch phonological reduction in Japanese casual speech. In section 2.1, we will discuss what kinds of changes occur in a certain type of ϕ , examine some conceivable analyses in section 2.2, and propose our analysis based on syllable structure in section 2.3.

2.1 Reducible Phrases

Consider the following examples of reducible phrases. In (30) we have sequences of demonstratives and the topic marker wa and (31) sequences of verb stems plus the provisional ba.¹¹ Column B in (30) and column C in (31) are reduced phrases.

	A		B	
(30)	a. /kore-wa/
this Top	→	koryaa	
	b. /sore-wa/
it	→	soryaa	
	c. /are-wa/
that	→	aryaa	
-
	A		B		C
(31)	a. /ik-re-ba/
go if	→	ik-e-ba	→	ikyaa
	b. /tir-re-ba/
scatter	→	tir-e-ba	→	tiryaa
	c. /nak-re-ba/
cry	→	nak-e-ba	→	nakyaa
	d. /ne-re-ba/
sleep	→	ne-re-ba	→	neryaa
	e. /mi-re-ba/
see	→	mi-re-ba	→	miryaa
	f. /ker-re-ba/
kick	→	ker-e-ba	→	keryaa

In order to derive reduced forms in (31), there has already been applied a rule deleting the first consonant of any morpheme following consonant stem verbs.¹² Actually, this is a more general rule covering deletion of a first vowel of any morpheme following vowel stem verbs.

As a first approximation, in the reduced phrases of (30) and (31), w in the topic marker wa and b in the provisional ba drop, and then y is inserted before e between two morphemes (e.g. (31a-c) and (31f)) and inside morphemes (e.g. (31d-e)). The elimination of b in the last syllable of the morpheme is very peculiar as compared with that of w,¹³ and such a deletion might be unique in deriving reduced phrases. We leave open the question of the deletion of consonants like w and b in the last mora of relevant morphemes until we observe more about the reducible phrases.

Exactly the same process, observed in (31), can be applied to some frozen expression of modality like /ana-ker-e-ba/ (or /ane-ba/) naranai 'obligation', which changes into anakeryaa (or anyaa) naranai. The epenthetic y is introduced before the mid front e whether the immediately preceding consonant is a flap r, as in (30)-(31), or a nasal n adduced to the above anaba anyaa.

A further examination of the y-epenthesis phenomenon broadens the domain of its application. In (32), i would be taken as a nominalizing suffix, and the contrastive wa or ya is attached to nominalized verbs in negative sentences to give some emphatic meaning, whereas re in (33) is a

(32) a. (ϕ yom-i wa ϕ) $\longrightarrow$ yomyaa
read

b. (ϕ kas-i wa ϕ) $\longrightarrow$ kasyaa
lend

c. (ϕ oyog-i wa ϕ) $\longrightarrow$ oyogyaa
swim

d. (ϕ yame wa ϕ) ($\leftarrow$ /yame-i/) $\longrightarrow$ yamyaa
quit

(33) a. (ϕ yom-e ϕ) ($\leftarrow$ /yom-re/) ya sinai $\longrightarrow$ yomyaa sinai
read do-not

b. (ϕ kas-e ϕ) ($\leftarrow$ /kas-re/) ya sinai $\longrightarrow$ kasyaa sinai
lend

c. (ϕ yame-re ϕ) ya sinai $\longrightarrow$ yameryaa sinai
quit do-not

(34) a. John wa (ϕ gakusei de wa ϕ) nai
student Prdc neg
'John is not a student'

b. John wa gakusei dyaa nai.

(35) a. sugu ni mise o (ϕ sime-ru wake ni wa ϕ) ik-ana-i daroo ka.
store close reason cannot Ques
'I wonder if we could close the store right away.'

b. sugu ni mise o sime-ru wake nyaa ik-ana-i daroo ka.

- (36) a. $\left(\begin{array}{c} \phi \\ \left\{ \begin{array}{l} \text{mi} \\ \text{tabe} \\ \text{i} \\ \text{it} \\ \text{yon} \end{array} \right\} \end{array} \right\} \begin{array}{c} \\ -\text{te} \\ -\text{de} \end{array} \right\} \text{wa } \phi \text{ ikenai}$
- Gerundive prohibitive
- 'Don't $\left\{ \begin{array}{l} \text{look at (it)} \\ \text{eat} \\ \text{stay} \\ \text{go} \\ \text{read} \end{array} \right\} .'$
- b. $\left\{ \begin{array}{l} \text{mityaa} \\ \text{tabetyaa} \\ \text{ityaa} \\ \text{ittyaa} \\ \text{yondyaa} \end{array} \right\} \text{ ikenai.}$

In (34) and (35), the two consecutive particles de wa and ni wa are reduced to dyaa and nyaa, respectively (cf. (27b)), whereas the gerundive ending te and wa in (36) undergo a change of te wa to tyaa or, when the initial t of the te is voiced by VOIG (cf. (22b)), the sequence is changed into dyaa.

Either the complementizer koto 'fact' or the clause specifier wake 'reason', as in (38a-b), when attached by wa, undergoes reduction in phrase-final position. Wa is encliticized to adverbs derived from adjective stems with an affix ku (e.g. (37a)) or adverbs from nominal adjectives with an affix ni (e.g. (37b)). The rule of y-epenthesis is not applicable before the back vowels o and u, as well as a, in reducible phrases of (37a) and (38b), though it does take place in those of (37b) and (38a).

- (37) a. $\text{sonna ni } \left\{ \begin{array}{l} \text{yo-ku wa} \\ \text{yokaa} \end{array} \right\} \text{ nai}$
 so much as good not
 'It isn't that good.'
- b. $\left\{ \begin{array}{l} \text{kantan-ni wa} \\ \text{kantan-nyaa} \end{array} \right\} \text{ yuk-anai}$
 easily go-not
 'It doesn't go easily.'
- (38) a. $\text{kare ga kantan-ni dooi suru } \left\{ \begin{array}{l} \text{wake wa} \\ \text{wakyaa} \end{array} \right\} \text{ nai}$
 he easily agree reason not
 'There is no reason he will agree with it easily.'
- b. $\text{omae no suru } \left\{ \begin{array}{l} \text{koto wa} \\ \text{kotaa} \end{array} \right\} \text{ ki-ni-kuwanai.}$
 you do fact unsatisfactory
 'I am dissatisfied with what you do.'

To recapitulate, we have observed the following phrase-final reductions:

(39) a. Complementizer or clause specifier plus wa

koto wa → kotaa
wake wa → wakyaa

b. Verb ending re plus provisional ba

Verb stem + (r)e ba → Verb stem + (r)yaa

c. Nominalizer i or potential re or gerundive ending te plus wa (or ya)

Verb stem + i wa → Verb stem + yaa
Verb stem + (r)e ya → Verb stem + (r)yaa
Verb stem + te wa/de wa → Verb stem + tyaa/dyaa

d. Demonstrative plus wa

$$\left\{ \begin{array}{c} \text{ko} \\ \text{so} \\ \text{a} \end{array} \right\} -\text{re wa} \rightarrow \left\{ \begin{array}{c} \text{ko} \\ \text{so} \\ \text{a} \end{array} \right\} \text{ryaa}$$

e. Adjective stem and affix (Adverb) plus wa

yo-ku wa → yokaa
kantan-ni wa → kantan nyaa

f. Two consecutive particles containing wa

de wa → dyaa
ni wa → nyaa

Notice here that reducible phrases are defined essentially in terms of particles and are consistent with the definition of ϕ 's.

This reduction in final position of ϕ 's does not occur in sequences of regular nouns and wa, as in (40):

(40) a. tori wa → *toryaa
bird

b. kuruma wa → *kurumaa
car

Accordingly, reduction is seen in all possible ϕ 's that wa, ya, and ba can take, excluding the cases in (40), independent of whether the preceding element contains: a sentence plus complementizers or clause specifiers (39a), a sentence itself (39b), verb stems plus a nominalizer or the other (39c), demonstratives (39d), adverbs (39e), or the other particles (39f).

Phrase-final reduction is now tentatively defined in (41).

(41) Reduction takes place in

$(\phi \dots \alpha \text{ Part } \phi)$, where $\text{Prt} = \underline{\text{wa}}, \underline{\text{ya}}, \underline{\text{ba}}$

if α neither contains any small bracket nor belongs to a 'lexical category' (Chomsky 1965) like N, V, Adj, and Adv.

According to the above observations, α in (41) may be complementizers, clause specifiers, nominalizer i, the potential re, demonstratives, affixes like re, ku and ni, and other particles like de and ni.

2.2 Phrase-final Reduction and Morphology

It is claimed in the definition of (41) that the domain ϕ does not secure the environment where reduction occurs, but that a further syntactic specification--i.e. syntactic information of whether or not the unit immediately preceding the particles wa, ya, and ba does not belong to the 'lexical category' -- is necessary. This is not a favorable consequence at all in spite of the fact that such syntactic information, as claimed by Kaisse (1977), is essential in the formulation of vowel deletion rules such as those for fast speech in Athenian Greek. In this section, we shall further examine how syntactic information can be expressed in morphological terms. We will find out that Williams' (1979) notion 'head of the word' is useful in our discussion.

The Japanese demonstrative words kore 'this one', sore 'that one', and are 'that one there' are morphologically complex, and ko 'proximal', a 'distal', and so 'neutral' are combined with the pronoun re 'one'. This process is productive in that ko, for example, is combined with itu, no, na, ko, tira, and o to make ko-itu 'this guy', ko-no '(of) this', ko-na 'like this', ko-ko 'here', ko-tara 'this way or person', and ko-o 'this manner', respectively (cf. Kuno 1976:282). In these complex words, the 'head of the word' (Williams 1979) is the righthand member which determines the category of the whole, as represented in (42).

Only morphologically complex words like yo-ku 'well', kantan-ni 'easily', yom-i 'reading', and yom-e 'capable of reading' can undergo reduction when followed by wa, ya or ba. The complex words are represented as follows:

To rephrase, the 'head' of a morphologically complex word and the particle wa, ya, or ba can undergo reduction. We can now correctly predict that all the other demonstrative words and wa undergo reduction (e.g. ko-itu wa → koit(s)aa and ko-tira wa → kotiraa). Furthermore, a plural affix for animate nouns, tati, can be reduced when preceded by such nouns, as in $[[otoko]_N - [tati]_N]_N wa$ 'men + Topic' → otokotatyaa.

The internal structure of the words is defined with terms like stem, root, and affix. All the above morphologically complex words are represented by the following structure:

The seeming compounds $[[yom]_V [re]_V]_V$ and $[[otoko]_N [tati]_N]_N$ should not be analyzed as:

because independently $[re]_V$ is neither inflected with respect to tense, progressive aspect, and so on (e.g. *re-ta, *re-te i-ru, etc.), nor does $[tati]_N$ inflect independently. These two are affixes. In general, the 'head' of the morphologically complex word is an affix, i.e., not a stem (cf. Williams (1979) for the English examples), which can undergo reduction together with wa, ya, or ba.

In cases of the other ϕ -final reduction, phonological changes occur between 'non-lexical categories' (Chomsky (1965)) — i.e. complementizers, clause specifiers, and particles on the one hand, and particles like wa, ya, and ba on the other. None of the non-lexical categories in Japanese inflect and are, therefore, morphologically simplex. That is, they cannot be stems but are rather roots. We can now characterize reduction in morphological terms, as in the following:

(44) Reduction occurs unless α is a stem in:

$(\phi \dots [\dots]_{\alpha} \beta \phi)$

where β is wa, ya, or ba and α does not contain any smaller bracket.

2.3 Analyses of Reduction

We have assumed without any evidence that phrase reduction is triggered by deletion of w, y, and b, and that y-epenthesis and a change of ia, ea to aa follow. For the phonological change of wa, ya, and ba in ϕ -final position, there are at least three different treatments to be considered: the initial consonants of these particles are deleted or either progressively or regressively assimilated. In what follows, we shall examine what the right analysis of reduction is.

2.3.1 Possible Analyses

The first analysis deletes the initial consonant of the relevant particles. After deletion of the consonant, y-epenthesis follows. An epenthetic y is observed in borrowing. According to Ohso (1973), the Japanese glides y and w behave differently in borrowing depending on what vowel follows. The glide y occurs only before back vowels a, o, and u and w only before the low vowel a. Borrowing observes the restriction so that the English y, when borrowed, is retained before back vowels in Japanese and the English w before a. The glides are vocalized in the other environments -- which are not possible environments for the glides in non-foreign morphemes -- unless they are followed by high vowels i and u. The glide y is lost before i, as in (45a), and w before u. (45b) is none of the above cases, but follows a relevant rule of borrowing.

(45)	a. 'year'	b. 'air'
English	[yɪər]	[ɛər]
	⋮	⋮
Japanese	[iaa]	[eaa]

According to the principle of borrowing, (45a) and (45b) in Japanese themselves should be the correct outputs. However, they contain the cluster of three consecutive vowels, which is one of the inadmissible clusters. To break up the illegitimate cluster, y is inserted, thereby yielding the correct outputs [iyaa] and [eyaa].

The y-epenthesis, suggested in the account of phrase reduction, does not have this effect. Rather, the result of its application creates the inadmissible combination yi or ye. The incorporation of this rule into a grammar will impair the general character of y-epenthesis we have observed in borrowing.

It would be interesting to see a phonological phenomenon 'compensatory lengthening' (Ingria 1978), observed in Greek and Latin, where deletion of a consonant results in the lengthening of a segment preceding the deleted segment. A parallelism might suggest an analysis of diphthongization (instead of y-epenthesis); in ko-re wa, for example, deletion of w of the particle is compensated by diphthongization, resulting in the lengthening of the preceding mora re to a heavy mora rye. However, diphthongization is generally associated with tense or stress; the English tense vowels i, e, u, and o "phonetically are often diphthongs" and "Italian diphthongization took place when the vowel was stressed" in an open syllable (Schane 1973:58). To our knowledge, no such cases where tense or stress is phonologically significant in Japanese have been known so far.

The second analysis is that w becomes y due to the assimilation of the preceding front vowel, and then metathesis takes place between i or e and y. For example, reduction of ko-re wa is illustrated as follows:

(46)	/ko-re wa/
<u>w</u> → <u>y</u>	ko-re ya
Metathesis	ko-ryea
<u>ea</u> → <u>aa</u>	ko-ryaa

However, this analysis cannot give a unified explanation of b-drop in the analogous environments, since any reasonable explanation for change of b to y is impossible.

Metathesis, in general, takes place when it simplifies syllable structure by creating a unit segment like a glottalized segment or an aspirated segment. In Hanunoo (Schane 1973:56-57), ka 'times' and ?sa 'one' becomes kas?a 'once' word-internally (i.e., CV-CCy becomes CV-C?y) and in Zoque, poy 'run' + pa '3P. Sg. impf.' becomes popya, creating py instead of yp. Undoubtedly, the sequence p and y are more closely connected with each other than yp, as is evident from the fact that coronal obstruents, such as t and s, plus y become palatalized in this language. Contrary to expectations, metathesis between vowels and y in (46) brings about a complex syllable structure, i.e., kore wa with the structure of CV-CV-CV is reduced to koryaa with CV-CyVV.

The foregoing argument is not necessarily a strong one, but it sufficiently motivates the consideration of a third analysis.

2.3.2 Proposed Analysis

The third analysis is a regressive assimilation (RA) or wa, ya and ba to aa. No words in Japanese end with ia, ea, oa, and ua; and aa is permitted only in loan words or onomatopoeia, both of which have a peculiar status in Japanese phonology and will thus be excluded from the present discussion for the sake of simplicity. Besides, there is one and only one morpheme with a monophthong a, i.e., morpheme /a/ 'sub-', which turns out to be a prefix.¹⁴ Therefore, in no cases other than reduction does the geminate aa appear in final position of ϕ 's. An advantage of the proposed analysis is that the subsequent change can be based on this fact.

In connection with the second rule, let us observe fast speech rules investigated by Kaisse (1977) in Greek and by Hutchinson (1974) in Spanish. Both languages and Japanese have the typical five-vowel system and CV is the basic syllable type. In Greek, "high vowels are always shortened or semivocalized rather than removed" (Kaisse 1977:173) between full words. In (47), the high vowel i is semivocalized into y.

- (47) to agori erxete → to agory erxete
the boy is coming

The more striking fact in semivocalization is given in Spanish. Details aside, word final front vowels turn into y and word-final (non-low) back vowels into w when words starting with vowels are followed. Examples are taken from Hutchinson (1974).

- (48) a. su amante → swa-man-te
her lover
- b. como Eva → kom-we-ba
how
- c. mi obra → myo-bra
my work
- d. me urge → myur-xe
me urge

What is common in Greek and Spanish is that weakening of the vowels occurs in final position of the preceding word, although there is a distinction as to whether the preceding is a full word or not. In Spanish cases, it is shown that so-called word boundaries do not correspond to syllable boundaries. We will see on the basis of Japanese examples that if we take syllable structure into consideration we can account for the changes of i, e to y and u, o to w in Greek and Spanish.

We now introduce a hierarchical syllable structure that is well attested.

It is shown in Selkirk (1978) that the branching structure of the syllable naturally expresses the restricted phonotactics and the relative value of sonority of the two constituents or segments. Returning to the Spanish example (48a), the vowel weakening of /u/ to w occurs after an independent syllable is assigned by (re)syllabification to the phonological representation /sua/ : /sua/ has a complex peak ua and a simplex onset s. Once, however, /u/ is weakened into w, it can no longer hold a part of the peak and should be taken as part of the onset, because the peak consists of a single syllabic segment in Spanish, and sw composed of non-syllabic segments obeys the maximal onset principle (cf. Kahn (n.d.) and Selkirk (1978)). Consequently, reinterpretation of syllable structure is necessary to assign a well-formed syllable structure to the output swa.

We assume that the same weakening process we saw in Spanish and Greek occurs between the onset and the peak of the syllable in Japanese. Nevertheless, the situation is more complex and the vowel weakening takes place in near-final position of ϕ 's only when the environment satisfies the condition of reduction defined in (44).

Based on the fact of the uniqueness of the geminate aa in final position of ϕ , we can represent the vowel weakening rule, as in the following:

(50) Vowel-Weakening Rule (VW)

$$[+syll] \rightarrow [-syll] / \dots __ [+low][+low] \phi$$

This rule changes (ϕ kore aa ϕ) to koryaa and (ϕ ... koto aa ϕ) to ...ko+waa which needs further deletion of w to give the correct phonetic output. Alternatively, one can say that the weakening rule applies only to front vowels and that word-final back vowels merely delete. The alternative, however, cannot provide a principled basis of why only back vowels are deleted in this environment, but in our analysis based on syllable structure, deletion of w is a natural consequence of the constraint on the onset structure in Japanese.

To clarify the constraint on the onset structure alluded to in the above, let us introduce the syllable template of Japanese.

(51)

We now consider the following steps for reduction of the representative cases / (ko) re wa/ and / ... (ko) to wa/. \$ is a syllable node and the rhyme constituent is left out in the syllable representation of (52) for the sake of simplicity

(52) i. (ϕ (ko)re wa ϕ)

ii. (ϕ ... (ko)to wa ϕ)

e.

When Regressive Assimilation (RA) applies to /wa/ with a simple onset and a simple peak in (52a), the output aa no longer maintains the same syllable structure and should be reinterpreted as constituting a complex peak, since only the peak is composed of syllabic segments in Japanese (cf. (51)). In (52c), the output ry or tw, effected by Vowel-Weakening Rule (VW), loses the status of a syllable -- i.e., ry or tw is "desyllabified". We assume a universal convention that the desyllabified cluster cannot be dominated by the node \$ and should be interpreted as a constituent of the preceding or the following \$-node. In Japanese syllable structure, the coda is always simplex (cf. (51)), but the onset can be complex. Consequently, ry is uniquely analyzed as a complex onset; it is interpreted as the onset of the following \$ having no onset segment but only the complex peak. Thus the output ryaa has a well-formed syllable structure.

In our analysis, deletion of w in (52e) is not accidental and is taken as a constraint on the onset structure. The syllable in Japanese allows a structure with CyVV, yVV, or VV, but not (C)wVV. For (C)(y)VV, a sequence of low vowels aa is disallowed in syllable-final position except when reduction occurs in ϕ -final position. This is indicated in the following (we have already discussed that only back vowels are permitted after y):

(53)	a.	(C)(y)uu	e.g.	nyuu-gyuu	'milch cow'	d.	(C)(y)u
	b.	(C)(y)oo	e.g.	kyoo-koo	'enforce'	e.	(C)(y)o
	c.	* (C)(y)aa				f.	(C)(y)a

Reduction fills up an accidental gap in (C)(y)VV -- but only when (53e) appears in ϕ -final position.

The analysis based on syllable structure furnishes a unified account of the two representative changes, as indicated in (52i) and (52ii), before the phrase-final aa. It naturally explains that syllable merger, changing two basic syllable structures CV-CV into a heavy syllable CyVV, is an indispensable process.

More significantly, it provides a basis of why Vowel-Weakening Rule (50), changing a cluster VVV into yVV, is a natural one. In general, no cluster of three consecutive vowels is allowed in Japanese. The template (51) suggests that either two syllabic segments are taken as the peak and the other one is reduced, or the other one is an epenthetic segment intro-

duced to break up the illegitimate cluster. The application of the vowel weakening to CVVV neither yields CVyV, since a universal rule of syllabification assigns CVyV two syllables contrary to the reduction process nor does it yield CVVy. By (51), y cannot be a coda; CVVy is ill-formed. Accordingly, only CyVV is a possible reduced form. Interestingly, this weakening process results in making a complex onset structure in Greek, Spanish, and Japanese. This seems to be a property of fast or casual speech, especially in languages with CV as the basic syllable structure.

The alternative analysis of deletion of the initial consonants of wa, ya, and ba cannot give any basis of why y is epenthesis in CVV after the application of this deletion rule. CVV is a possible syllable, therefore only coalescence of ia, ea, oa, and ua to aa would be a subsequent cogent rule. There is no motivation for an epenthesis rule changing CVV into CyVV, although this rule is logically needed to give the correct phonetic forms.

Finally, we attempt to roughly formulate Regressive Assimilation which remains to give a cogent rule. The domain of this rule, represented by ϕ , is a crucial one.

(54) Regressive Assimilation (RA)

$$w, y, b \rightarrow a / (\phi \dots [\dots]_{\alpha} \text{---} a \phi)$$

where α neither contains any smaller bracket nor is a stem.

This condition is required in the other alternative like deletion of w, y, b of the relevant particles. We shall leave a perusal of this form of phonological rules with variable α for future research.

We have not expounded what force has brought about changes in syllable structure coupled with fast speech rules like RA, VW, and w-deletion, as shown in (51). We may speculate a syllable merger, caused by some international force in fast speech, as in

$$\begin{array}{c} \wedge \\ \$ \quad \$ \rightarrow \$ \quad \$ / \dots \text{---} \phi \end{array}$$

where two syllables in the final position of ϕ coalesce into one under a condition similar to that of RA in (54). Suppose this speculation is a valid one. Then, the question of whether a series of fast speech rules form a separate set from ordinary rules at the stage of rule application or are distributed throughout the derivation is an empirical one. If the former is the case, we have to reformulate RA, since the condition of RA won't be necessary. Any further discussion of this issue of rule application is beyond the scope of this paper.

3. Summary

A phonological phrase (ϕ) in Japanese is defined in terms of particles. We claimed that reduction seen in Japanese casual speech occurs in a separate ϕ , and that the vowel weakening, common in fast speech of Greek

and Spanish, takes place in near-final position of ϕ 's. In other words, reduction is a phonological change between some particular particles and the preceding vowel. To circumvent a circularity, we have shown that the basic domain of tone association rules and the domain of a few tonal rules and some segmental rules correspond to ϕ ; that stress assignment for phrase emphasis is made for every ϕ ; and that a syntactic rule wa-attachment can be rephrased as one for making maximal ϕ 's. Thus ϕ will be a "must" in an adequate grammatical theory.

It is not unreasonable to assume that the phrasing of ϕ 's defined in (2) plays the most important role in mapping from syntactic to phonological representation, considering that the next larger domain, intonational phrase (I), is based on the specification of ϕ 's, as Selkirk (1978) proposed. A close interrelation between ϕ and (I) was observed from a tonal phenomenon called downdrift.

A fast speech rule, Vowel-Weakening, requires semi-vocalization, which changes the positive value of the feature syllabic into the negative value. We assume the following universal convention: When the CV is semivocalized, the desyllabified Cy or Cw loses the syllable node $\$$ and is instantly followed by resyllabification or reinterpretation of the syllable structure. Our proposed analysis of reduction is the most natural one in terms of syllable structure. For (i) a change of VVV to yVV in ϕ -final position is the natural consequence of a general constraint on vowel clusters and the syllable structure; (ii) a merger of the desyllabified Cy and the onset-less structure with only the peak VV forms a permissible syllable structure; and (iii) deletion of w is due to a phonotactic constraint on the onset.

The exact specification of reducible phrases needs a morphological characterization, which would be indispensable to the structural description of Regressive Assimilation. The postulation of phonological rules with morphological terms like stem, root, or affix will be an interesting future topic.

Notes

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¹The abbreviations that appear in this paper are as follows:

Top	Topic	Sre	Source
Nom	Nominative	Comp	Complementizer
Acc	Accusative	Trm	Terminus
Gen	Genitive	Com	Comitative
Prdc	Predicative	Ques	Question

²Palatalization supplies the correct output, which is transcribed as [nakuʃiɕaa], where the alveolars s and t are palatalized before the high front vowel i or the high glide y, with a concomitant deletion of the y.

³Whether the whole ai ni ik-u constitutes a ϕ or two ϕ 's, i.e. ai ni and ik-u, depends on the analysis of ni. We would take ni to be an infinitive marker as is the English equivalent to in the infinitive to see.

⁴n is a transcription of mora nasal.

⁵A discussion along this line will be seen in section 2.2.

⁶The accent-placement in this paper is based on McCawley's data (1977). My informant of the Tokyo dialect from Shitamachi district does not always agree with his data. I employ McCawley's data simply because it presents some interesting aspects for my own purposes. It is noteworthy that speakers of the Tokyo dialect from the Shitamachi district and those from a major district Yamanote in Tokyo show some discrepancies in accent. And it is true that accent-placement in the Shitamachi subdialect is closer to McCawley's data than in the Yamanote subdialect.

⁷In (15), the object NP is avoid of the Accusative particle. This phenomenon might be common in this dialect, because we see more examples of this kind in Okuda (1971). To my knowledge, deletion of the Accusative particle is rather common in local dialects of Japanese.

⁸The (I) would correspond to McCawley's (1968) 'major phrase.'

⁹This possibility was suggested by Lisa Selkirk.

¹⁰This condition, in a strict sense, is not adequate, but we will expand it in the subsequent sections.

¹¹A Japanese provisional is implicitly assumed to take the form reba in many places (e.g. McCawley 1968). Conventional grammar of Japanese takes ba as a particle and re as a verbal ending. There is some evidence for the latter morphological analysis. In the conditional nara of (a), ba is optionally attached. (b-c) suggest that re or e ($\leftarrow$ /re/) is a kind of verbal ending.

a. anata ga ik-u nara(ba) watasi mo ik-u
 you Sub go if I also go
 'If you go, I'll go (there).'

- b. mi-re domo, mi-e-zu
see through see-potential-not
'I try to see (it), but (I) can't.'
- c. ik-e domo, ik-e domo, hatake bakari
go through go through field only
'Though (we) go on and on, only the fields (we can see).'

Henceforth, we analyze ba as a provisional particle.

¹²The terms 'consonant stem verb' and 'vowel stem verb' come from McCawley (1968:94), but Bloch (Miller 1970) first made such a distinction between 'consonant verbs' and 'vowel verbs.' The distinction has been a great contribution to the account of the verb morphology, as shown below.

	/ki/	/kir/
	'wear'	'cut'
Present tense	ki-ru	kir-u
Negative	ki-na-i	kir-ana-i
Past tense	ki-ta	kit-ta
Polite	ki-mas-u	kir-imas-u

¹³There are a sequence of rules deleting w inside morpheme before the low vowel a. Optional ordinary rules would change w into ʔ and then ʔ into $\emptyset$.

- a. mawaru ~ maʔaru ~ maaru
'go round'
- b. sawaru ~ saʔaru ~ saaru
'touch'
- c. kowasu ~ koʔasu ~ koasu
'break'
- d. kuwasii ~ kuʔasii ~ kuasii
'deatiled'

¹⁴See Takeda and Hisamatsu (1969).

¹⁵Anderson (1974:298) defines the feature continuant:

Noncontinuant sounds are made with a complete blockage of the oral tract. Stops, affricates, flaps and nasals... are noncontinuant.

In Japanese, these four articulatory classes, excluding the voiced obstruents, can appear as the coda.

Our assumption is that syllabification first applies to the under-

lying representation, and then reinterpretation of the syllable structure follows if necessary. The template (51) is not applicable to the phonetic representation because a palatalized fricative s can be in the coda: [gassoo] 'chorus' is derived by gaku - syoo/, as in (a-c).

	/gaku syoo/
a. Palatalization	gaku ʃoo
b. High Vowel Deletion (cf. Haraguchi (1976))	gak ʃoo
c. ASSM	gaʃ ʃoo
Output	[gaʃʃoo]

Resyllabification, interpreting gak as a new syllable, would follow the High Vowel Deletion in (b).

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