Travaux du 19ème CIL | 19th ICL papers
Congrès International des Linguistes, Genève 20-27 Juillet 2013
International Congress of Linguists, Geneva 20-27 July 2013

19th International
Congress of Linguists
July 21-27 2013
Geneva - Switzerland

Shin-ichiro SANO

Okayama Prefectural University
shinichirosano@gmail.com

Modeling the Sequential Changes of Verbal Inflections in Potential Forms in Japanese

oral presentation in session: 4 Phonology and Morphology (Marc van Oostendorp)

Published and distributed by: Département de Linguistique de l'Université de Genève, Rue de Candolle 2, CH-1205 Genève, Switzerland
Editor: Département de Linguistique de l'Université de Genève, Switzerland
ISBN:978-2-8399-1580-9

Modeling the Sequential Changes of Verbal Inflections in Potential Forms in Japanese*

Shin-Ichiro Sano

Okayama Prefectural University

shinichirosano@gmail.com

Abstract: In Japanese, a series of morphophonological changes that reorganizes the verbal inflectional paradigm is currently underway. The changes in potential forms are serially rendered by three innovative processes named *ar*-Deletion, *ra*-Deletion, and *re*-Insertion, respectively. This paper addresses these morphophonological changes in the Japanese potential forms, and models the mechanism that governs these sequential changes in potential forms, using the *Corpus of Spontaneous Japanese*. Assuming the chronological order of these changes, we can argue that the initial change in consonant verbs is motivated by the semantic disambiguation; the subsequent change in vowel verbs is triggered by analogical leveling for the optimization of the conjugation paradigm, and it reorganizes the paradigm in order to reduce the increased discrepancy between potential forms of consonant verbs and of vowel verbs caused by the preceding change. I propose that this two-step process is the core mechanism of the changes in potential forms.

Keywords: analogical leveling, semantic disambiguation, corpus, morphophonology, paradigm, insertion, deletion

1. Introduction

In Japanese, a series of morphophonological changes that reorganizes the verbal inflectional paradigm is currently underway. This innovation in potential forms has lasted over 400 years (from the 16th century on). The changes are created by the serial application of three innovative processes named (i) *ar*-Deletion (Aoki, 1993; Hibiya, 1999; Sato, 1977; Shibuya, 1990; Yamaguchi & Akimoto, 2001), (ii) *ra*-Deletion (Fukushima, 2004; Inoue, 1998; Ito & Mester, 2004; Kanda, 1964; Kinsui, 2003; Matsuda, 1993; Nakamura, 1953; Sano, 2010, 2011; Shibuya, 1990), and (iii) *re*-Insertion (Inoue & Yarimizu, 2002; Sano, 2010, 2011; Shin, 2004; Shioda, 2000), respectively.

This previous research has extensively examined each of these phenomena, with respect to the linguistic as well as the social (extra-linguistic) factors, both from a theoretical angle as well. Some have contributed to our understanding of the interaction between the changes and social factors (e.g. Matsuda, 1993; Sano, 2011), while others have contributed to linguistic theory in general (e.g. Fukushima, 2004; Ito & Mester, 2004; Sano, 2011). However, because each of the phenomena has mostly been analyzed independently with distinct focuses and methodologies, a unifying account of the three morphophonological phenomena is still lacking. Furthermore, previous work has emphasized intuition-based and dictionary-based data, while data from spontaneous speech such as those from large-scale corpora have rarely been conducted. Thus, at this point the underlying mechanism governing the changes is not yet completely understood. This paper, therefore, further examines these morphophonological changes in the Japanese potential forms with the following objective. I propose a unified account

to these seemingly separate phenomena, and propose a single mechanism that governs the sequential changes in potential forms. The proposed model is based on an empirical analysis of the three changes in the *Corpus of Spontaneous Japanese* (henceforth CSJ, Kokuritsu Kokugo Kenkyuujo, 2008).

The remainder of this paper is organized as follows. Section 2, describes the verbal inflections and the potential forms in Japanese, and the properties of each innovative process. Section 3 presents the quantitative examination of the changes. Based on the result of the quantitative examination, Section 4 proposes a model of the changes. Finally, Section 5 concludes the discussion.

2. Background

In this section, I first describe the verbal inflections and the potential forms in Japanese. Subsequently, I present the properties of each of the innovative processes. In doing so, I clarify the issues to be discussed in the following sections.

2.1. Verbal inflections in Japanese

Japanese verb stems are classified into two types: one type is a consonant verb that has a stem ending in a consonant (as in *ik*- 'go,' and *nom*- 'drink'); and the other type is a vowel verb that has a stem ending in a vowel (as in *mi*- 'see,' and *tabe*- 'eat') (Bloch, 1946). Each of the inflectional forms in Japanese is obtained by attaching the suffixes to verb stems. As shown in Table 1, the difference in the types of verbs produces allomorphy in the verbal inflectional paradigm; in other words, the suffixes undergo morphophonological alternation, in such a way that the consonant verbs and

the vowel verbs take distinct inflectional suffixes.

Table 1. Verbal inflections in Japanese[1]

Inflectional form	Consonant verb (e.g. *ik*-)	Vowel verb (e.g. *mi*-)
Present indicative	ik-u	mi-ru
Imperative	ik-e	mi-ro
Conditional	ik-eba	mi-reba
Causative	ik-ase-	mi-sase-
Passive	ik-are-	mi-rare-
Honorific	ik-are-	mi-rare-
Spontaneous	ik-are-	mi-rare-

Table 1 illustrates the suffix allomorphy for representative inflectional forms. The passive, honorific and spontaneous forms take identical suffixes, *-are-* for consonant verbs and *-rare-* for vowel verbs. The crucial point for the following discussions is that the consonant verbs take vowel-initial suffixes; on the other hand, the vowel verbs take consonant-initial suffixes. This alternation is partly driven by the strong preference for the CV syllable structure in Japanese (Ito, 1989; Kubozono, 1989; Labrune, 2012). Furthermore, except for the imperative forms, the difference between the suffixes for the consonant verbs (in the middle column) and those for the vowel verbs (in the right column) can be reduced to the presence/absence of initial consonants. For example, for the present indicative, consonant verbs take *-u* as in *ik-u*; on the other hand, vowel verbs take *-ru* as in *mi-ru*, and hence the difference between these two suffixes is the

presence/absence of *r*. The potential forms, however, does not follow this pattern. In the next section, I will describe the suffix allomorphy of the potential forms in more detail.

2.2. Potential forms

Next, I describe the suffix allomorphy in potential forms. The potential forms presented here are based on the current norm for Standard Japanese.[2]

Table 2. Suffix allomorphy in potential forms

Inflectional form	Consonant verb	Vowel verb
Potential	ik-e-	mi-rare-
	nom-e-	tabe-rare-

(1) asita-wa gakkoo-ni ik-e-nai.
tomorrow-TOP school-LOC go-POT-Neg.NonPast
'Tomorrow, (I) cannot go to the school.'

(2) kokode hosi-ga mi-rare-ru.
here star-NOM see-POT-NonPast
'(We) can gaze at the stars here.'

As shown in Table 2, and examples (1) and (2), consonant verbs take the potential suffix *-e-*, as in *ik-e-* 'can go,' and *nom-e-* 'can drink.' Vowel verbs, on the other hand, take the potential suffix *-rare-*, whose initial segment is a consonant, as in *mi-rare-* 'can

see,' and *tabe-rare-* 'can eat.' Unlike other inflectional forms, potential forms do not follow the pattern observed in the verbal inflectional paradigm, that is, consonant verbs take *-e-*; on the other hand, vowel verbs take *-rare-*, and hence the difference between these two suffixes is the presence/absence of *rar*, instead of *r* alone.

2.3. Innovative processes

The morphophonological changes in the potential forms in Japanese are created by serial application of three kinds of innovative processes, *ar*-Deletion, *ra*-Deletion, and *re*-Insertion. The application of these processes produces the sequential changes in potential forms. In this section, I describe the properties of the innovative processes one by one. An overview of the different phases in the sequential changes is presented in Figure 1.

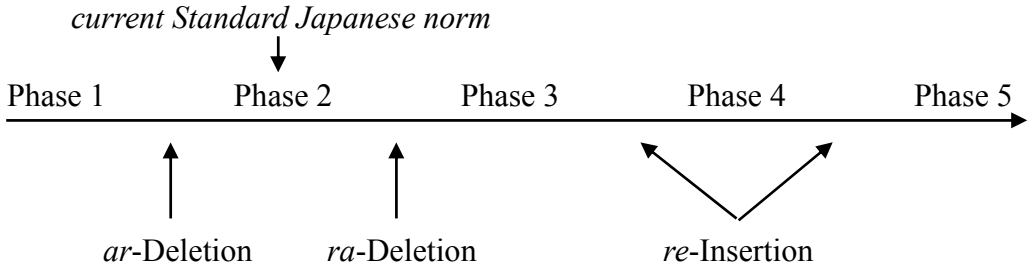

Figure 1. Phases in the sequential changes

Specifically, *ar*-Deletion proceeded the change from Phase 1 to Phase 2; *ra*-Deletion proceeded the change from Phase 2 to Phase 3; and *re*-Insertion proceeded the change from Phase 3 to Phase 4 and from Phase 4 to Phase 5. Additionally, the current norm reflects the potential forms in Phase 2. This means that there is a gap

between the norm and actual usage.

2.3.1. *ar*-Deletion

As mentioned above, *ar*-Deletion proceeded the change from Phase 1 to Phase 2. This innovative process has been observed since the 16th century, at the end of Muromachi period, and the change has almost finished (Shibuya, 1990; Yamaguchi & Akimoto, 2001). Importantly, only consonant verbs are subject to *ar*-Deletion; in other words, the change that potential forms of consonant verbs underwent in this time period is interpreted as the consequence of *ar*-Deletion. Unlike the current norm, potential forms for consonant verbs in this time period (Phase 1) were derived by attaching the potential suffix *-are-* to verb stems. That is, the potential forms took the same suffix as passive, honorific, and spontaneous forms did (see Table 1). Thus, the potential suffix subject to *ar*-Deletion is *-are-* (Aoki, 1993; Hibiya, 1999; Sato, 1977; Shibuya, 1990; Yamaguchi & Akimoto, 2001). I will present some examples of the traditional variant (1) and of the innovative variant (2) in consonant verbs that were observed in the CSJ.

(1) Examples of the traditional variant in consonant verbs

a. gaikoku-ni nanka ik-<u>are</u>-nai. (S00M0213)[3]
foreign country-LOC NPI go-POT-Neg.NonPast
'(I) can never go to foreign countries.'

b. kono kata-to-nara nakayoku yatteik-<u>are</u>-ru. (S01F1388)
this person-with-if friendly get along-POT-NonPast
'With this person, (I) can get along.'

c. mono-o tabe-nakereba iki-te-ik-<u>are</u>-nai. (S07F1002)

thing-ACC eat-Neg.COND live-TE-go-POT-Neg.NonPast

'Without eating, (we) cannot survive.'

(2) Examples of the innovative variant in consonant verbs

a. yutorinoaru kaigairyokoo-mo ik-<u>e</u>-ru. (A07F0908)

leisurely foreign travel-too go-POT-NonPast

'(I) can make a leisurely foreign trip, too.'

b. kanjoo-o arawas-<u>e</u>-ru. (A07F0908)

emotion-ACC express-POT-NonPast

'(I) can express emotions.'

c. meikakuna kotae-ga das-<u>e</u>-nai. (S00M0061)

clear answer-NOM provide-POT-Neg.NonPast

'(I) cannot provide a clear answer.'

The traditional variant of the potential for a consonant verb comprises the verb stem and the potential suffix *-are-*; on the other hand, *ar*-Deletion yields the innovative variant that comprises the verb stem and *-e-*. The crucial difference between the traditional variants and the innovative variants is that the segments *ar* are deleted in the innovative forms. Thus, *ar*-Deletion produces the change in potential forms for consonant verbs in such a way that the traditional variants such as *ik-are-* 'can go' and *nom-are-* 'can drink' change to the innovative variants *ik-e-* and *nom-e-* as shown in Figure 2.

ar-Deletion => Changes in potential suffix attached to consonant verb stems

	Phase 1		*Phase 2*
ik- ‘go’	ik-<u>are</u>-	=>	ik-<u>e</u>-
nom- ‘drink’	nom-<u>are</u>-	=>	nom-<u>e</u>-

Figure 2. Changes in the potential suffix from Phase 1 to Phase 2

2.3.2. *ra*-Deletion

Ra-Deletion produced the change from Phase 2 to Phase 3. This innovative process has been observed since the 1920s, at the time of the early Showa period, and is regarded as a change in progress (Kindaichi et al., 1995). Unlike *ar*-Deletion, *ra*-Deletion affected only vowel verbs. To put it differently, the change that potential forms of vowel verbs underwent in this time period is interpreted as the consequence of *ra*-Deletion. The potential forms for vowel verbs in this time period (from Phase 1 to Phase 2) are derived by attaching the potential suffix *-rare-* to verb stems. That is, similar to consonant verbs, the potential forms for vowel verbs also take the same suffix as the passive, honorific, and spontaneous forms do (see Table 1). Thus, the potential suffix subject to *ra*-Deletion is *-rare-* (Fukushima, 2004; Ito & Mester, 2004; Kanda, 1964; Kinsui, 2003; Matsuda, 1993; Nakamura, 1953; Sano, 2010, 2011; Shibuya, 1990).[4] I will present some examples of the traditional variant (3) and of the innovative variant (4) in vowel verbs.

(3) Examples of the traditional variant in vowel verbs

a. wazukana okane-de ironna mono-ga tabe-rare-ru. (S11F1157)
a little money-by various things-NOM eat-POT-NonPast
'(We) can eat various foods with only a little money.'

b. siai-ni-wa de-rare-masen-desita. (S01M0158)
match-DAT-TOP participate-POT-Neg.POL-COP.Past
'(I) could not participate in the match.'

c. jittchi-no siken-wa uke-rare-nai. (S04F0069)
field-GEN test-TOP take-POT-Neg.NonPast
'(We) cannot take the field-test.'

(4) Examples of the innovative variant in vowel verbs

a. aruite-mo nijuppun-de-wa ko-re-masu. (S03F1443)
by foot-even twenty minutes-by-TOP come-POT-POL.NonPast
'Even by foot, (we) can come in twenty minutes.'

b. mawari-ga mattaku mi-re-naku-naru. (S00M0475)
around-NOM completely look-POT-Neg-become.NonPast
'(We) completely lose sight of our surroundings.'

c. hokani-mo kangae-re-ru-ndesu-ga. (A03M0555)
other-too think-POT-NonPast-POL-but
'(We) can also think of others, but...'

The traditional variant of the potential for a vowel verb comprises the verb stem

and the potential suffix -*rare*-, while *ra*-Deletion produces the innovative variant that comprises the verb stem and -*re*- that is the reduced form of the potential suffix -*rare*-. The crucial difference between the traditional variants and the innovative variants is that the syllable *ra* is deleted in the latter. Thus, *ra*-Deletion produces the change in potential forms for vowel verbs in the following manner: the traditional variants such as *mi-rare-* 'can see' and *tabe-are-* 'can eat' change to the innovative variants such as *mi-re-* and *tabe-re-* as shown in Figure 3. At this stage where consonant verbs have undergone *ar*-Deletion and vowel verbs have undergone *ra*-Deletion, the suffixes representing the potential forms for both consonant verbs and vowel verbs become distinct (-*e*-, and -*re*-) from those representing the passive, honorific, and spontaneous forms (-*are*-, and -*rare*-).

ra-Deletion => Changes in potential suffix attached to vowel verb stems

	Phase 2		*Phase 3*
mi- 'see'	mi-<u>rare</u>-	=>	mi-<u>re</u>-
tabe- 'eat'	tabe-<u>rare</u>-	=>	tabe-<u>re</u>-

Figure 3. Changes in the potential suffix from Phase 2 to Phase 3

2.3.3. *re*-Insertion

Re-Insertion produced the changes from Phase 3 to Phase 4, and from Phase 4 to Phase 5. This innovative process has been observed since the 1990s, at the beginning of Heisei period, and the change is currently underway (Shioda, 2000; Inoue & Yarimizu, 2002). Unlike the previous two deletion processes, *re*-Insertion was initially observed in

consonant verbs, followed by vowel verbs, producing the change from Phase 3 to Phase 4. After the application of *ar*-Deletion (from Phase 2 to Phase 3), potential forms for consonant verbs are derived by attaching the potential suffix *-e-* to verb stems. Thus, the potential suffix subject to *re*-Insertion is *-e-* (Inoue & Yarimizu, 2002; Sano, 2010, 2011; Shin, 2004; Shioda, 2000). I present some examples of the innovative variant (5) in consonant verbs. Because the potential forms in consonant verbs at this time period (Phase 3) have undergone *ar*-Deletion, the traditional variant here is same as the innovative variant presented in (2).

(5) Examples of the innovative variant in consonant verbs (after *ar*-Deletion)

a. sinu-made soko-de sum-ere-tara. (S03M0570)
die-until there-LOC live-POT-COND
'If (I) could live there, I would - for the rest of my life.'

b. kou-iu siki-de arawas-ere-ru. (A07M0956)
like this formula-by express-POT-NonPast
'(We) can express (it) in this kind of formula.'

c. yuuzai-ni motteik-ere-ru. (S04M1512)
guilty-DAT take-POT-NonPast
'(We) can get a conviction.'

The traditional variant of the potential for a consonant verb comprises the verb stem and the potential suffix *-e-*; on the other hand, *re*-Insertion produces the innovative variant that comprises the verb stem and *-ere-* with the additional syllable *re*. The

crucial difference between the traditional variants and the innovative variants is that the syllable *re* is inserted in the latter. Thus, *re*-Insertion produces the second change in potential forms for consonant verbs in the following manner: the traditional variants such as *ik-e-* ‘can go’ and *nom-e-* ‘can drink’ change to the innovative variants such as *ik-ere-* and *nom-ere-* as shown in Figure 4.

re-Insertion => Changes in potential suffix attached to consonant verb stems

	Phase 3		*Phase 4*
ik- ‘go’	ik-e-	=>	ik-ere-
nom- ‘drink’	nom-e-	=>	nom-ere-

Figure 4. Changes in the potential suffix from Phase 3 to Phase 4

Re-Insertion subsequently diffused to vowel verbs, and produced the change from Phase 4 to Phase 5. After the application of *ra*-Deletion (from Phase 3 to Phase 4), potential forms for vowel verbs are obtained by attaching the potential suffix *-re-* to verb stems. Thus, the potential suffix subject to *re*-Insertion is *-re-* (Inoue & Yarimizu, 2002; Sano, 2010, 2011; Shin, 2004; Shioda, 2000). I will present some examples of the innovative variant (6) in vowel verbs. Because the potential forms in vowel verbs at this time period (Phase 4) have undergone *ra*-Deletion, the traditional variant here is same as the innovative variant presented in (4).

(6) Examples of the innovative variant in consonant verbs (after *ra*-Deletion)

a. subete jibun-de kime-rere-ru. (S08M1255)
everything self-by decide-POT-NonPast
'(I) can decide everything by myself.'

b. sono kodomo-mo kendo-no boogu-o tuke-rere-ru. (S08M1255)
that child-too Kendo-GEN protector-ACC wear-POT-NonPast
'Also the child can wear Kendo gear.'

c. itiban-dearu yoona mono-o uke-rere-ru-nodeareba. (S08M1255)
best-COP like thing-ACC take-POT-NonPast-AUX
'If (I) can take one that is like one of the best.'

The traditional variant of the potential for a vowel verb comprises the verb stem and the potential suffix *-re-*; on the other hand, *re*-Insertion produces the innovative variant that comprises the verb stem and *-rere-* with the additional syllable *re*. The crucial difference between the traditional variants and the innovative variants is that the syllable *re* is inserted in the latter. Thus, *re*-Insertion produces the second change in potential forms for vowel verbs in such a way that the traditional variants such as *mi-re-* 'can see' and *tabe-re-* 'can eat' change to the innovative variants such as *mi-rere-* and *tabe-rere-* as shown in Figure 5.

re-Insertion => Changes in potential suffix attached to vowel verb stems

	Phase 4		*Phase 5*
mi- ‘see’	mi-re-	=>	mi-rere-
tabe- ‘eat’	tabe-re-	=>	tabe-rere-

Figure 5. Changes in the potential suffix from Phase 4 to Phase 5

As we saw in this section, the previous studies identified the properties of each of the phenomena. However, in order to shed light on the global picture of the change and on the mechanism behind the whole change, I conducted an empirical study of the use of these variants in a large-scale corpus of spontaneous speech. The next section presents the quantitative analysis of these data.

3. Quantitative analysis

This section presents the quantitative analysis. The purposes of using a speech corpus are summarized as follows, (i) to understand the current distribution or usage of potential forms, (ii) to understand the progress of the changes, and (iii) to confirm the order of the changes proposed in the previous studies, as illustrated in Figure 6.

ar-Deletion => *ra*-Deletion => *re*-Insertion (C-verb) => *re*-Insertion (V-verb)

(from 16c.) (from the 1920s) (from the 1990s) (from C-verb to V-verb)

Figure 6. Order of the changes in potential forms

(C-verb: consonant verb, V-verb: vowel verb)

I first present the method of the data collection and of the analysis. Subsequently, I present the results and the discussion on the current distribution and the chronological change.

3.1. Method

To investigate the current distribution of the potential forms and how the changes proceed, I searched through the CSJ (Kokuritsu Kokugo Kenkyuujo, 2008). This is one of the largest corpora in spoken Japanese, based on 662 hours of speech with 7.5 million words, produced by a total of 1417 speakers. This corpus is large in size and comes with a rich annotation system. Most of the samples are monologues. These monologues are classified into two types: "Academic Presentation Speech (APS)" and "Simulated Public Speaking (SPS)." APS samples are live recordings of academic presentations at the meetings of various academic societies. SPS samples, on the other hand, are general remarks or comments by laypeople on everyday topics like "a joyful memory in my life," "the town I live in," "commentary on recent news" and so on. Most APS and SPS samples are 10-15 minutes long. In general, APS samples are characterized by a stiff, formal speaking style, whereas SPS samples are characterized by a relatively more casual and informal style. Thus, in general, APS and SPS samples represent two different speech styles according to their different social contexts.

I retrieved the target items from the CSJ in the following manner: (i) I used *YokkaGrep* (http://www.yokkasoft.net/) that is an editor for general purposes, (ii) all sub-corpora of the CSJ were targeted, every utterance in the CSJ was included, and (iii) I employed the phonetic transcription provided by "TRN-SJIS" files.[5] The retrieved

data was then further refined to meet the following conditions. Especially, in cases where potential forms are identical to passive, honorific, and spontaneous forms (the traditional variant in consonant verbs in Phase 1 (before *ar*-Deletion), such as *ik-are-*, and *nom-are-*, and the traditional variant in vowel verbs in Phase 1 and Phase 2 (before *ra*-Deletion), such as *mi-rare-*, and *tabe-rare-*), the data were manually examined with reference to the context, and forms other than potential forms were excluded from the dataset.

In the analysis, I assumed the apparent-time hypothesis (Bailey, 2002), where the difference in speakers' birth-year corresponds to the apparent flow of time. That is, utterances produced by the speakers in older generations represent the properties of the dialect/language in the past. Utterances produced by the speakers in younger generations, on the other hand, represent the recent trends thereof. Thus, there should be the temporal gap between these two kinds of utterances. By comparing the utterances by speakers in different generations, we can derive the manner with which the changes proceed. Although past speeches cannot be directly observed, this method makes it possible to investigate linguistic changes at the same point in time.

3.2. Current distribution

In this section, I present the analysis of the current distribution of the potential forms, based on the data retrieved from the CSJ following the method previously mentioned. An exhaustive search of the CSJ provided the dataset consisting of 13,176 tokens of potential forms. The variants were limited to either the innovative variant or the traditional variant. This primary classification constitutes the basis of the following

analysis. The rate of innovative variant is calculated based on this variable. The breakdown of the dataset is shown in Table 3.

Table 3. Distribution of innovative and traditional variants of potential forms in the CSJ

Process	Innovative	Traditional	Rate of innovative variant (%)
ar-Deletion	1,304	37	97.24
ra-Deletion	543	7,615	6.66
re-Insertion (C-verb)	9	1,296	0.69
re-Insertion (V-verb)	11	2,361	0.46

In Table 3, the innovative variants represent the tokens that underwent processes specified in the leftmost column, the traditional variants represent the tokens that did not undergo the processes and remain intact. As Table 3 shows, the rate of *ar*-Deleted variants is close to 100%, suggesting that the change of *ar*-Deletion has almost completed.[6] The rates of *ra*-Deleted, and *re*-Inserted variants are less than 10%. This suggests that these changes are currently in progress.[7] Furthermore, the rate of *re*-Inserted variants for consonant verbs is higher than the one for vowel verbs. This suggests that the change of *re*-Insertion started with consonant verbs, and has diffused to vowel verbs.

On the assumption that changes spread gradually and the rates of each innovative variant reflect the degree of progression (the higher the rate of an innovative form, the more advanced the change), the order of the three changes would be *ar*-Deletion => *ra*-Deletion => *re*-Insertion (consonant verbs) => *re*-Insertion (vowel verbs). This is

consistent with the previous observations: *ar*-Deletion has been observed since the 16th century, *ra*-Deletion has been observed since the 1920s, and *re*-Insertion has been observed since the 1990s, after which it diffused to vowel verbs.

3.3. Chronological transition

With the current distribution of the potential forms in mind, I will in turn present the chronological transition of the changes, more specifically, I will discuss how the changes have proceeded. Figure 7 illustrates the chronological changes in the rates of three innovative forms, according to the birth-year of speakers with 10-year increments. The rate of *re*-Inserted forms is not presented separately for consonant verbs and for vowel verbs, as I did not obtain sufficient number of tokens of *re*-Inserted forms.

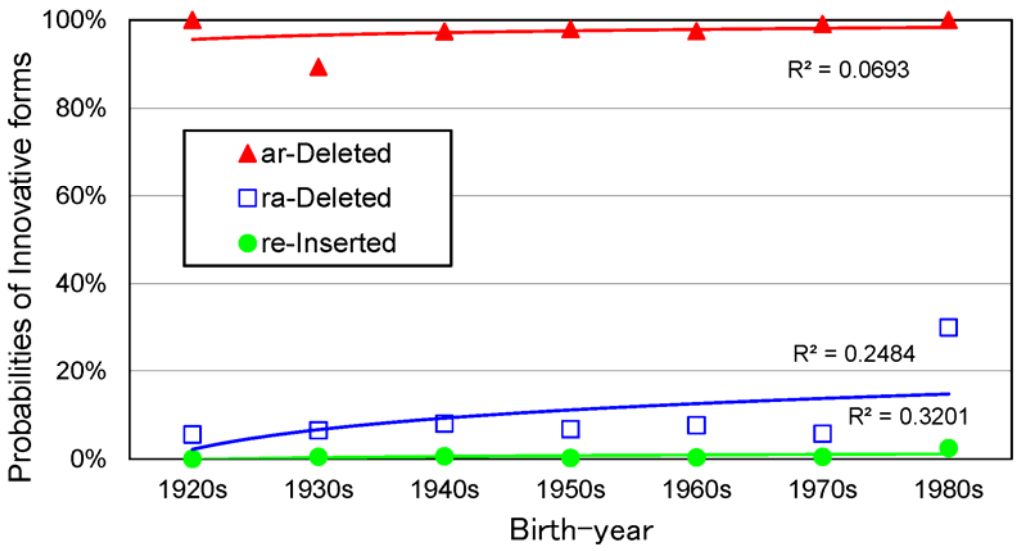

Figure 7. Chronological changes in the rates of innovative forms[8,9]

As Figure 7 shows, across every birth-year decade, the rate of *ar*-Deleted forms is consistently the highest, the rate of *ra*-Deleted forms is the next highest, and the rate of

re-Inserted forms is the lowest. The result supports the order of the changes. Also, the rate of *ra*-Deleted forms gradually rises as speakers' birth-year becomes more recent. This suggests that *ra*-Deletion is currently in the intermediate stage of the change. The rates of other innovative forms, on the other hand, are consistently close to 100% or 0% with little fluctuation, suggesting that the change of *ar*-Deletion has almost finished, and the change of *re*-Insertion has just began.

To summarize, in this section we confirmed the order of the changes proposed in the previous literature: *ar*-Deletion was observed first followed by *ra*-Deletion, subsequently, *re*-Insertion affected consonant verbs, and finally *re*-Insertion diffused into vowel verbs. As illustrated in Figure 8, the change in the potential suffix following consonant verb stems is summarized as follows: the potential suffix originally takes the -*are*- form, then *ar*-Deletion applies, resulting in the -*e*- form, and finally *re*-Insertion applies, resulting in the -*ere*- form. Similarly, the change in vowel verbs is summarized as follows: The potential suffix originally takes the -*rare*- form, then *ra*-Deletion applies, resulting in the -*re*- form, and finally *re*-Insertion applies, resulting in the -*rere*- form. Based on the results of the quantitative analysis, the next section discusses the underlying mechanism that governs the changes.

Change in the potential suffix attached to consonant verb stems

		ar-Deletion		*re*-Insertion	
ik- ‘go’	ik-are-	=>	ik-e-	=>	ik-are-
nom- ‘drink’	nom-are-	=>	nom-e-	=>	nom-are-

Change in the potential suffix attached to vowel verb stems

		ra-Deletion		*re*-Insertion	
mi- ‘see’	mi-rare-	=>	mi-re-	=>	mi-rere-
tabe- ‘eat’	tabe-rare-	=>	tabe-re-	=>	tabe-rere-

Figure 8. Changes in the potential suffixes for consonant verbs and vowel verbs

4. Modeling

This section presents a unified model of the underlying mechanism that governs the sequential changes in potential forms. Firstly, I perform the phase-by-phase analysis of the changes and the causes, and subsequently propose the model of the changes in potential forms.

4.1. From Phase 1 to Phase 2 (*ar*-Deletion)

To begin with, let us consider the change from Phase 1 to Phase 2, where *ar*-Deletion comes into play. As mentioned above, in the oldest paradigm (Phase 1), the potential forms for consonant verbs take the same suffix as passive, honorific, and spontaneous forms (-*are*-); in other words, a single suffix had four distinct meanings, as shown in Table 4.

Table 4. Verbal inflections for consonant verbs (Phase 1 => Phase 2)

Phase	Meaning	Consonant verb (e.g. *ik*-)
1	Passive, Honorific, Spontaneous, Potential	ik-are-
	⇩	
2	Passive, Honorific, Spontaneous	ik-are-
	Potential	ik-e- (*ar*-Deleted)

In Phase 1, the consonant verbs express passive, honorific, spontaneous, and potential meanings by taking the suffix -*are*-. In Phase 2, however, passive, honorific and spontaneous forms remain -*are*-; on the other hand, potential forms that have undergone *ar*-Deletion take the *ar*-Deleted suffix -*e*-. That is, due to the application of *ar*-Deletion driven by analogical leveling, potential forms took suffix forms different from the passive, honorific, and spontaneous forms. As a result, the suffix -*are*- that has four meanings in Phase 1 has three meanings in Phase 2. At the same time, the potential meaning is expressed only by the new suffix -*e*-. Introducing the innovative potential suffix reduced the number of meanings that each of the suffixes has, and the four meanings involved in a single suffix -*are*- is disambiguated. Therefore, we can argue that semantic disambiguation triggers *ar*-Deletion and the change from Phase 1 to Phase 2.

4.2. From Phase 2 to Phase 3 (*ra*-Deletion)

In the change from Phase 2 to Phase 3, *ra*-Deletion comes into play. The application of *ar*-Deletion contributed to semantic disambiguation, but at the same time

it created the larger gap in allomorphy in Phase 2. In Phase 1, the difference between the potential suffixes for consonant verbs and for vowel verbs is only the presence/absence of initial *r* (*-are-* for consonant verbs and *-rare-* for vowel verbs). In Phase 2, however, the difference is the presence/absence of three segments *rar* (*-e-* for consonant verbs and *-rare-* for vowel verbs) as Table 5 shows, because *ar*-Deletion deleted the segments *ar* in *-are-* for consonant verbs, and produced the reduced form *-e-*.

Table 5. Verbal inflections (Phase 2 => Phase 3)

Inflectional form	Consonant verb (e.g. *ik-*)	Vowel verb (e.g. *mi-*)
Present indicative	ik-u	mi-ru
Imperative	ik-e	mi-ro
Conditional	ik-eba	mi-reba
Causative	ik-ase-	mi-sase-
Passive, Honorific, Spontaneous	ik-are-	mi-rare-
Potential (Phase 2)	ik-e- (*ar*-Deleted)	mi-rare-
	⇩	
Potential (Phase 3)	ik-e- (*ar*-Deleted)	mi-re- (*ra*-Deleted)

Subsequently, *ra*-Deletion was applied to vowel verbs in Phase 3. *Ra*-Deletion deleted the segments *ra* in *-rare-* for vowel verbs, and produced the reduced form *-re-*. As a result, consonant verbs take *-e-*, and vowel verbs take *-re-*. The difference was again put back in place, i.e., the presence/absence of initial *r* that is the pattern consistent with other inflectional forms. Thus, *ra*-Deletion created the straightforward

paradigm, where the suffix allomorphy is the presence/absence of an initial consonant. In other words, the potential suffix for vowel verbs was reduced to *-re-*, reducing the discrepancy between the allomorphs to the presence/absence of an initial consonant, and thus increasing consistency across the entire inflectional paradigm. This is consistent with previous research on analogical leveling (Fukushima, 2004; Ito & Mester, 2004; Matsuda, 1993; Paul, 1970)[10]. Therefore, we can argue that analogical leveling triggers *ar*-Deletion and the change from Phase 2 to Phase 3.

In addition to analogical leveling, *ra*-Deletion is also associated with semantic disambiguation. Similar to the inflections for consonant verbs, the potential forms for vowel verbs also take the same suffix as passive, honorific, and spontaneous forms (*-rare-*); in other words, a single suffix had four distinct meanings, as shown in Table 6.

Table 6. Verbal inflections for vowel verbs (Phase 2 => Phase 3)

Phase	Meaning	Consonant verb (e.g. *mi-*)
2	Passive, Honorific, Spontaneous, Potential	mi-rare-
	⇩	
3	Passive, Honorific, Spontaneous	mi-rare-
	Potential	mi-re- (*ra*-Deleted)

In Phase 2, the suffix *-rare-* following a consonant verb expressed four meanings. In Phase 3, however, passive, honorific and spontaneous forms still took *-rare-*; but potential forms that had undergone *ra*-Deletion took the *ra*-Deleted suffix *-re-*. That is, due to the application of *ra*-Deletion driven by analogical leveling, potential forms took

suffix forms different from the passive, honorific, and spontaneous forms. As a result, the suffix *-rare-*, which had four meanings in Phase 2, only had three meanings in Phase 3. At the same time, the potential meaning is expressed only by the new suffix *-re-*. Introducing the innovative potential suffix reduced the number of meanings that each of the suffixes has, and the four meanings involved in a single suffix *-rare-* is disambiguated (Fukushima, 2004; Ito & Mester, 2004). Therefore, we can argue that semantic disambiguation is associated with *ra*-Deletion and the change from Phase 2 to Phase 3.

4.3. From Phase 3 to Phase 4 (*re*-Insertion for consonant verbs)

The change from Phase 3 to Phase 4 is driven by *re*-Insertion. Traditionally, the difference in potential meaning is not expressed by suffixes. However, *re*-Insertion enhances the potentiality expressed by potential forms. That is, the potential meaning expressed by potential forms with *re*-Deleted suffix such as *ik-ere-* is more clearly understood by hearers (Inoue & Yarimizu, 2002).[11] As shown in Table 7, in Phase 3, the suffix following a consonant verb stem does not make a distinction between potential meanings, using *-e-* regardless of the potentiality.

Table 7. Verbal inflections for consonant verbs (Phase 3 => Phase 4)

Phase	Meaning	Consonant verb (e.g. *ik*-)
3	(Enhanced) Potential	ik-e-
		
4	Potential	ik-e-
	Enhanced Potential	ik-ere- (*re*-Inserted)

In Phase 3, the suffix following consonant verb stems expresses potential as well as enhanced potential meanings by taking the suffix *-e-*. In Phase 4, however, the potential forms remain as *-e-*; while the enhanced potential forms that have undergone *re*-Insertion take the *re*-Inserted suffix *-ere-*. That is, due to the application of *re*-Insertion, enhanced potential forms become unique. As a result, the suffix *-e-* that had two meanings in Phase 3 has only a single meaning in Phase 4. At the same time, the enhanced potential meaning is expressed by the new suffix *-ere-*. Introducing the innovative potential suffix reduced the number of meanings that each of the suffixes has, resulting in *re*-Insertion creating a contrast in potential meaning. Therefore, we can argue that semantic disambiguation again causes *re*-Insertion and the change from Phase 3 to Phase 4.

4.4. From Phase 4 to Phase 5 (*re*-Insertion for vowel verbs)

Re-Insertion also triggers the change from Phase 4 to Phase 5. The application of *re*-Insertion to consonant verbs contributed to semantic disambiguation, but at the same time it created an idiosyncratic allomorphy in Phase 4. In Phase 3, the difference

between the potential suffixes for consonant verbs and for vowel verbs is only the presence/absence of initial *r* (*-e-* for consonant verbs and *-re-* for vowel verbs). In Phase 4, however, the difference is the presence/absence of the initial vowel, unlike other inflectional forms (*-ere-* for consonant verbs and *-re-* for vowel verbs), because *re*-Insertion inserted the syllable *re* into the suffix*-e-* for consonant verbs, producing *-ere-*.

Table 8. Verbal inflections (Phase 4 => Phase 5)

Inflectional form	Consonant verb (e.g. *ik-*)	Vowel verb (e.g. *mi-*)
Present indicative	ik-u	mi-ru
Imperative	ik-e	mi-ro
Conditional	ik-eba	mi-reba
Causative	ik-ase-	mi-sase-
Passive, Honorific, Spontaneous	ik-are-	mi-rare-
Potential (Phase 4)	ik-ere- (*re*-Inserted)	mi-re- (*ra*-Deleted)
	⇩	
Potential (Phase 5)	ik-ere- (*re*-Inserted)	mi-rere- (*re*-Inserted)

Subsequently, *re*-Insertion was applied to vowel verbs in Phase 5. *Re*-Insertion again inserted the syllable *re* to *-re* for vowel verbs, and produced the innovative suffix *-rere-*. As a result, consonant verbs take *-ere-*, and vowel verbs take *-rere-*. The difference was again put back in place, i.e., the presence/absence of initial *r* that is the pattern consistent with other inflectional forms. Thus, *re*-Insertion also created the

straightforward paradigm, where the suffix allomorphy is the presence/absence of an initial consonant. In other words, the potential suffix for vowel verbs was modified to *-rere-*, to reduce the discrepancy between the allomorphs to the presence/absence of an initial consonant, and thus increasing consistency across the entire inflectional paradigm. Therefore, we can again argue that analogical leveling causes *re*-Insertion and the change from the Phase 4 to Phase 5.

In addition to analogical leveling, *re*-Insertion is also associated with semantic disambiguation. That is, *re*-Insertion created the contrast in potential meaning also for vowel verbs, as shown in Table 9.

Table 9. Verbal inflections for consonant verbs (Phase 4 => Phase 5)

Phase	Meaning	Vowel verb (e.g. *mi-*)
4	(Enhanced) Potential	mi-re-
	⇩	
5	Potential	mi-re-
	Enhanced Potential	mi-rere- (*re*-Inserted)

In Phase 4, the consonant verbs express potential as well as enhanced potential meanings by taking the suffix *-re-*. In Phase 5, however, potential forms remain as *-re-*; while the enhanced potential forms that have undergone *re*-Insertion take the *re*-Inserted suffix *-rere-*. That is, due to the application of *re*-Insertion, enhanced potential forms become unique. As a result, the suffix *-re-* that had two meanings in Phase 4 has only a single meaning in Phase 5. At the same time, the enhanced potential meaning is

expressed by the new suffix -*rere*-. Introducing the innovative potential suffix reduced the number of meanings that each of the suffixes has, resulting in *re*-Insertion creating a contrast in potential meaning. Therefore, we can argue that semantic disambiguation is again associated with *re*-Insertion and the change from Phase 4 to Phase 5.

4.5. Mechanism

In this section, we will consider the underlying mechanism that governs the sequential changes by summarizing the results of the analysis in the previous sections. The pattern in the sequential changes is summarized as shown in Table 10.

Table 10. Summary of sequential changes

Phase	Consonant verb (e.g. *ik*-, *nom*-)	Vowel verb (e.g. *mi*-, *tabe*-)	Main factor
1	-are-	-rare-	NA
2	-e- (*ar*-Deleted)	-rare-	semantic disambiguation
3	-e-	-re- (*ra*-Deleted)	analogical leveling
4	-ere- (*re*-Inserted)	-re-	semantic disambiguation
5	-ere-	-rere- (*re*-Inserted)	analogical leveling

The first change from Phase 1 to Phase 2, motivated by semantic disambiguation, affected consonant verbs, and renders the innovative potential suffix -*e*- through the deletion of the segments *ar* from -*are*- (*ar*-Deletion), producing *ar*-Deleted forms, such as *ik*-*e*- and *nom*-*e*- (Shibuya, 1993, Yamaguchi and Akimoto, 2001). The second

change from Phase 2 to Phase 3, mainly motivated by analogical leveling (Paul, 1970), in turn affected vowel verbs, and renders the innovative potential suffix *-re-* through the deletion of the syllable *ra* from *-rare-* (*ra*-Deletion), producing the potential forms, such as *mi-re-* and *tabe-re-* (Fukushima, 2004; Ito & Mester, 2004; Matsuda, 1993). The third change from Phase 3 to Phase 4, motivated by semantic disambiguation, affected consonant verbs, and renders the innovative potential suffix *-ere-* through the insertion of the syllable *re* to *-e-* (*re*-Insertion), resulting in the potential forms, such as *ik-ere-* and *nom-ere-*. *Re*-Insertion subsequently diffused to vowel verbs motivated mainly by analogical leveling, and renders the innovative potential suffix *-rere* through the insertion of the syllable *re* into the suffix *-re-* (*re*-Insertion), yielding the potential forms such as *mi-rere-* and *tabe-rere-* (Inoue and Yarimizu, 2002). To summarize these processes, semantic disambiguation in consonant verbs creates the larger gap in allomorphy; subsequently, analogical leveling in vowel verbs optimizes the paradigm, that is, it reorganizes the paradigm in order to reduce the increased discrepancy between potential forms of consonant verbs and of vowel verbs caused by the preceding change.[12] Thus, I propose that the underlying mechanism governing the sequential changes is the cyclic application of this two-step process.

5. Conclusion

In this paper, I modeled the sequential changes of potential forms in Japanese. In the quantitative analysis using the CSJ, I confirmed the order of the changes. The diachronic pattern is summarized as follows: first, semantic disambiguation triggers the change in consonant verbs, and it expands the gap in the inflectional paradigm; then

analogical leveling triggers the change in vowel verbs, and reorganizes and optimizes the inflectional paradigm. This two-step process is the principle that governs the sequential changes. Additionally, semantic disambiguation applies first, and breaks the balanced paradigm; this implies that the forces motivating semantic disambiguation are stronger than those motivating analogical leveling or paradigm uniformity. If the sequence that I propose is correct, then we can predict that the next step in the change will be semantic disambiguation in consonant verbs; after which analogical leveling in vowel verbs will follow. In summary, this paper demonstrated the pattern with which the verbal inflectional paradigm sequentially changes, and pointed out the root causes of the changes.

I conclude by arguing that the findings of this corpus-based study could not have been obtained by more traditional (i.e., intuition-based and dictionary-based) studies. This emphasizes the importance of taking a variety of approaches in linguistic research.

References

Aoki, Hirofumi. (1996) Kanoodooshi-no seeritsu-nitsuite [On the emergence of potential verbs] *Gobun Kenkyuu* [Research on language and literature], 81, 1-12.

Bailey, Guy. (2002) Real and apparent time. In Chambers, J.K., Trudgill, Peter, & Schilling-Estes Natalie (Eds.), *The Handbook of Language Variation and Change*, (pp. 312-332). Oxford: Blackwell.

Bloch, Bernard. (1946) Studies on colloquial Japanese: II Syntax. *Language*, 22, 200-248.

Fukushima, Kazuhiko. (2004) Conspiracy of the form and function for optimization of language change. *Journal of East Asian Linguistics*, 20, 1-18.

Hibiya, Junko. (1999) Kotoba-no yure [Variation in languages]. In The Department of Linguistics, Sophia University (Ed.), *Gengo kenkyuu-no susume* [An encouragement of linguistic research], (pp. 58-61). Tokyo: Sophia University.

Inoue, Fumio (1998) *Nihongo watching* [Japanese-watching]. Tokyo: Iwanami.

Inoue, Fumio & Kanetaka Yarimizu. (2002) *Jiten-Atarashii Nihongo* [Dictionary: Innovative Japanese]. Tokyo: Toyo Shorin.

Ito, Junko. (1989) A prosodic theory of epenthesis. *Natural Language and Linguistic Theory*, 7, 217-259.

Ito, Junko & Armin Mester. (2004) Morphological Contrast and Merger: Ranuki in Japanese. *Journal of Japanese Linguistics*, 13, 181-196.

Kanda, Sumiko. (1964) Mireru, Dereru: Kanoohyoogen-no ugoki [Trends in potential expressions such as *mireru* and *dereru*]. In Kenji Morioka (Ed.), *Koogo bumpoo kooza 3: yureteiru bumpoo* [Courses in colloquial grammar 3: variation in grammar], (pp. 81-91). Tokyo: Meiji Syoin.

Kinsui, Satoshi. (2003) Ranuki kotoba-no rekishiteki kenkyuu [Historical research on *ra*-Deletion]. *Gengo* [Language], 32(4), 56-62.

Kokuritsu Kokugo Kenkyuujo. (2008) *Nihongo hanashikotoba koopasu* [The Corpus of Spontaneous Japanese], Version 2. Database.

Kubozono, Haruo. (1989) The mora and syllable structure in Japanese: evidence from speech errors. *Language and Speech*, 32(3), 249-278.

Labrune, Laurence. (2012) *The Phonology of Japanese*. Oxford: Oxford University Press.

Maekawa, Kikuo. (2004) Nihongo hanashikotoba koopasu-no gaiyoo [Overview of the Corpus of Spontaneous Japanese]. *Nihongo Kagaku* [Japanese linguistics], 15, 111-133.

Matsuda, Kenjiro. (1993) Dissecting analogical leveling quantitatively: The case of the innovative potential suffix in Tokyo Japanese. *Language Variation and Change*, 5, 1-34.

Nakamura, Michio. (1953) Koreru, mireru, tabereru nadotoiu iikata-nitsuiteno oboegaki [Notes on expressions such as *koreru*, *mireru*, and *tabereru*]. In Kindaichi hakase kokikinen rombun hensyuu kankookai (Ed.), *Kindaichi hakase kokikinen gengo, minzoku ronsoo* [Festschrift in linguistics and ethnology in honor of Dr. Kindaichi], (pp. 579-594). Tokyo: Sanseidoo.

Paul, Hermann. (1970) *Principles of the history of language*. (translated by Strong, Herbert A.) College Park, MD: McGroth Publishing Company.

Sano, Shin-Ichiro. (2010) Gendainihongo-no voisu-niokeru shinkootyuu-no gengohenka-nikansuru suuryooteki kenkyuu: Ranukikotoba, sairekotoba, retasukotoba-o reitoshite [Quantitative analysis of ongoing linguistic changes in grammatical voice in modern Japanese: Cases of *sa*-Insertion, *ra*-Deletion, and *re*-Insertion]. *Sophia Linguistica*, 57, 341–356.

Sano, Shin-Ichiro. (2011) Real-time demonstration of the interaction among internal- and external factors in language change: A corpus study. *Gengo Kenkyuu* [Linguistic Research], 139, 1-27.

Sato, Kiyoji (Ed.). (1977) *Kokugogaku kenkyuu jiten* [Dictionary of the study of Japanese language]. Tokyo: Meiji Syoin.

Shibuya, Katsumi. (1990) *Nihongo kanoohyoogen-no syosoo-to hatten* [Aspects and development of potential expressions in Japanese]. Doctoral dissertation, University of Osaka.

Shioda, Takehiro. (2000) Kotoba, kotoba, kotoba: ranuki-kara retasu-e [Language, language, and language: From *ra*-Deletion to *re*-Insertion]. *Hoosookenkyuu-to tyoosa* [Broadcast research], 50(8), 55.

Shin, Sojung. (2004) Linguistic vs. extra-linguistic determinants of re-tasu verb frequencies: A comparison of native speakers vs. Japanese language learners. *Mathematical Linguistics*, 24(6), 290-307.

Yamaguchi, Akiho & Morihide Akimoto (Eds.). (2001) *Nihongo bumpoo daijiten* [Dictionary of Japanese grammar]. Tokyo: Meiji Syoin.

Appendix: List of abbreviations

ACC: accusative	AUX: auxiliary	COND: conditional
COP: copula	DAT: dative	GEN: genitive
LOC: locative	NOM: nominative	NPI: negative polarity item
POL: polite form	POT: potential	TE: *te* form of the verb
TOP: topic marker		

* I would like to thank Kevin Heffernan, and the participants of the 19th International Congress of Linguists for their invaluable comments. I am also grateful to the members of the Swiss Linguistics Society and of the University of Geneva for their help organizing the conference. Any remaining faults are, of course, mine.

[1] The causative, passive, honorific, and spontaneous forms are followed by the suffixes such as -(*r*)*u* (present indicative) and -*ta* (past), while the present indicative, imperative, and conditional forms do not.

[2] Standard Japanese is a conservative variety based on the written language that is taught in schools, used in formal speech and writing, etc. By these standards, innovations such as those discussed in this paper, are generally considered as "grammatical errors," or at the very least, inappropriate colloquial language.

[3] The alphanumeric character at the end of each example (S00M0213) is the 'speech ID' which is used as the index of each sample in the CSJ. In each speech ID, the leading character 'A' indicates that the sample in question is classified as academic presentation speech (APS). 'S' indicates simulated public speaking (SPS), 'R' readings, 'D' dialogs, and 'M' others. The letter in the middle, 'M' or 'F', indicates whether the speaker is male or female.

[4] There are a number of extensive studies on *ra*-Deletion from various linguistic perspectives, and its sociolinguistic aspects have been identified (Nakamura, 1953; Kanda, 1964; Shibuya, 1990; Matsuda 1993, Inoue 1998, Kinsui 2003, and others). These previous studies show that *ra*-Deletion (i) is more compatible with the affirmative contexts than with negative contexts; (ii) is restricted to short stem verbs; (iii) does not occur in compound verbs, auxiliary verbs, and causative verbs; (iv) is more frequent in main clauses than in subordinate clauses; (v) is more compatible with verb stems that end in *i* than with verb stems that end in *e*; (vi) is preferred by younger speakers; (vii) is preferred by female speakers.

[5] In a pilot study, the total number of tokens of traditional variants for *re*-Insertion exceeds 20,000, as opposed to 20 tokens of *re*-Inserted forms in the CSJ. This yields a rate of *re*-Insertion of less than 0.01%. This makes it almost impossible to analyze the chronological distribution of *re*-Insertion. Therefore, I extracted the traditional variants for *re*-Insertion by limiting the target to verbs that produced the *re*-Inserted forms. In other words, if a verb is not observed in *re*-Inserted forms, I do not include traditional variants for *re*-Insertion with that verb in the dataset.

[6] In the CSJ, the traditional variant of consonant verbs for *ar*-Deletion was limited to a particular verb *ik*- 'go' as in *ik-are*-, and compound verbs that contain *ik*- as their second member, such as *ikite<u>ik</u>-are* 'can survive.'

[7] Lower rates of *ra*-Deletion and of *re*-Insertion is associated with speaking style. The utterances in the CSJ take the form of speech, rather than everyday conversation, and hence non-standard variants such as *ra*-Deleted forms and *re*-Inserted forms are not frequently used in such formal settings. *Ar*-Deleted forms, on the other hand, are incorporated into the current norm, and is regarded as a standard variant. Therefore, *ar*-Deleted forms are frequently used in formal settings.

[8] There may be a strong connection between the sharp rise in the rate of *ra*-Deletion for the 1980s and the differences between APS and SPS. In APS, which is characterized by formal style, the speakers' ages are relatively high; on the other hand, SPS, which is characterized by informal style, includes a high percentage of younger speakers. In fact, a large majority of data for the 1980s is observed in SPS. Also, *ra*-Deletion is more compatible with informal settings (e.g. SPS) than formal settings. It follows that *ra*-Deletion shows a higher rate for the 1980s.

[9] The results of the fisher's exact test show that for *ar*-Deletion and *ra*-Deletion the chronological distribution was significant at the 1% level. For *re*-Insertion, however, the distribution was not significant, suggesting that the change of *re*-Insertion has yet to develop so that it shows the characteristic of linguistic change, that is, the correlation with time.

[10] Analogical leveling is a morphophonological process where among the allomorphs of a particular form in the inflectional paradigm, one allomorph changes to take the similar form as the other allomorph by analogy. As a result, the number of allomorphs is reduced, and accordingly the inflectional paradigm becomes uniform (Paul 1970).

[11] Inoue and Yarimizu (2002) do not mention the difference in feasibility of events denoted by ordinary potential forms and enhanced potential forms. However, what is crucial in the present discussion is that *re*-Insertion produces the difference in potential meaning, and details of the potential meaning are beyond the scope of this study.

[12] The question arises as to why semantic disambiguation first applies to consonant verbs. If semantic disambiguation by *ra*-Deletion triggers the change in vowel verbs first, an idiosyncratic

allomorphy with the presence of an extra vowel in the suffix for consonant verbs would be created (-*are*- and -*re*-), like the case of *re*-Insertion in consonant verbs. On the other hand, if *ar*-Deletion applies first, the gap in allomorphy becomes three segments (-*e*- and -*rare*-). Compared with the former pattern, this pattern is more similar to other inflectional forms, i.e., the suffixes for vowel verbs have extra segments. But this account is not successful in the case of *re*-Insertion, because *re*-Insertion for consonant verbs actually creates the idiosyncratic allomorphy (-*ere*- and -*re*-). It may be the case that the order of the two-step process has already been established, and *re*-Insertion follows this order, i.e., semantic disambiguation is applied to consonant verbs first, then analogical leveling to vowel verbs follows.