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On Japanese Verb Morphology

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In this paper, I will attempt to present a possible analysis of Japanese verb morphology in the light of the several different derivations of the past tense forms of Japanese which have been offered in the literature. Selected data will be considered in the frameworks of Transformational Generative Phonology (henceforth TGP) and Natural Generative Phonology (henceforth NGP) for the purpose of accounting most effectively for the alternations observed in the language.

Selected data from Japanese verbs shown in three different forms, i.e., simple present, polite present, and past tense are illustrated in Table 1.

	Simple Present	Polite Present	Past	Gloss
(1)	tabe+ru	tabe+mas+u	tabe+ta	'eat'
(2)	noke+ru	noke+mas+u	noke+ta	'remove'
(3)	mi+ru	mi+mas+u	mi+ta	'see'
(4)	ki+ru	ki+mas+u	ki+ta	'wear'
(5)	ne+ru	ne+mas+u	ne+ta	'sleep'
(6)	kir+u	kir+i+mas+u	kit+ta	'cut'
(7)	ner+u	ner+i+mas+u	net+ta	'knead'
(8)	mat+u	mat+i+mas+u	mat+ta	'wait'
(9)	kat+u	kat+i+mas+u	kat+ta	'win'
(10)	yob+u	yob+i+mas+u	yon+da	'call'
(11)	asob+u	asob+i+mas+u	ason+da	'play'
(12)	yom+u	yom+i+mas+u	yon+da	'read'
(13)	tum+u	tum+i+mas+u	tun+da	'pile'
(14)	sin+u	sin+i+mas+u	sin+da	'die'
(15)	das+u	das+i+mas+u	das+i+ta	'put out'
(16)	hanas+u	hanas+i+mas+u	hanas+i+ta	'speak'
(17)	kak+u	kak+i+mas+u	ka+i+ta	'write'
(18)	suk+u	suk+i+mas+u	su+i+ta	'become empty'
(19)	oyog+u	oyog+i+mas+u	oyo+i+da	'swim'
(20)	kaseg+u	kaseg+i+mas+u	kase+i+da	'earn'

Table 1.

It is a well-known fact that Japanese verbs fall into two categories according to whether the stem ends in a vowel or a consonant, and are hence referred to as vowel-stem and consonant-stem verbs, respectively. The first five verbs in Table 1 contain the stems, *tabe, noke, mi, ki,* and *ne* to which are added a present marker /-ru/, a politeness marker /-mas-/ and the past tense marker /-ta/. The remaining verbs have /-u/ in place of the /-ru/ in the simple present and have an /-i-/ before the /-mas+u/ in the polite present. As the items from (6) to (20) show, all of these verbs have stems ending in consonants. Thus, the verbs (1) to (5) can be referred to as vowel-stem verbs which end either in /-e-/ or /-i-/, and the rest of the verbs can be referred to as consonant-stem verbs.

Before taking up the problems of the several past tense formations, let us consider items (4), (5), (6) and (7) in Table 1. As the data show, (4) and (6) have the same surface forms and so do (5) and (7), as in /kiru/ and /neru/, respectively. However, the polite present forms of these verbs vary, as illustrated in Table 1; that is, /ki+mas+u/ versus /kir+i+mas+u/ and /ne+mas+u/ versus /ner+i+mas+u/. Here the distinction between vowel-stem and consonant-stem verbs is necessary to arrive at the proper derivation. That is, setting up /ki-/ and /ne-/ as underlying forms for the former and /kir-/ and /ner-/ for the latter, /ki+mas+u/, /ne+mas+u/ and /kir+i+mas+u/, /ner+i+mas+u/ would be respectively obtained for the polite present forms. Without this distinction of the verb stems, proper derivations of the polite present forms would not be obtained. It is thus necessary to establish the two categories of vowel-stem and consonant-stem verbs.

The next problems to be raised are as follows:

1. Why does /-ru/ appear for the vowel-stem verbs while /-u/, which is regarded as the basic form of the present morpheme, appears in consonant-stem verbs ?

2. How is /i/, which is manifested between the stem and the polite present marker in the case of consonant-stem verbs, motivated ?

Here, I would like to explore the application of the notions of 'Syllable Structure Constraints' and 'Strength Hierarchy',[1] posited by Hooper (1976) to an explanation of the above facts. With regard to srength hierarchy, Foley may be the first linguist advocating this concept in the discipline; thus, both Foley's (1977) and Hooper's treatments are used in this paper.

As far as syllable structure constraints are concerned, Japanese has a very restricted set of possibilities for syllable structures: syllables are basically open; moreover, there appears to be preference for consonant-vowel syllable structure over a vowel, and even a vowel-vowel sequence is not preferred. Consonants are thus inserted in the environment of VV sequences, such as /haru/ 'spring' + /ame/ 'rain' → /haru+s+ame/ 'spring rain' or /ko/ 'little' + /ame/ 'rain' → /ko+s+ame/ 'drizzle'. Also, in Modern Japanese, /y/ glides are found in a hortative formation of the verb, such as /de/ + /oo/ → /de+y+oo/ meaning 'let's go out' or /kari/ + /oo/ → /kari+y+oo/ meaning 'let's borrow'. Further epenthesis is exemplified in Miller (1967:209). He notes that the appearance of Japanese /-r-/ is often found where Old Japanese borrowed Chinese words as loans or transcription value. For instance, *tsan* meaning 'praise' was borrowed as /sa+r+a/ and *chün* meaning 'rapid' came into the language as /su+r+u/. Miller shows great interest in the sporadic appearance of Japanese /-r-/ in these items; however, he does not fully explain the source of the /-r-/.

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[1] The universal strength hierarchy scale proposed by Hooper (1976:206)
1. glides (weakest), 2. liquids, 3. nasals, 4. voiced continuant
5. voiceless continuant, voiced stop, 6. voiceless stop. (strongest)

These examples show the strategy of avoiding the VV sequence. It is thus necessary to have the insertion of /r/ in the case of the present form of /tabe+r+u/ 'to eat' or /oki+r+u/ 'to rise' to avoid a VV sequence in */tabe+u/ or */oki+u/. The reason for the inserted consonant being /y/ or /r/ is to be seen in the light of Hooper's strength hierarchy; that is, these two consonants are classified as the weakest consonants of all. However, /s/, which is placed at the higher end of Hooper's universal scale, is also involved in epenthesis.[2] It is thus appears that Hooper's scale is not sufficient to account for this fact. With respect to this point, Foley (1977) proposes several different strength hierarchies among phonological elements based on an abstract relation. One of his phonological relations is called the ρ phonological relation whose parameter is relative resonance. Adhering to his notion of the ρ relation, the strength scale is as follows (1977:35).

(weak) t s n l (strong)
$\longrightarrow$

According to this scale, /s/ is placed at the weaker position and the following phonetic change from Vulgar Latin into Modern Italian, as in *collis* → *colle* 'hill', *vocalis* → *vocale* 'vowel', involving the loss of final /s/ suggest that /s/ is a weak consonant in terms of the ρ phonological relation. Korean and Turkish both show evidence of a similar rule of consonant epenthesis. In the case of the former, /r,n/ are inserted and in the latter, /y,n,s,ş/. They have the effect of preventing a VV sequence in the language in much the same fashion as happens in Japanese. This is illustrated by forms like in Table 2. It is interesting to note that Turkish shows the strong group of consonants, i.e., /s,ş/ in terms of Hooper's scale, also acting as epenthetic consonants. Further investigation is needed to account for this fact, even if the epenthetic /s/ seems to be accounted for adopting Foley's ρ phonological scale.

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[2] Japanese /s/ epenthesis occurs only with one lexical item /ame/ 'rain'. e.g. /kiri/ + /ame/ → /kiri+s+ame/ 'foggy rain'. Thus, the /s/ may be regarded as a morphological rule.

Korean:

/r/: Accusative case

-c:	/nom/ + /ɯl/	→	/nom+ɯl/	'body (accusative)'
-v:	/namu/ + /ɯl/	→	/namu+r+ɯl/	'tree (accusative)'

/n/: Nominative case

-c:	/pyəl/ + /ɯn/	→	/pyəl+ɯn/	'star (nominative)'
-v:	/pi/ + /ɯn/	→	/pi+n+ɯn/	'rain (nominative)'

Turkish:

/y/: Definite object case

-c:	/kız/ + /i/	→	/kız+ı gördum/	'I saw the daughter'
-v:	/kedi + /i/	→	/kedi+y+i gördum/	'I saw the cat'

/n/: Genitive 'of'

-c:	/kız/ + /in/	→	/kız+ın/	'of the daughter'
-v:	/kedi/ + /in/	→	/kedi+n+in/	'of the cat'

/s/: 'his'

-c:	/kız/ + /i/	→	/kız+ı/	'his daughter'
-v:	/kedi/ + /i/	→	/kedi+s+i/	'his cat'

/ş/: 'each'

-c:	/bir/ + /er/	→	/bir+er/	'one each'
-v:	/iki/ + /er/	→	/iki+ş+er/	'two each'
-c:	/dokuz/ + /er/	→	/dokuz+ar/	'nine each'
-v:	/altı/ + /er/	→	/altı+ş+ar/	'six each'

N.B. The above high-vowel suffixes undergo a four way i/ü/ı/u alternation and the non-high suffix an e/a alternation according to the vowel of the preceding syllable.

Table 2.

Just as epenthetic consonants appear in certain phonetic environments between underlying adjacent vowels, so are vowels inserted in almost all contexts where a CC sequence would otherwise occur.[3] Thus morpheme structures such as CVCV and CVCVCV are

[3] Since mora phonemes such as /N/ or /Q/ appear in the morpheme structure in Japanese as in CVNCV or CVQCV, we cannot say that vowel insertion occurs in *all* phonetic environments of CC sequence. These /N,Q/, however, have moraic status, and thus are naturally excluded from a true consonant value. This being so, *all* phonetic environments of CC sequence undergo the vowel insertion rule.

generated in the surface realization of forms. Evidence for this process comes especially from recent loanwords in the Japanese language. For example, *labour strike* is borrowed as /sutoraiki/; *brake* is /bureeki/; and *beefsteak* is assimilated into the language either as /biFuteki/ or /biiFusuteeki/[4]. In most cases, an epenthetic high vowel has the effect of preserving the basic consonant-vowel (CV) syllable structure of Japanese. It is interesting to note that the high vowels, i.e., /i,u/ are the only vowels that undergo the devoicing rule in the appropriate phonetic environment, such as [s̥ika] 'deer', [nasi̥] 'nothing', [kɯ̥se] 'habit' or [ongakɯ̥] 'music'. Furthermore, consider the following example:

karasu	*to*	*kitsutsuki*	*wa*	*tori*	*desu*
[karasɯ̥	to	ki̥cɯcɯki̥	wa	tori	des]
raven	and	woodpecker	SUB	bird	are

' The raven and the woodpecker are birds.'

Here, the /u/ of /desu/ which appears in phrase-final position is completely deleted. Suffice it to say that these high vowels are the weakest vowels in terms of strength hierarchy. They thus readily appear as epenthetic vowels and by the same token, /u/ is optionally deleted in phrase-final position as illustrated above.

Since the two Japanese high vowels /i,u/ are considered as the weakest vowels in terms of strength hierarchy, we can say that the aforementioned /i/ in the polite present of consonant stem verbs is to be regarded as a vowel whose insertion has the effect of preserving the consonant-vowel (CV) syllable structure. Otherwise, forms such as */kir+mas+u/ or */asob+mas+u/ would appear in the surface representation.

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[4] F = bilabial fricative.

Now, I turn to the discussion of the past tense forms of Japanese verbs. At a glance, the several allomorphs of the past tense marker /-ta/, such as /-da/, /-i+ta/, and /-i+da/ are recognized in Table 1. With respect to these allomorphs, McCawley (1968:96) states:

> *The simplest generative description of these forms is clearly one which takes /ta/ as the basic form of the past tense morpheme and has rules for assimilative and other changes which take place when the /t/ of the ending is immediately preceded by a consonant. A voicing assimilation rule is needed to account for the forms which have /da/ instead of /ta/.*

As for the derivations of items (6) to (9) in Table 1, the regressive assimilation rule which was first posited by Kuroda (1965:210ff) and developed by McCawley (1968:124,5) seems to be sufficient to account for these derivations. The rule which is proposed by McCawley is given below;

R1. regressive assimilation rule A:

$$[+\text{cons}] \longrightarrow \begin{bmatrix} \alpha\text{grv} \\ \beta\text{cmp} \\ \gamma\text{shp} \end{bmatrix} \Big/ \_\_\_\_ \begin{bmatrix} +\text{cns} \\ \alpha\text{grv} \\ \beta\text{cmp} \\ \gamma\text{shp} \end{bmatrix} \quad \text{(McCawley 1968:125)}$$

R2. regressive assimilation rule B:

$$\begin{bmatrix} +\text{cons} \\ +\text{voc} \end{bmatrix} \longrightarrow [+\text{obs}] \Big/ \_\_\_\_ \ \&^{5} \ [+\text{obs}] \quad \text{(McCawley 1968:124)}$$

The above assimilation rules, however, will be revised later with respect to the other phonological rules.

Let us next consider items (10) to (14) of Table 1. Here, two other rules should be considered as yielding the correct surface representations. The voicing and nasalization rules which were also posited by Kuroda (1965:212) are the two new ones. These two rules are shown in R3 and R4.

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[5] & = morpheme boundary.

R3. voicing rule:

$$[+\text{cons}] \longrightarrow [+\text{voice}] \;/\; \begin{bmatrix} +\text{cons} \\ -\text{voice} \\ +\text{son} \\ -\text{nas} \end{bmatrix}^{6} + \_\_\_\_$$

R4. nasalization:

$$[+\text{cons}] \longrightarrow [+\text{nasal}] \;/\; \_\_\_\_ \begin{bmatrix} +\text{cons} \\ +\text{voiced} \end{bmatrix}$$

These rules, however, should be ordered as R3, R4, and then either R1 or R2, otherwise the correct surface representations cannot be obtained.

In items (15) and (16) of Table 1, the high front vowel /i/ appears between the two morphemes, i.e., /das/ + /ta/ → /das+i+ta/ and /hanas/ + /ta/ → /hanas+i+ta/. Since these stems are categorized as consonant-stem verbs, the high front vowel must be regarded as being epenthetic. The high front vowel is thus treated as an inserted vowel which has the effect of retaining the consonant-vowel (CV) syllable structure. This is accounted for by incorporating the notions of strength hierarchy and syllable structure constraints.

Finally, consider the last four items (17) through (20) of Table 1. These verbs contain either underlying final /-k/ or /-g/. They undergo deletion of final consonants, i.e., /-k,-g/, and the high front vowel /i/ appears between the verb stem and past tense morpheme as illustrated in Table 1. The inserted high front vowel /i/ seems to be accounted for in the same way as in the polite present forms (6) through (20) as well as the aforementioned underlying final /-s/ stem verbs. The problem here is to account for the deletion of the /-k/ or /-g/. McCawley (1968: 96) proposes a rule making velars [+cont] before the past tense ending, i.e., turning /k,g/ into /h/. This rule is given in R5.

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[6]The features,[+son] and [-nas]are added by the author in order to block incorrect application of the R3 in the case of some forms, as in /kir/ + /ta/ → */kir+da/.

R5. /h/ conversion:

$$\begin{bmatrix} +\text{obs} \\ +\text{cmp} \end{bmatrix} \longrightarrow [+\text{cons}] \;/\; \underline{\quad} \;\&\; [+\text{obs}]$$

Following this analysis, the /h/ created by rule R5 is turned into /?/. McCawley (1968:80) maintains a rule whereby an intervocalic /h/ is converted into glottal constriction /?/ unless an external boundary /:/, which is marked in the lexicon between the two components of a Noun + Noun compound, appears before the intervocalic /h/. The retention of intervocalic /h/ is illustrated below.

Retention of intervocalic /h/:

/hoo:hoo/	'method'	/ke:hai/	'sign'
/ku:huu/	'schme'	/ya:hari/	'as expected'

The above examples are historically compounds and are all written with two Chinese characters in the standard orthgraphy as shown below;

/hoo:hoo/	/ku:huu/	/ke:hai/	/ya:hari/
方 法	工 夫	気 配	矢 張

It should be noted that McCawley (1968:96) proposes a rule which deletes /?/ when it occurs between certain vowels, but he does not discuss it completely. I will therefore consider this problem in more detail. Additional verb roots with final underlying velars are illustrated in Table 3.

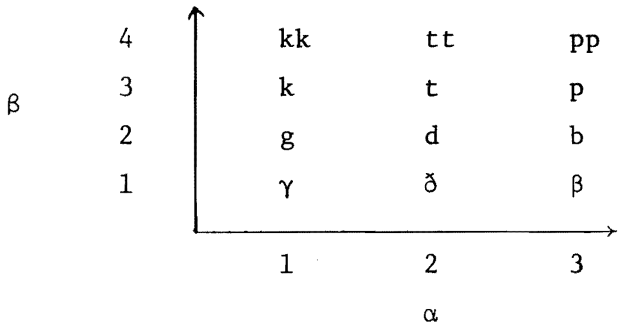
	Present	Past	Gloss		Past	Gloss
(1)	kik+u	ki+i+ta	'listen'	(6) *CVCig+u		
(2)	sek+u	se+i+ta	'hasten'	(7) huseg+u	huse+i+da	'defend'
(3)	mak+u	ma+i+ta	'sow'	(8) kag+u	ka+i+da	'smell'
(4)	tok+u	to+i+ta	'solve'	(9) isog+u	iso+i+da	'hurry'
(5)	huk+u	hu+i+ta	'wipe'	(10) nug+u	nu+i+da	'take off'

Table 3.

With respect to the /k,g/ deletion , R5 applies following all five of the Japanese vowels, /i, e, a, o, u/ and preceding the past tense suffix. Furthermore, the rule is reminiscent of the diachronic change from Vulgar Latin into Modern French, whereby eventual loss of medial *k occurred following its palatalization. This diachronic change can be observed in the following examples: *factum* → *fait* 'fact', *lactem* → *lait* 'milk', and *noctem* → *nuit* 'night'. In Finnish, the deletion of /k/ is apparent in both noun and verb morphology. For instance, *joki* 'river (nom. sing.)' appears in the genitive as *joen*, i.e., with deletion of the /k/: This, and further examples, are set out below.

joki	'river (nom. sing.)	:	*joen*	'river (gen. sing.)'
virka	'government service (nom. sing,)'	:	*viran*	'government service (gen. sing.)'
lukee	'he reads'	:	*luen*	'I read'

This phonetic change is well accounted for by using another strength hierarchy: Foley's α and β strength hierarchy (1977:34).



According to Foley (1977:107), weak stops, such as /k,g/ which appear in weak environments, such as intervocalic position further weaken and will be deleted under certain phonetic conditions. With regard to the inserted /i/ of Table 3, the insertion is well motivated in terms of syllable structure constraints. Accordingly, the following ordered rules are set up with respect to the verb roots with final underlying velars.

R6. /h/ conversion:

$$\begin{bmatrix} -\text{cont} \\ -\text{ant} \\ -\text{cor} \\ +\text{back} \\ +\text{high} \end{bmatrix} \longrightarrow \begin{bmatrix} +\text{cont} \\ -\text{back} \\ -\text{high} \end{bmatrix} \Big/ \underline{\qquad} + [+\text{obs}]$$

R7. /i/ insertion:

$$\emptyset \longrightarrow \begin{bmatrix} +\text{syll} \\ +\text{high} \\ +\text{front} \end{bmatrix} \Big/ \begin{bmatrix} +\text{cons} \\ +\text{cont} \\ -\text{nas} \end{bmatrix} \underline{\qquad} + C$$

R8. /ʔ/ conversion:

$$\begin{bmatrix} +\text{cont} \\ -\text{back} \\ -\text{high} \end{bmatrix} \longrightarrow [-\text{cont}] \Big/ V \underline{\qquad} V$$

R9. /ʔ/ deletion:

$$\begin{bmatrix} -\text{cont} \\ -\text{cor} \\ -\text{ant} \\ -\text{high} \\ -\text{back} \end{bmatrix} \longrightarrow \emptyset \Big/ V \underline{\qquad} + \begin{bmatrix} +\text{syll} \\ +\text{high} \\ +\text{front} \end{bmatrix}$$

Before proposing the ordering of rules, I would like to consider the aforementioned regressive assimilation. According to McCawley (1968:85), when a consonant sequence is created, the first consonant becomes either the mora nasal /N/, or the mora obstruent /Q/, depending on the nature of the first consonant. However, with regard to a CC sequence, as in /hanas+ta/ or /oyog+ta/, neither the mora nasal nor the mora obstruent are generated by the rules. Thus, such forms as */hanaNta/, */hanaQta/, */oyoNda/ or */oyoQda/ are never manifested as surface forms. What is needed then is a rule which excludes segments such as /s/ and /k,g/ from assimilating to a following /t/. In other words, the regressive assimilation only applies to /r/ and /m/ (including

instances of /m/ which have been derived from /b/ by the nasalization rule.). Accordingly, a revised form of McCawley and Kuroda's regressive assimilation rule is given in R10.

R10. revised regressive assimilation rule:

$$\begin{bmatrix} +\text{son} \\ \alpha\text{nas} \end{bmatrix} \longrightarrow \begin{bmatrix} -\alpha\text{obs} \\ +\text{ant} \\ +\text{cor} \end{bmatrix} \Big/ \underline{\quad\quad} \; + \begin{bmatrix} +\text{obs} \\ +\text{ant} \\ +\text{cor} \end{bmatrix}$$

After considering the possible phonological problems with regard to past tense formation, the ordered rules which are necessary in order to yield the proper output with respect to consonant-stem verbs in the past tense are illustrated in Table 4.

U.R.		/kir+ta/	/mat+ta/	/asob+ta/
1. voicing	(R3)	——	——	/asob+da/
2. /h/ conversion	(R6)	——	——	——
3. nasalization	(R4)	——	——	/asom+da/
4. regressive assimilation	(R10)	/kit+ta/	——	/ason+da/
5. /i/ insertion	(R7)	——	——	——
6. /?/ conversion	(R8)	——	——	——
7. /?/ deletion	(R9)	——	——	——
S.R.		/kit+ta/	/mat+ta/	/ason+da/
U.R.		/hanas+ta/	/kak+ta/	/oyog+ta/
1. voicing	(R3)	——	——	/oyog+da/
2. /h/ conversion	(R6)	——	/kah+ta/	/oyoh+da/
3. nasalization	(R4)	——	——	——
4. regressive assimilation	(R10)	——	——	——
5. /i/ insertion	(R7)	/hanas+i+ta/	/kah+i+ta/	/oyoh+i+da/
6. /?/ conversion	(R8)	——	/ka?+i+ta/	/oyo?+i+da/
7. /?/ deletion	(R9)	——	/ka+i+ta/	/oyo+i+da/
S.R.		/hanas+i+ta/	/ka+i+ta/	/oyo+i+da/

Table 4

So far, I have discussed the phonological problems of Japanese verb morphology with emphasis on past tense formation. I have tried to account for these derivations within the frameworks of TGP and NGP from a synchronic point of view. My analysis, however, is based on the hypothesis that consonant-stem verbs did not derive from vowel-stem verbs; these stems historically ended in consonants, i.e., CVC syllable structure was characteristic of proto-Japanese. Based on this hypothesis, I analysed Japanese verb morphology making use of the notion of 'insertion' in terms of strength hierarchy and syllable structure constraints. It is necessary to consider the Japanese language from a diachronic point of view in order to support my hypothesis.

It is a widely accepted theory that the ancestor of the Japanese language was proto Ural-Altaic. Adhering to Miller (1971) and Martin (1966)'s principle, the origin of Japanese can be traced back to the proto-Altaic language, and it is therefore genetically related to the Korean, Mongol, Turkish, and Tungus languages. With respect to this point, Martin (1966)'s treatise entitled *Lexical Evidence Relating Korean to Japanese* and Miller (1971)'s book *Japanese and the Other Altaic Languages* have very interesting and far-reaching implications. Recently, a noted Japanese linguist, Hattori (1959:99) suggested that Japanese might be related to Ainu. These views suggest that Japanese in a proto stage might have had a closed syllable structure, since the dominant present-day syllable structure in the above languages is certainly CVC.

The same idea was expressed by the Japanese linguist Atsushi Hamada in 1951. Since then, Ohno (1953) has developed this idea and has tried to account for the origin of the Japanese verb conjugations by basing his thinking on the hypothetical notion of closed-syllable structure in the proto-Japanese language. The following examples show how Ohno (1978:180) demonstrates this by comparing certain forms

of Old Japanese, such as *isi* 'stone', *isago* 'sand', *isunokami* 'on the stone', and *iso* 'seashore'. Among this group of lexical items, there can be seen a common element /is/. Similar examples are shown in *asita* 'morning', *asa* 'morning', *asate* 'the day after tomorrow', and *asu* 'tomorrow', in which /as/ is regarded as the common element. Ohno (1978:180) postulates that only the /is/ of the former group designates the meaning 'stone', while /as/ of the latter designates 'dawn'. This is why the vowels following /is/ and /as/ are free to vary. This being so, our hypothesis is that the proto-Japanese language had lexical items with final consonants, such as **is* and **as*. It is interesting to note that Miller (1971:97) offers cognates of *isi* 'stone' among other Ural-Altaic languages:

pA.[7] *tal$_2$ [8], OT. taš, Chu. cul, pKJ. *dyoš, MK. tolh, K. tol.

It will be observed that all the cognate lexical items end in final consonants, as hypothesized for proto-Japanese.

With respect to the verbs, the forms given in (4), (5), (6), and (7) in Table 1 show superficial homophony involving the shapes /kiru/ and /neru/. I maintain that the /r/ of items (4) and (5) appeared as a result of consonant insertion. In fact, Old Japanese counterparts of (4) and (5) were *ki* and *ne*, respectively. The /r/ of items (6) and (7) was the original consonant of the stem, which means that these verbs had final consonants. According to Miller (1971:72), /kir-/ 'cut' has cognates in other Altaic languages. The cognates of *kir-u* shown by Miller are given below.

pA. *kïr, Mo. kir-ga-, Osm. qïr-, Ma. giri-, Go. geri-, pT. *qïrï-, pKJ. *kyɔr-, MK. kɔl-, K. kal-.

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[7] pA. proto-Altaic, pKJ. proto-Korean-Japanese, pT. proto-Turkish, Chu. Chuvash, Go. Goldi, K. Korean, MK. Middle Korean, OT. Old Turkish.

[8] For an extensive description of *l$_2$, see Miller (1970) and (1971). Miller traces the development of *l$_2$ as /l/, /s/ or /š/.

Consequently, Miller (1971:73) maintains that the final /r/ of the Japanese reflex represents a Japanese inheritance and preservation of the original Altaic root-final consonant /r/. Similar examples are found in the case of /sir+u/ meaning 'know' or /hasir+u/ meaning 'run'. These stems also preserve the original Ural-Altaic /r/ as the Japanese reflex in their stems, and accordingly, these verbs have a typical consonant-stem morphology, as in /sir+i+mas+u/, /hasir+i+mas+u/ and /sit+ta/, /hasit+ta/ in their derivations of polite present and past tense, respectively. They are thus never conjugated as */si+mas+u/, */hasi+mas+u/, */si+ta/ and */hasi+ta/, since the /r/ of those stems are not to be confused with inserted /r/.

Furthermore, even contemporary Japanese forms such as /tabe+ru/ which are characterized as vowel-stem verbs had a consonant ending ancestrally. According to Miller (1971:86), the proto-Altaic form of this verb is *ǯėp- , since the other related forms are proto-Turkish *ǯäp-, Evenki ǯep, Lamut ǯeb-, Manchu ǯe-, proto-Korean-Japanese *cab-, and Middle Korean ca(ɔps)-. With respect to the etymology of /tabe+ru/, Miller (1971:95) makes the following proposal:

> *In the formations ultimately responsible for the forms that are attested in all these languages there was no original vowel following the final /-p/ of the root and preceding any subsequent consonant-initial suffixed element. The /-e-/ of the modern Japanese forms (taberu, tabeta, tabeyō, etc.) which here goes back to OJ /-ë-/, is a Japanese innovation, inserted according to the canons of Japanese syllabic structure and morae accounting but nevertheless still in vowel harmony with the original vocalization of the root element* *ǯäp-. *The striking point is that the evidence for this original vocalism survives in the Japanese verbal morphology even though early in the history of pre-Japanese the vocalism of the root itself was leveled out to its now familier /tab-/ shape, probably through assimilation to the position of articulation of the root-final consonant ('labial attraction').*

Here, Miller also maintains that the /ë/ emerges as a result of 'insertion'. With respect to this point, I hypothesize that first, /i/ appeared as the epenthetic vowel just as in the other instances. Then, /i/ of /tab+i/ was lowered under the influence of the stem vowel /a/; this can be viewed as being a instance of vowel harmony.

It is a well-known fact that Old Japanese had an eight-vowel system, i.e., /i,e,a,o,u/ + mid high /ï, ë, ö/ which are known as *Otsu*-vowels or Series B vowels, in contrast to the former group which is referred to as *Koo*-vowels or Series A vowels. Old Japanese shows certain structural limitations in the distribution of its eight vowels. These restrictions on the occurrence of vowels are sometimes referred to as 'vowel harmony' which was commonly observed in Old Japanese as well as other Ural-Altaic languages. Some examples of this vowel harmony are illustrated below.

/kökörö/ 'heart', /itoko/ 'dear', /uko/ 'foolish',
/Fadara/, /Födörö/ 'fall lightly'

As we have seen above, there was a strong possibility that Old Japanese underwent a change from closed-syllable to open-syllable structure, while other Ural-Altaic languages escaped such a change.

My hypotheses are thus as follows:

1. As far as we adhere to the theory of the Ural-Altaic origin of the Japanese language, proto-Japanese had closed-syllable structure.
2. Proto-Japanese was possibly affected by contact with a language of some other family in which the syllable structure was open; possibly, one of the Austronesian languages. Alternatively, the language had enough time in its history for its syllable structure type to change through internal evolution.

According to Hattori (1959:13), it is wrong to claim that the difference between the open-syllable structure of Japanese and the closed-syllable structure of other Ural-Altaic languages is an important point in terms of genetic relationships. Since this difference is not so important, he maintains that we cannot deny genetic relationship between Japanese and Ural-Altaic only on the strength of this argument. Hattori (1959:13) enumerates the following examples to support his argument. Manchu, which is one of the Tungus languages, has open-syllable structure as a result of the deletion of final consonants, and Mongol and the Kagoshima dialect of Japanese are now in a stage of closed-syllable structure because of the loss of second-syllable vowels. Moreover, Hattori (1959:43) cites Ramstead's statement that some of the CV-structured words in Japanese developed from CVC shapes. Thus CV sequences, such as /ka/ can be traced back to one of the following forms: */kak/, */kag/, */kar/, or */kal/. This being so, the final consonant in such cases has since undergone deletion.

After open-syllable structure was firmly established in Japanese, every consonant-final lexical item had thus been modified to conform with the present-day basic open-syllable structure. Originally, /u/ appeared as an epenthetic vowel and then /i/, in conformity with the emerging basic syllable structure. The appearance of epenthetic /i,u/ is well motivated in terms of strength hierarchy and syllable structure constraints. It is interesting to note that even without a consideration of strength hierarchy and syllable structure constraints, the historical documents evince this fact. According to Sakakura (1966:285), the /u/ was highly involved in verb formation, since all the indicative verb forms end with /u/, and the old nominal forms ended with this /u/, possibly representing a usage analogous to verb formation. The basic vocabulary thus contained a suffix /-u/,

as in *haru* 'spring', *natu* 'summer' *Fuyu* 'winter', i.e., in the names of seasons. Further examples are shown below.

day and time: *Firu* 'day', *yoru* 'night', *keFu* 'today', *kinoFu* 'yesterday', *yuFu* 'evening'

necessities of life: *midu* 'water' *usu* 'mortar' *situ* 'textile goods', *kinu* 'silk'

animals or plants: *kitu* 'fox', *saru* 'monkey', *tadu* 'crane', *karasu* 'raven', *kudu* 'arrow root', *matu* 'pine tree'

However, the /u/ could be replaced by /i/, since /i/ itself had a lexical meaning. That is, it designated 'person' or 'thing'. Ohno (1978:201) cites the following sentence taken from *Zoku Nihonki* (written in 720 A.D.) in exemplifying /i/ 'person' :

Kore	*o*	*motu*	*i*	*wa*	*homare*	*o*	*itasi*
this	OBJ	possess	person	SUB	honour	OBJ	do
suturu	*i*	*wa*	*sosiri*	*o*	*manekitu*		
abandon	person	SUB	censure	OBJ	bring upon		

'A person who possesses this will be honoured, but
one who abandons it will bring public censure upon himself.'

Consequently, /-u/ in old nominal forms was sometimes replaced by /-i/, as in *tuku(yo)* 'a moonlit night' → *tuki* 'moon', *Kamu(sabi)* 'very Godlike' → *kami* 'God', or *kuku(tati)* 'a spike of rape, a kind of plant with oil-yielding seeds' → *kuki* 'a stalk or a spike'. The former compound forms of *tuku*, *kamu*, and *kuku* are the Old Japanese forms of Modern Japanese *tuki*, *kami*, and *kuki*, respectively. According to the old records, the /i/ of modern forms, however, were all written in Series B-/ï/ in the above instances, as in /tukï/, /kamï/, and /kukï/. Ohno (1978:198) thus maintains that Series B-/ï/ emerged as a result of coalescence, whereby /u/ + /i/

→ /ï/. He posits a hypothetical transitional form */tuku+i/ as being a mid point in the derivation /tuku/ → /tukï/. This hypothesis is based on the idea that some old nominal forms in /-u/ were affected by the new nominalizer /-i/ and yielded the new /u+i/ form. Ohno also suggests that /o/ + /i/ → /ï/ is an another possible source of Series B-/ï/. Furthermore, Ohno (1978:198) proposes that three other vowels, i.e., Series A-/e/, Series A-/o/, and Series B-/ë/ were also the result of coalescence. That is, /i/ + /a/ → /e/, /u/ + /a/ → /o/, and /a/ + /i/ → /ë/. The main reason for the vowel coalescence is that Old Japanese prohibited the use of V + V sequences. For instance, *nagëki* meaning 'grief' comes from *nagaiki* meaning 'deep sigh', literally, 'long breath', since the word *nagaiki* is a compound which consists of *naga* 'long' and *iki* 'breath'. Here, the VV sequence /ai/ of /naga+iki/ coalesced into Series B-/ë/ and yielded a new lexical item *nagëki*. There is special reason for believing that the analysis of Series B-/ï/ as a vowel arising from coalescence may be correct since there is a strong possibility that normal epenthesis occurs in a weak phonetic environment, such as syllable-final /-u/, which was originally an epenthetic vowel. Accordingly, a new nominalizer /i/ had a strong possibility of acting as an epenthetic vowel in addition to the original epenthetic vowel /u/. After a VV sequence, i.e., /u/ + /i/ was created, these two epenthetic vowels coalesced and yielded a new segment of Series B-/ï/. This is partly because of the nature of the two weak epenthetic vowels and partly because of the prohibition on the use of V + V sequences. This phonetic change is thus reasonably accounted for by adopting the notion of strength hierarchy and adhering to Ohno's proposal.

Consequently, Ohno (1978:199) postulates that the basic vowels of pre-Old Japanese were only four in number, that is,

/i, a, ö, u/, since other four vowels, i.e., /ï, e, ë, o/ are assumed to have emerged later as a result of coalescence. The high front and back vowels, i.e., /i, u/ are considered weak vowels in terms of the strength hierarchy of vowel. The /i/ had thus a great potential to serve as an inserted vowel. In these ways, the /i/ certainly acted as an epenthetic vowel in proto-Japanese, either appearing as a lexical suffix which acted as a nominal marker or maintaining its status as an epenthetic vowel which had the effect of bringing about the CV pattern.

With respect to the CV syllable structure of the language, the reader may notice the appearance of a VV sequence (in contrast to the CV dominant structure), such as /ka+i+ta/ 'wrote' or /oyo+i+da/ 'swam' (see Table 1 and 3) resulting from the /k, g/ deletion. It seems that the above examples are counter-examples of the basic CV structures. This phonetic change, i.e., deletion of /k, g/, however, occurred in more recent times. Thus, transitional forms, such as /kak+i+ta/ or /oyog+i+ta/ were found in the literature. One might hypothesize that the consonant insertion took place in a very early stage of the language, i.e., pre-Old Japanese, and the language possibly had the following syllable structure change.

$$*CVC \xrightarrow[\text{insertion}]{} CVC\text{-}V \xrightarrow[\text{deletion}]{} CV\emptyset\text{-}V \text{ (i.e., CVV)}$$

Accordingly, the present-day VV sequence was created later as a result of the deletion of the second syllable consonant. This change occurs faily commonly in languages. This being so, the analysis involving the insertion of /i/ or /r/ in a pre-Old Japanese stage seems quite reasonable in terms of strength hierarchy and syllable structure constraints from both the synchronic and diachronic point of view.

Consequently, the hypothesis of CVC syllable structure in the proto-language is not such an extravagant idea; rather, it is quite natural and useful notion reflecting the history of language as well as providing answers to some previously unsolved quiestions relating to verb morphology, the origin of modern verb conjugations and word formation in the Japanese language.

It is of course impossible to conclude that proto-Japanese roots definitely had a CVC structure. However, if the widely accepted view of the origin of the Japanese language is correct, then it is probable that syllable structure in the proto-languge was basically CVC; otherwise the above theory could be incorrect.

This paper represents only a preliminary attempt to incorporate the current theory of linguistics and traditional comparative method, and the subject certainly needs further investigation in order to account fully for the phonological processes in Japanese verb morphology and for the origin of the Japanese language.

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