

The y-Problem in Japanese

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0. In his review of Wenck's voluminous work, Martin (1959) lists four problems of Japanese phonology "that have caused difficulty in analyzing standard Japanese, the dialects, and historical developments alike." (p. 377). One of these four is what he calls "the y-problem," which involves all the consonants but especially the segments [t, d, s, z, š] and the corresponding affricates [tš, dž, ts, dz]. ([ž] does not occur in Japanese except as a rare variant of [dž].) The y-problem is a problem because the phonological reasoning and symmetry on the one hand, and the native intuition regarding the nine segments on the other do not exactly coincide. One of the most interesting ways the y-dilemma is expressed is the existence of the numerous proposals that have been made for the romanization of the Japanese language. The orthographic proposals concerning the nine consonants are discussed at some length below by way of explaining the nature of the y-problem.¹

The best place to start is the Tanakadate-Nippon system :

(A)	1.	sa	si	su	se	so	sya	syu	syo
	2.	za	zi	zu	ze	zo	zya	zyu	zyo
	3.	ta	ti	tu	te	to	tya	tyu	tyo
	4.	da	di	du	de	do	dya	dyu	dyo

The complete parallelism of this solution is impressive, but this orthography fails to fit the surface phonetics of the language, hence, other possible solutions. Kunrei Siki differs from Tanakadate-Nippon Siki only in Line (A4), which is :

(B)	4.	da	zi	zu	de	do	zya	zyu	zyo
-----	----	----	----	----	----	----	-----	-----	-----

This solution is more faithful to the surface structure in the sense that it reflects the merge of /d/ and /z/ in five of the eight syllables, but the Hepburn-Hyoozyun Siki is even closer to the actual phonetic reality (but not a perfect fit) as shown in (C) :

(C)	1.	sa	shi	su	se	so	sha	shu	sho
	2.	za	ji	zu	ze	zo	ja	ju	jo
	3.	ta	chi	tsu	te	to	cha	chu	cho
	4.	da	ji	zu	de	do	ja	ju	jo

The merging of /d/ and /z/ are reflected in the use of *j*; similarities of the consonants in the *i*-syllable with the *a-o-u* cases are also more faithfully expressed here than in (B). But this orthography fails to reflect the basic five-vowel concept of Japanese in all of the four lines, since it introduces two orthographic units for the consonant of Lines 1, 2, and 4, and three units for Line 3. To preserve the five-vowel concept in the orthography somewhat better, Sakuma proposed his Maru Siki, which is (D) :

(D)	1.	sa	syi	su	se	so	sya	syu	syo
	2.	dza	dyi	dzu	dze	dzo	dya	dyu	dyo

This was modified and complemented by the following proposal made by Hattori (1951):

(E)	2.	dza	zyi	dzu	dze	dzo	dya	dyu	dyo
	3.	ta	ci	cu	te	to	cya	cyu	cyo

(E2) differs from (D2) only in the *i*-syllable. (E3) is intended to treat the five-vowel concept and the stop-affricate difference of the consonants in a relatively equal manner, by not reflecting either of them perfectly. The logical consequence of Hattori's Line (E3) would probably be a proposal like the following:

(F)	4.	da	ji	ju	de	do	jya	jyu	jyo
-----	----	----	----	----	----	----	-----	-----	-----

This, in turn, would give rise to the choice between (G1) and (G2), if the surface merge must be expressed by a single orthographic solution:

(G)	1.	zyi	dzu	dya	dyu	dyo
	2.	ji	ju	jya	jyu	jyo

Hattori already and tacitly chose (G1) over (G2). The consequence of this choice is the variety of solutions for the consonants within one orthographic system, which is striking when (D1), (E2), and (E3) are placed together, but especially when the fourth group (E4) of eight syllables is placed next to them:

(E)	4.	da	zyi	dzu	de	do	dya	dyu	dyo
-----	----	----	-----	-----	----	----	-----	-----	-----

In summary, the three major romanization systems propose the

spelling units for the consonants as tabulated in (H) :

(H)					
a. Tanakadate-Nippon Siki					
b. Hepburn-Hyoozyun Siki					
c. Sakuma-Hattori Siki					
a.	s	sy	b.	s	sh
	z	zy		z	j
	t	ty		t	ts ch
	d	dy		d	
			c.	s	sy
					dz zy
				t	d cy
				d	dy

In any event, if the generative theory is to maintain the thesis that "a native intuition . . . should be incorporated into the theory of Japanese in some form," (Kuroda (1965), p. 203), then some justification must be found on theoretical grounds for the traditional y-analysis of [š, tš, dž].

1. The native intuition dictates first of all that the consonants [t, d, s, z], like all the rest of the consonants, combine with all the five vowels of Japanese /i, e, a, o, u/, and form four complete sets of consonant-vowel combinations, pairing the voiced series with the voiceless counterparts :

(1)	a.	si	se	sa	so	su
	b.	zi	ze	za	zo	zu
(2)	a.	ti	te	ta	to	tu
	b.	di	de	da	do	do

Secondly, the native idealization posits the same voiced-voiceless correspondences for the affricates, which combine with the last three of the five vowels :

(3)	a.	ša	šo	šu
	b.	ja	jō	ju

- (4) a. ča čo ču
 b. ja jo ju

(3b) and (4b) are phonetically identical in almost all the dialects and correspond to the fricative [š] in (3), and to the affricate [č] in (4). Despite this fact, the native interpretation of Japanese phonology finds no difficulty in establishing the two parallel sets of voiced-voiceless series exactly this way. Thus (1)–(4), to the Japanese mind, is a neat symmetry. It is not only in the syllabary chart that the voiced-voiceless correspondence is symmetrical. There is a large number of morphophonemic alternations of the following type:

- (5) a. *toki* ‘time’ *sio-doki* ‘high time’
 b. *sika* ‘deer’ *ko-zika* ‘small deer’
 c. *ni-suN* ‘two inches’ *saN-zuN* ‘three inches’

To account for a large number of voiced-voiceless consonant alternations in the language, and to reflect the native intuition, the phonological theory of Japanese must devise parallel solutions for the voiced and the voiceless series of CV combinations in so far as the consonants have the axis of voice. Otherwise, the theory will (1) complicate the description of morphophonemic alternations based on the feature [\pm voice], and (2) fail to reflect the native speaker’s competence regarding this feature.

2. Another important factor in the native competence is that there are two series of vowels, the first comprising all the five vowels /i, e, a, o, u/ and the second only the last three. The second series may be distinguished by the feature [+ back], while the first series includes both [+ back] and [– back] vowels:

- (6) a. i e a o u [± back]
 b. a o u [+ back]

The [+ back] vowels occur after both non-palatal consonants [p, b, m, n, k, g, h, r] and their palatal counterparts [p^y, b^y, m^y, n^y, k^y, g^y, h^y, r^y]. In this and the following section, these eight pairs of palatals and non-palatals will be discussed; we must postpone our discussion on [t, d, s, z, š] and their affricate counterparts until Section 4.

Of the two [- back] vowels, /i/ occurs with the palatal consonants, and /e/ occurs with the non-palatal consonants. If, instead of (6), /i/ were to be listed along with the [+ back] vowels of (6b) on the ground that /i/ also occurs with palatals, then the vowels are to be categorized as in (7):

- (7) a. e a o u
 b. i a o u

This classification is against the native intuition.² It also fails to reflect the morphophonemic vowel alternations in the verbal paradigm of the following type:³

- | | | |
|-------------------|--------------|--------------|
| (8) a. 'to write' | b. 'to knit' | |
| kaki-(-masu) | ami-(-masu) | Polite pres. |
| kake-(-ba) | ame-(-ba) | Prov. |
| kaka-(-nai) | ama-(-nai) | Neg. |
| kako-(-o) | amo-(-o) | Tent. |
| kaku | amu | Pres. |

The importance of this class of verbs makes the five-vowel analysis of (7a) more convincing as a class.

The five-vowel analysis is also useful in the following way. There are a number of pairs of words in Japanese that are phonologically

and semantically similar to the English pairs like *lie—lay*, *rise—raise*, etc. The pairs in Japanese are also formed by a transitive verb and an intransitive verb lexically, and, phonologically, by vowel alternations as in the following:⁴

- | | | | |
|-----|----|--------|-------------------------|
| (9) | a. | hamaru | ‘to fit’ |
| | | hameru | ‘to fit (something) in’ |
| | b. | deru | ‘to come out’ |
| | | dasu | ‘to push out’ |
| | c. | aku | ‘to open’ |
| | | akeru | ‘to open (something)’ |

The morpholexical structure of this type of alternations must be studied further in detail. But at first sight, all the five vowels seem to participate in this phenomenon. For that reason, it is interesting to have a five-vowel lists somewhere in the phonological description.

The three-vowel category of (6b) is also highly significant in that /y/ appears only before [+ back] vowels as a non-vocalic element, and neither before /i/ nor /e/.⁵

3. Having thus defended the five- and three- vowel categorization, we are now left with the problem of palatal consonants that occur before the vowel /i/: of the five vowels of (6a), /i/ is the only vowel that occurs consistently on the surface preceded by a palatal. The five-vowel analysis thus entails the palatalization rule for the consonants occurring before the vowel /i/. This type of palatalization rule, however, is neither unnatural in feature terms nor uncommon in phonological analyses of other languages of the world. It is, in fact, so natural and common that the generative feature system owes

its conception of palatal features to this and similar phenomena. (See McCawley (1967), and Chomsky-Halle (1968), pp. 304-308.) A consonant, then, is palatalized in the environment, before /i/:

(10) Consonant \longrightarrow Palatal/ _____ /i/

In the feature system proposed in Chomsky-Halle (1968), a consonant is non-vocalic and consonantal, while a palatal nature of a sound is broken down into three features, high, non-low, and non-back. All the three features of a palatal are shared by the vowel /i/. In the feature notation of Chomsky-Halle, therefore, (10) is rewritten as in (11):

(11) $\left[\begin{array}{l} - \text{vocalic} \\ + \text{obstruent} \end{array} \right] \longrightarrow \left[\begin{array}{l} + \text{high} \\ - \text{low} \\ - \text{back} \end{array} \right] / \text{_____} \left[\begin{array}{l} - \text{consonantal} \\ + \text{high} \\ - \text{back} \end{array} \right]$

The feature [- low] of /i/ is redundant and therefore excluded from the rule. (11) applies not only to consonants before /i/ but also to those before /y/ for the reasons explained immediately below. To permit both /i/ and /y/ to qualify as environment for Rule (11), the rule does not include [+ vocalic] in its feature specification of the segment in the environment.⁶

The surface palatals that occur before the [+ back] vowels are not the same in nature as the palatals that occur before /i/. Palatals and non-palatals do not contrast before /i/, but they do before [+ back] vowels:

(12) a. kookai 'open to the public'
 k^yookai 'church'
 b. moo 'already'

	m ^y oo	'strange'
c.	sakai	'boundary'
	šakai	'society'

It seems reasonable, therefore, that the palatals which occur before [+ back] vowels be posited in the underlying form. This means that there are two distinct sources for the surface palatal consonants: (1) the underlying palatals that occur before [+ back] vowels, and (2) the palatals that are derived from the non-palatal counterparts when these occur before /i/. The underlying palatals may be posited in the form /C^y/, which undergoes the same Palatalization Rule (11). This technical framework of generative phonology accommodates both the native speaker's intuition regarding the vowel categorization (6) on the one hand, and the phonetic distribution and contrast of palatals on the other.

This is a useful device for the purpose of accounting for the phenomena related to the verb paradigms such as (8) and (9). All the five-vowel verb stems, including those in (8) and (9),⁷ end with a non-vocalic segment.⁸ If the palatal consonants in the verb stems were to be represented in the underlying forms of these stems, then there would have to be two stems for each verb, such as /kak/ and /kak^y/ 'to write,' etc. This obviously means twice as long a list of verb stems. A far more serious defect in this kind of description, however, is that it overlooks the regularity or predictability of consonant palatalization before /i/ and /y/ in the entire language.

Also, the pairs of verbs in (9) would become less perfectly related in underlying forms, and in fact no more related than pairs of words such as those in (12), which means not at all related; thus the de-

scription fails to reflect the native intuition that the words in (9) are related and those in (12) are not.

If the surface palatal consonants in the verb stems such as those in (8) and (9) are not to be represented as palatals in the underlying forms, the only remaining alternative is to derive them in the manner formulated in (11).

4. Rule (11) is sufficient to produce the palatal counterpart for the consonants /p, b, m, n, r, k, g, h/.⁹ But for /t, d, s, z/, Rule (11) produces only intermediate sounds which do not occur in the surface phonetics of Japanese. These four intermediate entities will be called α , β , γ , and δ respectively for convenience. The input segments to Rule (11) are shown below in Table (13a), and the output of (11), in (13b).¹⁰

Rule (11) leaves the features of the categories 2, 3, and 4 intact.

(13) a.

		A.					B.				C.		
		p	b	m	n	r	t	d	s	z	k	g	h
1.	high	-	-	-	-	-	-	-	-	-	+	+	-
	back	-	-	-	-	-	-	-	-	-	+	+	-
	low	-	-	-	-	-	-	-	-	-	-	-	+
2.	anterior	+	+	+	+	+	+	+	+	+	-	-	-
	coronal	-	-	-	+	+	+	+	+	+	-	-	-
3.	continuant	-	-	+	+	-	-	-	+	+	-	-	+
	strident	-	-	-	-	-	-	-	+	+	-	-	-
4.	vocalic	-	-	-	-	-	-	-	-	-	-	-	-
	consonantal	+	+	-	-	-	+	+	+	+	+	+	+

(13) b.

		A'					B'				C'		
		p ^y	b ^y	m ^y	n ^y	r ^y	α	β	γ	δ	k ^y	g ^y	h ^y
1.	high	+	+	+	+	+	+	+	+	+	+	+	+
	back	-	-	-	-	-	-	-	-	-	-	-	-
	low	-	-	-	-	-	-	-	-	-	-	-	-
2.	anterior	+	+	+	+	+	+	+	+	+	-	-	-
	coronal	-	-	-	+	+	+	+	+	+	-	-	-
3.	continuant	-	-	+	+	-	-	-	+	+	-	-	+
	strident	-	-	-	-	-	-	-	+	+	-	-	-
4.	vocalic	-	-	-	-	-	-	-	-	-	-	-	-
	consonantal	+	+	-	-	-	+	+	+	+	+	+	+

If the segments α , β , γ , and δ existed in the surface structure, they would sound like the palatals in Russian; since they do not occur in the Japanese surface structure, they must further be processed in the manner described below.

First of all, the surface segments corresponding to α , β , γ , and δ are all non-anterior, so the output (13b) of Rule (11) must undergo a rule like (14):

$$(14) \left[\begin{array}{l} + \text{ coronal} \\ + \text{ consonantal} \end{array} \right] \longrightarrow [- \text{ anterior}] / \text{ — } \left[\begin{array}{l} - \text{ consonantal} \\ + \text{ high} \\ - \text{ back} \end{array} \right]$$

The feature [+ consonantal] is necessary to prevent [n^y, r^y] from undergoing this rule. The output segments of Rule (14) are tabulated below in (17a). Rule (14) turns γ into [š], which is the terminal representation for this segment. α , β , and δ are now changed into α' , β' , and δ' respectively, all of which are non-anterior. The first two

must further go through a rule that changes them into strident segments:

$$(15) \begin{bmatrix} + \text{ coronal} \\ + \text{ consonantal} \end{bmatrix} \longrightarrow [+ \text{ strident}] / \text{---} \begin{bmatrix} - \text{ consonantal} \\ + \text{ high} \\ - \text{ back} \end{bmatrix}$$

The segments α' and β' have now become the terminal [č, j] as shown in (17b). But δ' which is a continuant [ž], is realized in most dialects as an affricate, which is non-continuant. Therefore, for the majority of dialects, the rule (16) is needed:

$$(16) \begin{bmatrix} + \text{ continuant} \\ + \text{ voice} \\ - \text{ nasal} \end{bmatrix} \longrightarrow [- \text{ continuant}] / \text{---} \begin{bmatrix} - \text{ consonantal} \\ + \text{ high} \\ - \text{ back} \end{bmatrix}$$

The features [+ voice] and [- nasal] are necessary to exclude [š, h] and [m, n] respectively. The input feature specifications of the Rules (14), (15), and (16) are made in such a way that all the seg-

(17) a. Output of Rule (14):

		α'	β'	š	δ'
2.	anterior	-	-	-	-
	coronal	+	+	+	+
3.	continuant	-	-	+	+
	strident	-	-	+	+

b. Output of Rule (15):

		č	j
2.	anterior	-	-
	coronal	+	+
3.	continuant	-	-
	strident	+	+

(17) c. Output of Rule (16):

		ǰ
2.	anterior coronal	- +
3.	continuant strident	- +

ments of Category B of (13a) (and no other segments) will automatically qualify to undergo those rules. The output of the three rules are shown in (17a)-(17c) respectively.

The ensemble of the Rules (14), (15), and (16) will be called the Frication Rules for practical purposes. Given this set of Frication Rules, it is now possible, for instance, to posit a unique underlying form of a verb stem, even when it involves a segment of Category B of (13a). This is illustrated by the following two examples:

- | | |
|------------------------|---------------------|
| (18) a. 'to add' /tas/ | b. 'to stand' /tat/ |
| tasi(-masu) | tati(-masu) |
| tase(-ba) | tate(-ba) |
| tasa(-nai) | tata(-nai) |
| toso(-o) | tato(-o) |
| tasu | tatu |

This corresponds to the examples listed under (8). By undergoing the Frication Rules, the forms in (18) change into the correct surface representations.

The set of Frication Rules proposed here creates two distinct routes via which the voiced affricate [j] of the surface structure is derived:

- | |
|----------------------------|
| (19) a. /d/ → β → β' → [j] |
| b. /z/ → δ → δ' → [j] |

It is useful to have these two distinct ways of obtaining the surface affricate. They reflect the native intuition about the underlying parallelism of (1) and (2) by allowing both /d/ and /z/ to occur with all the five vowels of Japanese. At the same time, the surface merger of /d/ and /z/, which is automatic and therefore part of the native competence, is reflected in the phonological rules of derivation. Besides, for the few dialects where [ji] and [zi] are distinguished, this solution allows the possibility of eliminating Rule (16), the last detail rule added most recently in the historical development of the surface forms.¹¹

Furthermore, corresponding to the intransitive-transitive pairs of (9) are examples such as (20) that involve the surface affricates:

(20)	a.	odiru	'to feel threatened'
		odosu	'to threaten'
	b.	toziru	'to close'
		tozasu	'to close (something)'
	c.	tatu	'to stand'
		tateru	'to cause to stand'
	d.	mitiru	'to become full'
		mitasu	'to fill'

The related nature of these pairs of verbs would not be reflected in the underlying forms unless the derivational processes (19a) and (19b) existed in the phonology of Japanese.

5. One additional detail related to the Frication has to do with the three /u/-cases in (1) and (2): /zu/, /tu/, and /du/ are realized on the surface as [dzu], [tsu], and [dzu] respectively. These have nothing to do with the Palatalization of (11), but they must undergo

some form of Frication Rules. The feature specifications of the input to such a rule are tabulated in (21a), and the desired surface targets, in (21b):

(21) a.

		t	d	s	z
1.	high	-	-	-	-
	back	-	-	-	-
	low	-	-	-	-
2.	anterior	+	+	+	+
	coronal	+	+	+	+
3.	continuant	-	-	+	+
	strident	-	-	+	+

b.

		ts	dz	dz
2.	anterior	+	+	+
	coronal	+	+	+
3.	continuant	-	-	-
	strident	+	+	+

/s/ in (21a) requires no change. /t/ and /d/ must become strident, and /z/ must become non-continuant. Notice that the earlier Frication Rule (15) can apply to /t/ and /d/ of (21a) with only a slight modification on the conditions of its application: (15), which applies only to the consonants before /i/, now must apply both before /u/ and /i/, or before the [+ high] vowels.

$$(15') \left[\begin{array}{l} + \text{ coronal} \\ + \text{ consonantal} \end{array} \right] \longrightarrow [+ \text{ strident}] / \text{---} \left[\begin{array}{l} - \text{ consonantal} \\ + \text{ high} \end{array} \right]$$

The Frication Rule (16) also applies to /z/ before /u/ with exactly

the same modification in the specification of its environment:

$$(16') \begin{bmatrix} + \text{continuant} \\ - \text{nasal} \\ + \text{voice} \end{bmatrix} \longrightarrow [- \text{continuant}] / \text{---} \begin{bmatrix} - \text{consonantal} \\ + \text{high} \end{bmatrix}$$

The modified Frication Rules (15') and (16') give two routes (19') via which a surface [dzu] is derived:

$$(19') \quad \begin{array}{ll} \text{a. } /du/ & \text{b. } /zu/ \\ (15') \quad \text{dzu} & \text{---} \\ (16') \quad \text{---} & \text{dzu} \end{array}$$

In the few dialects that retain the [zu] : [dzu] distinction, Rule (16') can easily be dropped, being the last detail rule added to the phonology of Japanese.¹¹

In many dialects of Japanese, /z/ undergoes a Frication Rule and becomes [dz] before /e, a, o/, as well as before /u/. For these dialects (16') can be modified as in (16'') on the condition that (16'') apply after the Palatalization Rule (11):¹²

$$(16'') \begin{bmatrix} + \text{continuant} \\ - \text{nasal} \\ + \text{voice} \end{bmatrix} \longrightarrow [- \text{continuant}] / \text{---} [+ \text{vocalic}]$$

The ordering condition is necessary to prevent /z/ before /i/ from becoming [dz]. Once Palatalization Rule applies to /z/, it can no longer undergo Rule (16''), so that (16'') changes /z/ into [dz] before the four vowels /e, a, o, u/.

The set of rules proposed here provides a way of accounting for the distinction between the following two words:

- (22) a. tikai 'near'
 b. tukai 'errand'

Martin (1959) (p. 379) points out that when /u/ and /i/ between the voiceless consonants are devoiced and even absent from the surface utterance, the distinction between these two words relies solely on the [ts] : [č] distinction as in (23):

(23) a. čkai b. tskai

By positing (22) as underlying forms, and by applying the Palatalization Rule (11) to (22a), and the Frication Rule (15') to both (22a) and (22b), as shown in (24), it is possible to account for (1) the native intuition, (2) the sound distinction, and (3) the surface distribution of the two affricates [ts] and [č]:

(24)	a.	/tikai/	b.	/tukai/
	Rule (11):	t ^ʎ ikai		—
	Rule (15'):	čikai		tsukai
	V-Devoicing: ¹³	č ^h ikai		ts ^h ukai
	V-Truncation: ¹³	čkai		tskai

6. There are other, more or less related topics that cannot be dealt with in the present paper. These are (1) the doublets, (2) the syllable truncation processes, and (3) y- (and somewhat related w-) insertion cases. The doublets are of the type such as /omoNziru/ and /omoNzuru/ 'to consider important,' /haziru/ and /hazuru/ 'to be ashamed of,' etc. The syllable truncation is seen when /dewa/ 'now' is realized as [jaa], /kaitewa/ 'if written' as [kaičaa], /site simaQta/ 'finished doing' as [sičimatta] or [sičatta], etc. The y- (or w-) insertion occurs between vowels in words like /baai/ 'case,' /siai/ 'game' and /guai/ 'condition' when they are realized as [bayai] (or [bawai]), [siyai], and [guwai] respectively. These are certainly related cases

but are also sporadic and less systematic.

Somewhat more systematic cases are the loan words. Kiparsky (1973), for instance, points out that Japanese interprets English [kæ] as [k^ya] in the loan words corresponding to *cap*, *captain*, *candy*, etc., but that an older loan word for *cabin* reflects the /ke/ interpretation in /kebiN/. (p. 113). This must be dealt with in a more comprehensive manner, because other English consonants before [æ] vary in their interpretations in Japanese: the initial consonants in *map*, *ramp*, *sack*, etc. are interpreted with no [y], while *jet*, *check*, *shirt*, etc. are interpreted with [y]. Detailed discussion on these related topics must await another opportunity.

Notes

- 1 All the orthographic proposals are discussed in Hattori (1951), pp. 219–241. His discussion is based partly on the Trager-Smith phonology, and partly on the practical considerations of what an orthography ought to be like.
- 2 See, however, note 5.
- 3 The terms “Polite present,” etc. are borrowed from McCawley (1968). See pp. 95ff. Semantically, they refer to the parenthesized particles and not to the stems *kaki*-, etc. or *ami*, etc., which simply mean ‘write’ and ‘knit’ respectively. The *u*-form can occur by itself but the others are all bound forms.
- 4 Notice that this is not the same phenomenon as the syntactic suffixing such as causative /sase/ and potential /re/ as in /hanas-(s)ase-/ ‘to make (someone) talk,’ and /oyog-(r)e-/ ‘to be able to swim.’ See Kuno (1973), pp. 138f., and pp. 296ff. Both words in each pair in (9) can undergo syntactic suffixation: /hamar-(s)ase-ru/ and /hame-sase-ru/, /de-sase-ru/ and /das-(s)ase-ru/, etc.
- 5 In a recent commercial coinage [jéi], the palatal [j] occurs before /e/. The word is pronounced with a prolonged [j], so that in some instances it sounds almost like [ijéi]. The coinage is obviously intended for its West-

erized or borrowed flavor in its sound structure. It is interesting to notice that, of the two vowels /i/ and /e/, the innovating combinations tend to be palatals plus /e/ (e.g., the Japanese words for *jet* and *check*), and non-palatals plus /i/ (e.g., the Japanese word for *party*), and not vice versa. If loan words make inroads into the Japanese phonological system, it is possible that Japanese might eventually have the vowel system like (7), in which case some way of describing this vowel categorization must be devised. In order not to exclude that eventuality, the relevant part of the tentative feature specifications of the Japanese vowels will be assumed to be as follows:

	i	e	a	o	u
high	+	-	-	-	+
low	-	-	+	-	-
front	+	-	-	-	-
back	-	-	+	+	+

Given this feature system, (7a) may be described as [- front], and (7b) as [α front, β back]. For the present discussion, however, the feature [\pm front] is not necessary and will not be mentioned in the rest of this paper.

- 6 Note that in those dialects where [š] and [ž] occur before /e/, these palatals do not contrast with their nonpalatal counterpart. Hattori (1951), pp. 134f. Thus in those dialects, palatalization rule (11) must apply not only to the eight consonants under discussion but also to the fricatives /s/ and /z/ before /e/. See Note 9 for more on this.
- 7 Of the six verbs listed under (9), the intransitives in the pairs a, and c are five-vowel verbs; in the pair b, the transitive verb is the five-vowel verb.
- 8 The commonly used term "consonant verb" is misleading because the stem final segment may well be /w/ as in /aw/ 'to meet' and /iw/ 'to say.' Since /w/ is [-consonantal], it is not a consonant in that sense, but it is [-vocalic].
- McCawley (1968) posits /Hip/ 'to say' (pp. 119f.), and /warap/ 'to laugh' (p. 94) instead of /iw/ and /waraw/ respectively. Which non-

vocalic segment to posit stem finally in the underlying form is not at issue here as long as a stem ends with a [-vocalic] segment.

- 9 Actually, a palatalized /h/ is strident in some dialects. For such dialects (11) must have additional features as follows:

$$(11') \left[\begin{array}{l} - \text{vocalic} \\ + \text{obstruant} \\ \langle + \text{low} \rangle \end{array} \right] \longrightarrow \left[\begin{array}{l} + \text{high} \\ - \text{low} \\ - \text{back} \\ \langle + \text{strident} \rangle \end{array} \right] / \text{---} \left[\begin{array}{l} - \text{cons} \\ + \text{high} \\ - \text{back} \end{array} \right]$$

Also, for those dialects where [š] and [ž] occur before /e/ instead of [s] and [z], (11) must be modified as follows:

$$(11'') \left[\begin{array}{l} - \text{vocalic} \\ + \text{obstruant} \\ \langle - \text{strident} \rangle \end{array} \right] \longrightarrow \left[\begin{array}{l} + \text{high} \\ - \text{low} \\ - \text{back} \end{array} \right] / \text{---} \left[\begin{array}{l} - \text{consonantal} \\ \langle + \text{high} \rangle \\ - \text{back} \end{array} \right]$$

10. The nine features specified in these tables are the minimum necessary for our discussion here. A complete feature specification must include at least three other features in addition to those listed in (13): voice, nasal, and obstruant. The values for the first two are self-evident. The segments included in the tables are all [+obstruant]. This differs from McCawley's feature system on two important counts: (1) the features [grave, diffuse, compact], and [sharp] and not utilized, and (2) instead of McCawley's minimal specification system, (13) is a fully specified system. See McCawley (1968), pp. 88ff.
- 11 This is the kind of mechanism described by Kiparsky (1971).
- 12 The ordering condition can be replaced by a more precise feature specification on the vowel in the environment of Rule (16'') : / ____ [+vocalic, - front] instead of just / ____ [+vocalic]. This is another reason why [± front] can be a useful feature for the vowels. See Note 5.
- 13 The Vowel-Devoicing and Truncation Rules are beyond the immediate scope of the present paper and not discussed in detail.

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