

PROSODIC MINIMALITY IN JAPANESE

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1. **Introduction.** Prosodic Minimality plays a key role in the theory of Template Morphology (McCarthy & Prince 1986, 1990, etc.), and a number of proposals have appeared in the literature crucially utilizing minimality requirements of various types.¹ This paper argues that a deeper understanding of the nature and role of minimality constraints can be gained through the principles of word structure and prosodic theory. On the one hand, the scope of prosodic minimality needs to be restricted by incorporating the distinction between underived lexical items and productively derived forms which plays a fundamental role in Lexical Phonology (Kiparsky 1982b, 1985, etc.). On the other hand, the theory is in need of further hierarchical elaboration. In particular, the morphological categories STEM and WORD have separate associated prosodic minimality constraints. Once this differentiation is recognized, it is important to ask how the interaction of the various size requirements is governed by prosodic principles. Prosodic coherence turns out to play a key role in this context.

1.1 **Preliminaries.** Crosslinguistic investigation has revealed that restrictions on truncation patterns often result from minimal word requirements. The descriptive basis for this paper is the system of loanword abbreviations in Modern Japanese. Representative examples are given in (1).²

- | | | | |
|--------|-----------------|------------|----------------------------|
| (1) a. | amachua | → ama | 'amateur' |
| | purofessionaru | → puro | 'professional' |
| | herikoputaa | → heri | 'helicopter' |
| | ruporutaaaju | → rupo | 'reportage' (Fr.) |
| | chokoreeto | → choko | 'chocolate' |
| | terorizumu | → tero | 'terrorism' |
| | birudiNgu | → biru | 'building' |
| | opereeshON | → ope | 'operation' |
| b. | haNkachiifu | → haNkachi | 'handkerchief' |
| | furasutoreeshON | → furasuto | 'frustration' |
| | irasutoreeshON | → irasuto | 'illustration' |
| | sukatorojii | → sukatoro | 'scatology' |
| | akuserureetaa | → akuseru | 'accelerator' |
| | iNtorodakushON | → iNtoro | 'introduction' |
| | koNsaabatibu | → koNsaaba | 'conservative (in attire)' |
| | asuparagasu | → asupara | 'asparagus' |

New loanwords are constantly being introduced (and productively abbreviated) in newspapers, magazines, and advertisements, making this a rich source

of empirical evidence. Because of the productivity of the system, the degree of intersubjective agreement on possible shortening patterns is very high.³

In Prosodic Morphology (McCarthy & Prince 1986, 1990), shortening patterns as in (1) are analyzed as a mapping to the minimal prosodic template of the language. For example, the minimal word in English is the monosyllabic foot, i.e. a single heavy syllable. So-called stump words therefore contain a diphthong (*pro* [prow] 'professional') or a closing coda consonant (*prof* [prɔf] 'professor'), but a short vowel without a closing consonant is impossible (*[prɔ], *[prɔ̃]).

For Japanese, extensive work by Poser (1984a, 1984b, 1990) has demonstrated that the system of hypocoristic name shortenings involves mapping to a bimoraic foot template (two light syllables or a single heavy syllable). A name like *Mariko* has several possible hypocoristic forms: *mari-chaN*, *mako-chaN*, *riko-chaN*, *maa-chaN*, etc. As illustrated in (2), the segmental melody of the original name is mapped onto the bimoraic template [$\mu \mu$], with an invariant suffix *-chaN*. The mapping respects linear order but can skip melody elements (2c) or remap them (3), as long as the outcome conforms to the syllable structure restrictions of Japanese.⁴

- | | | |
|--|--|--|
| (2) a. <i>mari-chaN</i> | b. <i>riko-chaN</i> | c. <i>mako-chaN</i> |
| $\begin{array}{c} [\mu \quad \mu] \text{-chaN} \\ / \quad / \\ \text{ma r i ko} \end{array}$ | $\begin{array}{c} [\mu \quad \mu] \text{-chaN} \\ / \quad / \\ \text{ma r i ko} \end{array}$ | $\begin{array}{c} [\mu \quad \mu] \text{-chaN} \\ / \quad / \\ \text{ma r i ko} \end{array}$ |

The principle of Template Satisfaction (McCarthy & Prince 1986, Steriade 1988) ensures that the template is never incompletely filled. Notice that the mapping can also result in a single syllable [maa].

- (3)
$$\begin{array}{c} [\mu \quad \mu] \text{-chaN} \\ /|/ \\ \text{m a r i ko} \end{array} \rightarrow \text{maa-chaN}$$

Since the result is bimoraic, it still satisfies the template. On the other hand, a single monomoraic syllable such as [ma] violates template satisfaction, and indeed there are no monomoraic hypocoristics like **ma-chaN* or **ri-chaN*. These facts suggest as an initial hypothesis that the minimal prosodic word of Japanese equals the bimoraic foot.

As further evidence for foot structure, Poser 1984b notes that a repetition of the bimoraic foot pattern is also possible in hypocoristics (4).

- | | |
|--|--|
| (4) a. <i>wasaburo-chaN</i> | b. <i>tomisabu-chaN</i> |
| $\begin{array}{c} [\mu \quad \mu] [\mu \quad \mu] \text{-chaN} \\ / / \quad / / \\ \text{wasa buro o}^5 \end{array}$ | $\begin{array}{c} [\mu \quad \mu] [\mu \quad \mu] \text{-chaN} \\ / / \quad / / \\ \text{tomi sabu roo} \end{array}$ |

Longer names like *Wasaburoo* and *Tomisaburoo* can thus be truncated not only to a two-mora form like [*sabu*]-*chan*, but also to four-mora forms.

Loanword abbreviations seem to fall into similar two-mora (1a) and four-mora (1b) patterns. This initial observation already invites a parallel analysis invoking a mechanism of mapping to a single bimoraic template (5), or to a sequence of two such templates (6).

- (5) a. *kone* 'connection' b. *pera* 'propeller' c. *mohi* 'morphine'

$\begin{array}{c} [\mu \quad \mu] \\ /| \quad /| \\ ko \ ne \ kushon \end{array}$

$\begin{array}{c} [\mu \quad \mu] \\ /| \quad /| \\ puro \ pe \ ra \end{array}$

$\begin{array}{c} [\mu \quad \mu] \\ /| \quad /| \\ mo \ ru \ hi \ ne \end{array}$

- (6) a. *han**kachi* 'handkerchief' b. *risu**ri**n* 'glycerin' c. *torap**e**n* 'transparencies'

$\begin{array}{c} [\mu \quad \mu] \quad [\mu \quad \mu] \\ /| \quad /| \quad /| \quad /| \\ ha \ N \ ka \ chi \ ifu \end{array}$

$\begin{array}{c} [\mu \quad \mu] \quad [\mu \quad \mu] \\ /| \quad /| \quad /| \quad /| \\ gu \ ri \ su \ ri \ n \end{array}$

$\begin{array}{c} [\mu \quad \mu] \quad [\mu \quad \mu] \\ /| \quad /| \quad /| \quad | \\ to \ ra \ Nsu \ pe \ are \ N \ shii \end{array}$

The mapping possibilities are very similar to the hypocoristics: The majority of cases take the leftmost string of the original loanword ((5a) and (6a)), but some map the end of the word ((5b) and (6b)), and there are also cases of melody skipping ((5c) and (6c)).⁶ One difference between loanword abbreviations and hypocoristic formations is that abbreviations are in general unique: Once an abbreviated form is established, other possibilities are highly disfavored.⁷ However, some loanwords do have more than one abbreviated form, as in (7).

- (7) a. *sutoma*i 'streptomycin' b. *maishi**n* 'streptomycin'

$\begin{array}{c} [\mu \quad \mu] \quad [\mu \quad \mu] \\ /| \quad /| \quad /| \quad | \\ su \ to \ re \ pu \ to \ ma \ i \ shi \ n \end{array}$

$\begin{array}{c} [\mu \quad \mu] \quad [\mu \quad \mu] \\ /| \quad /| \quad /| \quad | \\ su \ to \ re \ pu \ to \ ma \ i \ shi \ n \end{array}$

At first glance, the system of loanword abbreviations seems to be little more than another addition to the already extensive evidence for the bimoraic foot template in Japanese. Closer investigation, however, reveals several interrelated problems, calling for a deeper exploration of the theory of prosodic minimality.

1.2 Background. In loanword phonology, it is important to distinguish between the phonology and morphology of the source language (from which the words are borrowed) and of the language into which the words are introduced (see e.g. Hyman 1970, Lovins 1973 for insightful discussion). Once established in the target language, the original morphology and phonology of the loanword in the source language become more or less irrelevant.

Although English is the primary source of recent loanwords in Japanese, the productive shortening patterns are entirely native and are not based on any phonological or morphological characteristics of English.

Confusions sometimes arise because some cases accidentally have equivalent shortening patterns in the two languages (e.g. *puro* 'pro' (8a)), or the shortening may correspond to a morphological boundary (e.g. *heri* 'heli=copter' (8c)). Such resemblances, however, are clearly coincidental since the vast majority of cases correspond in English neither to coherent phonological units (e.g. *suto* corresponds only to a portion of the onset consonant cluster (8b)), nor to morphological units (e.g. *kone*, where the cutting point is neither a phonological nor a morphological juncture (8d)).

(8)	a.	<i>puro</i>	'pro'	<i>purofesshonaru</i>	'professional'
	b.	<i>suto</i>	[st]	<i>sutoraiki</i>	'(labor) strike'
	c.	<i>heri</i>	'heli-'	<i>herikoputaa</i>	'heli = copter'
	d.	<i>kone</i>	[conne...-]	<i>konekushoN</i>	'connect = ion'

The words themselves are 'borrowed', but the shortening pattern reflects a property of Japanese, not of the source language.⁸

It is also worth noting that many loanwords have undergone morphological compounding in the target language. For example, Japanese has regular dvandva (coordinate) compounding (e.g. *oya-ko* 'parent and child'), and appropriate loanwords can combine into dvandvas (9). Since English does not have such compounding possibilities, it is clear that this morphological operation is performed in Japanese.

(9)	<i>ero-guro</i>	'erotic and grotesque'	(a genre of cinema)
	<i>sado-mazo</i>	'sadism and masochism'	(a genre of cinema)
	<i>ana-deji</i>	'analog and digital'	(a type of clock)

It is not unusual for an English loanword to compound with a native Japanese word, a Sino-Japanese word, or even with loanwords from other European languages.⁹

(10)	<i>kara-oke</i>	'empty orchestra'
	<i>ita-choko</i>	'bar chocolate'
	<i>hiru-mero</i>	'noon melodrama' (soap opera)
	<i>aru-chuu</i>	'alcoholic poisoning'
	<i>geru-pin</i>	'Geld (Ger.) pinch' (financial crisis)

Both the morphological and the phonological behavior of these loanwords clearly reflect generalizations of Japanese, and our investigation will further demonstrate the various ways in which the system is dependent on the prosodic structure of Japanese.

2. Minimality Problems. This section presents the main generalizations obtained in a comprehensive lexical survey of abbreviated loanwords in

Japanese. The overall summary of our results in (11) indicates the number of examples found for each moraic pattern, together with one representative example.

(11) μ -Pattern	Count	Example	
1 μ	2	pe(eji)	'page'
2 μ	86	heri(koputaa)	'helicopter'
3 μ	53	terebi(joN)	'television'
4 μ	55	rihabiri(teeshoN)	'rehabilitation'
5 μ	1	koNkurii(to)	'concrete'
6 μ	1	suter(e)otaipu	'stereotype'
7 μ	1	asutorinZen(to)	'astringent'

There is an overwhelming tendency for abbreviations to be 2-, 3-, or 4-moras long. The two examples of 1-mora abbreviations (*pe* from *peeji* 'page' and *po* from *poiNto* 'point (size of print)') are found in Kenkyusha's Katakana Dictionary, with the crucial note that they occur only in *written* form (as single kana abbreviations for page number and print size designations). The three isolated longer examples (5 μ , 6 μ , 7 μ) are most plausibly analyzed as sporadic cases of final syllable drop or vowel cluster simplification; they clearly do not figure in the productive abbreviation system.

The bimoraic foot hypothesis outlined in section 1 immediately accounts for the two-mora pattern as mapping to a [$\mu \mu$] template; the four-mora pattern arises in the same way, with the difference that the mapping target is a template consisting of two feet. An unexpected aspect of chart (11) is the frequency of the three-mora pattern, which rivals the four-mora pattern in the number of instantiations. We will see below that these cases have a proper place within the overall system.

A more detailed breakdown (12), which takes the syllabic organization of the moras into account, reveals several important subgeneralizations.

(12) μ -Pattern	σ -Pattern	Example	
1 μ	# [σ_μ]		
2 μ	[$\sigma_\mu \sigma_\mu$] # [$\sigma_{\mu\mu}$]	choko(reeto)	'chocolate'
3 μ	[$\sigma_{\mu\mu} \sigma_\mu$] [$\sigma_\mu \sigma_\mu \sigma_\mu$] # [$\sigma_\mu \sigma_{\mu\mu}$]	saike(derikku) anime(eshoN)	'psychedelic' 'animation'
4 μ	[$\sigma_{\mu\mu} \sigma_{\mu\mu}$] [$\sigma_{\mu\mu} \sigma_\mu \sigma_\mu$] [$\sigma_\mu \sigma_\mu \sigma_{\mu\mu}$] [$\sigma_\mu \sigma_\mu \sigma_\mu \sigma_\mu$] # [$\sigma_\mu \sigma_{\mu\mu} \sigma_\mu$]	baateN(daa) iNtoro(dukushoN) eakoN(dishonaa) furasuto(reeshoN)	'bartender' 'introduction' 'airconditioner' 'frustration'

Unproductivity of a pattern is marked by "#". We will take it as a criterion of adequacy for our analysis whether it succeeds in providing principled explanations for the marginal status of the nonproductive patterns in (12). Are they in any way prosodically deficient?

As summarized in (13), monosyllables are hardly attested as abbreviations, this includes monomoraic (13a) and surprisingly also bimoraic forms (13b); for polysyllabic cases, there is a strong bias against any pattern starting with a light syllable followed by a heavy syllable (13c).

- (13) Nonproductive abbreviation patterns:
- a. # [σ_μ]
 - b. # [$\sigma_{\mu\mu}$]
 - c. # [$\sigma_\mu \sigma_{\mu\mu} \dots$]

Each of the disfavored patterns highlights a separate problem in prosodic minimality. The three problems are sketched below in this section, with preliminary answers. The remainder of the paper provides further empirical motivation and theoretical development.

2.1 Problem I: Monomoraic lexical items. The fact that there are hardly any monomoraic abbreviations receives a straightforward explanation if we appeal to the standard approach to such minimality requirements: Assume that the minimal prosodic word of Japanese is of bimoraic size. For a loanword such as *birudiŋgu* 'building', this immediately entails that only (14a) is possible. A smaller one-mora-sized template (14b) would violate minimality; and the other potential derivation of a monomoraic form in (14c), with incomplete filling of a bimoraic template, fails because it violates Template Satisfaction.

- (14) a. [$\mu \mu$]
 /| /|
 b i r u (diŋgu)
- b. [μ]
 * /|
 b i (rudiŋgu)
- c. [$\mu \mu$]
 * /|
 b i (rudiŋgu)

The reasoning here is straightforward, but there is a serious problem with its basic empirical premise: namely, that Japanese words are minimally bimoraic. A cursory look at the Japanese lexicon reveals that such a limit is quite unrealistic, since there are numerous monomoraic words which are by no means marginal. Relevant examples, which could easily be multiplied, appear in (15).

- (15) su 'vinegar' ya 'arrow' ki 'tree'
 na 'name' ko 'child' to 'door'
 ta 'rice field' ka 'mosquito' hi 'blood'
 no 'field' hi 'fire' e 'picture'
 ne 'root' te 'hand' ha 'tooth'
 de-ru 'to exit' ki-ru 'to wear' mi-ru 'to see'

In English, some words (e.g. *the*, *a*) also do not satisfy the minimal heavy syllable requirement, and the uncontroversial explanation is that such function words are not full prosodic words. The words in (15), however, are real content words (nouns and verbs), and a parallel account is not possible.

If the 'minimal' word in Japanese is indeed monomoraic, as the forms in (15) might suggest, then the monomoraic template (14b) is licit, with the unwelcome consequence that forms like monomoraic **bi* are predicted as wellformed shortening products. In order to derive the correct facts, it would always be possible to retract to a descriptively safe position and simply stipulate a two-mora template for loanword abbreviations. Such a move, however, is undesirable, since it cannot do justice to the widespread role of such a template, which is called upon again and again in Japanese (see Poser 1990, and section 3 below). A series of construction-specific stipulations turns this into a mere coincidence. We are thus faced with a dilemma: A *bimoraic* template cannot explain why monomoraic lexical items exist, whereas a *monomoraic* template cannot explain why all loanword abbreviations (and hypocoristics) must be bimoraic.

It turns out, however, that bimoraic minimality can indeed be upheld as the fundamental generalization; the recalcitrant monomoraic forms fall under a separate generalization which is captured by the lexical-phonological concept of (*un*)*derivedness*. The idea (further developed in section 3 below) is that the minimal bimoraic template in Japanese is enforced on *derived* forms only, not on *underived* forms. Truncated hypocoristics and abbreviated loanwords are *derived* from their base forms, and hence must satisfy the minimality requirement of the language. The *underived* monomoraic words in (15) come with their own underlying templates, which makes them exempt from minimality.

2.2 Problem II: Word-size requirements. From a moraic perspective, one heavy syllable and two light syllables should be equivalent fillings of a two-mora template. A curious asymmetry, then, is the fact that out of the 86 bimoraic abbreviations (11), only one example is a heavy monosyllable¹⁰, all the others consist of two light syllables, as illustrated in (16).

(16)	$[\sigma_\mu\sigma_\mu]$			
	suto(raiki)	'strike'	ope(reeshoN)	'operation'
	ado(resu)	'address'	poji(chibu)	'positive'
	ama(chua)	'amateur'	hazu(baNdō)	'husband'
	geba(ruto)	'Gewalt' (Ger.)	roke(eshoN)	'location'
	ita(rikku)	'italic'	tero(risuto)	'terrorist'
	nega(chibu)	'negative'	puro(fessionaru)	'professional'
	reji(sutaa)	'cash register'	rabo(ratorii)	'laboratory'
	zemi(naaru)	'Seminar' (Ger.)	deko(reeshoN)	'decoration'
	piri(odo)	'period'	kone(kushoN)	'connection'

The cases where one might expect to find heavy monosyllables instead result in bisyllabic (and trimoraic) forms:

(17)		$[\sigma_{\mu\mu} \sigma_{\mu}]$	$*[\sigma_{\mu\mu}]$	
	maikurohoN	→ maiku	*mai	'microphone'
	saikederikku	→ saike	*sai	'psychedelic'
	paamaneNto	→ paama	*paa	'permanent (hairstyle)'
	saNdoitchi	→ saNdo	*saN	'sandwich'
	daiyamoNdo	→ daiya	*dai	'diamond'
	shiNpasaizaa	→ shiNpa	*shiN	'sympathizer'
	aNpurifaiaa	→ aNpu	*aN	'amplifier'
	iNpotentsu	→ iNpo	*iN	'impotent'
	koNbineeshoN	→ koNbi	*koN	'combination'
	paNkuchaa	→ paNku	*paN	'puncture, a blowout'

The pattern in (16) conforms to a bimoraic foot template (see (18a)), but the pattern in (17) does not (see (18b)).

(18) a.	F	b.	F
	/ \		/ \
	$\mu \mu$		$\mu \mu$
	/ /	*	/
	su to (raiki) 'strike'		ma i (kurohoN) 'microphone'

What seems to be required is a bisyllabic template $[\sigma \sigma]$ (19), which correctly predicts both the patterns in (16) and (17).

(19) a.	$[\sigma \sigma]$	b.	$[\sigma \sigma]$
	/ /		/ \ /
	su to (raiki) 'strike'		ma i ku (rohoN) 'microphone'

Simply revising the minimal word template to bisyllabic size is not a satisfactory solution, however. Recall that for hypocoristic formation and other cases discussed in Poser 1990 (see also section 3 below), bimoraicity (and crucially not bisyllabicity) is the relevant factor. Our loanword project has uncovered another such area, namely compound abbreviations (20).

(20)	waado purosessaa	→ waa puro	'word processor'
	hebi metaru	→ hebi meta	'heavy metal'
	rajio kasetto rekoodaa	→ raji kase	'radio cassette recorder'
	sukeeto boodo	→ suke boo	'skateboard'
	paasonaru koNpyuutaa	→ paso koN	'personal computer'
	paNtii sutokkiNgu	→ paN suto	'panty stockings'

Chart (21) shows the typology of loan compound abbreviations, with the moraic breakdown per compound member indicated in square brackets. The scarcity of bimoraic and trimoraic compound abbreviations can be traced

to the fact that individual members of the compound cannot be truncated to one-mora size, and it is reasonable to assume that this again reflects the ban against monomoraic forms.¹¹

(21)	μ -Pattern	Count	Example	
	$2\mu = [1\mu + 1\mu]$	4	be(esu) a(ppu)	'base up, pay raise'
	$3\mu = [2\mu + 1\mu]$	4	dore(su) me(ekaa)	'dressmaker'
	$4\mu = [2\mu + 2\mu]$	134	suke(eto) boo(do)	'skateboard'

The overwhelmingly productive compound pattern in (21) is the four-moraic one, composed of two bimoraic members. The mappings in (22) illustrate that, as long as bimoraicity is satisfied, the compound members can be both bisyllabic (22a), both monosyllabic (22b), or any combination thereof (22c,d).

(22) a.	sara-dore 'salad dressing'	b.	jii-paN 'jeans pants, jeans'
	$\begin{array}{cc} [\sigma_\mu \sigma_\mu] & - & [\sigma_\mu \sigma_\mu] \\ / & / & / \\ sa & ra & da \end{array}$		$\begin{array}{cc} [\sigma_{\mu\mu}] & - & [\sigma_{\mu\mu}] \\ / \backslash & & / \backslash \\ j & i & i \end{array}$
	do re sshiNgu		Nzu pa N tsu
c.	haN-suto 'hunger strike'	d.	rimo-kON 'remote control'
	$\begin{array}{cc} [\sigma_{\mu\mu}] & - & [\sigma_\mu \sigma_\mu] \\ / \backslash & & / & / \\ haN & gaa & su & to \end{array}$		$\begin{array}{cc} [\sigma_\mu \sigma_\mu] & - & [\sigma_{\mu\mu}] \\ / & / & / \backslash \\ r & i & mo \end{array}$
	su to raiki		oto kON torooru

The members of the abbreviated compound need not themselves be possible abbreviated words in isolation. In particular, none of the monosyllabic members can occur alone. As shown in (23) and (24), *jii, *paN, and *haN are only allowed as compound members, whereas the disyllabic suto (24b) occurs both as a compound member and as an abbreviated form by itself.¹²

(23) a.	*jii	← jiiNzu	'jeans'
b.	*paN	← paNtsu	'pants'
c.	jii-paN	← jiiNzu paNtsu	'jeans pants'
(24) a.	*haN	← haNgaa	'hunger'
b.	suto	← sutoraiki	'strike'
c.	haN-suto	← haNgaa-sutoraiki	'hunger strike'

The decisive observation here is that two types of requirements are involved: one based on the mora count for members of loan compounds, and another based on the syllable count for single loanwords. More generally, the solution lies in recognizing a morphologically based prosodic distinction between (bound) *stem* and (unbound) *word* in Japanese. The members of the compounds are arguably bound stems which cannot occur in isolation.

The minimal prosodic stem is the bimoraic foot (25), and the prosodic word must be minimally bisyllabic, i.e. longer than one syllable (26).

- (30) a. Word 'helicopter'
 |
 Stem_F
 / \
 σ_μ σ_μ
 /| /|
 he ri (koputaa)
- b. Word 'bartender'
 / \
 Stem_F S
 / \
 σ_{μμ} σ_{μμ}
 /| /|
 baa te N (daa)
- c. Word 'combination'
 / \
 Stem_F S
 | |
 σ_{μμ} σ_μ
 /| /|
 koN bi (neeshoN)
- d. Word 'demonstration'
 / ?
 Stem_F ?
 / ? ?
 * σ_μ σ_{μμ}
 /| /|
 de moN (sutoreeshoN)

The first three cases (30a, b, c) have properly bracketed constituent structure: In (30a), stem and word totally overlap; in (30b, c), the bisyllabic word contains the bimoraic stem at the left edge, plus one extra syllable S (which can be considered a suffixal element, or another stem). The structure in (30d), however, is prosodically incoherent: The stem cannot exclusively dominate the initial monomoraic syllable *de*, because the template would then be incompletely filled. It cannot dominate both the first syllable *de* and the heavy second syllable *moN*, because a bimoraic foot template cannot accommodate three moras. And although all template size constraints would be fulfilled if the stem exclusively dominated the second syllable *moN*, this violates the Left Edge Requirement.

The question why the light-heavy [σ_{μ} $\sigma_{\mu\mu}$] pattern (27) is unattested now has a simple answer: No wellformed structures could underlie it. We will see in section 5 that a parallel analysis carries over to the second unattested pattern in (27b) as well as to other problematic cases.

3. Minimality and Derived Forms. We now return to the problem of monomoraic lexical items, which can be recapitulated by the grammaticality contrasts in (31):

- (31)
- | | | | | |
|----|--------------|-------------|-------------|-----------------|
| | 1μ | 2μ | | |
| a. | ya | | | ‘arrow’ |
| | yu | | | ‘hot water’ |
| b. | * bi, | biru | ← birudiNgu | ‘building’ |
| | * ma(-chaN), | mari(-chaN) | ← mariko | ‘little Mariko’ |

Although lexical words such as *ya* (31a) are quite commonly monomoraic (cf. (15) above), shortened forms of loanwords and hypocoristics (31b) are consistently minimally bimoraic (*biru*, *mari-*) and not monomoraic (**bi*, **ma-*).

In this section, we further explore the idea that the bimoraic minimality template in Japanese is only enforced on *derived* forms (31b) and not on *underived* lexical items (31a). The distinction between derived and underived environments, familiar from Lexical Phonology (Kiparsky 1982, etc.), is based on the observation that lexical rules are systematically blocked in basic lexical entries (Kiparsky 1968). This distinction is operative, for example, in English pluralization (Kiparsky 1974), as illustrated in the paradigm (32).

(32) Singular	Special plural	Regular -s plural
mouse	mice	*mouses
goose	geese	*gooses
Mickey Mouse	*Mickey Mice	Mickey Mouses
Mother Goose	*Mother Geese	Mother Gooses

The simple underived *mouse* requires the special plural *mice* (not **mouses*), but for the derived name *Mickey Mouse* the regular plural is obligatory (*Mickey Mouses*, not **Mickey Mice*). Examples of this kind can easily be multiplied (cf. Kiparsky 1974).¹⁴

If we make the assumption that bimoraicity, as the regular pattern of the language, is enforced in Japanese as a *lexical constraint*, we predict that it will not affect *underived* words, but will apply to truncated hypocoristics and shortened loanwords, which are *derived* from their bases. This yields the correct distinction in (31). It is beyond the scope of this paper to explore further questions regarding the concept of derivedness (for relevant discussion, see Kiparsky 1974 and later work), but an intuitive grasp of the distinction is sufficient to evaluate the evidence for bimoraicity in Japanese from this new perspective. Besides the truncation evidence just discussed (hypocoristics and loanword abbreviations (31)), the remaining cases also fall under derived bimoraic minimality, albeit in a more subtle way. The evidence can be divided into two categories: Stem shape determination (section 3.1) and monomoraic lengthening (section 3.2).

3.1 Stem shape determination. In the mimetic vocabulary of Japanese, all stems obey a bimoraic constraint (cf. Hamano 1986, Mester & Itô 1989, Poser 1990).

(33) a. [$\sigma_\mu\sigma_\mu$]		b. [$\sigma_{\mu\mu}$]	
pika-	'shining'	guN-	'steadily'
zabu-	'splashing'	pyoN-	'jumping'
noru-	'sluggishly'	hyoi-	'by fits and starts'
niko-	'smiling'	buu-	'complaining'

The representative examples in (33) illustrate that mimetic stems are composed of either two light syllables (33a) or one heavy syllable (33b), never of a single light syllable. The derivedness hypothesis compels us to ask

in what sense such mimetic forms are derived. Hamano (1986) develops a detailed analysis of the Japanese mimetic vocabulary, showing that numerous consonantal and vocalic features are sound-symbolic and combine to produce the desired meaning. Compositional semantics implies internal analysis into (feature-sized) morphemes and hence derivedness, and the prosodic shape of the root is predicted to be bimoraic.

A second case of stem shape determination is found in the reversing argot popular in the entertainment industry, extensively analyzed in Tateishi 1989, see also Poser 1990.

(34)	Base Form		Argot Form:	[$\mu\mu$] [$\mu\mu$]
a.	koohii	'coffee'	→	hii koo
b.	oNna	'woman'	→	naa oN
c.	yamada	'Yamada'	→	daa yama
d.	maneejaa	'manager'	→	jaa mane

The determination of the unit that undergoes reversal depends on various morphological, prosodic, and sometimes orthographic factors. The important prosodic invariant lies in the output structure: According to Tateishi 1989, regardless of the mora count of the original word, the result is two bimoraic feet, achieved by lengthening (34b,c) or shortening (34d).¹⁵ Details aside, the relevant point for our purposes is that this is clearly another instance of derivedness entailing bimoraicity, here of the derived argot stem.

3.2 Monomoraic Lengthening. A different type of evidence for derived bimoraicity is monomoraic lengthening found in (i) 'schedule' compounding, (ii) telephone number recitation, and (iii) verbal root reduplication. As illustrated below, vowel lengthening occurs only when the form is monomoraic. This generalization finds its rationale in our derivedness hypothesis: All three cases are productively derived, triggering bimoraic minimality.

First, as discussed in Martin 1987,¹⁶ when the stems denoting the days of the week (35a) are compounded (35b) (omitting the suffix *-yoobi*), the monomoraic *ka-* 'Tues-' and *do-* 'Satur-' lengthen their vowels.

(35) a. Days of the Week	b. Compounded Forms
nichi -yoobi 'Sunday'	sui-kiN 'WF'
getsu -yoobi 'Monday'	kaa-moku 'TuTh' *ka-moku
ka -yoobi 'Tuesday'	getsu-kaa 'MoTu' *getsu-ka
sui -yoobi 'Wednesday'	kaa-doo 'TuSa' *ka-do
moku-yoobi 'Thursday'	
kiN -yoobi 'Friday'	
do -yoobi 'Saturday'	

Derived bimoraic minimality means that the two-mora template needs to be satisfied by each of the derived stems, which is fulfilled by vowel lengthening:

- (36) $\begin{matrix} [\mu \ \mu] & [\mu \ \mu] \\ /|\cdot & /|\cdot \\ k a & - d o \end{matrix} \rightarrow kaa-doo \quad \text{'Tuesdays and Saturdays'}$

A similar monomoraic lengthening pattern is a characteristic part of a widely used technique of telephone number recitation. As Noriko Kawasaki (personal communication) has pointed out to me, in reciting strings of numbers, every digit is realized as a bimoraic unit. The telephone number 459-3284 is given in (37) as an illustration, where the genitival *-no* separates the telephone prefix. The base forms of the number words appear in (37b) for comparison.

- (37) 4 5 9 - 3 2 8 4
 a. yon goo kyuu (no) san nii hachi yon
 b. ichi '1' ni '2' san '3' shi/yon '4' go '5'
 roku '6' shichi '7' hachi '8' ku/kyuu '9' ree '0'

In (37a), the bimoraic variants of '4' and '9' (*yon* and *kyuu*) are used instead of the monomoraic variants (*shi* and *ku*), and when no bimoraic variant exists (as is the case with '2' and '5'), the vowels of *ni* and *go* are lengthened.

Poser 1990 (see also Kageyama 1976-77) offers as evidence for a bimoraic foot the monomoraic lengthening facts observed in verbal stem reduplication (38).¹⁷

- (38) a. tabe 'to eat' → tabe-tabe 'while eating'
 nak(i) 'to cry' → naki-naki 'while crying'
 odor(i) 'to dance' → odori-odori 'while dancing'
 b. mi 'to look' → mii-mii 'while looking'
 ne 'to sleep' → nee-nee 'while dozing'
 sh(i) 'to do' → shii-shii 'while doing'

Kageyama 1976-77 notes that when the verbal stem is equal to or larger than two moras (38a), full stem reduplication takes place, but when the verbal stem consists of a single mora (38b), both vowels are lengthened in the reduplicated form.¹⁸

In each of the three cases, then, we encounter monomoraic forms which undergo lengthening in a derived context.¹⁹ While individually the various pieces of evidence do not make a decisive case, taken together, they provide considerable support for our hypothesis of derived bimoraicity.

To recapitulate, we can maintain bimoraic minimality in Japanese if we view minimality constraints as being strictly enforced on derived forms but not on underived forms. From this perspective, it is not surprising to find such minimality constraints observed under what may seem to be unusual situations (e.g. hypocoristics, loanword abbreviations, reversing argot, sound-

symbolic mimeics, etc.): After all, these are the productively derived forms in the language.²⁰

4. Minimality Requirements. The different patterning of single and compounded loanword abbreviations detailed in section 2.2 points towards a distinction between the two minimality requirements in (26) and (27), repeated below in (39):

- (39) *Minimal Stem Requirement:* $\text{Min(STEM)} = F = [\mu \mu]$
Minimal Word Requirement: $\text{Min(WORD)} > \sigma$

We will now show that this distinction, far from being an arbitrary extension of minimality canons, is firmly rooted within the overall system of Japanese morphology, as the prosodic counterpart of a basic categorical distinction between (bound) stems and (free) words.²¹

4.1 Truncated hypocoristics and abbreviated loanwords. The basic idea can be illustrated by the near minimal pair in (40), contrasting a truncated hypocoristic form and an abbreviated loanword. The hypocoristic, but not the loanword, is shortened to the (bimoraic) monosyllable *sai*.

(40)	Base Form	Shortened Form	
	saiko	sai(-chan)	'little Saiko'
	saikederikku	*sai, saike	'psychedelic'

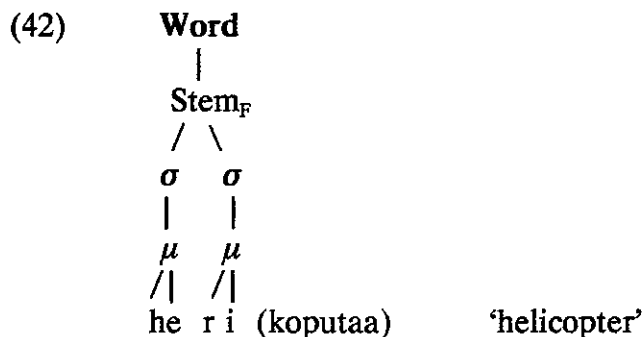
The contrast here derives from a category distinction: Hypocoristic truncations are bound stems (obligatorily followed by the suffix *-chan*), whereas abbreviated loanwords are free-standing words. The size requirements in (39) then yield the truncated hypocoristic structure in (41a) and the shortened loanword structure in (41b).

(41) a.	Word	'little Saiko'	b.	Word	'psychedelic'
	/ \			/ \	
	Stem_F	Suffix		Stem_F	Suffix
	/ \	/ \			
	σ	σ		σ	σ
	/	\		/	
	$\mu \mu$	$\mu \mu$		$\mu \mu$	μ
	/	/		/	/
	s a i (ko)	chaN		s a i	ke (derikku)

The structures (41a) and (41b) satisfy the minimal stem requirement in the same way, namely by the bimoraic *sai*. But the situation for the minimal word requirement is different. In (41a), the addition of the (monosyllabic) suffix *-chan* to the stem *sai* already yields a bisyllabic hypocoristic word, so the rest of the base melody (*ko*) is not in further demand. In (41b), on the other hand, the abbreviated loanword, not augmented by an additional suffix,

has to fulfill both parts of (39) by itself. Consequently, beyond the initial *sai* (which fulfills the stem requirement), an additional chunk of the base melody is taken as a quasi-suffix *ke*, in order to fulfill the word size requirement.²²

It should be noted that such a quasi-suffix is not an obligatory part of loanword abbreviations: The stem can be co-extensive with the word when it consists of two light syllables (42). Here the stem and word requirements are simultaneously met by the same string of segmental material.



The different size restrictions for truncated hypocoristics and abbreviated loanwords thus follow directly from their respective stem and word status.

4.2 Compounding. Single and compound loanword abbreviations display a prosodic contrast exactly parallel to the one in (40). The paradigm (43) again illustrates the central fact: The loanword *koNpanii* 'party, company' shortens to disyllabic *koNpa*, not to monosyllabic **koN*; but as part of the compound *kurasu-koNpa* 'class party', the very same form can be further shortened to monosyllabic *kura-koN*.

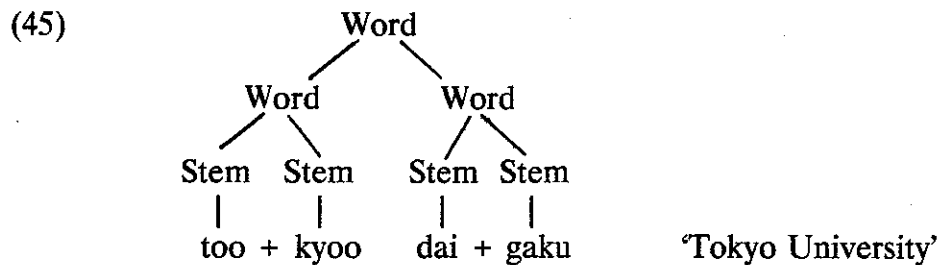
- | | | | | | |
|------|----|--------------------------|---|-------------------------|-----------------------------------|
| (43) | a. | koNpanii
kurasu-koNpa | → | koNpa, *koN
kura-koN | 'company, party'
'class party' |
| | b. | saNdoitchi
hamu-saNdo | → | saNdo, *saN
hamu-saN | 'sandwich'
'ham sandwich' |

With respect to the normal assumption that each member of a compound is an independent word, this contrast appears puzzling. The problem resolves itself within the Japanese compounding system, which requires a distinction between word-word compounds (44a), and stem-stem compounds (44b).

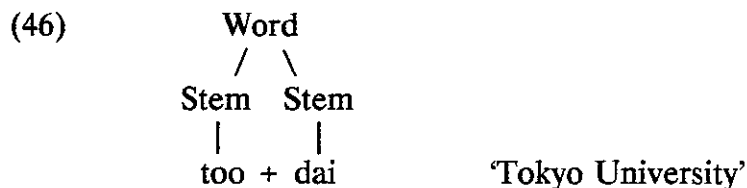
- | | | | | | | | | | | | |
|---|------|-----|-----------|--|------------------------------------|---|------|-----|-----------|--|---|
| <p>(44) a. Word-Word Compounds
(free compounds)</p> <table style="margin-left: 40px;"> <tr><td style="text-align: center;">Word</td></tr> <tr><td style="text-align: center;">/ \</td></tr> <tr><td style="text-align: center;">Word Word</td></tr> <tr><td style="text-align: center;"> </td></tr> <tr><td style="text-align: center;">hana kazari 'flower decoration'</td></tr> </table> | Word | / \ | Word Word | | hana kazari 'flower decoration' | <p>b. Stem-Stem Compounds
(bound compounds)</p> <table style="margin-left: 40px;"> <tr><td style="text-align: center;">Word</td></tr> <tr><td style="text-align: center;">/ \</td></tr> <tr><td style="text-align: center;">Stem Stem</td></tr> <tr><td style="text-align: center;"> </td></tr> <tr><td style="text-align: center;">suu + gaku 'number study'
 'mathematics'</td></tr> </table> | Word | / \ | Stem Stem | | suu + gaku 'number study'
'mathematics' |
| Word | | | | | | | | | | | |
| / \ | | | | | | | | | | | |
| Word Word | | | | | | | | | | | |
| | | | | | | | | | | | |
| hana kazari 'flower decoration' | | | | | | | | | | | |
| Word | | | | | | | | | | | |
| / \ | | | | | | | | | | | |
| Stem Stem | | | | | | | | | | | |
| | | | | | | | | | | | |
| suu + gaku 'number study'
'mathematics' | | | | | | | | | | | |

The two types of compounding have quite different properties.²³ Word-compounding (44a) is the site of *rendaku* voicing; stem-compounding usually operates with two Sino-Japanese morphemes. Such morphemes are normally found not in isolation but only compounded with other Sino-Japanese morphemes.²⁴

A further crucial property of stem compounds in Japanese is that they can themselves enter the word compounding process. In (45) the two stem compounds *too+kyoo* 'eastern capital' and *dai+gaku* 'big school' form the word compound *too+kyoo dai+gaku*, 'Tokyo University'.



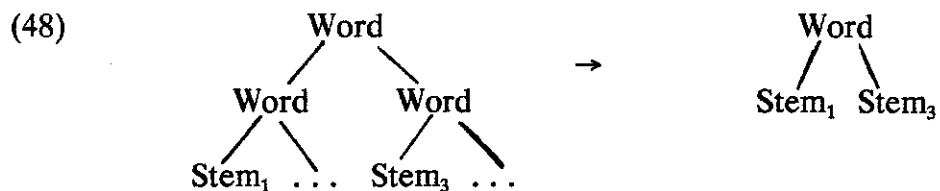
An interesting aspect of such multiply compounded forms is the fact that they are often abbreviated by taking the initial morpheme of each compound member. The abbreviation for *too+kyoo dai+gaku* (45) is the new bound compound *too+dai* (46).



Other examples of this very productive process are given in (47).²⁵

- | | | | |
|------|---------------------------|---------------------|-----------------------|
| (47) | <i>koku+sai reN+goo</i> | → <i>koku+reN</i> | 'United Nations' |
| | <i>ka+tei sai+baN+sho</i> | → <i>ka+sai</i> | 'family court' |
| | <i>koku+yuu tetsu+doo</i> | → <i>koku+tetsu</i> | 'state railway' |
| | <i>shi+ei deN+sha</i> | → <i>shi+deN</i> | 'municipal streetcar' |

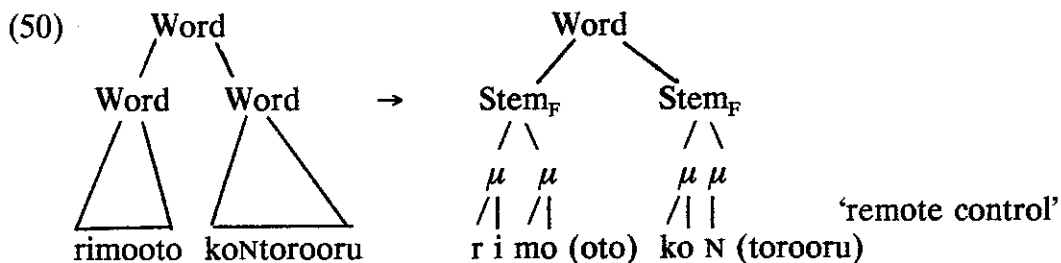
Simply put, word-word compounds shorten into stem-stem compounds by abbreviating each word.



Loan compound abbreviations as in (49) are clearly modelled on this native abbreviation pattern.

(49)	sarada doresshiNgu	→ sara + dore	'salad dressing'
	waado purossessaa	→ waa + puro	'word processor'
	haNgaa sutoraiki	→ haN + suto	'hunger strike'
	rimooto koNtorooru	→ rimo + koN	'remote control'
	jiiNzu paNtsu	→ jii + paN	'jeans pants, jeans'
	paasonaru koNpyuutaa	→ paso + koN	'personal computer'

Parallel to the Sino-Japanese abbreviations (47), portions of the first word and the second word combine to form a new compound. Crucially different from the Sino-Japanese cases, the abbreviated loanwords in (49) disregard the original morphological structure (i.e. in the source language). As schematized in (50), the cut occurs not at a morphological or orthographic boundary, but at a prosodic juncture: after the first foot (= the minimal prosodic stem).



Since the resulting word is a bound stem compound, it is no longer surprising that the abbreviated parts often cannot stand in isolation.²⁶ Just as in the case of truncated hypocoristic names, each member of the truncated loan compounds need only satisfy the bimoraic stem template; it is only the compound word as a whole that must satisfy the word size requirement of polysyllabicity. Loanword abbreviations, not guided by pre-existing internal morphological structure, constitute strong evidence for a purely prosodic characterization of stem and word.

5. Prosodic Coherence and the Left Edge Requirement. We have seen that many prosodic characteristics of loanword abbreviations follow from the simple requirement that words properly contain stems. The remaining pieces of the puzzle fall into place once the positioning of the stem within the word is taken into account.

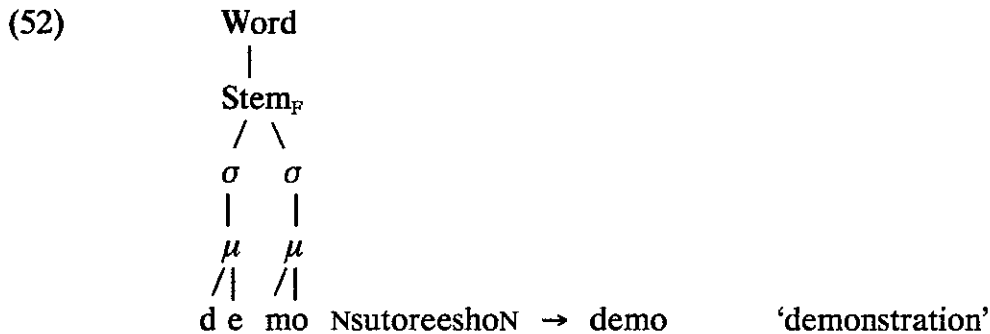
For a suffixing language like Japanese, the unmarked locational assumption is that the stem occupies the left edge of the word (cf. section 2.3 above). Technically, this Left Edge Requirement can be encoded by means of a word-structure rule like (51) (see Selkirk 1983).

(51) Word → Stem X

The rule (51) expresses both dominance and linear precedence relations: The category WORD is expanded into the category STEM followed by suffixes (or other stems). Together with the other word structure requirements as well

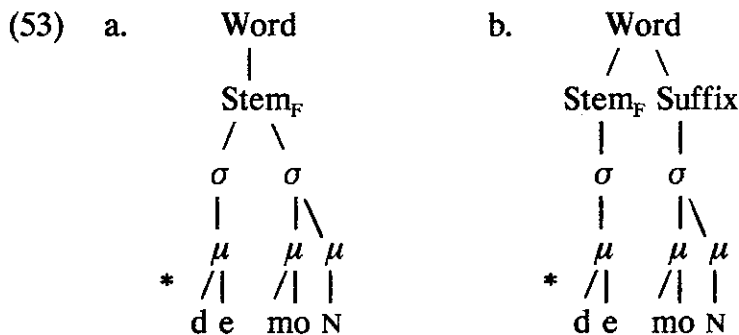
as general prosodic principles, (51) explains the systematically marginal status of certain loanword abbreviation patterns.

We will begin by discussing one representative example in some detail: the case of *demon**nsutoreeshoN* 'demonstration'. The attested abbreviated form is the bimoraic *demo* (52), which satisfies all word structure requirements: The stem is bimoraic, the word is bisyllabic, and as the sole daughter of the word, the stem is trivially also at the left edge.

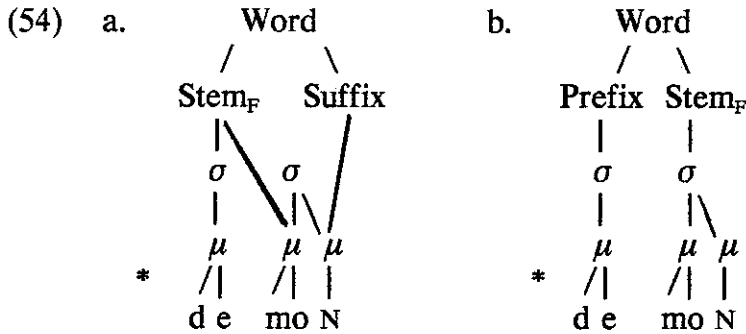


Considering the string of base melody segments, another (*a priori* not implausible) possibility would have been to include the next segment *N* to form **demon**N*. Why is the pattern represented by **demon**N* unattested and judged to be illformed? The answer (as already indicated above in section 2.3) is that this form simply has no wellformed prosodic structure.

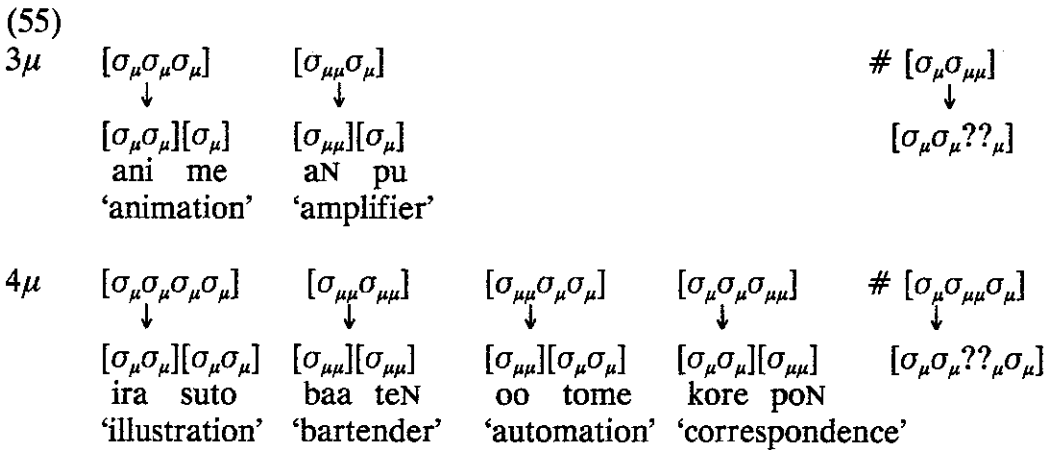
There are four cases to consider. The first two, illustrated in (53), violate the bimoraic stem requirement in familiar ways: (53a) with an oversized trimoraic stem, and (53b) with an undersized monomoraic stem.



The two other structures, illustrated in (54), are more subtly deviant. While satisfying the word and stem size requirements, they violate other principles. In (54a), the foot-sized prosodic stem (Stem_F) has an incoherent structure splitting the second syllable *moN*. Such improper bracketing constitutes a violation of syllable integrity. The structure in (54b) is prosodically coherent; but here the stem does not occupy the left edge, violating (51).



It turns out that such an analysis carries over to the entire paradigm of 3μ and 4μ loanword abbreviation patterns (cf. (12)). As shown below in (55), the difference between the attested and the unattested patterns is traceable to the Left Edge Requirement. All wellformed patterns have an analysis in terms of a bimoraic stem at the left edge, followed by additional material (either a monomoraic suffix or another bimoraic stem). In contrast, the two unattested cases ($\#[\sigma_\mu \sigma_{\mu\mu}]$ and $\#[\sigma_\mu \sigma_{\mu\mu} \sigma_\mu]$) have no such analysis.



The wellformed four-mora patterns involve a sequence of two bimoraic stem templates and are in effect prosodic compounds. A form like *irasuto*, although derived from a single loanword *irasutoreeshoN* 'illustration', is prosodically identical to the four-mora compounds in the previous section. The crucial point is that the abbreviated form must be coherently divisible into two bimoraic halves (e.g. [ira] and [suto]). This is why a four-mora abbreviation pattern $[\sigma_\mu \sigma_{\mu\mu} \sigma_\mu]$ is impossible: The medial heavy syllable fits neither into the first nor into the second part of the prosodic compound.

5.1 Left Edge Requirement. The Left Edge Requirement is an output constraint and not part of the template mapping procedure.²⁷ Although most abbreviated forms utilize the initial (leftmost) chunk of the base melody, some appear to have mapped the melody from the right edge (56).²⁸

(56)	(puro) pera	'propeller'	(aru) baito	'Arbeit' (Ger.)
	(kari) pasu	'calipers'	(daina) maito	'dynamite'
	(wa) nisu	'varnish'	(arumi) nyuumu	'aluminum'
	(furaN) neru	'flannel'	(haNka) chiifu	'handkerchief'
	(heru) metto	'helmet'	(kosume) chikku	'cosmetic'
	(toraN) petto	'trumpet'	(ado) baNsU	'advance pay'

There is no inconsistency here as long as the Left Edge Requirement is conceived of as a condition on output structures: It is irrelevant for the prosodic wellformedness of the output whether the melody of the abbreviated form corresponds to the initial portion (57a) or to the final portion (57b) of the base melody.

(57)	a.	Word	b.	Word
		/ \		/ \
		Stem _F Suffix		Stem _F Suffix
		σ σ		σ σ
		\		\
		μ μ μ		μ μ μ
		/ /		/ /
		d a i y a (moNdo) 'diamond'		(aru) ba i t o 'Arbeit'

In the abbreviated form *baito* (57b), the initial syllable *bai* properly fulfills the Left Edge Requirement even though it occupied a medial position in the base melody *arubaito*.

5.2 The Prosodic Size Requirements. Since the Left Edge Requirement must function as an output constraint, it is appropriate to briefly examine the status of the two size requirements, repeated in (58).

(58)	a.	<i>Minimal Stem Requirement:</i>	Min(STEM) = F = [μ μ]
	b.	<i>Minimal Word Requirement:</i>	Min(WORD) > σ

The stem requirement (58a) can equivalently be viewed either as a bimoraic foot template to which melodies are mapped, or as an output constraint requiring all prosodic stems to be exactly bimoraic. In our discussion, both constraint and procedure terminology have been used interchangeably since the empirical effects are identical in this case.

The word size requirement (58b), on the other hand, resembles the Left Edge Requirement in that it is output-oriented. We can bring its status as an output constraint into focus by comparing the prosodic forms of the two attested trimoraic patterns [$\sigma_{\mu\mu} \sigma_{\mu}$] (59a) and [$\sigma_{\mu} \sigma_{\mu} \sigma_{\mu}$] (59b). Representative word structures for (59a) and (59b) are given in (60a) and (60b). The structures are quite parallel except for the overall number of syllables per word: (60a) is bisyllabic, (60b) trisyllabic.

(59) a. $[\sigma_{\mu\mu} \sigma_{\mu}]$		b. $[\sigma_{\mu} \sigma_{\mu} \sigma_{\mu}]$	
maiku(rohoN)	'microphone'	anime(eshoN)	'animation'
saike(derikku)	'psychedelic'	arumi(nyuumu)	'aluminum'
paama(neNto)	'permanent'	asesu(meNto)	'assessment'
saNdo(itchi)	'sandwich'	barasu(to)	'ballast'
daiya(moNdo)	'diamond'	basuke(tto)	'basket'
shiNpa(saizaa)	'sympathizer'	defure(eshoN)	'deflation'
aNpu(rifaiaa)	'amplifier'	denomi(neeshoN)	'denomination'
iNpo(teNtsu)	'impotent'	derika(tessen)	'delicatessen'
koNbi(neeshoN)	'combination'	heriko(putaa)	'helicopter'
paNku(chaa)	'puncture'	karuchi(beetaa)	'cultivator'

(60) a. Word		b. Word	
/ \ Stem _F Suffix		/ \ Stem _F Suffix	
		/ \ σ σ σ	
σ σ			
		μ μ μ	
μ μ μ		/ /	
/ /		/ /	
ma i ku (rohoN) 'microphone'		te re bi (joN) 'television'	

In (60a), since the bimoraic stem *mai* is monosyllabic, the quasi-suffix *-ku* is necessary to fulfill (58b). In (60b), on the other hand, since the stem *tere* is already bisyllabic, it fulfills both stem and word requirements, and the quasi-suffix *-bi* appears prosodically redundant. How is such excess material possible in a system of shortening based on minimality? Here it becomes important to construe (58b) as an output constraint. As such, the requirement is met whenever the output is minimally two syllables long; it does not prevent the inclusion of further material in the word.²⁹

This predicts the possibility of variation, which is in fact observed: For example, as abbreviations for the loanword *herikoputaa* 'helicopter' (61), both the bisyllabic *heri* and the trisyllabic *heriko* are attested.

(61) a. Word		b. Word	
		/ \ Stem _F Suffix	
Stem _F		/ \ σ σ σ	
/ \ σ σ			
		μ μ μ	
μ μ		/ /	
/ /		/ /	
he ri (koputaa)		he ri ko (putaa)	

Both structures in (61) fulfill all universal and language-specific word structure requirements discussed in this paper: The words are minimally bisyllabic, the stems are made up of exactly one bimoraic foot each, they are located at the left edge of the word, and prosodic coherence is respected.

NOTES

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1. Recent work on the topic includes Black 1990, Cole 1990, Lombardi & McCarthy 1990, McCarthy & Prince 1986, 1990, McNally 1990, Spring 1990, Wilkinson 1988, among others.

2. The moraic nasal is denoted by [N], and long vowels are represented by doubling the vowel symbol. Otherwise, the transcription used in this paper follows the romanization adopted in Kenkyusha's New Japanese-English Dictionary.

3. This study collected loanword abbreviation examples primarily from the following sources: Katakana English dictionary, Kenkyusha, 1987, Tokyo; English Loanwords in Japanese, Charles E. Tuttle Co., Tokyo, 1979; Kenkyusha's New Japanese-English Dictionary, Kenkyusha Ltd., Tokyo 1974. I would like to thank Yukako Sunaoshi for her assistance with the loanword database.

4. An analysis of Japanese syllable structure constraints is developed in Itô (1988, 1989). Important earlier generative studies regarding the role of moras and syllables in Japanese include Kuroda 1965 and McCawley 1968. Relevant speech error evidence is found in Kubozono 1989. The phonetic reality of the mora is critically evaluated in Beckman 1982 and Port, Dalby, and O'Dell 1987. On the status of the bimoraic foot templates in Japanese, a detailed and insightful analysis of the jazz musician's jargon is found in Tateishi 1989. Poser 1990 gives a comprehensive review of the prosodic and morphological evidence for the bimoraic foot in Japanese. For further crosslinguistic empirical motivation and theoretical development regarding the bimoraic trochee, see Mester 1990b, and references cited therein.

5. For convenience, V_iV_i and C_iC_i are used as shorthand expressions for geminate single melody elements in the base form unless the context calls for more representational detail.

6. An interesting resyllabification case is *baNkame*, a shortened form of 'Bank of America', where *k* has been (re)syllabified as the onset of *a*.

7. This is in fact also the case for hypocoristic names, where uniqueness is relativized in terms of individuals: A given person usually has only one hypocoristic name, variants (as in (2)) nearly always denote different individuals.

8. The massive productivity of the shortening pattern can be further illustrated by the fact that specialized jargons using the same type of template have developed at institutions where English words are commonly used. A case in point is the student argot for course titles at ICU (International Christian University, Tokyo): *iN-riN* 'Introduction to Linguistics', *iN-kuri* 'Introduction to Christianity', *moda-daN* 'Modern Dance', *jene-edo* 'General Education'.

9. Even when both members of the compound are English loanwords, they may have undergone compounding in Japanese. Two oft-mentioned examples which have acquired a more specialized meaning in Japanese are *ime+cheN* 'image-change' and *tore+paN* 'training

pants'. The former means "a change from one's usual clothing or hairstyle, due to a new love affair or heartbreak", and the latter only denotes regular gymnastic pants.

10. The one example is *guu* (from *guddo* 'good'), a quasi-interjection derived by lengthening.

11. The other two- and three-mora compound abbreviations found in the Katakana dictionary are the following:

2 μ :	<i>mobo</i> (\leftarrow <i>modaaN booi</i>)	'modern boy'
	<i>moga</i> (\leftarrow <i>modaaN gaaru</i>)	'modern girl'
	<i>sufu</i> (\leftarrow <i>suteepuru faibaa</i>)	'staple fiber'
3 μ :	<i>tereke</i> (\leftarrow <i>teepu rekoodaa</i>)	'tape recorder'
	<i>puramo</i> (\leftarrow <i>pura(suchikku) moderu</i>)	'plastic model'
	<i>shaabo</i> (\leftarrow <i>shaapupeNshiru boorupeN</i>)	'mechanical pencil and ball-point pen' (brand name)

12. As is to be expected, not all disyllabic cases occur as single word abbreviations. For example, in *rimo-koN* (22d), the first member *rimo* is not attested in isolation, but it is a possible abbreviated form. The monosyllabic second member *koN*, on the other hand, is not only unattested, but also judged illformed.

13. There are two examples of the bisyllabic case (27a) and three examples of the trisyllabic case (27b) listed in the Katakana Dictionary:

$[\sigma_{\mu} \sigma_{\mu\mu}]$	<i>semeN(to)</i>	'cement'
	<i>suteN(resu)</i>	'stainless (steel)'
$[\sigma_{\mu} \sigma_{\mu\mu} \sigma_{\mu}]$	<i>depaato(meNto)</i>	'department store'
	<i>apaato(meNto)</i>	'apartment house'
	<i>achiibu(meNto)</i>	'achievement test'

None of these are *bona fide* cases of prosodic shortening. In the first form, the final [t] in English is often unpronounced (with the word ending in a glottalized [n]). All the other examples have truncated a suffix (*-less* and *-ment*), so a kind of Japanese morphologically based 'back formation' may be operative here.

14. See McCarthy & Prince (1990) for arguments that plural formation in Arabic is divided along similar lines.

15. There are certain systematic exceptions to this two-foot analysis (see Poser 1990 and Tateishi 1989): If the base form is three light syllables, the output structure is prosodically the same (e.g. *piyano* 'piano' \rightarrow *yanopi*). Some suggestions for an appropriate analysis for such cases are given in note 30 in section 5 below.

16. Thanks to Armin Mester for bringing this case to my attention.

17. Used as an adjunct clause describing an action performed simultaneously with that of the main verb.

18. In the context of current templatic reduplication theories, it is interesting to note that here the minimal word template shapes not only the reduplicand but also the the base form. Intuitively, it appears that the base must be a valid prosodic unit before it can be mapped onto another prosodic template in reduplication.

19. Cases of vowel lengthening are also found in truncated hypocoristics, as in *midori* \rightarrow *mii-chaN*, *taroo* \rightarrow *taa-chaN*, *chiyoko* \rightarrow *chii-chaN* (cf. also (3)). The abbreviated loan compound for a grounder to the pitcher is a parallel example: *pitchaa goro* \rightarrow *pii-goro* 'pitcher grounder'.

20. This by no means universally excludes cases of absolute minimality. For example, all Lardil words, both derived and underived, must meet the minimality requirement (Wilkinson 1988). Actually, even for Japanese, the derivedness factor holds only for the standard (Tokyo) dialect, with its numerous underived monomoraic lexical items. In other dialects, the

corresponding forms contain long vowels instead (e.g. *yu* 'hot water' (31a) is *yuu* in the Kyoto dialect). Kyoto Japanese (more generally, the Kansai dialects), then, obeys strict bimoraic minimality, without the derivedness qualification. See also Mester 1990b for implications of strict minimality in Latin phonology.

21. It may also be possible to recast the analysis in terms of constraints on different levels/strata in Lexical Phonology.

22. The question may arise how monosyllabic loanwords like *baa* 'bar', *kaa* 'car', *kii* 'key', etc. are possible at all. The crucial distinction is that such cases do not constitute derived forms. See Hyman (1970) and Lovins (1973) for general discussion regarding underlying representations in loan phonology.

23. For expository convenience, members of bound stem compounds are separated by "+", members of free word compounds by a space. The hierarchical morphological structure follows the word structure model proposed in Selkirk (1983).

24. Most Greek origin words in English, like *heli+copter* and *octo+pus*, fall into a similar category: They normally do not occur in isolation, but the meanings of the parts are relatively transparent, and they compound with other Greek morphemes fairly freely.

25. These can be considered functional equivalents of English examples like NATO, U.N., CLS, NELs, OPEC, UCLA. From the parts of the compound, English acronyms take the initial letter, whereas Sino-Japanese abbreviations take the initial Kanji character, each representing one morpheme.

26. This analysis then maintains that bimoraicity is a characteristic of bound stems, which cannot occur in isolation. Truncated hypocoristics (Poser 1984, 1990) and members of loanword compounds fall correctly into this category. The evidence for bimoraicity cited above in section 3 further confirms bimoraic stem formation: The mimetic forms (Hamano 1986) are always either reduplicated or suffixed; the reversing argot is analyzed as compounding of two bimoraic templates (Tateishi 1989); the forms that have undergone monomoraic lengthening always appear reduplicated (verbal stems), as members of compounds (days of the week), or as part of a recitation sequence (numbers).

27. See McCarthy & Prince 1990 and Mester 1990a for discussions of various template uses.

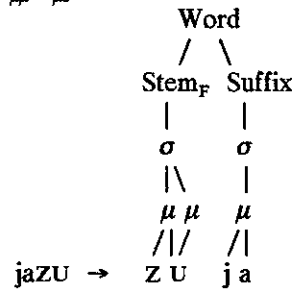
28. Melody skipping patterns (e.g. *mo(ru)hi(ne)* 'morphine', *koN(teN)pora(rii)* 'contemporary', *kore(su)poN(deNsu)* 'correspondence', *tora(Nsu)pe(are)N(shii)* 'transparency') are much less frequent. Besides continuity of mapping (McCarthy & Prince 1986), recoverability is perhaps involved here: Beginnings and ends are easier to recognize.

29. This is not to say that loanword abbreviations can be of any length. The function of abbreviations clearly plays a role here: Their purpose is, after all, to make 'long' words shorter. In fact, there is some evidence that trimoraic structures such as (60), with a bimoraic stem and a monomoraic suffix, are canonical in Japanese. Recall that the reversing argot mentioned in section 3 also systematically produces trimoraic output patterns (see note 16): When the base form consists of three light syllables, the argot form remains trimoraic (with the appropriate segment reversals) (i); and when the base form consists of two light syllables, the argot turns into a heavy-light pattern (ii).

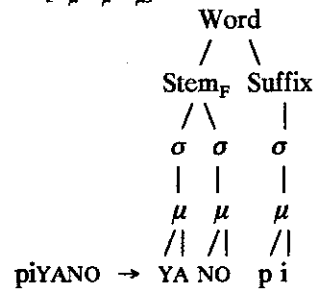
- | | | |
|------|-----------------|------------|
| (i) | piYANO → YANOpi | 'piano' |
| | kuSURI → SURiku | 'medicine' |
| (ii) | meSHI → SHIIme | 'food' |
| | jaZU → ZUUja | 'jazz' |

We can assume that some portion of the melody at the end of the base form fills the argot stem template (see Tateishi 1989 for details).

(iii) a. [$\sigma_{\mu\mu} \sigma_{\mu}$]



b. [$\sigma_{\mu} \sigma_{\mu} \sigma_{\mu}$]



The two output structures are identical with the two trimoraic patterns discussed above in (60): a leftmost bimoraic stem (mono- or bisyllabic), plus a monomoraic suffix. In (iiia), the monomoraic *zu* must be lengthened to fill the bimoraic stem template, and suffixation of *ja* results in trimoraicity. In (iiib), on the other hand, the bimoraic stem is filled by the string *yano*, and *pi* fills the quasi-suffix position. As in the case of the loanword abbreviations (cf. **demon*), the illicit light-heavy pattern cannot arise because the stem must be bimoraic and word-initial. Whenever a final monomoraic syllable is taken as the melody of the argot stem as in (iv), it will always undergo lengthening to fulfill the bimoraic stem requirement.

- | | | | | |
|------|--------|---|------------------|----------|
| (iv) | komBO | → | BOOKON, *BOKON | ‘combo’ |
| | yamaDA | → | DAAYama, *DAYama | ‘Yamada’ |

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