

Shigeto Kawahara

11 The phonology of Japanese accent

1 Introduction

1.1 Background and the aims of this chapter

The Tokyo dialect of Japanese exhibits lexical contrasts based on pitch accent; that is, there are minimal pairs of words that are identical segment-wise,¹ but can be distinguished in terms of their pitch contours (the term “accent” is defined shortly below in section 1.2). While what kind of pitch contour a particular word shows is often unpredictable for many lexical words, there are many phonological and morphological environments in which the distribution of lexical accent is predictable, at least to some extent. In other words, there are some regularities regarding the phonological distributions of Japanese pitch accent. This chapter provides an overview of the phonology of pitch accent patterns in modern Tokyo Japanese (henceforth “Japanese”).

Since the accentual system of Japanese is so complex, it is impossible to provide a full description of its system, let alone an analysis, in a single chapter. Many details of Japanese accentology therefore have to be set aside. For example, although there is a wealth of literature on the accent patterns of non-Tokyo dialects, it is far beyond the scope of this chapter to discuss them. See, for example, Haraguchi (1977, 1991, 1999), Kubozono (2010, 2011), and Uwano (1999, 2007) for some descriptions of non-Tokyo dialects written in English. Neither does this chapter go into the details of phonetic realization of Japanese accent (for which see Beckman 1986, Pierrehumbert and Beckman 1988, Poser 1984 and Sugiyama 2012 and references cited therein, as well as Igarashi, this volume, and Ishihara, this volume). This chapter instead provides an overview of the complex patterns of Tokyo Japanese accentology with an emphasis on the description of the system, while also discussing it from the cross-linguistic perspective of metrical phenomena in other languages.

The aim of the current chapter is to make the materials accessible to those who have little or no knowledge of Japanese phonetics and phonology, although this chapter does assume some familiarity with basic phonological notions in some parts of the discussion. Readers are also referred to other overview articles (Akinaga 1985; Haraguchi 1999; Kubozono 2008, 2011, 2013) and relevant chapters on accent in

¹ Presence of accent does affect the phonetic realization of segments in dimensions other than fundamental frequency; for example, accented syllables are slightly longer than unaccented syllables (Hoequist 1982). See Beckman (1986), Pierrehumbert and Beckman (1988), Poser (1984), and Sugiyama (2012) and references cited therein, as well as some discussion in Igarashi (this volume) and Ishihara (this volume) for the phonetics of Japanese pitch accent.

books on Japanese phonology (Labrune 2012; Vance 1987, 2008) for further discussion and references, although this chapter itself draws heavily on them.

The rest of this chapter proceeds as follows. The remainder of this introduction clarifies the terms and introduces the basic phonetic and phonological nature of Japanese pitch accent. Section 2 discusses accent patterns of loanwords, which have been argued to reflect the default accent assignment rule in Japanese. Section 3 observes that the default pattern may be reflected in the Japanese lexicon in a stochastic way. Section 4 is a discussion of compound accent rules, which have attracted much attention in the literature. Section 5 briefly provides an overview of the accent patterns of verbs and adjectives. Section 6 discusses several types of affixal accent patterns. Section 7 presents some other domains of Japanese phonology in which accent patterns are more or less predictable. Section 8 discusses how accent patterns interact with other phonological patterns in Japanese. Section 9 presents some remaining issues, and Section 10 is an overall conclusion.

1.2 Clarification of the terms used

To begin our discussion, some clarification of the term “pitch accent” may be useful. There are two senses in which the term “pitch accent” can be and has been used in the literature. A pitch accent can refer to an abrupt fall in fundamental frequency (i.e., F₀ or pitch²) that is found in many words in Tokyo Japanese; for example, one finds a statement like “the word /kokoro/ ‘heart’ has pitch accent on the second syllable”.³ When the term is used in this sense, it refers to a physical, acoustic event, that is, a tonal fall found from the second syllable to the third syllable, or it can refer to phonological prominence associated with that tonal fall.

The same term “pitch accent” can also refer to a lexical contrast based on the presence or location of that pitch fall; when the term is used in this sense, it refers to a phonological distinction or property. For instance, we can talk about “the accent of loanwords”, “the accent of adjectives”, or even “the accent of unaccented words”. See the Introduction to this volume for more on the ambiguity of this term. Finally, the term “pitch accent” does not refer here to – as it would in describing languages like English (Bolinger 1958) – phrasal prominence that is assigned to focused constituents. Pitch accent in Japanese is fundamentally a word-level property, not a phrasal or sentence-level property, although it interacts non-trivially with sentence-level intonational patterns (see Igarashi, this volume, and Ishihara, this volume for more on the interaction between word-level accent and sentence-level tones).

² The term “pitch” is sometimes used to refer to a perceptual correlate of F₀ (fundamental frequency), which is on the other hand an acoustic/physical property – how many times the glottis vibrates per second. It is common, however, in the Japanese literature to use the term “pitch” to refer to the acoustic event (fall in F₀) rather than the perceptual property, and this chapter follows that convention.

³ For the sake of simplicity, examples in this chapter are given in romanized phonemic forms rather than phonetic transcriptions.

1.3 Pitch contrasts in Japanese

Having clarified the meanings of the term “pitch accent”, we now turn to how Japanese accent is mapped onto actual tonal (or F0) patterns. First, setting aside the precise phonetic realizations, Japanese makes lexical contrasts in terms of pitch accent in two ways: (i) presence vs. absence, and (ii) if present, location. The examples in (1) illustrate the lexical contrast based on the presence vs. absence of pitch accent.⁴

- (1) Minimal pairs of unaccented and accented words
- a. ame+ga (unaccented) ‘candy+NOM’
 - b. a’m+ga (accented) ‘rain+NOM’
 - c. sake+ga (unaccented) ‘alcohol+NOM’
 - d. sa’ke+ga (accented) ‘salmon+NOM’
 - e. kaki+ga (unaccented) ‘persimmon+NOM’
 - f. ka’ki+ga (accented) ‘oyster+NOM’
 - g. kaku+ga (unaccented) ‘rank+NOM’
 - h. ka’ku+ga (accented) ‘core+NOM’
 - i. aki+ga (unaccented) ‘availability+NOM’
 - j. a’ki+ga (accented) ‘autumn+NOM’

Whereas the words in (1a, c, e, g, i) are unaccented, those in (1b, d, f, h, j) are accented. It is common to represent the presence and location of accent with /’/ after the accented syllable. Phonetically speaking, an accented vowel is assigned a High tone followed by a Low tone on the following vowel, resulting in an abrupt H(igh)-L(ow) fall in F0, whereas unaccented words do not show such a fall. The use of this diacritic /’/ has the virtue of directly representing this phonetic implementation of Japanese pitch accent. Unlike in many other tonal languages (Yip 2002), Japanese lexically uses only two levels of tonal heights (High and Low, and not, for example, Mid).⁵

⁴ A few notes about data presentation and data sources in this chapter are in order. This chapter uses the following conventions to denote several types of boundaries: “+” for morphological boundaries; “-” for mora boundaries; and “.” for syllable boundaries – see Kubozono’s introduction to this volume and Otake (this volume) for the nature of the moraic system in Japanese. In illustrative examples, the nominative marker /+ga/ is often attached – the reason for this convention will become clear shortly. The data in this chapter come from various sources cited below, including the NHK dictionary (NHK 1998), as well as from suggestions from my colleagues; there are cases in which the accent locations are based on the author’s intuition as a native speaker of Tokyo Japanese. This intuition-based approach may not be the optimal methodology for data collection in linguistics, but this approach is deployed for practical reasons in this chapter. See section 10.1 for some discussion.

⁵ McCawley (1968) used Mid to represent downstepped H, a lowered H tone following another H tone (see Igarashi, this volume, and Ishihara, this volume). Complex tonal interactions occur at phrasal and sentential levels, which, phonetically speaking, result in many more than binary tonal height (Pierrehumbert and Beckman 1988, Kawahara and Shinya 2008, and Igarashi, this volume, and Ishihara, this volume); however, at the lexical level, it is safe to say that Japanese makes use of only two level tones.

Japanese also distinguishes words in terms of where pitch falls; i.e., in terms of accent location. This contrast in accent placement is exemplified in (2), where the words in (a, c, e) are accented on their initial syllables, while the words in (b, d, f) have final accent. A classical set of examples showing the “ $n+1$ pattern” (Akinaga 1985; Haraguchi 1999; McCawley 1968; Shibatani 1990; Uwano 1999, 2007) is given in (3), where for words consisting of n -syllables, there are $n+1$ accent patterns (McCawley 1968: 138). In this particular case, for trisyllabic words, we find four distinct accent patterns: accent can fall on any of the n -th syllables, and there can additionally be an unaccented word.

- (2) Minimal pairs illustrating the contrastiveness of accent locations
- a. ka'ta+ga (initial accent) 'shoulder+NOM'
 - b. kata'+ga (final accent) 'frame+NOM'
 - c. ko'to+ga (initial accent) 'Japanese zither+NOM'
 - d. koto'+ga (final accent) 'matter+NOM'
 - e. ka'ki+ga (initial accent) 'oyster+NOM'
 - f. kaki'+ga (final accent) 'fence+NOM'
- (3) $n+1$ accent pattern
- a. i'noti+ga (initial accent) 'life+NOM'
 - b. koko'ro+ga (penultimate accent) 'heart+NOM'
 - c. atama'+ga (final accent) 'head+NOM'
 - d. miyako+ga (unaccented) 'city+NOM'

According to Sibata and Shibata (1990), cited by Kubozono (2001a) and Labrune (2012), 14% of minimal pairs in Japanese are distinguished by a pitch contrast.

A few final remarks are in order. First, although the Tokyo dialect of Japanese allows $n+1$ accent patterns, this description does not hold for words of any syllable length. Especially in long words (words longer than 4 moras, in particular), words with initial or final accent are rare at best (Kawahara and Kao 2012; Kubozono 2008; Labrune 2012; Sibata 1994).

Second, there is a non-negligible degree of inter-speaker as well as intra-speaker variability in accent placement. For example, the word for ‘cousin’ can be pronounced as /i'toko/ (with initial accent) or /ito'ko/ (with penultimate accent). The word for ‘mind’ can be /koko'ro/ (with penultimate accent) or /kokoro'/ (with final accent). In some cases, different accent assignments may be due to the influence of non-Tokyo dialects. The data presented in this chapter, therefore, involves some level of simplification and abstraction by the author, and not every speaker of Tokyo Japanese may agree with all the data presented here.

1.4 From pitch accent to surface tones

Now we turn to how these accent patterns are mapped onto surface tonal patterns. A HL fall in F0 occurs across the two syllables separated by /'/; in other words, the

accented vowel bears a H tone and the following vowel bears a L tone, as schematically illustrated in (4).

(4) Tones assigned by accent

a. ka'ta+ga 'shoulder+NOM'

k	a'	t	a	g	a
	H		L		

b. kata'+ga 'frame+NOM'

k	a	t	a'	g	a
			H		L

Aside from the tones assigned by pitch accent, the first two syllables in a word bear a LH tonal sequence, sometimes known as initial lowering or initial rise, unless the first syllable is accented.⁶ (5a) illustrates the tonal assignment due to initial rise for the word /atama'+ga/ 'head'. When the initial syllable is accented, the word receives the accentual HL fall instead; i.e., initial rise does not apply, as in (5b).

(5) Tones assigned by initial rise

a. atama'+ga 'head+NOM'

a	t	a	m	a'	g	a
L		H		H		L

b. ka'ta+ga 'shoulder+NOM' (Initial rise is blocked by initial accent)

k	a'	t	a	g	a
	H		L		

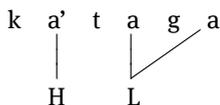
Finally, when syllables do not receive a tonal specification either from pitch accent or from initial rise, then these tonally-unspecified syllables get their tonal specifications by copying the tone from the rightmost specified syllable, which results in the forms like (6). This term "copying" is used here as a descriptive term; Haraguchi (1977), for example, achieves this result by autosegmental spreading (Goldsmith 1976), the notation which is used in (6). It may alternatively be better

⁶ Some researchers consider this initial lowering as a case of tonal dissimilation (Haraguchi 1977, 1991, 1999; Labrune 2012), whereas others, including the J-ToBI transcription system (Maekawa et al. 2002; Venditti 2005), consider the initial L tone to be a phrasal tone (Kawakami 1961; Pierrehumbert and Beckman 1988). See also Igarashi (this volume) and Ishihara (this volume). When the initial syllables contain a long vowel (e.g., /tookyoo/ 'Tokyo'), they can be pronounced with HH without initial lowering (Haraguchi 1977, 1991; Vance 1987). See again Igarashi (this volume).

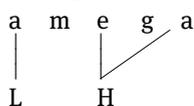
characterized as phonetic interpolation, in which case syllables that do not receive tones either from pitch accent or initial rise are toneless phonologically even at the surface level (Pierrehumbert and Beckman 1988 – see Igarashi, this volume, for further discussion and Myers 1998 for more on tonal phonetic underspecification at the surface level).

(6) Tones assigned by tonal spreading/copying/interpolation

a. ka'ta+ga 'shoulder+NOM'



b. ame+ga 'candy+NOM'



As a result of these tonal assignment mechanisms, all syllables receive tonal specifications. For example, initially-accented trisyllabic words receive a HLL tonal contour, whereas medially-accented trisyllabic words receive a LHL tonal contour.

To summarize, the tonal shape of a particular word can be completely determined by the presence/absence of a pitch accent and its location. The derivations in (7–9) illustrate how each accent pattern receives its full tonal specification, taking unaccented, initially-accented, and medially-accented words as examples.⁷

(7) From accent to tones: Unaccented nouns

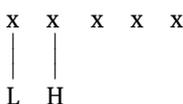
1. Underlying form

x x x x x

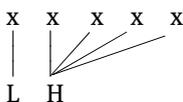
2. Accentual tone assignment (does not apply)

x x x x x

3. Initial rise



4. Tonal spreading



⁷ This model is just an example. For various proposals on how to represent Japanese accent underlyingly and how to derive surface tonal patterns from particular underlying representations, see Haraguchi (1977), Pierrehumbert and Beckman (1988), Poser (1984), and Pulleyblank (1984).

(8) From accent to tones: Initial accent

1. Underlying form

x' x x x x

2. Accentual tone assignment

x' x x x x
 | |
 H L

3. Initial rise (does not apply)

x' x x x x
 | |
 H L

4. Tonal spreading

x' x x x x
 | / / / /
 H L

(9) From accent to tones: Antepenultimate accent

1. Underlying form

x x x' x x

2. Accent assignment

x x x' x x
 | |
 H L

3. Initial rise

x x x' x x
 | | | |
 L H H L

4. Tonal spreading

x x x' x x
 | | | /
 L H H L

Since accent is realized as a HL fall, the distinction between finally-accented words (e.g., /kaki'/ 'fence') and unaccented words (e.g., /kaki/ 'persimmon') are phonetically very similar, if not identical, when they appear in isolation (Vance 1995; Warner 1997); in the case of disyllabic words, for example, both finally-accented words and unaccented words receive a LH contour. This is why when examples are shown, a nominative particle suffix [+ga] is often attached: by providing

an extra syllable at the end, it allows us to make clear the distinction between final accented words and unaccented words. (Not all particles are tonally-neutral, however; see section 6).

Unlike some other tonal languages, which can have tonal contrasts on all syllables, Japanese allows only one HL pitch fall within a word; this restriction – that there can maximally be one prominence within a word – is sometimes called “culminativity” (Alderete 1999b; Hayes 1995; Hyman 2009; Ito and Mester 2003, 2012; Revithiadou 1999; Trubetzkoy 1939/1969 – see also Ishihara, this volume). In the context of Japanese, the culminativity restriction means that there can be at most one accentual HL fall.⁸ Given this culminativity restriction, the whole tonal contour of words can be predicted as long as the location of accent (and the presence thereof) is known. This limited use of tonal contours is a primary reason for considering Japanese a pitch accent language rather than a tonal language (but see Hyman 2009 for arguments against this view; see also Hulst 2011 for further discussion on this debate).

Since, as illustrated in this section, the tonal contour of a word can be determined based on its accentual properties, the rest of this chapter provides accentual representations only.

2 Loanword accentuation: a default accent pattern

Although the distribution of Japanese accent is often considered to be unpredictable, as the examples in (1) and (2) show, there are environments in which the presence and the location of accent are more or less predictable. This chapter focuses on such predictable patterning. We will start with loanword patterns in this section, which arguably instantiate a default accentuation pattern in Japanese (see Kubozono, Ch. 8, this volume, for more on loanword accent). Here, the studies on loanword accentuation are making a general, but not uncontroversial, assumption that loanword adaptation is a natural, real-world “wug-test” (Berko 1958), in which speakers are forced to pronounce words that they have not encountered before (Kang 2011). Wug-tests are known to be a good tool to reveal speakers’ grammatical knowledge (see Kawahara 2011 for a recent overview).

⁸ One exception is phrasal compounds which allow more than one accent. Many such examples are right branching compounds with three elements (e.g., /si'n+[nihon+pu'roresu]/ ‘New Japan Wrestling’) (Ito and Mester 2007; Kubozono, Ito, and Mester 1997). These compounds arguably involve more than one Prosodic Word (Ito and Mester 2007), which suggests that culminativity should be perhaps determined over a phonological Prosodic Word (or a Minor Phrase), rather than a morphological word. See also Ishihara (this volume) for further discussion on culminativity in Japanese.

2.1 Basic patterns

Loanwords are vocabulary items that Japanese speakers have recently borrowed from other languages, mainly from English (see Kubozono, Ch. 8, this volume; see Kang 2011 for more general discussion on loanword adaptation and loanword phonology). When new words are borrowed into Japanese, they do not have lexical specification for accent. Therefore, Japanese speakers were/are free to assign an accent pattern at their disposal.⁹ For this reason, loanword accent provides a window into the default accentuation pattern in Japanese. As a first noticeable characteristic of loanwords, they are more frequently accented than native words; according to Kubozono (2008), 93% of the loanwords in his corpus (N = 778) are accented, whereas only 29% of the native words (N = 2,220) are accented. Kubozono (2006) hypothesizes that when Japanese speakers borrow English words, they hear English pitch patterns in citation forms and map that percept of prominence as Japanese accent, but that its location is determined by the phonological grammar of Japanese.

The locations of accent in loanwords are more or less predictable. Some typical examples are shown in (10), and they are all accented on the antepenultimate mora (the third from the end), which is shown in bold (recall that mora boundaries are shown by -).

(10) Accent assigned on the antepenultimate moras in loanwords

- | | | |
|----|-------------------------------|-----------------|
| a. | ku-ri- su '-ma-su | 'Christmas' |
| b. | a-pa- ra '-ti-a | 'Appalachia' |
| c. | a-n-da- ru '-si-a | 'Andalusia' |
| d. | o-o-su-to- ra '-ri-a | 'Australia' |
| e. | o-o-su- to '-ri-a | 'Austria' |
| f. | su- to '-re-su | 'stress' |
| g. | a-su- fa '-ru-to | 'asphalt' |
| h. | ma-ku-do- na '-ru-do | 'McDonald' |
| i. | pu-ro- gu '-ra-mu | 'program' |
| j. | a-su-pa- ra '-ga-su | 'asparagus' |
| k. | pu-ra- mo '-de-ru | 'plastic model' |
| l. | e-me- ra '-ru-do | 'emerald' |
| m. | zya-a-na- ri '-zu-mu | 'journalism' |
| n. | yo-o- gu '-ru-to | 'yogurt' |
| o. | a-bu-ra-ka- da '-bu-ra | 'Abracadabra' |

⁹ There may be some cases in which Japanese speakers assign accent by mimicking the original English stress pattern. See note 29 for some potential examples. This borrowing pattern can be formally modeled as a faithfulness effect between source forms and borrowed forms (Smith 2007).

In Japanese, any vowel, a coda nasal, and the second half of a geminate are moraic (see Kubozono's introduction to this volume; Kawahara, this volume; Kawagoe, this volume; and Otake, this volume). In (10), accent falls on the antepenultimate mora in the words. This accent pattern is recurrently observed in many loanwords, for which there are arguably no underlying accentual specifications. Therefore, this antepenultimate accent rule has been considered a default accent assignment rule in Japanese (McCawley 1968). For bimoraic forms, there are no antepenultimate syllables, so the accent falls on the penultimate – the second-to-last – syllable (e.g., /mo'ka/ 'mocha' and /mo'ma/ 'MoMA (the Museum of Modern Art)').

From the perspective of modern prosodic phonology (Liberman and Prince 1977; Selkirk 1980 *et seq.*), this antepenultimate accent pattern can be derived by positing a bimoraic trochaic foot (Poser 1990), with the word-final syllable being unfooted; e.g., /kuri(su'ma)su/ (Ito and Mester 1992/2003, 2012; Kawahara and Wolf 2010). See Ito and Mester (2012) and Katayama (1998) for an alternative analysis.

2.2 Syllables as accent-bearing units

When the antepenultimate mora is a so-called deficient (or non-head) mora – the second part of a diphthong (see Kubozono, Ch. 5, this volume), the second half of a geminate or a long vowel, or a coda nasal – the accent does not fall on that mora, and instead shifts to the pre-antepenultimate mora, as the examples in (11) show, in which the antepenultimate moras are shown in bold. A deficient mora combines with the preceding mora and constitutes the second half of a syllable; or differently put, deficient moras are those that do not occupy the head position of a syllable. Based on this observation, McCawley (1968) proposed that the default accentuation in Japanese is that the syllable containing the antepenultimate mora receives accent. For example, /painappuru/ is syllabified as /pai.nap.pu.ru/, and the accent falls on the syllable containing the antepenultimate mora (i.e., /nap/).

- (11) Accent assigned on the pre-antepenultimate mora in loanwords
- a. pa-i-na'-**p**-pu-ru 'pineapple'
 - b. ta'-**k**-ku-ru 'tackle'
 - c. gu-ra'-**n**-pu-ri 'Grand prix'
 - d. ka'-**n**-za-su 'Kansas'
 - e. ka-re'-**n**-da-a 'calendar'
 - f. pu-ri'-**n**-se-su 'princess'
 - g. syu-no'-**o**-ke-ru 'snorkel'
 - h. pa'-**a**-pu-ru 'purple'
 - i. ra'-**i**-fu-ru 'rifle'
 - j. ta-i-pu-ra'-**i**-ta-a 'typewriter'
 - k. ri-sa'-**i**-ku-ru 'recycle'
 - l. bu-ro'-**i**-ra-a 'broiler'

Since we can unify the case in (10) and the case in (11) from a syllable perspective (the accent falls on the syllable containing the antepenultimate mora), the data in (11) support the hypothesis that the bearer of accent is a syllable rather than a mora (McCawley 1968, 1977 – see Labrune 2012 for an alternative view).

Another piece of evidence that syllables bear accent in Japanese comes from the behavior of pre-accenting morphemes, which we will discuss more extensively in Section 6. For example, the suffix /+ke/ ‘family of’ puts accent on the final vowel of the root to which it is attached, as in (12b–d). When the root-final mora is a non-head of a syllable, however, the accent falls on the penultimate vowel of the root, i.e. the head of the root-final syllable, as in (12e–g). This patterning again shows that syllables bear Japanese accent, not moras.

- (12) A dominant pre-accenting suffix inserts accent on the syllable immediately preceding the affix
- | | | | |
|----|---------|-------------|---------------------------------|
| a. | /+’ke/ | ‘family of’ | |
| b. | ono | → | ono’+ke ‘family of Ono’ |
| c. | yosida | → | yosida’+ke ‘family of Yoshida’ |
| d. | edogawa | → | edogawa’+ke ‘family of Edogawa’ |
| e. | ku’dan | → | kuda’n+ke ‘family of Kudan’ |
| f. | ka’too | → | kato’o+ke ‘family of Kato’ |
| g. | ka’sai | → | kasa’i+ke ‘family of Kasai’ |

2.3 The Latin Stress Rule as an alternative formulation?

While the antepenultimate rule explains a good portion of the accentuation patterns in Japanese loanwords, an alternative way to characterize the default accent pattern has been developed in a series of works by Kubozono and others (Haraguchi 1991, 1999; Kubozono 1996, 1999, 2008, 2011; Shinohara 2000; see also Kubozono, Ch. 8, this volume). These works capitalize on the similarity between the antepenultimate accent rule and the Latin Stress Rule (Hayes 1995; Mester 1994). The Latin Stress Rule, which is arguably operative in many languages (Hayes 1995), states that the penultimate syllable is stressed if heavy, but that the antepenultimate syllable is stressed otherwise. Crucial to this rule is the notion of syllable weight – setting aside cross-linguistic complications (Gordon 2002; Hayes 1989, 1995; Rosenthal and van der Hulst 1999; Zec 1995), in Japanese, syllables containing a coda consonant (a moraic nasal or the first part of geminate), a long vowel or a diphthong are bimoraic and heavy, whereas open syllables with short vowels are monomoraic and light. For example, /tan, tat, taa, too, tai, toi/ are all heavy, whereas /ta/ is light.

We can now compare the antepenultimate accent rule (AAR) and the Latin Stress Rule (LSR). Let H represent heavy syllables and L light syllables. Table 1 compares the predictions of these two rules for trisyllabic words with all possible syllable

weight compositions. We observe that in six out of eight conditions, these two rules make the same predictions. Only in two conditions (HLH and LLH) do the two theories make different predictions.

Table 1: Comparing the predictions of the antepenultimate accent rule (AAR) and Latin Stress Rule (LSR).
H=Heavy syllable; L=Light syllable.

	AAR	LSR	(mis)match
a.	HH'H	HH'H	match
b.	HH'L	HH'L	match
c.	HL'H	H' LH	mismatch
d.	H'LL	H'LL	match
e.	LH'H	LH'H	match
f.	LH'L	LH'L	match
g.	LL'H	L' LH	mismatch
h.	L'LL	L'LL	match

Kubozono (1996, 1999, 2008, 2011) points out that even in these two mismatching conditions, the forms that are predicted by LSR are actually observed. Some of these LSR-conforming forms appear as variants of the pronunciations predicted by AAR, as the examples in (13) and (14) show, although there are forms that are predicted only by AAR too, as in (15). Katayama (1998) and Kubozono (2008) further argue that the forms (or renditions) that conform to LSR are more common than those that follow AAR, suggesting that the default accentuation pattern in Japanese could be the Latin Stress Rule.¹⁰

(13) HLH words whose accent locations are predicted by LSR

- a. be'e.ka.rii 'bakery'
- b. ma'a.ga.rin 'margarine'
- c. po'o.to.ree 'portray'
- d. my'uu.zi.syan~myuu.zi'.syán 'musician'
- e. ha'n.ga.ríi~han.ga'.ríi 'Hungary'
- f. e'n.de.baa~en.de'.baa 'endeavor'
- g. o'o.di.syon~oo.di'.syon 'audition'
- h. ka'a.de.gan~kaa.de'.gan 'cardigan'
- i. ra'n.de.buu~ran.de'.buu 'rendez-vous'
- j. ba'n.ga.roo~ban.ga'.roo 'bungalow'
- k. pyu'u.ri.tan~pyuu.ri'.tan 'Puritan'

¹⁰ Two caveats: (i) LSR does not allow for unaccented outcomes, while Japanese does (see section 2.4 and Ito and Mester 2012); (ii) when words with a sequence of four light syllables (LLLL) are accented, the accent can fall on the pre-antepenultimate mora, as in /bi'zinesu/ 'business' and /a'kusesu/ 'access'. The pre-antepenultimate pattern in this type of word is not predicted by LSR (or by AAR either). It is possible that the final vowels of these words may be invisible to the accent assignment rule since they tend to be epenthetic (Kubozono 1996, 2001b).

- (14) LLH words whose accent locations are predicted by LSR
- | | | |
|----|-----------------------------|----------------|
| a. | do'.ku.taa | 'doctor' |
| b. | ma'.su.taa | 'master' |
| c. | pi'.re.nee | 'the Pyrenees' |
| d. | te'.he.ran | 'Teheran' |
| e. | te'.ne.sii | 'Tennessee' |
| f. | a'.ma.zon | 'Amazon' |
| g. | me'.ru.hen | 'Fairly tale' |
| h. | to'.ro.fii | 'trophy' |
| i. | su'.ri.raa~su'.ri'.raa | 'thriller' |
| j. | do'.ra.gon~do'.ra'.gon | 'dragon' |
| k. | re'.ba.non~re'.ba'.non | 'Lebanon' |
| l. | ma'.zi.syan~ma'.zi'.syon | 'magician' |
| m. | e'.ne'.ru.gii~e'.ne.ru'.gii | 'energy' |
- (15) LLH and HLH forms that follow AAR
- | | | |
|----|--------------|--|
| a. | bi.ta'.min | 'vitamin' |
| b. | a.se'.an | 'ASEAN (Association of SouthEast Asian Nations)' |
| c. | hi.ro'.in | 'heroin' |
| d. | bu.re'.zaa | 'brazier' |
| e. | su.pu'.ree | 'spray' |
| f. | bu.ra'.zyaa | 'bra (brassiere)' |
| g. | baa.be'.kyuu | 'barbecue' |
| h. | kuu.de'.taa | 'coup' |
| i. | kon.di'.syon | 'condition' |

If the Japanese default accentuation rule is indeed the LSR, then Japanese is a weight-sensitive language in which heavy syllables attract metrical prominence. This cross-linguistically widely observed pattern – the requirement that heavy syllables receive metrical prominence – is called the Weight-to-Stress Principle (WSP) (Hayes 1995; Prince 1983, 1990; Prince and Smolensky 1993/2004). Furthermore, this weight-sensitivity may explain why loanwords are much more likely to be accented than native words (Ito and Mester 2012; Kubozono 1996, 2006, 2008; Sibata 1994). Kubozono (2008) argues that loanwords contain many more heavy syllables than native words (see Nasu, this volume, and Kubozono, Ch. 8, this volume), and that because of the WSP, there are many more accented loanwords.

2.4 Unaccented loanwords

Although loanwords are generally pronounced with accent, as we observed in the previous discussion, there are particular phonological environments in which unaccented words appear. One is the case of four-mora words with two final light syllables, where both of the last two vowels are non-epenthetic, as shown in (16) (Kubozono 1996, 2010, 2011; Kubozono and Ogawa 2005, see also Ito and Mester

2012). This pattern should be contrasted with the cases in (17), where either or both of the final two vowels are epenthetic (shown by < >), and (18), where either of the last two syllables is a heavy syllable.¹¹

(16) Unaccented loanwords: four mora words with two final light non-epenthetic syllables

- a. a.me.ri.ka 'America'
- b. i.ta.ri.a 'Italia'
- c. me.ki.si.ko 'Mexico'
- d. ai.o.wa 'Iowa'
- e. a.ri.zo.na 'Arizona'
- f. ai.da.ho 'Idaho'
- g. mo.su.ku.wa 'Moscow'
- h. ma.ka.ro.ni 'macaroni'
- i. kon.so.me 'consommé'
- j. mo.na.ri.za 'Mona Lisa'
- k. an.te.na 'antenna'

(17) The presence of an epenthetic vowel results in accented words

- a. a'n.de.s<u> 'Andes'
- b. u.we'r<u>.z<u> 'Wales'
- c. si'n.ba.r<u> 'cymbal'
- d. si'n.bo.r<u> 'symbol'
- e. a'i.do.r<u> 'idol'
- f. p<u>.ro'.se.s<u> 'process'
- g. he'e.ge.r<u> 'Hegel'
- h. ma'.r<u>.k<u>.s<u> 'Marx'

(18) Penultimate or final heavy syllables result in accented words

- a. pa.re'e.do 'parade'
- b. o.re'n.zi 'orange'
- c. go.bi'n.da 'Govinda (personal name)'
- d. o.ha'i.o 'Ohio'
- e. i.ra'i.za 'Eliza'
- f. e.ri'i.ze 'Elise'
- g. ro'n.don 'London'
- h. su.to'.roo 'straw'
- i. bi.ta'.min 'vitamin'
- j. a.se'.an 'ASEAN'

¹¹ Given LHL words, if the first vowel is epenthetic and the final vowel syllable is /to/ or /do/ with epenthetic /<o>/, they can often be unaccented; e.g., /s<u>keet<o>/ 'skate', /p<u>reet<o>/ 'plate' and /p<u>raid<o>/ (Kubozono and Ohta 1998).

There are a number of exceptions to these generalizations as well, however. The words in (19) are pronounced as unaccented, despite the fact that the final vowels are all epenthetic. The words in (20) are also unaccented, despite the fact that their penultimate syllables are heavy.

(19) Unaccented nouns with epenthetic vowels

- a. bu.ra.zi.r<u> ‘Brazil’
- b. boo.ka.r<u> ‘vocal’
- c. san.da.r<u> ‘sandal’
- d. ka.ta.ro.g<u> ‘catalog’
- e. o.mu.re.t<u> ‘omelet’

(20) Unaccented nouns with heavy syllables

- a. hu.ran.su ‘France’
- b. o.ran.da ‘Holland’
- c. ku.ree.mu ‘claim’
- d. hu.ree.zu ‘phrase’

Setting aside these complications, the emergence of unaccented forms in four-mora words is observed in compounds created by truncation as well, as we will observe in section 7.2 (see also Kubozono, Ch. 8, this volume, for more data about unaccented words). See Ito and Mester (2012) and Tanaka (2001) for analyses of the emergence of unaccented patterns in Japanese.

Another case in which unaccented renditions of words appear is so-called *senmonka akusento* (or ‘specialists’ accent’), in which common jargon terms within a certain community tend to be pronounced as unaccented, even when they are pronounced as accented outside of that community (Akinaga 1985; Inoue 1998; Labruno 2012). For example, two loanwords, /rake'tto/ ‘racket’ and /sa'abisu/ ‘service’, are usually accented, but those who engage in playing tennis can and often do pronounce these words as unaccented. Likewise, many computer jargon terms like /sukuriputo/ ‘script’, /purintaa/ ‘printer’ and /puroguramu/ ‘program’ are often pronounced as unaccented. *Zuuzya-go* (or *zuoja-go*), a secret language among musicians (Ito, Kitagawa, and Mester 1996), often results in unaccented words, which again may be an instance of *senmonka akusento*. Finally, phonologists can talk about “auto-segmental spreading” as /supuredingu/ and ‘constraint ranking’ as /rankingu/, both pronounced as unaccented.

This *senmonka akusento* resulted in some minimal pairs in terms of the presence of accent in loanwords. For example, /pa'ntu/ means ‘underwear’, whereas /pantu/ (unaccented) can mean ‘trousers’ (in the field of fashion). Similarly, /ku'rabu/ means ‘groups in extracurricular activities (in schools)’ whereas /kurabu/ means ‘(night) club’, and /sa'akuru/ means ‘circle’ but /saakuru/ means ‘extracurricular groups (in colleges)’.

3 Stochastic skews in native and Sino-Japanese nouns

The general assumption about Japanese accent, at least for native and Sino-Japanese (SJ) nouns,¹² is that its distribution is not predictable, as there are examples like (1) and (2) (e.g. /ka'ki/ 'oyster' vs. /kaki'/ 'fence' vs. /kaki/ 'persimmon'), although there are some regularities concerning the accent distributions in loanwords. Kubozono (2006, 2008, 2011) challenges this view, pointing out that there is a stochastic skew in the Japanese lexicon already, which hints at the antepenultimate accent pattern. Many native nouns and SJ nouns are actually unaccented: 71% of native nouns (N = 2,220) and 51% of Sino-Japanese nouns (N = 4,939) in his database. If we look at only accented nouns and examine the distribution of accent locations, an interesting pattern emerges. Consider Table 2, which is adapted from Kubozono (2008: 170).

Table 2: Distributions of different accent patterns in trisyllabic words

Accent pattern	antepenultimate	penultimate	final	N
Native	59%	33%	9%	634
SJ	95%	2%	3%	2,427
Loanwords	96%	2%	2%	722

We observe that in Sino-Japanese nouns, antepenultimate accent is the dominant pattern. Even in native words, more than half of the accented nouns have the antepenultimate accent. In both cases, the accent patterns in the Japanese lexicon are skewed toward antepenultimate accent. These observations show that the default accentuation assignment rule in loanwords may not have come out of the blue, but came instead from an abstraction over the distributional skew that already existed in the lexicon at the time of loanword adaptation.

For a more comprehensive analysis of distributional skews of accent types for words with different lengths, see Sibata (1994), translated into English by Labruno (2012), as well as Kitahara (2001), further analyzed by Ito and Mester (2012).

4 Compound accent

Compound accent is arguably one of the most extensively discussed areas of research in Japanese accentology. A traditional view of this research categorizes compound accent rules into two cases according to the phonological length of

¹² Sino-Japanese nouns are borrowings from old Chinese words. See Ito and Mester (1995, 1996, 1999, 2008) as well as Kawagoe (this volume) and Ito and Mester (Ch. 7, this volume).

second elements (N2) (Akinaga 1985; McCawley 1968; Poser 1990), where a short N2 is either monomoraic or bimoraic. Although there have been attempts to unify these cases (Kubozono 1995, 1997, 2008; Kubozono and Mester 1995), the discussion here follows this traditional dichotomy.

4.1 Short N2

Short nouns are either monomoraic or bimoraic. They can behave in two ways:¹³ those that retain their accent, or those that assign accent on the last syllable of the N1, as exemplified in (21) and (22), respectively.¹⁴ Labrune (2012) and Tanaka (2001) provide more examples of each type of these N2s.

(21) Short N2 that retain their N2 accent¹⁵

a.	fa'asuto+ki'su	→	faasuto+ki'su	'first kiss'
b.	koosoku+ba'su	→	koosoku+ba'su	'Highway bus'
c.	tennen+ga'su	→	tennen+ga'su	'natural gas'
d.	kyooiku+ma'ma	→	kyooiku+ma'ma	'education-minded mama'
e.	ku'kkingu+pa'pa	→	kukkingu+pa'pa	'cooking papa'
f.	niho'n+ha'mu	→	nihon+ha'mu	'Japan ham'
g.	boohan+be'ru	→	boohan+be'ru	'security alarm'
h.	niho'n+sa'ru	→	nihon+za'ru	'Japan monkey'
i.	takara+hu'ne	→	takara+bu'ne	'treasure ship'
j.	pe'russy+ne'ko	→	perusya+ne'ko	'Persian cat'
k.	garasu+ma'do	→	garasu+ma'do	'glass window'

(22) Pre-accenting short N2

a.	ka'buto+musi	→	kabuto'+musi	'beetle'
b.	minasi+ko	→	minasi'+go	'orphan'
c.	ma'igo+inu'	→	maigo'+inu	'lost puppy'
d.	undoo+kutu'	→	undo'o+gutu	'exercise shoes'
e.	kana'gawa+si'	→	kanagawa'+si	'Kanagawa City'
f.	sa'rada+ba'a	→	sarada'+baa	'Salad bar'
g.	kuri'im+pa'n	→	kuriimu'+pan	'custard bread'
h.	hirosima+ke'n	→	hirosima'+ken	'Hiroshima Prefecture'
i.	ni'ngyo+hi'me	→	ningyo'+hime	'Little Mermaid'

¹³ For now we set aside deaccenting morphemes, and will come back to them in section 6.

¹⁴ When a compound consists of bimoraic N1 and bimoraic N2, resulting in compounds with 4 moras, we often observe an unaccented outcome: /neko+basu/ 'cat bus'. See section 7.2 and Kubozono and Fujiura (2004).

¹⁵ In some compound forms, the first consonant of N2 becomes voiced. This phenomenon is called "rendaku". See Vance (this volume) for extensive discussion of this phenomenon.

j.	sizyu'u+ka'ta	→	sizyu'u+kata	'forty(-year-old)'s shoulder (adhesive capsulitis)'
k.	na'iron+i'to	→	nairo'n+ito	'nylon thread'
l.	niwaka+a'me	→	niwaka'+ame	'sudden rain'
m.	yoyaku+se'ki	→	yoyaku'+seki	'reserved seats'
n.	ueno+e'ki	→	ueno'+eki	'Ueno station'
o.	gakusyu+zzyu'ku	→	gakusyu'u+zzyuku	'learning prep-school'

All the examples in (21), which retain their N2 accent, have accent on their penultimate syllables, whereas many of the N2s in (22) are unaccented or have final accent (=22a–h). Kubozono (1995, 1997, 2008), building on Poser (1990), points out that when N2 bears accent on its final syllable, it very often loses its accent and becomes pre-accenting.¹⁶ Kubozono (1995, 1997) attributes this loss of final accent to a constraint against having prominence at word edges (also known as NONFINALITY(σ): Prince and Smolensky 1993/2004; Hyde 2007, 2011).

For N2s which have non-final accent, there is lexical variation: those that retain their accent like /ne'ko/, as in (21), and those that lose their accent, like /hi'me/, as in (22i–o). Furthermore, the last two forms (=21j–k) may allow the pre-accenting pronunciation as a variant form. The fact that some items lose their penultimate accent indicates that penultimate accent, which is in the final foot, are marked.¹⁷ This effect can be attributed to another sort of NONFINALITY constraint: i.e. NONFINALITY(FT) (Kawahara and Wolf 2010; Kubozono 1995, 1997; Kurisu 2005; Shinohara 2000). The remaining issue is how to model the item-specific behavior in terms of whether they are allowed to violate NONFINALITY(FT) (=21) or not (=22), which is a general challenge to phonological theory (Coetzee 2009; Inkelas 1999; Inkelas and Zoll 2007; Inkelas, Orgun, and Zoll 1997; Kisseberth 1970; Pater 2000, 2010, among many others).

Among those that retain N2 accent, many of the examples are of foreign origin (i.e., loanwords) (see Tanaka 2001 for details). In (21), more than half of the examples involve a loanword N2 (=21a–g). The retention of N2 accent may thus partly be due to a faithfulness effect specific to loanwords (Ito and Mester 1999, 2008). The fact that few if any loanwords lose their penultimate accent – no words in (22) are loanwords – supports this idea (see Kubozono, Ch. 8, this volume, for additional evidence). Finally, Sino-Japanese words, (22m–o), almost always lose their N2 penultimate accent (Kawahara, Nishimura, and Ono 2002; Kubozono 1997; Tanaka 2002). To summarize, there are differences among different lexical classes in

¹⁶ There are exceptions, which retain the final accent of N2; e.g., *kenkyuu+zyo'* 'research center', *keisatu+syo'* 'police station' and *bitamin-si'i* 'Vitamin C' (Tanaka 2001).

¹⁷ Regardless of whether the final syllable is footed (e.g., *ninyo-(hi'me)*) or not (e.g., *nin(gyo-hi')me*), the penultimate accent is in the final foot.

terms of the likelihood of the attrition of N2 penultimate accent: Sino-Japanese > native words > loanwords.¹⁸

4.2 Long N2

When N2 is trimoraic or longer, there are two major generalizations: (i) if N2 is unaccented or has accent on the final syllable, then the accent falls on the initial syllable of N2, as in (23); (ii) otherwise, the accent of N2 is retained, as in (24).

(23) N2 initial accent

a.	si'n+yokohama	→	sin+yo'kohama	'Shin-Yokohama (place name)'
b.	minami+amerika	→	minami+a'merika	'South America'
c.	ko'o+ketuatu	→	koo+ke'tuatu	'high blood pressure'
d.	onna'+tomodati	→	onna+to'modati	'female friend'
e.	kuti+yakusoku	→	kuti+ya'kusoku	'verbal promise'
f.	dame'+otoko'	→	dame+o'toko	'unreliable men'
g.	de'ka+atama'	→	deka+a'tama	'big head'
h.	nise+takara'	→	nise+da'kara	'fake treasure'

(24) Retention of N2 accent

a.	si'n+tamane'gi	→	sin+tamane'gi	'new onion'
b.	ya'mato+nade'siko	→	yamato+nade'siko	'Japanese lady'
c.	be'suto+hure'ndo	→	besuto+hure'ndo	'best friend'
d.	a'ka+ore'nzi	→	aka+ore'nzi	'red-orange'
e.	tuukin+sarari'iman	→	tuukin+sarari'iman	'commuting salaryman'
f.	natu'+kuda'mono	→	natu+kuda'mono	'summer fruits'

Moreover, for those N2 that have penultimate accent, there can be some variation (Kubozono 2008), as exemplified in (25). As is the case for short N2, it seems that penultimate accent in N2 in compounding may be marked (i.e., the effect of NONFINALITY(FT)).

(25) Variation between initial accenting and retention of N2 accent

a.	na'ma+tama'go	→	nama+ta'mago~nama+tama'go	'raw egg'
b.	kami'+omu'tu	→	kami+o'mutu~kami+omu'tu	'paper diaper'
c.	hidari+uti'wa	→	hidari+u'tiwa~hidari+uti'wa	'being luxurious'

¹⁸ This observation counter-exemplifies the proposal by Ito and Mester (1999) that faithfulness constraints for Sino-Japanese are always ranked above faithfulness constraints for native words (Kawahara, Nishimura, and Ono 2002).

Given what we have seen for short N2 and long N2, some general tendencies emerge. First, as in (22) and (23), accent on the final syllables of N2 tends to get lost, and new compound accent is assigned (except for some exceptions noted in note 16). As stated above, this pressure is perhaps a reflection of a cross-linguistic tendency to avoid final prominence. Since final accent is allowed in free-standing lexical items, Japanese compound accentuation is a case of “the emergence of the unmarked” (Becker and Flack 2011; McCarthy and Prince 1994) in morphologically derived environments, in which only unmarked structures are allowed in particular (phonological or morphological) environments.

Accent on the final foot is avoided but can be tolerated, as shown by the difference between (21) and (22) as well as the variability in (25). For example, in *ningyo+(hi)me*, the accent in the final foot is marked, and therefore a new compound accent is assigned for the forms in (22). Accent on final syllables is more likely to be avoided than accent on final feet, which indicates that $\text{NONFINALITY}(\sigma)$ and $\text{NONFINALITY}(\text{FT})$ are separate constraints (Kubozono 1995, 1997; Tanaka 2001).

Finally, to complete the picture, when N2 is longer than 4 moras, the compound accent tends to simply retain the accent of N2 (Kubozono, Ito, and Mester 1997; Labrune 2012). Even when N2 is unaccented, it does not result in N2-initial accent, unlike the forms in (23). This avoidance of N2-initial accent may be related to a ban on putting accent on a syllable that is too far away from the right edge of a word.

(26) Superlong N2

- a. si'donii+orinpi'kku → sidonii+orinpi'kku 'Sydney Olympics'
- b. iso'ppu+monoga'tari → isoppu+monoga'tari 'Aesop's Fables'
- c. minami+kariforunia → minami+kariforunia 'Southern California'
- d. nyu'u+karedonia → nyuu+karedonia 'New Caledonia'
- e. nankyoku+tankentai → nankyoku+tankentai 'South Pole expedition team'

There have been extensive theoretical analyses of compound accent patterns – and other related accentual phenomena – in Japanese, especially within the framework of Optimality Theory (Prince and Smolensky 1993/2004), building on the patterns reviewed in this section. Readers are referred to this body of literature for further details (Ito and Mester 2003, 2007, 2012; Kawahara and Wolf 2010; Kubozono 1995, 1997, 2008, 2011; Kubozono, Ito, and Mester 1997; Labrune 2012; Poser 1990; Shinohara 2000; Tanaka 2001).

5 Verbs and adjectives

Compared to the accent patterns of nouns, the accentual properties of verbs and adjectives are relatively simple. Concretely, verbs and adjectives do not contrast in

terms of the location of accent; rather, the contrast is simply a matter of accented vs. unaccented. The examples in (27) and (28) illustrate this contrast, using the non-past forms for illustration. In recent years, unaccented adjectives are becoming accented, especially among young speakers, which results in the neutralization of the accentual contrast in adjectives (Akinaga 2002; Kobayashi 2003).¹⁹

(27) Verb accent

- | | | | | | |
|----|------------|------------------------|-----|---------|-----------------|
| a. | moe'+ru | 'to come into blossom' | vs. | moe+ru | 'to fire' |
| b. | ki'r+u | 'to cut' | vs. | ki+ru | 'to wear' |
| c. | na'r+u | 'to become' | vs. | na+ru | 'to ring' |
| d. | hare'+ru | 'to be sunny' | vs. | hare+ru | 'to be swollen' |
| e. | yoroko'b+u | 'to be pleased' | vs. | utaga+u | 'to doubt' |

(28) Adjective accent

- | | | | | | |
|----|------------|-------------|-----|-----------|-----------------|
| a. | atu'+i | 'hot' | vs. | atu+i | 'thick' |
| b. | uma'+i | 'delicious' | vs. | ama+i | 'sweet' |
| c. | tanosi'+i | 'fun' | vs. | tumeta+i | 'cold' |
| d. | omosiro'+i | 'funny' | vs. | usugura+i | 'slightly dark' |

As observed in (27) and (28), the location of accent for accented words is on the penultimate mora.²⁰ Since verbs and adjectives inevitably come with inflectional endings in Japanese, one could imagine that some mechanism similar to the compound accent rule for short N2 is operative, as in (22) (Kubozono 2008).

However, when we consider a full set of inflected forms, the story becomes more complicated. Japanese regular verbs are classified into two sets, V-final roots and C-final roots, and they behave slightly differently in terms of accentuation (see also Ito and Mester, Ch. 9, this volume). First, Table 3 shows example inflectional paradigms for V-final verbs. In the case of an accented verb, the accent falls on the penultimate, root-final syllable in the negative and conditional forms. These suffixes may be accent-shifting suffixes. In the polite and volitional forms, the accent shifts to the suffix. Such a suffix is called a dominant suffix; see section 6 for more on these types of suffixes. Another interesting puzzle is that the accent shifts to the antepenultimate position in the gerundive and past forms (McCawley 1968; Yamaguchi 2010).

¹⁹ Based on a sociolinguistic production study, Kobayashi (2003) found that among other factors, sonority of the penultimate syllable affects this sound change in such a way that the less sonorous the consonant in the penultimate syllable is, the more likely it is that the word becomes accented. This pattern is parallel to onset-driven stress patterns where syllables with low-sonority onsets attract stress (e.g., Gordon 2005 and references cited therein).

²⁰ Similar to the case of loanword accentuation, when the penultimate mora is a second part of a syllable, the accent shifts one mora leftward to the antepenultimate mora; e.g., /ha'i+ru/ 'enter' and /to'o+ru/ 'go through' (Vance 1987). However, there is a (near) minimal pair like /ka'e+ru/ 'to return' and /hae'+ru/ 'to reflect', which adds another layer of complication (Yamaguchi 2010).

In the case of unaccented V-final roots, most forms are unaccented except when one of the two dominant suffixes is attached (the polite form and the volitional form). In addition, the conditional suffix /+reba/ shows its accent only when it is attached to unaccented roots – this suffix is a recessive suffix. Again see section 6.

Table 3: Verb inflection table: V-final roots

	Accented 'to be sunny'	Unaccented 'to be swollen'
negative	hare'+nai	hare+nai
polite	hare+ma'su	hare+ma'su
non-past	hare'+ru	hare+ru
gerundive	ha're+te	hare+te
past	ha're+ta	hare+ta
conditional	hare'+reba	hare+re'ba
volitional	hare+yo'o	hare+yo'o

Consonant-final verbs behave slightly differently, as shown in Table 4. For accented roots, the polite, non-past, conditional, and volitional forms pattern the same as with V-final roots. Two differences are (i) in the negative form, the accent falls on the suffix-initial vowel, and (ii) in the gerundive and past tense forms, no shift to the antepenultimate position occurs. C-final unaccented roots behave much the same way as V-final unaccented roots.

Table 4: Verb inflection table: C-final roots

	Accented 'to be pleased'	Unaccented 'to work'
negative	yorokob+a'nai	hatarak+anai
polite	yorokob+ima'su	hatarak+ima'su
non-past	yoroko'b+u	hatarak+u
gerundive	yoroko'n+de	hatarai+te
past	yodoko'n+da	hatarai+ta
conditional	yoroko'b+eba	hatarak+e'ba
volitional	yorokob+o'o	hatarak+o'o

As observed, accent patterns in the various inflectional forms of Japanese verbs are complex. Accordingly, there are a number of analyses of verbal accent patterns (Clark 1986; Haraguchi 1999; McCawley 1968; Nishiyama 2010; Yamaguchi 2010).

Table 5 illustrates typical inflectional paradigms for adjectives.²¹ In the inflected forms of an accented adjective, the accent falls on the penultimate mora of the root (not the word). It is not root-initial accentuation, as shown by a longer root,

²¹ There is non-negligible variation in adjective accent (Akinaga 1985; Martin 1967), which is abstracted away from here, due to space limitations.

like /tano'si-sa/. For unaccented roots, some suffixes (suspensive and conditional) assign accent on the root-final syllable – a case of pre-accentuation. See again section 6.

Table 5: Adjective inflection table

	Accented 'delicious'	Unaccented 'sweet'
non-past	uma'+i	ama+i
deverbal	u'ma+sa	ama+sa
suspensive	u'ma+kute	ama'+kute
adverbial	u'ma+ku	ama+ku
conditional	u'ma+kereba	ama'+kereba

6 Accent patterns of affixes

Several studies, on Japanese and on other languages, have examined how affixes interact with roots in terms of accent. This section introduces various types of affixes that interact with root accent in different ways, as we saw some examples already in section 5. There are many types of affixes in Japanese in terms of their accentual behaviors (Alderete 1999b; Kurisu 2001; McCawley 1968; Poser 1984). The following description draws on Poser (1984) and Vance (1987), and discusses the following eight types of affixes: (i) recessive suffixes, (ii) dominant suffixes, (iii) recessive pre-accenting suffixes, (iv) dominant pre-accenting suffixes, (v) accent shifting suffixes, (vi) post-accenting prefixes, (vii) deaccenting suffixes, and (viii) initial accenting suffixes.

First, we start with the recessive suffix.²² Recall that Japanese allows one accent per word (culminativity). Therefore, when two morphemes with accent are concatenated, one accent has to be deleted. In such cases, a recessive suffix loses its accent.²³ In other words, it is accented only when it is attached to unaccented roots, as in (29b–d), but it loses its accent when the root is accented, as in (29e–g). This recessive behavior may reflect general tendencies in natural languages to preserve more information from roots than from affixes (Alderete 1999b, 2001b; Beckman 1998; McCarthy and Prince 1995; Urbanczyk 2006, 2011). Another example of this kind of suffix is /+na'do/ 'etc' (Vance 1987).

²² Whether a particular morpheme is an affix or a clitic (or even a bound morpheme root) is controversial, but this chapter sets aside this issue.

²³ It may be that the accent deletion results in incomplete neutralization in which some trace of underlying accentedness may be left at the surface (Matsumori et al. 2012: 53–54, see also Igarashi, this volume). For recent reviews of incomplete neutralization, see Braver (2013), Kawahara (2011) and Yu (2011).

(29) A recessive suffix: suffix loses its accent if attached to an accented root

- a. /+ta'ra/ 'conditional'
- b. her+ta'ra → het+ta'ra 'if decreased'
- c. ne+ta'ra → ne+ta'ra 'if sleep'
- d. mage+ta'ra → mage+ta'ra 'if bent'
- e. tabe'+ta'ra → ta'be+tara 'if eat'
- f. nage'+ta'ra → na'ge+tara 'if throw'
- g. nagare'+ta'ra → naga're+tara 'if flow'

Unlike a recessive suffix, the dominant suffix retains its accent regardless of whether the root is unaccented or not. /+ppo'i/ is an example of this kind – it is accented both when the root is unaccented (30b–d) and when it is accented (30e–g). /+gu'rai/ 'at least' behaves in the same way in that it deletes the root accent to retain its own accent (Vance 1987). In this sense, these suffixes behave like those N2 nouns that retain their accent in compound formation (see (21)). The behavior of these suffixes is different from the general tendency to preserve information from roots, and hence has been analyzed as a result of additional grammatical mechanisms (Alderete 1999b, 2001a; Kurisu 2001).

(30) A dominant suffix: suffix bears accent, and causes deletion of root accent

- a. /+ppo'i/ '-ish'
- b. abura → abura+ppo'i 'oily'
- c. kaze → kaze+ppo'i 'sniffly'
- d. kodomo → kodomo+ppo'i 'childish'
- e. ada' → ada+ppo'i 'coquettish'
- f. netu' → netu+ppo'i 'feverish'
- g. ki'za → kiza+ppo'i 'snobbish'

The next type of suffix is the pre-accenting suffix, and there are three sub-types: recessive, dominant, and accent-shifting. Pre-accenting suffixes insert accent on the root-final syllable. A recessive suffix of this type, exemplified in (31), inserts accent to its immediately preceding syllable when the root is unaccented as in (31b–d), but does not do so when the root is accented, as in (31e–h).

(31) Recessive pre-accenting: accent inserted on the syllable immediately preceding the suffix, but only if the root is unaccented

- a. /+si/ 'Mr.'
- b. ono → ono'+si 'Mr. Ono'
- c. yosida → yosida'+si 'Mr. Yoshida'
- d. edogawa → edogawa'+si 'Mr. Edogawa'
- e. u'ra → u'ra+si 'Mr. Ura'
- f. mu'raki → mu'raki+si 'Mr. Muraki'
- g. nisi'mura → nisi'mura+si 'Mr. Nishimura'
- h. tesiga'wara → tesiga'wara+si 'Mr. Teshigawara'

The dominant pre-accenting suffix, on the other hand, puts accent on the root-final syllable of both accented and unaccented roots, as in (32). This behavior is similar to those N2 nouns that assign compound accent on the last syllable of N1 (see (22)).

- (32) Dominant pre-accenting: accent inserted on the syllable immediately preceding the suffix, regardless of the accent pattern of the root
- | | | |
|----|-------------|---|
| a. | /+'ke/ | 'family of' |
| b. | ono | → ono'+ke 'family of Ono' |
| c. | yosida | → yosida'+ke 'family of Yoshida' |
| d. | edogawa | → edogawa'+ke 'family of Edogawa' |
| e. | u'ra | → ura'+ke 'family of Ura' |
| f. | mu'raki | → muraki'+ke 'family of Muraki' |
| g. | nisi'mura | → nisimura'+ke 'family of Nishimura' |
| h. | tesiga'wara | → tesigawara'+ke 'family of Teshigawara' |

The third type of pre-accenting suffix inserts accent on the root-final syllable, but only if the root is accented. This suffix does not carry accent of its own, but if a root comes with accent, it attracts that accent immediately to its left. In other words, this suffix can shift already-existing accent, but it cannot insert new accent, unlike other pre-accenting suffixes.

- (33) Accent shifting: accent inserted on the syllable immediately preceding the suffix, if the root already has accent
- | | | |
|----|-------------|---------------------------------------|
| a. | /+mono/ | 'thing' |
| b. | ka'k(+u) | → kaki'+mono 'thing to write' |
| c. | yo'm(+u) | → yomi'+mono 'thing to read' |
| d. | tabe'(+ru) | → tabe'+mono 'thing to read' |
| e. | ni(+ru) | → ni+mono 'cooked food' |
| f. | nor(+u) | → nori+mono 'thing to ride' |
| g. | wasure(+ru) | → wasure+mono 'forgotten things' |

Although Japanese has many more suffixes than prefixes, there are some prefixes, some of which are post-accenting. One example is the honorific prefix /o+/, as in (34) (Haraguchi 1999) (some examples involve truncation of the root materials).²⁴ Another case of this prefix is /ma+/ (Poser 1984), as exemplified in (35). This suffix causes gemination of the root-initial consonants as well.

²⁴ This post-accentuation has a fair number of exceptions, with /o+/ sometimes behaving as a deaccenting prefix (e.g., *o+ma'nzyuu* → *o+manzyuu* 'Japanese cake' and *o+imo* → *o+imo* 'potato'), and sometimes behaving as accentually neutral (e.g., *o+misosi'ru* → *o+misosi'ru* 'miso soup').

(34) Post-accenting prefix /o+/

- a. /o+/ 'honorific'
 b. huro' → o+hu'ro 'bath'
 c. susi' → o+su'si 'sushi'
 d. tegami → o+te'gami 'letter'
 e. sentaku → o+se'ntaku 'laundry'
 f. kotatu → o+ko'ta 'a warm table'
 g. satumaimo → o+sa'tu 'potato'
 h. itazura → o+i'ta 'trick'
 i. hurui → o+hu'ru 'second-handed'
 j. kakimoti → o+ka'ki 'rice cracker'

(35) Post-accenting prefix /ma+/

- a. /ma+/ 'truly'
 b. ma+maru → mam+ma'ru 'truly round'
 c. ma+sakasama → mas+sa'kasama 'truly downward'
 d. ma+syoomen → mas+syo'omen 'truly face to face'
 e. ma+taira → mat+ta'ira 'truly flat'
 f. ma+hiruma → map+p'iruma 'noon'
 g. ma+kura'(i) → mak+ku'ra 'truly dark'

There are also morphemes, sometimes called deaccenting morphemes, that result in unaccented words, as in (36).²⁵ One important generalization about the deaccenting morphemes is that most if not all of them are one or two moras long (e.g., /-iro/ 'color', /-tama/ 'ball', /-too/ '(political) party', etc.) (Akinaga 1985).

(36) Deaccenting: affix bears no accent, and causes deletion of root accent

- a. /+teki/ '-like'
 b. ke'izai → keizai+teki 'economic'
 c. ro'nri → ronri+teki 'logical'
 d. go'ori → goori+teki 'efficient'
 e. bu'ngaku → bungaku+teki 'literature-like'
 f. riki'gaku → rikigaku+teki 'in terms of dynamics'
 g. ana'ta → anata+teki 'In your opinion (colloquial)'

A local version of this deaccenting behavior is exemplified by the genitive suffix /+no/, which deletes only root-final accent, as in (37d–e) (Haraguchi 1999; Poser 1984). However, there are some complications with this pattern (Vance 1987); for

²⁵ Giriko (2009) points out that there are pseudo-suffixal endings in loanwords that behave as if they are deaccenting suffixes – /(-)in/, /(-)ia/, /(-)ingu/ (e.g., /insurin/ 'insulin', /makedonia/ 'Macedonia', and /ranningu/ 'running').

example, it does not delete accent of a monosyllabic root, as in (37f–h). Further, /+no/ does not tend to delete final accent on heavy syllables, as in (38), although /niho'n/ 'Japan' (38i) is an exception to this sub-generalization.

(37) Local Deaccenting: affix bears no accent, and causes deletion of root-final accent

- | | | | |
|----|-------------|---|------------------------|
| a. | /+no/ 'GEN' | | |
| b. | i'noti+no | → | i'noti+no 'life+GEN' |
| c. | koko'ro+no | → | koko'ro+no 'heart+GEN' |
| d. | atama'+no | → | atama+no 'head+GEN' |
| e. | kawa'+no | → | kawa+no 'river+GEN' |
| f. | ha'+no | → | ha'+no 'tooth+GEN' |
| g. | ki'+no | → | ki'+no 'tree+GEN' |
| h. | su'+no | → | su'+no 'vinegar+GEN' |

(38) Deletion does not target accent of a final heavy syllable

- | | | | |
|----|--------------|---|-------------------------------|
| a. | zyapa'n+no | → | zyapa'n+no 'Japan+GEM' |
| b. | koohi'i+no | → | koohi'i+no 'coffee+GEN' |
| c. | buru'u+no | → | buru'u+no 'blue+GEN' |
| d. | wanta'n+no | → | wanta'n+no 'wonton+GEN' |
| e. | koozyo'o+no | → | koozyo'o+no 'factory+GEN' |
| f. | hyoozyo'o+no | → | hyoozyo'o+no 'expression+GEN' |
| g. | masi'n+no | → | masi'n+no 'machine+GEN' |
| h. | nihon+n+no | → | nihon+n+no 'Japan+GEN' |

In addition to these types of suffixes that are recognized in the traditional literature, there may be a new type of suffix, /+zu/, which assigns accent on root-initial syllables, in addition to sometimes lengthening the root-final vowel (Kawahara and Wolf 2010). This suffix is based on a borrowing of the English plural -s, and is used to create group names. In some environments at least (Kawahara and Wolf 2010; Kawahara and Kao 2012), this suffix assigns accent on root-initial syllables (see Giriko, Ohshita, and Kubozono 2011 for a reply). This behavior is particularly interesting, since it constitutes a case of non-local interaction between two phonological entities: the suffix and root-initial accent.²⁶

²⁶ Some authors claim that cross-linguistically, accent inserted by affixes can land only on adjacent syllables (Alderete 2001a; Kurisu 2001; Revithiadou 2008), but a set of standard assumptions in Optimality Theory (Prince and Smolensky 1993/2004) – in particular, morpheme-specific ALIGNMENT constraints and the existence of ALIGN-L (McCarthy and Prince 1993) – predicts that such a non-local behavior is possible (Kawahara and Wolf 2010; Kawahara and Kao 2012).

(39) Accent pattern of /+zu/

- a. raion → ra'ion+zu 'Lions (team name)'
- b. tonneru → to'nneru+zu 'Tonneruzu (comedian name)'
- c. okamoto → o'kamoto+zu 'Okamotozu (band name)'
- d. heppoko → he'ppokoo+zu 'Heppokoozu (personal name)'

Another point worth mentioning is that in the nonce word studies conducted by Kawahara and Kao (2012), initial-accenting was observed more frequently in 4-mora nonce roots (e.g., /husonii+zu/) than 5-mora nonce roots (e.g., /muhusonii+zu/). This difference may be related to the fact that in long nouns, words with initial accent are very rare at best (Kubozono 2008), indicating that Japanese accent is generally right-aligned.

To summarize this section, various types of suffixes interact with root accent in very complex ways. Therefore, modeling the behavior of these different types of suffixes has received some attention in the recent literature (Alderete 1999b, 2001a; Inkelas 2011; Inkelas and Zoll 2007; Kawahara and Wolf 2010; Kurisu 2001; Labrune 2012), especially in the context of Optimality Theory (Prince and Smolensky 1993/2004).

7 Other predictable patterns

This section surveys other domains of Japanese phonology in which accentuation is more or less predictable (see also Akinaga 1985).

7.1 Proper names

Although most proper names – family names and place names – are arguably of native or SJ origin, their accentual properties are more or less predictable, at least more predictable than those of ordinary native nouns (Shinohara 2000). First, names are either accented (40) or unaccented (41), and if accented, the accent falls on the antepenultimate mora; i.e., the default accent location (see section 2). This emergence of the default accentuation in proper names can also be seen in personal names like /sa'kura/ and /hi'nata/, which are accented on the antepenultimate mora, whereas the words that these names are based on are unaccented (/sakura/ 'cherry blossom' and /hinata/ 'sunlight').

(40) Monomorphemic accented names

- a. a'kira
- b. yu'taka
- c. sa'tosi
- d. tu'yosi
- e. ma'doka
- f. a'sina
- g. ta'maki
- h. si'zuka
- i. ho'noka
- j. yosi'masa
- k. take'hiko

(41) Monomorphemic unaccented names

- a. minoru
- b. takeru
- c. manabu
- d. susumu
- e. nagisa
- f. yayoi
- g. sizuku
- h. saori
- i. kaori

In names that are three moras long, those that are derived from adjectives are generally accented (e.g., *tu'yosi* < *tuyo'+i* 'strong'), whereas those that are derived from verbs (e.g., *minoru* < *mino'r+u* 'to ripen') are unaccented (Akinaga 1985).

The accentual properties of first names with a personal suffix are often determined by the suffix. For example, the common female suffix /+ko/ creates accented names, whereas another common female suffix /+mi/ results in unaccented names.²⁷ If accented, the location is the default – the syllable containing the antepenultimate – as illustrated in (42).

(42) Pairs of accented and unaccented names sharing the same roots

- a. to'mo+ko vs. tomo+mi
- b. mi'na+ko vs. mina+yo
- c. ha'na+ko vs. hana+e
- d. ma'sa+si vs. masa+o
- e. si'ge+to vs. sige+o
- f. ta'ku+to vs. taku+mi
- g. ta'ku+ya vs. taku+mi

²⁷ Some suffixes show more complicated behaviors; e.g., /-taroo/ and /-ziroo/ (Kubozono 2001b). Also, /+ko/ shows some irregularity; when it is attached to 3-mora roots, the entire names receive the penultimate accent (e.g., /sakura'+ko/ and /kaoru'+ko/).

7.2 Prosodically truncated words

Japanese exhibits a productive truncation pattern in which long words can be truncated into bimoraic forms, which is arguably a foot-based prosodic morphology pattern (Ito 1990; Ito and Mester 1992/2003; Mester 1990; Poser 1990; see also Ito and Mester, Ch. 9, this volume). This truncation pattern usually, but not always, keeps the first two moras of the original words, and the truncated forms usually have initial accent (Shinohara 2000), whether they are created from native words (43) or loanwords (44). The truncation pattern can truncate personal names into two moras, which results in initially-accented forms (43d–f), as well. See also Mester (1990) and Poser (1990) for other foot-based name forming patterns in Japanese.

(43) Native truncated words (two moras)

- a. na'subi → na'su 'eggplant'
- b. tyarinko → ty'a'ri 'bicycle'
- c. moti'ron → mo'ti 'of course'
- d. hanae → ha'na 'Hanae (personal name)'
- e. ma'sako → ma'ko 'Masako (personal name)'
- f. takumi → ta'mi 'Takumi (personal name)'

(44) Foreign truncated words (two moras)

- a. demonsutore'esyon → de'mo 'demonstration'
- b. tyokore'eto → tyo'ko 'chocolate'
- c. riha'asaru → ri'ha 'rehearsal'
- d. bi'rudingu → bi'ru 'building'
- e. roke'esyon → ro'ke 'location'
- f. robo'tto → ro'bo 'robot'
- g. terori'zumu → te'ro 'terrorism'

In some words, however, truncation keeps the last two moras, in which case the final accent or unaccented outcomes seem to be common, as the examples in (45) show. The last three examples in (45) are all place names, and deaccentuation in (45f–g) may have to do with *senmonka akusento* (section 2.4).

(45) Native truncated words

- a. wa'sabi → sabi' 'wasabi'
- b. tomodati → dati' 'friend'
- c. syooyu-zuke → zuke' 'pickled with soy source'
- d. katura → zura(?) 'wig'
- e. takara'zuka → zuka 'Takarazuka'
- f. sinzyuku → zyuku 'Shinjuku (place name)'
- g. takadanoba'ba → baba 'Takadanobaba (place name)'
- h. yokohama → hama' 'Yokohama (place name)'

When compounds are truncated into two bimoraic feet, the result is usually unaccented. Some examples in (46) and (47) illustrate this pattern.

- (46) Native truncated compounds (four moras)
- | | | | |
|----|--------------------------------------|-------------|------------------------------------|
| a. | akema'site omedetoo | → ake+ome | 'A Happy New Year' |
| b. | kotosimo yorosiku | → koto+yoro | 'Keep in touch this year' |
| c. | tama pura'aza | → tama+pura | 'Tama Plaza (place name)' |
| d. | hara'(+ga) ita'i | → hara+ita | 'I have a stomachache' |
| e. | toriatukai setumeesyō | → tori+setu | 'instructions' |
| f. | tora'nu ta'nuki
(no kawaza'n yoo) | → tora+tanu | 'ungrounded profit
expectation' |
- (47) Foreign truncated compounds (four moras)
- | | | | |
|----|------------------------|-------------|-------------------------|
| a. | pa'asonaru kompyu'utaa | → paso+kon | 'personal computer' |
| b. | mai me'rodii | → mai+mero | 'my melody' |
| c. | ea kondi'syooaa | → ea+kon | 'air conditioner' |
| d. | razio kase'tto | → razi+kase | 'radio cassette player' |
| e. | rimo'oto kontoro'oraa | → rimo+kon | 'remote controller' |
| f. | dezitaru ka'mera | → dezi+kame | 'digital camera' |

7.3 Mimetics

Japanese has a large number of sound-symbolic words, which are often referred to as mimetics (see Nasu, this volume). The prosodic shapes and suffixal patterns are regularized in mimetics, and accent patterns are (more or less) predictable for each prosodic pattern (Akinaga 1985; Hamano 1986; Nasu 2002). First, basic forms that appear with /+to/ receive antepenultimate (i.e., the default) accent, as in (48).²⁸ These roots may appear without the suffixal /+to/, in which case they receive accent on the penultimate mora in the root.

- (48) Some mimetic forms
- | | | |
|----|-------------|-------------------|
| a. | wa't+to | 'suddenly' |
| b. | sa't+to | 'swiftly' |
| c. | kara't+to | 'dry' |
| d. | piri't+to | 'stingy' |
| e. | niko'ri+to | 'smily' |
| f. | hiya'ri+to | 'chilly' |
| g. | ukka'ri+to | 'absent-mindedly' |
| h. | gakka'ri+to | 'disappointedly' |

²⁸ See also Hamano (1986) for an alternative formulation in which accent is assigned on the syllable contained in the strongest foot within a prosodic word.

Many mimetic roots appear reduplicated, and in many such cases, the accent falls on the initial syllable, as in (49).

- (49) Initially-accented reduplicated forms
- a. do'ki+doki 'nervous'
 - b. mo'zi+mozi 'shy'
 - c. go'ro+goro 'rolling'
 - d. ba'ta+bata 'hectic'
 - e. bu'ru+buru 'vibrating'
 - f. ki'ra+kira 'shining'

Some other reduplicated forms are unaccented, as in (50).

- (50) Unaccented reduplicated forms
- a. gaku+gaku 'quarrelsome'
 - b. moku+moku 'quietly'
 - c. tan+tan 'cooled down'
 - d. yuu+yuu 'relaxed'
 - e. men+men 'wide-spread'

In some instances, the same mimetic form can be initially-accented or unaccented, in which case (un)accentedness correlates with a particular semantic feature. When such forms are used adverbially to represent something ongoing, the forms tend to be accented; on the other hand, when the forms are used to represent a resultative state, the forms are unaccented (Tamori 1983), as some pairs in (51) show.

- (51) Reduplicated mimetic forms with and without accent
- a. pi'ka+pika to hikaru 'flashes shinely'
 - b. pika+pika ni migaku 'to polish something shiny'
 - c. tu'ru+turu to taberu 'eat smoothly (slurping)'
 - d. turu+turu ni suru 'to polish something smooth'
 - e. bo'ko+boko to sita miti 'a bumpy road'
 - f. boko+boko ni suru 'to hit somebody and cause injury'

For further data and analysis involving the phonological and accentual properties of mimetics, see Hamano (1986) and Nasu (2002).

8 Interaction with other phonological phenomena

Accent interacts with many phonological processes in Japanese. This section provides a brief overview of how Japanese accent placement interacts with other phonological phenomena.

8.1 Epenthesis

Cross-linguistically, it is common to avoid placing stress – or metrical prominence in general – on epenthetic vowels (Alderete 1999a; Broselow 1982; Gouskova and Hall 2009). Evidence for this sort of avoidance is also found in Japanese. Kubozono (2001b, 2006, 2011) shows that in loanwords consisting of a light syllable followed by a heavy syllable (LH), accent falls on the initial syllable if the first vowel is not epenthetic, as in (52). Placing accent on the initial syllable is avoided, however, if the initial vowel is epenthetic, as in (53) (epenthetic vowels are shown by < >) (Kubozono 2011: 2887).

(52) Initial accent in LH if the first vowel is not epenthetic

- a. se'-dan 'sedan'
- b. ha'-wai 'Hawaii'
- c. de'-byuu 'debut'
- d. ka'-nuu 'kanoe'
- e. gi'-taa 'guitar'
- f. pu'-rin 'pudding'

(53) Final accent in LH if the first vowel is epenthetic

- a. t<u>-i'n 'twin'
- b. t<o>-ra'i 'try'
- c. d<o>-ra'i 'dry'
- d. g<u>-re'e 'grey'
- e. b<u>-ru'u 'blue'
- f. d<o>-ro'o 'draw'

As an interesting complication, it is not the case that accent on epenthetic vowels is simply prohibited altogether (e.g., /k<u>'rasu/ 'class' and /d<o>'resu/ 'dress'). It is only when two constraints are violated – (i) placing accent on epenthetic vowels, and (ii) placing accent on a light syllable in the presence of a following heavy syllable – that Japanese allows final accent in LH sequences. In this sense, this pattern constitutes a case of “a gang effect” where a phonological process happens only when two independently motivated phonological pressures are at work (Crowhurst 2011; Pater 2009; Smolensky 1995).

See also (17) above and Kubozono (2001b) for other potential cases of the accent-epenthesis interaction.

8.2 Rendaku

Another phonological pattern that interacts with accent is rendaku, voicing of initial consonants in the second members of compounds (see Vance, this volume). For

some (or most) morphemes, rendaku is optional, and Sugito (1965) points out that rendaku is often accompanied by deaccenting in family names, especially in those names that end with /+ta/. This contrast is illustrated by the examples in (54) and (55).

(54) Rendaku → unaccented

- a. yosi+da
- b. yama+da
- c. ike+da
- d. mae+da
- e. oka+da
- f. matu+da

(55) No-rendaku → accented

- a. hu'zi+ta
- b. mo'ri+ta
- c. si'ba+ta
- d. ku'bo+ta
- e. yo'ko+ta
- f. a'ki+ta

There are, however, some exceptions; e.g., /oo+ta/ and /ha'ra+da/ (Sugito 1965; Zamma 2005). Sugito (1965) and Zamma (2005) present quantitative surveys of names that end with this morpheme, which show the correlation between the presence of rendaku and unaccentedness, as in Table 6.

Table 6: Correlation between rendaku and accent. Reproduced from Zamma (2005: 159)

	accented	unaccented	either (variation)	total
no rendaku	94	13	10	117
rendaku	64	95	56	215
either (variation)	8	0	22	30
Total	166	108	88	362

This connection between rendaku and unaccentedness seems to be observed in other domains, including island names with /+sima/ (Tanaka 2005), last names ending with /+kawa/ (Ohta 2013), and the light verb /+suru/ (Kurisu 2010; Okumura 1984) (see also Yamaguchi 2011 and references cited therein); some examples are shown in (56).

(56) The interaction between Rendaku and accent

- a. awazi'+sima vs. sakura+zima '(place name)'
- b. okino'+sima vs. iriomote+zima '(place name)'
- c. yosi'+kawa vs. sina+gawa '(personal name)'

- | | | | | |
|----|-----------------------|-----|----------|-------------------|
| d. | nami'+kawa | vs. | uda+gawa | '(personal name)' |
| e. | tai+su'ru 'to oppose' | vs. | mee+zuru | 'to order' |
| f. | koo+su'ru 'to resist' | vs. | hoo+zuru | 'to report' |

8.3 Vowel devoicing

Finally, accentuation interacts with high vowel devoicing in Japanese. Vowels between two voiceless consonants or those that are word-final and preceded by a voiceless consonant devoice in Japanese (see Fujimoto, this volume, for full discussion of vowel devoicing). There is a tendency to avoid placing accent on devoiced vowels, which is natural given that the metrical prominence provided by accent may not be very audible in voiceless vowels, since they do not involve robust periodic energy.

To illustrate this avoidance of accenting devoiced vowels, recall for example that accented verbs usually have their accent on the penultimate syllable – but, when the vowel in that syllable is devoiced, the accent can shift (Hirayama 1960; Vance 1987). This interaction between devoicing and accent shift is illustrated in (57). The example in (57d) (from Akinaga 1985: 8) shows this shift with an alternation: when the stem vowel gets devoiced, because the suffix-initial consonant is /t/, the accent may shift to the suffixal vowel.

- (57) Accent shift due to devoicing
- t_u'k+u → t_uk+u' 'arrive'
 - h_u'k+u → h_uk+u' 'blow'
 - kak_u's+u → ka'k_us+u 'hide'
 - hu'r+u 'fall' → h_ut+te' 'falling'

In short, there is a tendency to shift accent due to vowel devoicing. However, young speakers place accent on devoiced vowels and show no such accent shifts. See Akinaga (1985), Kitahara (1996) and Maekawa (1990) and references cited therein for more on the interaction between vowel devoicing and accent.

9 Theoretical contributions

The discussion so far has been more or less descriptive, although the discussion also included basic metrical analyses of the Japanese accent system. Now we briefly turn to the theoretical contributions that Japanese accentology has made in the history of generative phonology.

Although it is not possible – or useful, even – to fully reproduce theoretical analyses of Japanese accent in various theoretical frameworks, it is probably important

to note that Japanese accentology has contributed to developments in phonological theory. Japanese accent has been analyzed from several theoretical perspectives throughout the history of generative phonology, starting from McCawley (1968). Readers are referred to the original references for the details of each analysis and the implications that it had for contemporary theoretical debates.

In early years of generative studies, attention was paid to the issue of how to represent Japanese accent phonologically. For example, Haraguchi (1977, 1991) developed autosegmental analyses (Goldsmith 1976) of accent patterns in many dialects in Japan, deriving surface tonal patterns from underlying diacritics using (universal) autosegmental conventions. Some other authors developed more purely tonal analyses without resorting to underlying lexical diacritics (Pierrehumbert and Beckman 1988; Poser 1984; Pulleyblank 1984). Pierrehumbert and Beckman (1988) moreover showed, based on experimental work, that “spreading of tones” (section 1.4) can be better analyzed as phonetic interpolation, building on the idea of phonetic underspecification (Keating 1988).

Within the framework of Metrical Phonology and Prosodic Phonology (Lieberman and Prince 1977; Nespor and Vogel 1986; Selkirk 1978, 1980), in which linguistic utterances are organized into a set of hierarchical levels, Poser (1990) made an important contribution by showing that languages that do not possess stress (like Japanese) show evidence for the presence of a foot in their metrical organization. This contribution was not trivial because the foot was first proposed to compute stress placement (Hammond 2011; Hayes 1995; Selkirk 1980), and therefore it was not clear whether non-stress languages like Japanese could possess metrical feet or not.

Haraguchi (1999) offers an extensive analysis of the accentual behavior of verbs and adjectives (section 5) using the notion of extrametricality (Hayes 1982; Hyde 2011) and tonal spreading (Goldsmith 1976). The difference between the accentuation pattern of the non-past tense (penultimate) and the past tense (antepenultimate) has been analyzed in several ways, including extrametricality (Haraguchi 1999), the level ordering hypothesis (Clark 1986) (see Kiparsky 1982; Siegel 1974) and paradigm uniformity (Yamaguchi 2010) (see Benua 1997; McCarthy 2005a; Steriade 2000).

Soon after Optimality Theory (Prince and Smolensky 1993/2004) was proposed and became a dominant analytical framework in the field of phonology, Kubozono (1995, 1997) argued that a constraint-based model accounts well for various aspects of Japanese accent patterns. In particular, Kubozono (1995, 1997) developed a unified constraint-based analysis of compound accent rules, which we discussed in section 4.

Within Optimality Theory, the basic antepenultimate accent rule can be derived by having a trochaic foot with the final syllable unparsed (e.g., /kuri(su'ma)su/), and this foot placement can be explained as an interaction of two independently motivated constraints: RIGHTMOSTNESS and NONFINALITY, both of which have been proposed by Prince and Smolensky (1993/2004). The former constraint requires feet to be aligned to the right edge of a prosodic word, and one formulation of the latter

constraint requires that final syllables be unparsed. If NONFINALITY dominates RIGHTMOSTNESS, the final syllable remains unparsed, but the foot is placed rightwards to the extent possible.

Various morphologically controlled accent patterns have been analyzed from the perspective of modeling the phonology-morphology interface, especially in terms of how suffixes can affect roots' phonological shapes (Alderete 1999b, 2001a; Kawahara and Wolf 2010; Kurisu 2001; Inkelas 2011; Inkelas and Zoll 2007). For example, given that languages generally preserve underlying information from roots more often than from affixes, the behavior of dominant suffixes remains mysterious. Several solutions have been proposed to address this question; e.g., anti-faithfulness constraints (Alderete 1999b, 2001a) and a morpheme realization constraint (Kurisu 2001).

The privileged status of nouns – as compared to adjectives and verbs – in allowing contrastive accent locations has been discussed from the perspective of category-specific phonological patterns (Smith 1998, 2011). Cross-linguistically, there seems to be a general tendency to allow more contrasts in nouns than in adjectives and verbs, and Japanese fits this generalization well. Smith (1998) develops an analysis of this privileged status of Japanese nouns using category-specific faithfulness constraints.

10 Remaining issues

Accent is arguably the most extensively studied area in Japanese phonology, and the previous studies reviewed above, both in the traditional literature and in theoretical linguistics, have revealed many interesting patterns. There are a number of issues that remain to be addressed, however.

10.1 Experimentation with nonce words

Most studies on Japanese accent are based on descriptions in a dictionary (e.g., NHK 1998) or on impressionistic observations about existing words, and this chapter itself is no exception. This tradition is perhaps not without a reason – even linguistically naive native speakers of Tokyo Japanese have a fairly clear idea of accentual differences that exist among different words, and when asked, it is not difficult for them to choose an appropriate accent pattern for a particular word, even if they cannot identify its exact tonal contour or accent placement. Therefore, the data on Japanese accent, even though based on impressionistic observations, are fairly reliable.

Nevertheless, there have been a number of experimental works using nonce words (e.g., Katayama 1998; Kawahara and Kao 2012; Kubozono and Ogawa 2005; Tanaka 1995). Given the rise of laboratory approaches to phonology in recent years (Beckman and Kingston 1990; Pierrehumbert, Beckman, and Ladd 2000), we have

much to learn from experiments using nonce words (for example, wug-tests: Berko 1958). For example, experimentation is useful in order to address the true productivity of a particular accent pattern, or in order to solve particular theoretical debates, or to examine the quality of the data itself.

One could argue that loanword adaptation, reviewed in section 2, constitutes a more or less natural experiment on how Japanese speakers assign accent to nonce words (Kang 2011). However, when it comes to accentuation, one cannot deny the possibility that Japanese accent locations are influenced by the stress in the donor language (Akinaga 1985, cf. Kubozono 2006).²⁹ Studying loanword accentuation undoubtedly provides insight into Japanese accentuation systems, but systematic experimentation can complement that sort of study.

10.2 Lexical specification

As we have discussed throughout this chapter, Japanese does seem to have a default antepenultimate accent rule (or Latin Stress Rule). One question that arises is whether or not nouns that have lexical accent that happen to coincide with default accent (e.g., /i'noti/ 'mind') should be underlyingly specified for accent. A dominant assumption in the field has been that Japanese accent is unpredictable in nouns, so that accent locations need to be specified for all nouns. Kubozono (2006, 2008, 2011) challenges this traditional view, because if Japanese has a mechanism that assigns default accent, such lexical specifications are redundant. To the extent that Japanese phonology has a default accentuation assignment system, learners may as well take “a free ride” (McCarthy 2005b) on this rule, and leave the lexical representations unspecified.

This proposal is reminiscent of the idea that redundant features should be underspecified in the lexicon (i.e., the theory of underspecification) (e.g., Archangeli 1988). Although this theory has been challenged in Optimality Theory (McCarthy and Taub 1992; Prince and Smolensky 1993/2004), some recent psycholinguistic work argues that mental lexicons are indeed underspecified (Eulitz and Lahiri 2004; Lahiri and Marslen-Wilson 1991; Lahiri and Reetz 2002). On the other hand, there are some other lines of psycholinguistic work which argues for the opposite – that linguistic memories are richly encoded, including redundant information (e.g., exemplar theory) (Gahl and Yu 2006; Johnson 2007; Mitterer 2011).

This issue of underspecification is thus perhaps best discussed at two distinct levels – theoretical and psycholinguistic – and the Japanese accent system would bear on this debate from both perspectives. To address the question of whether

²⁹ Some examples include /a'kusento/ 'accent', /fa'inansu/ 'finance', /ta'aminaru/ 'terminal', /sa'ikuringu/ 'cycling' and /sa'iensu/ 'science'. These forms seem to reflect the stress pattern of the source language.

default accent is underspecified in the mental lexicon of actual Japanese speakers, psycholinguistic studies are necessary.

10.3 Acquisition of accent

As we have observed throughout this chapter, the Japanese accent system is a mixture of regularities and exceptions. To what extent semi-regular patterns are indeed grammaticalized in speakers' minds is an important but difficult question to address. One way to address this problem is to study the acquisition of accent patterns, and there have been various studies on this topic (Sato, Sogabe, and Mazuka 2010; Shirose, Kubozono, and Kiritani 1998; Shirose 2001). It is sometimes hard to transcribe accent patterns in child speech, but the study of acquisition of accent patterns (both in L1 and L2) should nevertheless provide us with much insight (see Ota, this volume, and Hirata, this volume).

11 Conclusion

This chapter has provided an overview of various aspects of Japanese accent patterns. It is impossible to provide a fully detailed description of the system in one chapter, let alone its analysis, so the aims of the current paper have been to introduce the basic patterns and analyses, and to place the discussion in cross-linguistic perspective. One of the challenges that Japanese accent patterns pose – which is an interesting one – is that the accent system of Japanese both show regularity and complex exceptions at the same time. The Japanese system will and should continue to provide an interesting testing ground for theoretical discussion.

Acknowledgements

I am grateful to Yosuke Igarashi, Shin-ichiroo Ishihara, Michinao Matsui, Toshio Matsuura, Yasutada Sudo, and Kazuko Yatsushiro for the contributions to the data collection. I am also grateful to Manami Hirayama, Yosuke Igarashi, Kazu Kurisu, Toshio Matsuura, Akio Nasu, Seunghun Lee, and Kyoko Yamaguchi for comments on earlier drafts of this chapter. Two reviewers (Haruo Kubozono and Tim Vance) provided very detailed comments on earlier drafts, which significantly improved this chapter. Donna Erickson, Jeremy Perkins, and Jess Trombetta very carefully proofread the drafts. All remaining errors are mine.

References

- Akinaga, Kazue. 1985. Kyōtsūgo no akusento [Accent of standard Japanese]. In NHK (ed.), *Nihongo hatsuon akusento jiten* [The Japanese language pronunciation and accent dictionary]. Tokyo: Nihon Hōsō Shuppan Kyōkai.
- Akinaga, Kazue. 2002. Tokyo no hatsuon no yure [Fluctuation of Tokyo Japanese pronunciations]. In Yoshifumi Hida and Takeyoshi Sato (eds.), *Gendai nihongo kōza 3: Hatsuon* [Series in modern Japanese 3: Pronunciation], 40–58. Tokyo: Meiji Shoin.
- Alderete, John. 1999a. Head dependence in stress-epenthesis interaction. In Ben Hermans and Marc van Oostendorp (eds.), *The derivational residue in Optimality Theory*, 29–50. Amsterdam: John Benjamins.
- Alderete, John. 1999b. *Morphologically-governed accent in Optimality Theory*. Amherst MA: University of Massachusetts dissertation.
- Alderete, John. 2001a. Dominance effects as transderivational anti-faithfulness. *Phonology* 18(2). 201–253.
- Alderete, John. 2001b. Root-controlled accent in Cupeño. *Natural Language and Linguistic Theory* 19 (3). 455–502.
- Archangeli, Diana. 1988. Aspects of underspecification theory. *Phonology* 5. 183–208.
- Becker, Michael and Kathryn Flack. 2011. The emergence of the unmarked. In Marc van Oostendorp, Colin J. Ewen, Elizabeth Hume and Keren Rice (eds.), *The Blackwell companion to phonology 3*, 1003–1026. Malden, MA and Oxford: Wiley-Blackwell.
- Beckman, Jill. 1998. *Positional faithfulness*. Amherst, MA: University of Massachusetts dissertation.
- Beckman, Mary. 1986. *Stress and non-stress accent*. Dordrecht: Foris.
- Beckman, Mary and John Kingston. 1990. An introduction. In John Kingston and Mary Beckman (eds.), *Papers in laboratory phonology I: Between the grammar and physics of speech*, 1–16. Cambridge: Cambridge University Press.
- Benua, Laura. 1997. *Transderivational identity: Phonological relations between words*. Amherst MA: University of Massachusetts dissertation.
- Berko, Jean. 1958. The child's learning of English morphology. *Word* 14. 150–177.
- Bolinger, Dwight L. 1958. A theory of pitch accent in English. *Word* 14. 109–149.
- Braver, Aaron. 2013. *Degrees of incompleteness in neutralization: Paradigm uniformity in a phonetics with weighted constraints*. New Brunswick, New Jersey: Rutgers University dissertation.
- Broselow, Ellen. 1982. On predicting the interaction of stress and epenthesis. *Glossa* 16. 115–132.
- Clark, Mary. 1986. Japanese as a tone language. In Takashi Imai and Mamoru Saito (eds.), *Issues in Japanese linguistics*, 53–105. Dordrecht: Foris.
- Coetzee, Andries W. 2009. Learning lexical indexation. *Phonology* 26. 109–145.
- Crowhurst, Megan. 2011. Constraint conjunction. In Marc van Oostendorp, Colin J. Ewen, Elizabeth Hume and Keren Rice (eds.), *The Blackwell companion to phonology 3*, 1461–1490. Malden, MA and Oxford: Wiley-Blackwell.
- Eulitz, Carsten and Aditi Lahiri. 2004. Neurobiological evidence for abstract phonological representations in the mental lexicon during speech recognition. *Journal of Cognitive Neuroscience* 16 (4). 577–583.
- Fujimoto, Masako. this volume. Chapter 4: Vowel devoicing. In Haruo Kubozono (ed.), *The handbook of Japanese phonetics and phonology*. Berlin: De Gruyter Mouton.
- Gahl, Susanne and Alan Yu (eds.). 2006. Special issue on exemplar-based models in linguistics. *The Linguistic Review* 23(3).
- Giriko, Mikio. 2009. *Nihongo ni okeru go ninshiki to heiban-gata akusento* [Word structure recognition and the unaccented pattern in Japanese]. Kobe: Kobe University dissertation.

- Giriko, Mikio, Takao Ohshita and Haruo Kubozono. 2011. Gomatsu ga zu dearu chīmumei/gurūpumei no akusento bunseki [On the nature of the morpheme [zu] in Japanese]. *NINJAL Research Papers* 2. 1–18.
- Goldsmith, John. 1976. *Autosegmental phonology*. Cambridge, MA: MIT dissertation.
- Gordon, Matthew. 2002. A phonetically driven account of syllable weight. *Language* 78(1). 51–80.
- Gordon, Matthew. 2005. A perceptually-driven account of onset-sensitive stress. *Natural Language and Linguistic Theory* 23. 595–653.
- Gouskova, Maria and Nancy Hall. 2009. Acoustics of unstressable vowels in Lebanese Arabic. In Steve Parker (ed.), *Phonological argumentation: Essays on evidence and motivation*, 203–225. London: Equinox.
- Hamano, Shoko. 1986. *The sound-symbolic system of Japanese*. Gainesville, Florida: University of Florida dissertation [CSLI, 1998].
- Hammond, Michael. 2011. The foot. In Marc van Oostendorp, Colin J. Ewen, Elizabeth Hume and Keren Rice (eds.), *The Blackwell companion to phonology 2*, 949–979. Malden, MA and Oxford: Wiley-Blackwell.
- Haraguchi, Shosuke. 1977. *The tone pattern of Japanese: An autosegmental theory of tonology*. Tokyo: Kaitakusha.
- Haraguchi, Shosuke. 1991. *A theory of stress and accent*. Dordrecht: Foris.
- Haraguchi, Shosuke. 1999. Accent. In Natsuko Tsujimura (ed.), *The handbook of Japanese linguistics*, 1–30. Oxford: Blackwell.
- Hayes, Bruce. 1982. Extrametricality and English stress. *Linguistic Inquiry* 13. 227–276.
- Hayes, Bruce. 1989. Compensatory lengthening in moraic phonology. *Linguistic Inquiry* 20. 253–306.
- Hayes, Bruce. 1995. *Metrical stress theory: Principles and case studies*. Chicago: The University of Chicago Press.
- Hirayama, Teruo (ed.). 1960. *Zenkoku akusento jiten* [All-Japan accent dictionary]. Tokyo: Tōkyōdō Shuppan.
- Hoequist, Carles E. 1982. Duraional correlates of linguistic rhythm categories. *Phonetica* 40. 19–31.
- Hulst, Harry van der. 2011. Pitch accent systems. In Marc van Oostendorp, Colin J. Ewen, Elizabeth Hume and Keren Rice (eds.), *The Blackwell companion to phonology 2*, 1003–1026. Malden, MA and Oxford: Wiley-Blackwell.
- Hyde, Brett. 2007. Non-finality and weight-sensitivity. *Phonology* 24(2). 287–334.
- Hyde, Brett. 2011. Extrametricality and non-finality. In Marc van Oostendorp, Colin J. Ewen, Elizabeth Hume and Keren Rice (eds.), *The Blackwell companion to phonology 2*, 1027–1051. Malden, MA and Oxford: Wiley-Blackwell.
- Hyman, Larry M. 2009. How (not) to do phonological typology: The case of pitch-accent. *Language Sciences* 31. 213–238.
- Hirata, Yukari. this volume. Chapter 18: L2 phonetics and phonology. In Haruo Kubozono (ed.), *The handbook of Japanese phonetics and phonology*. Berlin: De Gruyter Mouton.
- Igarashi, Yosuke. this volume. Chapter 13: Intonation. In Haruo Kubozono (ed.), *The handbook of Japanese phonetics and phonology*. Berlin: De Gruyter Mouton.
- Inkelas, Sharon. 1999. Exceptional stress-attracting suffixes in Turkish: Representation vs. the grammar. In René Kager, Harry van der Hulst and Wim Zonneveld (eds.), *The prosody-morphology interface*, 134–187. Cambridge: Cambridge University Press.
- Inkelas, Sharon. 2011. The phonology-morphology interaction. In John Goldsmith, Jason Riggle and Alan Yu (eds.), *The handbook of phonological theory*, 2nd edition. 68–102. Oxford: Blackwell.
- Inkelas, Sharon, Orhan Orgun and Cheryl Zoll. 1997. The implications of lexical exceptions for the name of grammar. In Iggy Roca (ed.), *Derivations and constraints in phonology*, 393–418. Oxford: Oxford University Press.

- Inkelas, Sharon and Cheryl Zoll. 2007. Is grammar dependence real? A comparison between cophonological and indexed constraint approaches to morphologically conditioned phonology. *Linguistics* 45. 133–172.
- Inoue, Fumio. 1998. *Nihongo uocchingu* [Watching Japanese]. Tokyo: Iwanami.
- Ishihara, Shin-ichiro. this volume. Chapter 14: Syntax-phonology interface. In Haruo Kubozono (ed.), *The handbook of Japanese phonetics and phonology*. Berlin: De Gruyter Mouton.
- Ito, Junko. 1990. Prosodic minimality in Japanese. In Michael Ziolkowski, Manual Noske and Karen Deaton (eds.), *Proceedings of the Annual Meeting of the Chicago Linguistic Society 26-II: Papers from the Parasession on the Syllable in Phonetics and Phonology*, 213–239.
- Ito, Junko, Yoshihisa Kitagawa and Armin Mester. 1996. Prosodic faithfulness and correspondence: Evidence from a Japanese argot. *Journal of East Asian Linguistics* 5. 217–294.
- Ito, Junko and Armin Mester. 2003 [1992]. Weak layering and word binarity. In Takeru Homma, Masao Okazaki, Toshiyuki Tabata and Shin-ichi Tanaka (eds.), *A new century of phonology and phonological theory: A festschrift for Professor Shosuke Haraguchi on the occasion of his sixtieth birthday*, 26–65. Tokyo: Kaitakusha.
- Ito, Junko and Armin Mester. 1995. Japanese phonology. In John Goldsmith (ed.), *The handbook of phonological theory*, 817–838. Oxford: Blackwell.
- Ito, Junko and Armin Mester. 1996. Stem and word in Sino-Japanese. In Takashi Otake and Anne Cutler (eds.), *Phonological structure and language processing: Cross-linguistic studies*, 13–44. Berlin: Mouton de Gruyter.
- Ito, Junko and Armin Mester. 1999. The phonological lexicon. In Natsuko Tsujimura (ed.), *The handbook of Japanese linguistics*, 62–100. Oxford: Blackwell.
- Ito, Junko and Armin Mester. 2003. *Japanese morphophonemics*. Cambridge: MIT Press.
- Ito, Junko and Armin Mester. 2007. Prosodic adjunction in Japanese compounds. *Proceedings of Formal Approaches Japanese Linguistics* 4, 97–112.
- Ito, Junko and Armin Mester. 2008. Lexical classes in phonology. In Shigeru Miyagawa and Mamoru Saito (eds.), *The Oxford handbook of Japanese linguistics*, 84–106. Oxford: Oxford University Press.
- Ito, Junko and Armin Mester. 2012. Unaccentedness in Japanese. Ms. University of California, Santa Cruz.
- Ito, Junko and Armin Mester. this volume. Chapter 7: Sino-Japanese phonology. In Haruo Kubozono (ed.), *The handbook of Japanese phonetics and phonology*. Berlin: De Gruyter Mouton.
- Ito, Junko and Armin Mester. this volume. Chapter 9: Word formation and phonological processes. In Haruo Kubozono (ed.), *The handbook of Japanese phonetics and phonology*. Berlin: De Gruyter Mouton.
- Johnson, Keith. 2007. Decisions and mechanisms in exemplar-based phonology. In Maria-Josep Solé, Patrice Beddor and Manjari Ohala (eds.), *Experimental approaches to phonology*, 25–40. Oxford: Oxford University Press.
- Kang, Yoonjung. 2011. Loanword phonology. In Marc van Oostendorp, Colin J. Ewen, Elizabeth Hume and Keren Rice (eds.), *The Blackwell companion to phonology* 4, 1003–1026. Malden, MA and Oxford: Wiley-Blackwell.
- Katayama, Motoko. 1998. *Optimality Theory and Japanese loanword phonology*. Sanra Cruz, California: University of California dissertation.
- Kawagoe, Itsue. this volume. Chapter 2: The phonology of sokuon, or geminate obstruents. In Haruo Kubozono (ed.), *The handbook of Japanese phonetics and phonology*. Berlin: De Gruyter Mouton.
- Kawahara, Shigeto. 2011. Experimental approaches in theoretical phonology. In Marc van Oostendorp, Colin J. Ewen, Elizabeth Hume and Keren Rice (eds.), *The Blackwell companion to phonology* 4, 2283–2303. Malden, MA and Oxford: Wiley-Blackwell.

- Kawahara, Shigeto. this volume. Chapter 1: The phonetics of sokuon, or geminate obstruents. In Haruo Kubozono (ed.), *The handbook of Japanese phonetics and phonology*. Berlin: De Gruyter Mouton.
- Kawahara, Shigeto and Sophia Kao. 2012. The productivity of a root-initial accenting suffix, [-zu]: Judgment studies. *Natural Language and Linguistic Theory* 30(3). 837–857.
- Kawahara, Shigeto, Kohei Nishimura and Hajime Ono. 2002. Unveiling the unmarkedness of Sino-Japanese. In William McClure (ed.), *Japanese/Korean Linguistics 12*, 140–151. Stanford: CSLI.
- Kawahara, Shigeto and Takahito Shinya. 2008. The intonation of gapping and coordination in Japanese: Evidence for Intonational Phrase and Utterance. *Phonetica* 65(1–2). 62–105.
- Kawahara, Shigeto and Matthew Wolf. 2010. On the existence of root-initial-accenting suffixes: An elicitation study of Japanese [-zu]. *Linguistics* 48(4). 837–864.
- Kawakami, Shin. 1961. On the relationship between word-tone and phrase-tone in Japanese Language. *The Study of Sounds* (The Phonetic Society of Japan) 9. 169–177.
- Keating, Patricia A. 1988. Underspecification in phonetics. *Phonology* 5. 275–292.
- Kiparsky, Paul. 1982. Lexical phonology and morphology. In In-Seok Yang (ed.), *Linguistics in the morning calm, vol. 2*, 3–91. Seoul: Hanshin.
- Kisseberth, Charles. 1970. The treatment of exceptions. *Papers in Linguistics* 2. 44–58.
- Kitahara, Mafuyu. 1996. Nihongo ni okeru museika onsetsu to picchi akusento no jitsugen ni tsuite [Devoiced syllables and the realization of pitch accent in Japanese]. *Gengo Kenkyu* 15. 1–17.
- Kitahara, Mafuyu. 2001. *Category structure and function of pitch accent in Tokyo Japanese*. Bloomington, Indiana: Indiana University dissertation.
- Kobayashi, Megumi. 2003. Tōkyōgo ni okeru keiyōshi akusento no henka to sono yōin [An examination of adjective accent changes in Tokyo Japanese]. *Onsei Kenkyū* [Journal of the Phonetic Society of Japan] 7(2). 101–113.
- Kubozono, Haruo. 1995. Constraint interaction in Japanese phonology: Evidence from compound accent. In Rachel Walker, Ove Lorentz and Haruo Kubozono (eds.), *Phonology at Santa Cruz (PASC) 4*, 21–38. Santa Cruz: Linguistics Research Center, UC Santa Cruz.
- Kubozono, Haruo. 1996. Syllable and accent in Japanese: Evidence from loanword accentuation. *The Bulletin* (The Phonetic Society of Japan) 211. 71–82.
- Kubozono, Haruo. 1997. Lexical markedness and variation: A nonderivational account of Japanese compound accent. In Brian Agbayani and Sze-Wing Tang (eds.), *Proceedings of West Coast Conference on Formal Linguistics*, 273–287. CSLI.
- Kubozono, Haruo. 1999. Mora and syllable. In Natsuko Tsujimura (ed.), *The handbook of Japanese linguistics*, 31–61. Oxford: Blackwell.
- Kubozono, Haruo. 2001a. Comments on “Privative tone in Bantu”. In Shigeki Kaji (ed.), *Proceedings of the Symposium ‘Cross-Linguistic Studies of Tonal Phenomena, Tonogenesis, Japanese Accentology, and Other Topics’*, 259–265. Tokyo: ILCAA.
- Kubozono, Haruo. 2001b. Epenthetic vowels and accent in Japanese: Facts and paradoxes. In Jeroen van de Weijer and Tetsuo Nishihara (eds.), *Issues in Japanese phonology and morphology*, 113–142. Berlin and New York: Mouton de Gruyter.
- Kubozono, Haruo. 2006. Where does loanword prosody come from? A case study of Japanese loanword accent. *Lingua* 116. 1140–1170.
- Kubozono, Haruo. 2008. Japanese accent. In Shigeru Miyagawa and Mamoru Saito (eds.), *The Oxford handbook of Japanese linguistics*, 165–191. Oxford: Oxford University Press.
- Kubozono, Haruo. 2010. Accentuation of alphabetic acronyms in varieties of Japanese. *Lingua* 120. 2323–2335.
- Kubozono, Haruo. 2011. Japanese pitch accent. In Marc van Oostendorp, Colin J. Ewen, Elizabeth Hume and Keren Rice (eds.), *The Blackwell companion to phonology 5*, 2879–2907. Malden, MA and Oxford: Wiley-Blackwell.
- Kubozono, Haruo. 2013. Japanese word accent. *Oxford Bibliographies Online*.

- Kubozono, Haruo. this volume. Introduction: Introduction to Japanese phonetics and phonology. In Haruo Kubozono (ed.), *The handbook of Japanese phonetics and phonology*. Berlin: De Gruyter Mouton.
- Kubozono, Haruo. this volume. Chapter 5: Diphthongs and vowel coalescence. In Haruo Kubozono (ed.), *The handbook of Japanese phonetics and phonology*. Berlin: De Gruyter Mouton.
- Kubozono, Haruo. this volume. Chapter 8: Loanword phonology. In Haruo Kubozono (ed.), *The handbook of Japanese phonetics and phonology*. Berlin: De Gruyter Mouton.
- Kubozono, Haruo and Yayoi Fujiura. 2004. Morpheme-dependent nature of compound accent in Japanese: An analysis of “short” compounds. *Phonological Studies* 7. 9–16.
- Kubozono, Haruo, Junko Ito and Armin Mester. 1997. On’inkōzō kara mita go to ku no kyōkai: Fukugō meishi akusento no bunseki [The phonological boundary between the word and the phrase: An analysis of Japanese compound noun accentuation]. In Spoken Language Working Group (ed.), *Bunpō to onsei* [Speech and grammar], 147–166. Tokyo: Kurozio.
- Kubozono, Haruo and Armin Mester. 1995. Foot and accent: New evidence from Japanese compound accentuation. Ms. University of California, Santa Cruz.
- Kubozono, Haruo and Shinji Ogawa. 2005. Sutoraiiki wa naze suto ka? Tanshuku to tango bunsetsu no mekanizumu [Why *sutoraiiki* becomes *suto*? Mechanisms for truncation and word segmentation]. In Tsuyoshi Oishi, Tetsuo Nishihara and Yoji Toyoshima (eds.), *Gendai keitairon no chōryū* [Trends in modern morphology], 155–174. Tokyo: Kurozio.
- Kubozono, Haruo and Satoshi Ohta. 1998. *On’in kōzō to akusento* [Phonological structure and accent]. Tokyo: Kenkyusha.
- Kurusu, Kazutaka. 2001. *The phonology of morpheme realization*. Santa Cruz, California: University of California dissertation.
- Kurusu, Kazutaka. 2005. Gradient prosody in Japanese. *Journal of East Asian Linguistics* 14. 175–226.
- Kurusu, Kazutaka. 2010. Japanese light verb voicing as a connective morpheme. *Proceedings of WAFL* 6, 213–227.
- Labrone, Laurence. 2012. *The phonology of Japanese*. Oxford: Oxford University Press.
- Lahiri, Aditi and William Marslen-Wilson. 1991. The mental representation of lexical form: A phonological approach to the recognition lexicon. *Cognition* 38. 245–294.
- Lahiri, Aditi and Henning Reetz. 2002. Underspecified recognition. In Carlos Gussenhoven and Natasha Warner (eds.), *Laboratory phonology 7*, 637–675. Berlin: Mouton de Gruyter.
- Liberman, Mark and Alan Prince. 1977. On stress and linguistic rhythm. *Linguistic Inquiry* 8. 249–336.
- Maekawa, Kikuo, Hideaki Kikuchi, Yosuke Igarashi and Jennifer Venditti. 2002. X-JToBI: An extended J-ToBI for spontaneous speech. *Proceedings of the 7th International Congress on Spoken Language Processing*, 1545–1548.
- Maekawa, Kikuo. 1990. Production and perception of the accent in the consecutively devoiced syllables in Tokyo Japanese. *Proceedings of ICSLP 1990*, 517–520.
- Martin, Samuel E. 1967. On the accent of Japanese adjectives. *Language* 43. 246–277.
- Matsumori, Akiko, Tetsuo Nitta, Noriko Kibe and Yukihiko Nakai (eds.). 2012. *Nihongo akusento nyūmon* [Introduction to Japanese accent]. Tokyo: Sanseido.
- McCarthy, John J. 2005a. Optimal paradigms. In Laura Downing, T. Alan Hall and Renate Raffelsiefen (eds.), *Paradigms in phonological theory*, 170–210. Oxford: Oxford University Press.
- McCarthy, John J. 2005b. Taking a free ride in morphophonemic learning. *Catalan Journal of Linguistics* 4. 19–55.
- McCarthy, John J. and Alan Prince. 1993. Generalized alignment. *Yearbook of Morphology*. 79–153.
- McCarthy, John J. and Alan Prince. 1994. The emergence of the unmarked: Optimality in prosodic morphology. In Merce Gonzalez (ed.), *Proceedings of the North East Linguistic Society 24*, 333–379. Amherst, MA: GLSA.

- McCarthy, John J. and Alan Prince. 1995. Faithfulness and reduplicative identity. In Jill Beckman, Laura Walsh Dickey and Suzanne Urbanczyk (eds.), *University of Massachusetts occasional papers in linguistics* 18, 249–384. Amherst: GLSA.
- McCarthy, John J. and Alison Taub. 1992. Review of Carole Paradis and Jean-François Prunet eds., 1991. The special status of coronals: Internal and external evidence. *Phonology* 9. 363–370.
- McCawley, James D. 1968. *The phonological component of a grammar of Japanese*. The Hague: Mouton.
- McCawley, James D. 1977. Accent in Japanese. In Larry Hyman (ed.), *Studies in stress and accent* (Southern California Occasional Papers in Linguistics 4), 261–302. Los Angeles: USC.
- Mester, Armin. 1990. Patterns of truncation. *Linguistic Inquiry* 21. 475–485.
- Mester, Armin. 1994. The quantitative trochee in Latin. *Natural Language and Linguistic Theory* 12. 1–61.
- Mitterer, Holger. 2011. The mental lexicon is fully specified: Evidence from eye-tracking. *Journal of Experimental Psychology: Human Perception and Performance* 37(2). 496–513.
- Myers, Scott. 1998. Surface underspecification of tone in Chichewa. *Phonology* 15. 367–391.
- Nasu, Akio. 2002. *Nihongo onomatope no gokeisei to inritsu kōzō* [Word formation and metrical structure in Japanese onomatopoeic words]. Tsukuba, Japan: University of Tsukuba dissertation.
- Nasu, Akio. this volume. Chapter 6: The phonological lexicon and mimetic phonology. In Haruo Kubozono (ed.), *The handbook of Japanese phonetics and phonology*. Berlin: De Gruyter Mouton.
- Nespor, Marina and Irene Vogel. 1986. *Prosodic phonology*. Dordrecht: Foris.
- NHK. 1998. *Nihongo hatsuon akusento jiten* [The Japanese language pronunciation and accent dictionary]. Tokyo: Nihon Hōsō Shuppan Kyōkai.
- Nishiyama, Kunio. 2010. Penultimate accent in Japanese predicates and the verb-noun distinction. *Lingua* 120(10). 2353–2366.
- Ohta, Satoshi. 2013. On the relationship between rendaku and accent: Evidence from -kawa/-gawa alternation in Japanese surnames. In Van de Weijer and Tetsuo Nishihara (eds.), *Current issues in Japanese phonology: Segmental variation in Japanese*, 63–87. Tokyo: Kaitakusha.
- Okumura, Mitsuo. 1984. Rendaku. *Nihongogaku* 35. 89–98.
- Ota, Mitsuhiro. this volume. Chapter 17: L1 phonology: phonological development. In Haruo Kubozono (ed.), *The handbook of Japanese phonetics and phonology*. Berlin: De Gruyter Mouton.
- Otake, Takashi. this volume. Chapter 12: Mora and mora timing. In Haruo Kubozono (ed.), *The handbook of Japanese phonetics and phonology*. Berlin: De Gruyter Mouton.
- Pater, Joe. 2000. Nonuniformity in English secondary stress: The role of ranked and lexically specific constraints. *Phonology* 17. 237–274.
- Pater, Joe. 2009. Weighted constraints in generative linguistics. *Cognitive Science* 33. 999–1035.
- Pater, Joe. 2010. The locus of exceptionality: Morpheme-specific phonology as constraint indexation. In Steve Parker (ed.), *Phonological argumentation: Essays on evidence and motivation*, 123–154. London: Equinox.
- Pierrehumbert, Janet B. and Mary Beckman. 1988. *Japanese tone structure*. Cambridge: MIT Press.
- Pierrehumbert, Janet B., Mary Beckman and Robert Ladd. 2000. Conceptual foundations of phonology as a laboratory science. In Noel Burton-Roberts, Phillip Carr and Gerard Docherty (eds.) *Phonological knowledge: Conceptual and empirical Issues*, 273–303. Oxford: Oxford University Press.
- Poser, William. 1984. *The phonetics and phonology of tone and intonation in Japanese*. Cambridge, MA: MIT dissertation.
- Poser, William. 1990. Evidence for foot structure in Japanese. *Language* 66. 78–105.
- Prince, Alan. 1983. Relating to the grid. *Linguistic Inquiry* 14(1). 19–100.

- Prince, Alan. 1990. Quantitative consequences of rhythmic organization. In Michael Ziolkowski, Manuela Noske and Karen Deaton (eds.), *Proceedings of the Annual Meeting of the Chicago Linguistic Society 26-II: Papers from the Parasession on the Syllable in Phonetics and Phonology*, 355–398.
- Prince, Alan and Paul Smolensky. 1993/2004. *Optimality Theory: Constraint interaction in generative grammar*. Malden and Oxford: Blackwell. (Originally circulated in 1993 as ms. University of Colorado and Rutgers University).
- Pulleyblank, Douglas. 1984. Autosegmental accent. *Proceedings of NELS*, 343–359.
- Revithiadou, Anthi. 1999. *Headmost accent wins: Head dominance and ideal prosodic form in lexical accent systems*. Leiden: University of Leiden dissertation.
- Revithiadou, Anthi. 2008. Colored turbid accents and containment: A case study from lexical stress. In Sylva Blaho, Patrik Bye and Martin Kraemer (eds.), *Freedom of analysis?*, 149–174. Berlin: Mouton de Gruyter.
- Rosenthal, Sam and Harry van der Hulst. 1999. Weight-by-position by position. *Natural Language and Linguistics Theory* 17. 499–540.
- Sato, Yutaka, Yuko Sogabe and Reiko Mazuka. 2010. Development of hemispheric specialization for lexical pitch-accent in Japanese infants. *Journal of Cognitive Neuroscience* 22(11). 2503–2513.
- Selkirk, Elisabeth. 1978. On prosodic structure and its relation to syntactic structure. In Thorstein Fretheim (ed.), *Nordic prosody, vol. 2*, 111–140. Trondheim: TAPIR.
- Selkirk, Elisabeth. 1980. The role of prosodic categories in English word stress. *Linguistic Inquiry* 11. 563–605.
- Shibatani, Masayoshi. 1990. *The languages of Japan*. Cambridge: Cambridge University Press.
- Shinohara, Shigeko. 2000. Default accentuation and foot structure in Japanese: Evidence from Japanese adaptations of French words. *Journal of East Asian Linguistics* 9. 55–96.
- Shiroye, Ayako. 2001. Nihongo ni okeru akusento no kakutoku [The acquisition of accentuation in Japanese]. *On'in Kenkyū* [Phonological Studies] 4. 97–102.
- Shiroye, Ayako, Haruo Kubozono and Shigeru Kiritani. 1998. The acquisition of compound accent in Japanese. In Robert H. Mannell and Jordi Robert-Ribes (eds.), *Proceedings of the 5th International Conference on Spoken Language Processing (ICSLP '98)*, Sydney, Australia, 2671–2674. Australia: Australian Speech Science and Technology Association, Incorporated (ASSTA).
- Sibata, Takesi. 1994. Gairaigo ni okeru akusento kaku no ichi [The location of accent in loanwords]. In Kiyoji Sato (ed.), *Kokugo ronkyū 4: Gendaigo hōgen no kenkyū* [Studies in Japanese 4: Studies in modern Japanese and dialects], 388–418. Tokyo: Meiji Shoin.
- Sibata, Takesi and Ritei Shibata. 1990. Akusento wa dōongo o dono teido benbetsu shiuru ka [To what extent can word accent distinguish homophones?]. *Keiryō Kokugogaku* 17(7). 311–323.
- Siegel, Dorothy. 1974. *Topics in English morphology*. Cambridge, MA: MIT dissertation.
- Smith, Jennifer. 1998. Noun faithfulness: Evidence from accent in Japanese dialects. In Noriko Akatsuka, Hajime Hoji, Shoichi Iwasaki, Sung-Ock Sohn and Susan Strauss (eds.), *Japanese/Korean Linguistics 7*, 611–627. Stanford: CSLI.
- Smith, Jennifer. 2007. Source similarity in loanword adaptation: Correspondence Theory and the posited source-language representation. In Steve Parker (ed.), *Phonological argumentation*. London: Equinox.
- Smith, Jennifer. 2011. Category-specific effects. In Marc van Oostendorp, Colin J. Ewen, Elizabeth Hume and Keren Rice (eds.), *The Blackwell companion to phonology 4*, 2439–2463. Malden, MA and Oxford: Wiley-Blackwell.
- Smolensky, Paul. 1995. On the internal structure of the constraint component CON of UG. Talk presented at the University of California, Los Angeles.

- Steriade, Donca. 2000. Paradigm uniformity and the phonetics-phonology boundary. In Michael B. Broe and Janet B. Pierrehumbert (eds.), *Papers in laboratory phonology V: Acquisition and the lexicon*, 313–334. Cambridge: Cambridge University Press.
- Sugito, Miyoko. 1965. Shibata-san to Imada-san: Tango no chōkakuteki benbetsu ni tsuite no ichi kōsatsu [Mr. Shibata and Mr. Imada: A remark on the perceptual discrimination of words]. *Gengo Seikatsu* 165. 64–72.
- Sugiyama, Yukiko. 2012. The production and perception of Japanese pitch accent. Cambridge Scholars Publishing.
- Tamori, Ikuhiro. 1983. Onomatope – On'in keitai to goisei – [Onomatopoeia–Phonological shapes and lexicality]. *Jinbun Ronshū* 19(2). 63–85.
- Tanaka, Shin'ichi. 1995. Onsetsu kōzō kara mita katakana muimigo to gairaigo no akusento [Accent of nonce words and loanwords from the perspective of syllable structure]. *Nihongo/Nihon Bunka Kenkyū* 5. 59–68.
- Tanaka, Shin-ichi. 2001. The emergence of the “unaccented”: Possible patterns and variations in Japanese compound accentuation. In Jeroen van de Weijer and Tetsuo Nishihara (eds.), *Issues in Japanese phonology and morphology*, 159–192. Berlin: Mouton de Gruyter.
- Tanaka, Shin-ichi. 2002. Three reasons for favoring constraint reranking over multiple faithfulness. *Shogengo no on'in kōzō to onsei riron ni kansuru sōgōteki kenkyū* [A comprehensive study of phonological structure and phonological theories] (KAKENHI report), 121–130.
- Tanaka, Shin-ichi. 2005. Where voicing and accent meet: (In-)completeness in the harmonic scale of phonological prominence. In Jeroen van de Weijer, Kensuke Nanjo and Tetsuo Nishihara (eds.), *Voicing in Japanese*, 261–278. Berlin and New York: Mouton de Gruyter.
- Trubetzkoy, Nikolai S. 1939/1969. *Grundzüge der phonologie*. Güttingen: Vandenhoeck and Ruprecht (English translation by Christiane A.M. Baltaxe 1969. Principles of phonology. Berkeley: University of California Press).
- Urbanczyk, Suzanne. 2006. Reduplicative form and the root-affix asymmetry. *Natural Language and Linguistic Theory* 24. 179–240.
- Urbanczyk, Suzanne. 2011. Root-affix asymmetry. In Marc van Oostendorp, Colin J. Ewen, Elizabeth Hume and Keren Rice (eds.), *The Blackwell companion to phonology* 4, 2490–2515. Malden, MA and Oxford: Wiley-Blackwell.
- Uwano, Zendo. 1999. Classification of Japanese accent systems. In Shigeki Kaji (ed.), *Proceedings of the Symposium 'Cross-Linguistic Studies of Tonal Phenomena, Tonogenesis, Typology, and Related Topics'*, 151–186. Tokyo: ILCAA.
- Uwano, Zendo. 2007. Two-pattern accent systems in three Japanese dialects. In Carlos Gussenhoven and Tomas Riad (eds.), *Tones and tunes, vol. 1: Studies in word and sentence prosody*, 147–165. Berlin: Mouton de Gruyter.
- Vance, Timothy J. 1987. *An introduction to Japanese phonology*. Albany, NY: SUNY Press.
- Vance, Timothy J. 1995. Final accent vs. no accent: Utterance-final neutralization in Tokyo Japanese. *Journal of Phonetics* 23(4). 487–499.
- Vance, Timothy J. 2008. *The sounds of Japanese*. Cambridge: Cambridge University Press.
- Vance, Timothy J. this volume. Chapter 10: Rendaku. In Haruo Kubozono (ed.), *The handbook of Japanese phonetics and phonology*. Berlin: De Gruyter Mouton.
- Venditti, Jennifer. 2005. The ToBI model of Japanese intonation. In Sun-Ah Jun (ed.), *Prosodic typology: The phonology of intonation and phrasing*, 172–200. Oxford: Oxford University Press.
- Warner, Natasha. 1997. Japanese final-accented and unaccented phrases. *Journal of Phonetics* 25. 43–60.
- Yamaguchi, Kyoko. 2010. The difference in accentuation between the present and the past tenses of verbs in Japanese. *Journal of the Phonetic Society of Japan* 14(3). 1–10.

- Yamaguchi, Kyoko. 2011. Accentedness and rendaku in Japanese deverbal compounds. *Gengo Kenkyu* 140. 117–134.
- Yip, Moira. 2002. *Tone*. Cambridge: Cambridge University Press.
- Yu, Alan. 2011. Contrast reduction. In John Goldsmith, Jason Riggle and Alan Yu (eds.), *The handbook of phonological theory*, 2nd edition, 291–318. Oxford: Blackwell.
- Zamma, Hideki. 2005. Correlation between accentuation and rendaku in Japanese surnames: A morphological account. In Jeroen van de Weijer, Kensuke Nanjo and Tetsuo Nishihara (eds.), *Voicing in Japanese*, 157–176. Berlin and New York: Mouton de Gruyter.
- Zec, Draga. 1995. Sonority constraints on syllable structure. *Phonology* 12. 85–129.