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Ancient Greek Pitch Accent: Anti-Lapse and Tonal Antepenultimacy*

Junko Ito and Armin Mester

University of California, Santa Cruz

1. Introduction

Modern phonological theory advanced our understanding of so-called pitch accent languages such as Lithuanian, Northern Bizkaian Basque, or Somali by recognizing that they do not constitute a separate third type of languages besides stress languages and tone languages, but result from the overlay of metrical and tonal factors (Prince (1983: 88), Hyman (2006)). While the broad picture is clear in its general outlines, the exact distribution of labor between metrical and tonal constraints is by no means easy to determine in individual cases, and widely different approaches have been pursued, with success, for specific languages. In the case of Japanese, for example, Shosuke Haraguchi has at different points advocated both purely tonal and purely metrical types of analysis (Haraguchi (1977, 1991)). More recently, a whole dissertation (Poppe (2015)) addresses the difficult task of sorting out the relative roles of tonal and metrical constraints in the analysis of Japanese and its dialects. While many questions of detail are still unsettled, some basic points have become clear. In an important series of papers, Haruo Kubozono has established the fact that

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the (bimoraic trochaic) foot plays an irreducible role in the accent pattern of Japanese (Kubozono (1988, 1989, 1995, 2009)). In this short note, we would like to make a small contribution to the establishment of a complementary point, namely, that some features of particular pitch accent systems are irreducibly tonal in nature. Focusing on tonal anti-lapse constraints, we will briefly review the main results of our earlier study of Japanese minor phrasing (Ito and Mester (2013)), and will then devote the main part of this paper to the lexical pitch accent pattern of Ancient Greek. Our main finding is that the antepenultimacy characterizing recessive accent, which never fit well into standard foot-based antepenultimacy, follows in its entirety from the tonal pattern: the basic word melody and the constraints governing it, crucially including a tonal anti-lapse constraint.

2. No-Lapse in Japanese

Anti-lapse constraints militate against stretches of low-toned material exceeding a certain limit, typically at the ends of words and phrases. Ito and Mester (2013) develop an analysis of the way Japanese utterances are parsed into phonological phrases where NoLapse plays a central role in forcing the accentual fall to occur late in the word.

The facts at issue are well-known since Kubozono's (1988, 1989) ground-breaking work, we illustrate them with phrases consisting of two content words (after Vance (2008: 181)). The parses assigned to these examples by the theory proposed in Ito and Mester (2013) appear in the second column in (1), where (1cd) crucially involve recursive phrasing, as first recognized by Kubozono.[1]

(1)	Syntactic phrasing:	Prosodic phrasing:	Schematic tonal profile:
a.	$[_{XP}[_{XP}$ u] u]		
	[[Hiroshima-no] sakana-to]	($_{\phi}$ u u)	(u u)
	'Hiroshima fish and …'		

[1] Notation: ϕ = "phonological phrase", ω = "phonological word", a = "accented ω", u =

b. [$_{XP}$ [$_{XP}$ u] a]
[[Hiroshima-no] tamágo-to] ($_{\phi}$ u a)
'Hiroshima eggs and …'

c. [$_{XP}$ [$_{XP}$ a] a]
[[Okáyama-no] tamágo-to] ($_{\phi}$ ($_{\phi}$ a)($_{\phi}$ a))
'Okayama eggs and …'

d. [$_{XP}$ [$_{XP}$ a] u]
[[Okáyama-no] sakana-to] ($_{\phi}$ ($_{\phi}$ a)($_{\phi}$ u))
'Okayama fish and …'

The differences between these parses—flat prosodic phrasing in (1ab), recursive phrasing in (1cd), but never exactly mirroring the syntax—are entirely due to the locations of accented and unaccented words within the two-word phrase. As shown in the schematic tonal profiles (where the main tonal events are indicated with schematic pitch arrows), the beginning of a phonological phrase in Japanese is cued by a tonal rise ($_{\%}$LH-), and accented words contain a steep tonal fall following the accented syllable (H*L).[2]

While two *a*'s are each parsed as a separate phrase (1c) (because each accent has to be the head of a minimal phrase), *u* is typically phrased together with an adjacent *a* or *u* (1ab) (because one-word phrases violate binarity). This is where Kubozono (1988: 150–154) discovered a directional asymmetry: *u* is only phrased together with a following *u* (1a) (*uu*) or *a* (1b) (*ua*), not with a preceding *a* (1d) ((*a*) (*u*)). So the results are (*uu*) and ((*a*) (*a*)), but ((*a*) (*u*)) with an initial rise at the beginning of the second word and (*ua*) without such a rise. In Ito and Mester (2013), we argue that this asymmetry is caused by the anti-lapse constraint in (2).

(2) NoLapse-L/ω No tonal lapses. Violated by each fully L-toned ω in ϕ

The tonal profiles of the words in (3) contain no violations of the anti-

"unaccented ω", "[…]" indicates syntactic phrasing, "(…)" phonological phrasing.

[2] It is always possible, in careful pronunciation, to parse each word as a separate ϕ, with its own initial rise, but we here focus on the usual default pattern.

lapse constraint, since no ω is fully L-toned.

(3) NoLapse-L/ω observed:

a. (u u)
(Hiroshima-no sakana-to)

b. (u a)
(Hiroshima-no tamágo-to)

} No rise on the second ω.

c. ((a)(a))
((Okáyama-no) (tamágo-to))

d. ((a)(u))
((Okáyama-no) (sakana-to))

} Rise on the second ω.

A fully L-toned ω arises after an accentual fall unless it is in its own ϕ (thereby receiving the tonal rise on its own). In (3c, d), this is exactly what happens, leading to a rise on the second ω. The directional asymmetry (singly-phrased (*ua*) is acceptable but *(*au*) is not) is illustrated in (4), where the competing candidate (*au*) with a single phrase has a fatal NoLapse-L/ω violation.

(4) Directional asymmetry

= (3b) (u a)
(Hiroshima-no tamágo-to)
NoLapse-L/ω fulfilled: The leading *u* is tonally high after the initial rise.

cf. (3d) *(a u)
*(Okáyama-no sakana-to)
NoLapse-L/ω violated: The final *u* is fully L-toned after the accentual fall.

In this analysis, the directional asymmetry has an explanation rooted in the very shape of the tonal melody of (Tokyo) Japanese (unaccented $_{\%}$LH- and accented $_{\%}$LH-H*L). A virtue of this approach is that the orientation of the accent towards the end is not accounted for by means of a right alignment constraint, a strictly formal device, but rather by substan-

tive tonal factors. In other words, explaining the right-alignment of the accent as a way of avoiding a long final tonal lapse is more principled and more revealing than explaining it by a statement that blandly says that the accent is right-aligned.

3. Ancient Greek Accent: Tonal Antepenultimacy and NoLapse[3]

NoLapse-L/ω is part of a family of tonal anti-lapse constraints that also includes the constraint operative in Ancient Greek against more than one low-toned vocalic mora at the end of the word. As is well known, the accent of Ancient Greek is governed by what is traditionally called the "three-syllable law". The accent can only fall on one of the last three syllables of the word, and on the antepenult only when the final contains no more than one vocalic mora: Antepenult accent is possible in a word like *Hɛɛrákleitos* 'Heraclitus' with short /o/ in the last syllable, but not in *Sɔɔkrátɛɛs* 'Sokrates' (**Sɔɔ́kratɛɛs*) with long /ɛɛ/.[4] When the antepenult has a long vowel or diphthong, accent can only fall on its second mora (acute, not circumflex, in the standard terminology): *beboúleust^{h}e* 'you have deliberated' (**bebóuleust^{h}e*), and the same is true for penult accent when the final has two vocalic moras: *epeít^{h}ou* 'you were obeying' (**epéit^{h}ou*). The complexity of the rule stems from the intricate way it depends on the weight of the final syllable, and has given rise to a number of different analyses. Building on earlier work including Misteli (1868), Allen (1966, 1973, 1987), Steriade (1988), Sauzet (1989), Golston (1990), Kiparsky (2003), and Probert (2003, 2006), we interpret the accentual melody of a Greek word as arising out of a combination of two things: a HL pitch accent (the "contonation", in Allen's terminlogy) and a word-final boundary tone $L_{\%}$. The overall word melody is thus HL + $L_{\%}$, and the law of limitation is in our analysis essentially reduced to the constraint on $L_{\%}$ in (5).

[3] We are indebted to Alan Prince for helpful discussion of the antepenultimacy syndrome.

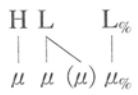
[4] The location of stress in the English versions of these names follows the Latin stress rule, which is sensitive to the weight of the penult, not of the final.

(5) NoLapse-$L_{\%}/\mu$: Boundary $L_{\%}$ occupies no more than one mora.

NoLapse-$L_{\%}/\mu$ rules out a boundary tone $L_{\%}$ stretched out over more than the prosodic minimum: one mora.[5] Such a restriction seems eminently natural, given the very role of $L_{\%}$ as a boundary tone. We follow Allen (1966: 10) in assuming that the contonation is a tonal [HL] complex: a high pitch on the accented mora followed by a low tone, probably realized as a falling glide—Misteli's (1868) *Mittelton* 'mid tone'. Kiparsky (1967: 75) conjectures in a similar way that the post-tonic string of moras was "probablement réalisée phonétiquement comme un contour accentuel descendant".

(6) Word melody: HL + $L_{\%}$

If H is linked to the first mora of a syllable with two vocalic moras, the L of the accent is linked to its second mora, otherwise it is linked to the subsequent syllable. It is followed by boundary $L_{\%}$ occupying no more than one mora. This yields the window in (7) for licit accentuations.

(7)


To forestall misunderstandings sometimes encountered in linguistic writings, it might be useful to point out that three-syllable windows, including the one in Greek, are not basic principles of grammar to be taken at face value, whose rationale would remain mysterious, but rather emerge out of the interactions of more basic constraints, as recognized in classical metrical phonology (see Hayes 1982 and work cited there).

That the accent is "recessive" in certain word classes means that the H of the accent associates as far to the left as compatible with (7). More formally, H is aligned as closely as possible with the left word edge (8e), provided (8a–d) are satisfied.

[5] An empirically almost equivalent statement was proposed by Jakobson (1962: 263) ("the vocalic morae between the accented vocalic mora and the final one cannot belong to different syllables. In other words, the span between the accented and the final mora cannot exceed one syllable.")

(8) a. AlignRight-$L_{\%}/\omega$ — $L_{\%}$ is a word-final boundary tone.

b. NoLapse-$L_{\%}/\mu$ — $L_{\%}$ occupies no more than one mora.

c. Contiguity-T — Tone domains are contiguous.[6] One violation for every pair of adjacent tone domains in a word that are not contiguous (i.e., separated by one or more toneless vocalic moras).

d. CrispEdge-σ/T — Multiple linking of tones between syllables is prohibited. One violation for every tone associated to two syllables.[7]

e. AlignLeft-H/ω_i — H is leftmost in ω. One violation for every vocalic mora intervening between the left edge of H and the left edge of the prosodic word. The subscript *i* indicates that this constraint is indexed to specific lexical classes designated to carry recessive accent.

These constraints give rise to alternations between antepenult and penult accent throughout the language, as between the different case forms in (9).

(9) a.

ánt^{h}rɔɔpos

ἄνθρωπος

'human being', nom.sg.

cf. *ant^{h}rɔ́ɔpos

*ἀνθρῶπος

b.

ant^{h}rɔɔ́puu

ἀνθρώπου

'human being', gen.sg.

cf. *ánt^{h}rɔɔpuu

*ἄνθρωπου

($L_{\%}$ occupies 2μ)

[6] This is part of Goldsmith's (1976: 27) "Wellformedness Condition".

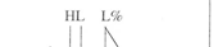
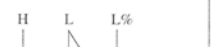
[7] For such CrispEdge constraints, see Ito and Mester (1999).

Recessive accent is illustrated in (9a): Here the last syllable contains only a single vocalic mora carrying the $L_{\%}$, the L of the accent can fill the penult, and the H can (and therefore must, when the accent is recessive) associate to the antepenult. On the other hand, when the final syllable has two vocalic moras (9b), antepenult accent is not possible: If H is associated to the antepenult, the trailing $L_{\%}$ stretches out over more than the prosodic minimum, one mora. The ranking of the constraints given in tableau (10) accounts for these facts. A final syllable with a single vocalic mora gives rise to antepenult accent, as in (10a), where all constraints are satisfied. On the other hand, when the final syllable has two vocalic moras, the accent not only has to be on the penult, it also has to be the acute (10c), with H on the second mora of the penult, not the circumflex (10d), with H on the first vocalic mora. The antepenult can thus carry the accent (10a), or the penult the circumflex (10c), only when the final has a short vowel.[8]

(10)

/anthrɔɔpos/$_i$ HLL$_{\%}$	AlignRight-$L_{\%}$	Contiguity-T	CrispEdge-σ/T	NoLapse-$L_{\%}/\mu$	AlignLeft-H/ω_i
a. ▶  ánt^{h}rɔɔpos					
b.  ant^{h}rɔ́ɔpos					*W

[8] The tableaux below are violation tableaux with added comparative markings (Prince (2000)), with W's and L's appearing in the rows of losing candidates. "W" in a constraint column indicates the winner is favored by the constraint, "L" indicates the loser is favored, and no entry indicates a tie (i.e., the violation marks for the winner equal those of the loser). In order for a ranking tableau to be consistent, each L has to be preceded by a W in its row (in order to win, the winner needs to do better than each loser on the highest-ranked constraint that distinguishes the two, in Jane Grimshaw's succinct phrasing).

/anthrɔɔpuu/$_i$ HLL$_{\%}$						
	c. ▶  ant^{h}rɔ́ɔpuu					**
	d.  ant^{h}rɔ́ɔpuu				*W	*L
	e.  ánt^{h}rɔɔpuu				*W	L
	f.  ant^{h}rɔ́ɔpuu			*W		*L
	g.  ánt^{h}rɔɔpuu		*W			L
	h.  ánt^{h}rɔɔpuu	*W				L

When an antepenult with two vocalic moras carries the accent, it can only be the acute (11a), not the circumflex (11b). Pre-antepenult accent is never a possibility (11c).

(11) a. 
bebuúleust^{h}e
βεβούλευσθε
'you have deliberated'
Acute on antepenult
(in spite of violation of low-ranked AlignLeft-H/ω_i)

b. 
*bebúuleust^{h}e
*βεβοῦλευσθε
*Circumflex on antepenult
($L_{\%}$ occupies 3μ, in violation of NoLapse-$L_{\%}$/μ)

c. 
*bébuuleust^{h}e
*βέβουλευσθε
*Preantepenult accent
($L_{\%}$ occupies 3μ, in violation of NoLapse-$L_{\%}$/μ)

This is the Misteli-Allen "Law of Limitation", and what we see here is a pattern of antepenultimacy which follows entirely from the tonal melody and its alignment, crucially including a NoLapse constraint, there is no influence of metrical structure. One could do worse than quote Misteli's characterization of tonal antepenultimacy in detail:

> Die beschränkung des tones innert der drei letzten moren oder wenigstens silben folgt daraus, dass die Griechen den ton nicht weiter vom ende zurückziehen wollten, als es überhaupt sprachaccente gab; denn weil mit jeder auf den hauptton folgenden silbe der ton schwächer wird, unter der tieftonigen silbe aber sich nichts mehr findet, musste der hauptton höchstens der dritten silbe vom ende weg zufallen, so dass die zweite den mittelton, die dritte den tiefton erhielt [...] (Misteli (1868: 92)).[9]

As long as it stays within the limits of tonal antepenultimacy, the Greek word accent is in the general case free, i.e., subject to lexical marking. Thus we find accentual contrasts due to lexical marking as in (12), where recessive accent would entail accent on the penult (**hippeus*, **hippeu*).

(12) hippeús 'horseman', nominative hippéu 'horseman', vocative

Crucially, no such lexical accents are found earlier in the word, outside of the tonal antepenultimacy window. This follows from the constraint ranking in (13), where NoFlop-H protects lexical accent against the general imperative for accent to be left-aligned, modulo NoLapse-$L_{\%}$/μ.

(13) NoLapse-$L_{\%}$/μ >> NoFlop-H >> AlignLeft-H/ω

Certain word classes, including finite verbs, neuter nouns, and exocentric

[9] 'The limitation of the tone within the last three moras or at least syllables follows from the fact that the Greeks did not want to pull the tone further away from the end than there were linguistic accents; given that with every syllable following the main tone the tone is getting weaker, and that there is no room left below the low-toned syllable, the main tone had to fall maximally on the third syllable from the end, so that the second syllable received the mid tone, and the third one the low tone [...]' (our translation).

compounds, have recessive accent and have been illustrated above in (9)–(11), meaning that here the accent must appear as far to the left as possible within the accent window, overriding any lexical specifications.[10] Recessive accent is due to a higher-ranked specific ALIGNLEFT-H/ω_i constraint indexed to these lexical classes (see Wackernagel (1877) for an idea of how to understand recession in a more principled way). The overall ranking is as in (14).

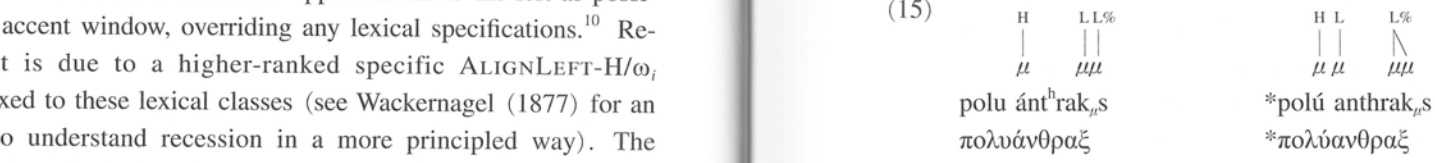
(14) NOLAPSE-$L_{\%}/\mu$>>ALIGNLEFT-H/ω_i>>NOFLOP-H >> ALIGNLEFT-H/ω

Up to this point, we have assumed that NOLAPSE-$L_{\%}/\mu$ scrutinizes only vocalic moras. Things change once we consider words ending in underlying clusters. The empirical observation is that such word-final consonant clusters, whose first consonant carries weight (single final consonants are not moraic), always limit the accent to the penult. This restriction, clearly stated in the works of 19th century accentologists (Misteli (1868: 107), Chandler (1881: 176), see Probert (2006: 60)), was in the generative tradition rediscovered by Steriade (1988: 273–275). For example, in compounds known to have recessive accent, such as bahuvrihis like *polú-naos* 'with many temples' or synthetic compounds like *p^{h}iló-ksenos* 'hospitable', a word-final cluster implies penult accent and excludes antepenult accent: *polu-ánt^{h}raks* 'with much coal', not **polú-ant^{h}raks*, *p^{h}ilo-spéelunks* 'fond of grottoes', not **p^{h}iló-speelunks*. It would be possible to follow earlier generative approaches starting with Steriade (1988) and interpret this as the place where foot structure makes itself felt within this system. But in the approach pursued here, a simpler and more tantalizing idea suggests itself. We can assume that in these cases $L_{\%}$ is forced to link to the word-final intrametrical consonantal mora, so the L of the accent links to the vowel of the last syllable, and H ends up on the last (or only) vocalic mora of the penult. This is shown in (15) (where consonantal moras

[10] Probert (2006: 128–148) makes a strong case that recessive accentuation is in fact the default.

have been subscripted).[11]

(15)



Steriade-type accentuation holds even when the cluster is merely an underlying one and has undergone simplification in the output, resulting in opacity, as in *et^{h}élon* (**ét^{h}elon*) 'want', part.pres.nom./acc. (from */et^{h}élont/*, cf. *et^{h}élontos* gen.neut.). Such underlying clusters attract the accent only when they are supported by synchronic alternations, not when they are merely reconstructible on historical grounds. So we find antepenult accent in *et^{h}éleesan* 'want', 3.pl.aorist (historically from *et^{h}éleesant*) because no alternation supports an underlying cluster.[12]

If the accent of Ancient Greek is truly a case of antepenultimacy completely determined by the tonal melody and its alignment conditions, not by foot structure and NONFINALITY, as in standard cases of antepenulti-

[11] In this context, another ingredient of Greek accent needs to be considered, the so-called σωτῆρα (sotera) Law, which allows only circumflex (H on first μ), not acute (H on second μ), on a penult with two vocalic moras preceding a final with one vocalic mora (the mnemonic example is σωτῆρα *sɔɔtéera* 'savior' (acc.sg.), not *σωτήρα **sɔɔtéera*). The σωτῆρα Law counts only vocalic moras, so the final counts as monomoraic for σωτῆρα in *p^{h}ilo-spéelunks* (i.e., with circumflex). Such cases require the accentual H to first be assigned immediately before the last syllable as an acute, i.e., to the second vowel mora of the penult in *p^{h}ilo-speélunks*. It is then, perhaps at a later stratum, retracted by σωτῆρα. A stratal account, with early accent assignment, has been motivated for Ancient Greek accentuation by Kiparsky (2003) for situations where the accent has to be assigned before vowel contraction. No workable alternative to such a stratal analysis, e.g. by means of OO-constraints, is known to us.

[12] Sauzet (1989: 101) points to some complications: Underlying *-id-s*, well supported by alternations, sometimes attracts the accent to the penult, sometimes not. Thus we see the effect in *hikétis* 'female supplicant' (from */hikétid-s/*), but not in *áleksis* (from */áleksid-s/*) (proper name), or in *artópɔɔlis* 'baker' fem.nom.sg. and in all other words in *-pɔɔlis*, whose other case forms (such as *artopɔɔ́lid-a* acc. sg.) clearly require underlying *-id-s*. We assume that $L_{\%}$ is linked to the final consonantal mora in cases like *hikétis* but not, for reasons unknown, in cases like *áleksis*.

mate stress (Prince and Smolensky (1993)) and also antepenultimate pitch accent, as in Japanese (see Ito and Mester (2016)), this might be the reason why the Greek rule has been so recalcitrant to metrical approaches within the generative tradition. Since the tones associate to vowel moras, a tonal melody counts moras in ways somewhat similar to feet, so it is not surprising that analyses in terms of foot structure can approximate the pattern quite closely without actually capturing its real nature.

Two main lines of approach to a foot-based treatment of Greek accent have been pursued in the past. The first sticks to the standard idea that the H tone of the accent has to coincide with a foothead, its foremost implementation is the one proposed by Steriade (1988). With final light syllables declared extrametrical, the challenge is to reach across a heavy penult with two vocalic moras and plant a foothead on the antepenult, as in *ánt^{h}rɔɔpos* 'human being'—something unthinkable in a quantitative trochaic system like Latin or English. Steriade's answer is to instead build a quantity-insensitive syllabic trochee: (*ánt^{h}rɔɔ*)⟨*pos*⟩. This is descriptively successful, but Sauzet (1989) points out a deep problem with this kind of quantity-insensitive footing within an otherwise thoroughly quantitative system, whose quantity-sensitivity is even recognized within the same analysis (which declares final syllables extrametrical only when they are light). Sauzet (1989, 105) argues that metrical theory should not allow this kind of discrepancy between the quantity conditions governing the metrical structures of a language in general, determining which kinds of syllables can occupy weak positions of feet, and the quantity conditions on extrametrical material: "Une séquence extramétrique pour un niveau doit être définie dans les mêmes termes que les constituants de ce niveau".[13] His general conclusion sees the standard approach locating the H tone in the foothead at a dead end: "Les representations organisées en constituants que permet de construire la théorie métrique n'apparaissent pas capables de caractériser directement la place de l'accent en grec ancient" (Sauzet (1989: 81)).[14] This leads to his own proposal, the second main line of analysis, which divorces H tone from foothead, and places it instead before it "[...] par une règle assignant un ton haut à la syllable precedent le pied final [...]"[15] (Sauzet (1989: 105)): *án*(*t^{h}rɔɔ*) ⟨*pos*⟩. This is further rationalized by understanding the accentual melody as HL*, where it is the designated low tone that associates to the foothead. Now the trochee can be quantity-sensitive, as seems required, but at a cost: The cross-linguistically solid link between H tones and footheads (de Lacy (2002)) is severed, *contra naturam*. There are certainly intonational pitch accents whose designated tone is L, but we are here not dealing with special intonational markers with specific meanings, but with the basic word prominence marker of a language.

Golston (1990) and Kiparsky (2003) have developed Sauzet's approach further, the latter using a tonal faithfulness constraint in stratal OT to prevent any accentuation or deaccentuation within the final trochaic foot, and then aligning the H tone as far to the right as possible, effectively to the immediate left of the foot declared inaccessible in this way. Besides the problematic aspects of Sauzet's analysis already outlined, this approach incurs a further liability in that it not only necessitates a non-parallel version of OT to be formalized, but also makes the implausible prediction that accent assignments as in Greek should only be possible at non-initial strata (since the foot that rejects the H tone must already have been established at an earlier stratum before H can then be aligned to its immediate left). This is unlikely to withstand typological scrutiny.

All these various solutions along two different paths are ingenious ways of trying to reconcile the recalcitrant Greek accent with the foot structure which is supposed to be its anchor, but as often in linguistics, their very ingenuity is also their liability. In contrast, the rather straightforward analysis in terms of tonal antepenultimacy developed here, based on

[13] 'An extrametrical sequence at a given level must be defined in the same terms as the constituents of that level' (our translation).

[14] 'The representations organized into constituents that metrical theory allows us to build seem unable to characterize the place of the Ancient Greek accent in direct terms' (our translation).

[15] '[...] by a rule assigning a high tone to the syllable preceding the final foot' (our translation).

Misteli's (1868) insight, associates the H tone of the accent to the correct mora/syllable by simply lining up the three tones of the melody (HL + $L_{\%}$) at the right word edge, with very mundane conditions on their alignment with syllables and moras—including NoLapse-$L_{\%}$ as a crucial ingredient. In a more general perspective, both the directional asymmetry in Japanese discovered by Kubozono and the unusual antepenultimacy pattern of recessive Greek accent find a direct explanation in the shape of the tonal word melodies involved and the general constraints governing them. The next step should be a further exploration of the factorial typology of the constraint system, which might yield unexpected and surprising results.

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Rendaku Following a Moraic Nasal*

Timothy J. Vance

National Institute for Japanese Language and Linguistics

1. Introduction

The term *rendaku* 連濁 denotes a well-known set of morphophonemic alternations in Japanese. The phenomenon is now so widely known among phonologists all over the world that no English translation is necessary, and I will use the Japanese term hereafter without italicization.

Rendaku can be described as a process that replaces a morpheme-initial voiceless obstruent with voiced obstruent. The prototypical environment for this replacement is immediately following the primary boundary in a two-element compound (E1+E2). For example, the E2 in /kami+bukuro/ 紙袋, 'paper bag' appears as a word on its own as /fukuro/ 袋 'bag'.

Two important characteristics of rendaku are often treated as uninteresting or disregarded entirely. First, because of historical changes, the voiced and voiceless obstruents paired by rendaku differ in many cases by more than just the presence vs. absence of voicing (Vance (2014: 139–141, 2015a: 397–398)). Second, rendaku is irregular to a significant degree, often failing to apply to an eligible E2 even when no known inhibiting factor is at work (Vance (2015a: 408)).

* The research reported here was carried out as part of the NINJAL project headed by the author ("The Japanese Lexicon: A *Rendaku* Encyclopedia"), which ran from December of 2010 until March of 2016. Some of the material in this paper was presented on March 4, 2016, at Lexicon Festa 4, the last annual conference of NINJAL's Department of Linguistic Theory and Structure.

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吉田優子（よしだ・ゆうこ） 同志社大学・教授

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