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Licensed Segments and Safe Paths

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0. *Introduction*

The following pages[1] sketch a system of constraints intended to sharpen and organize a number of current assumptions surrounding the concept of "prosodic licensing", as proposed in Itô (1988) and further developed in later work (Bagemihl 1991; Charette 1990; Goldsmith 1990; Inkelas 1991; Itô and Mester 1991; Kaye 1990; Lombardi 1991; Piggott 1991; Zec 1988; and others). The proposal to be developed below draws on Optimality Theory (Prince and Smolensky 1993); one of the goals is to explicate the notion of the coda as a "secondary licenser" (Goldsmith 1990) and to clarify the privileged status of geminate and partial geminate clusters (Prince 1984) with respect to syllabification. After laying out some background assumptions (Section 1), we present the definitions and constraints that form the core of our theory of licensing (Section 2). We illustrate the approach with an analysis of the syllable structure of Japanese (Section 3) and conclude the paper with a discussion of remaining issues and problems relating to the general typology of syllabification systems (Section 4).

1. *Preliminaries*

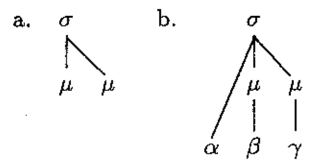
1.1. Syllable-internal structure

In conformity with the moraic hypothesis (see Hyman 1985; McCarthy and Prince 1986; Zec 1988; Hayes 1989; Itô 1989; Steriade 1990; and others), we assume a model of syllable-internal structure as in (1a), with segments

[1]Earlier versions of this work were presented at the NSF Phonology Workshop held during the 1991 Summer Linguistics Institute, and in class lectures at Santa Cruz, and we would like to thank the audiences for helpful suggestions. We are particularly grateful to Jaye Padgett and the editors of the present volume for extensive comments which led to significant improvements. Portions of this work have been supported by NSF grant BNS-9021357 and faculty research grants from the University of California/Santa Cruz.

linked to prosodic structure as in (1b). Onset consonants are directly linked to the syllable node and hence structurally not affiliated with syllable-weight units.[2]

(1)



1.2. Onset principle

The universally marked status of onsetless syllables provides evidence that the grammar of every natural language contains the constraint "Avoid onsetless syllable". The difference between absolute and relative enforcement of the onset principle noted in Itô (1989:223) has been shown by Prince and Smolensky (1993) to result from language-particular constraint ranking (see also McCarthy, this volume). Various strategies repairing violations of syllabification principles like the onset principle are explored in the Theory of Constraints and Repair Strategies (TCRS, see Paradis 1988, and other contributions to this volume).

1.3. Sonority sequencing

We adopt the traditional view (Sievers 1881; Jespersen 1904; de Saussure 1916; and others) that (core) syllabification is governed by a Sonority Sequencing Principle, here formulated in (2). See in particular Selkirk (1984) and Clements (1990) for important recent work in this area.

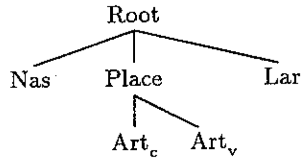
(2) *Sonority Sequencing Principle*:
Within a syllable, the peak must be the single local sonority maximum, with sonority strictly declining from the peak outwards.

1.4. Segment-internal structure

The theory of segment licensing, concerned with the feature-prosody interface, requires limited access to segment-internal feature structure, which is represented as a "geometry", i.e., a hierarchical arrangement of nodes along the lines of (3) (Clements 1985, 1993; Hume 1992; McCarthy 1988; Sagey 1990; Padgett 1991; and others).

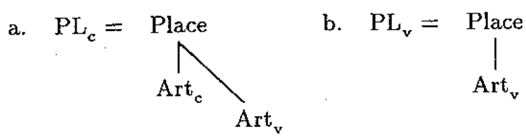
[2] This will be important for our definitions and constraints, although alternatives in other conceptions of the segment-prosody interface are possible.

(3)



The structure in (3) is simplified in various respects for the purposes at hand and abstracts away from further node structure (like V-Place, stricture features, etc.). $\mathrm{Art_c}$ and $\mathrm{Art_v}$ stand for the consonantal and vocalic articulators (which might partially comprise the same elements). A segment with the place configuration Place[$\mathrm{Art_c}$] is a simplex consonant (e.g., [p]), and a segment with the place configuration Place[$\mathrm{Art_c}$ $\mathrm{Art_v}$] is a consonant with a secondary articulation (e.g., [$\mathrm{p^y}$]). Vocoids are characterized by the configuration Place[$\mathrm{Art_v}$]. Expressed in terms of headedness, Head(Place) = $\mathrm{Art_c}$, with Head(Place) = $\mathrm{Art_v}$ only if $\mathrm{Art_c} = \emptyset$.[3] In the interest of a more succinct statement of the constraints dealt with below, we will refer to a Place containing a consonantal articulator $\mathrm{Art_c}$ as "$\mathrm{PL_c}$" (4a), and to a Place with only a vocalic articulator $\mathrm{Art_v}$ as "$\mathrm{PL_v}$" (4b).

(4)



2. *Licensing Theory*

This section reduces the central concept of segment licensing to the notion "safe prosodic path", which is itself defined in terms of path conditions on the segment-prosody interface. Informally speaking, prosodic paths are those parts of a phonological representation that establish the connection between elements of segment structure and moras or syllables (prosodic paths in this sense are a special case of the concept of "path" defined in Archangeli and Pulleyblank 1993). A formal definition appears in (5).

(5) *Prosodic Path* (definition):
A prosodic path $\langle n_1 — n_t \rangle$ is a sequence of nodes $(n_1, \ldots, n_j, n_{j+1}, \ldots, n_t)$ in a phonological representation such that n_i $(1 \leq i \leq t)$ immediately dominates n_{i+1} and n_1 is a prosodic category.

For prosody-segment paths:
i. $n_1 \in \{\sigma, \mu\}$,
ii. n_t is an element of segment structure (Root, Place, . . .).

[3] Ní Chiosáin and Padgett (1993) show that this asymmetry is a direct consequence of a principle of maximal constriction determining segment type.

For example, in (1b) the prosodic paths of interest are the onset path $<\sigma - \alpha>$, the nuclear path $<\mu - \beta>$, and the post-nuclear/coda path $<\mu - \gamma>$. These paths are minimal in the sense that their first element is the lowest prosodic category dominating α, β, or γ. Non-minimal paths are $<\sigma - \beta>$ and $<\sigma - \gamma>$, properly containing the minimal paths $<\mu - \beta>$ and $<\mu - \gamma>$. Since the relevant properties of minimal paths are inherited by all non-minimal paths containing them, we will restrict our attention to minimal paths in the discussion below.

2.1. Path conditions and path safety

Paths are governed by path conditions, which they either fulfill or not. This gives rise to the important distinction between "safe" and "unsafe" paths defined in (6).

(6) *Safe Prosodic Path* (definition):
A prosodic path π is safe if and only if it obeys all path conditions. Otherwise, π is unsafe.

The path conditions deal with the minimal sonority requirement for moras (7a) and the avoidance of consonantal place in codas (7b).

(7) *Path Conditions:*

a. Mora Sonority Threshold

$$\begin{array}{c} *\mu \\ | \\ [\text{sonority } <\alpha]_{\text{RT}} \end{array}$$

—Mora Sonority Index
for Japanese: $\alpha = \{\text{nasal}\}$

b. Coda Place Condition

$$\begin{array}{c} *\mu \\ | \\ \text{PL}_{\text{c}} \end{array}$$

In most current conceptions, sonority is a Root property, only meaningful at the level of the whole segment (see e.g., Browman and Goldstein 1989), and is immediately accessible to prosodic structure (McCarthy 1988). The Root node is thus the target of the condition in (7a), where the value of the mora sonority index α is supplied by the grammar of each language (as the cutoff-point for potential morahood). Anticipating current mora theory, Prince (1983:57–58) makes the important observation that α in (7a) is determined on the familiar sonority scale, with the typological consequence that the mora requirements of languages form a single hierarchy of inclusiveness (see Zec 1988 for a recent development).

The Coda Filter proposal in Itô (1988, 1989), which bars consonantal place features from coda position in many languages, is restated in (7b) as a condition on paths from μ to consonantal Place.

The combined effect of (6) and (7) is that all paths $<\mu - PL_c>$ and $<\mu - RT_{|<\alpha|}>$ are unsafe, where $RT_{|<\alpha|}$ is a Root node with less than α-sonority.[4] This will be exemplified below in Section 3. Since onset material is immediately dominated by σ (see Section 1.1), this means that onset paths are not subject to the path conditions in (7) (which refer to "μ"): Onsets are typically unrestricted. The general theory, however, allows for the existence of special onset path conditions rendering certain onset paths unsafe.

2.2. The segment licensing condition

As we will see, the safety of all paths is not a necessary prerequisite for the well-formedness of a representation. Rather, the necessary condition is the licensing of all segments. And while it is true that segment licensing is defined in terms of path safety, this does not mean that all paths must be safe. In order to make this precise, it is useful to conceive of segments as headed structures whose head position is occupied by the Place node (8).

(8) *Place Head Hypothesis*:
Head(Root) = Place

In terms of (8), the licensing of a segment can be thought of as the licensing of its Root and the Root's head, i.e., Place. The concept of Segment Licensing is defined in (9), followed by the Segment Licensing Condition in (10).

(9) *Segment Licensing* (definition):
a. Let ρ be a Root or head-of-Root. ρ is licensed if and only if there exists at least one safe prosodic path terminating in ρ.
b. A segment is licensed if and only if both its Root and head-of-Root are licensed.

(10) *Segment Licensing Condition*:
All segments must be licensed.

The important point, illustrated in the next section, is that a segment is licensed once both its Root and Place (i.e., head-of-Root) terminate a safe

[4]We leave open the question whether the two path conditions can be reduced to a single one, e.g., by factoring the presence of PL_c directly into the computation of segment sonority, or by letting the absence of PL_c entail a certain degree of sonority. But note that there are, on the one hand, segments without consonantal place with low sonority ([h]) and, on the other hand, vocoids (glides [y, w]) whose phonological behaviour in some cases indicates the presence of a consonantal articulator (e.g., [coronal]) in addition to vocalic features.

path. This does not preclude the existence of additional unsafe paths terminating in those positions.

3. *Exemplification: Japanese*

We will now illustrate and motivate this theory of licensing with an analysis of Japanese syllable structure. Besides CV, CVV, and CVN-syllables (11a) (where onsets are optional), Japanese only allows syllables closed by geminates (11c) and partial geminates (11d). No other codas (11b, 11e) are admitted.

(11) Licit syllable types in Japanese:

a.

CV	ki	'tree'	
CV_iV_i	noo	'Noh play'	
CV_iV_j	kai	'shell'	
CVN	seN	'thousand'	([N] = placeless mora nasal)

b. illicit codas:
*kam, *kit, *kap, *kas, *kar, etc.

c. geminates:

kip.pu	'ticket'	kit.te	'stamp'
mač.ča	'powdered (green) tea'	dak.ko	'hold, hug'
kas.sai	'applause'	haš.šiN	'dispatch'
on.na	'woman'	sam.ma	'Pacific saury'

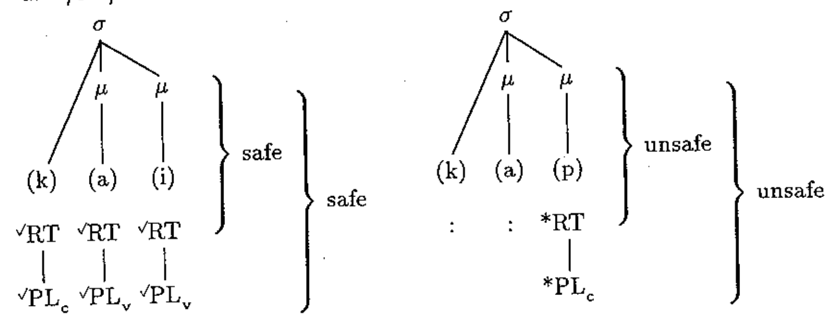
d. place-assimilated NC-clusters:

sam.po	'stroll'	han.tai	'opposed'
haŋ.ko	'seal'	dom.buri	'bowl'
mon.dai	'problem'	daŋ.go	'dumpling'

e. illicit consonant clusters:
*pak.pa, *pat.ko, *kas.tai, *kit.na, *kapma, *kamna, *mod.nai, *kar.ta, *kar.na, *domtai, etc.

The notion of safe and unsafe paths is illustrated by the contrast in (12). For expositional clarity, the segmental content is indicated in parenthesis above the root nodes. In (12a), the path conditions (7) are fulfilled everywhere, hence all paths are safe. The onset Root path $<\sigma — RT(k)>$ and the onset Place path $<\sigma — PL(k)>$ are both safe, in the absence of constraining path conditions. Hence both $RT(k)$ (i.e., the root node of /k/) and $PL(k)$ (the place node of /k/) are licensed (indicated by $\surd$). Proceeding to the syllable nucleus /a/, the nuclear Root path $< \mu - RT(a) >$ and the nuclear Place path $<\mu — PL(a)>$ are safe since they do not violate the path conditions (7a and 7b, respectively). Thus, the segment /a/ is licensed.

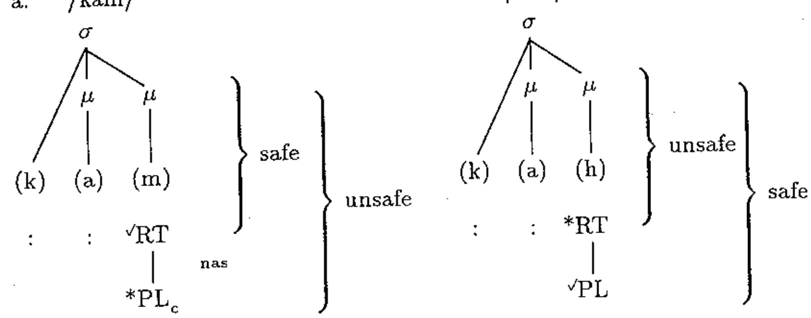
(12) a. /kai/ 'shell' b. */kap/



The licensing contrast arises with the different status of the post-nuclear paths (12a and 12b). In (12a), the post-nuclear Root path $<\mu - RT(i)>$ and the post-nuclear Place path $<\mu - PL(i)>$ also do not violate the relevant path conditions: the vocoid [i] has a higher degree of sonority than {nasal}, fulfilling path condition (7a), and it does not have consonantal place, fulfilling path condition (7b). Consequently, the segment /i/ is licensed. Since all segments are licensed, the representation (12a) is well-formed. In (12b), **kap*, the two prosodic paths starting with the post-nuclear mora are unsafe: The post-nuclear Root path $<\mu - RT(p)>$ violates the Mora Sonority Threshold (7a) (the sonority of obstruents is less than that of nasals), and the post-nuclear Place path $<\mu - PL(p)>$ violates the Coda Place Condition (7b) (/p/ has the consonantal Place [labial]). Therefore, neither $RT(p)$ nor $PL(p)$ is licensed (the unlicensed status is indicated by * next to the nodes). Since segments are licensed only if both their Root and their Place are licensed, the segment /p/ is not licensed.

In (12), the status of the post-nuclear root and place paths was identical, either both were safe (12a), or both unsafe (12b). The examples in (13) show that the safety can be different for the two paths.[5]

(13) a. */kam/ b. */kah/



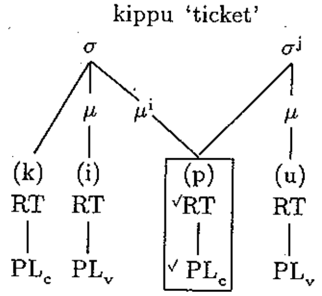
[5]Forms like /kaN/ '(a) can' with placeless nasal codas are well-formed. We return to these cases in Section 4.2.

For the post-nuclear labial nasal /m/ in (13a), the Root path $<\mu — RT(m)>$ terminates in a nasal root and hence fulfills the Mora Sonority Threshold (7a). On the other hand, /m/ has an unsafe Place path that terminates in $PL_c(m)$, violating the Coda Place Condition (7b). Even though its Root node is licensed, its Place is not. By (9b), for the segment to be licensed both its root node and place node must be licensed. Hence, the segment /m/ is not licensed.

The reverse situation holds in (13b): the post-nuclear Root path is unsafe, because the sonority of /h/ is too low. On the other hand, the Place path is safe, because /h/ does not have consonantal place.[6]

For the examples seen so far, the step from path safety to segment licensing is very direct and straightforward. The rationale for the distinction emerges at the next higher order of syllabic complexity, namely structures involving geminates and partial geminates. Here we encounter the situation where all segments are licensed even though not all paths are safe. Consider the geminate in (14) *kippu* 'ticket'. Further examples appear in (11c), above.

(14) kippu 'ticket'



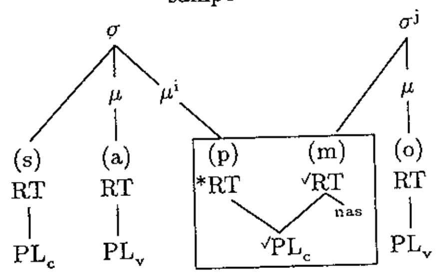
We restrict our attention to the Root node $RT(p)$ and the Place node $PL_c(p)$, since no licensing issues arise for /k/ and the nuclear vowels /i/ and /u/. The two prosodic paths originating from μ^i, the post-nuclear Root path $<\mu^i — RT(p)>$ and the post-nuclear Place path $<\mu^i — PL_c(p)>$, are unsafe. The former, terminating in an obstruent root, violates the Mora Sonority Threshold (7a). The latter violates the Coda Place Condition (7b), which targets PL_c. But this does not immediately lead to ill-formedness. Here the distinguishing characteristic of geminate structures becomes pivotal — multiple paths terminating in the same element. Consider $RT(p)$: Even though one of its paths to prosody is unsafe, there is another prosodic path which is perfectly safe, namely the onset path $<\sigma^j — RT(p)>$, and therefore $RT(p)$ is licensed. In a similar way, $PL_c(p)$ is licensed because of

[6]In fact, /h/ may lack a place node altogether, trivially satisfying the Coda Place Condition (7b). A similar situation arises with the placeless nasal, to be discussed in Section 4.2.

are redeemed within the linked bisyllabic context because it provides an additional prosodic path which is safe.[8]

Consider then the structure in (16) *sapmo, which is minimally different from the earlier form (15) *sampo*:

(16) sampo 'stroll'



Parallel to (15), $PL_c(p/m)$ in (16) is licensed through the safe onset Place path $<\sigma^j — PL_c(p/m)>$. The licensing status of *RT*(*p*), however, is entirely different: being an obstruent, it does not fulfill the Mora Sonority Threshold, and the post-nuclear Root path $<\mu^i — RT(p)>$ is unsafe. Different from the post-nuclear *RT*(*p*) in (14) (*kippu*), it does not have a prosodic path to the following syllable. Since *RT*(*p*) terminates only the unsafe post-nuclear path, it is unlicensed. The contrast between *sampo* and **sapmo* thus reduces to the fact that the sonority of /p/, but not that of /m/, lies below the sonority threshold (7a), resulting in a Root without a safe path. Both *sampo* and **sapmo* have licensed post-nuclear Place paths, but only *sampo* has a licensed post-nuclear Root. The whole post-nuclear segment /p/ is thus unlicensed, and the representation is not well-formed. Similarly, illicit clusters as in **kap.ma*, **kar.ta*, or **kas.tai* (see 11e for other examples) all fail in terms of post-nuclear Root node licensing.

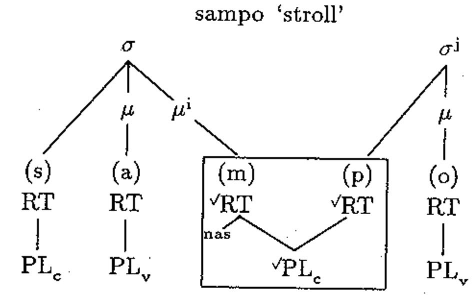
By parallel reasoning, we obtain the result that obstruent geminates as in *kippu* must have the single-Root structure in (14) and not the two-Root structure in (17), where the coda Root *RT*(*p*) terminates only the unsafe post-nuclear Root path $<\mu^i — RT(p)>$ and is therefore unlicensed (see the single-Root representation in 14). Note, however, that this conclusion only holds for obstruent geminates. For sonorant geminates as in *onna* 'woman', a two-Root structure (see Selkirk 1990) is not excluded by licensing considerations because the sonorous coda root can be licensed by a safe path from the mora. This raises the possibility, to be pursued in future work, that sonorant geminates, different from obstruent geminates, have a two-

[8]Note that bisyllabic forms such as **kapta* or **samda* will also be ill-formed since the post-nuclear segments /p/ and /m/ will not be licensed, lacking safe paths to the following syllable onset (see Itô 1988, 1989 for further discussion).

the existence of the safe path $<\sigma^{j} — PL_c(p)>$. Since both $RT(p)$ and $PL_c(p)$ are licensed, the segment /p/ is licensed. The Segment Licensing Condition (10), with Segment Licensing defined as in (9), requires only the existence of some safe path, not that all paths terminating in an element must be safe.[7] The basic idea here follows the proposal in Goldsmith (1990:130–131), which is an improvement of Itô's (1988) Coda Filter relying on linkage counting. It is not the number of lines per se that bestows licensing on geminates—rather, geminates have two prosodic paths, hence two potential sources of licensing. Even in the absence of a safe coda path, a safe onset path is sufficient.

Consider next partial geminate structures as in (15) (see 11d for further examples):

(15) sampo 'stroll'



Again we focus on the intersyllabic structure, i.e., $RT(m)$, $RT(p)$, and $PL_c(m/p)$. The post-nuclear Root path $<\mu^{i} — RT(m)>$ is safe, terminating in a nasal root, which fulfills the Mora Sonority Threshold (7a), hence $RT(m)$ is licensed. The root node $RT(p)$ is also licensed because it terminates the safe onset Root path $<\sigma^{j} — RT(p)>$. The key question is the status of the shared Place head $PL_c(m/p)$, which terminates the safe onset Place path $<\sigma^{j} — PL_c(m/p)>$, besides the unsafe post-nuclear Place path $<\mu^{i} — PL_c(m/p)>$ violating the Coda Place Condition (7b). Again, since Licensing requires only the existence of at least one safe path, not the safety of all paths, $PL_c(m/p)$ is licensed. Thus, the segments /m/ and /p/ are both licensed, because their roots and place-heads are licensed. This case shows that the segmental elements need not be licensed through the same prosodic unit. For /m/, its Root and Place are licensed through paths initiated from different units of prosody.

The existence vs. non-existence of a safe path to prosody explains the contrast between the ill-formed **kap* (12b) or **kam* (13a) and the well-formed *kippu* (14) or *sampo* (15). The single syllables, ill-formed in isolation,

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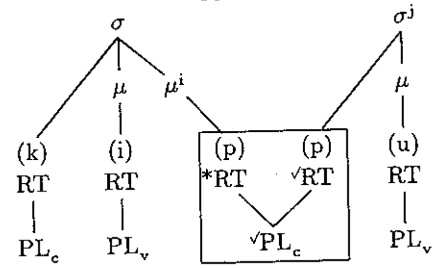
[7]The account of English ambisyllabic /r/ in McCarthy (this volume) is an instance of the same kind of reasoning.

(17) kippu 'ticket'



Root representation as a structural option, besides the single-Root structure in (14). This might account for some of the differences in behaviour between obstruent and sonorant geminates (e.g., some languages allow only sonorant geminates).

The ill-formedness of examples like **karta* bears out the fact that the segment /r/, an apico-alveolar tap in Japanese (see e.g., Vance 1987:27–28), is less sonorous than the nasals. In the articulator group theory of Padgett (1991), clusters like **st*, and others of the form "continuant + stop", cannot show place-linking. If so, they would also have an unlicensed Place in the coda.

4. *Further Issues*

4.1. Lexical constraint domains

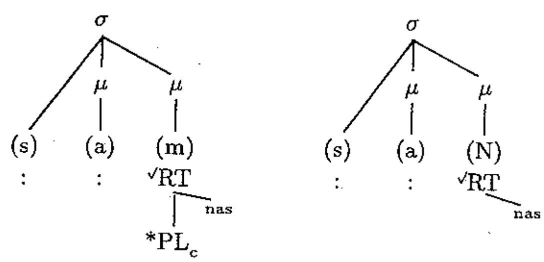
What we have outlined above, for purposes of illustration, is not a complete analysis of Japanese syllable structure. We believe, however, that the framework developed earlier provides the means necessary to fill in the missing details. For example, even though geminates are admitted, as we have seen, there is a restriction against voiced geminates: Forms like **kadda*, **kabba*, etc. are generally impossible (and only found in recognizably unassimilated loans like *hotto-doggu*). This might be construed as the effect of a coda voicing restriction disallowing distinctive (obstruent) voicing in the coda. Similar restrictions are familiar from other languages, like Russian, Turkish, or German, in the form of coda devoicing; see Lombardi (1991) for a recent proposal. Different from the other conditions considered above, the coda voicing restriction in Japanese must be a pure domination constraint and not a path condition entering in the definition of "safe prosodic path". Instead, it is a constraint whose violation directly leads to ill-formedness.

Further issues to be dealt with concern the scope of constraints within the lexicon as a whole, comprising a continuum from core native items to barely assimilated peripheral foreign loans. As mentioned above, peripheral lexical items sometimes violate the coda voicing restriction. Another voicing constraint in Japanese governs exclusively the core native (Yamato) vocabulary and requires voicing on all nasal + obstruent clusters: *tombo* 'dragonfly', **tompo*, etc. (analyzed, in terms of Optimality Theory, as exhibiting a forced laryngeal link in Itô et al 1993, taking up an idea in Borowsky 1990). Such facts provide evidence for a gradual weakening of the constraints within the lexicon towards the periphery.

4.2. Headedness requirement

Japanese admits placeless nasal segments (transcribed [N])[9] as post-nuclear elements (see the last example in 11a). The difference between a placeless nasal and a regular nasal consonant in post-nuclear position is depicted below.

(18) a. *sam b. saN 'three

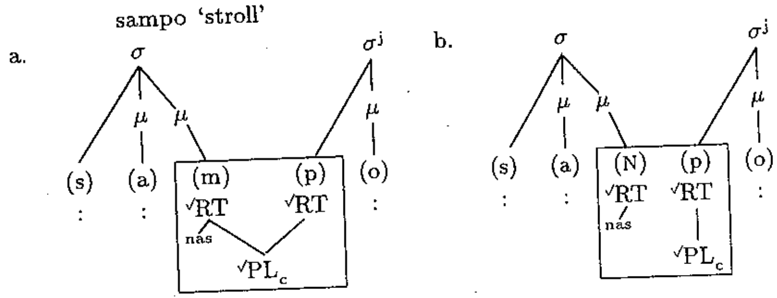


In (18a), given a licensed $RT(m)$ and an unlicensed $PL(m)$, the entire segment /m/ is unlicensed (see the discussion of example 13a). The segment *N* in (18b), on the other hand, has a different status: Being nasal, $RT(\text{N})$ fulfills the Mora Sonority Threshold (7a). Being placeless (i.e., headless, in our terms), it trivially fulfills the Coda Place Condition (7b). Since the relevant path conditions are met, the segment *N* is licensed.

An additional issue arises with respect to NC clusters. As we have seen earlier, an example like (19a) fulfills segment licensing while containing the unsafe post-nuclear Place path $<\mu^i - PL_c(m/p)>$. We need to explain why (19a) is preferred over (19b), which instead shows a placeless mora nasal, i.e., no place linking and hence no unsafe place path. Example (19b) is the avoided form, and place linking as in (19a) is in fact required in this context.

[9]We are here assuming, in conformity with the standard view in Japanese phonology, that this nasal segment (a "nasal glide" pronounced without complete closure) is not specified for consonantal place. The coronals (/t/, etc.) are specified for place, i.e., have a [coronal] articulator — or at least an empty consonantal Place node, in radical approaches to underspecification. Within Optimality Theory, underspecification questions are largely replaced by markedness considerations and thus appear in a rather different light. This issue is further explored in Itô et al (1993).

(19)



The answer, we believe, lies in an independent constraint governing the structure of segments, the Segment Head Requirement (20).

(20) *Segment Head Requirement*:
Roots are headed.

In conjunction with (8), which designates Place as the head of Root, (20) forces the presence of a Place node, if at all possible. As we have seen, placeless nasals do occur in coda position when no consonantal place can be licensed (13a). But in a situation like (19), obeying (20) is possible and hence preferred. In terms of Optimality Theory, this amounts to the ranking [Segment Licensing (10) ≫ Segment Head (20)] (modulo "Structure Preservation" as a higher-ranking block of constraints). In these terms, examples with placeless nasals, like (18a) *saN*, show a violation of a lower-ranked constraint (here, 20) forced by the preferred compliance with a higher-ranked constraint (here, 10). See Prince and Smolensky (1993) and McCarthy (this volume) for further discussion.

4.3. Typological considerations

In conclusion, let us consider some of the typological consequences of the theory of path safety and segment licensing sketched in this paper. Among syllable systems less complex than Japanese, we find pure CV languages (like Hawaiian) that permit neither independent codas nor total or partial geminates. One possibility is that such languages show that there is in fact a penalty on unsafe (coda) paths (21), even if all segments are licensed.

(21) *Path Safety Condition*:
Prosodic paths should be safe.

In terms of Optimality Theory (Prince and Smolensky 1993), we would be dealing with a constraint which is obeyed in pure CV-languages, but quite massively violated in other languages. For Japanese, this would amount to an overall ranking: [Segment Licensing (10) ≫ Segment Head (20) ≫ Path Safety (21)]. Even in languages that allow geminates and partial geminates, Path Safety (21) would account for the fact that they are always more marked than open-syllabled structures.

However, languages that admit assimilated NC clusters while disallowing geminates provide some indication that the correct account for the markedness of geminates might not lie in a constraint like (21), but rather in a direct penalty on heterosyllabic multiple linking. Such languages clearly tolerate violations of Path Safety but make a sharp distinction between structures with two Roots (NC clusters) and structures with a single Root (geminates). Since the absence of geminates in general cannot be reduced to coda sonority considerations (sonorant geminates are often ruled out together with obstruent geminates — but see the remarks at the end of Section 3), the most promising avenue lies in a constraint against Roots being shared by syllables (possibly to be viewed as a segment-syllable alignment constraint). Once this idea is adopted, it provides a natural account for the markedness of geminate structures (with a doubly linked Root) with respect to NC structures (with a doubly linked Place node), which are in turn more highly marked than open-syllabled structures without any double linking. The rarity of languages with the opposite characteristics (no NC-clusters, but allowing geminates — no actual examples are known to us) follows from this logic of markedness.

A very different kind of question is raised by languages lying at the other end of the spectrum, namely those that admit codas rather freely (e.g., English). It is clear that the Coda Place Condition still shows some consequences (Borowsky 1990; Myers 1987), which provides evidence for its presence in the grammar. Such languages raise the issue of the status of the Segment Licensing Condition (10). The question is whether it is an inviolable condition fulfilled everywhere, as in the standard conception, or whether it is instead a violable constraint defining a measure of prosodic optimality for segmental material. The latter option, a natural idea in terms of Optimality Theory, would represent a radical departure from the standard conception of licensing found in the current literature: "Licensing" would no longer be tantamount to "being part of prosodic structure" (being "parsed", in the terminology of Optimality Theory). While it remains (almost) definitionally true that all segments must ultimately find a place somewhere in prosodic structure in order to be realized, this would no longer imply that they must necessarily be licensed in the sense of (10). In such a scenario, Prosodic Licensing could be said to define a level of optimal parsing.

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