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STRUCTURE PRESERVATION AND THE SYLLABLE CODA IN ENGLISH*

Complex codas in English syllables have an asymmetrical distribution: rimes of more than two positions are limited to word edges. This fact is attributed to a CODA CONDITION which restricts syllabification to two rime positions, but which no longer holds at the word level. At Level 1, the principle of STRUCTURE PRESERVATION (Kiparsky 1985) enforces conformity with the Coda Condition, thus explaining the distribution of complex codas as well as the application of vowel shortening. Apparent exceptions to the Coda Condition result from an independent principle which licenses an additional rime position if the position is half of a partial geminate (Ito 1986). After Level 1, Structure Preservation is turned off, and as a result, syllable structure is less restrictive, allowing larger codas and making vowel shortening unnecessary.

1. INTRODUCTION

It has been recognized that the possible sequences of consonants found in word-initial and word-final positions are not an altogether true reflection of the possible sequences found in syllable-initial and syllable-final positions. Languages often allow various violations of syllable structure at word edges – the APPENDICES. The appendix may contain a consonant, or series of consonants, which is not normally permitted medially and which violates some phonotactic constraints. English, for example, allows a sequence of coronal consonants to attach to the end of a word-final syllable (Fujimura 1976; Fujimura and Lovins 1978; Kiparsky 1979/80 and others) and it allows an *s* word-initially. However, even given this observation, studies of syllable structure still concentrate on generalizations about the distribution of consonantal segments made on the basis of possible word-initial and word-final sequences (albeit minus the appendices) equating these positions with the syllable-initial and syllable-final positions.

In this paper I claim that these kinds of generalizations do not actually hold in English in word-medial position. One finds discrepancies between word-final and word-medial coda types over and above the appendix

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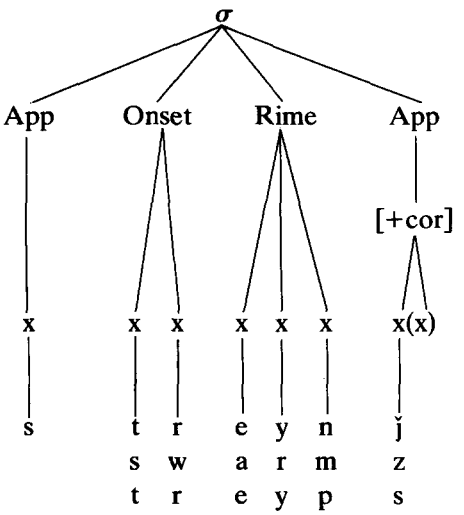
differences: medially, codas are far more limited in their structure than word-finally. I will claim that the asymmetry found in the distribution of complex codas in English can be explained in a model of the phonology which recognises two levels of morphological affixation such as that found in Siegel (1974), Selkirk (1982a) or Kiparsky (1985).

Consider the diagram in (1). (App = APPENDIX.)

(1) (Fudge 1968; Clements & Keyser 1983; Selkirk 1982b; Kiparsky 1980; Halle & Vergnaud 1980; Fujimura 1976; Fujimura & Lovins 1978, etc.)



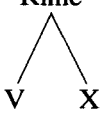
According to most of the earlier workers in the field (cited above) the rime may consist of three positions followed by the appendix[1] of coronals. Yet, if this structure is assumed to be the correct characterization of the English syllable, some interesting phonological anomalies arise. Medial syllables of the form VVC and VCC in monomorphemic words, and before level 1 affixes, are rare. The vast majority of English words have internal rimes of the form V(X), and no larger: *in.ter.nal*, *vo.wel*, *an.swer*, *hus.band*, *al.ge.bra*, *seg.ment*, *pre.scrip.tion*, *sy.lla.ble*. Long vowels in medial positions generally appear in open syllables: *me.di.al*, *so.nant*, *fi.nal*. In underived environments, at level 1, medial closed syllables are short. In derivation, long vowels shorten before tautosyllabic

[1] I will not discuss the appendix here. I refer the reader to the references cited above. I assume that it is adjoined to the syllable at the word level by a rule I shall call the APPENDIX RULE.

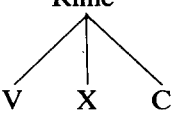
consonants at level 1 */mean + t/ → meant, /five + th/ → fifth, /serene + ity/ → serenity* (Myers 1985, 1987). However, long vowels followed by tautomorphemic word-final consonants do not shorten; see for example, *traipse, moist, coax*.

On the basis of the observation that vowels shorten at level 1 to maintain a basic rime structure of two positions, I claim that the English Rime is restricted, at level 1, to a structure like that shown in (2a). There is only *one* postnuclear position medially, and not two as is more usually claimed. (Church (1983) makes the same observation.) The structure in (2b) arises only word-finally after level 1.

(2)a. Medial:



b. Final:



I argue that as a consequence of this claim, the observations about the limited distribution of medial syllables of the type VXC noted above are no longer anomalous. It follows that such syllables should be rare and that some restructuring should take place if such a structure arises. Strong phonological evidence for my view comes from the phenomenon of vowel shortening, which I will discuss in Section 3. After this I consider the distribution of rimes of the form VXC and the apparent counterexamples to my claim in some detail. I will then propose an explanation of these forms which makes them unexceptional. Before moving on to these issues let me clarify some of the theoretical assumptions that play a part in the analysis.

2. Theoretical Assumptions

2.1. *Lexical Phonology*

My analysis is couched within the framework of LEXICAL PHONOLOGY. The crucial aspects of this model of English phonology for our purposes are: (1) There are two groups of affixes – those that attach first, at level 1, and those that attach next, at level 2. (ii) The application of all phonological rules, including syllabification rules, is constrained by the principles of the theory (see Kiparsky (1985) and Borowsky (1986)). The particular principle that will play an important role in this analysis is STRUCTURE PRESERVATION which, I claim, holds only at level 1 in English. That is, only the phonology of level 1 is structure-preserving.

I will also make the generally accepted assumption that final con-

sonants are extraprosodic (see Hayes 1982, Harris 1983). The claim that final consonants are extrametrical has been well established in the stress literature. For example, in many languages final consonants do not make final syllables heavy; stress rules scanning for heavy syllables ignore those that occur at word edges. Consider as an example final-stressed English verbs and underived adjectives. In this class, stress falls on a final syllable which is closed by two consonants, but on the penultimate syllable if the final syllable is closed by only one consonant – compare *devélo(p)*, *cómmo(n)* with *molés(t)*, *ovér(t)*. The final consonant does not count and thus a final rime of the form VC is construed as light. For reasons such as this, I assume that final consonants are actually unsyllabified, i.e. extrasyllabic (Clements and Keyser 1983; Steriade 1982; Ito 1986), and that is why they are invisible.

I make no claims about the universality of the model I assume. The analysis is equally compatible with any model of phonology which recognises the role of Structure Preservation and the bilevel morphology. The explanation of the facts of English syllable structure to be presented here serves as further evidence for this view.

2.2. *Structure Preservation*

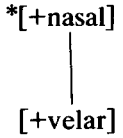
I formulate the principle in (3).

(3) Structure Preservation:[2]
Language-particular structural constraints holding for underlying representation hold also for derived representation, and vice versa.

By this we mean that structural constraints persist, and no new constraints may be introduced during the derivation. A phonological rule may not apply to create some segment which is nondistinctive – that is, not a phoneme of the language. Nor may structures which violate structural templates, such as syllable structure or stress patterns be created. Thus, for example, aspiration in English is not distinctive and may only be assigned to stops postlexically. Similarly, since the velar nasal is not a

[2] This formulation differs from those of Kiparsky (1985) and Borowsky (1986) although it is, I believe, identical in spirit to those. Previous statements of Structure Preservation were made using the terms DISTINCTIVE and PHONEMIC whose application to prosodic structures is dubious. For example, syllable structure and stress are entirely predictable and thus not distinctive. The earlier formulations thus suggested that only segmental constraints are structure preserving.

phoneme of English, the rule which creates /ŋ/ may not apply lexically. All feature co-occurrence restrictions are conceived of as structural constraints. Under the assumption of autosegmental phonology and feature geometry this follows. Segments are considered to be structures made up of features and not indivisible units. Independent features and arrangements of these features may function as independent constituents and subconstituents within the segment. For example, there is a structural constraint forbidding the co-occurrence of the feature [+velar] with [+nasal]:

(4) 

Structure Preservation holds in a definable domain;[3] I will assume for the purposes of this paper that this domain is level 1 in English.[4] In Borowsky (1986) it is argued that Structure Preservation does not hold for the phonology at level 2 in English. For example, syllabic sonorants are not phonemic in English and may not arise at level 1, but must be created at level 2. Syllabic sonorants are never stressed. In addition, they are never found preceding level 1 affixes but occur only word-finally or before level 2 affixes: consider alternations such as: *cyclic*, *cyclicity*, **cyc*[*l̩*]*icity* vs. *cyc*[*l̩*]*e*, *cyc*[*l̩*]*ing*. (The alternate pronunciation *cyc*[*liŋ*] is a casual speech variant.) To take another example, velar nasals cannot be derived by Nasal Assimilation at level 1 like the other nasals, because the velar nasal, /ŋ/, is not a phoneme of English. Structure Preservation blocks assimilation of nasals to velars – compare *i*[*m*]*press* with *i*[*n*]*gress*. Both are derived at level 1 – from /iN + root/. If the relevant assimilation rule were an independent cyclic stress-conditioned rule which applies only to velars, then we would expect it to apply at level 1 in a form such as *congréssional*, from *có*[*ŋ*]*grĕss*, but it does not. Velar nasals must arise at level 2. This can be seen if we consider the rule

[3] So do all such principles, e.g. the Obligatory Contour Principle, or the Strict Cycle Constraint.

[4] On other views the domain is considered to be the lexical phonology. Since in English the domain of Structure Preservation appears to be the phonology of the first level only, we might conclude that only the level 1 phonology is lexical, and all phonology thereafter is postlexical. Alternatively, we could conclude that Structure Preservation is not a defining characteristic of lexical rules, contrary to what is usually assumed in theories of Lexical Phonology. This is an issue that requires further research and is beyond the scope of the present paper. (See Borowsky (1986) for some discussion.)

deleting the *g*. The velar nasal in *long*, *longing*, must be derived before the deletion of the *g*. *G* cannot be deleted prior to level 2 because it occurs in level 1 derivatives, e.g. *longer*, *longitude*, *elongate*. This fixes the rule of *G* Deletion at level 2, and since nasal assimilation to velars must apply before the *g* disappears, it is clear that the /ŋ/ must have entered the phonology by level 2. So I conclude that since nonphonemic segments are created at level 2, Structure Preservation no longer applies.

3. Vowel Shortening

At level 1 long vowels shorten in derivation. This is shown in the examples in (5).

(5) keep, kept; leave, left; bereave, bereft; deal, dealt; dream, dreamt; mean, meant; leap, leapt; kneel, knelt; heal, health; deep, depth; wide, width; five, fifth, fifty; receive, receptive, reception; prescribe, prescription, prescriptive; resume, resumptive, resumption; decide, decision; nose, nostril; goose, gosling; sheep, shepherd; vine, vineyard; scribe, scripture; wise, wisdom.

Wherever a consonant is incorporated into a syllable already containing a long vowel, the vowel shortens. (Final consonants are assumed to be extrametrical – see below.) Why should this happen at all if syllables can have three rime positions? It follows without question if the syllable only has two rime positions.

Adopting the analysis of Myers (1985), the Shortening rule is formulated as a closed syllable shortening process.

(6) CC Shortening:
$VV \rightarrow V / \_\_ C]_{\sigma}$

This rule shortens vowels when they are followed by a tautosyllabic consonant. The rule is triggered by Structure Preservation. That is, shortening is the automatic disconnection, due to Structure Preservation, of part of the long vowel, simultaneous with the incorporation of the consonant into the syllable. This happens because the syllable resulting when a consonant is syllabified after a long vowel violates the template in (2a), which contains only two positions.

If the claim that there are only two rime positions is true, then why is there no shortening after the first level? *Meanly*, *dreamed*, *dreams*, *kneels*, *deeply* etc., derived at level 2, all have long vowels. If three position rimes are ruled out at level 1 why are they allowed thereafter? The restriction of the rule of CC Shortening to the level 1 phonology is a consequence of the fact that Structure Preservation has no role after

level 1. That is why forms like *dreamed*, *dreams*, *kneels*, and *wildness* for example, exist alongside forms like *dreamt*, *knelt*, *wilderness*. The former are derived at level 2 where the syllabification of a consonant doesn't do anything to the vowel because Structure Preservation is off. The latter are derived at level 1 where Structure Preservation is working to maintain the two position rime structure.

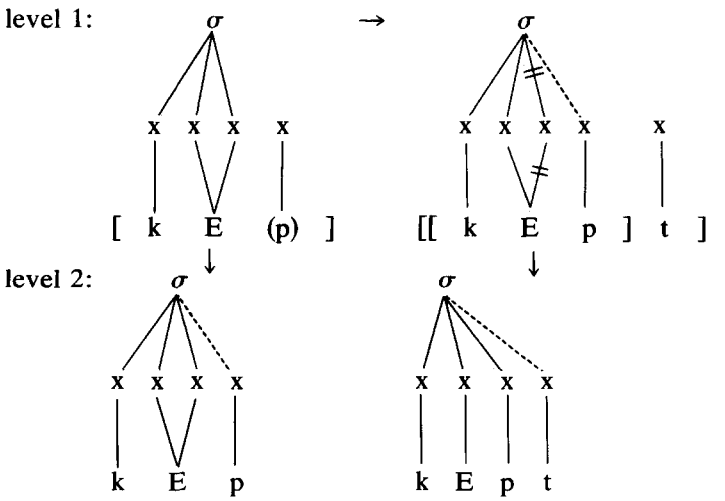
In the standard view, Vowel Shortening is apparently restricted to derived environments and constrained by the Strict Cycle condition. There is no shortening found before either a single final consonant, or two final consonants as shown in the examples in (7) below.

(7) node, tape, keep, fake, child, wild, beast, paint, flounce.

According to Myers the lack of shortening in this type of case can be explained as following from the fact that the final consonants are extrasyllabic on the first cycle. For the cases with a single final consonant this is straightforward. All final consonants are extrametrical for stress purposes – see Hayes (1982). In the cases in which there are two final consonants we must assume that both of the consonants are marked extraprosodic. Recall that this means they are not syllabified. On a subsequent cycle, syllabification of a final consonant into the rime would create a structure which does not fit the template in (2a). Structure Preservation enforces shortening in order to remove this violation, thus *children*, *wilderness*, *kept*.

Observe below the derivations of *keep* and *kept*. At level 1, on the first cycle, the final consonant is extrametrical and unsyllabifiable. On the second cycle the vowel shortens to make room for the consonant, which is no longer extrametrical. At level 2, Structure Preservation is off and the final consonant may be syllabified. No shortening takes place.

(8)



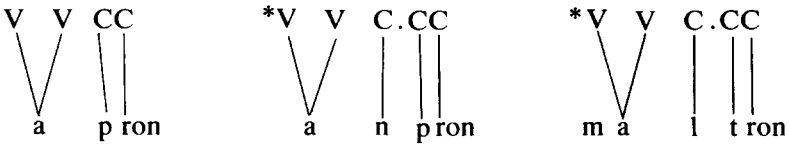
4. Three-position Rimes

In general, rimes larger than VX are found only at word-edges, inside compounds, and preceding level 2 affixes.

(9)a. serene, traipse, coax, hoax, child, saint, ghost, quartz, world
b. worldwide, bandsman, coltsfoot, tribesman, helmsman, bargeman
c. childhood, apartment, chintzy, cowardly, eventful, saintly, worldy.

There are however a few occurrences of medial VCC and VVC which I will now discuss. As pointed out above, long vowels usually appear medially in open syllables. Thus though there are numerous cases like *apron*, *matron*, there are very few like [*ey*]*n.pron* *m*[*ey*]*l.tron*.

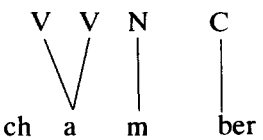
(10) patron, matron, poster, coaster, Euclid, eagret . . .



All examples of the type VVC are listed in (11).[5] In (11a), cases where the long vowel is followed by a nasal identical in place with the following consonant appear. In (11b) we see other cases in which the sequences of consonants after the vowel share features for place.[6] We will see that it is this factor that makes these cases systematic. This leaves only the cases in (11c) as counterexamples to the claim that there is only one post-nuclear coda position.

(11) Rimes of the form VVC:

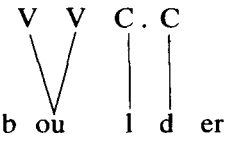
a.



angel, ancient, danger, maintain, council, cambric, dainty, launder, Cambridge, wainscot, foundry, poinciana, poinsettia, mountain, scoundrel, laundry, bounteous, ointment

[5] This list is complete, I believe. The word lists were obtained by automatic search of the Collins English Dictionary. Nonexhaustive lists of examples in the text are supplemented in the appendix, which contains all the relevant examples.

[6] As it happens, they are all sequences which share coronality. This is because the second rime slot in such structures can only be *r* or *l* if it is not a nasal.

(11)b. 

shoulder, cauldron, poultry, doldrums, moisture, riesling, smoulder, soldier

c. deictic, deixis, seismic, peascod, fo'c'sle

Before moving on to further discussion of these examples, let me mention one more anomalous fact about the distribution of consonants after long vowels. As noted in Chomsky and Halle (1968, p. 172), even in final position, rimes of the form VVCC are limited. Such a structure is permitted only if both consonants are coronals.

(12) *VV/__CC where C = [−cor]

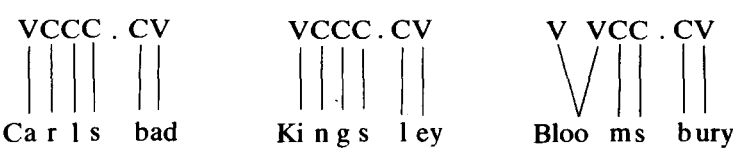
With the exception of the three words in (13a), there are no forms in which a long vowel is followed by a sequence of consonants where at least one of these consonants is noncoronal. (Coronals are exempt because they are in the appendix.) Even after short vowels, sequences of three consonants in which the second (i.e. the final nonappendix consonant) is noncoronal, are few, as shown in (13b).

(13)a. traipse, coax, hoax

b. corpse, turps, mulct, sculpt
(also lexicalized plurals, e.g. (the) works, creeps, breeks)

Clusters of two or more consonants in the coda are also rare. In (15) I list the various types of counterexamples which show more than one postnuclear consonant. The largest class of counterexamples is the class of names. Some examples are given in (14). This is not really surprising since names seem often to constitute a deviant subsystem with respect to many phonological phenomena. However, notice that most of them appear to be compounds, or other level 2 derivatives, or are obviously foreign. I will assume that they are derived at level 2 and thus they follow without ado from the system to be put forward. In this view they do not constitute a problem at all.

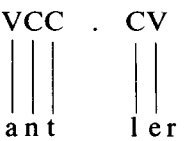
(14) Rimes of the form VCC(C):
names:



(14) Gardner, Augsberg, Aylesbury, Bentley, Charleston, Bournemouth, Beardsley, Chandler, Darnley, Elmhurst, Finchley, Gainesville, Grimsby, Houslow, Orkneys, Priestley, Salzburg, Thompson, Yangtse, Terpsichore . . .

In (15a) and (15b) we see examples of words with medial homorganic nasal + obstruent clusters, both mono- and polymorphemic; and in (15c), cases in which an intrusive consonant appears in derived forms. Notice again that these are all nasal + obstruent sequences sharing place features.

(15) VNC:

a. 

empty, pumpkin, bumpkin, palimpsest, gauntlet, rundlet, ointment, plankton, sphincter, apopemptic, vintner, eclampsia

b. extinction, instinction, tincture, anxious, scrumptious, unctuous, rambunctious, bumptious

c. derivatives of /-join/: conjunction, disjuncture
/-sume/: assumption, consumption, consumptive
/-deem/: redemption
/-point/: punctuation, compunction

In (16a–d) there are a few other examples which do not fit into the same category.

(16)a. absorb, absorption/tive; sculpt, sculpture/tor; mix, mixture; fix, fixture

b. ordnance, vestment, palsgrave, armlet, harpsichord

c. partner, fartlek

d. Antarctica, arctic

Those in (16b) can be explained away as level 2 derivatives. They are mostly forms with affixes that are no longer productive: [[*arm*] *let*], [[*vest*] *ment*], etc. or archaic compounds like [[*pals*][*grave*]]. The two cases in (16c) share place features. The true counterexamples are given in (16a) and (16d). The cases in (16a) are especially problematic since they are forms arising in derivation at level 1. I will return to these below.

It can be seen that the majority of the examples in (15) have the same structure we saw occurring after long vowels: nasal + obstruent sequences sharing place features. Thus although the general observation is that the rime allows only two positions medially, homorganic nasal + obstruent sequences appear to be systematically excepted. Similarly, sonorant + obstruent sequences sharing place features are excepted.

4.1. *Segmental Linking*

What sets off these nasal + obstruent clusters from other sequences of consonants is the fact that they are homorganic. They are partial geminate structures linked for place features. As shown by Steriade (1982), and more recently by Ito (1986), many languages show similar facts – the coda of a syllable may be restricted to consonants which are linked for place, or manner, to a following onset. That is, the coda must be the first element of a geminate, partial geminate or otherwise linked cluster. (I refer the reader to the above-mentioned authors for discussion of this point with reference to various languages.)

In order to account for this sort of case, Ito (1986) puts forward the notion of a Coda Condition. Such conditions state the restrictions on the form of a coda for a particular language and block the association of any violating segments to the syllable. For example, a language *L* might have a constraint against syllables closed by any consonant, unless that consonant is a sonorant. This would be stated in Ito's terms, as follows:

(17) Coda Condition for *L*:

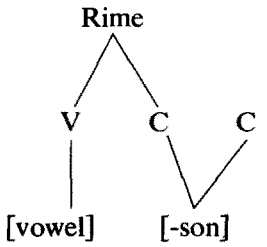
However, in apparent violation of this constraint, rimes such as V + obstruent may occur when the obstruent is part of a geminate. These are explained by Ito with an ingenious interpretation of Hayes' Linking Constraint (Hayes 1986) which overrules the coda condition. This constraint forbids a rule from applying to a multiply-linked segment if the rule mentions only a single association line.

(18) Linking Constraint:
Association lines in structural descriptions are interpreted as exhaustive.

In the case of linked structures, a segment may be incorporated because

the coda condition mentions only a singly-linked consonant. Thus, in *L*, geminate obstruents escape the prohibition on obstruents in the coda because they are doubly-linked structures.

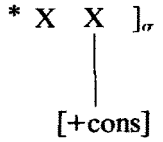
(19)



4.2. *Syllabification of English Codas*

Making use of these ideas we can explain the English facts. Since we have seen that the English rime may contain only two positions medially, we require the following Coda Condition for English.

(20) English Coda Condition:



The coda is preceded by a nuclear position[7] filled by a vowel or part of a vowel. This condition therefore only ranges over the positions following the first vowel slot and rules out the final consonant in the structures VVC and VCC. The condition rules out the possibility of anything mapping to the third position in a rime. In our system, as in Ito's, the condition is enforced by Structure Preservation.

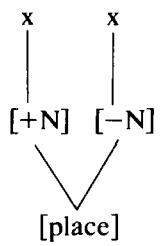
The constraint as formulated appears to be too strong; it rules out all three-position rimes. Yet we have seen that they do exist word-finally, as well as when the extra consonant(s) are homorganic nasal + obstruent sequences. Let us consider each of these in turn.

Linked consonants slip through the Coda Condition because of the Linking Constraint in the interpretation of Ito which we have adopted. The first position of the coda is free, the second may be filled only by a multiply-linked consonant. This accounts for the cases under discussion: a nasal which is homorganic with the following obstruent may be in-

[7] I do not intend to imply any internal structure in the syllable; I use the terms CODA and NUCLEUS because they are familiar and easy to refer to.

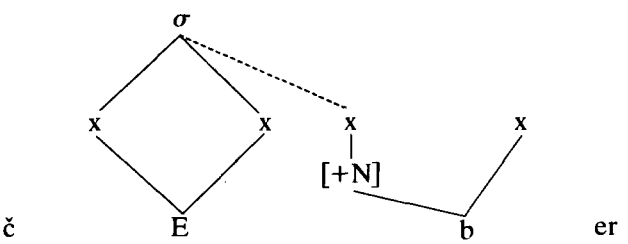
corporated because it is multiply-linked, as shown below, and the English Coda Condition mentions only a singly-linked consonant.

(21)

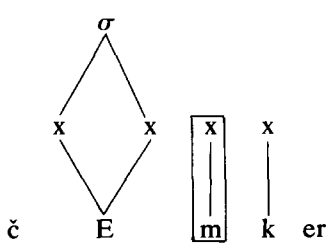


For example, in *chamber* the [m] is incorporated into the syllable because it does not violate the Coda Condition. The form in (22b) is ruled out by the Coda Condition because the [m] is not linked to the [k].

(22)a. chamber

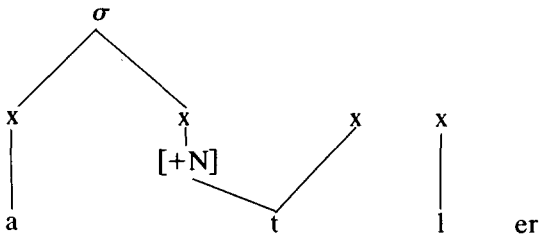


b. *chamker

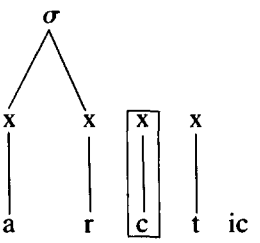


Cases with two consonants following the nucleus will yield to the same treatment. Consider *antler*. Since the sequence *tl* is ruled out in an onset, this world must have the syllabification *ant.ler*. How does the final consonant of the first syllable escape the Coda Condition? Its syllabification is licensed once again by the fact that it is a multiply-linked structure sharing place of articulation features with the preceding consonant. Similarly, in *shoulder*, *doldrums* etc., the Coda Condition is ineffective because the consonants are linked for place.

(23)a. antler



b. arctic



Cases like *arctic* should be ruled out but are not. I assume that they are entered in the lexicon with their aberrant syllabification. (But, notice that *arctic* is often pronounced [artik].)

Now we will turn to word-final codas of the form VXC.

4.3. *Word-final Rimes*

The English coda constraint basically says that rimes with three slots cannot occur. But recall that they do. Word-finally and before level 2 derivatives rimes are often of three positions. The Coda Condition does not have any apparent effect on the length of a rime after level 1.

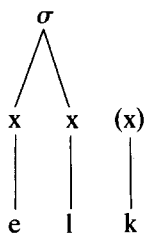
(24)a. keep, leave, field, lark, elk, harp . . .
b. worldly, worldwide, childhood, fieldhand, keepsake . . .

This asymmetry can be explained by recourse to the principle of Structure Preservation again. Recall that Structure Preservation holds only of the level 1 phonology. At level 2, Structure Preservation is no longer guarding the derivation and therefore the coda constraint is not enforced. Since final consonants are regularly extrametrical, they are not

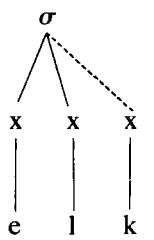
available for syllabification on the first cycle.[8] Unsuffixed words will therefore continue into the level 2 phonology with a final stray consonant or consonants. On the first cycle of level 2, final stray consonants are free to be incorporated into the third rime slot of the syllable. Consider as example the derivation below:

(25) elk

level 1:



level 2:



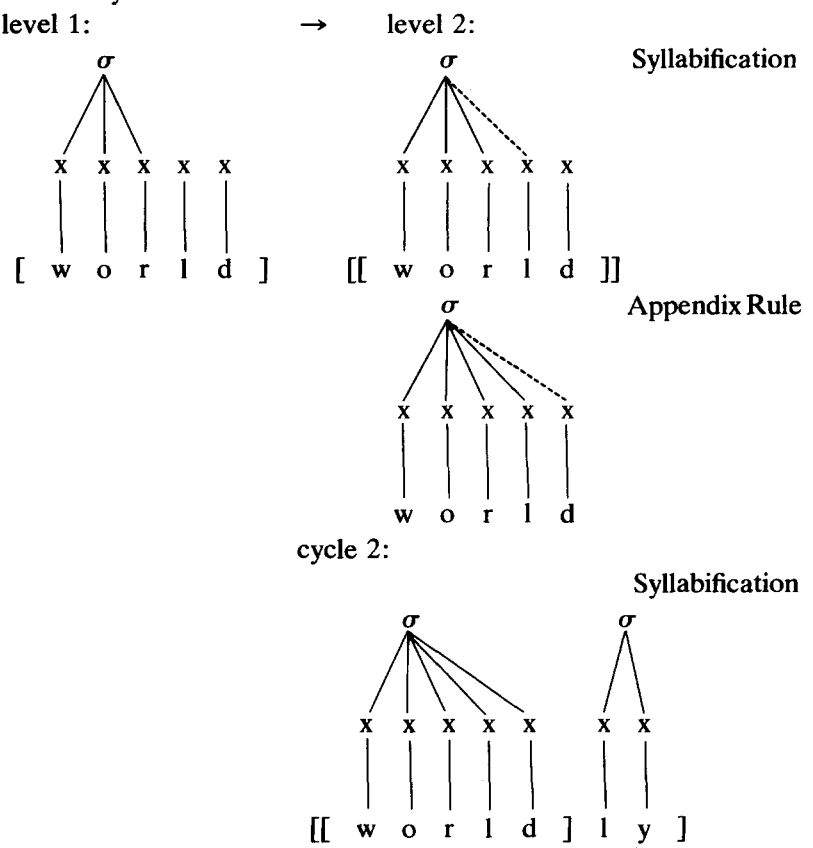
At level 1 the final consonant is extrametrical. It is not syllabified and there is no possible violation of the coda constraint. At level 2, because Structure Preservation is turned off, the Coda Condition is ineffective. The final consonant may be syllabified.

In (26) I show an example with level 2 suffixation after the word level syllabification of a third rime position, as well as an appendix consonant. Again notice that only one consonant is syllabified into the coda at level 1 while Structure Preservation is still in force. At level 2 the third consonant is syllabified. Then the remaining coronals are adjoined as appendix.

---

[8] Note that in many cases the Coda Condition prevents the syllabification of the final consonant, thus it appears that extrametricality is unnecessary. For example, strings of final consonants may be extrametrical because they may not be syllabified. Thus, in words like *child*, *world*, the final two consonants may not be syllabified at level 1. Thus we might want to assume that extrametricality can be derived from the fact that the consonants are not syllabified. However, this is not true in cases in which the final syllable is short, and closed by a single consonant. These cases require that the final consonant be extrametrical for stress: *jacke(t)*, *sweate(r)*. Extrametricality cannot therefore be derived from the syllabification in every case, and we must retain the view that in some cases it must be marked in some way or another.

(26) worldly



To summarize: in order to explain the distribution of complex codas I have proposed that English has a Coda Condition which is enforced at level 1 by Structure Preservation, but has no effect at level 2 because Structure Preservation plays no role after level 1. The Coda Condition may be independently overridden at level 1 if consonants are in partial geminate constructions – i.e. they are linked for place. This results in a system of syllabification which differs at levels 1 and 2 because of the constraining power of the principle of Structure Preservation.

The phenomenon of vowel shortening can now be explained in the same terms. In these cases, when a consonant is incorporated into the third position in the rime, the vowel is forced to shorten by Structure Preservation in order to overcome the violation of the Coda Condition.[9]

[9] Note that the fact that two segments are homorganic is not enough to exempt them from the Coda Condition – shortening still takes place in *meant, knelt*. This is because the final

At level 2 there is no shortening because there is no enforcement of the Coda Condition and codas are allowed to have three positions filled.

5. Melody Integrity

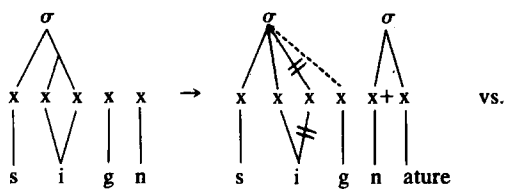
Let us briefly consider two related questions that arise in connection with this analysis. Firstly, *why* is it that the vowels shorten rather than, say, leaving the consonant stray and subsequently deleting it? Why does */keep + t/* not become **keepØ*, **keeØt*? Secondly, given that there is a vowel shortening process repairing syllables which are too large, why is there no similar effect found with consonants – why do consonant clusters arising in derivation not simplify? For example, why does the irregular *absorption* not become **absortion* or **absoption*?[10]

---

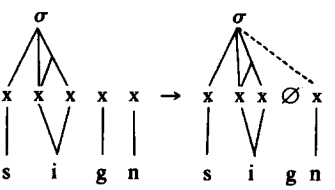
nt, *lt* do not *share* place features; they are in separate morphemes and thus each must have its own independent feature matrix. The crucial factor is that C C is distinguished from C + C as usual. Also, Voicing Assimilation, which links segments on the laryngeal tier, does not create partial geminates; so */leave + t/ → left* and not *leaft*. The relevant linkage must be one for place.

[10] Although notice *government*, *bankruptcy*, *Christmas* which are usually pronounced [govɾmənt], [bæŋkrʌpsi], [krismɔs] rather than [govɾnmənt], [bæŋkrʌptsi] and *[kristmɔs] (see Jespersen (1909)). Also, forms with the so-called intrusive obstruent *handsome*, *empty*, *contemptible* are pronounced both with and without the obstruent following the nasal – probably more frequently without.

Other cases of consonant deletions which could be attributed to the consonant not being syllabifiable are the various word-final deletions found, for example the Final Voiced Obstruent Deletion in *bomb*, *long* etc. and the G Deletion found in the *paradigm-paradigmatic* and *sign-signature* alternations. We might explain this last as follows:



CC Shortening



*gn in a coda

It appears that languages prefer to maintain their melodic material wherever possible, sometimes introducing segments in order to syllabify material which is otherwise unsyllabifiable. I assume that there is some sort of principle that ensures that the phonology respects the integrity of segmental elements maximizing the association of melodic material over that of skeletal material.

(27) Melody Integrity:
Maximize the association of melodic material.

Languages may choose to respect this principle, in which case they would have either an epenthesis rule (e.g. Arabic, Yawelmani) or maintain segments even in violation of structural conditions, like English. Or a language could ignore the principle and delete segments instead of syllabifying (e.g. Finnish). Presumably the principle has the status of a parameter. English chooses to retain segments. Yet there is no regular epenthesis rule with which to fix up the violating syllable structures that arise because of the maintenance of segments. In the case of long vowels, dissociation of melodic material from one position won't result in the deletion of a whole segment because long vowels are multiply associated. The melodic material is maintained; it is a structural position which is lost. The principle of Melody Integrity forces the syllabification of the consonant and thereby causes the shortening of the vowel. Deleting the consonant, in such a situation, would remove that melodic segment altogether and thereby run counter to the principle.

5.1. *Allomorphy and Rime Structure*

As was pointed out to me by Alan Prince, rime structure may in part determine allomorphy, thus also ensuring the maintenance of melodic material. The choice of the allomorph *-ation*, rather than *-tion*, seems to be determined by the rime structure of the word concerned. The suffix *-tion* does not generally attach to forms with final clusters except, predictably, where the consonants are homorganic nasal obstruent sequences. Consider the examples in (28). In (28a) we see the only forms

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On the first cycle neither the *g* nor the following nasal can be syllabified. If an affix is added, the principle of Melody Integrity forces the syllabification of the *g* and the vowel shortens. If no affix is added then at level 2 the principle of Melody Integrity forces the syllabification of everything that is syllabifiable. Sonority restrictions rule out voiced obstruent + nasal sequences so the *g* deletes. What is not clear in this explanation is why it is the *g* and not the nasal that is deleted.

in the dictionary in which *-tion* attaches to words with final consonant clusters. Compare the place-linked sequences in (28b), as well as the forms in *-ation* in (28c).

(28)a. absorb + tion → absorption
infarct, infarction
excerpt, ?excerption[11]

b. distinction, exemption, junction, assumption, redemption, compunction . . .

c. usurpation, *usurption
exculpation, exterpation, inculcation etc.

In conclusion, I have presented an analysis of the English rime in which there are three possible positions. The slots are constrained at level 1 by a language-particular coda condition which, in effect, limits the rime to only two positions at level 1, except where an additional factor, the Linking Condition, intervenes to override the Coda Condition and allow for the syllabification of a third segment. The interplay of Structure Preservation with this constraint explains the less restrictive syllable structures found at level 2. Since Structure Preservation has turned off at level 2, the Coda Condition may be violated and larger syllables are formed. In this way we explain why it is that vowels shorten in closed syllables at level 1 but not at level 2, and sequences of consonants are found only word-finally or before level 2 affixes and not in monomorphemic forms or before level 1 affixes.

APPENDIX

CCC clusters:

absorption
admixture
Antarctic
arctic
coarctate
contextual/ure/ive
fixture
infarction
hoactzin
koftgar
mitzvah
sculptsit
sculptor
sculpture
sorption

[11] This form is listed in the dictionary so I have included it even though all the native speakers I have consulted reject it.

CCC clusters with linked matrices:

acupuncture
ademption
adjunctive
ancient
antler
anxious
apopemptic
appointment
assumption
asymptomatic
bilharzia
bumptious
centner
chandler
cincture
comfortable (i.e. [kamftəbl])
compunction
conjunction/ive/ure
conjunctivitis
consumption/ive
contemptible
contemptuous
copartner
cunctative
disjunction/ive
disfunction
eclampsia
elenctic
empty
emunctory
exemption
expunction
extinction/ive
fartlek
function
functional
functionalism
functionary
gumption
impromptu
indistinctive
injunction
instinctive
intelligentsia
intinction
inunction
junction/ure
kunzite
limpkin
linctus
martlet
muntjak
partner
peremptory
pindling
pinxit
plankton
preeclampsia
preemption/ive
presumption/ive
presumptuous
pumpkin
punctate
punctual
punctuate
puncture
redemption
resumption
sanctimonious
sanction
sanctity
sanctuary
sanctus
scrumptious
sphincter
sumptuous

symptom
texture
textual
tincture
unction
unctuosity
unctuous
vintner
zooplankton

VVC with linked matrices:

ancient
angel
bounteous
cambric
Cambridge
cauldron
council
dainty
danger
doldrums
foundry
launder
laundry
maintain
moisture
mountain
ointment
poinciana
poinsettia
poultry
riesling
scoundrel
shoulder
smoulder
soldier
wainscot

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