Syllable Codas in English and Syllabification

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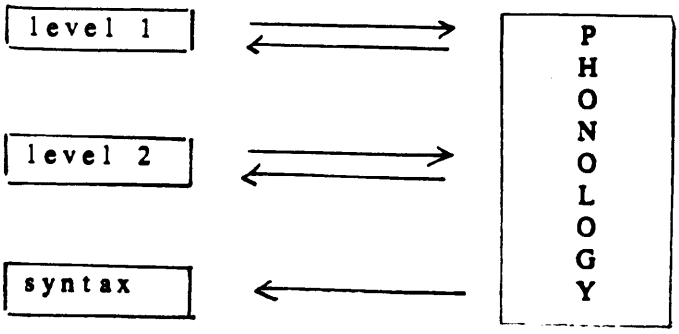
1. Introduction

It has been recognised that the possible sequences of consonants found in *word* initial and final positions are not an altogether true reflection of the possible sequences found in *syllable* initial and final positions. For example, languages often allow various violations of syllable structure at word edges - the appendices. The appendix may contain a consonant, or series of consonants, not normally permitted medially and which violate 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 an *s* word-initially. However, even given this observation, studies of syllable structure still concentrate on generalizations about the distribution of the consonantal segments made on the basis of possible word-initial and word-final sequences (albeit minus the appendices) equating these with syllable initial and syllable final.

In this paper I will show 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 differences: medially, codas are far more limited in their structure than word finally. I will claim that the assymetry found in the distribution of complex codas in English can be explained in a Lexical model of phonology and reflects the interplay of the principles of the theory with the levels of the phonology. I posit a system of syllabification which applies differently at levels 1 and 2 due mainly to the constraining effect of Structure Preservation, which, I claim, holds only at level 1 in English (Borowsky 1986) and Extrametricality.

Due to constraints on space I will not go into any detail about the theory - the model of Lexical Phonology assumed herein is sketched in (1). (See Kiparsky 1985 and Borowsky 1986.) An informal definition of Structure Preservation is given in (2). I also make the generally accepted assumption that final consonants are extrametrical (see Hayes 1982, Harris 1982).

(1)



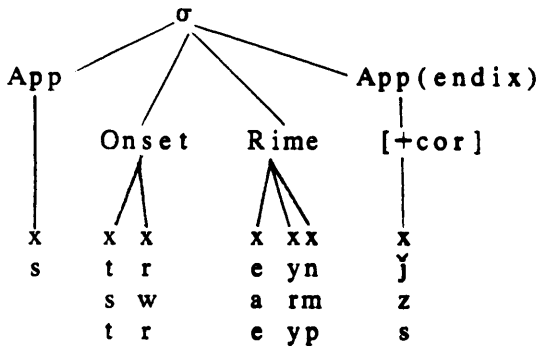
(2) Structure Preservation:

> A lexical rule may not create any structure which is non-distinctive in the language.

2. The English Coda

Consider now the diagram in (3).

(3) (after Fudge 1968; Clements & Keyser 1983; Selkirk 1982,83,84; Kiparsky 1979,80; Halle & Vergnaud 1980; Fujimura 1976; Fujimura & Lovins 1978 etc.)



According to most earlier workers in the field, the rime may consist of three positions followed by the appendix of coronals. Yet, there are some phonological anomalies if we accept this structure. The three position rime is highly limited in its distribution medially. Most of the few occurrences to be found are systematically exceptional and can, I will show, be explained away. Long vowels in medial positions appear mostly only in open syllables. In underived environments, at level 1, medial closed syllables are short. In derivation long vowels shorten before tautosyllabic consonants. These same long vowels may remain if followed by a word final consonant; see for example, *traipse* in (3). Similarly medial syllables of the form VCC are rare. In general, the three position rime is found only at word-edges, inside compounds, and preceding level 2 affixes.

(4) mixture, moisture, amendment, apartment, bandsman, chintzy
cowardly eventful, worldly, etc.

I claim that the English Rime is restricted at level 1 to a structure like that shown in (5.a). There is only one post-nucleic position medially, and not two as is more usually claimed. (A similar observation was made in Church 1983.) The structure in (5.b) arises only word-finally after level 1.

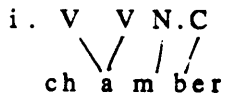
(5) a. Final: b. Medial:

Let us now consider in detail the distribution of medial rimes of the form VXC. 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 *aynpron* or *mayltron*.

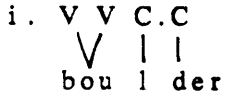
(6) patron, matron, poster, coaster, Eulid, eagret

All examples of the type VVC are listed in (7). In (7.i) cases where the long vowel is followed by a nasal identical in place with the following consonant appear. In (7.ii) there are cases of liquids followed by obstruents after the vowel. In these cases, again, the consonants share features for place. I will show later that it is this factor that makes these cases systematic. This leaves only the cases in (7.iii) as counterexamples to the claim that there is only one postnuclear coda position.

(7) Rimes of the form VVC:



angel, ancient, danger, maintain, council,
cambric, dainty, laundry, Cambridge, wainscot ...



shoulder, cauldron

iii. deictic, deixis, seismic

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 S.P.E, even in final position, rimes of the form VVCC are limited. Such a structure is permitted only if both consonants are coronals.

(8). *VV/__CC where C = [-cor] (SPE pp 172)

With the exception of the three words in (9.a), there are no forms in which a long vowel is followed by a sequence of consonants where at least one of these consonants is non-coronal. (Coronals are exempt because they are in the appendix.) Even after short vowels, sequences of three consonants, in which two are noncoronal, are few - as shown in (9.b).

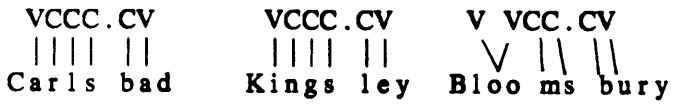
(9)a. traipse, coax, hoax

b. corpse, turps, mulct, sculpt
(lexicalized plurals eg. (the) works, breeks, creeps)

Now let us return to medial occurrences of syllable final consonant sequences. Clusters of two or more consonants in the coda are also rare. The norm is a single consonant. In (10) I list the various types of counterexamples which show more than one post-nucleic consonant.

(10) Rimes of the form VCC(C):

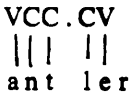
i. names:



Gardner, Augsberg, Aylesbury, Bentley, Charleston
Bournemouth, Beardsley, Chandler, Darnley, Elmhurst
Finchley, Gainesbille, Grimsby, Hounslow, Orkneys
Priestley, Salzburg, Thompson, Yangtse, Terpsichore

ii. VNC:

a.



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

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

b'. absorb, absorption/tive; sculpt, sculpture/tor

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

d. ordnance, vestment, palsgrave, armlet

e. dextrose, arctic, harpsichord, fartlek

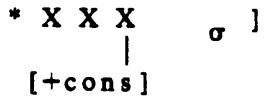
The largest class of counterexamples is the many many names. Some examples are given in (10.i). I am going to disregard these. I will assume that since names seem often to constitute a deviant subsystem with respect to many phonological phenomena, that they can be ignored. But, for the record, notice that most of them are (historically at least) compounds, or other level 2 derivatives, or are obviously foreign. In fact, if they are level 2, they follow without ado from the system to be put forward and constitute no problem at all.

In (10.ii.a) We see all other examples of monomorphemic words with medial sequences of homorganic nasal obstruent clusters; in b, some forms arising in derivation at level 1, and in c, cases in which an intrusive consonant appears in derived forms. Notice again, that apart from the two examples in b', these are all homorganic nasal obstruent sequences. In d. and e. there are a few other examples which do not fit into the other categories. Those in d. can be explained away as level 2 derivatives. They are mostly forms with affixes that are no longer productive: *[[arm] let], [[bump] kin], [[vest] ment], [[oint] ment].* The true counterexamples are given in e.

So we see that the majority of counterexamples have the same structure we saw occuring after long vowels: nasal + obstruent.

Assume that the English coda may contain three positions. This third position can only be filled at level 1 by a segment which is linked to another adjacent consonant in the manner of Steriade 1982. That is, the third position is tightly constrained at level 1 by a coda condition (Ito 1986), as formalized in (11).

(11) English Coda Condition:



(Ito 1986 - after Steriade 1982)

This condition, enforced by Structure Preservation at level 1, rules out the possibility of anything mapping to the third position in a coda.

In Ito's view, the coda condition blocks the association of any violating segments to the syllable. It may be overruled, in cases in which the consonant is linked to another partial geminate structure, by the geminate constraint in the formulation of Hayes 1986. The Linking Constraint forbids a rule from applying to a multiply linked segment if the rule mentions only a single association line.

(12) Linking Constraint: (Hayes 1986)

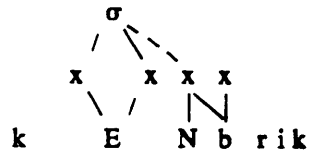
> Association lines in structural descriptions
> are interpreted as exhaustive.

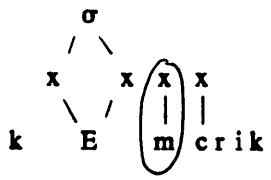
Thus, in the cases under discussion, a consonant may be incorporated, if it is multiply linked, because the coda condition mentions only a singly linked consonant. This accounts for the cases in which there is a homorganic nasal obstruent sequence.

(13)

For example, in *cambric* the [m] is incorporated into the syllable because it does not violate the coda condition. The form in b. is ruled out by the coda condition because the [m] is not linked and so cannot get in under the coda condition.

(14) .a. cambric b. *camcric





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 word must have the syllabification *ant.ler*. How does the final consonant of the first syllable get by 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. So the coda condition is ineffective. This leaves very few real counterexamples. Cases like *arctic* should be ruled out but are not so I am forced to consider them as truly exceptional. But, notice that *arctic* is often pronounced [artik].

(15) a. antler b. *arctic

If the account of these cases is acceptable, we can maintain the generalization that the syllable has a very restricted coda word-internally. This, as we shall see, makes the account of vowel shortening in English very perspicuous.

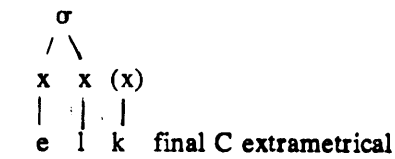
One might object that the coda constraint is an odd sort of constraint since it basically says that rimes with three positions do not exist. But recall that they do exist - after level 1. The coda condition does not have any apparent effect on three position rimes in word-final positions.

(16) keep, leave, ague, feel, goose, lift, part, lark, elk, harp

Since final consonants are regularly extrametrical, they are not available for syllabification on the first cycle. In unsuffixed words they continue into the level 2 phonology with a final stray consonant. At level 2, Structure Preservation is no longer guarding the derivation and therefore the coda constraint is no longer in force. So, on the first cycle of level 2 they are incorporated into the third rime slot of the syllable. Consider as example the derivation below:

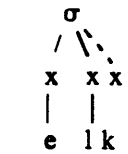
(17) elk

level 1:



final C extrametrical

level 2:

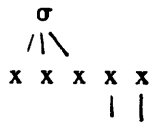


Structure Preservation off
Coda Condition no longer in force

In (18) I show an example with level 2 suffixation after the word level syllabification of a third rime position as well as an appendix consonant.

(18) worldly

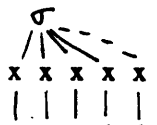
level 1:



level 2: SP off

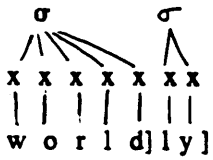
Syllabification

Level 1 governed strictly by SP
Coda condition enforced



Appendix rule

cycle 2:



In conclusion, I have posited a system of syllabification in which a Coda Condition is enforced at level 1 because of the constraining power of the principle of Structure Preservation. This condition may be overridden independently by the linking for place of the consonant/s in question.

In the next section I will discuss the evidence for this view of the process of vowel shortening in English.

3. Vowel Shortening

As shown in the examples in (19), at level 1, syllables arising in derivation, which would have the structure VVC medially and thus violate the coda condition, shorten the vowel.

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

Adopting the analysis of Myers 1985/86, I formulate the Shortening rule as in (20).

(20) CC Shortening: (Myers 1985, 1986)

$$VV \rightarrow V \,/\, \_C\ ]_{\sigma}$$

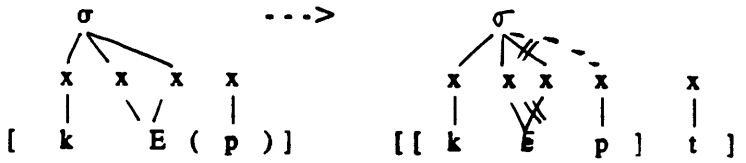
In the standard view of this process, shortening is apparently restricted to derived environments. There is no shortening found before either a single final consonant, or two final consonants as shown in the examples in (21a) below.

(21)a. node, tape, keep, fake, ague, child, wild, beast, paint, flounce

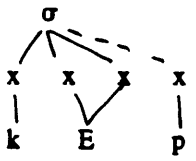
In our terms this follows instead from the fact that the final consonants are extrametrical at level 1 on the first cycle. On a subsequent cycle, syllabification of a final consonant into the rime would create a structure which violates the coda condition. Structure Preservation enforces shortening in order to remove this violation; thus *children, wilderness, kept.*

So shortening is to be seen as the automatic disconnection, due to Structure Preservation, of part of the long vowel, simultaneous with the incorporation of the consonant. Notice that on this view, the fact that the rule is restricted to the level 1 phonology is a consequence of the fact that SP is limited to level 1. So we can get forms like *dreamed, dreams,* and *wildness* etc, as opposed to *dreamt, wilderness,* because these are derived at level 2 where the coda condition has no effect because SP is off. The syllabification of a consonant doesn't do anything to the vowel. Observe below the derivations of *keep* and *kept.*[1]

(22) level 1:



level 2: SP off



A question that we should consider is: why is there no alternation with consonants similar to that discussed above for vowels? Why does the irregular *absorption* not become **absortion* or **absobtion*? English chooses to retain segments and does not have a regular epenthesis rule with which to fix up violating syllable structures which result from having to maintain these consonants[2]. But, as was pointed out to me by Alan Prince, rime structure may in part determine allomorphy. The choice of the allomorph *-ation*, rather than *-tion* may have something to do with the fact that *-tion* does not generally attach to forms with final clusters. The only cases of these, other than those with nasal obstruent sequence, are given in (23a)

(23)a. absorb + tion --> absorption **absortion* or **absobtion*
infarct + tion, sculpt + or/ure
?exerption

vs. distinction, exemption, junction etc.

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

4. The distribution of syllabic sonorants/schwa deletion in lexicalized forms

In this final section I will briefly present some facts about the distribution of syllabic sonorants in morpheme-internal positions.

Forms like *wonder, monstrous* arose historically through the operation of the rule of schwa deletion. (This rule may still be seen in operation in casual speech - eg. *choc'late, jav'lin, marv'lous*.) Presumably, the result of schwa deletion was sometimes lexicalized giving the underlying representations: /wondr/, /monstr/ rather than /wondVr/, and /monstVr/; compare *thunder* </ɵndVr/.

If this is how these forms arose, how can we explain the fact that there are no words corresponding to *wondrous* like **marvlous*? This form is possible by post-lexical schwa deletion, but it is clearly different from the other cases in that they do not allow the option of having the schwa at all.

(24)

a. wonder, wondrous vs. marvel, marvellous
*wonderous *marvlous

I suggest that only those forms which obey language particular constraints on possible syllables are lexicalized. *marvlous*, although allowed as a casual speech variant, is ruled out as a lexical possibility because no syllabification is available. *vl* is ruled out as an onset, and *arv* is not a possible rime according to what we have said before because it has three positions.

(25) *mar. vlous cf. wond.rous or won.drous
*marv.lous

It has been pointed out by Zwicky (1970) and Hooper (1976) that post-lexical schwa deletion is constrained in that the sequence of consonants resulting as output must be incorporable to the right - ie. into the followwing onset. This turns out to only be true of those cases in which the preceding syllable is a heavy one. Where a consonant may be syllabified into a rime it seems to be because there is space for it. Consider for example:

(26) every, camera, general, family ---> ev.ry, cam.ra, gen.ral, fam.ly

In conclusion, I have presented an analysis of the English rime in which thgere are three possible positions. However, these slots are constrained at level 1 by a language particluar coda condition. This means, in effect, that the rime has only two positions at level 1 - except where an additional factor, the Geminate Constraint, 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 SP has turned off at level 2, the coda condition may be violated.

In the same way we explain vowel shortening in closed syllables. In these cases. when a consonant is incorporated into the third position in the rime, the vowel is forced to shorten by SP in order to overcome the violation of the coda condition. At level 2 there is no shortening because there is no enforcement of the coda condition.

Footnotes:

*I am grateful to Lisa Selkirk and Alan Prince for discussion of the work in this paper.

1. I assume that there is some sort of principle that ensures that the phonology of English respects the integrity of segmental elements. It is this principle that forces us to syllabify the consonant and shorten the vowel, rather than, say, delete the consonant instead of syllabifying it. Because the long vowel is multiply associated, dissociation from one position won't result in a deletion of a segment. Deleting the consonant would remove that segment altogether and thereby run counter to the principle. Languages may choose to respect this principle, in which case they would have either an epenthesis rule (eg. Arabic, Yawelmani), or maintain segments like English, or not (eg. Finnish).
Melody Integrity: Respect segmental elements.

2. This is due to the Principle of Melody Integrity.

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