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Notes On English Syllable Structure

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In this paper I investigate in some detail two points (sections 1 and 3) which were raised in Lawrence 1986 but which were not given detailed enough justification there. Section 3 of this paper is basically independent of the other sections, and section 2 is an offshoot from section 1.

The work in the three sections below is not intended to be definitive in any way, but it is hoped that it will lead to further research in these and related fields.

1. Restriction on -VVCC rhymes.

In Lawrence 1986 I proposed a syllable-based treatment which derived the distribution of -ation and -tion from the underlying form without recourse to allomorphy rules. My proposal hinges crucially on the non-syllabificability of /-ent/ as a rhyme in English. It has, however, been pointed out to me that this is suspect because of the existence of syllables in /-end/ fiend, /-ant/ paint and /-int/ pint. Such evidence makes it look as if /-ent/ is an accidental gap. Here I present evidence that /-ent/ is no accidental gap.

Parallel to the existence of /-end/ but the lack of /-ent/ is the existence of /-eld/ and the lack of /-elt/. /-eld/ is found in field, yield, shield, wield, etc., but there are no syllables in /-elt/. In fact there is positive evidence that /-elt/ is not syllabifiable in the form of dealt, felt, kneel (=/-ell/) where the vowel is shortened in order to allow the /t/ into the syllable. If /-elt/ were a possible rhyme in English, the past tense of deal would be [di:lt].

There are examples of syllabified /-erd/ in wierd, beard, but there is no /-ert/. The fact that heard appears to be an example where /-erd/ is not syllabifiable suggests that /-erd/ is syllabifiable only in underived forms.²

The non-existence of /-ent/ is suggested by dreamt.
This all suggests that there is a restriction in the structure of English which does not allow stratum I syllables of the type described in (1).

(1) \[ \underbrace{XXX} \quad | \quad \underbrace{[-\text{high}] [+\text{son}]} \quad \text{t} \]

The reference to [+son] in (1) is probably not necessary, because rhymes with the structure (2) are ruled out anyway.

(2) \[ \underbrace{XXX} \quad | \quad \underbrace{[-\text{son}]} \quad \text{C} \]

We have seen that the t in (1) cannot be generalised to take in d, because of the existence of such forms as fiend, field, beard. However it does appear that t can be generalised to [+cor, -voice] to include the [+cont] segment θ. This accounts for the shortened vowel in stealth [stelθ] ← /stɛlθ/ and dearth [dɛrθ] ← /dɛrθ/. In exactly the same way as we explain the difference in vowel length between content ( -ent is not syllabifiable so is shortened) and restraint ( -ent is syllabifiable as in paint etc.), so can we explain the difference in vowel length in fifth (-īvθ and -ifθ not syllabifiable by (2)) and ninth (-înt is syllabifiable as in pint, and so presumably is -înθ).

2. Restriction on -VCC rhymes.

In section 1 we saw that there is a restriction on the vowels that can appear in syllables of the shape -VCC. There are also restrictions on the vowel in syllables of the shape -VCC when the last consonant is noncoronal. There is no /o/ in syllables of that shape. /o/ is [-high, -low], so the lack of -oCC coupled with the lack of (1) suggests that there may be a restriction like (3).

(3) \[ \underbrace{*XXX} \quad | \quad \underbrace{[-\text{high}] [+\text{cor}]} \quad \underbrace{[-\text{voice}]} \quad \text{C} \]

There is however an abundance of -A CG syllables. It has been noted
that [u] - [ʌ] contrasts are very rare in English (Chomsky & Halle 1968, 203), and this fact can be consistent with (3) only if we have a rule u → ʌ in the relevant environment. A first approximation would be (4).

\[
(4) \quad u \rightarrow \text{ʌ} / \_ \_ [^{+}\text{son}]
\]

We must now consider the exceptions to (4), pull, bull, full, wool. The common factors in these syllables are the non-nasal labial onset, the postvocalic /l/ (cf. fun, pun, bum), and the lack of a second consonant after the vowel (cf. pulp, bulk, bulb). This suggests that there is a rule (5) ordered after (4), and wolf and Fullk (note the labial onsets) would be exceptions to (4).

\[
(5) \quad \text{ʌ} \rightarrow u / [^{+}\text{lab}] \_ \_ [^{+}\text{nas}] \_ \_ [^{+}\text{son}]
\]

Or another possibility is that pulp, bulk, bulb are the exceptions in which case (6) would be ordered after a slightly simplified (5).

\[
(6) \quad \text{ʌ} \rightarrow u / [^{+}\text{lab}] [^{+}\text{cor}] \_ \_ [^{+}\text{nas}] \_ \_ [^{+}\text{son}]
\]

Whichever treatment is nearer the truth, there is little doubt that (4) is correct, and with rule (4), we can now simplify Halle & Mohanan's (1985, 108) rule of Backing Ablaut which they formulate as (7).

\[
(7) \quad \left\langle ^{<-\text{high}>}_a \right\rangle \rightarrow \left\langle ^{+\text{back}}_a \right\rangle \left\langle ^{+\text{round}}_b \right\rangle \\
\text{Condition: if } a, \text{ then } b
\]

This rule is used by words marked to undergo the rule, and is responsible for producing the past participles of such verbs as:

(8) a. i. cling, spin, shrink... 
    ii. bind, find, grind, wind 

b. break, wake, get, swear, tear...

In (7), if the input vowel is [−high], the output is [+round], and
this gives the correct result as in (8b). If the input vowel is [+high, -round] as in the examples in (8a), the output will be /i/. Short /i/ (in (8ai)) is then subject to a rule called ː-lowering (9), and long /ː/ (in (8aii)) undergoes Vowel Shift and Diphthongisation to produce the correct [aː] as required.

\[
(9) \quad R \\
\quad + \rightarrow [+\text{high}] / \quad _{-} [+\text{syl}] \\
\]

I suggest that (7) is to be simplified to (10).

\[
(10) \quad V \rightarrow 
\left[
\begin{array}{c}
  [+\text{back}] \\
  [+\text{round}] \\
\end{array}
\right]
\]

This automatically gives the correct results for (8b), and if (4) is used (8aii) is accounted for. I believe that (9) is unnecessary, and there is evidence, which we shall see below, that it is wrong anyway.

The examples in (8aii), i.e. those with underlying long /ː/, remain to be accounted for. (10) would change the /ː/ into /ʊ/. It may be that this is correct, and that after Vowel Shift and Diphthongisation have applied to give ɔː, the ɔ is unrounded to a. Another possibility is that before Vowel Shift applies, there is a rule that converts /ʊ/ to /*))/. Further evidence is required before deciding between the two possibilities.

It would now seem as though the underlying vowel in profound is /ʊ/, and in profundity this vowel is shortened (Trisyllabic Shortening) and undergoes rule (4) to become [ʌ]. But there are examples of underlying /ː/. One is foul. I take this to be /fʊl/ underlingly, and it is nominalised with the stratum 1 suffix -ʃ which we saw in section 1. The vowel in the nominalised form is shortened to give /fʊlʃ/, and presumably a low level rule changes ː into ı. Under Halle & Mohanan's set of rules, both profound and foul must have the same underlying /ː/, so filth would, by (9), turn out to be [fʊlʃ] which is incorrect.

Under the above treatment, there are now no -ʌ[+son][-cor] or -ʊ[+son][-cor] rhymes in the underlying representation of English. This brings us to -e[+son][-son]. There are only one or two -eNk
words (blenk, penk) and two -eNP words (hemp, Kemp). There are a multitude of -el[-cor] words, but possibly there is a process converting /i/ to ə in this environment (witness pilfer - pelf, kilp (kelp)), in which case (3) becomes a real possibility.

3. Restriction on -G rhymes.

In English there are such words as rhythm, prizm which have an underlying /-bm/, /-zm/ with no intervening vowel, as shown by rhythmic and prizmatic. In Lawrence 1986, in a footnote, I suggested that the lack of -wm (syllabic m after y) "is no doubt to be derived from the restriction which prohibits two labials in the onset" (33). I shall attempt to provide evidence supporting that suggestion here.

Clements & Keyser (1983, 43-4) list five restrictions on the onsets of English syllables of which the following four are relevant to what follows.

(11) a.  
\[\text{[+lab]} \text{[+lab]} \quad \text{[b]-, p]-, f]-, v]-\]

b.  
\[\{[+cor] \text{[+lat]} \quad \text{[t]-, d]-, θ]-, b]-\]

c.  
\[\text{[-son] C} \quad \text{[z]-, ə]-, z]-, v]-, b]-, w]-, v]-\]

d.  
\[\{[+strid] \text{[+cor]} \quad \text{[s]-}\]

Note that, although the exact meaning of [labial] has yet to be clarified, if the [+high,+round] vowels are [+labial] and [-high,+round] are not, the restriction (11a) would also seem to be a restriction on the rhyme in view of the fact that English has no /-up/, /-ub/, /-uf/, /-uv/, /-um/. The order of the two elements in (11a) makes no difference, but (11b) shows that, if it is to be a restriction on the rhyme (and as such (11b) applies
vacuously as the role of sonority in syllable construction already rules out such rhymes), it must be a restriction on the occurrence of the two elements in the order given by (11b), as the opposite (as in salt, fault, filth, gold etc.) is allowed.

Not only does (11a) seem to be a restriction on the onset and rhyme of English syllables, it would also seem to be a restriction on the distribution of syllabic sonorants, i.e. consonants in English which do not have vocalic nuclei at stratum 1 but which are syllabified as rhymes nevertheless. Our first indication that this might be so is the lack of -vm words to stand alongside -bm (rhythm) and -zm (prize).

Let us now take a look at the distribution of syllabic sonorants which is outlined in table 1.

Let us first look at /mn/ — the example given being abdomen. Noting that there are no forms which exhibit an alternation [-man]~[-mV], it might be considered possible to set up the underlying form as /aabdorman/ and have a vowel inserted before the n prior to all affixation. However this approach is ruled out by the fact that words like autumn, damn end in /-mn/. The underlying form of abdomen must therefore be /aabdorn/. I assume in the same way that all words on the right-hand side of table 1 have an underlying (not inserted) vowel before the stem-final sonorant. The forms on the left-hand side have no underlying vowel in the same position.

Note that there are no -vr, -vl, -zr, -zl sequences on the left-hand side of table 1. If (11a-d) were restrictions on the distribution of syllabic sonorants, the above sequences would be ruled out as an automatic consequence of (11c). (11c) would also rule out -bm and -zm sequences. It is, however, often assumed in the literature, apparently without adequate justification, that -bm, -zm are underlingly -wm, -sm sequences (e.g. Bailey 1978, 2, 8). We are forced to adopt this option.

There is no -tl or -dl, a fact which appears to be related to (11b). But there is direct evidence that -tl does in fact exist. The word nestle [nestl], from nestl, is obviously /nsetl/. Other examples are curdle /kVrdl/, handle /handl/, startle/startl/, throttle /θr3tl/ and windle /windl/. It appears that -tl/-dl
| theatrie | /tr/ | slaugerous |
| lustrous | /str/ | pesteroous |
| monstrous | /nstr/ | alteration |
| filtrate | /ltr/ | odorosous |
| central | /ntr/ | founderous |
| cedrine | /dr/ | murderess |
| hind(e)rance | /ndr/ | glamorous |
| | /drr/ | lecherous |
| | /mr/ | dangerous |
| | /dr/ | ulcerous |
| | /sr/ | cancerous |
| | /nsr/ | rigorous |
| ogress | /gr/ | rancorous |
| hungry | /ngr/ | vaporeous |
| mediocrtiy | /kr/ | |
| chaucrous | /nkr/ | |
| lepruous | /pr/ | |
| fibrous | /br/ | |
| cumbrance | /mbr/ | |
| coffret | /fr/ | sufferance |
| | /vr/ | severance |
| | /stl/ | crystalloid |
| | /ndl/ | scandalous |
| | /nl/ | crenelate |
| | /sl/ | fossilise |
| | /nsl/ | cancelation |
| | /zl/ | dieselise |
| multiply | /pl/ | |
| amplify | /mpl/ | |
| noblesse | /bl/ | |
| resemblance | /mb1/ | |
| cyclic | /kl/ | libellous |
| | /vl/ | |
| | /tn/ | nickelie |
| | /kn/ | civilise |
| | /zn/ | matinal |
| | /mm/ | lichenous |
| | /jm/ | resinos |
| | /nm/ | abdomeonal |
| | /nn/ | regional |
| | /nm/ | venomous |
| | /stn/ | customary |
exists only in derived environments.

There is no -sr. This at first blush would appear to be related to (11d), but there is also no -sl which would then be unaccounted for. According to Clements & Keyser (1983, 43), Halle & Vergnaud in a 1979 paper have suggested that the lack of sr could be attributed to a rule s → f / __ r. We cannot, however, use this to explain the distribution of syllabic consonants because there is apparently no -fr, as the last example in (12) indicates.

(12) a. janitor janitress
editor editress
exactor exactress
supporter supportress
tempter temptress
founder foundress
b. diviner divineress
confessor confessress
archer archeress
usher usheress

The distribution of -Cr (12a) and -CVr (12b) coincides with the distribution of underlying sonorant consonants observed in table 1. I have no explanation for the absence of -fr, -Cr (note archeress, not *[artfres*]) and -sr.

The lack of -mr is probably to be explained by -mr → -mbr, parallel to the well attested -ml → -mbl, the effects of which are seen in (13).

(13) gamble game /gɔml/
humble humility /hʌml/
semblance seem /sɛml/
tremble tremor tremulous /treml/ /

The forms in (13) are interesting in two respects. First note the y inserted in tremulous. This y is inserted before -ar, -ous, and -ate between the stem final l and a preceding m (as in tremble - tremulous /treml/), b (as in fable - fabulous /fæbl/), g (as in angle - angular /æŋgl/), k (as in muscle - muscular
and p (people - popular /pepl/ with backing ablaut). We can now explain why there are no examples of y being inserted after l and d. It is because of the paucity of words which end in -li and -di.

The second interesting point is the alternation of vowel length observed in three of the four words in (13), and also in the pair throat - throttle /θrɔtl/. I suggest that these alternations do not fall out from Halle & Mohanan's (1985, 77) Cluster Shortening, given here as (14).

\[(14) \quad [-\text{cons}] \rightarrow [-\text{cons}] / \ X X \]

If, for gamble and semblance, the relevant shape is \(\text{\~V}ml\), the structural description of (14) is not met because \(l\) is not part of the rhyme. If the relevant form is \(\text{\~V}ml\), the most reasonable assumption is that the \(b\) is the onset to the syllable the rhyme of which is \(l\), in which case again the structural description is not met. For the structural description to be met, the \(b\) must be tautosyllabic with the \(m\), and this means that the first syllable is being made more marked (CVC \(\rightarrow\) CVCC) at the expense of the presumably marked onsetless next syllable.

\textit{Humble} /h\~nml/ is most instructive. The vowel cannot be shortened at the cyclic stratum \(l\) unless the form is derived, and it can only be derived through the insertion of material (i.e., with the application of a structure building process). The material inserted is \(b\) (taking point of articulation features from \(m\) and other features from the following sonorant. cf. Hayes 1986, 476). This gives the structure in (15).

\[(15) \quad \text{h} \ X \text{m} \text{b} \text{l} \]

The \(b\) must now be syllabified. \(b\) must obviously become the onset for the ultimate syllable, but then there is no reason for \(\text{\~A}\) to be shortened. Let us assume that (re)syllabification proceeds from
left to right (a common assumption in the literature). First the first rhyme is looked at, but b cannot join that rhyme because -VC[-cor] rhymes are not permitted. In an attempt to put b in that syllable the vowel is shortened (parallel to fifth, stealth, dearness, dream etc. given in section 1, and the forms given in Lawrence 1986). Assume that even then b is not syllabified in the standard modern day English dialects, and so the resyllabification process proceeds to the next syllable where b becomes the onset. In those dialects where b does become part of the first syllable, the b is resyllabified as the onset in the next syllable when the resyllabification process moves on to the next syllable, so there is no surface difference between dialects with respect to the above forms.

What leads me to think that b is not syllabified as part of the rhyme in humble? There is the well-known distribution in (16).

\[(16) \quad \text{Nn} \rightarrow \text{nb} \rightarrow \text{m} \]
\[\text{Nd} \rightarrow \text{nd} \]
\[\text{Ng} \rightarrow \text{ng} \rightarrow \text{n} \]

The first step, nasal assimilation, does not require that the two segments be tautosyllabic, as imbalance (/iN]b[e]lVENs/) demonstrates. The question to be asked is why d is not deleted but b and g are. I suggest that this is connected with the fact that coronal obstruants are more easily syllabified than non-coronial obstruants — note that only a coronal can be syllabified as the second member of the coda. If b and g are not syllabifiable after N, then they will automatically be deleted as floating material at the end of the stratum (see Lawrence 1986). Halle & Mohanan (1985, 95) have a rule called Noncoronal Deletion to effect the deletion of postnasal b and g, but the noncoronal segment is deleted only when standing at the end of a morpheme (at a stratum 2 boundary). This however provides no explanation for the lack of forms like -Vmbg- and -Vmg- in English. Under the syllable-based method proposed here, the lack of forms like -Vmbg- falls out without special devices.

Halle & Mohanan's, Noncoronal Deletion is ordered at stratum 2
after Nasal Assimilation which is likewise ordered at stratum 2. Nasal Assimilation is a structure building process so can be ordered at the cyclic stratum 1, and Noncoronal Deletion becomes unnecessary.

We have now explained the vowel shortening in humble, gamble etc. The unsyllabified b is the ultimate cause, vowel shortening taking place to allow the b to be syllabified. The problem now becomes throttle /0r3t1l/ which has no unsyllabified material to trigger shortening. One difference between liger /t1gr/, where the vowel is not shortened, and throttle is that -gr is a possible syllable (see table 1) whereas -ll is not. I am not certain of the exact mechanism to be used to account for the shortening of the vowel, but the distinction between the syllable which has an onset (-gr in liger) and the onsetless rhyme (-l in throttle) appears to be crucial, and so the vowel shortening would seem to be a blind attempt to provide the rhyme with an onset, or to reduce the markedness of the form as a whole. That it is indeed the particular consonant sequences which decide whether a vowel will be shortened or not, and not only the distinction between derived (throttle) and nonderived (tiger) forms, is evidenced by the forms southern, southerly and eastern, easterly. The vowel in south, whatever it is (see note 3), is long but is shortened in souther- /s1bərl/, but the long vowel in east is not shortened in easter- /ɛst1r/. Both forms here are derived. The difference is that in easter- the r has an onset as in (17).

(17)  \[ \begin{array}{c}
R \quad O R \\
| \quad \quad | \\
e \quad s \quad t \quad r 
\end{array} \]

On the other hand, the tautosyllabic sequence br is not permitted so before vowel shortening we have (18), a situation identical to that observed in throttle /0r3t1l/.

(18)  \[ \begin{array}{c}
O \quad R \quad R \\
| \quad \quad | \\
s \quad V \quad b \quad r 
\end{array} \]

Returning now to the main stream of this section, we have
the three cases in (19) where the $z[+lab][+lab]$ restriction applies.

(19) a.  

$$
\begin{array}{c}
+lab \\
\hline
+lab \\
\end{array}
\quad zp\text{-}, \ b\text{-}, \ ...
$$

b.  

$$
\begin{array}{c}
+lab \\
\hline
R \\
\hline
+lab \\
\end{array}
\quad z\text{-up}, \ -ub, \ ...
$$

c.  

$$
\begin{array}{c}
+lab \\
\hline
R \\
\hline
R \\
\hline
+lab \\
\end{array}
\quad z\text{-v}\text{m}
$$

The same situation exists for the other restrictions given in (11b-d). If we take $O$ and $R$ to be nothing more than convenient shorthand for the configurations in (20), and if $O$ and $R$ are basically the same (say $Q$, with their differences deriving from their different positions in the syllable), the restrictions in (19) can be derived from (21), and much of the distribution observed in table 1 can be derived when (11) is reformulated along the same lines.

(20)  

$$
\begin{array}{c}
O \\
\hline
O \\
\end{array}
\quad R \\
\hline
R \\
\hline
R \\
\end{array}
$$

(21)  

$$
\begin{array}{c}
+lab \\
\hline
Q \\
\hline
Q \\
\end{array}
\quad z \\
$$

Some gaps in table 1 are not accounted for by the restrictions in (11). The complete absence of syllabic $n$ in the sequence $-Cn$ is unexplained. The situation is similar to that of $-ll/-dl$ in that $-Cn$ sequences appear to exist only in derived forms (as in hasten /hæstn/). In Lawrence 1986 I offered an account of the syllabification of resign (underlyingly /rēsīgn/). It relies on $n$ not being a possible syllabic consonant in English, but why this is so is what is unexplained. Also unexplained is the lack of syllabic $m$ after non-continuant segments (note phlegm /flegm/, drachm /drækm/).
I am indebted to Morris Halle without whose comments on Lawrence 1986 this paper would never have been written. Masao Okazaki, who should have been busy with Old English and his MA thesis, somehow found time to give me detailed comments on a draft of this paper which resulted in many changes, but I alone am to blame for any remaining inadequacies.

1 This process whereby the vowel is shortened in order to make possible the syllabification of otherwise unsyllabified material is introduced in Lawrence 1986 where it is shown to be superior to Halle & Mohanan's (1985, 77) Cluster Shortening if -ent is not an accidental gap. Further examples of this process are given in section 3.

That a long vowel is shortened, in preference to a consonant being deleted, would appear to be connected to the principle of recoverability of deletion (Chomsky 1981).

2 For /-êrd/ to be syllabifiable in underived words but not syllabifiable in words derived at stratum 1, syllabification of underived words must be different from resyllabification. One possibility is to have underived words syllabified at a pre-stratum 1 stratum, say stratum 0.

Note that there are no stratum 1 derived rhymes of the shape (i).

\[
\begin{array}{cccc}
X & X & X & X \\
\text{[-high]} & \text{[-low]} & C & C \\
\end{array}
\]

The restriction in (1) would therefore be a restriction on syllabification at stratum 0 and (i) would be a stratum 1 restriction.

3 This rule should have its structural description extended to the position before g, and possibly k (note the alternation south ~ southern, where the underlying vowel is probably /û/).

4 This rule should have its structural description extended to the position before l and ñ.

5 This claim, which is also found in Lawrence 1986, is revised below.
6 [ɔi] is also excluded from appearing with [+labial] segments (with the exception of coif), supporting the suggestion that [ɔi] is underlyingly /ʊ/ or /ɨ/ (see Halle and Mohanan 1985, 102). In section 2 I proposed that /ʊ/ does exist but that it surfaces as [aw] if not shortened, so it follows that [ɔi] derives from /ʊ/, the only other [+labial] possibility.

[ɔi] also does not appear before ɛ, ɨ, ɡ, o and l. It is noteworthy that /u/ does not appear before g, and there is only one example of /uθ/ (crwth). The examples of /uɛ/ (putsch) and /uʃ/ (push, bush, whoosh) all begin with non-nasal labials. See note 4.

7 The vowel shortening process used here and explained in Lawrence 1985 supersedes the Cluster Shortening rule of Halle & Mohanan. Contrary to Halle & Mohanan, this process cannot be collapsed with Trisyllabic Shortening as numeral and number show. Numeral is derived as /nʌmləl/ (cf. numeric), and is an exception to Trisyllabic Shortening. The morpheme /nʌm]/ is therefore marked as an exception. Number is derived as /nʌm]/, which, parallel to humble, undergoes vowel shortening. If this vowel shortening and Trisyllabic Shortening are but parts of the same rule, we would expect /nʌm]/ in number to be an exception to vowel shortening.

8 The dialects referred to here where b is syllabified after nasals are those historical dialects of English where the b of climb, comb etc. was pronounced.

REFERENCES


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