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 /-ēnt/ as a rhyme in English. It has, however, been pointed out to me that this is suspect because of the existence of syllables in /-ēnd/ fiend, /-ǣnt/ paint and /-īnt/ pint. Such evidence makes it look as if /-ēnt/ is an accidental gap. Here I present evidence that /-ēnt/ is no accidental gap.

Parallel to the existence of /-ēnd/ but the lack of /-ēnt/ is the existence of /-ēld/ and the lack of /-ēlt/. /-ēld/ is found in field, yield, shield, wield, etc., but there are no syllables in /-ēlt/. In fact there is positive evidence that /-ēlt/ is not syllabifiable in the form of dealt, felt, knelt (-ĕllt) where the vowel is shortened in order to allow the t into the syllable.[1] If /-ēlt/ were a possible rhyme in English, the past tense of deal would be [di:lt].

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

The non-existence of /-ēnt/ is suggested by dreamt.

This all suggests that there is a restriction in the struc-
ture of English which does not allow stratum 1 syllables of the
type described in (1).

(1)   X X   X   X
       \\/ | |
    [-high] [+son] t
    [-low]
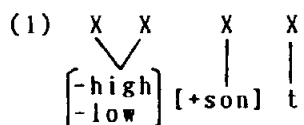
The reference to [+son] in (1) is probably not necessary, because
rhymes with the structure (2) are ruled out anyway.

(2)   X X   X   X
       \\/ | |
        V   [-son]   C
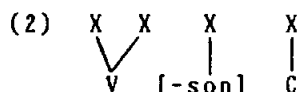
We have seen that the t in (1) cannot be generalised to take
in d, because of the existence of such forms as fiend, field, beard.
However it does appear that t can be generalised to [+cor,-voice]
to include the [+cont] segment θ. This accounts for the shortened
vowel in stealth [stelθ]← /stēl]θ/ and dearth [dərθ] ←/dēr]θ/.
In exactly the same way as we explain the difference in vowel
length between content (-ēnt is not syllabifiable so is shortened)
and restraint (-ænt is syllabifiable as in paint etc.), so can we
explain the difference in vowel length in fifth (-īvθ and -īfθ not
syllabifiable by (2)) and ninth (-īnt is syllabifiable as in pint,
and so presumably is -īnθ).

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 -V̄CC. 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)   *   X   X   X
            | | |
         [-high] C [-cor]
         [-low]   [-voice]
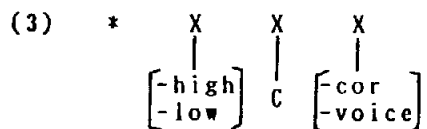
There is however an abundance of -ʌCC syllables. It has been noted

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 u̠ → ʌ̠ in the relevant environment. A first approximation would be (4).[3]

(4)
$$u \rightarrow \Lambda \ / \ \underline{\quad} \ \overset{\textstyle R}{\underset{\textstyle [+son]}{|}}$$

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)[4] ordered after (4), and wolf and Fulk (note the labial onsets) would be exceptions to (4).

(5)
$$\Lambda \rightarrow u \ / \ \begin{bmatrix} +lab \\ -nas \end{bmatrix} \ \underline{\quad} \ \overset{\textstyle R}{\underset{\textstyle l}{\cancel{|}}}$$

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

(6)
$$\Lambda \rightarrow u \ / \ \begin{bmatrix} +lab \\ -nas \end{bmatrix} \ \underline{\quad} \ \overset{\textstyle R}{\underset{\textstyle l \ [-cor]}{\frown}}$$

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)
$$\begin{bmatrix} V \\ <-high>_a \end{bmatrix} \rightarrow \begin{bmatrix} +back \\ <+round>_b \end{bmatrix}$$
Condition: if a, 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 /ɨ/. Short /ɨ/ (in (8ai)) is then subject to a rule called ɨ-Lowering (9), and long /ɨ̄/ (in (8aii)) undergoes Vowel Shift and Diphthongisation to produce the correct [aw] as required.

(9)
$$\ddot{\imath} \rightarrow [\text{-high}] \; / \; \underline{\quad} \quad \overset{\displaystyle R}{\underset{\displaystyle [\text{-syl}]}{\mid}}$$

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

(10) $V \rightarrow \begin{bmatrix} +\text{back} \\ +\text{round} \end{bmatrix}$

This automatically gives the correct results for (8b), and if (4) is used (8ai) 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), ie. those with underlying long /ī/, remain to be accounted for. (10) would change the /ī/ into /ū/. It may be that this is correct, and that after Vowel Shift and Diphthongisation have applied to give ɔw, the ɔ is unrounded to a. Another possibility is that before Vowel Shift applies, there is a rule that converts /ū/ to /ɨ̄/. Further evidence is required before deciding between the two possibilities.

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

Under the above treatment, there are now no -ʌ[+son][-cor] or -o[+son][-cor] rhymes in the underlying representation of English. This brings us to -e[+son][-son]. There are only one or two -eNk

words (<u>blenk</u>, <u>penk</u>) and two -<u>eNp</u> words (<u>hemp</u>, <u>kemp</u>). There are a
multitude of -<u>el</u>[-cor] words, but possibly there is a process
converting /i/ to <u>e</u> in this environment (witness <u>pilfer</u> - <u>pelf</u>,
<u>kilp</u> (<u>kelp</u>)), in which case (3) becomes a real possibility.

3. Restriction on -C rhymes.

In English there are such words as <u>rhythm</u>, <u>prizm</u> which have
an underlying /-ðm/, /-zm/[5] with no intervening vowel, as shown by
<u>rhythmic</u> and <u>prizmatic</u>. In Lawrence 1986, in a footnote, I
suggested that the lack of -<u>vm</u> (syllabic <u>m</u> after <u>v</u>) "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. *

         [+lab] [+lab]   *<u>bw</u>-, <u>pw</u>-, <u>fw</u>-, <u>vw</u>-

       b. *

$$\begin{bmatrix} +cor \\ -strid \end{bmatrix} \quad [+lat]$$

                         *<u>tl</u>-, <u>dl</u>-, <u>θl</u>-, <u>ðl</u>-

       c. *

$$\begin{bmatrix} -son \\ +cont \\ +voice \end{bmatrix} \quad C$$

                      *<u>zl</u>-, <u>ðr</u>-, <u>zw</u>-, <u>vr</u>-, <u>ðw</u>-, <u>vl</u>-

       d. *

$$\begin{bmatrix} +strid \\ +cor \end{bmatrix} \quad \begin{bmatrix} +cor \\ +low \end{bmatrix}$$

                         *<u>sr</u>-

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/.[6] 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, ie. 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 -ðm
(rhythm) and -zm (prizm).

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 [-mən]∼
[-mnV], it might be considered possible to set up the underlying
form as /æbdɔmn/ 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 /æbdɔmVn/. 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 -ðm and -zm sequences. It is, however, often assumed in
the literature, apparently without adequate justification, that
-ðm, -zm are underlyingly -θm, -sm sequences (eg. 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 [nesl], from nest, is obviously /nestl̩/. Other
examples are curdle /kVrdl̩/, handle /hændl̩/, startle /startl̩/,
throttle /θrɔ̄tl̩/ and windle /wīndl̩/. It appears that -tl/-dl

theatric	/tr/	slauterous
lustrous	/str/	pesterous
monstrous	/nstr/	
filtrate	/ltr/	alteration
central	/ntr/	
cedrine	/dr/	odorous
hind(e)rance	/ndr/	founderous
	/rdr/	murderess
	/mr/	glamorous
	/čr/	lecherous
	/nĵr/	dangerous
	/lsr/	ulcerous
	/nsr/	cancerous
ogress	/gr/	rigorous
hungry	/ngr/	
mediocrity	/kr/	
chancrous	/nkr/	rancorous
leprous	/pr/	vaporous
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/	libellous
resemblence	/mbl/	
cyclic	/kl/	nickelic
	/vl/	civilise
	/tn/	matinal
	/kn/	lichenous
	/zn/	resinous
	/mn/	abdomenal
	/ĵn/	regional
	/nm/	venomous
	/stm/	customary

Table 1

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 → ʃ / __ r. We cannot, however, use this to explain the distribution of syllabic consonants because there is apparently no -ʃr, 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   confessoress
         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 -ʃr, -čr (note archeress, not *[artʃres]) 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   /gæml/
      humble   humility   /hʌml/
      semblance seem   /sēml/
      tremble   tremor   tremulous   /treml/

The forms in (13) are interesting in two respects. First note the u inserted in tremulous. This u 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

/mʌskɪ/) and p (<u>people</u> - <u>popular</u> /pepl/ with backing ablaut). We
can now explain why there are no examples of u being inserted
after t and d. It is because of the paucity of words which end in
-<u>tl</u> and -<u>dl</u>.

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

(14)   [-cons] → [-cons]   / __ X X
               X   X   X   R
                 R   R

If, for <u>gamble</u> and <u>semblance</u>, the relevant shape is V̄ml, the
structural description of (14) is not met because l is not part
of the rhyme. If the relevant form is V̄mbl, 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 (CV̄C→ CV̄CC) at the expense of the
presumably marked onsetless next syllable.

   <u>humble</u> /hʌ̄ml/ is most instructive. The vowel cannot be
shortened at the cyclic stratum 1 unless the form is derived, and
it can only be derived through the insertion of material (ie.,
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)   O   R   R
       | ∧ |
       h ʌ̄ m b l

The b must now be syllabified. b must obviously become the onset
for the ultimate syllable, but then there is no reason for ʌ̄ 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 b̲ cannot join that rhyme because -V̄C[-cor] rhymes are not permitted. In an attempt to put b̲ in that syllable the vowel is shortened (parallel to fifth, stealth, dearth, dreamt etc. given in section 1, and the forms given in Lawrence 1986).[7] I assume that even then b̲ is not syllabified in the standard modern day English dialects, and so the resyllabification process proceeds to the next syllable where b̲ becomes the onset. In those dialects where b̲ does become part of the first syllable,[8] the b̲ 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 b̲ is not syllabified as part of the rhyme in humble? There is the well-known distribution in (16).

(16)   Nb →   mb →   m
        Nd →   nd
        Ng →   ŋg →   ŋ

The first step, nasal assimilation, does not require that the two segments be tautosyllabic, as imbalance (/iN]bælIVNs]/) demonstrates. The question to be asked is why d̲ is not deleted but b̲ and g are. I suggest that this is connected with the fact that coronal obstruents are more easily syllabified than non-coronal obstruents — note that only a coronal can be syllabified as the second member of the coda. If b̲ and g are not syllabifiable after N̲, then they will automatically be deleted as floating material at the end of the stratum (see Lawrence 1986). Halle & Mohanan (1985, 96) have a rule called Noncoronal Deletion to effect the deletion of postnasal b̲ and g̲, 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 -Vŋgd- 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 /θrɔtll/ which has no unsyllabified material to trigger shortening. One difference between tiger /tīgr/, where the vowel is not shortened, and throttle is that -gr is a possible syllable (see table 1) whereas -tl 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 tiger) 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- /sʌðlrl/, but the long vowel in east is not shortened in easter- /ēstlrl/. Both forms here are derived. The difference is that in easter- the r has an onset as in (17).
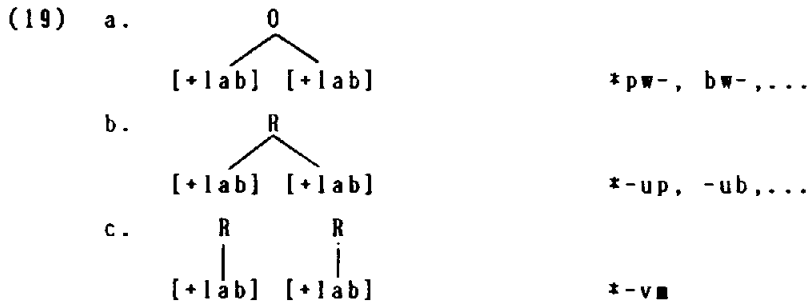
(17)   R   O R
         | ╱│ |
         e̅ s t r

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 /θrɔtll/.

(18)   O R   R
         | ╲ |
         s V̄ð r

Returning now to the main stream of this section, we have

the three cases in (19) where the *[+lab][+lab] restriction applies.

(19) a.   0

        [+lab] [+lab]   *pw-, bw-,...

    b.   R

        [+lab] [+lab]   *-up, -ub,...

    c.   R   R

        [+lab] [+lab]   *-vm

The same situation exists for the other restrictions given in (11b-d). If we take 0 and R to be nothing more than convenient shorthand for the configurations in (20), and if 0 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)   0   R

        0   0   R   R

(21) *   Q   Q

        [+lab] [+lab]
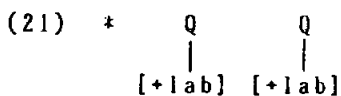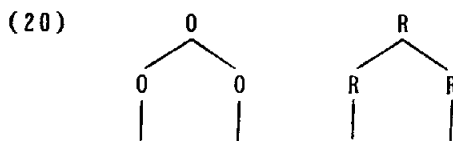
Some gaps in table 1 are not accounted for by the restrictions in (11). The complete absence of syllabic n̲ in the sequence -Cn̲ is unexplained. The situation is similar to that of -t̲l̲/-d̲l̲ in that -Cn̲ sequences appear to exist only in derived forms (as in hasten /hæst]n/). In Lawrence 1986 I offered an account of the syllabification of resign (underlyingly /rēsīgn/). It relies on n̲ not being a possible syllabic consonant in English, but why this is so is what is unexplained. Also unexplained is the lack of syllabic m̲ after non-continuant segments (note phlegm /flegm/, drachm /drækm/).

NOTES

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 -ḗnt 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 /-ērd/ 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).

(i)   X X   X   X
        \/ | |
     [-high]   C   C
     [-low]
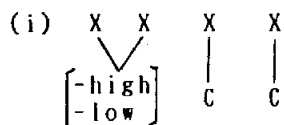
The restriction in (1) would therefore be a restriction on syllabification at stratum 0 and (i) would be a stratum 1 restriction.

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

[4] This rule should have its structural description extended to the position before ʃ and x̌.

[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 /ū/ or /ū̄/ (see Halle and Mohanan 1985, 102). In section 2 I proposed that /ū/ does exist but that it surfaces as [aw] if not shortened, so it follows that [ɔi] derives from /ū̄/, the only other [+labial] possibility.

[ɔi] also does not appear before č, ǰ, g, θ and ʃ. It is noteworthy that /u/ does not appear before g, and there is only one example of /uθ/ (crwth). The examples of /uč/ (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 1986 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 /nǖm]er]al/ (cf. numeric), and is an exception to Trisyllabic Shortening. The morpheme /nǖm]/ is therefore marked as an exception. Number is derived as /nǖm]r/, which, parallel to humble, undergoes vowel shortening. If this vowel shortening and Trisyllabic Shortening are but parts of the same rule, we would expect /nǖm]/ 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.

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