ON SOME /n/-FINAL PREFIXES, BOUNDARIES AND NASAL ASSIMILATION

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O. INTRODUCTION

Since the beginning of the generative tradition in phonology it has been obligatory for phonological boundaries to receive morphosyntactic motivation. Yet, substantive evidence for positing specific boundaries in particular cases has been drawn mostly from the observation of phonological interactions of neighbouring formatives. While this phonological bias has admittedly led to some inconsistencies and problems in handling morphology (see Öhlander's criticism (1976:141—53) of SPE on this point), it is fairly easy to understand why phonological evidence has been so vigorously studied. After all, it is in phonology that grammatical boundaries manifest themselves most openly.

Yet, phonological interaction of formatives is not indiscriminately free. Some classes of morphemes easily undergo phonological processes at or over certain boundaries, others are fairly stable and the amount of allomorphy is slight. In such cases it is particularly difficult to find sufficient phonological evidence to support morphosyntactic motivation for a specific boundary at a given intramorphemic gap. One such class of English morphemes notorious for exhibiting little phonological interaction in the vicinity of boundaries is the class of derivative prefixes. In the words of Marchand (1969:90), "With the exception of /ɛn-, ɛm-/whose variants are phonetically predictable, prefixes have the same phonic form in all conditions ...". This statement obviously needs a qualification but its general validity has been indirectly proved by the fairly limited interest that English prefixes have received so far in generative phonology. They were quite simply not allomorphic enough to constitute interesting evidence for positing or defending phonological solutions.

The aim of this paper is to investigate one interesting subclass of English prefixes, the one that perhaps exhibits most allomorphy: the /n/-final prefixes (all lexical material taken from *The Shorter Oxford English Dictionary*, edited

by C. T. Onions, 1956). The prefixes to be discussed, therefore, are (phonologically): *in-*, *en-*, *un-*. The allomorphy exhibited (or blocked) is a result of (basically) three fairly general phonological rules, evidence for which comes from many different and divergent areas of English phonology: Nasal (Place of Articulation) Assimilation (NA), (Nasal) Complete Assimilation (CA) and Cluster Simplification (CS). The first two rules will be of main interest here, generating phonetically the following prefixal allomorphs: [in, im, ir, il, iŋ, iɱ, iɲ, iɴ, ən, əm, əŋ, əɱ, əɲ, əɴ, ʌn, ʌm, ʌɲ, ʌɱ, ʌŋ, ʌɴ]. (Some of these are, however, unattested or exceptional; compare remarks on page 90 and table 4).

The nature of phonological processes generating allomorphy will be considered as they interact with the morphosyntactic boundaries that may be present between the prefixes discussed and the stems. The character of these boundaries will be investigated. The syllable boundary, however, will not be taken into account, which is not to deny the possibility of getting some interesting new insights from investigating its function in the processes here considered (cf. in particular Hooper 1972). The general framework assumed here is basically that of the standard SPE type, including in particular the readjustment and the cyclic components.

The present paper is divided into three parts: 1. prefixes, 2. boundaries, 3. rules. The first part will include an excursus on compounding as it interacts rather closely with the issues under discussion.

1. PREFIXES

Morphosyntactically and semantically, *in-* represents two different morphemes: the negative adjectival prefix, as in *inapplicable* and the 'adverbial particle' prefix, as in *inmesh*. Phonologically, however, there is little ground to treat the two prefixes differently. It will be shown that the assimilation processes affecting them and the boundaries separating them from the stems are by and large identical. In this respect they both form a class vis-à-vis another /in-/ initial class of lexical items, namely /in-/ initial locative compounds. While compounding lies outside the scope of this paper, some discussion seems in order here.

Perhaps the most conspicuous feature of *in-* functioning as the first element of compounds is its stress. While as a prefix *in-* never carries heavy stress and can only be secondarily stressed for rhythmic reasons (*indiscriminate, impersónify*), in compounds it typically carries primary stress: *income, inlet, insight, indwelling, infighting, inborn, ingrown, indoors, incoming, ingathering*.

Another feature, which is of particular interest here, is that in compounds there is virtually (with reservations to be specified later) no phonological interaction between *in-* and the second element. In particular, there is no as-

similation of the nasal to the following consonant:

-b...	-p...	-m...	-l/r...
inborn	in-process	in-migrant	in-land
inboard	in-patient	inmate	in-law
in-brother	in-party	inmeats	inlet
in-breeding	in-pile	inmilk	in-road
in-breath	input	in-maintenance	in-rush

Table 1

These two facts (heavy stress and lack of NA) plus an obvious syntactic argument for treating *in* as a 'major category'[1] in these cases furnish evidence for positing a full word boundary /##/ between the two elements of a compound. This boundary will block assimilation and will correctly make *in-* compounds subject to Compound Stress Rule, as formulated in SPE (p. 92). There is one important problem here, however. There is a class of verbs where the lack of assimilation would suggest positing a strong word boundary /##/: *inbréed inbúrst, inbúild, inbind, inpóur, inmésh, inláy, inláw, inlét*. The stress, however, falling on the second element, is not assignable by the SPE regular compound rule. While Marchand points out that verbal composition is fairly infrequent in present-day English (Marchand 1969:59), the paradoxical class of verbs needs explanation. It is hard to decide whether these combinations should be treated as compounds exempted from Compound Rule (in its SPE formulation; see note 2) or as prefixal derivatives (like *imbed, impack, immingle*) exempted from NA, which otherwise affects such dervatives quite freely. It seems that the former solution is preferable as otherwise this class of verbs would constitute absolute exceptions within the *in-stem* pattern, where *in-*particle is always assimilated.[2]

Whether *con-* and *syn-* are regarded as prefixes or as etymological elements of loanwords depends on the vexed question of the analysability of complex

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[1] Probably as Adv or as Adj. But this is a difficult question. SPE did not treat adverbs as a 'major category' but others (og. Sommerstein 1977: 147) did. Perhaps we can make the categorial specification of *in-* in compounds dependent on that of the second element:

[in]$_{Adj}$ if second element is a noun,

[in]$_{Adv}$ if second element is a verb or adjective.

[2] It is also tempting to exempt these verbs from Compound Rule thereby automatically allowing them to undergo Nuclear Stress Rule, which in SPE (92) is disjunctively ordered with respect to the former. This would assign correct final stress to the compound verbs under discussion. A similar solution is suggested in Halle and Keyser (1971:21) whereby postressed compounds like *Mádison Róad* are exceptions to the first expansion, which is like Nuclear Stress Rule except for being restricted to lexical categories: ...$/[\#\#X--Y\#\#]_{(N,V,A)}$.

lexical items of foreign origin in the English vocabulary.[3] The concensus of linguistic opinion seems to favour the solution regarding *con-* and *syn-* as non-prefixes (Marchand, Aronoff, Fisiak) and stating that derivative affixes can only be attached to independent lexical items, forming a semantically compositional whole (in fact, the whole Aronoff's theory of word-formation (Aronoff 1976) is organized on this principle) — the behaviour that *con-* and *syn-* never exhibit. Yet, the high incidence of *con-* and *syn-* as formatives in the learnéd (or latinized) part of the lexicon has prompted some linguists to regard these and similar strings *de-*, *re-*, *ab-*, *ad-*, *ex-* as at least partly 'prefixal' (Chomsky and Halle, Jackendoff). While *con-* and *syn-* will not be discussed here, in much detail, they will be brought forward to support certain solutions, as they show the alternation of the final nasal which is investigated in this article.

In this way, additional evidence for the investigation of prefixes will come from the analysis of formatives which are more-than-prefixal (locative compound *in-*) on the one hand and less-than-prefixal *con-*, *syn-* on the other.

The question of whether a formative is a prefix or not, is more difficult than the above discussion would indicate. Synchronically, it is fairly difficult to decide whether *im-* in *impress* is a prefix any more than *de-* in *depress*, *re-* in *repress* or *ex-* in *express*. While *impress* seems semantically a little more freely analysable than the rest of the set, this may be due to the mental association with a verb+particle combination ('phrasal verb') like *press in*. This association, however 'psychologically real' though it may be, is irrelevant to the question of analysability of such items as *impress*. Incidentally, a pre-position of the particle in *press in* would give us a compound (if anything at all) **inpress* and not a prefixal construction (cf.: *pour in/inpour*, *put in/input*, *rush in/inrush*, etc).

Semantic arguments concerning the compositionality of such derivatives are notoriously unreliable. While *impress* is not a compositional semantic unit, other latinate stems may exhibit closer meaning affinity to their derivatives: *implant*, *immix*, *imban*. Semantic compositionality and productivity of a pattern are evidently relative and not absolute. To obtain a binary decision in cases such as *im-press* on semantic grounds, then, seems to be hardly at all possible.

Diachrony would probably furnish an answer in (most) problems of this kind but this would leave us with a host of idiosyncratic cases where a general

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phonological solution would be all the more difficult to find. Even Marchand is forced to say (1969:115): "...it is practically impossible to tell whether in this or that word the prf [prefix — WS] is Latin or native *in-* though in learned words the prf *can safely be considered* as Latin" (emphasis mine — WS).

Synchronically, then, the only consolation left to us is the comparatively limited number of cases like *impress* (the class includes: *implant, impart, immerge, immix, imbrute, imprison, impaint, imban, immigrate, impose, implosion*, and some others) with the *in-*part and the stem functioning both as an element of loanwords and as an independent formative. As an arbitrary ad hoc solution for the purposes of this paper *impress*-type combinations are regarded as legitimate prefixal dervatives formed on the basis of independent lexical items.

There is less difficulty with the *in-*neg prefix. In the majority of cases it forms derivatives by attachment to full lexical words and therefore its status as a legitimate prefix cannot be doubted. Yet, there is a remainder of cases where the prefix, retaining its negative meaning, shows the behaviour typical of such formatives as *de-*, *re-*, *ex-*, etc., and must, therefore, be properly analysed as a non-prefixal element. The situation arises when *in-*neg attaches to stems which do not function independently in English, eg., *ineffable, inept, incult, intact*, etc. Such words will, then, be analysed with the prefix-stem boundary /=/, similarly to such loanwords from Latin as *in=cite, im=bibe, im=ply*.

It is probably debatable whether *en-* and *in-*part are allomorphs of the same morpheme. Marchand provides historical and semantic arguments to show that they are (or rather that, in his non-generative parlance, *in-/im-* are allomorphs of *en-/em-*). Yet, morphophonologically speaking, there are striking differences between them. The two allomorphs seem neither to be in free variation (Marchand apparently believes that they are) nor in complementary distribution (before /l, r/ only the *en-* variant appears but in other contexts there is, by and large, free variation), and sometimes they even function contrastively: *insure — ensure*. For the above-mentioned reasons and for ease of exposition *en-* and *in-* will be treated separately here.

Why there are no /el-, er-/ allomorphs is a matter of speculation. One possibility is that somehow a boundary blocks the assimilation of the nasal to the following liquid. This will be discussed in the section on boundaries. Another possibility is a type of semantic blocking. Notice that words like **/əreidʒ, əritʃ, ərol, əla:dʒ, əlist/* could be understood by listeners as derived by *ex-* prefixation (the phonetic reflexes of the two prefixes — *en-* and *ex-* — would be homophonous) and the meaning constructed would then, by virtue of the general meaning of *ex-*, be opposite in most cases to the meaning of *en-* prefixed derivatives (cf. *elocution, erupt, elongate, election*): **erage* — to tame, **erich* — to pauperize, to rob(?), **eroll, *elist* — to strike from the list, **elarge* — to diminish.

The negative adjectival/verbal prefix **un-** has traditionally been regarded

as the most (phonologically) stable of the set under discussion. In fact, it shows virtually no allomorphy in slow speech, preserving its basic $/\wedge n/$ form, where the final nasals of *en-/in-* prefixes would freely undergo assimilation.

2. BOUNDARIES

In the framework of generative phonology a situation like this would be explained by recourse to the boundary separating the prefix from the stem. Apparently, the boundary after *un-* must be stronger than after *in-* or *en-*, and so it blocks NA from applying in the former case. The situation here, however, is not so simple. If we follow Chomsky and Halle's fairly logical and effective algorithm for the assignment of word boundaries, all of the prefixes under discussion will be separated from their stems by a 'weak' word boundary /#/ by virtue of the fact that "...the boundary # is automatically inserted at the beginning and end of every string dominated by a major category" (SPE:366). As prefixes are here defined as formatives attaching to full lexical items, the typical situation at the surface syntactic level will be the following:[4]

$$\left[\# \left\{ \begin{matrix} \text{in} \\ \text{en} \\ \text{un} \end{matrix} \right\} [\# \text{stem} \#]_{\text{N, V, Adj, Adv}} \# \right]_{\text{N, V, Adj, Adv}}$$

At this level, therefore, it is impossible to distinguish *un-* from *in-/en-*. As is well known, some of the word boundaries have to be reduced on a language-specific basis before the surface syntactic representation enters phonology. In SPE this move is necessary mainly to ensure regular application of cyclic stress rules which take some affixes into their domain but leave others outside. The former will, then, be separated by + boundary, which does not block the rules, while the latter will retain the # boundary. It is interesting to note that the morpheme + boundary is doubly motivated at this point of derivation: some of its occurrences come from the lexicon, where certain lexical items are presumbly entered with the internal +: *mono+lith, bio+scope, endo+morph, meta+soma*, etc. (SPE: 100—106), some from the reduction of # in the Readjustment Component: *department+al, divin+ation, person+ify, histor+ic(al), theatrical+ity*, etc. This can be shown as (SSS=Surface Syntactic Structure, UPS=Underlying Phonological Structure):

SSS (after assignment of #):   #   +

UPS (after readjustment):   #   +

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[4] The complex (and interesting) question of the organization of the lexicon with respect to complex lexical items, as well as the controversy between lexicalists and transformationalists, lies far beyond the scope of this paper and will not be discussed.

Yet, all the /n/-final prefixes are neutral with respect to stress assignment (do not cause stress shift) and are themselves nearly never stressed (exception: *infamous*). This suggests rather strongly that they keep the # boundary through readjustment and enter phonology with it. At this level, then, a typical situation is as follows (table 2):

However, it is a well known fact that NA (and CA) does not cross over word boundaries, as is shown in the following examples: *film#s, dream #ed, open#ly*. It would seem, then, that at least after some of the /n/-final prefixes the # boundary should be reduced. Yet, in the SPE framework (and in the ensuing tradition) there

in-_neg	$[\#$ in$[\#$ person$+$al$\#]_A\#]_A$
in-_part	$[\#$ in$[\#$ mingle$\#]_V\#]_V$
on-	$[\#$ on$[\#$ bitter$\#]_A\#]_V$
un-	$[\#$ un$[\#$ button$\#]_N\#]_V$
in-_comp	$[\#[\#$ in$\#]_A[\#$ sight$\#]_N\#]_N$

Table 2

is paradoxically no other point in the derivation than Readjustment Component where boundary reduction could be carried out. Hence, it seems necessary to propose another # reduction rule to be situated somewhere in the system of P-rules. This 'somewhere' must obviously come (1) after all the cyclic stress rules have applied (to ensure correct placement of stress on the stems of prefixed derivatives), (2) before NA. The point that seems fairly natural is just after the completion of the cycle and before non-cyclic word-level rules start applying.

In a way, this solution is not new. Siegel (1974) divided English affixes into two classes: I attached prephonologically and carrying a + boundary, II attached postcyclically and carrying a # boundary. In this theory, morphological operations would apply at different levels, at least one of them intraphonological. Boundaries would then encode information about the place where a given affixation process occurred. This theory was later accepted and elaborated by Aronoff (1976).

This approach will not solve the problem of /n/-final prefixes, however. According to Siegel/Aronoff, these, being stress-neutral, would presumably be attached postcyclically with a # boundary (class II). But this would bring us back to the old problem and the boundary would have to be reduced anyway. So far, then, it seems that there are two rules reducing the # boundary: one prephonological and one postcyclic. They tend to exhibit an interesting kind of symmetry in two respects: (1) both reductions are necessary to bring some affixes into the domain of the P-rules following (cyclic stress and word-level P-rules respectively), so that they both 'feed' the rules, (2) both reductions bifurcate affixes into those which reduce their boundaries and those which do not. Thus, this system is similar to Siegel's in that it postulates two classes of affixes: I these that have their boundary reduced prephonologically, and II those that allow the reduction postcyclically.

Having these two # reductions we can now explain why *un-* behaves differently from *in-/en-*. The latter are class II affixes, whereas the former is not. The # boundary after *un-* does not reduce postcyclically and consequently NA is blocked. But which class is *un-*? It is obviously not class I (where we have such affixes as the mentioned: *-al, -ation, -ify, -ical,* or *-ity*) as it has to keep its # through the cycle. Do we, then, have affixes that never have their boundaries reduced?

So far, the discussion has been proceeding in terms of slow speech phenomena. Yet, it has been acknowledged a number of times in he literature that while "... the lentissimo style is the representation on the basis of which phonological production is initially organized" (Devine and Stephens 1980:74, quoted after Linell 1976), yet, the maximization of the application of rules is achieved in rapid styles (cf. Harris 1969).

In fast speech, the final nasal of *un-* is in fact assimilated to the following consonant: *u/m/bearable, u/m/pleasant, u/m/married, u/ŋ/grateful, u/ŋ/common.*

This seems to suggest one of two things: "... the nasal assimilation rule would have to be modified for such [rapid — WS] styles by, say, inserting an optional word boundary into its structural description or by the addition of a rule which replaced word boundaries by morpheme boundaries in rapid styles" (Gussmann 1978:142). In view of such fast speech strings as: /tem/ *pairs,* /wam/ *mile,* /gom/ *back,* /teŋ/ *cups,* /teŋ/ *girls,* inserting a single word boundary will not do. The optional element inserted into NA would have to be /#/#// or #₀, which seems methodologically suspect. One objection that might be raised is that the rule would then neither be ranked by, nor be delineated by, nor require, the ## boundary. And according to the widely accepted suggestion of Stanley (1973) these are the only three types of possible interaction between a rule and a boundary.

While it is difficult to decide the question in a principled manner, the other solution will be chosen: reduction. In the framework of this article this would be reduction No 3. Where should it be situated? As it should allow a maximal application of allergo rules,[5] it must be located before them and after all lento rules have applied[6]. Consequently, there are only two possible points in the derivation where III reduction can operate: just before or just after Lento Representation (slow speech level). Situating it after Lento Representation will leave us with the problem of accounting for why unreduced # and ## in,

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[5] Whether these should be identified with phonostylistic rules of Rubach (1975 a, b, 1976) is a difficult question. Compare the pertinent remarks on page 96.

[6] Or at least before those allegro rules that would be incorrectly blocked by a strong boundary and after those lento rules that needed the boundary either in its motivating or blocking function. The passage from lento to allegro rules is probably more realistically envisaged as a cline rather than a clear-cut step. For the sake of exposition, however, the schematically simplified framework will be accepted.

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say, *un#bearable, in##borne* are not realized as pauses in slow speech. (That this is in fact the case can be demonstrated in any spectrographic analysis). One way out of this difficulty would be to reject the view whereby word boundaries, if retained, are necessarily realized as pauses on the phonetic level (cf. on this point Kahn 1976:11). Another option is to posit III reduction before lento representation thus disallowing any boundaries stronger than + phonetically. While it is difficult to decide this way or the other, the latter solution will be chosen here.

As seen in the examples on page 88, the III reduction, unlike the former, will have effect not only on # but on the full ## word boundary as well. Incidentally, the latter boundary will also be reduced in compounds to allow for such fast speech assimilated variants as: *i/ŋ/come, i/m/born, i/m/put, i/ŋ/growing.*[7]

Apart from # and ##, the last reduction will probably also affect =. This latinate prefix-stem boundary has to be retained in the first boundary reduction to allow proper statement of stress rules (Alternating Stress among others, SPE:96). It seems that it is also retained in the second reduction to allow =—sensitive *s*-voicing (SPE: 95) in e.g., *re=sign.* The reduction of = in III is debatable, however, as it does not in any way (unlike reduction of the other boundaries) affect the applicability of the allegro rules following. The motivation for this particular boundary reduction is, admittedly, rather weak.

In this way, the last boundary reduction appears to be the most general, affecting three different boundaries (##, #, =) and leaving in its wake only the weakest + boundary allowing free application of all rules (SPE:364).

Thus, we have posited three different, yet equivalent, boundary reduction rules, coming in three fairly natural points: prephonologically, postcyclically, pre-lento. The proposed structure of the phonological component is presented below, and the effects of the derivation on the /n/-final prefixes (in the context before labials) are summarized on page 91.

1. Surface Syntactic Structure
2. Readjustment Component (I reduction)
3. Underlying Phonological Structure
4. The Cycle
5. II reduction

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[7] Allen's (1980: 24—25) suspect 'compound-like' formations arose through lack of methodological distinc ion between lento and allegro representations. NA (*græmmə*), Voicing Assimilation /*guzbri*/ or Consonant Drop (*læmpoust*) can in fact apply in these compounds only as fast speech rules after the ## boundary has been reduced. In slow speech, the forms are unassimilated (*grandma, gooseberry, lamppost*) and with the consonant retained (as a geminate, obviously). Hence, these "formations' are true compounds.

6. Word-level P-rules
7. III reduction
8. Lento Representation
9. Allegro Rules ⎫
10. Allegro Representation ⎬ optional
                ⎭

As has been mentioned, in this framework, the only boundary type remaining after III reduction would be the simple morpheme boundary +. While the point is not particularly important, it may be assumed that there is another postphonological reduction (or loss) of boundary whereby the + is erased. Yet, the retention of the boundary is not tragic, unless it is believed to constitute an element of the string. But this is a separate issue.

The only pauses that do appear phonetically in a flow of speech are those at the ends of melodic groups or phrases, and they can conveniently be encoded in phonology with a phonological phrase boundary ||, which is exempt from reductions. In lentissimo, or unnaturally slow speech, where word boundaries are in fact realized as pauses, a different boundary reduction system would be needed.[8]

3. RULES

As has in fact been stated many times, the *in-* and *en-* prefixes function mainly in the learnéd, latinized part of the lexicon. Hence, they are quite exceptionally followed by stems beginning with native English, non-Latin sounds /θ, š, č/:[9] *insure, ensure, enshrine, enthrone, enchain* nearly exhaust the list (compare gaps in table 4). Existence of such strings as *tenth, seventh, tension, lunch,* shows that the constraint is morphological and not phonological.

Another interesting fact to be observed about NA is that while in fast speech the nasal of *in-, en-* and *un-* is obligatorily assimilated to the following

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[8] Or, perhaps, Lentissimo Representation comes just before III reduction and just after word-level rules so that this portion of derivation would look like this:

    — word-level rules
    — Lentissimo Representation
    — III reduction
    — Lento Representation.

This arrangement, while purely speculative, would speak in favour of retaining the requirement whereby word boundaries are realized as pauses phonetically.

[9] Most of the derivatives in Table 4 are listed as 'rare' in OED, and there are some others, not included in the table, given as 'obsolete'. The latter are usually *in-* variants of *en-* forms. The voiced counterparts of /θ, š, č/ present an even more complicated situation as in the case of /ž/ and /ǰ/ the factors concerned with borrowings from French come into play. Both /ž, ǰ/ and native /ð/ are, however, also exceptional after /n/-final prefixes (and, incidentally, after *in-* of compounds).

	in-_comp [#in#]A[#born#]lv	in-_comp [#in#]A[#born#]lv	in-_part [#in[#pack#]v#]lv	in-_neg [#in[#pure#]A#]lv	en- [#en[#body#]N#]lv	un- [#un[#born]A#]lv	un- [#un[#born]A#]lv	in-= [#in=bibe#]	in-= [#in=bibe#]lv
1	in # # born	in # # born	in # pack	in # pure	en # body	un # born	un # born	in=bibe	in=bibe
2			in # páck	in # púre	en # bódy			in=bibe	in=bibe
3			in+páck	in+púre	en+bódy				
4			im+páck	im+púre	em+bódy			—	—
5								im–bibe	
6	in+born							im+bibe	im+bibe
7	in+born					un+bórn			
8	im+born		m+páck	im+púre	em+bódy	un+bórn			
9						um+bórn			
10	imborn		impáck	impúre	embódy	umbórn			imbibe

velar stop, it is not the case with lento representation. This phenomenon has been discussed a number of times, notably in SPE (:419) and in Gussmann (1978: 141). In SPE the allomorphy of *con-* in pairs such as *có/n/gress — co/ŋ/gréssional* was seen as due to differences in stress patterns, with the alveolar nasal appearing when directly following a stressed vowel. Yet, it was demonstrated by Gussmann (1978: 141) that this sort of argument is simplistic. In British English, the post-stressed cases allow both alveolar and velar nasal optionally.[10] This is in fact corroborated by data coming from prefixal derivatives under discussion here (slow speech): *ingratitude, incalculable, incase, ingrain, encage, engarland*, where /n/ and /ŋ/ can freely interchange in all the prefixes.

In terms of the framework developed in this paper, the question to be asked is: where does the optionality reside: in the II reduction of the # boundary or in the assimilation rule itself? There is one interesting, though indirect, argument pointing towards the latter solution as preferable. If the NA rule is in fact obligatory at this point of derivation, then the only lento representation of such words as [in=k/g...stem] will be /iŋ=k, iŋ=g/ because, obviously, the = boundary cannot block the rule: *imbibe, incite, imply*, etc. Yet, slow speech allows for alternation here: *ingress — i/ŋ/gress, ingredient — i/ŋ/gredient, incarnate — i/ŋ/carnate, include — i/ŋ/clude*, etc, just like in the prefixal derivatives of the *in#stem* type. It follows, then, that NA must be made

optional in the context: $-\begin{Bmatrix} = \\ + \end{Bmatrix} \begin{Bmatrix} k \\ g \end{Bmatrix}$, that is, intermorphemically before a velar

(intramorphemically, it is obviously obligatory: /bæŋk, siŋ/).

As has already been mentioned, the nasal is retained in the *en-* prefix before liquids (*enlist, enrage*), while the *in-* prefix allows its nasal to assimilate completely to the following liquid (*illogical, irregular*). Any proposed solution here would seem to have to be idiosyncratic as otherwise the prefix behaves fairly regularly with respect to NA and boundary reductions. One possibility is obviously to stop the # reduction at the second stage (III stage reduction can be carried out and will not affect CA for reasons to be explained later). in the context *en___r/l*. CA will then be blocked from applying. Another option is to attach a blocking condition onto the rule itself. All these solutions, however, appear to be ad hoc. There is probably only one principled way to solve the problem, namely to treat CA as a minor rule (cf. Gussmann 1978:144).

This move would ensure that *en-* will not in fact assimilate as it will not be positively marked with a rule feature [+CA]. It will share this behaviour with *un-* (in this case, however, as in *-ly, -less, -let, -ling, -like* suffixal derivatives with /n/-final stems, CA would be blocked by the non-reduced boundary anyway) as opposed to *in-* (and *con-, syn-*[11]) which will be positively specified for the applicability of CA: *illogical, illiberal, illicit, irregular, irrational, irradiate*.[12] This approach accounts naturally for the lack of CA intramorphemically (*only, Henry, Conrad*, etc.): there is no reason to mark words idiosyncratically as [+CA].

CA must additionally be followed by an independently needed cluster simplification (degemination) rule (SPE:148—150) to derive single liquids phonetically.

The exact formulation of the CA rule remains a problem. It has usually been contexed before sonorants but there are arguments against this solution. First, in the framework where the assimilating nasal is fully specified as alveolar, CA before another alveolar is evidently vacuous. The crucial context is before a bilabial nasal, as in: *immoral, immature, immerge, immixture*. The question is: shall the assimilation before /m/ be classified as CA, falling together with the minor rule before r/l, or shall it be treated as place-of-articulation assimilation, falling with NA?[13] Note that NA, as it has usually been formulated (before noncontinuants; cf. Rubach 1976: 30), will naturally accomodate a nasal functioning as context.

Consider such derivatives as: *environment, government, westernmost*. Their lento forms are exactly as those given (for some items, the # boundary before *-ment* would have to be reduced in the I reduction to allow for shift of stress: *ádvertise — advértisement*). But in fast speech there is a considerable amount of reduction: /envaiəmənt, gʌvəmənt, westəmoust/. The deletion of one nasal must be due to the degemination rule mentioned. But the condition for is application is the identity of the two segments affected. Consequently, there must have been assimilation in the case of *-ment* and *-most* derivatives. If this assimilation were classified as CA we would be forced to mark such stems as *environ, govern, western*, and others idiosyncratically as [+CA], considering that CA has been postulated as a minor rule (treating CA as a major regular rule would not help either). As the lento forms of the derivatives are unassimilated, the assimilation rule must be ordered with other allegro rules (after III re-

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[10] And so, Onions (1956:370) has *co/ŋ/gress* vs *co/n/gressional*, Jones (1977:103) has *co/ŋ/gress* vs *co/ŋ/gressional*, and Gimson (1974:198) says: "/ŋ/, or less commonly /n/ in such words as — *income, conclude, encourage, concrete* (...)". Cf. also Lewis (1963:160). "Theoretically, at least, and usually so on educated levels, the first syllable is pronounced as in the word *in*, but many people in everyday speech nasalize the *-ng*, pronouncing *inglorious*, for example, as *ing-GLAWR'-ee-əs*".

[11] *Corrector* will be exceptional, and *syr-* is not attested.

[12] This last word seems the only *in-*_part_ derivative in the whole class under discussion. If CA were to apply to *in*_neg_ but not to *in-*_part_, this would be the only important phonological difference between the two prefixes.

[13] Zwicky (1970) wishes to see the whole process as a deletion of a nasal before a sonorant over a = boundary. His framework, however, is not compatible with the one adopted in this paper.

duction). Yet, CA is a lento-only rule, as can be seen in lento forms such as *illogical*, *irregular*, where CA has already applied, and in unexistence of fast speech *urreal*, *ullikely*, which would have to be attested were CA an allegro rule. Consequently, nasal assimilation before /m/ cannot be a rule of complete assimilation. This explains why such variant of *enmesh* as *emmesh* occurs, while any *el-/er-* prefixal derivatives are not attested. *Emmesh* simply falls together with *embank* and *empanel*, all undergoing NA.

Thus, the minor rule of complete nasal assimilation is formulated as:

$$
\text{SD:} \quad \begin{bmatrix} +\text{nasal} \\ -\text{coronal} \end{bmatrix} \quad (=) \quad [+\text{liquid}]
$$

$$
\text{SCh:} \qquad 1 \qquad\qquad 2 \dashrightarrow 2\ 2
$$

Let us now consider the form of the NA rule. Generally speaking, it assimilates anteriority and coronality from the following consonant onto the alveolar nasal. As has been remarked, the [−cont] feature is legitimate in the context segment. One of its functions is to allow NA before bilabial nasals. Another is to block NA from applying in pre-fricative contexts, as there the nasal is in fact unassimilated in slow speech:[14]

Intramorph.	in-$_{part}$		in-$_{neg}$		en-
tension	infix		infelicity		enshrine
month	insure		infallible		enframe

Table 3

The nasal is, however, equally unassimilated before postalveolar affricates: *enchain*, *ingeminate*, *engender*. To stop assimilation in this context, Gussmann (1978: 140) provides a condition which says that "... if the features for anteriority and coronality in the following obstruent do not have the same value, then the nasal must be anterior and it agrees in coronality with the obstruent" — which means that it will be an alveolar. The condition covers /š/ as well in Gussmann's framework. According to Gussmann, however, the nasal is assimilated in pre-apico-dental and pre-labio-dental contexts. It is doubtful if phonetic data warrant the introduction of this asymmetrical dichotomy. It seems that in slow speech nasals are in fact assimilated to the following plosives only. And so, while it is on the whole rather difficult to evaluate rule conditions vis-à-vis distinctive features, it seems preferable here to add both [−cont] and [−del rel] to the environment segment to stop NA from applying before affricates.

[14] Assimilation before /s/ would be vacuous anyway. *un-* is unassimilated as the # boundary has not been reduced for slow speech. There are some exceptions within the prefix=stem class: *comfort*, *comfit*, *comfrey*, *symphily*, *symphony*, *symphysis*, *emphasis*, *emphysema*.

In fast speech, the situation with respect to NA is radically different. The nasals in all the prefixes (as well as in the *in-* of compounds, for that matter) are now assimilated, as shown in table 4. As can be seen, assimilation has applied regardless of the consonant following, generating bilabial, labio-dental, dental, postalveolar and velar nasals. This allegro rule is, then no longer restricted to noncontinuants, and can apply freely, as in fact should be the case with fast speech rules. Accordingly, the [−cont, −del rel] specification must have been dropped for allegro NA.

in-$_{comp}$	in-$_{neg}$	in-$_{part}$	en-	un-	before:
imborn	as in	slow speech		umbearable	-b/p/m
iŋgoing	as in	slow speech		uŋgracious	-g/k
iɱflow	iɱ fallible	iɱ fringe	eɱ feeble	uɱ faithful	-f
inthrough	—	inthrust	enthrone	unthrifty	-θ
inshore	—	insure	enshrine	unsure	-š
inroad	—	inróad	enrage	unreal	-r
—	—	—	enchain	unchain	-č

Table 4.

Notice also that while the bilabial and velar alternants can be accounted for by the assimilation of only two features (anteriority and coronality), the nasals before nonplosive obstruents warrant the introduction of another feature to fill in phonetic detail. Otherwise NA would not differentiate between /ɱ/ and /m/, as well as /n̪/ and /ɳ/ as opposed to /n/. The obvious candidate is [±distributed] (and this is the solution that was chosen by Gussmann (1978: 140)). The assimilated nasals will then have the following feature composition:

	m	ɱ	n	n̪	ɳ	ŋ
anterior	+	+	+	+	−	−
coronal	−	−	+	+	+	−
distributed	+	−	+	−		

Table 5

There will be one more change (except dropping some features in the environment segment and adding phonetic detail) between the lento and the allegro variants of NA. In the former, an optional = boundary had to be included to allow for assimilation in *ingress*, *include*, *imbibe*, *imply*, which would otherwise have presumably been blocked by =. As an allegro rule, coming after III reduction, it does not have to contain this optional element. At this point of derivation there are only + boundaries left and the = has already been reduced. This deletion of the optional =, just like the drop of [−cont, −del rel], nicely reflects the non-restricted type of application of allegro rules in general and of NA in particular.

Notice (in table 4) that the /r/-preceding nasals (the ones that for some reason have not undergone CA) in fast speech assimilate the place of articulation of the following retroflexed liquid, but fail to assimilate completely. This seems to indicate once again (see page 94) that CA is exclusively a lento rule and does not have an allegro equivalent, as NA does. Incidentally, the allegro NA rule could probably be collapsed with the functionally and formally similar phonostylistic rule of assimilation in consonant clusters: *width, try, obvious* (with labiodental b) (cf. Rubach 1976:31). This problem, however, lies beyond the scope of this paper.[15]

Eventually, then, we have arrived at a formulation of two equivalent, though different, NA rules, one for slow speech, the other for rapid speech:

Lento NA:

$$\begin{bmatrix} +\text{nasal} \\ +\text{coronal} \end{bmatrix} \rightarrow \begin{bmatrix} \alpha \text{ anterior} \\ \beta \text{ coronal} \end{bmatrix} / \underline{\hspace{2cm}} \ (=) \begin{bmatrix} -\text{cont} \\ -\text{del rel} \\ \alpha \text{ anterior} \\ \beta \text{ coronal} \end{bmatrix}$$

condition: optional if intermorphemically and before velars

Allegro NA:

$$\begin{bmatrix} +\text{nasal} \\ +\text{coronal} \end{bmatrix} \rightarrow \begin{bmatrix} \alpha \text{ anterior} \\ \beta \text{ coronal} \\ \gamma \text{ distributed} \end{bmatrix} / \underline{\hspace{2cm}} \begin{bmatrix} \alpha \text{ anterior} \\ \beta \text{ coronal} \\ \gamma \text{ distributed} \end{bmatrix}$$

Setting up two different rules of NA which are both functionally and formally similar (though not readily collapsible) is, admittedly, a controversial solution. According to Gussmann (1978: 122), it "… destroys the fundamental unity of this simple assimilatory process". It has been demonstrated in this article that NA is in fact anything but simple. Moreover, while it is true that there is a basic unity of NA, yet the need for fast speech (phonostylistic, detail, late phonetic; etc.) rules has commonly been recognized on independent grounds (Postal 1968:66, Anderson 1975, Shibatani 1973, Stanley 1967, Rubach 1975 a, b, 1976, Herok and Tonelli 1979.[16] It should be noted here that the hypothesized allegro NA would *not* fulfill the formal requirements imposed on phonetic rules by Anderson in his 1975 paper. Specifically, it *does* alter categorial values of features distinctively specified in underlying forms, eg. [anterior] and [coronal]. Yet, the close affinity of phonetic rules (eg. vowel nasalization in

English) and allegro rules should not be overlooked in this connection (phonetic motivation, association with stress, word boundaries and style of speech).

A number of arguments have been given in this article to support the conclusion that NA must be one of those rules which function at two different places in phonology: among other lento rules deriving slow speech representation, and among allegro rules generating fast speech strings. In terms of rules discussed in this paper, this type of behaviour is probably shared with degemination, which is obligatory intramorphemically in slow speech and intermorphemically in fast speech (cf. SPE:148—149 and Zwicky 1970:585.[17] CA, on the other hand, for reasons explained earlier, has to be considered a lento-only rule.

4. CONCLUSIONS

In the light of the evidence adduced in the article concerning the methodological distinction between lento and allegro representations, it would be interesting to reconsider once again the principle of the standard GP theory refusing theoretical status to any intermediate representation between the systematic phonemic and systematic phonetic levels. At this time, it is not clear, however, how the latter should be situated with respect to the lento and allegro representations hypothesized in this paper.[18]

Elements of the framework proposed here have gained some notoriety in the literature. The need for boundary reductions (cf. Selkirk 1972 and Basbøll 1981: 265—266) and the distinction between slow and fast speech rules has been widely acknowledged. Yet, it seems that the particular interaction of rules and boundaries suggested in this article has not in fact been envisaged so far. It is believed that the framework is flexible enough to accomodate certain troublesome phenomena arising at the interface between morphology and phonology, and to provide principled solutions.

One result would probably be a certain regularization of morphology in the GP framework, and phonology could no longer be freed from irregularity at the cost of pushing it into morphology (*mini+ster, ana+lyse, meta#soma, in-*

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15 Cf. remarks below.

16 In Herok and Tonelli's (1979) interesting article, fast speech is further divided into 'colloquial speech' and 'casual speech'. In the former, rules can apply across # boundaries, in the latter, also across # # boundaries. Boundaries do not reduce in this framework. Whether it is in general methodologically profitable to set up several 'fast speech' levels, is far from clear at the moment.

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17 In Zwicky (1970:585) it is claimed that "DEGEMINATION is obligatory within morphemes. It is also obligatory between morphemes when one (or both) of the morphemes is unstressed, as in the normal pronunciations of *unnatural, totally,* and *with the.* It is optional, in slow speech [or (?) — WS], when both of the morphemes bear stress, as in *embalmment, ruleless, subbasement, pen-knife,* and *black cat*".

18 Cf. also 'categorial phonetic' level of Sommerstein (1974:72), and see Shibatani (1973:88), where he speaks of "… a representation that contains all the necessary articulatory instructions (still in binary terms for most parameters) for the characteristics of *careful speech*". (emphasis mine — WS).

form+at+ion, loc+ate vs locate; all examples taken from SPE: 82, 86, 106, 112, 155 respectively. Öhlander's criticism (Öhlander 1976) would then no longer be justified. But any principled conclusions in this matter would need further empirical study.

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