Feature Domains in Hellendoorn Dutch

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1 Introduction

Phonological features sometimes originate in a position which is less than consonantal segments may underlyingly occupy a typically vocalic position. If this happens, the misplaced features of the consonant will tend to occupy a better position, or be deleted altogether.

On the other hand, allowing too many spreading and moving operations on the underlying structure and the morphological form of the words: if all the phonologically ideal position, it would become hard to distinguish morphemes, or to find the boundaries of morphological and syntactic coercion.

The behaviour of misplaced phonological features thus represents the interaction between different factors: phonological wellformedness on faithfulness to the input and respect for morphological and syntactic coercion.

That is in the centre of interest for modern phonological theories of output constraints, such as Optimality Theory.

In this article we present a case study of this phenomenon, based on phenomena relating to nasal consonants in the Hellendoorn dialect of Dutch. Nasal consonants appear in a syllable rhyme, three things to them: sometimes they disappear completely, leaving a trace of nasal vowel; sometimes they assimilate in place to an adjacent consonant; sometimes their nasality feature to an adjacent obstruent. We show that these phenomena are explained in terms of phonological domains: the consonantal features to be in a syllable rhyme. The choice among the different options, on the dictated by the wish to show the boundaries between morphemes and words possible.

This article is structured in the following way:

• In section 2 we present the facts of Hellendoorn Dutch that need to be understood in terms of Optimality Theory.
• Section 3 gives an analysis of place assimilation of nasals.
• Section 4 formulates this analysis in terms of Optimality Theory.
• Section 5 extends the analysis to nasalization, nasal deletion and
• Section 6 discusses what is superficially the most problematic aspect at hand, viz. a case of opacity.
• The last section is devoted to a conclusion.

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1 Hellendoorn Dutch is a Low Saxonian dialect of West Germanic, spoken in the Dutch territory of us (Nijen Twilhaar) is a native speaker of this dialect.
2 The behaviour of nasals in Hellendoorn Dutch

In this section we discuss the forms of assimilation in Hellendoorn Dutch. We distinguish between two types of assimilation: (i), nasal consonants as preceding or following consonants in certain positions; (ii), voiced obstruents completely assimilate to a following nasal. The latter process superface the first: an obstruent almost always assimilates to a nasal which has an obstruent first. We will discuss these phenomena in turn. But before that, we discuss a phenomenon that bleeds the type of nasal assimilation we usually encounter: the preceding vowel.

2.1 Nasalization

In many languages, such as English (or, for that matter, Standard Dutch), immediately following heterosyllabic consonants are homorganic: impolite, impolite, bank, damp. In Hellendoorn Dutch, however, this type of evidence for regressivility is lacking, because a vowel followed by a coronal nasal is always subject while the coronal nasal itself disappears. This is illustrated in (1):

(1) [I]jectie injection
    [ ]benul dimwit (on+benul, un+inkling)
    [A ]geven to hand an+geven, on+give

We also find nasalization if the vowel+coronal nasal sequence is followed by consonants:

(2) daans: d[a ø]s dance
    (hee) daanst: d[a ø]st(he) dances

The environment for nasalization is the syllable (rhyme). When the nasal the onset of the following syllable, we do not find nasalization. Resyllabification occurs across word boundaries:

(3) in april: [I]n april
    oneerlijk: [ ]neerlijk (eerlijk = fair)
    an alles: [A]n alles everything

One of the pluralization suffixes of Hellendoorn Dutch is -(«)n (the other need not concern us here; cf. Nijen Twilhaar 1990). This suffix turns a vowel attached to a vowel-final stem, as is to be expected (4a). Interestingly, the suffix already contains a nasalised vowel, the suffix shows up as a coronal syllable vowel is denasalized in those environments.
These facts seem to show that the deletion of the nasal consonant is regarded as nasalization of the vowel. There cannot be an independent rule of nasal since this rule would incorrectly affect the plural of man as much as the singular.

### 2.2 Regressive place assimilation of nasals

Even though most potential cases of regressive assimilation are bled by nasal consonant in the rhyme after a vowel, there is still at least one the reduced form of the indefinite determiner. In Hellendoorn Dutch, we genders, each with its own determiner. The full forms of this article distinguished: n«n (masculine), n« (feminine) and «n (neutral). Yet the reduced, form, which is the same for all genders, viz. a syllabic nasal meets a right environment, it is assimilated regressively to the consonantal nasal immediately.

(5) Regressive nasal assimilation

- \[n\text{"}'] doeve a pidgeon
- \[M\text{"}'] fietse a bike
- \[l\text{"}'] j sse a coat
- \[m\text{"}'] bal a ball

Regressive assimilation thus is not completely absent from Hellendoorn its effects are not as clearly visible as those of progressive assimilation to the indefinite determiner for independent reasons.

Interestingly, the reduced form of the masculine definite determiner unaffected even though it sounds like a syllabic nasal as well. This na however:
(6) Definite article den (with masculines)

\[n']\] man, boom, kop man, tree, head

2.3 Progressive place assimilation of nasals

The examples in (7) show that in each case the syllabic nasal is homorganic immediately preceding consonant. The category singular nouns contains no derived form up from a root plus a class I suffix; there happen to be no underived \(w\) Dutch which end in a syllabic nasal (cf. Nijen Twilhaar 1990: 71-72).

(7)

Verbs (infinitives, formed from stem + suffix -(«)n))

<table>
<thead>
<tr>
<th>Verb</th>
<th>Singular nouns</th>
</tr>
</thead>
<tbody>
<tr>
<td>loa[tn']to let</td>
<td>zei[sn']scythe</td>
</tr>
<tr>
<td>roe[pm'] to call</td>
<td>straam[pm'] wedge</td>
</tr>
<tr>
<td>w r[kN'] to work</td>
<td>v r[kN']pig</td>
</tr>
<tr>
<td>po[fM']to roast</td>
<td>sto[fM'] substances</td>
</tr>
<tr>
<td>goo[jl']to throw</td>
<td>buu[jl']showers</td>
</tr>
</tbody>
</table>

Examples such as the following seem to indicate that the domain of this assimilation is the syllable rhyme. Clusters which occur together in an underlying cluster do not assimilate:

(8) k[n] rre old crone

Bruck[n]er

ramp[n]acht night of disaster (ramp disaster + nacht)
haek[n]oale crochet hook (haak crochet + noale hook)

loop [n]ie don't walk (loop walk + nie not)
w rk [n]ie don't work (w rk work + nie not)

There is no progressive assimilation of the syllabic nasal in the follow:

\(^2\) Cf. Humbert (1997) for similar facts in a range of other languages.
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(9) loop [N'] keer walk once
     w rk [n'] dag work a day
     goo i [m'] bal throw a ball

The reason for this, informally speaking, is that we already have regressive assimilation: we try to apply regressive assimilation first, and only subsequently apply progressive assimilation. In other words, it is as if in these cases regressive assimilation (see above) takes precedence over progressive assimilation. In other words, it is as if the syllabic nasal is not homorganic to the immediately preceding consonant, in the examples in (11) it is.

(10) Progressive nasal assimilation

     loo[pm'] walk a ...
     wr[kN'] work a ...
     goo[jl'] throw a ...

It is as if in these cases regressive assimilation (see above) takes precedence over progressive assimilation. In other words, it is as if the syllabic nasal is not homorganic to the immediately preceding consonant, in the examples in (11) it is.

(11) pa[kn'] took (12) pa[kN'] take
     la[xn'] laughed la[xN'] laugh
     sto[pn'] stopped sto[pm'] stop
     stra[fn'] punished stra[fM'] punish

This phenomenon is not restricted to the verbal category, or to derived instances such as the plurals a[kn'] certificates and li [fn'] elevators. Instead, in order to avoid a cluster Ctn of an obstruent C, a /t/ and syllabic nasal /n/ in fact does not disappear in comparable clusters in which the nasal is assimilated to the coronal /t/, and apparently afterwards. The nasal is assimilated to the coronal /t/, not to the consonant /n/ in the surface. We have to extrinsically order t-deletion to get the right result.

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3 Cf. Humbert (1997) for a similar process in Groningen Dutch.
4 Some Frisian dialects distinguish between fricatives and stops (nasals tend not to even if they assimilate freely to the latter; cf. Visser 1997, Van Oostendorp in prep)
In certain constructions we may see progressive and regressive assimilation at the same time. This results in sequences of nonhomorganic syllabic nasals in examples in (13), in which both progressive and regressive assimilation:

\[(13) \text{ de kat}[n\, m']betti\text{en} \]
\[
\text{the cats a little}
\]
\[
\text{de kip[m' N']keer} \]
\[
\text{the chickens once}
\]
\[
\text{de rek[N' M']}\text{ v rfien} \]
\[
\text{the shelves a coat}
\]

Somewhat more complex are the following examples, in which sequences occur four nasals respectively.

\[(14) \begin{align*}
\text{a. op de w [NN' m']} & \text{ bettien snee} \\
& \text{on the roads some snow}
\end{align*} \]
\[
\begin{align*}
\text{b. op de w [NN' n' n]acht snee} \\
& \text{on the roads the snow of one night}
\end{align*}
\]

Note that in these examples the fricative ( of weg /wEÄ/ road totally syllabic nasal, a phenomenon which will be discussed now.

2.4 Total assimilation of voiced obstruents and nasals

Compare the examples in (15) with those in (16).

\[
(15) \begin{align*}
\text{ze[tn']} & \text{ to put (from /zEt/)} \\
\text{klo[pm']} & \text{ to knock (from /kl p/)} \\
\text{slo[fM']} & \text{ to shuffle (from /lsrof/)} \\
\text{la[xN']} & \text{ to laugh (from /lAx/)} \\
\end{align*}
\]
\[
(16) \begin{align*}
\text{bi[nn']} & \text{ to pray (from /bId/)} \\
\text{schro[mm']} & \text{ to scrub (from /sxrob/)} \\
\text{loo[MM']} & \text{ to praise (from /loëv/)} \\
\text{la[NN']} & \text{ to say (from /zEÄ/)}
\end{align*}
\]

(15) gives yet another set of examples of assimilation of nasal place to i.e. progressive nasal assimilation. (16) in addition shows another type of the obstruent to the following nasal. The phenomenon is not rest.

Compare the following plural nouns: bi[NN'] pigs, vla[NN'] flags, d rae[MM'] ravens. We think that it is possible to analyse the behavior of the determiner in the same way. It can be seen as /dn/ underlyingly, which the onset assimilated to the rhyme, (which means that (14b) even has fi
One consonant somewhat mysteriously seems to duck out of the process: following examples:

\begin{align*}
(17) & \text{Verbs} & \text{Plural nouns} \\
& \text{bloa}[zn`] & \text{to blow} & \text{deu}[zn`] & \text{boxes} \\
& \text{l} & \text{to read} & \text{loo}[zn`] & \text{sheds} \\
\end{align*}

It is not clear to us why /z/ is an exception (while e.g. /d/ or /v/ are).

This process, which we call regressive obstruent assimilation or a voiced obstruent and a following nasal if the nasal also assimilates: consonant. For instance, underlying voiced obstruents do not assimilate:

\begin{align*}
(18) & \text{bi}[t \, n] & \text{og} & \text{n keer} & \text{pray once again} \\
& \text{schro}[p \, n] & \text{og} & \text{n k\text{eer}rub} & \text{once again} \\
& \text{loo}[f \, n] & \text{og} & \text{n k\text{eer}praise} & \text{once again} \\
& \text{ze}[x \, n] & \text{og} & \text{n k\text{eer}say} & \text{once again} \\
\end{align*}

Further, if a nasal assimilates progressively, we do not find regressive of the other consonant to the preceding nasal:

\begin{align*}
(19) & \text{bi}[t \, N`] & \text{keer} & \text{pray once} \\
& \text{schro}[p \, N`] & \text{keer} & \text{scrub once} \\
& \text{loo}[f \, N`] & \text{keer} & \text{praise once} \\
& \text{ze}[x \, N`] & \text{keer} & \text{say once} \\
\end{align*}

It thus looks as if application of obstruent assimilation is dependent nasal assimilation: regressive obstruent assimilation only applies to t progressive nasal assimilation has applied first.

**2.5 Rule ordering analysis of the Hellendoorn Dutch facts**

In the above, along with the facts of Hellendoorn Dutch, we have provided a rule-based analysis. It turns out that such a rule-based analysis requires quite a lot of extrinsic rule ordering:

- Nasalization has to be ordered before regressive nasal place assimilation;
- Regressive nasal assimilation and progressive nasal assimilation have disjunctively;
• T-deletion has to be extrinsically ordered after progressive nasal as opaque (counterfeeding) order;
• Regressive obstruent assimilation has to be extrinsically ordered after assimilation.

This dependence on rule ordering seems to constitute a serious problem such as Optimality Theory, which denies the existence of all sorts of rules. In recent times, several mechanisms have been proposed which could potentially be invoked to account for this type of effect. For instance, the opaque ordering of T-deletion and regressive voicing assimilation is popular among these undoubtedly is Sympathy Theory of McCarthy (1998).

Yet this does not solve all our problems. For instance, we have seen that the process of progressive nasal assimilation is restricted to a very small number of cases while this is not true for regressive assimilation, which applies even in other cases.

Furthermore, a rule based analysis has problems of its own. It can be shown why regressive nasal assimilation would have a different domain than progressive assimilation, or why the first rule is ordered before the second, rather around. It can formulate these things, but it does not provide us with a clear picture of the interaction between various forms of assimilation.

We believe that it is possible to formulate a theory about the domains of assimilation processes which is sufficiently simple and intuitive and to some of these questions. An upshot of this theory about domains is that ordering nor Sympathy Theory need to be invoked. The facts can be made fairly classical version of Optimality Theory.

In the following two sections, we provide an analysis of the Hellendoorn data along these lines. In section 3, we explain how the difference between regressive and progressive assimilation, and the relative ordering of the two rules from the assumption that phonological structure should mirror morphological structure as much as possible. In section 4 we then turn to the interaction of T-deletion, and the interaction of plural formation and nasal deletion and can be made to follow from the interaction between the desire to make the structure inherently well-formed, and to match it to the morphological way.

### 3. Progressive and regressive assimilation as a uniform process

In a constraint-based analysis, it is of course no longer possible to describe regressive and a progressive rule of assimilation, which are ordered which have a different type of domain. On the other hand, the fact that formally independent, rules to describe this phenomenon itself is somewhat two rules seem to conspire to achieve the following effect:

(20) **ASSIMILATE**: (Coronal) nasal consonants in the rhyme are assimilated to a coronal consonant.
Conspiracies are the classical argument against a purely rule-based analysis (1970). In this case it is a simple truth that surface forms always satisfy: a consonant in a rhyme position can only have its own, independent place if not adjacent to any other consonant. Since (coronal) nasal consonants do not occur in coda in Hellendoorn Dutch, they are always deleted in that position, leaving nasalization on the vowel , this is, in actual practice, a restriction.

Hellendoorn Dutch. The following two possible structures are crucially in agreement with (20):

\[
\begin{align*}
(21) & & [sC \quad [R \quad N]_{a} \quad [s] \quad (R)_{a} \\
& & [\text{Place}] & [\text{Place}] \\
& & C \text{ any consonant; } N \text{ a nasal; } [s] \text{ a syllable node; } [R] \text{ a rhyme node}
\end{align*}
\]

The lefthand structure gives us the result of progressive assimilation, the righthand structure the result of regressive assimilation.

Acknowledging that the reason behind both progressive and regressive assimilation is to achieve (20) at the surface, means that it is no longer necessary to list the properties of these two processes. For instance, it has been shown that progressive nasal assimilation is restricted to the domain of the syllable. It is necessary to explicitly state this fact. Progressive assimilation would follow the configuration:

\[
\begin{align*}
(22) & & C_{a} \quad [sN \quad [sC \quad N]_{a} \quad R]_{a} \\
& & [\text{Place}] & [\text{Place}] \\
& & C \text{ any consonant; } N \text{ a nasal; } [s] \text{ a syllable node; } [R] \text{ a rhyme node}
\end{align*}
\]

The nasal would always be in an onset in cases like this. Therefore, (20) is driving force behind the process. And we may assume that in all configurations of (22), assimilation is not absolutely necessary, assimilation is disallowed. Instead, (23) follows:

\[
\begin{align*}
(23) \quad \text{WFC: Every (place) feature should be linked to exactly one segment.}
\end{align*}
\]

The structures in both (21) and (22) violate the WFC, but the structure (21) satisfies \text{ASSIMILATE}, and ranking \text{ASSIMILATE} \enspace \text{WFC} in Optimality Theory therefore gives us the required results. As for the structures in (22), they violate the WFC here (\text{ASSIMILATE} is not applicable), so that they are disallowed.

The question arises, of course, whether the restriction to rhymal makes sense. We believe that it does: it is well-known that the rhyme is

\[
\text{In other languages, (20) may be the driving force behind regressive assimilation to that it is usually regressive assimilation to this position would then be due to the assimilation of an obstruent to an adjacent nasal in the rhyme is a logical impossibility. An intervening vowel in a well-formed syllable. It would be possible to assimilate pre-coda consonants, however (e.g. in a cluster [VCN], where C is a liquid). The issue with languages of the world is worthy to be explored.}
\]
position for consonantal material (or, in terms of moraic theory, that preferably not attached to a mora). In particular, this could be true for Articulation. ASSIMILATE could then be restated in the following way:

(24) *RHyme/CONSONANT: Consonantal place features should be linked to some outside the syllable rhyme.

The formula in (24) does not explain why this constraint would mainly concern consonants, or why it is always the place feature that originates from survives, but answering these questions would lead us too far astray. We will also not go into the question as to why only underlyingly coronal nasals are affected by the constraint, or why it is always the place feature that originates from underlyingly labial ones (/bEs%mstEln'/) broom stick does not turn into... simply assume that faithfulness to a coronal specification is weaker than labial (or velar) specification, a quite natural assumption in our view. 

(25) IDENT(velar), IDENT(labial) * RHyme/CONSONANT IDENT(coronal)

We are now ready to tackle another question, however, which is more central concerns, viz. the relative ordering of regressive versus progressive assimilation in a phonological context such as work [n'] a day, involving a: both regressive and progressive assimilation in principle are possible, regressive assimilation?

(26) \[
\begin{array}{c}
\sigma C \\
[\text{Place}] \\
\sigma C
\end{array}
\]

It seems strange to say that syllabic domains are involved in this, because, the obstruent following the nasal is further away than the one. Furthermore, in many cases, Hellendoorn Dutch actually prefers progressive assimilation. These are the cases which involve a suffix -en or a stem -en.

(27) lo[pm `k] nnen can walk (lopen walk, k nnen can)

These facts give us a clue about what may actually be going on in these hard to think of a reason why the syllabic nasal assimilates to the coronal place rather than to one which is in a following. We could say that assimilate to consonants which are as close to them as possible. This can be done in various ways, one of them being Alignment (cf. It and Mester 1996):

(28) Alignment (Crisp Edge)

Association lines should not cross morphological (or syntactic) boundaries.

\[^6\] See Humbert (1995) for some discussion.
In a regressively assimilated structure *lo[pN`k] nnen a word boundary which would not be the case in lo[pm`k] nnen. This may be the reason structure is preferred. Presumably, also in the latter case a morpholog crossed, viz. the one between the stem and the affix. Apparently, this violation that is as fatal as crossing a word boundary. We thus have to morphological boundaries, for instance along the following lines:

(29) affix boundary < word boundary < syntactic boundary

Association lines prefer not to cross any boundaries at all; if they still prefer the weaker boundaries over the stronger ones.

We can now turn to work [n`] dag work a day and similar cases. I assume that this phrase has approximately the following:

(30) [VP w rk [NP n` dag ]]

In other words, there is a major syntactic boundary between the verb and which is absent between the determiner and the noun. Of course there is syntactic boundary between the latter two words in most grammatical the not seem absurd to say that this is a weaker kind of boundary than a major boundary. We should thus refine (29) in the following way:

(31) affix boundary < word boundary within XP < XP boundary

The idea thus is that in structures such as work [n`] dag Hellendoorn I regressive rather than progressive assimilation, because this gives a b reflection of the morphosyntactic structure.

There are various ways of combining a constraint such as Crisp Ed hierarchy such as (31). One way would be to declare Crisp Edge a constr which a set of specific constraints Crisp(XP) Crisp(word) Crisp(aff) which would get this (possibly universal) ranking order. (Crisp(affix) consideration, in the remainder of this article, since it does not play analysis.)

As a matter of fact, syntactic XP boundaries possibly are never c! Hellendoorn Dutch at all. This we can conclude from facts such as the f:

(32) Hee lik [n`] aanderen man
    He resembles a different man
    He looks like a different man

In this example, the syllabic nasal cannot assimilate to the following with a vowel. Apparently, it also does not assimilate to the preceding would have surfaced as [N`]).
The facts with incomplete constructions (from (10), repeated below) somewhat mysterious:

(10) Progressive nasal assimilation

loop m`walk a ...

w rk Nwork a ...

gooj l`throw a ...

In these cases, the association line seems to cross the boundary between determiner indeed. We can assume that a determiner without a following project a full NP (or DP), but of course it is difficult to get any case: the constructions in (10) do not count as grammatical or normal. hardly count as crucial evidence for anybody’s theory.

4. Progressive and regressive assimilation: OT analysis

We can now formalise the analysis in terms of constraint tableaux. We have established the following constraint ranking:

(33) Crisp(XP) IDENT(velar) IDENT(labial)
     |                     *RHYME/CONSONANT
     |   Crisp(word) IDENT(coronal) WFC

The fact that Crisp(XP) dominates *RHYME/CONSONANT gives us that XP boundary be crossed; the fact that *RHYME/CONSONANT dominates the other constraints gives us that the other boundaries can be crossed (albeit only minimal is dominated by *RHYME/CONSONANT, finally, implies that we only find assim cases where this is necessary (in particular, with syllabic nasals at onset position).

We give a few selected examples below to illustrate this:

(34) w rk nie work not

|                              Crisp(word) |
|---------------------------------|----------------------------------|
| Crisp(XP)*R/C WFC              |
| ⇒a. w rk n|ie                         | *! |
| b. w rk N|ie*!)                      | *! |

12
Nasals in an onset do not assimilate, because there is no reason for as some analysts may argue that there is a major syntactic boundary between negation in this particular example; if that is true, the assimilated e: additional violation of Crisp(X), marked here in parentheses.)

(35) lo[pm ` k] nnen

<table>
<thead>
<tr>
<th>Crisp(XP)*Rh/C</th>
<th>WFC</th>
<th>Crisp(word)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. lo[pN ` k] nnen</td>
<td>(*)</td>
<td>*</td>
</tr>
<tr>
<td>b. lo[pn ` k] nnen</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>c. lo[pm ` k] nnen</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

In this particular instance, there are three possibilities: the nasal a obstruent (35a), to the preceding obstruent (35c), or not at all (35b). necessary (and possible), so that we can immediately discard option (35b) between (35a) and (35c), and in that case the latter form is clearly pr stem-final obstruent is closer than the one in the other verb. (Again posit a major syntactic boundary between the two verbs in some analy: (35a) would get an extra violation.)

(36) loop [N`] keer

<table>
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<th>Crisp(word)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. loop [N`] keer</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>b. loop [n`] keer</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>c. loop [m`] keer</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

In this syntactic environment we have the same three possibilities as in assimilation is possible and necessary, we can immediately discard the (36b). But in this case, the closest obstruent is the one following the

(37) lik [n`] aanderen man

<table>
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<tr>
<td>a. lik [n`] aanderen</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b. lik [N<code>] aand</code>eren</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

In this case, the syllabic nasal could only assimilate to the preceding allowed to do that, because this obstruent is too far away.

Feature alignment in these cases arguably corresponds to syntactic structure, not to the determiner behaves as an enclitic rather than a proclitic as far as syllabification i. W Zxonneveld (p.c.) for pointing this out.
5. Nasalization, nasal deletion and obstruent assimilation

We now have a fairly straightforward analysis of nasal assimilation: they need to acquire a place of articulation and for this they grab the place of the consonant that is nearest. This replaces the extrinsic ordering of two assimilation rules. We are now ready to consider some of the other phenomena that fit into this general picture.

First we turn to nasalization and nasal deletion. These two processes are found nasalization of the vowel in exactly those environments in which nasal deletion is deleted. Furthermore, nasal deletion seems to be subject to more or less restrictions as nasal assimilation: it does not occur if the nasal appears in the same syllable as mysterious facts in a rule-based analysis.

We propose that there is a causal relation between the two: the vowel because the consonant disappears. In other words, the nasal consonant completely, but it leaves behind its feature [nasal] on the vowel. A reactivation of this kind of faithfulness:

\[
(38) \text{TRACE: No segment may disappear without a trace.}
\]

TRACE can be seen as a kind of constraint on the morphology - phonology segment that is present in the underlying, morphological, representative of the surface phonological structure as well. As often, there are many ways For instance, we could invoke a kind of Correspondence. The underlying prefix /on/ is approximately the following (concentrating on the most important disregarding details of feature geometry):

\[
(39) \begin{array}{c}
\text{o} & \text{n} \\
\text{[round]} & \text{[lax]} & \text{[nasal]} & \text{[sonorant]} \\
\text{[mid]} & \text{[coronal]} \\
\end{array}
\]

Every segment has a unique index. TRACE says that all indexes in the input must correspond to some correspondent in the output. The output \([o~]\) satisfies this constraint:

\[
(40) \begin{array}{c}
\text{o} \\
\text{[round]} & \text{[lax]} & \text{[nasal]} \\
\text{[mid]} \\
\end{array}
\]

Why does the consonant disappear at all? We propose that the reason for this constraint is the constraint *RHYME/CONSONANT. Until now we have interpreted this as stringent Place features in rhyme position, but of course we may also give an interpretation and have it disallow any kind of consonantal feature in
course, the question then remains why this affects only nasals, a ques
tion here.)

The combination of Trace and *RHYME/CONSONANT gives us the required re


\[
\begin{array}{c|cc}
\text{(41)} & \text{[~]} \text{benul dimwit} & \\
\hline
\text{TRACE} & \text{*Rh/C} \\
\hline
\Rightarrow \text{a. [~]} \text{benul} & * \\
\Rightarrow \text{b. [~]} \text{benul} & * \\
\Rightarrow \text{c. [n]} \text{benul} & **! \\
\end{array}
\]

We have given the winning candidate one violation for *RHYME/CONSONANT, ass
sume feature [nasal] gives a minimal violation of this constraint. Yet this
the whole consonantal segment, as happens in (41c) (which should probab
violations than just one).

On the other hand, in cases such as in april, the nasal get resyll
the following syllable. There thus is no reason to delete the nasal con
no reason to assimilate a syllabic nasal in these contexts):

\[
\begin{array}{c|cc}
\text{(42) i [n] april} & \\
\hline
\text{TRACE} & \text{*Rh/C} \\
\hline
\Rightarrow \text{a. [I.n] april} & \\
\Rightarrow \text{b. [I] april} & * \\
\Rightarrow \text{c. [I~] april} & * \\
\end{array}
\]

The question now is: why doesn t the syllabic nasal get deleted, if it
*RHYME/CONSONANT and if deletion is an option. Why don t we get e.g. *[lo
[lopm`] to walk ? According to Nijen Twilhaar (1990), the underlying f:
suffix and all other instances of the syllabic nasal underlingly actua
becomes syllabic after the schwa has been deleted. But in any case it s
possible to epenthesize a schwa. Why doesn t this happen?

We suspect the reason is that nasalized schwa is strongly avoided
Dutch, as it is in many other languages: schwa, being a phonologically :
empty vowel, is not sufficiently strong to carry nasalization (cf. Van
overview of the literature on the phonological properties of schwa). Fc
that there is a specific constraint to this effect, although this might
more general requirement that nasals should be realized with a place sp
pointed out to us by Wim Zonneveld, p.c., cf. Trigo 1988):

\[
\text{(43) *NASAL/« : Schwa should not be nasalised.}
\]

Interaction of this constraint with the ones just established gives us
Another candidate, satisfying all of these constraints as well as (a), depends on the underlying forms we posit which constraint would be held the fact that this alternative is not selected. If the underlying form at work (dispreferring vowel epenthesis); if the underlying form is /«n be one preferring schwa to be in an open syllable rather than a closed 1995, 1998 gives ample evidence for this preference).

Finally, we want to discuss the phenomena of nasals surfacing in the singular. The relevant facts in (4) are repeated below.

(4) singular plural

<table>
<thead>
<tr>
<th></th>
<th>singular</th>
<th>plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>r[IØ]</td>
<td>r[Iø ]</td>
</tr>
<tr>
<td></td>
<td>spr[ ø]</td>
<td>spr[ ø]</td>
</tr>
<tr>
<td></td>
<td>vl[oø]</td>
<td>vl[oø ]</td>
</tr>
<tr>
<td>b.</td>
<td>b[o ]</td>
<td>b[onn’]</td>
</tr>
<tr>
<td></td>
<td>m[A ]</td>
<td>m[ann’]</td>
</tr>
<tr>
<td></td>
<td>l[oø ]</td>
<td>l[oønn’]</td>
</tr>
</tbody>
</table>

In the plural forms in (4a) and the singular forms in (4b), the vowel satisfaction TRACE after the deletion of a consonant which itself is necessary) only one nasalization mark on the vowel. One of the two underlined therefore violates the constraint TRACE, while in (45a) and (45b) both s
visible. However, in (45b) the rhyme has to bear a consonantal place feature it can share it with an onset in (45a). This causes the latter candidate to be the phonological process that can now be understood in somewh

Another phonological process that can now be understood in somewha

obstruent assimilation: voiced obstruents in the onset of a syllabic nas

themselves. Some examples are given in (11) and repeated below:

\[(11)\begin{align*}
\text{bi[nn']} & \quad \text{to pray} \quad \text{(from /bId/)} \\
\text{schro[mm']} & \quad \text{to scrub} \quad \text{(from /sxrob/)} \\
\text{loo[MM']} & \quad \text{to praise} \quad \text{(from /lo\text{"}v/)} \\
\text{ze [NN']} & \quad \text{to say} \quad \text{(from /zh\text{"}/)} \\
\end{align*}\]

What is the reason behind this assimilation process? We propose that the constraint *RHYME/CONSONANT: no consonantal feature likes to be in the rhy

the feature [nasal]. That is why (46a) is preferred over (46b):

\[(46) \begin{align*}
a. & \quad \sigma \\
b. & \quad \sigma \\
\end{align*}\]

In (46a) there is literally no consonantal feature at all which is atta

syllable nucleus. We thus propose that in cases like this, *RHYME/CONSONAN

cause of Place features spreading to a nasal consonant, but of the feat

itself as well.

Nasal spreading seems to be much more restricted than the other ty

discussed here. For instance, both the target and the source of spreadi

restrictions: spreading only occurs from a syllabic nasal (and not from voiced obstruent (and not a voiceless one). The latter restriction can as a kind of faithfulness. One could say that voiced obstruents are mor

their voiceless counterparts. Therefore, turning the latter into nasals faithfulness violations than doing this to the former. This still leave /bon/ does not turn into *[mo~] (rather than [bo~]): why is this type o

to syllables with a syllabic nasal as their head. The reason for this π be between a vowel and a consonant is kept to a minimum; we are not aware this type of sharing is needed in the analysis of Hellendoorn Dutch phr

Nasal spreading is restricted in other ways as well. Its scope see the syllable. The feature [nasal] spreads from a syllabic consonant lef the same syllable, not rightward to another syllable: [m bAl] a ball mAl]. Similarly, the feature does not seem to leave the morpheme for wh

is impossible in the incomplete constructions mentioned above.

---

* Another possible candidate is [b ~nn'], which presumably is rules out by a (fairly against unnecessary nasal vowels.
This latter case however is difficult to analyse straightforwardly, since it involves a construction which can hardly be counted as grammatical, and since it deals with Final Devoicing, a general process devoicing obstruents at the end of syllables.

We thus only find hard evidence for a restriction on phonological spreading. This could be formulated in for instance the following way (languages may have active constraints for larger domains):

\[(48) \text{NASAL DOMAIN: The feature [nasal] cannot be associated to segments in syllable.}\]

It remains to be seen whether (48) can be grounded in phonetics or in phonological explanation can be given to it.

6. Opacity effects

Even though we believe that we have gained some insight into the nature of processes in Hellendoorn Dutch, one problem still needs to be resolved. Strange behaviour of the plural suffix, once it is attached to a stem, denasalizes the vowel and surfaces itself as a syllabic nasal which is the result of assimilation.

Opacity facts provide a strong argument in favour of rule-based analysis of a theory incorporating a mechanism such as Sympathy Theory. On the particular the behaviour of the plural suffix is extremely problematic ordering of processes, as we will show below. We will argue here that a problem can be solved if we take the theoretical instruments which have been in seriously.

Let us therefore consider past tense cases such as \([pAkn']\) took, present tense cases such as \([pAkn']\) take. What causes the different forms? Clearly the past tense morpheme should have something to do with this morpheme is a suffix -t- (after a stem ending in a voiceless obstruents cases). It thus looks as if the syllabic nasal has assimilated to the coronal consonant is no longer present on the surface. Further analysis the problem arises: if assimilation is desirable for consonantal features to be present in a position outside benefit is there in assimilating to a consonant which itself does not occur at all?

We propose that in these cases there is no assimilation in the segment associated to two segments at the same time. We thus propose that the syllable of \([pAkn']\) is something along the following lines:
This means that in this case the nasal has an independent place feature probably originates from the past tense morpheme /t/, which has itself structure in (49) represents a very marked violation of the constraint first sight, we might think that this violation is forced by some const morpheme to be visible on the surface: if the feature [coronal] would d would spread in (49), the resulting structure would be indistinguishable tense form. Yet this cannot be the whole story, since also the plural for elevator ends in a heterorganic cluster [fn'] and there is no independent the underlying /t/ is a morpheme in this case.

It thus looks as if we have found another effect of the constraint input in (50a) (the last three relevant segments of pak+t+n) with the and (50c):

\[
\begin{align*}
(49) \quad \sigma \\
& k \quad n \\
& [velar] \quad [coronal]
\end{align*}
\]

The subscripts represent underlying segmental affiliation; a segment an are underlyingly associated to it, get the same indices.

Candidate output (50b) violates the constraint \textsc{trace}, because one u segment has disappeared without leaving a visible trace (there is no ma index j). In (50c), on the other hand, all underlying segments are present. Both in (50b) and in (50c), the underlying Place feature of the nasal is irrelevant, however, since other features of this segment (such as nasal still is material with index k on the surface.

The examples discussed so far all involve a voiceless obstruent. Be example with a voiced obstruent underlyingly:

\[
\begin{align*}
(50) \quad a. \quad k_i \quad t_j \quad n_k \\
& [velar]_i [coronal]_j [nasal]_k [coronal]_k \\
& b. \quad k_i \quad N_k \quad c. \quad k_i \quad n_k \\
& [velar]_j [nasal] [velar]_i [coronal]_j [nasal]_k
\end{align*}
\]

We thus see that the nasal feature still spreads to the preceding consonant is not the source of the place feature for the nasal notion nasal spreading is preferable over total obstruent assimilation
forms is as follows (dashed lines are used simply to facilitate the reproduction of the three-dimensional structure in a twodimensional picture):

\[
(52) \begin{array}{c}
\text{[velar]}_i \quad \text{[coronal]}_j \quad \text{[nasal]}_k \\
\end{array}
\]

The nasal feature spreads in these cases because of $^{*}$Rhyme/Consonant. It is a constraint that is violated by the place feature already, but this does not prevent violations of this constraint$^9$ from being acceptable:

\[
(53) /lEÄ+/d+/n/ \\
\begin{array}{|c|c|}
\hline
\text{TRACE} & \text{*Rh/C} \\
\hline
\Rightarrow a. \ [lEN'] & * \\
\hline
b. \ [lEFn'] & **! \\
\hline
c. \ [lE宁波市'] & ** \\
\hline
d. \ [lENN'] & * \\
\hline
\end{array}
\]

The so-called opacity cases in the interaction between t-deletion (or c and nasal assimilation) thus turns out to be not opaque at all. They are the same interaction of factors which is also responsible for the fact that deletion is a direct consequence of nasal deletion.

### 7. Conclusion

Nasals in Hellendoorn Dutch display a pattern which is quite complicated to explain upon an analysis involving extrinsically ordered rules. We have, however, seen that these facts are more profitably seen as a result of the interaction of factors. In the first place, the features of nasal consonants prefer nasal consonants in a nearby onset. In the second place, phonological structure morphosyntactic structure as much as possible: association lines should little morphological and syntactic boundaries as possible and certain a cross any boundary at all. And finally, underlying segments should not completely; preferably they should leave at least a minimal trace. The as a purely phonological type of wellformedness. The second and third factors of the interface between morphological and syntactic structure and phonological essence, they suggest that the phonological structure should mirror the syntax as exactly as possible.

These assumptions obviate the need for many of the presumed orderi mentioned above:

$^9$ Of course, all of these purely phonological phenomena interact with considerations of the interface between morphological and syntactic structure and phonology interface in ways outlined above.
Nasalization bleeds nasal assimilation because it better satisfies *RHYME/CONSONANT; it is better to delete a consonant than to assimilate preceding or following consonant;

There is no need to distinguish between regressive nasal assimilation assimilation, or to order these processes disjunctively; they are tw same medal; whether a nasal consonants assimilates to the left or to which consonant is nearest;

There similarly is no need to distinguish between obstruent assimilat and nasal assimilation, because again, both are instances of a gener requirements of *RHYME/CONSONANT, be it that the former is somewhat more than the latter.

Even apparent opacity, such as the interaction between t-deletion and can be analysed in a fairly simple constraint-based system, assuming segments are preferably not deleted entirely; this idea has been form condition TRACE.

All in all, we have established the following constraint rankings:

\[
\begin{align*}
(54) \quad \text{Crisp}(XP) & \quad \text{IDENT}(\text{velar}) \quad \text{IDENT}(\text{labial}) \quad \text{TRACE} \quad *\text{NASAL} /« \\
& \quad *\text{RHYME} /\text{CONSONANT} \\
& \quad \text{Crisp}(\text{word}) \quad \text{IDENT}(\text{coronal}) \quad \text{WFC}
\end{align*}
\]

We have thus set up a fairly simple grammar of Hellendoorn Dutch nasal based on constraints we think are quite plausibly universal and which e put forward in this article: that Hellendoorn Dutch nasalization result phonological domains in which consonantal material prefers to be in con and morphological and syntactic domains in which all phonemes should su: morphological boundaries should be respected.

References


