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**A propos of the Dutch vowel system 21 years on, 22 years on**

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*Bert Botma & Marc van Oostendorp*

A propos of the Dutch vowel system 21 years on, 22 years on\*

## 1 Introduction

When this paper appears, it will be almost exactly 22 years since Norval Smith, together with a group of students, presented a paper at the annual conference of the Dutch Linguistics Association, entitled ‘‘A propos of the Dutch vowel system’ 21 years on’. The title of the talk, and of the article which appeared later that year (Smith et al. 1989), referred to an unpublished manuscript written by Rudolf de Rijk in 1967, during a stay at MIT.<sup>1</sup> De Rijk’s study of the Dutch vowel system was the first in the then emerging framework of generative phonology — though the problems posed by the phonological classification of Dutch vowels had been a concern of linguists for a much longer time, dating back at least as far as the end of the 19<sup>th</sup> century (see e.g. Van Helten 1887).

As for other West Germanic languages, the main challenge facing an analysis of the Dutch vowel system is how the phonological difference between two sets of vowels — one typically transcribed as /a:, e:, ø:, o:, i, y, u/, the other as /ɑ, ɛ, ɪ, ɔ, ʏ/ — should be characterized.<sup>2</sup> Phonetically, there appear to be two differences between these sets. First, all members of the second set are short, while all but the high vowels in the first set are long. Second, the two sets differ in terms of quality, with (for want of more specific terms) the former usually described as ‘tense’ and the latter as ‘lax’.

For the purposes of phonology, a more important observation is that the two sets show different phonological behaviour. This concerns first and

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\* The authors would like to thank Norval Smith for his inspiration, his insights, and his many contributions to phonology in the Netherlands and the phonology of Dutch. Thanks are also due to Colin Ewen, Ben Hermans, and Björn Köhnlein for useful comments, and to Koen Sebregts for sharing his data on Dutch bunched /r/. The first author acknowledges the assistance of the Netherlands Organization of Scientific Research (NWO) for funding project no. 2008/01214/GW.

<sup>1</sup> This originally unpublished manuscript was published many decades later, in an Internet collection of 100 influential articles on Dutch linguistics (see de Rijk 1967).

<sup>2</sup> The native Dutch vowel system also contains schwa, as well as the diphthongs /au, ɛi, œy/.

foremost their phonotactic distribution. The most prominent difference is that long/tense vowels can be followed by *at most* one consonant, whereas short/lax vowels must be followed by *at least* one consonant — or alternatively, that short/lax vowels necessarily occur in a closed syllable. This is illustrated in (1), where /a/ in (1a) represents the short/lax vowels and /a:/ in (1b) the long/tense ones:

- |        |        |          |          |            |
|--------|--------|----------|----------|------------|
| (1) a. | */ra/  | /ram/    | /rap/    | /ramp/     |
|        |        | ram      | rap      | ramp       |
|        |        | 'ram'    | 'quick'  | 'disaster' |
| b.     | /ra:/  | /ra:m/   | /ra:p/   | */ramp/    |
|        | ra     | raam     | raap     |            |
|        | 'yard' | 'window' | 'turnip' |            |

Some exceptions to this generalization should be noted. First, short/lax vowels are found at the end of interjections, as in *bah* [ba], *goh* [xɔ]. Second, long/tense vowels can be followed by a cluster if the consonants involved are coronal (e.g. *paars* 'purple', *haard* 'hearth'), as well as in a handful of exceptional words (e.g. *twaalf* 'twelve', *hielp* 'help-PAST-SG'). These exceptions are usually relegated to specific parts of the lexicon, as are interjections, while coronal consonants are usually assigned a special phonotactic status (e.g. Paradis & Prunet 1991).

With these qualifications in mind, we now turn to the ways in which the two sets of Dutch vowels have been analyzed. Broadly speaking, three approaches can be distinguished in the phonological literature. These are summarized in (2).

- (2) Approaches to the phonological classification of Dutch vowels
- a. The phonetic property of length is basic; the other properties are derived from this.
  - b. The phonetic property of tenseness is basic; the other properties are derived from this.
  - c. The (phonological) distinction between open and closed syllables is basic; the other (phonetic) properties are derived from this.

In recent years, the Dutch phonological community seems to have converged on (2b), which is the approach advocated by Smith et al. (1989), among others. However, approach (2a) still enjoys considerable support, e.g. in phonological descriptions of Dutch (Booij 1995) and in textbooks (Kooij & Van Oostendorp 2003). Approach (2c) was favoured by such linguists as Sievers (1901) and Trubetzkoy (1939), and is also reflected by the descriptive terms 'checked vowel' and 'free vowel', used in (mostly) the British tradition (e.g. Cohen 1952) — but it has not, as far as we are aware, figured in any recent analyses of the Dutch vowel system.

In this chapter, we review the arguments put forward in the literature for each of the three approaches described above. This will lead us to return to approach (2c), a perspective which has long been out of the limelight but fits in well with what we believe is a promising trend in recent work, viz. the idea that certain phonological contrasts are more appropriately encoded in representational terms rather than in terms of phonetically based features (e.g. Golston & Van der Hulst 1999; Pöchtrager & Kaye 2010).

The chapter is structured as follows. First, in section 2, we provide a brief historical overview of previous analyses of the Dutch vowel system. In section 3, we note two problems that are faced by an approach in which the basic distinction is taken to be one of ‘tense’ vs. ‘lax’. The first of these is that in such an approach the distributional restrictions on short/lax vowels must be stated twice: once in the form of a feature and once in the form of a constraint on the syllable in which these vowels appear. The second problem is that the phonetic correlates of the labels ‘tense’ and ‘lax’ on which this approach is based are unclear. In view of these problems, we go on to offer a re-appraisal of approach (2c) in section 4, where we argue that the basic distinction between the two sets of vowels is made at the syllabic level. More specifically, our claim is that tense and lax vowels are identical at the segmental level, but differ in terms of the structure of the syllable rhymes which contain them. Section 5 examines briefly some consequences of this proposal, viz. the idea that syllable structure forms part of the underlying representation, the status of schwa (which can occur in both open and closed syllables), and the way in which the structures we propose are implemented by the phonetics.

## 2 Phonological approaches to the Dutch vowel system

The question of the proper classification of the Dutch vowel system is one of the oldest problems in Dutch phonology. Pre-structuralist linguists (who did not call themselves phonologists) such as Van Helten (1887) and Verdam (1923) referred to a distinction between ‘long’ and ‘short’ vowels, in line with approach (2a). Their focus was primarily on earlier stages of Dutch, for which a length distinction is reasonably well supported. Historically, the long/tense vowels of Dutch derive from vowels which were either already long in earlier stages of (West) Germanic, or were the result of lengthening processes (e.g. open syllable lengthening).

The early structuralists tended to take a different point of view. For example, De Groot (1931) distinguished between ‘bright’ (for ‘long’) and

‘dull’ (for ‘short’) vowels, but this impressionistic classification was not accepted by many of his contemporaries (see e.g. Moulton 1962). More typically, structuralist authors would adopt approach (2c) and refer to the contrast as one of ‘strongly cut’ vs. ‘weakly cut’, a terminology which had originally been introduced by Sievers (1901) and further developed in the work of Trubetzkoy (e.g. 1939: 196). In this view, the greater length of vowels in a weakly cut position was taken to be a by-product of a more basic distinction between open and closed syllables, viz. ‘the syllable cut’. As far as we can see, no theoretical or empirical arguments were provided for taking the syllable cut, rather than length, to be primary in this approach. For Trubetzkoy, vowel length certainly was a possible dimension of contrast, for example in his analysis of Hopi.

Post-war (late-structuralist, pre-generative) phonologists took an entirely different perspective. For example, Cohen et al. (1959) objected to the syllable cut and a length contrast on the grounds that the phonetic basis for both was unclear. In particular, they observed that the high vowels /i, y, u/ pattern with the non-high vowels /a, e, ø, o:/ phonologically, despite the fact that the former are short phonetically. For this reason, Cohen et al. preferred the term ‘tense’ to describe this set. This term was also adopted by early generative phonologists. For example, De Rijk’s (1967) choice for ‘tense’ is explicitly based on the work of Cohen et al., although he argues that the distinction between ‘tense/lax’ and ‘long/short’ is merely a terminological matter, which does not affect the phonological analysis. A large part of De Rijk’s paper is devoted to the formalization of a system of rules that tense vowels in contexts which could be called ‘open syllables’ and lax them in ‘closed syllables’ — though the notion of the syllable was absent from the (pre-) SPE framework in which De Rijk presented his ideas.

The advent of Autosegmental Phonology (Goldsmith 1976) gave a new impetus to approach (2a). In autosegmental terms, length is not represented by a feature, as it was in SPE, but by the association of a bundle of phonological features to two ‘skeletal’ or ‘x’-positions. Zonneveld (1978) was the first to point out that such a representation, when incorporated in a model that recognizes the syllable, goes a long way towards explaining the distribution of Dutch long/tense vowels. In such a model, the distributional restrictions that were given in (1) can be understood as follows:

- (3) a. Dutch rhymes contain at least two positions and at most three.  
 b. Short vowels occupy one position and long vowels two.

An autosegmental approach to vowel length is therefore capable of describing an important aspect of Dutch phonotactics, and does so in a way that is much more natural and straightforward than the rather complex and arbitrary set of rules of, for example, De Rijk. As a result, this version of the

length-based approach became part of the generative mainstream in the 1980s and 90s, figuring in, among others, Van der Hulst (1984), Trommelen & Zonneveld (1989), Kager (1989), Fikkert (1994), and Booij (1995).

The autosegmental length theory is not without problems, however. For one thing, Van Oostendorp (1995, 2000) observes that such a theory must stipulate that schwa is long phonologically (despite being short phonetically), because, like long vowels, it can occur word-finally (e.g. *mode* /mɔːdə/ ‘fashion’) but not before two non-coronal consonants (e.g. *arend* /aːrənd/ ‘eagle’ vs. \*/aːrəmp/). Van Oostendorp further observes that a length-based approach is problematic from the point of view of markedness. First, with regard to stress, it would imply that Dutch is a weight-sensitive language in which only closed syllables count as heavy — a typologically highly marked state of affairs. Second, with regard to syllable structure, the implication would be that Dutch lacks the universally unmarked CV syllable type (at least, in stressed position).

Observations like these led some phonologists to return to approach (2b), viz. one in which the basic contrast is one of quality rather than quantity. The main proponents of this approach are Smith et al. (1989), Van Oostendorp (1995, 2000), and, more recently, Gussenhoven (2009).<sup>3</sup> Assuming a version of Dependency Phonology, Smith et al. argue that long/tense vowels are distinguished from their short/lax counterparts in having an additional privative feature (or ‘element’) [I], which they equate with tenseness, or [ATR].<sup>4</sup> Smith et al. further propose a set of three ‘Syllabification Principles’, given in (4):

- (4) Syllabification Principles (Smith et al. 1989: 138, 141)
- a. A syllable with a specified vowel must have a rhyme with at least two slots.
  - b. A lax (specified) vowel may not be the final sound in a syllable.
  - c. Syllables containing specified vowels must if possible fill unoccupied slots, from a rhyme-external source.

We will not go into the rather complicated way in which these principles interact, except to say that (4a,b) cover similar ground as (3a,b), but are more arbitrary. For example, no reason is provided why it should be the absence of [I] which makes a segment unable to occur at the end of a syllable.

Principle (4c) serves to distinguish between short and long high tense vowels. Dutch has a marginal contrast between these, with the latter occurring in loanwords, e.g. native *kiem* /kim/ ‘germ’ vs. non-native *team*

<sup>3</sup> For a Government Phonology perspective of this approach, see Van der Hulst (2003); Polgárdi (2008).

<sup>4</sup> The same feature in head position denotes palatal constriction and is a property of front vowels.

/ti:m/ ‘team’, but neither can occur in syllables closed by more than one non-coronal consonant (e.g. \*/kimp/, \*/ti:mp/). It will be clear that this difference is difficult to represent in a purely length-based account, although it is not impossible. For example, Hermans (1992) represents long tense vowels as having two *x*-positions that are both linked to segmental material, while in short tense vowels only the first of the two *x*-positions is linked. Smith et al. employ the same surface representations for this contrast, except that in their approach the extra *x*-position of short high tense vowels is filled by material from the following consonant. However, there seems to be no empirical difference between the two representations, since Dutch lacks geminate consonants, at least within prosodic words (e.g. Booij 1995).<sup>5</sup>

Smith et al., then, present a hybrid approach between tenseness and length in which the former is underlying and the latter derived in the phonology. The special status of schwa is captured by the proviso that the principles in (4) apply to ‘specified’ vowels only. The invisibility of vowel length to stress is treated derivationally, by assuming that stress assignment applies before lengthening of tense vowels.

Van Oostendorp (1995, 2000) proposes a more radical version of the tense/lax approach. His claim is that length does not play a role in the phonology of Dutch at all.<sup>6</sup> Rather, length is taken to be a phonetic derivative of a phonological contrast that is represented by an underlying, monovalent feature [lax] (or [RTR]). Van Oostendorp expresses the correlation between lax vowels and their phonotactic distribution in terms of an Optimality-theoretic constraint, which we give here in a slightly simplified form:

(5) CONNECT(rhyme, [lax])

A vowel is the head of a branching rhyme *iff* it has the feature [lax].

The constraint in (5) forces lax vowels to be heads of closed syllables and tense ones to be heads of open syllables. Such an analysis has two immediate advantages. First, it accounts for the distribution of schwa, which, like tense vowels, lacks [lax] and therefore must occur in open syllables. Second, since length is absent from the phonology, syllables containing tense vowels function as light, making Dutch a regular weight-sensitive language.

One objection that could be raised against (5) is that like Smith et al.’s approach, it establishes an arbitrary relation between a segmental property (viz. the feature [lax]) and a syllabic structure (viz. a branching rhyme). Van Oostendorp attempts to remedy this in two different ways. First, he argues

<sup>5</sup> However, Nooteboom (1971) shows that consonants following short vowels are significantly longer than those following long vowels (see also Ernestus 2000).

<sup>6</sup> Except in loan phonemes, i.e. the vowels which Smith et al. (1989: 135) call “French tense” (/i:, y:, u:/) and “French lax” (/ɛ:, ɣ:, ɔ:/).

that CONNECT(rhyme, [lax]) is a member of a more general family of constraints that links aperture features to prosodic complexity. For example, CONNECT constraints also regulate the phonotactics of schwa, which has no aperture features at all and so can occur in an extremely limited subset of syllable templates only (basically, CV syllables).<sup>7</sup> Second, Van Oostendorp argues that there are languages in which the relation between laxness and a branching rhyme holds independently. For example, in Eastern Javanese, all vowels in a word are RTR if the final syllable is closed, and are ATR otherwise. This suggests that in this language final syllables must satisfy CONNECT(rhyme, [lax]), with RTR spreading leftwards. Notice that an analysis of this pattern in terms of autosegmental length is much less straightforward, since bi-positionality cannot spread.

The most recent contribution to the debate is Gussenhoven (2009), who follows the main tenets of Van Oostendorp's approach, but argues that the presence of length in the (native) phonology of Dutch is independently required. One of Gussenhoven's arguments concerns the observation that high tense vowels undergo lengthening before /r/, except when this /r/ is part of a cluster (e.g. *vier* [vi:r] 'four' vs. *wierp* [virp] 'throw-SG-PAST').<sup>8</sup> We return to this issue below, in section 5. Gussenhoven further observes that all tense vowels are long when they occur in a stressed syllable, which he attributes to an Optimality-theoretic constraint STRESSTOWEIGHT. However, in Gussenhoven's approach, too, length is absent underlyingly, and so does not influence the stress system.

### 3 The tense/lax approach: two problems

In the preceding section, we have seen that there are good arguments for taking the underlying contrast in the Dutch vowel system to be one of quality rather than quantity, e.g. between a series of tense and lax vowels. However, while such an analysis seems in general to be preferable to a length-based analysis, we believe that it faces two problems. We examine these problems in this section, setting the stage for the alternative, syllabic approach that we present in section 4.

<sup>7</sup> Except in word-final position, where schwa can be followed by a single consonant. For discussion, see Kager & Zonneveld (1986) and Van Oostendorp (1995, 2000).

<sup>8</sup> Gussenhoven further observes that the [i] in *wierpen* [virpən] 'throw-PL-PAST' is short, which suggests that the lengthening process is restricted to stems.



The first problem is one of duplication. In the tense/lax analyses of both Smith et al. and Van Oostendorp, the phonological properties of the lax vowels are stated twice: once at the level of segmental structure (in terms of the absence of a dependent [l], or the presence of [lax]), and once at the level of syllabic structure (in terms of an obligatorily branching rhyme). This dual specification is not only unparsimonious, but also requires a relation between segmental and syllabic structure that is essentially arbitrary — recall (4b) and (5). Clearly, it would be preferable to state the contrast between tense and lax vowels just once.

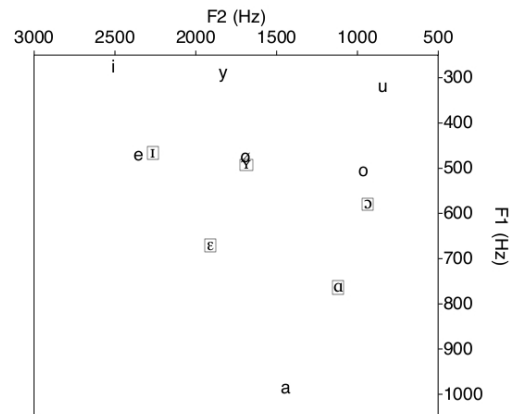
The second problem facing a tense/lax account concerns the phonetic correlates of tenseness, which have so far proved elusive. Here the first question that should be asked is whether this is a serious problem. On the one hand, it is widely accepted that the features used to account for phonological phenomena must be grounded in phonetics (though see e.g. Hjelmslev 1953; Hale & Reiss 2008). On the other, the question of how tense and lax vowels should be defined phonetically is perhaps not a strictly phonological question, but one which concerns the phonetics–phonology interface. From this perspective, the main observation is that Dutch has two sets of vowels with phonologically distinct behaviour — something which holds irrespective of the phonetic exponence of these sets. Recent tense/lax approaches have tended to take a somewhat agnostic view on this issue, as is reflected by Van Oostendorp’s (1995, 2000) use of the terms ‘A’ and ‘B’ vowels, for example. Nevertheless, it is clear that a tense/lax analysis of the Dutch vowel system would gain considerable support if the labels ‘tense’ and ‘lax’ could be shown to have consistent correlates. Convincing phonetic support for these labels has not been forthcoming, however.

Smith et al. and Van Oostendorp both implicate the tongue root in the phonetic feature definition of tenseness, in line with earlier studies on other, non-Germanic languages (see in particular Stewart 1967; Halle & Stevens 1967). Smith et al. (1989: 134) assume that dependent [l], which specifies tense vowels, correlates with “pharyngeal expansion”, i.e. tongue-root advancement (ATR). Van Oostendorp (1995: 43) represents lax vowels in terms of the feature [lax], which he notes has “a straightforward articulatory definition” in terms of tongue-root retraction, or RTR. However, closer inspection reveals that there are good grounds to be suspicious of these accounts. First of all, Dutch does not provide any consistent evidence for what is considered to be the main correlate of tongue-root advancement, viz. a lowered  $F_1$ . In a recent experiment in which the formant values ( $F_1$ ,  $F_2$ ) of tense and lax mid-vowel pairs were measured, /e, o/ were seen to have a lower  $F_1$  than their lax congeners /ɪ, ɔ/, but the  $F_1$  of lax /ʏ/ was higher than that of tense /ø/ (Botma et al. 2012). Cross-linguistic evidence also suggests that tenseness does not correlate with tongue-root advancement in any

straightforward way. For example, MacKay (1977) shows that English tense vowels do not necessarily involve tongue-root advancement; on the basis of his data, the best that can be said is that tense vowels show tongue-root advancement compared to lax vowels with the same height and frontness. MacKay further observes that /o/ involves tongue-root retraction, despite patterning as tense. The relation between tongue-root advancement and tenseness is also tenuous in German, where /ɪ/ has a greater degree of tongue-root advancement than /i/ (Ladefoged & Maddieson 1996), even though /ɪ/ patterns as lax and /i/ as tense. More generally, Ladefoged & Maddieson observe that the nature of tongue-root advancement in English and German differs from that in West African languages like Akan and Igbo, for which [ATR] was originally proposed. Tongue-root position is a separately controlled variable in Akan and Igbo, which have ATR-harmony, but correlates with tongue height in English and German, leading Ladefoged & Maddieson to conclude that tenseness is not an independent parameter in vowel description.

It has also been proposed that the tense/lax contrast can be defined in terms of relative peripherality, with the lax vowels being more centralized than their tense congeners (e.g. Lindau 1979; Harris & Lindsey 1995; Botma et al. 2012). Such an account has been criticized on the grounds that it would make tenseness the only feature whose exponence is defined in relative terms (e.g. Lass 1984; Van Oostendorp 1995, 2000). However, as Botma et al. note, this does not seem to be a problem in the approach of Harris & Lindsey, where the representation of vowels includes a ‘centrality’ element that is more prominent in lax vowels than in tense ones, with relative prominence formalized in terms of dependency relations, in much the same way as in Smith et al.’s approach. Compare in this respect the mean formant frequencies ( $F_1$ ,  $F_2$ ) of the Dutch tense and lax vowels as measured by Van Nierop et al. (1973) and Pols et al. (1973), in (6). (Lax vowels are represented in boxes.)

- (6) The Dutch tense and lax vowels (adapted from Van Nierop et al. 1973 and Pols et al. 1973)



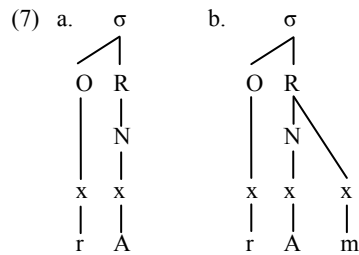
On the basis of (6), Botma et al. conjecture that the lax vowels are closer to the ‘neutral position of the vocal tract’ — a position which is characterized acoustically by the vowel space in the region of around 650Hz (F<sub>1</sub>) and 1500Hz (F<sub>2</sub>). They observe that this characterization corresponds reasonably well to part of the articulatory definition of tense vowels in Chomsky & Halle (1968: 324–325), as having “a greater deviation from the neutral or rest position of the vocal tract” (see Jakobson et al. 1952 for an acoustic definition). However, this account of the Dutch tense/lax contrast requires a more precise characterization of the notion of ‘neutral position of the vocal tract’. Botma et al. do not discuss this issue, except to note that this position is unlikely to correlate with schwa.

These problems notwithstanding, it is worth noting that both approaches described above offer some potentially interesting insights. For example, an approach which equates laxness with [RTR] can attribute the lack of high lax vowels in Dutch to the marked feature combination [RTR, high] (Archangeli & Pulleyblank 1994; see also Van Oostendorp 1995, 2000). An approach which equates tenseness with relative peripherality, on the other hand, offers what seems to be a straightforward explanation for the predictable length of the non-high tense vowels: if such vowels involve a greater magnitude of their articulatory gestures, then their greater duration would follow from this. However, as there seems to be insufficient evidence for relative peripherality, and sufficient evidence against tongue-root involvement, we conclude that to date no consistent phonetic correlate of tenseness has been found.

In view of the problems noted above, we will suggest an alternative approach which by-passes the featural level altogether and encodes the relevant contrast exclusively at the syllabic level. We develop a preliminary outline of this approach in section 4.

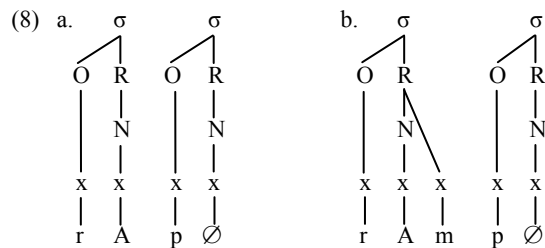
4 A prosodic alternative: the return of the syllable cut

We believe that the problems noted in section 3 are avoided if we make the contrast between the two sets of vowels in the Dutch vowel system exclusively at the prosodic level. More specifically, we suggest that the difference between long/tense and short/lax vowels is made in terms of a branching vs. a non-branching rhyme structure. This is illustrated in (7) for the low vowels [a:] and [a], in the words *ra* [ra:] ‘yard’ (7a) and *ram* [ram] ‘ram’ (7b) respectively.



In (7a,b), ‘A’ denotes the set of features which the vowels in *ra* and *ram* have in common. These features, it will be noted, are identical, because the contrast between the vowels is not made at the segmental level, but at the level of the rhyme: (7a) has a non-branching rhyme while (7b) has a branching rhyme. We assume that the phonetic differences between long/tense [a:] and short/lax [a] are the result of this structural difference. We will offer some speculations as to how structures of the kind in (7) are implemented by the phonetics in section 5.

Our account crucially relies on the assumption that the syllable rhyme is restricted to a maximum of two segments. More concretely, following Van Oostendorp (1995, 2000) we assume that consonants which cannot be syllabified under the rhyme occupy the onset position of a following empty-headed syllable. This is the case, for example, for /p/ in words like *raap* [ra:p] ‘turnip’ (8a) and *ramp* [ramp] ‘disaster’ (8b):



As was already intimated, the essence of this approach goes back to Sievers (1901), who distinguished between *stark geschnitten* and *swach geschnitten* syllables, and to Trubetzkoy's (1939) *Silbenschnittkorrelation*. Notice that an approach which allocates the phonological contrast at the syllabic level obviates the two problems observed in section 3. First, the contrast between the two sets of vowels is stated just once (at the level of the syllable rhyme), and so does not involve an ad hoc relation between segmental composition and syllabic structure. Second, since the contrast is not specified at the segmental level, no recourse is required to features whose phonetic exponence is unclear. Finally, notice that in a syllabic approach, just as in a tense/lax approach, the long/tense vowels are phonologically short, i.e. dominate just one *x*-position, which makes them light for the purposes of stress assignment.

## 5 Some implications of the syllabic approach

The decision to specify the contrast between long/tense and short/lax vowels at the level of the syllable rhyme raises a number of questions. The most important of these concern the implication that syllable structure is underlying, the status of schwa (which can occur in both open and closed syllables), and the question of how the structures we propose are implemented by the phonetics. Finally, we consider briefly how our approach can deal with Gussenhoven's arguments for recognizing phonologically relevant length.

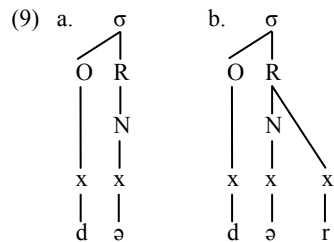
First, the syllabic approach outlined in section 4 can be maintained only if syllable structure is posited as underlying. As such, our proposal is in line with the ideas put forward in Golston & Van der Hulst (1999), who claim that certain phonological features — structure features, in their case — can be dispensed with if they are construed of instead as forming part of the phonological structure. Our proposal is also in line with ideas developed in Pöchtrager & Kaye (2010), who argue that a contrast which is realized as voicing phonetically (the |L| element of Government Phonology) can be formalized phonologically in terms of the presence or absence of prosodic positions.

Traditionally, the main argument against underlying syllable structure is that it is predictable from underlying precedence relations between segments. Golston & Van der Hulst point out that this argument can also be reversed: if syllable structure is underlying, then the linear order of segments can be derived from this. (For instance, if a complex onset consists of /p/ and /r/, then

the order [pr] is predictable.) Golston & Van der Hulst also adduce various types of phonological evidence for underlying syllables. For example, they observe that lexical templates and word minimality requirements are often sensitive to syllable structure. In addition, they note that the presence of underlying syllables is well motivated on psycholinguistic grounds, among other things by tip-of-the-tongue phenomena.

A potential drawback of positing underlying syllable structure is that differences in syllabification never appear to be distinctive: there are no languages with minimal pairs such as /o.ma/ vs. /om.a/, for example. It is worth noting that this observation concerns onsets and not rhymes, and that it is a problem not just for our approach. As far as we know, all existing theories of syllable structure must stipulate that a consonant in a CVC sequence will, all things being equal, form a syllable with the following vowel. In our approach, a requirement is needed to the effect that underlying syllabic configurations are maintained, as otherwise the contrast between tense and lax vowels will be neutralized.

Another question that is raised by a syllabic approach concerns the status of schwa, which occurs in both open and closed syllables (e.g. *mode* /modə/ ‘fashion’, *moeder* /mudər/ ‘mother’). This means that schwa is found in the structural configurations in in (9a,b), the final syllables of *mode* and *moeder* respectively.



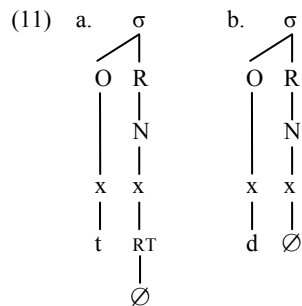
The fact that the phonetic implementation distinguishes between (7a) and (7b), i.e. between /rA/ and /rAm/, but not (apparently) between (9a) and (9b), is interesting, but not necessarily a strong argument against our approach. Indeed, it has often been suggested that schwa is a ‘targetless’ vowel (e.g. Browman & Goldstein 1992), or that it lacks featural content (Van Oostendorp 1995, 2000; see also Koopmans-Van Beinum 1993). If so, it seems reasonable to assume that the phonetic implementation treats schwa different from other, specified vowels.

A more problematic observation is that Dutch schwa syllables cannot end in more than one non-coronal consonant — recall *arend* vs. *\*aremp*. This has been taken as an indication, e.g. by Zonneveld (1978), that schwa forms a natural class with the long/tense vowels, despite the fact that it is neither

tense nor long. This is not the only possible conclusion, however. Given our assumptions about syllable structure, we can rephrase the ban on əCC sequences as a ban on sequences of a (closed) schwa-headed syllable and a following empty-headed syllable.<sup>9</sup> Similarly, the observation that tense vowels cannot be followed by two consonants can be rephrased as a ban on two consecutive empty-headed syllables — a restriction which figures prominently in the Government Phonology literature. We can generalize over these two observations as follows:

- (10) Schwa-syllables and empty-headed syllables cannot be followed by an empty-headed syllable.

The generalization in (10) makes sense for the following reasons. First, if it is indeed the case that schwa lacks a feature specification, then we expect it to display similar behaviour as empty heads. A syllable headed by schwa differs minimally from one whose head is completely empty. This is illustrated in (11) for the second syllable of the words *tante* /tantə/ ‘aunt’ and *kant* /kant/ ‘lace’ respectively. The schwa in (11a) has a root node (represented as ‘RT’) but lacks any further segmental specification, such as place or aperture features. The nucleus of the empty-headed syllable in (11b) lacks any segmental specification whatsoever:



A second argument for (10) concerns the observation that both schwa-headed and empty-headed syllables avoid stress. In fact, these syllables do not just resist stress, but require the immediately preceding syllable to be stressed. This suggests that both schwa-headed and empty-headed syllables prefer to be in the weak position of a foot (in Dutch, a trochee), which in turn suggests the following principle:

<sup>9</sup> Modulo coronal clusters, as in *arend*, which require a different analysis. We could assume, for example, that they are dominated directly by the Prosodic Word, similar to what is proposed in Van Oostendorp (2002).

- (12) Syllables whose heads lack (sufficient) features appear in the weak position of a trochaic foot.

Since a trochaic foot has just one weak position, (10) follows from this as a lemma.

To conclude this section, we offer some speculative thoughts on how we envisage the phonetic implementation of the contrast between branching and non-branching rhymes. Let us suppose first of all that rhymes — which in our approach are limited to a maximum of two *x*-positions — have a roughly fixed duration.<sup>10</sup> (This may be true for stressed vowels in particular.) If this is the case, then we may expect vowels in non-branching rhymes to be longer than those in branching ones; the latter contain two segments, which must be squeezed in the same temporal domain as a single segment in a non-branching rhyme. We might further conjecture that the ‘tenseness’ of vowels in non-branching rhymes is an automatic consequence of their greater length, which permits a greater magnitude of the vowels’ articulatory gestures. However, in the absence of compelling phonetic support for ‘tenseness’, such an account remains highly tentative — and it is in any case not strictly required in our approach.

Finally, let us briefly return to Gussenhoven’s reasons for representing length in the (native) Dutch vowel system. As was already noted in section 2, one reason concerned the observation that stressed vowels are phonetically long. This argument does not strike us as very compelling, however. If the length of stressed vowels is predictable, then it would seem reasonable to attribute this to the phonetic implementation, in much the same way as we suggest for the comparatively greater length of vowels in non-branching rhymes.

We also believe that there is some reason to be skeptical of Gussenhoven’s second argument, viz. the observation that high vowels lengthen before stem-final /r/ (as in *vier* [vir] ‘four’). Lengthening of vowels before /r/ is not limited to high vowels but affects all vowels (e.g. ‘t Hart 1969; Collins & Mees 1999). In addition, depending on the type of /r/ allophone involved, the effect on the preceding vowel may be characterized as lengthening, or as a kind of diphthongization (or breaking). The latter effect appears to be typical for speakers who have a ‘bunched’ approximant /r/, a realization that is increasingly found in modern Standard Dutch (e.g. Van Bezooijen 2005). It seems to us that the greater length of the preceding vowel can in such cases be attributed to the transition from the (pre-)dorsal gestures of the high vowel to the gestures of /r/, in line with the Articulatory Phonology approach in

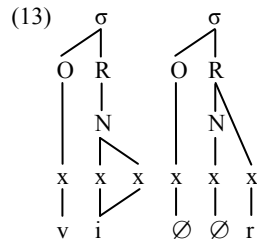
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<sup>10</sup> We could refer to this as ‘rhyme-timing’, on analogy with the notions of ‘stress-timing’ and ‘syllable-timing’ from Pike (1945) — though whether there is empirical evidence for rhyme-timing is an open question.



Gick & Wilson (2006). The data in Scobbie & Sebrechts (2011) show that bunched /r/ in Dutch is consistently characterized by pharyngeal constriction, effected by retraction of the tongue root. This suggests that if pre-/r/ breaking is accounted for in terms of a constraint, a feasible candidate would be a markedness constraint that militates against the combination of [RTR] and [high] — the same constraint that was mooted in section 3 to account for the absence of lax high vowels. (See also Hall & Hamann 2010 for an articulatory account of the dispreference of sequences of /r/ and a high front vocoid.)

If it is indeed the case, as Gussenhoven claims, that high vowels are lengthened before /r/ (and more so than non-high vowels), then pre-/r/ lengthening apparently suspends the marginal contrast between short and long high vowels found in pairs like *kiem* /kim/ vs. (non-native) *team* /ti:m/. In our approach, a form like *vier* would then consist of an initial open syllable with a long vowel, with the /r/ forming part of a following empty-headed syllable. This analysis ties in rather well with Lavoie & Cohn's (1999) observation that English words such as *feel* and *fail* (and in rhotic varieties, *fear* and *fire*) are perceived by speakers as being somewhere between one and two syllables, in particular when the liquid is 'dark', i.e. vocalized. Botma et al. (2008) offer a Government Phonology account of such forms in which dark liquids occupy the rhymal adjunct position of the second, empty-headed syllable. Such a representation also seems feasible for words like *vier*, as in (13).



In realizations such as [vi:ər] and [vi:jər], the syllabic positions between the vowel and /r/ are filled with transitional, non-distinctive material.

If the claim that length is absent from the phonology is to be maintained, then the lengthening of high vowels before /r/ must be a property of surface representations. This suggests that the syllabification in (13) is enforced by a constraint such as in (14).

- (14) No high vowel in a syllable closed by /r/.

The motivation for this constraint is likely to be the articulatory conflict between high vowels and bunched/RTR [r], as outlined above. Notice also

that (14) seems to be violable, since it does not appear to be satisfied in exceptional forms such as *wierp* ‘throw-SG-PAST’. Following Gussenhoven, we may assume that this decision is made at the stem level, and that later levels of the phonology respect the length established there. This would also account for the short vowel in the form *wierpen* ‘throw-PL-PAST’.

## 6 Conclusion

Are we going round in circles? Do phonologists merely write papers every twenty-odd years to solve old problems with old analyses? As we have seen, it has been recognized for quite some time that Dutch has two sets of vowels which differ from each other in length, tenseness, and syllable structure. Each of these three properties has at some point been argued to be central, basic, or ‘underlying’. The analysis we offer in this paper can in some sense be seen as going back to one of the earliest analyses, Sievers’ and Trubetzkoy’s distinction in terms of two types of syllables.

However, we believe that there is no reason for pessimism, as the circles seem to us to be spiralling inwards. Just as Smith et al.’s proposal made use of the insights of length theory, ours builds on the insights of both the length and the tense/lax approach. The optimal theory may ultimately be one in which we can plausibly say that length, tenseness, and syllable structure comprise the same formal object. In fact, our speculations on the phonetic implementation of branching and non-branching rhymes already hint in this direction: a vowel in an open syllable has more ‘space’ and so a more ‘pronounced’ articulation, which is manifested phonetically by a greater length and tenseness. We believe that phonological theory is advancing in the right direction, and are confident that it will have made even more progress 23 years on.

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