

ON THE PHONOLOGICAL INTERPRETATION OF THE  
FALLING DIPHTHONGS IN DANISH

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Abstract: 'Diphthong' is here taken to be a phonetic and not a phonological concept. The meaning of the term 'diphthong' is discussed in section 2, and the classification of (Danish) diphthongs into rising and falling in section 3.1. Section 3 contains proposals as to the phonological treatment of the falling diphthongs in Danish from several angles. In section 4, finally, we shall ask and try to answer the question: can 'diphthong' in any sense be considered a phonologically (i.e. functionally) relevant concept in Danish?

1. Introduction

The point of departure of the present analysis lies within phonetics, and we try to argue from the phonetic facts towards a functional interpretation of the diphthongs. The general orientation of the paper is thus of a structural type (the criteria chosen will be discussed in section 3). But although I shall not give any generative rule formulations in this paper, it should be emphasized that I consider a generative analysis a useful complementary tool to more traditional phonological descriptions, and generative considerations will be explicitly included in the discussion.<sup>1</sup>

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1) Section 3 of the present paper is a condensed version of parts of my mimeographed notes (Basbøll 1973a), which contain a detailed generative - as well as structuralist - analysis of the Danish diphthongs. The contents of sections 2 and 4 were first presented at a guest lecture held at the University of Aarhus on March 18, 1975. I am indebted to Eli Fischer-Jørgensen, Steffen Heger, Peter Holtse, Jørgen Rischel, Nina Thorsen and Oluf Thorsen for helpful comments on the manuscript.

## 2. What is a diphthong?

As already mentioned, 'diphthong' will in this paper be considered a phonetically defined concept. This does not, of course, exclude that 'diphthong' might also (or might alternatively) be defined as a phonological (or functional) concept, cf. section 4. Below, I shall briefly discuss a widespread traditional definition of the (phonetic) diphthong, but I will include only a very limited part of the general literature on diphthongs, since the main purpose of the paper is the phonological analysis of Danish diphthongs, not the phonetic nature of diphthongs, nor a survey of diphthongs in a number of languages.

### 2.1 A traditional definition

A very widespread definition of a 'diphthong' runs approximately as follows: "A diphthong is a sequence of two vowels in the same syllable" (cf. Jespersen 1897-99, p. 549). Other definitions attempt to avoid including the syllable in the definition, e.g. by speaking of a close-knit (or tight) sequence of vowels or of complex vowels (cf. Pike 1947a, p. 236), or of a gliding vowel (cf. Jones 1934, p. 57). The reason why "a sequence of two vowels" is an insufficient definition is shown by words like Aïda in Danish: [aɪ:da] (where [ɪ:] may even be preceded by a glottal attack), in which no one would classify [aɪ:] as a diphthong. I do not see, however, why it should be an improvement to exclude "in the same syllable" from the definition if the other reservations mentioned are only less precise ways of expressing approximately the same thing. But the term 'gliding vowel' may be an apt characterization of (at least certain types of) diphthongs, cf. section 2.3 below; the terms 'complex vowel' and 'close-knit sequence of vowels' may also suggest something different from 'homosyllabic', viz. that the

sequence should function like a single vowel, but then it will no longer be a purely phonetic definition.

## 2.2 Explication of the concepts entering into the definition

The statement "A diphthong is a sequence of two vowels in the same syllable" can, of course, be accepted as a well-defined (or valid) definition only to the extent that the concepts entering into the definition are well-defined (or valid). Below I shall discuss what is meant by 'sequence' (section 2.2.1), 'vowel' (2.2.2) and 'syllable' (2.2.3). Although the meaning of the word "two" is uncontroversial, it is nevertheless not entirely unproblematic what it means that there should be two vowels, in contradistinction to, say, one, three or infinitely many. The distinction between a monophthong and a polyphthong will be discussed in section 2.2.4, whereas the distinction between a diphthong and a triphthong will be taken up in section 2.2.5. In section 2.3 I shall conclude this part of the paper by slightly rephrasing the traditional definition.

### 2.2.1 What does 'sequence' mean?

In the definition, 'sequence' means that the two vowels in question are not simultaneous (which seems obvious) and, furthermore, that they must be adjacent. It may be possible, however, to leave the word 'sequence' out of the definition altogether, viz. if it is universally true that two (phonetic) vowels within the same syllable are never separated by a (phonetic) consonant.

The theoretical status of the last-mentioned statement depends on the conception of a syllable (see section 2.2.3 below). If the syllable is defined as a top of sonority (where all (phonetic) vowels are more sonorous than all (phonetic) consonants), cf. Jespersen 1897-99, p. 521 ff, then it becomes a

truism that two homosyllabic vowels cannot be separated by a consonant. If, on the other hand, the syllable is taken to be an immediately given entity (e.g. a psychologically real unit), then the statement that two homosyllabic vowels are never separated by a consonant is an empirical one - or maybe part of the more general empirical statement that the syllable is a top of sonority - which is in principle falsifiable by confrontation with new empirical data (e.g. when a hitherto unknown language is discovered), presupposing that sonority can be objectively measured.

As a matter of fact, Hjelmslev (1951, p. 17) seems implicitly to have made contiguity within the syllable part of his definition of a (functional) 'vowel': Hjelmslev phonemically identified the syllabic [u] and the non-syllabic [ɥ, v] as manifestations of the taxeme /u/, and, similarly, the syllabic [i] and the non-syllabic [j] as manifestations of the taxeme /i/. But whereas the taxeme /u/ is considered to be both selected and selecting (i.e. to function both as a (phonemic) vowel and a (phonemic) consonant), the taxeme /i/ is considered a normal (functional) vowel because [j] can never be separated from the vocalic nucleus (cf. elv 'torrent' [ɛlʔv]/'ɛlu/). This reasoning is dubious for several reasons and has been criticized e.g. by Povl Skårup and Henning Spang-Hanssen, see Basbøll 1972a, p. 176 ff (with references).

### 2.2.2 What does 'vowel' mean?

It is clear that 'vowel' in the present context must be a phonetically defined concept, and not a functionally defined one. A good definition seems to be Pike's (1943, p. 78) of 'a vocoid' as (approximately) a central oral resonant. Ladefoged (1971, p. 91) considers [consonantal] to be a "cover feature", i.e. a feature which is definable exclusively in terms of features already defined. He does not define it explicitly,

however, but I shall follow his suggestions and use the term (phonetic) vowel (or 'vocoid') as designating the class of [-consonantal] segments, defined by the following equivalence (cf. Basbøll 1974, p. 99 f):

$$[-\text{consonantal}] \equiv [+ \text{sonorant}, + \text{continuant}, - \text{lateral}],$$

where [sonorant] is defined, in agreement with Ladefoged, as an acoustic-auditory concept, and where [-continuant] (equivalent to Ladefoged's [+stop]) is defined as having complete closure in the mouth channel (at least once during the articulation). It is a consequence of this definition of the phonetic vowels that the class of phonetic consonants (or 'contoids' in Pike's terminology) is the union of the non-overlapping classes of obstruents, non-continuant sonorants and sonorant laterals:

$$[+\text{consonantal}] \equiv \left\{ \begin{array}{l} [-\text{sonorant}] \\ [+ \text{sonorant} \\ - \text{continuant}] \\ [+ \text{sonorant} \\ + \text{lateral}] \end{array} \right\}$$

The main advantage in operating with [consonantal] as a cover feature in Ladefoged's sense, is its definition by means of independently needed features which are all much more clearly defined than proposed independent definitions of [consonantal], [vocalic], and so on. This procedure also excludes the possibility of ill defined and dubious categories "in between" phonetic vowels and consonants, such as glides according to Roman Jakobson's system, for example (in the present paper I use the term "glide" for a [-consonantal, -syllabic] sound, i.e. "glide" is here defined by means of syllabicity, which is a

feature of quite another sort than the other features mentioned).

All voiceless and fricative sounds are obstruents (i.e. [-sonorant]), according to the present definition; thus voiceless nasals and fricative laterals are obstruents, but they still belong to the natural classes of [+nasal] and [+lateral] sounds, of course (phonemically, all nasals and laterals in Danish can be considered voiced). Voiced nasals are non-continuant sonorants. If the passage of air through the mouth is completely blocked throughout the articulation, the only sonorant possible is a nasal. But with the present definition of the feature [continuant], a sound is [-cont] also if there is a complete closure in the mouth channel during only one moment, or during a few (discrete) moments, of the articulation. Thus normal vibrants ("trills"), taps and flaps are also to be considered [-cont], just like they are classified as [+stop] according to Ladefoged 1971, p. 108.<sup>1</sup> Such non-continuant r-sounds are therefore always [+consonantal]. Other r-sounds are either obstruents (all voiceless r's, of course, as well as e.g. the initial [ʁ] in Danish), or they are sonorants and therefore [-consonantal], since they are neither nasals or laterals, nor trills, flaps or the like. It is an open question whether all "r-sounds" constitute a natural phonetic class. Furthermore, I think that the relatedness of l- and r-sounds which probably exists (together they constitute the class of "liquids") is an auditory (and not an articulatory) phenomenon, i.e., I propose the auditory feature [liquid] recognized, cf.

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1) Trills, taps and flaps were not included in my earlier discussion of distinctive features, all Danish r's being [+continuant]. (In a universal phonetic framework, a special feature "vibration" is probably demanded, cf., e.g., Ladefoged 1971, p. 55 f.)

the auditory feature [grave] (such an auditory feature should, of course, be established by means of auditory tests). It is possible, however, that an auditorily defined class of "liquids" will turn out not to be coextensive with the union of all laterals and (what is generally termed) r-sounds; in that case, the conclusion would invite itself that the term "liquid" has (sometimes, at least) been used on the basis of historical and distributional evidence alone, i.e. not necessarily designating a natural phonetic class.

According to the definitions adopted here, the natural class of consonantal sonorants in Danish consists of (voiced) nasals and (sonorant) laterals, but excludes r-sounds (since /r/ in Danish is never manifested by trills, flaps or the like). The establishment of this natural class agrees well with facts in Danish phonology, in particular the following one: before consonantal sonorants (i.e. nasals and /l/) there is a stable opposition of vowel quantity (e.g. pæn, pen; mile, milde [pɛ:ʔn, pɛnʔ; mi:lə, milə]); before obstruents as well as before non-consonantal (but non-syllabic) sonorants, i.e. "glides", on the other hand, either only short vowels are found (with a few exceptions), this is the case before plosives and [f], and before [j] in conservative standards; or there is a great deal of vowel length vacillation, both in alternating pronunciations of the same word (e.g. bor 'lives, v.', bider 'bites, v.' [bo:ʔr/borʔ, bi:ʔðʌ/biðʔʌ]), and in the same morpheme in different words (e.g. bad 'bath', bade 'baths'; gris, 'pig', grise 'pigs', grisesti 'pigsty' [bað, bæ:ðə; gʁi:ʔs, gʁi(:)sə, gʁisəsdi:ʔ]).

If a diphthong is defined as two adjacent homosyllabic vowels defined as above (viz. as [-consonantal] segments), then all groups of a Danish [ð] (which is phonetically a sonorant) and a preceding vowel must be considered (phonetic) diphthongs. This consequence has also been drawn e.g. by Heger (forthcoming). However, they will thus constitute a special type of diphthongs, see section 2.3 below (and cf. section 4).

### 2.2.3 What does 'syllable' mean?

In the present context 'syllable' is, of course, a phonetic and not a phonemic concept. It is impossible in this paper to present a general discussion of the syllable (cf. Kloster Jensen 1963). Suffice here to say that syllables may be considered as tops of sonority (cf. section 2.2.1 above), with a non-consonantal center (which may be a mono-, di- or triphthong) and a voiceless margin, separated by consonantal sonorants and voiced obstruents, respectively (see Basbøll 1974).<sup>1</sup> In the communication process, syllables may function as a means of structuring the sound chain so that it becomes easier to encode and decode (cf. Kim 1971). This structuring thus belongs to the expression plane of language (in Hjelmslev's terminology), as opposed to the structuring into morphemes which is a projection of higher level information into the expression chain (this does not exclude, however, that certain syllable boundaries are located depending on the occurrence of specific grammatical boundaries, cf. Basbøll 1972b and forthcoming).

### 2.2.4 Monophthong or polyphthong?

It is, of course, well known that there are no sharp limits between successive sound segments on the articulatory level: there is a constant coarticulation between adjacent sounds, the transition from one sound to the next one is smooth, and it is often impossible to tell where one sound ends and the next one begins. At least for the non-consonantal part of the syllable this indeterminacy of limits on the articulatory level is matched by an indeterminacy on the acoustic level too (whereas e.g. the limit between certain consonants and the vowel can be well-defined, as in the case of voiceless fricatives, even though the acoustic structure of each of the sounds is influenced by neighbouring sounds). The question thus arises what is meant by 'two vowels' in the definition. This

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1) Needless to say, both consonantal sonorants, voiced obstruents, and the voiceless margin are optional in the syllable.



is evidently part of the general question of segmentation which, however, cannot be dealt with here. Notice that it is not sufficient to refer to the commutation test at this place, since we are explicitly dealing with phonetic diphthongs (the criterion that the sound chain is segmented into as many units as are separately commutable will be used in section 3.5.1). It thus seems that there are, phonetically speaking, an excessive number of successive vowel quality shades in both kan, Kain and jer ([kan?, kaɪ?n, ɪæɹ]). What is the justification for claiming that the first word contains a monophthong, the second one a diphthong, and the third one a triphthong? This question will be discussed in two tempi: (1) when the quality of every vowel is influenced by its surroundings, how do we distinguish between a monophthong and a polyphthong (this section), and (2) provided that we have a polyphthong (according to (1)), how do we distinguish between a diphthong and a triphthong, etc., when in both cases there are an excessive number of different vowel quality shades? (section 2.2.5). These considerations will be concluded in section 2.3.

It has recently been claimed (Heger forthcoming and this volume; Brink and Lund 1974, p. 30 and forthcoming, § 15) that Danish words like græs, traditionally described [gʁæs, gʁas] (or, in the Danish transcription system Dania, [græs]) in fact contain an "ultra-short diphthong" (starting at a higher F1 value than what seems to be conditioned by [ʁ]), which would most adequately be transcribed [ɑ̃] or the like. Heger bases his claim on formant measurements. I shall not try to settle this question here, but only point out what I consider relevant for the decision of the issue.

First of all, in order to accept that the vocalic part of a syllable is not a monophthong, the gliding should, of course, be perceptually recognizable. But this is not enough, since one can be trained to hear differences (transitions) which are not generally perceptible. Only if the gliding cannot be

accounted for as the simplest way (a notion which should be made more precise) from the target of the prevocalic consonant via the vowel target (which may, however, not be reached if the vowel is short) to the target of the postvocalic consonant, are we justified in concluding that the vocalic part in question is not a monophthong. Notice that this decision cannot be made from the acoustic or auditory data alone, but that it presupposes knowledge of the complex relationships between the movement of the articulatory organs and their acoustic (and auditory) results.

### 2.2.5 Diphthong or triphthong?

The considerations above also suggest the criteria for distinguishing between a diphthong and a triphthong: If the change of quality in the vocalic part of a syllable cannot be accounted for by two vowel targets, but presupposes a third vowel target, situated in time between the two others, then it is a triphthong. Thus [aɪ], with a gliding from about a low mid unrounded vowel and ending with, e.g., an [ɛ] or [e], can be accounted for as the simplest way between two targets (of which the second one may well be a higher vowel than the one which is actually reached, see section 2.3 below); in [ɪəʊ], on the other hand, the simplest way from [ɪ] to [ʊ] is by no means via a low vowel like [a], and there must thus be a third target in between the other two, with the consequence that [ɪəʊ] should be considered a triphthong. This account is in full agreement with usual practice (and comes close to statements of Trubetzkoy and many others).

### 2.3 Conclusion of section 2

The reflections of the preceding sections may be condensed in the following general definition of an n-phthong: "a perceptible change of quality ("gliding") within the non-consonantal part of one syllable is an n-phthong, provided that it cannot be explained as the result of the simplest movement between the

target of the preceding consonant (if there is any), n-1 different vowel targets, and the target of the following consonant (if there is any), and provided that it can be explained with the addition of one more vowel target to the above information".

The definition just given includes combinations of a vowel and a following (Danish) [ø] in the class of diphthongs. These groups differ, however, from the other Danish diphthongs in that [ø] need not be considered to lie within the normal vowel space (e.g. within the limits of Jones's Cardinal Vowel diagram), cf. its coronal place of articulation. If it seems preferable, the definition of an n-phthong might be modified so as to exclude the [ø]-combinations, viz. by adding the reservation "(change of quality) within the normal vowel space", or by excluding vowels with coronal articulation (but cf. the retroflex vowels). It is, as far as I can see, a purely terminological question how these [ø]-groups should be handled. In the following I do not consider them to be diphthongs, but the arguments given would remain essentially unaltered if they were included.<sup>1</sup> See further sections 3 and 4.

One further consequence of the definition of diphthongs in terms of vowel targets necessary in order to explain the movement in question should be mentioned. In falling diphthongs like Danish [au, ʌi] (see section 3.1 below), it is irrelevant where, exactly, the gliding stops: only its starting point and direction seem to matter perceptually (this is, of course, a well-known observation). The point is that the same two vowel

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1) If the [ø]-groups were included in the class of diphthongs, the widespread sound change in Danish dialects ø > j could not be described as a "diphthongization" of the Vø-sequences; again, the matter seems to be terminological, but the choice may nevertheless have one phonologically relevant consequence: if the Vø-sequences are "diphthongized" in many different dialects, and if this terminology is phonologically justified, this could be a generalization of the phonological rule of diphthongization in Danish to include all sequences of vowels plus underlying voiced fricatives.

targets can explain the movement, irrespectively of the exact ending point of the gliding. Thus [aɛ̥, aɛ̥, aɪ̥] etc. can be considered the same diphthong phonetically, defined in terms of vowel targets.

What is the justification for the notation of the second part of the falling diphthongs in Danish as [ɪ̥, ʊ̥, ɤ̥] instead of, say, [ɛ̥, ɔ̥, ʌ̥] or [j, w, ɜ]? First of all, vowel symbols are used for the second component since it can never be pronounced as a phonetic consonant, and this is in full agreement with the characterization of a diphthong as involving a gliding within the normal vowel space. Second, we have chosen to use one single symbol for the second component of e.g. [iʊ̥, eʊ̥, εʊ̥, aʊ̥], although the actual "endings" are more and more open vowels, from about [ʊ̥] to about [ɔ̥] or [ɤ̥]. These second parts of the diphthongs in question have been identified in agreement with normal notational practice, since they represent communicational constancy and stylistically (in the broad sense) only quite insignificant variability.<sup>1</sup> The choice of the extreme

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1) This characterization of "normal notational practice" is, of course, very crude. Communicational constancy (i.e. non-contrastiveness) is generally considered a sine qua non for the notational identification, but if it is taken to mean that any sound difference which can by itself distinguish between two utterances within the language norm described should be observed in the notation, then it is, in fact, a very strong criterion. As an example, consider the vowels (normally analysed as bound variants) [æ] and [a] which can distinguish between two utterances in cases like the following: the preterite bad 'asked' in pretonal position can be [bæð...] or [bað...] (cf. the stressed form [bæ:ʔð/bæðʔ/baðʔ]), whereas the noun bad 'bath' is always [bað], in stressed as well as unstressed position (an example of potential commutation would be bad om gódt véjr 'asked for fair weather' [bæð/bað...] vs. a constructed name for a sea-bath Bad "Om gódt véjr" [bað...]); or consider the glottal attack which can by itself distinguish between en ál 'an eel' [en(?)ɔ:ʔl] vs. en nål 'a needle' [en(n)ɔ:ʔl]. The strength of this criterion of communicational constancy is to a high degree, of course, dependent on the number of "diacritic signs" used in the transcription, like space (for word boundaries), syllable  
(cont. on the next page)

vowels [i̇, u̇, ʏ] as symbols can be defended for two reasons: they represent possible second parts for some of the diphthongs, at least, and they represent the points where the gliding crosses the limit of the vowel space; and, secondly, they can be said to represent the cross point of the glidings from different starting points, thus recalling the idea of formant "loci" (so that the locus of e.g.  $F_2$  of a [b] should be the cross point of the (extrapolated)  $F_2$  in [bi], [ba], [bu] etc., in some sense). If this interpretation is used, the common ending point of the different [u̇]-diphthongs (i.e. [i̇u̇, ɛu̇, ɔu̇] etc.) is an abstraction, whereas the common ending point of different pronunciations of [i̇u̇] is a generalization of a type which is inevitable in all systematic phonetic transcription.

At the very end, the information we look for in order to decide between a monophthongal or a diphthongal phonetic analysis probably is whether one or two vowel segments are encoded. At the time being, however, this question does not seem to be approachable by any direct methods (such as observation of the encoding process).

### 3. Diphthongs in Standard Danish

The following pages contain a phonological analysis of the phonetic diphthongs in Standard Danish, i.e. the [i̇]-, [u̇]-

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(continued)

boundaries (e.g. indicated by the location of stress symbols like ' and ), and so on. It also depends on how many potential distinctions between utterances are assigned to prosodic features like stress and intonation, as compared to the sound chain itself. In short, this problem is very complicated.

The other condition mentioned in the text, viz. that of insignificant stylistic variability, suggests that if the substitution of one sound with another can, in any context, have a stylistic effect, then these sounds should be distinguished in phonetic transcription, although they are "free variants". (As a considerably less precise criterion one could mention the traditional condition that variants which are phonetically clearly different should not be rendered by the same phonetic symbol.)

and [ɤ]-diphthongs (the Vð-sequences are not considered to be diphthongs here, cf. section 4 below). I shall mainly use "internal" ("structural") evidence, but it should be emphasized that I consider "external" evidence (as obtained from productivity tests, speech errors, language interference, etc. etc.) to be indispensable for a psychologically realistic phonological analysis (cf. Pike 1947b, Avram 1957).

In section 3.1 we consider the difference between rising and falling diphthongs, and the remaining parts of section 3 concern the falling diphthongs only. We proceed by first considering the falling diphthongs which occur as alternating pronunciations of vowel-consonant-sequences (section 3.2), e.g. stiv [sdi:ʔv, sdi:ʔy, sdiyʔ]. According to Linell's principle of psychologically central invariant structurings as identical to the maximally distinct (concrete) word forms (cf. section 4 below), these diphthongs should be considered phonemically /VC/-combinations. In section 3.3, we discuss the falling diphthongs in morphological alternation with vowel-consonant sequences, e.g. hav 'sea' [hɑy] (cf. have 'seas' [hæ:və]). According to Linell's concrete theory of phonology, these diphthongs cannot, in contradistinction to those mentioned in section 3.2, be considered /VC/-combinations except on an abstract level. Most other phonological analyses would, however, recognize hav as having the phonemic structure /hav/, cf. the arguments discussed in section 3.3. In section 3.4, we consider the non-alternating falling diphthongs, and we distinguish between a core of these, e.g. [œy] in støvle, and some residual (exceptional) cases, e.g. [yɤ] in syv.

In section 3.5 we discuss a number of functional arguments for the phonological interpretation of falling diphthongs in Danish, namely (3.5.1) commutability of the two parts of the diphthong, (3.5.2) occurrence of the stød, (3.5.3) phonotactic restrictions, and (3.5.4) occurrence of the ending /ə/. We

conclude that all these arguments point in the same direction, viz. to a phonological analysis of the falling diphthongs as /VC/-combinations. In section 3.6 we investigate the question whether the analysis proposed predicts the correct manifestation of the diphthongs after /r/ ("r-colouring") - the /r/-combinations having been excluded from consideration until this point - and we conclude that this is in fact the case. In section 3.7, finally, we discuss the "b-diphthongs" and find that they can be accounted for, by and large, within the already established analysis.

Let us end this brief introduction by pointing out that the glides, i.e. the non-syllabic phonetic vowels which occur as part of diphthongs (i.e. the prevocalic [j] and the post-vocalic [i̥, u̥, ɤ̥]) are distinguished by their place of articulation only (as palatal, velar,<sup>1</sup> and pharyngeal). It is important to notice that both degree of openness (in the articulatory sense, according to which [ɤ̥] is a narrow (i.e. constricted) pharyngeal vowel) and rounding seem irrelevant (with the possible exception mentioned in the footnote). In this respect, the glides clearly seem to function as phonemic consonants and not as vowels.

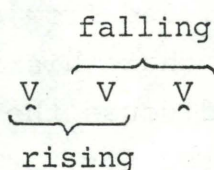
### 3.1 Rising vs. falling diphthongs

When two adjacent phonetic vowels in Danish occur within the same syllable, it is perceptually clear that exactly one of these constitutes the syllabic peak (cf. the Faroese diphthongs, for comparison). It follows, then, that Danish diphthongs can be divided into rising (V̆V) and falling (V̆V̆) diphthongs. It follows, furthermore, that Danish triphthongs have

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1) [u̥] is normally pronounced with lip-rounding, but without any possibility of contrast, with the possible exception of words like sagn : savn in certain conservative standards.

the structure  $\underline{V}V\underline{V}$ , and that tetraphthongs do not exist. The triphthongs (as in jer, jeg, (kisse)jav [ $\underset{\cdot}{i}\underset{\cdot}{æ}\underset{\cdot}{p}$ ,  $\underset{\cdot}{i}\underset{\cdot}{a}\underset{\cdot}{j}$ , (kisə) $\underset{\cdot}{i}\underset{\cdot}{a}\underset{\cdot}{y}$ ]) can be analysed as a rising and a falling diphthong with the same peak:



This agrees with the fact that there are no restrictions of combinability specific to triphthongs, i.e., all the phonotactic restrictions can be reduced to restrictions also applying to rising and falling diphthongs, respectively.

The rising diphthongs will not be discussed in the present paper. Suffice here to notice that they all begin with [ $\underset{\cdot}{i}$ ] (which may be realized as an obstruent, particularly in emphatic pronunciation), and that all criteria point towards their phonemic analysis as manifesting a /CV/-combination.<sup>1</sup> E.g. there are no specific combinability restrictions applying to rising diphthongs (with the possible exception of [ $\underset{\cdot}{i}i$ ], cf. section 4 below), and there is a full distinction of quantity in the following vowel. The rising diphthongs in Danish will here be considered, consequently, as manifestations of /jV/-sequences where /j/ is a phonemic consonant. This is in full agreement with the traditional analyses of these diphthongs.

### 3.2 Falling diphthongs as alternating pronunciations of vowel-fricative sequences

As already mentioned, certain Danish words are invariably pronounced with a falling diphthong (the diphthongs in question may be termed 'genuine'), whereas other words may be pronounced either with a diphthong or with a vowel-consonant sequence in-

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1) Thus, prevocalic [ $\underset{\cdot}{i}$ ] is devoiced after aspirates and ignored by the stød-rules.



stead (the diphthongs in question will here be termed 'non-genuine'). The genuine diphthongs are treated below, viz. in sections 3.3 (if they are in morphological alternation with a vowel-consonant sequence) and 3.4 (if they are non-alternating genuine diphthongs).

The non-genuine falling diphthongs alternating with a vowel plus the plosive [b] differ in many ways from the other non-genuine falling diphthongs which alternate with a vowel-fricative-sequence. For one thing, the alternation vowel-[b]/diphthong is lexically restricted, i.e. only a very limited number of all vowel-[b]-sequences may alternatively be diphthongally realized in Standard Danish, whereas the alternations vowel-fricative/diphthong are general, i.e. not lexically restricted (in all cases presupposing certain levels of style, see below). The non-genuine diphthongs alternating with a vowel-[b]-sequence will therefore be treated apart from the other non-genuine falling diphthongs, viz. in section 3.7 below.

Consider the following three possible pronunciations of each of three Danish words:

<u>lov</u> !	'promise!'	[lɔ:ʔv, lɔ:ʔy, lɔyʔ]
<u>lav</u>	'low'	[læ:ʔv, læ:ʔy, læyʔ]
<u>bor</u>	'lives, v.'	[bo:ʔv, bo:ʔy, boyʔ]

(The three pronunciations of each of the words represent decreasing levels of style, distinctness, etc.)

There is good evidence that such forms, viz. words with a non-genuine falling diphthong alternating stylistically with a sequence of long vowel plus voiced fricative, phonologically contain a long rather than a short vowel (phoneme): (i) In all cases where a long and the corresponding short vowel have a different quality, it is the quality of the long vowel which occurs (this is the case in the three words mentioned, where the quality of

the corresponding short vowels would have been [ʌ], [a] and [ɔ], respectively). (ii) When such forms are monosyllabic and stressed, they always have stød. Furthermore, stressed forms ending in e.g. stød-less [ɔ̥, æ̥, o̥] hardly occur at all (cf. sections 3.3 and 3.4 below), whereas genuine diphthongs like [ɔ̥] occur freely in stressed monosyllables both with and without stød: [tɔ̥, sgɔ̥?] tov 'rope', skov 'forest' (if forms with a possible realization [ɔ̥], e.g. in lov! above, contain a long vowel phonologically, in contradistinction to forms with a possible realization [ɔ̥] which contain a short vowel, the distinction in stød-possibilities is immediately accounted for). (iii) Phonotactics points toward the same phonological analysis, e.g. a form in [-ḁ?n] is possible (as in navn 'name' [nḁ?n]), as opposed to a form in \*[-æ̥?n].

Whereas pronunciations with long vowel plus [v] and with long as well as short vowel plus [ɥ] in words like those mentioned above occur in most varieties of Standard Danish, postvocalic [ɞ] (i.e. [ɞ] occurring after a homosyllabic vowel) is only found in very conservative standards (historically speaking, the vocalization of postvocalic [ɞ] has thus been carried through except in these standards). In younger forms of Standard Danish, therefore, words like bor can only be pronounced [bo:ʔɥ] or, more frequently, [boʔɥ]. In those younger standards, such words thus contain a genuine diphthong in the sense defined in this paper. Even in younger standards which never have postvocalic [ɞ], however, words like bor otherwise behave like lav (adj.) in that the quality is that of a phonologically long vowel, with regard to stød-conditions and phonotactics, and in that there is a stylistic alternation of (phonetic) vowel length (further, see below). It may therefore seem justified to treat words like bor on a par with words like lav, also in standards without postvocalic (fricative) [ɞ] (even though the [ɥ]-diphthongs in question should, strictly speaking, be considered in the following, together with the (other) genuine diphthongs).

The case is a little different with words like the following:

tag 'roof' [tæ:ʔγ tæ:ʔi tæiʔ tæ:ʔ]  
låg 'lid' [lɔ:ʔγ lɔ:ʔy lɔyʔ]

(The first, second and third pronunciation of each of the words represent decreasing levels of distinctness, style, and the like; the form [tæ:ʔ] is an old colloquial doublet which is not easy to place in a stylistic hierarchy with respect to the other forms mentioned.)

The Danish sound [γ] is, as far as I know, a sonorant (except when devoiced, of course) in all varieties of Standard Danish which use this sound at all. Since it is continuant and non-lateral, it must be classified as a vocoid within the framework of the present paper (cf. section 2.2.2 above), and the (homosyllabic) sequences of a vowel plus [γ] are then, strictly speaking, diphthongs. However, with respect to vowel quality, stød conditions and vowel length, the words which contain long vowel plus [γ] alternating stylistically with both long and short vowels plus [i] or [y] seem to follow a similar pattern as the words ending in [-v]/[-y] and in [-ɜ]/[-ɹ] mentioned above. Accordingly, they will be treated here, together with the representatives of the stylistic alternation between a diphthong and a long vowel plus (what is phonetically) a voiced fricative. This classification appears to permit the statement of the more significant generalizations, phonologically, in comparison to alternative classifications.

We have thus argued that words like lav (adj.), lag 'layer', låg, bor should all be analysed phonologically as containing a long vowel. This parallel treatment (which will be substantiated further below) agrees well with the obvious stylistic parallels between the corresponding pronunciations of the words in question:

	I	II	III
<u>lav</u>	[læ:ʔv]	[læ:ʔ <sub>u</sub> ]	[læ <sub>u</sub> ʔ]
<u>lag</u>	[læ:ʔɣ]	[læ:ʔ <sub>i</sub> ]	[læ <sub>i</sub> ʔ]
<u>låg</u>	[lɔ:ʔɣ]	[lɔ:ʔ <sub>u</sub> ]	[lɔ <sub>u</sub> ʔ]
<u>bor</u>	[bo:ʔɸ]	[bo:ʔ <sub>ɸ</sub> ]	[bo <sub>ɸ</sub> ʔ]

I do not claim that I, II and III represent unambiguously definable style levels, but I do claim that for each word considered separately, I represents a higher/more distinct pronunciation than II, and similarly for II in relation to III (similar problems are considered in section 3.7 below).

If the phonological length of the vowel in forms like those discussed above (e.g. lav (adj.), bor, tag) is well established, let us then turn to the phonological identity of the post-syllabic segment in question, i.e. to the glide which is the second component of the diphthong, and to [v, ɣ, ɸ]. There are several reasons for preferring a phonological analysis of this post-syllabic segment as [v, ɣ, ɸ] and not as [<sub>u</sub>, <sub>i</sub>, <sub>ɸ</sub>]:

(i) To the same glide, i.e. [<sub>u</sub>], can correspond two different "consonantal" realizations in the same phonetic environment, viz. [v] (e.g. in lov!) and [ɣ] (e.g. in låg); the same "consonant", on the other hand, in a given phonetic environment has only one possible realization as a glide.<sup>1</sup>

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1) The realization of [ɣ] as [<sub>i</sub>] (e.g. in tag) or [<sub>u</sub>] (e.g. in låg) is predictable from the place of articulation of the preceding sound, [ɣ] alternating with [<sub>u</sub>] after back sounds (i.e. back vowels and /r/), and with [<sub>i</sub>] after non-back sounds (i.e. front vowels and /l/). Whereas [ɣ] in conservative standards too is highly dependent on the place of articulation of the preceding sound, a rephonologization has taken place in younger speech, since the two reflexes of older ɣ, viz. [<sub>i</sub>] and [<sub>u</sub>], have merged with the reflexes of the phonemes /j/ and /v/, respectively. In Basbøll 1973a I suggested that the rule which assimilates ɣ to the preceding sound with respect to place of articulation is, in conservative standards, a late phonetic rule

(continued on the next page)

This is one of the clearest arguments for the direction of a phonological process.

(ii) The fullest form (corresponding to the most distinct pronunciation) has a long vowel followed by one of the sounds [v, γ, ʋ]. According to Linell's theory of concrete phonology (see further section 4 below), the psychologically central invariant structuring (which might be abbreviated 'PCIS-form') corresponds, roughly, to a maximally distinct (segmentalized) pronunciation, i.e. the PCIS-form would contain a long vowel plus a voiced fricative or [γ]. This agrees well with the following two hypotheses: a "stylistic rule" generally has a more conservative form as its input and a more colloquial form as its output, and, secondly, a reduction of a voiced fricative to a glide in the final part of the syllable is a more natural process (and thus more widespread, etc.) than one going in the opposite direction (it goes without saying that these arguments are only suggestive of a certain phonological analysis, they do not prove its correctness).

All the non-genuine falling diphthongs considered so far in this paragraph alternated stylistically with a long vowel plus one of the phonemes /v, γ, r/. Certain sequences of a short vowel plus a homosyllabic [ʋ, γ] alternate with falling diphthongs as well (whereas a short vowel is never followed by a homosyllabic [v]). The forms with a short vowel plus [γ] are

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(continued)

operating on a (continuous) scale of places of articulation (i.e. the assimilation is gradual), whereas it is, in younger speech, a categorical rule operating in binary features only (making γ [+back], i.e. [ɯ], or [-back], i.e. [i]). It should also be noticed that this γ-assimilation rule is dependent on the r-colouring of a preceding /a:/ in both younger and more conservative standards: compare brag 'crash' [bʁa:ʔγ, bʁa:ʔɯ, bʁaɯʔ] with tag mentioned in the text.

definitely conservative, just like other forms with [ɣ] (cf. Brink/Lund 1974, p. 39 ff). It should be noted, however, that the sound change [ɣ] → [i̥] (but not the change [ɣ] → [u̥]) after short vowels has been carried through even in the most conservative standards (thus nøgle 'key', egn 'region', etc. have diphthongal pronunciations in all varieties of Standard Danish: [nʌi̥lɐ, aɪ̥ʔn]). Concerning the sequences of short vowel plus a homosyllabic /r/, diphthongization has been carried through except in certain conservative standards, just as other instances of syllable-final /r/ have been vocalized, cf. Brink/Lund 1974, p. 43 ff. (The most salient result of this vocalization may be seen in the cases where [ɹ̥] derives historically from a voiceless [ɣ], viz. in the position between a short vowel and one of the phonemes /f, s/ or (written) p, t, k: imperatives like mærk! 'feel!', styrt! 'hurry!' may, in advanced speech, be pronounced with stød: [mæɹ̥ʔg, sdyɹ̥ʔd]; another result of the sound change [ɮ] → [ɹ̥] is that stød is no longer predictable in syllables historically derived from syllables containing a short vowel + /r/ + /p, t, k, f, s/, compare, for example, ært 'pea', vært 'host', persisk 'Persian' [æɹ̥(?)d, væɹ̥d, pæɹ̥(?)siŋg].)

### 3.3 Falling diphthongs in morphological alternation with vowel-consonant sequences

The diphthongs considered in the main part of the preceding section occurred with both (phonetically) long and short vowels, and they had a more distinct alternative pronunciation with a long vowel plus a voiced fricative (just before closing the paragraph, we quoted certain conservative standards having non-genuine diphthongs in stylistic alternation with short vowel plus voiced fricative). The diphthongs to be treated below, on the other hand, are genuine diphthongs in the sense that the words in question only have diphthongal realizations. Genuine diphthongs in Danish have a short vowel as their first component, both phoneti-

cally and concrete-phonologically (cf. below), with the reservation made in section 3.2 above concerning diphthongs historically derived from sequences of vowel plus [ɣ], as well as [ɣ̥]-diphthongs in standards with no postvocalic [ʊ]. In the present section we shall discuss genuine diphthongs in morphological alternation with vowel-consonant sequences.

Consider the related forms stiv, stivne [sdi:ʔv, sdiʊnə] 'stiff, stiffen'. The former word has the alternating pronunciations [sdi:ʔʊ, sdiʊʔ] in complete agreement with the principles discussed in the preceding section, i.e. [sdi:ʔv, sdi:ʔʊ, sdiʊʔ] are alternate pronunciations of the same word, belonging to decreasing style levels. But the relation between [sdiʊnə] and [sdi:ʔv] is different from that between [sdiʊʔ] and [sdi:ʔv], since stivne can only be pronounced with a diphthong, never as \* [sdi(:)vnə].

According to Linell's theory of concrete phonology, the PCIS-form of stivne should contain a diphthong, since the word is obligatorily pronounced with a diphthong. But according to more abstract theories of phonology, the simplest analysis would be to posit a long vowel and a fricative as the phonological notation, and operating with a rule of morphological shortening (as distinct from the rule of stylistic shortening mentioned in the preceding section). Whereas stylistic shortening is a variable (optional) rule, morphological shortening is categorial. Thus, stivne may contain phonological /i:v/, and a sequence of short vowel plus /v/ (the output of morphological shortening) is obligatorily realized as a diphthong. Similarly, the paradigm hav, have [hɑʊ, hæ:və] may, within the present analysis, be phonologically /hav - ha:və/, i.e., the apparent diversity in the stem forms is reduced to one of pure vowel quantity alternation, resembling an apparently simpler paradigm like bad 'bath', bade 'baths' [bað, bæ:ðə].

All sequences of a (phonologically) long front vowel plus /v/ can be in morphological alternation with a genuine [ʏ]-diphthong: stiv 'stiff', stivne 'stiffen';<sup>1</sup> lever 'liver', levret 'clotted'; bæve 'tremble', bævre 'quiver'; have 'seas', hav 'sea'; tyv 'thief', tyvte 'accuse somebody of theft'; øverst 'superior', øvrighed 'authorities' [sdi:ʔv, sdiʏnə; le:ʔvʌ, leʏʂð; be:və, beʏʂʌ; hæ:və, haʏ; ty:ʔv, tyʏdə; ø:ʔvʌsd, øʏʂihē:ʔð].<sup>2</sup> It is hard to find secure examples of (morphologically) shortened /o:v, u:v/; there is hardly any example of a Danish word ending in /o:v/ which could undergo morphological shortening, whereas the quasi-non-occurrence of words with morphologically shortened /u:v/ (e.g. in luvslidt 'threadbare') may be due to the phonetic fact that the gliding in [uʏ] is difficult to perceive (and thus also to be retained). [æʏ, ɔʏ] apparently only occur as morphologically shortened forms in stylistic alternation with [æ:v, ɔ:v,

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1) Compare the neuter form of 'stiff', viz. stift [sdifd], where the stem final /v/ is obligatorily realized as [f] (i.e. devoiced) before the ending /t/ (like in have 'have' [hæ:ʔ, hæ:və], participle haft [hafd]), cf. Rischel 1970.

2) I here use the symbol [ʌ] for the unstressed vowel derived from /er/, although it varies in the whole range [a-ʌ-ɐ], see Basbøll 1974, p. 89 (the footnote). The unstressed [ʌ] is here used as the syllabic counterpart of [ɹ] (= [ɹ̥], if you like), cf. that [o] may be used as the syllabic counterpart of [ʏ] (= [ʏ̥]), e.g. in mave 'stomach' = Mao [mæo] (the choice of an extreme vowel symbol for the second component of a falling diphthong was defended in section 2.3 above). The symbol [ʌ] is also used for the stressed vowel in godt 'good (neuter)' [gʌd] and the first component of the diphthong [ʌi], although the vowel in question is partly rounded, in contradistinction to the IPA-value of this symbol. My use of the symbol [ʌ] is in agreement with the transcription (by Uldall) in Principles of the International Phonetic Association (1949), p. 26, where the description "ʌ=ʌ+ except before r, where the sound is almost ɐ" is found (according to Eli Fischer-Jørgensen (personal communication), Uldall's [ʌ] was less rounded than the common pronunciation today). The use here advocated of the symbol [ʌ] for the stressed vowel is the only acceptable possibility, in my view, if all commutable Danish vowels should be designated by IPA-symbols without diacritics (notice that the symbol [ɔ], also used by Uldall, for the vowel of blå etc., is by now firmly established in IPA transcriptions of Danish). My choice of the symbol [ɐ] for the first component of the diphthong [ɐʏ] is confirmed by the fact that words like bov 'shoulder' [bɔʏʔ] may coalesce with words like borg 'castle' when the latter are stylistically shortened: [bɔ:ʔʏ/bɔ:ʔʏ/bɔʏʔ].



o:v], e.g. in stavning, lovning.<sup>1</sup>

Examples where a vowel plus [ʊ] is in morphological alternation with a genuine [ɥ]-diphthong are less easy to find (cf. the fact that all postvocalic [ʊ]'s have been vocalized, except in rather conservative standards, as mentioned in the preceding section). In rather conservative forms of standard Danish pairs like kære 'dear (definite or plural form)', kærlig 'loving' [kɛ:ʊʌ, kɛʀɥli] are found (the alternation in question is due to the chronology of the development [ʊ] → [ɥ], which took place earlier before consonants than before vowels). In most varieties of contemporary standard Danish, alternations between a genuine [ɥ]-diphthong and a sequence of a vowel plus [ʊ] are restricted to foreign words like klor 'chlorine', klorid 'chloride' [klo:ʔɥ/kloʊʔ, kloʊí:ʔð/kloʊíðʔ], as pointed out by Rischel (1969, p. 193).

Rischel (ibid. and 1970) also mentioned morphological alternations between genuine diphthongs and sequences of vowels plus [g], e.g. steg '(a) roast', stegt 'roasted' [sdɑiʔ, sdɛgd]. The description of such alternations demands the consideration of phonologically more abstract relationships than those considered in the present paper (Rischel 1970 contains a discussion of such forms).<sup>2</sup>

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1) The word bogstav 'letter (of the alphabet)' may be pronounced [bɔgsdæʊ], however (definite [bɔgsdæ:ʔvð/bɔgsdæ:ʔʊð/bɔgsdæʊʔð], plural [bɔgsdæ:ʔvʌ/bɔgsdæ:ʔʊʌ/bɔgsdæʊʔʌ]). The form [bɔgsdæʊ] (in contradistinction to its more regular sideform [bɔgsdæ:ʔv/bɔgsdæ:ʔʊ/bɔgsdæʊʔ]) is realized, in a stødless syllable, with a phonetically short vowel which has the quality of the long vowel. The obligatory shortness of the vowel as well as the lack of stød may be due to lack of stress, cf. a paradigm like madding 'bite' [mæðeŋ], definite [mæðeŋʔ], plural [mæðeŋʔʌ].

2) It should also be mentioned that certain words which may be pronounced with [ɑi, ʌi] have alternate pronunciations with [e:ʏ/e:i/ei, ø:ʏ/ø:i/øi], e.g. megen 'much', spøge(lse) 'haunt, ghost'. Other forms with [ɑi, ʌi], on the other hand, have invariant diphthongal pronunciations, e.g. vej 'road', løg 'onion' [vɑiʔ, ʌiʔ] (which never rhyme with neg 'sheaf', besøg 'visit' [ne:ʔʏ/ne:ʔi/neiʔ/ne:ʔ, besø:ʔʏ/besø:ʔi/besøiʔ/besø:ʔ]).

### 3.4 Non-alternating falling diphthongs

The non-alternating falling diphthongs fall into two groups: those which occur as genuine non-alternating diphthongs in a significant number of native words (these diphthongs will be treated in section 3.4.1 below), and those non-alternating diphthongs which occur only in a quite limited number of words which may thus be treated as exceptional (e.g. as violating otherwise descriptively valid redundancy rules). These diphthongs will be considered in section 3.4.2 below.

#### 3.4.1 The core of non-alternating falling diphthongs

The following falling diphthongs occur in a significant number of native Danish words which have no alternating non-diphthongal pronunciations and which are not in morphological alternation with vowel-consonant-sequences (notice that many of the diphthongs listed below are also found in alternation with vowel-consonant-sequences, e.g. lov(e) 'law(s)' [lɔv(ə), lɔ:və], but this is, of course, no evidence against what is being said here):

- (i) non-alternating [ɪ]-diphthongs: [aɪ, ʌɪ], e.g. in mig 'me', møg 'muck' [maɪ, mʌɪ];
- (ii) non-alternating [ʊ]-diphthongs: [ɛʊ, aʊ, œʊ, vʊ], e.g. in evne 'talent', savne '(to) miss', støvle 'boot', ovne 'ovens' [ɛvne, savne, sdœvle, vʊne];
- (iii) non-alternating [ɶ]-diphthongs: [iɶ, æɶ, yɶ, ɔɶ, uɶ], e.g. in lirke 'manoeuvre', lærke 'larch', dyrke 'cultivate', dørke 'floors', urter 'herbs' [liɶge, læɶge, dyɶge, dɔɶge, uɶɶ].

It can be seen from the above inventory that only a fraction (11 out of about 30, depending on how one counts the

number of vowel phonemes) of the possible vowel-glide-sequences belongs to the core of non-alternating falling diphthongs. Furthermore, the missing diphthongs in this inventory do not seem to be accidentally non-occurring, since some general rules can be given to characterize the inventory under discussion here (i.e. the occurring and/or the non-occurring diphthongs of the present inventory constitute a natural class in the phonological sense). The importance of this fact for a possible phonological definition of a diphthong will be taken up in section 4 below.

#### 3.4.2 Residual cases

Apart from the core of non-alternating falling diphthongs in Danish (which is listed in section 3.4.1 above), certain other non-alternating falling diphthongs occur in a small number of words, i.e. they are exceptional non-alternating falling diphthongs. But it is interesting to notice that all the residual [ɥ]- and [ɤ]-diphthongs<sup>1</sup> listed here do occur, quite regularly, as a result of morphological shortening (cf. section 3.3 above). Morphological shortening is, according to Linell's concrete theory of phonology (cf. section 4 below), an abstract phonological rule; if his assumptions are essentially correct (which seems plausible to me), one would expect the border line between the core of non-alternating falling diphthongs and the residual cases to be psychologically dubious. This agrees with my

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1) The [ɨ]-diphthong listed below, i.e. [uɨ], on the other hand, only occurs in the one stem mentioned. This is due to the fact that all sequences of a short vowel plus [ɨ] which are created by stylistic or morphological shortening are derived from /V:ɥ/-sequences (since the only other source of [ɨ], viz. /j/, never occurs after long vowels), and, as already mentioned, ɥ after a back vowel alternates with [ɥ], never with [ɨ].

suggestion (Basbøll 1973b,p. 119) that phoneme combinations which occur in polymorphemic native words can be introduced in new monomorphemic words without any 'cluster simplification'. This topic will be considered further in section 4 below.

- (i) Diphthong in [i̥]: [ui̥]. Only in the stem huj 'hoot' [hui̥].
- (ii) Diphthongs in [y̥]: [iy̥, ey̥, yu̥, øy̥]. In the stems: tvivl 'doubt', -lev '(a place name suffix)', peber 'pepper', syv 'seven', -løv '(a place name suffix)' [tviy̥ʌ, -ley̥, pey̥ʌ, syy̥ʌ, -løy̥].
- (iii) Diphthongs in [ɤ̥]: [eɤ̥, oɤ̥]. In the stems Per '(a boys' name)', sort 'black', skjorte 'shirt', fjorten 'fourteen', torden 'thunder', hurtig 'fast', mor 'mother', bror 'brother' [peɤ̥, soɤ̥d, sgjoɤ̥dø, fjøɤ̥dø, toɤ̥dø, hoɤ̥di, moɤ̥, bɔɤ̥].

### 3.5 Functional arguments for the phonological interpretation of falling diphthongs in Danish

The interpretation of diphthongs is one of the classic problems in structuralist phonology (such as Prague-phonology, Bloomfieldian-phonemics, and glossematics): Are they single phonemes or phoneme combinations? If they are single phonemes, have they long, short, or neutral quantity (in languages with distinctive vowel quantity)? If they are phoneme combinations, is the second part of falling diphthongs phonologically a vowel or a consonant, or something in between? And so on. The arguments to be discussed in the present section are all functional, i.e. purely phonetic facts will not be decisive for the interpretation. Furthermore, morphological and stylistic alternations will be disregarded here, i.e. we consider the non-alternating genuine falling diphthongs only.

It has already been argued above (cf. sections 3.2 and 3.3 in particular) that the (stylistically as well as morphologically) alternating diphthongs should be interpreted phonologically as /VC/-combinations, where /C/ is a voiced oral central continuant, viz. one of the phonemes /v, ɣ, r/.

The following four functional criteria, which apply to alternating as well as non-alternating diphthongs, will be discussed below: commutability (section 3.5.1), occurrence of the stød (section 3.5.2), phonotactics (section 3.5.3), and occurrence of the ending schwa (section 3.5.4). If these criteria do not give the same result, it is hard to see how the ultimate analysis could escape arbitrariness. But if the four criteria mentioned above all point towards the same analysis, and if, furthermore, this analysis concords with the other arguments advanced in the present paper, then the result would seem interesting, at least.

### 3.5.1 Commutability

The term 'commutability' here refers to the question whether the two components of a diphthong can be commuted independently of each other, and if so, with which other units they can be commuted. Martinet (1939) considered this criterion decisive for the choice between a monophonemic and a biphonemic interpretation. I refer to Martinet's paper and to Fischer-Jørgensen 1956 concerning the 'permissibility' of commutations. I here deviate from Martinet's principles (cf. Martinet 1965, p. 89) by demanding that 'syllabicity' should be kept constant during the commutation, i.e. the number of syllables as well as the location of their peaks should remain unaltered (I thus consider Martinet's commutation [o]:[p] (in French) by means of the example cahot 'bump', cap 'cape' [kao]:[kap], as 'impermissible'; in this pair, the commutation is in fact one of syllable number, just as in pays 'country', paye 'pays' [pei]:[pej]).

The criterion of commutability thus defined clearly points towards a biphonematic interpretation of the falling diphthongs in Danish. E.g. in [aɪ], [a] can be commutated with [ʌ], as in mig 'me' : møg 'muck' [maɪ, mʌɪ] (and possibly also with [ʊ], cf. the isolated example hej! 'hi!', huj 'hoot, n.' [haɪ, huɪ]). It is true for all genuine falling diphthongs that their first component can be commutated with at least one other vowel, and their second component with a number of consonants as well as with at least one other glide (in the case of some of the [ɥ]-diphthongs presupposing that the vowel quality be adjusted for 'r-colouring', but this is a general problem with the commutation test, cf. section 4 below). The present criterion thus excludes a monophonematic interpretation and points towards a /VC/-interpretation (although it does not exclude the possibility of the second component belonging to a particular functional class of 'semi-vowels').

### 3.5.2 Occurrence of the stød

Native Danish monosyllabic words with long vowels always have stød (e.g. gå 'walk', pæn 'nice' [gɔ:?, pɛ:ʔn]).<sup>1</sup> Short vowels in Danish never have stød (e.g. vi 'we', kat 'cat', mand 'man' [vi, kad, manʔ], cf. man! 'conjure!' [mæ:ʔn]).

Danish monosyllables ending in a short vowel followed by a voiced consonant either have stød (on the consonant) (e.g. mand 'man', hal 'hall' [manʔ, halʔ]) or do not have stød (e.g. man 'one', tal 'number' [man, tal]). If the voiced consonant in question is followed by another consonant, the (stressed) monosyllable always has stød (e.g. hals 'neck', vams 'doublet' [halʔs, vamʔs]).

Danish monosyllables ending in a diphthong either have stød (e.g.

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1) There is one reservation, however: in younger standards words like stork 'stork', barsk 'tough' may be pronounced with a long stød-less vowel, as [sdɔ:g, ba:sg]; the long vowel derives from a short vowel plus a (historically voiceless) /r/, cf. the old pronunciation [sdɔ:gg, ba:sg], and is thus the result of a 'compensatory lengthening'.

maj 'may, n.', skov 'forest' [maǐ?, sɡɔv?]) or do not have stød (e.g. mig 'me', tov 'rope' [maǐ, tɔv]). If the diphthong is followed by a consonant, the monosyllable always has stød (on the second part of the diphthong) (e.g. egn 'region', skovl 'shovel' [aǐ?n, sɡɔv?l]). Consequently, Danish diphthongs have stød-conditions like a sequence of short vowel plus a voiced consonant, but quite unlike both long and short vowels.

(If one would, despite the arguments adduced above, persist in claiming that Danish diphthongs phonologically behave like single vowels, one would be forced to recognize a distinction between long-vocalic diphthongs (e.g. in maj, skov) and short-vocalic diphthongs (e.g. in mig, tov), a distinction which could only manifest itself in positions where stød is allowed, and, furthermore, that this alleged quantity distinction could never be manifested as such, but only as a distinction in stød. Although a phonological quantity distinction under certain conditions can be realized as a stød-distinction (e.g. ud 'out', bud 'messenger' [uð?, buð], cf. Rischel 1969, p. 183 f), the postulated phonological vowel length in e.g. ud can be manifested under other conditions, e.g. in more distinct pronunciations ([u:ʔð]) and in forms with suffix (ude [u:ðə]), in contradistinction to the alleged vowel length in maj, skov etc. which can never be manifested. And, furthermore, if e.g. travl 'busy' [tɔv?l] should contain a long vowel phoneme, it is hard to figure out a plausible analysis of brav 'brave' [bɔv?v/bɔv:ʔv/bɔv?], in distinction to rav 'amber' [ɔv].)

### 3.5.3 Phonotactics

The phonotactics of Danish diphthongs deviates very much from the phonotactics of the short vowels. For example, a short vowel can be followed by two voiced consonants, e.g. halm 'straw', elg 'elk' [haʔm, ɛʔɣ], whereas a falling diphthong can be followed by at most one homosyllabic voiced consonant

(thus words ending in e.g. \*[-au(?)|m, -æp|(?)y] are systematically non-occurring).

The phonotactics of long vowels is more like the phonotactics of diphthongs. But these phonotactic similarities are such as apply also to sequences of a short vowel plus a voiced consonant (e.g. the very restricted inventory of following consonant clusters). We must therefore look for a phonotactic criterion distinguishing between long vowels and sequences of a short vowel plus a voiced consonant, and then see in which of these groups the falling diphthongs belong.

A possible candidate for such a phonotactic criterion is the possibility of occurring before the glide [ɤ]. All long vowels occur before [ɤ], whereas the occurrence of falling diphthongs before [ɤ] is, at best, dubious (the non-occurrence of [ɤ]-diphthongs before [ɤ] does not, of course, show anything, since it follows from the general impermissibility of identical adjacent homosyllabic segments). Possible counterexamples to the claim advanced here are a few words like sejr 'victory', navr 'common maple', tøjr 'tether'. These words are normally pronounced as bisyllabic, i.e. as [sai?ʌ, nau?ʌ, tʌi?ʌ], thus rhyming with bajer '(bottle of) lager', tau'er '(plural of Greek letter name)' [bai?ʌ, tau?ʌ], and coalescing with tøjer 'cloths' [tʌi?ʌ], respectively. But it is an option to certain speakers of Standard Danish to distinguish between monosyllabic and bisyllabic pronunciation in the cases just mentioned, so that e.g. tøjr may be pronounced as a monosyllable and thus be in commutation with tøjer. Nevertheless, I think the argument given above, in favour of considering, on phonotactic grounds, the falling diphthongs as /VC/-combinations rather than long vowels, is valid for all varieties of Standard Danish, for the following reason: After long vowel phonemes, there is a stable opposition between /r/ (manifested as [ɤ]) and /ər/ (manifested as [ʌ]), e.g. ser 'sees', seer 'seer (prophet)'; ror 'rows', roer 'rower'



[se:ʔɹ, se:ʔʌ; ʋo:ʔɹ, ʋo:ʔʌ]. After sequences of a short vowel plus a voiced consonant, on the other hand, there is in some cases a vacillation between /r/ and /ər/ (e.g. in imperatives like hædr!, bladr! which may be pronounced either mono- or bisyllabically); this vacillation just mirrors the vacillation in imperatives like sejr! 'win!', flagr! 'flutter!', which may also be pronounced either mono- or bisyllabically, just like the situation with sejr, tøjr and navr in those standards which have the option of a monosyllabic pronunciation of such forms.<sup>1</sup> To sum up: the falling diphthongs behave phonotactically as sequences of a short vowel phoneme plus a vowel-adjacent (voiced) consonant.

Another argument is the following: Presupposing that 'syllabicity' is kept unaltered during the commutation (see section 3.5.1 above), the second component of the diphthong in a case like mig 'me' [maɪ] is commutable with a large number of consonants and with the glide [ɥ]. If the glides are interpreted as vowel phonemes, a short vowel phoneme like /a/ could be followed by either a consonant (except /v/ and /r/, among others), or by one of the vowel phonemes u, ɹ, i (manifested as a glide). But if instead we consider the glides as manifestations of consonant phonemes, a short vowel phoneme like /a/ can be followed by consonants but not by vowels. This principle is much more general (cf. Levin 1974, p. 58).

Phonotactics also gives a hint as to which consonants the phonetic glides [ɪ ɥ ɹ] may be identified with phonologically (the initial [ɪ] and the final [ɹ] can be immediately identified phonologically):

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1) Cf. the vacillation between /l/ and /əl/ after nasals in imperatives, so that handl! 'trade!', skraml! 'clatter!' may coalesce, but need not do so, with the nouns handel 'trade', skrammel 'rubbish' (if the distinction is maintained, it is by means of "syllabicity", except in the rare cases where a [ə] is pronounced before /l/).

We noticed in section 3.2 above that [v] and [v̥] are free variants after long vowels (with different stylistic effect). After short vowels [v̥] occurs, but not [v], whereas [v] occurs in the initial part of the syllable, in contradistinction to [v̥]. According to normal phonological practice, [v] and [v̥] may thus be considered manifestations of the same consonant phoneme, i.e. /v/.

In the final part of the syllable, [ʀ] and [ʀ̥] occur as variants (under different conditions in different dialectal, sociolectal and stylistic standards). In the initial part of the syllable only [ʀ] occurs, and [ʀ] and [ʀ̥] may therefore be considered manifestations of the same consonant phoneme, i.e. /r/, according to normal principles of phonological analysis.

#### 3.5.4 The ending schwa

Definite and plural form of adjectives is normally constructed by addition of the ending schwa (e.g. gul (indef. sg.) 'yellow', gule (def. or pl.) [gu:ʔl, gu:lə]). Also infinitives generally end in schwa (e.g. spise 'eat' (inf.), spis! [sbi:sə, sbi:ʔs]). Certain adjectives in their definite and plural form, as well as certain infinitives, do not end in schwa, however, but in a stressed vowel (e.g. blå 'blue' (all forms), gå 'walk' (inf. and imp.) [blɔ:ʔ, gɔ:ʔ]).

According to Martinet (1937, chapter 4), who included such forms in his treatment of the Danish diphthongs, the rule is that stems ending in a consonant take schwa, whereas stems ending in a vowel take zero instead of schwa.

Martinet's formulation only applies to non-narrow vowels, however (and not to the verbs ae 'caress' [æ:ə], bejae 'say yes to' [bejǎ:ʔə]). The verbs tie 'keep silent' and true 'threaten', for example, have infinitives ending in schwa, just like the adjective fri in declined form most often takes schwa. Certain other stems ending in a narrow vowel have vacillation (e.g.

ny/nye 'new' (def. or pl.) [ny:?, ny:ə]), whereas still others never take schwa (e.g. si 'strain' (inf. and imp.), sy 'sew' (inf. and imp.), kry 'perky' (all forms) [si:?, sy:?, kɔy:?]). The correct generalization is thus weaker than Martinet's, viz.: stems ending in a consonant always take schwa, whereas stems ending in a vowel normally do not take schwa (where certain stems ending in a narrow vowel constitute exceptions to the normal case).

All stems terminating in a diphthong take schwa as ending in the relevant grammatical forms, e.g. sove 'sleep' (inf.), blege 'pale' (def. or pl.) [sɔvə, blɑjə] (of course, schwa in such forms can assimilate to neighbouring sonorants, just like all other schwas, whatever their origin: e.g. sove can be pronounced [sɔv] and the like, but the lack of stød as well as the two-peak-syllabicity clearly show that the form is bisyllabic, in casu constructed from the monosyllabic vowel stem plus the ending schwa; cf. the first footnote to section 3.7 below).

### 3.6 Falling diphthongs occurring after /r/

Up to this point, we excluded diphthongs occurring after /r/ from consideration, since they often begin with vowel qualities which are different from those of the first part of diphthongs not occurring after /r/. We are therefore obliged to investigate whether our results, which were obtained from an examination of diphthongs not occurring after /r/, account also for the diphthongs occurring after /r/, together with the independently needed principles for "r-colouring" (for a summary of these, see Basbøll 1972b, p. 202 ff).

Since initial [ɐ] in Danish does not occur before the glide [j] (except in very fast speech where a prevocalic /i/ may be desyllabified), all Danish diphthongs which may be /r/-coloured are falling. As for the non-genuine falling diphthongs occurring after /r/ (cf. section 3.2 above), the quality of their

first component is identical to the normal r-coloured quality of the long vowel with which it alternates: e.g. the word røv! 'rob!' has a lowered /ø:/ in both non-diphthongal and diphthongal pronunciations, cf. the word rød 'red' [ɞøʔ:ʔv, ɞøʔ:ʔu, ɞøʔuʔ; ɞøʔ:ʔð, ɞøʔðʔ] (/ø:/, as well as other vowels, may be r-coloured, i.e. lowered and/or retracted, to different degrees in different standards).

r-colouring in cases of morphological shortening (cf. section 3.3 above) follows a similar pattern: the /e:, e/ of brev 'letter', brevpakke 'small packet' is r-coloured just like the /e:, e/ of bred 'broad', bredskuldret 'broad-shouldered' [bɛɛʔ:ʔv, bɛɛʔ:ʔu, bɛɛʔuʔ; bɛɛʔuʔpɑgə; bɛɛʔ:ʔð, bɛɛʔðsgùl(?)ɞð]. The conclusion is that (the first component of) alternating (genuine as well as non-genuine) diphthongs undergo(es) r-colouring (i.e. lowering and/or retraction due to an /r/, which in this case precedes the diphthong) according to the same general principles as monophthongs.

We must now proceed to the non-alternating falling diphthongs occurring after /r/. Since these diphthongs do not alternate with any other segment(s), we do not know a priori which vowels their first components are to be identified with phonologically, and therefore we ignore, a priori, whether the general principles of r-colouring suffice to account for the inventory of non-alternating diphthongs occurring after /r/. The core of this inventory (cf. section 3.4.1 above) is as follows:

(i) [ɨ]-diphthongs after /r/: [ɑɨ, ʌɨ]. Thus regn 'rain', røg 'smoke' [ɞɑɨʔn, ɞʌɨʔ] rhyme with degn 'parish clerk', støj 'noise' [dɑɨʔn, sdʌɨʔ]. This agrees well with the notation of the first part of these diphthongs as low back vowels, since monophthongal low back vowels like [ɑ, ʌ] generally are not much r-coloured (from an auditory point of view): ram 'acid', rom 'rhum' [ɞɑmʔ, ɞʌmʔ] rhyme with tam 'tame', tom 'empty'

[tɑmʔ, tʌmʔ] (cf. the table below).<sup>1</sup> Ege's notation [ɕ] (equivalent to our symbol [œ]) for the non-r-coloured diphthong (1965, p. 26), on the other hand, is exceptional in two respects: this will be the only context where [ɕ] is not a result of r-colouring, and [ɕ] before [i] will be the only non-high front vowel which is not r-coloured (arguments like the preceding are not decisive to a purely phonetic notation, of course; but Ege himself asks whether the first part of the diphthong may be 'heard' as [ɕ] (instead of [ɸ]) "by account of intuitive preconceptions of morphophonemic patterns (conjugation type: [by:ðə ~ bø:ʔð] paralleling type: [ly:və ~ lɕjʔ]), or phonotactic phonemic patterns ([j] does not occur after other back vocoids either), maybe even furthered by etymology or spelling!" (ibid.)

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1) The notation [ɑ̣, ʌ̣] is also in accordance with another general principle of Danish, viz. that glides can only be dropped after homorganic vowels, presupposing that vowels be classified with respect to place of articulation according to their principal narrowing above the glottis, i.e. [ɑ, ɸ] are pharyngeal (and not velar) vowels. Thus [ɸ] is generally dropped after the pharyngeal vowels [ɑ, ɸ], e.g. har 'has', går 'walks' [hɑ:ʔ, gɸ:ʔ] but is always retained after palatal vowels like [i, ə], e.g. ir 'verdigris', bær 'berry' [iɸ, bæɸ] and after the velar vowels [u, o], e.g. sur 'sour', mor 'mother' [su:ʔɸ/suɸʔ, moɸ]. Similarly, [ɸ̣] can be dropped after the velar vowels [u, o], e.g. luv 'nap', tog 'took' [lu:ʔv/lu:ʔ, to:ʔv/to:ʔu/toʊʔ/to:ʔ], but not after palatal vowels like [i, ε], e.g. stivnē 'stiffen', evne 'talent' [sdiɸnə, sɸnə], nor after the pharyngeal vowels [ɑ, ɸ], e.g. hav 'sea', høv 'hoof' [hɑɸ, hɸʊʔ]. Finally, [ị] can be dropped after palatal vowels like [i, ə], e.g. vig 'cove', tag 'roof' [vi:ʔ, tæ:ʔi/tæ:ʔi/tæiʔ/tæ:ʔ], but is always retained after velar vowels, e.g. hụj [hụi] (except before [ð̣] in advanced speech, e.g. øjet, meget [ɸ:ð̣, mɑ:ð̣], cf. Brink/Lund 1974, p. 38 f). The nice symmetry of this system is retained with the notation [ɑ̣, ʌ̣], i.e. with an analysis of the first component of these two [ị]-diphthongs as back vowels. (The fact that glides may be dropped only after homorganic vowels might be explained by a general difficulty in perceiving just such glidings.)

(ii) [ɤ]—diphthongs after /r/: [aɤ, ɔɤ, əɤ, ɔɤ]; e.g. ravn 'raven', rogn 'roe' rhyme with savn 'want', sogn 'parish' [ʁaɤʔn, ʁɔɤʔn; saɤʔn, sɔɤʔn]. This notation agrees with one of the general principles of r-colouring, viz. that low back vowels are not much coloured by a preceding /r/ (cf. above). But words like revne 'crack', vrøyle '(to) drivel', on the other hand, show a considerable r-colouring (roughly, lowering by "one degree"), as compared to the non-r-coloured diphthongs in e.g. levne 'leave', støvle 'boot' [ʁæɤnə, vʁɔɤlɛ; lɛɤnə, sdæɤlɛ]. This agrees well with another general principle of r-colouring, viz. that low front vowels are considerably coloured by a preceding /r/.<sup>1</sup> ('Rhyme' is taken here in its auditory sense.)

(iii) [ɤ]—diphthongs after /r/. Since [ɤ] is a syllable-final manifestation of /r/, the genuine [ɤ]—diphthongs help define the notion of "r-colouring". The diphthongs to be considered in this paragraph are those with the structure /rVr/ where /V/ is a short vowel. However, there seem to be no genuine non-alternating forms with /rVr/.<sup>2</sup>

The results obtained in this section are summarized in the table below. The sign ~ means 'rhymes with', } means 'does not rhyme with'. These designations are only used as approximations, in the auditory sense. The pronunciations indicated in the table are based upon Advanced Standard Copenhagen speech.

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1) An isolated form with [ɛɤ] after /r/ may be heard, however, viz. rev (n.) 'reef' [ʁæɤ, ʁɛɤ] (Hansen 1962, p. 214). The pronunciation [ʁɛɤ] may be classified as a lexical exception, just like peber [pɛɤʌ], cf. section 3.4.2 above. Thus, I consider [ʁɛɤ] as an instance of the regularly r-coloured diphthong /ev/ (which does not belong to the core of non-alternating diphthongs in Danish, cf. section 3.4 above), and not as a manifestation of the /ɛv/-diphthong, which would then, quite exceptionally, not be subjected to r-colouring.

2) There only seems to be one morphologically shortened example with this structure, viz. rørilig 'movable' [ʁɔɤ ɹ|i], rhyming with gørilig 'possible (literally: "do-able")'. rørilig thus contains a genuine alternating diphthong, cf. røre 'move' [ʁæ:ʌ, ʁɔ:ʌ] (also with vowel shades in between [æ] and [ɔ]), but since the example is isolated, it can hardly be considered part of the core of falling diphthongs occurring after /r/.

Diphthongs	not occurring after /r/	occurring after /r/	Monophthongal parallels
[ɨ]-diphthongs	[ɑɨ] [sdɑɨ?] <u>degn</u> <u>støj</u>	[ɑɨ] [ʌɨ] [sɑɨ?n] [ʌɨ?] <u>regn</u> <u>røg</u>	[tɑm?, tʌm?] ~ [ʌm?, ʌm?] <sup>1</sup> <u>tam</u> , <u>tom</u> <u>ram</u> , <u>rom</u>
non-alternating [y]-diphthongs with front vowel	[ey] [œy] [eyne] [sœy e] <u>evne</u> <u>støvle</u>	[æy] [œy] [sæyne] [vœy e] <u>revne</u> <u>vrøvle</u>	[ɛnə, kœnə] } [ʌnə, ʌnə] <u>ende</u> , <u>kønne</u> <u>rende</u> , <u>rønne</u>
non-alternating [y]-diphthongs with back vowel	[ɑy] [ʁy] [hɑy] [hʁy?] <u>hav</u> <u>hov</u>	[ɑy] [ʁy] [hɑy] [hʁy] <u>rav</u> <u>rov</u>	[tɑm?, sɡɑ:ʔ] ~ [ʌm?, sɡʌ:ʔ] <sup>2</sup> <u>tam</u> , <u>skår</u> <u>ram</u> , <u>skrår</u>
alternating [y]- diphthongs with high vowel	[iy] [yü] [iyvi] [tyüde] <u>ivrig</u> <u>tyvte</u>	[iy] [yü] [viyne] [kvyü?] <u>rivning</u> <u>"krøb:"</u> <sup>3</sup>	[kidʌ, dydʌ] ~ [bidʌ, bydʌ] <u>kitter</u> , <u>dytter</u> <u>Ritter</u> , <u>rytter</u>
alternating [y]- diphthongs with high-mid vowel	[ey] [øy] [leybø] [løyfæl?] <u>levret</u> <u>løvfald</u>	[ey] [øy] [bøybø] [pøyne] <u>brevpakke</u> <u>prøvning</u>	[med, mød] } [bved, bæd] <u>midt</u> , <u>mødt</u> <u>bredt</u> , <u>rødt</u>

### 3.7 "b-diphthongs"

A few words should be said about a type of non-genuine falling diphthongs which has been disregarded up to this point, viz. the [ɥ]-diphthongs which are in stylistic alternation with sequences of a long vowel plus the stop [b], e.g. in the words pibe 'pipe', kneb 'pinched', sæbe 'soap', tabe 'lose', krybe 'crawl', løbe 'run', råbe 'cry' [pi:bə/pi(·)u, kne:ʔb/kneɥ?, sɛ:bə/sɛ(·)u, tæ:bə/tæ(·)u, kɔy:bə/kɔy(·)u, lɔ:bə/lɔ(·)u, ɔɔ:bə/ɔɔ(·)u].<sup>1</sup> We chose to consider these diphthongs, not

(footnotes to the table:)

- 1) In more conservative standards where /a/ in tam, etc., is not as retracted as in younger speech, and where tam } ram, the pronunciation of /a/ before [ɪ] is similar to the pronunciation of /a/ before labials or velars, according to the standard, whereas /a/ before [ɥ] is more lowered and retracted (so that this latter /a/ can be identical to the r-coloured /a/ also in conservative standards).
- 2) In this case only, the monophthongal parallels are long vowels. I argue in Basbøll 1972b (p. 202 ff) that vowel quantity is insignificant for the prediction whether a given vowel is r-coloured or not. (The best monophthongal parallel would be tom~rom quoted above.)
- 3) The pronunciation with [ɥ] instead of [b] in the word kryb! 'crawl!' is stylistically conditioned (restricted to definitely colloquial etc. speech), as opposed to the other examples, except prøvning, which have genuine, viz. non-alternating or morphologically conditioned, diphthongs.

(footnote to this page:)

- 1) e can be assimilated to a preceding [ɥ] just as it can be assimilated to other non-syllabic sonorants; the result of this assimilation is here rendered as [u], although the transcription [o] would in many cases, particularly after low vowels, be more exact (phonetically). I use the terms 'b-diphthongs', diphthongization, etc., also covering such assimilated forms, although they may be considered not to be phonetic diphthongs, strictly speaking, since the gliding is partitioned over two syllables (the location of the syllable boundary may be decisive for the classification of such forms, but I shall leave this problem here since it is non-pertinent for my purpose - and, at any rate, there are a lot of 'b-diphthongs' which are undoubtedly diphthongs in any phonetic sense of the term).



together with the other non-genuine falling diphthongs in section 3.2 above, but separately, in the present section, since they are deviant from those other diphthongs in the following respects:

(i) Words with a long vowel plus [b] may be in stylistic alternation (variation) only with forms containing a falling diphthong, never with forms containing a vowel plus a voiced fricative, e.g. [v] or [β] (the sound [β] does not occur in Standard Danish at all). The other non-genuine diphthongs, on the other hand, alternate stylistically with sequences of a long vowel plus a voiced fricative (e.g. løv 'foliage' [lø:ʔv/lø:ʔu/løuʔ]), never with a vowel plus a stop (but genuine falling diphthongs can be in morphological alternation with vowel-stop-sequences, e.g. spøge 'joke (inf.)', spøgt 'joked (ptc.)' [sbø:ʔə/sbø(:)jə, sbøgd], cf. section 3.3 above).

(ii) Not all words with a long vowel followed by [b] have [u]-diphthongs as alternating pronunciations, e.g. læbe 'lip', håbe 'hope' are always pronounced [lɛ:bə, hɔ:bə], cf. the alternating pronunciations of sæbe, råbe mentioned above. Since no general principle can be given predicting which vowel-b-sequences have alternating pronunciations with [u]-diphthongs, and which do not, the distinction between these two groups of vowel-b-words must be "lexically" (diacritically) marked. All words with long vowel plus /v, γ, r/, on the other hand, have alternating pronunciations with falling diphthongs (under certain stylistic conditions etc., but presupposing no lexical marking).

(iii) b-diphthongization in Standard Danish does not occur in higher styles (in certain regional varieties of the language, b-diphthongization is more widespread, both as regards the number of words which can undergo it, and as regards the frequency with which they undergo it). Thus, in Standard Danish there exist certain levels of style in which "b-words" are never diphthongized, as opposed to /v, γ, r/-words.

The three differences just pointed out do not, of course, show that b-diphthongization is unrelated to the other cases of diphthongization which have been discussed throughout this paper. On the contrary, we shall try in the present section to investigate the possibility that b-diphthongization can be accounted for according to similar principles as those which have already been suggested for the other diphthongs.

First of all, there must be a lexical distinction between b-words which are sometimes diphthongized (e.g. pibe, sæbe, råbe) and those which are never diphthongized (e.g. vibe, 'lap-wing', læbe, håbe). One way to mark this difference phonologically is through a notation with /b/ in the former case (e.g. /pi:bə, sɛ:bə, rɔ:bə/) and with /p/ in the latter (e.g. /vi:pə, lɛ:pə, hɔ:pə/), cf. Holt 1949. Accordingly, /V:b/-sequences may diphthongize, as opposed to /V:p/-sequences. This agrees well with the standard analysis of [ɥ] as derived from /g/ (remember that [ɥ] can be vocalized to [i̯] or [u̯]), whereas /Vk/-sequences never are turned into diphthongs.<sup>1</sup> However, this notation is hardly much more than a codification of the different behaviour of the two types of b-words.

We can thus, descriptively, posit a rule  $b \rightarrow u$  (which only applies to certain "b-words", as mentioned above). The rule applies only to words which in their distinct pronunciation have a long vowel plus [b]. Diphthongization does not occur if the vowel is u (grube 'pit', kube 'cube', strube 'larynx'; Hansen 1956, p. 51), and hardly if it is o (oktober

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1) This interpretation does not cover varieties of Standard Danish where words like rybe 'grouse' can be pronounced with an aspirated stop [ɥy:pə], but such forms seem to be very rare and unsystematically occurring, and, accordingly, I shall disregard the possibility of such pronunciations here.

'october', sober 'sober', knob 'knot', but possibly in hoben 'heap'; *ibid.*). These "exceptions" may be related to the fact that the sequences [u(:)u̥, o(:)u̥] generally do not occur (cf. section 3.3 above); if /u:b, o:b/-sequences were diphthongized, their phonological /b/ might coalesce with zero, as well as with /v, γ/.

It is clear that the direction of the rule is  $b \rightarrow \underline{u}$  in such words (rather than the reverse, i.e. that /u̥/ or the segment normally underlying [u̥], viz. /v/, should be pronounced [b] by a rule  $\underline{u} \rightarrow b$  or  $v \rightarrow b$ ):

(i) If [l̥ø:bə] were a derived form, and the phonological form contained /u̥/ or /v/, then we would expect, in agreement with the normal behaviour of optional rules, that the most distinct pronunciation be the one with [u̥] or [v], which contradicts the facts (the pronunciation with [v] is hardly possible at all in Standard Danish). (ii) Under certain conditions a postvocalic [b] never alternates with [u̥], although all lexical as well as stylistic conditions seem fulfilled: e.g. tabt, råbt are never, in Standard Danish, diphthongized: [t̥abd, ʁabd; \*t̥au̥d, \*ʁau̥d]; this suggests that the plosive be primary and the glide derived, see further below.

The optional manifestation rule  $b \rightarrow \underline{u}$  is unparalleled in Standard Danish. The possibility might therefore be considered that the effect of this rule be obtained by dissolving it into two other rules, viz:

$$b \rightarrow \beta \quad \text{and} \quad \beta \rightarrow \underline{u}.$$

The former rule bears evident similarities to the rules of "consonant gradation" proposed and discussed, e.g., by Uldall 1936, Hjelmslev 1951 and Rischel 1970, viz.:  $d \rightarrow \delta$  and  $g \rightarrow \gamma$ . The latter rule is reminding of the other diphthongization rules discussed in this paper, viz.:

$$v \rightarrow \underline{u}; \quad \gamma \rightarrow \underline{i}, \underline{u}; \quad r \rightarrow \underline{r}.$$

Below, we shall therefore consider the possibility that the rule  $b \rightarrow \underset{\text{u}}{\text{u}}$  is superfluous, since it can be substituted by two other rules which may be integrated into two independently needed rules, viz. consonant gradation and diphthongization, which will be considered in turn.

Ad consonant gradation: The central condition for the vocalization of /b/ is identical to the condition for the rules  $\underset{\text{d}}{\text{d}} \rightarrow \underset{\text{o}}{\text{o}}$  and  $\underset{\text{g}}{\text{g}} \rightarrow \underset{\text{y}}{\text{y}}$ , viz. that the consonants in question occur in the final part of the (phonological) syllable (thus words like nabo 'neighbour', Saba 'Sheba' are never diphthongized: [næ:bo, sæ:ba; \*næ(:)u<sub>o</sub>, \*sæ(:)u<sub>a</sub>], cf. the pronunciation of words like soda 'soda', Ida '(a name)' [so:da, i:da; \*so:ða, \*i:ða]). Furthermore, the class of /b d g/ is more natural than the class of /d g/ alone, and an extension of the rule of consonant gradation to cover /b/ too will thus be a generalization. On the other hand, the rule  $b \rightarrow \beta$  is variable, whereas  $\underset{\text{d}}{\text{d}} \rightarrow \underset{\text{o}}{\text{o}}$  and  $\underset{\text{g}}{\text{g}} \rightarrow \underset{\text{y}}{\text{y}}$  are categorial. But there exists a good argument, I think, to the effect that the generalization of consonant gradation to include  $b \rightarrow \beta$  is, in fact, linguistically significant: Under certain conditions, viz. before a voiceless consonant (not preceded by a strong grammatical boundary: #, cf. my paper on Grammatical Boundaries in this vol. p. 126 ff), a syllable-final /g/ is never realized [ɣ] (nor [i, u]), e.g. kogt 'cooked', bagt 'baked' [kʌgd, bagd; \*kʌɣd, \*baɣd] (a /d/ is deleted under such conditions, e.g. mødt 'met', hvidt 'white (neuter)' [mød, vid; \*møðd, \*viðd] - the sequence [ðd] is not phonotactically excluded, as opposed to [dd], e.g. perfidt 'perfid (neuter)' [pæpfɪ:ðd/pæpfɪðd]). Under exactly the same conditions, a syllable-final /b/ can never be manifested by [ɣ] although all stylistic and lexical conditions seem fulfilled: e.g. tabt(e) 'lost', råbt(e) 'cried' (disyllabic forms are preterites, monosyllabic forms are participles) [tabd(ə), ʁʌbd(ə); \*taɣd(ə), \*ʁʌɣd(ə)]. Thus, the rule

$g \rightarrow \gamma$  and the vocalization of  $b$  have identical contexts where they never apply, and this may be taken as a suggestion that these two rules are only parts of a more general process.

Ad diphthongization: Since  $[\beta]$  will be a member of any natural phonetic class which includes both  $[v]$  and  $[\underset{\cdot}{u}]$ , it should not create any complications at all to incorporate the change  $\beta \rightarrow \underset{\cdot}{u}$  into the general process of vocalization (one of whose results is  $[v] \rightarrow [\underset{\cdot}{u}]$ ). It does appear to be a complication, however, that the process  $[\beta] \rightarrow [\underset{\cdot}{u}]$  seems to be obligatory (since no phonetic  $[\beta]$ 's appear on the surface), whereas some other instances of vocalization (or diphthongization) are only optional (thus forms like løve need not be diphthongized:  $[l\emptyset:v\text{e}]$ ).

I do not think, however, that this fact invalidates the incorporation of  $[\beta] \rightarrow [\underset{\cdot}{u}]$  into the vocalization rule, nor that it motivates a special restriction on this rule: It is clear that there are speech style levels in which words with phonological  $/V:v/$  (like løve) are diphthongized, whereas all words with  $/V:b/$  (like løbe) are pronounced with  $[b]$ . The opposite situation, i.e. speech styles which have  $b$ -diphthongs but where all  $/V:v/$ -words are pronounced with  $[v]$ , do not exist, to my knowledge. Thus, a stylistic restriction is demanded, in any case, to the effect that  $b$ -vocalization is situated on a lower level of the speech level hierarchy than  $v$ -vocalization. If the rule  $b \rightarrow \underset{\cdot}{u}$  is split up, as proposed here, into  $b \rightarrow \beta$  and  $\beta \rightarrow \underset{\cdot}{u}$ , then the stylistic restriction (which, as noted, is needed anyhow) will guarantee that at speech levels where the rule  $b \rightarrow \beta$  applies, the rule  $\beta \rightarrow \underset{\cdot}{u}$  will apply also.

To give a little more substance to the treatment of optional rules suggested here, consider the rule of stylistic shortening (responsible for shortening the vowel of sød 'sweet'  $[s\emptyset:?\delta, s\emptyset\delta?]$  etc.). If there are speech styles in which long vowels are not shortened before  $[\delta]$  (e.g. båd 'boat'  $[b\text{a}:\text{?}\delta]$ ), but in which words with  $/V:v/$  may be diphthongized (e.g. lov!  $[l\text{v}:\text{?}\underset{\cdot}{u}]$ ), whereas the opposite situation seems to be non oc-

curring, then stylistic shortening should be situated below v-vocalization in the stylistic hierarchy. This placement would be sufficient to account for the non-existence of stylistically shortened forms with [v] instead of [u] (e.g. <sup>\*</sup>[løvə]). But it is not easy to determine the relation between v-vocalization and stylistic shortening in this respect.

Stylistic shortening is evidently situated higher up in the stylistic hierarchy than b-diphthongization, since there is hardly any doubt that long vowels can be stylistically shortened, e.g. before [ð], in style levels in which all words with /V:b/ are pronounced with the stop [b]. Now, this relative placement of stylistic shortening and b-diphthongization makes an interesting prediction: b-diphthongized forms should be stylistically shortened. This appears always to be true when the vocalized /b/ is word-final (e.g. løb! [lø:ʔb/løuʔ]), and concerning the vocalization of /b/ in the context /V\_\_e/, the prediction agrees well with the following quotations: "Pronunciations with [u] for [b] are strictly colloquial and in many cases distinctly substandard or dialectal. In my speech they are normally accompanied by shortness of the preceding vowel, which is not necessarily true of forms with [u] alternating with [v] (or [y]), cp. [kni:u:] (~[kni:bə]) 'be difficult for somebody' vs. [kni:u] (~[kni:və]) 'knives'" (Rischel 1970, p. 469); and "Those who use u in both cases [i.e. in both løve and løbe, etc.; HB] appear (according to Eli Fischer-Jørgensen) to differentiate by means of quantity: longer vowel before original v than before original b" (Hansen 1956, p. 70). Rischel's example is very well suited to show the difference, since the vowel is high (in which case the tendency towards shortening is very pronounced) and the quality of the short and long vowel is identical. In forms like tabe, råbe, on the other hand, the vowel quality (viz. [æ, ɔ]) in itself indicates the phonological vowel length, and the auditory length is not easy to agree on.

According to the account just given, the occurrence of *stød* should not be influenced by the diphthongization of a /V:b/-word, and generally, it is not: *skab* 'cupboard' [sgæ:ʔb, sgæyʔ]. In a pronunciation of *skib* 'ship' as [sgiy], on the other hand, we must recognize the existence of lexical doublets, cf. the alternative pronunciations [sgi:ʔb/sgiyʔ]. (Lexical doublets with long and short vowel phonemes, and occurring with and without *stød*, respectively, in monosyllabic forms, are found in *slag* [slæ:ʔy/slæ:ʔi/slæiʔ, slay/slay], *stød* [sdø:ʔð/sdøðʔ, sdøð], and in many other words. Examples like *slag* are particularly informative, since they demonstrate an obvious difference in vowel quality of the lexical doublets, clearly indicating a phonologically long and short vowel, respectively.)

4. Conclusion: can 'diphthong' in any sense be considered a phonologically relevant concept in Danish?

In the preceding section a number of arguments were advanced to the effect that the Danish diphthongs phonologically function as homosyllabic /VC/-combinations, where /C/ behaves like a voiced non-lateral continuant (voiced since it can receive the *stød*, and a central oral because the preceding vowel generally participates in vowel length alternations or -neutralizations, cf. section 2.2.2 above). Specific arguments pointed towards a phonemic identification of /C/ with one of the phonemes /v/, /r/, /j/, maybe /y/ (where /y/ may well be derived from /g/) and possibly partly /b/. If a 'phonological (or phonemic, functional) diphthong' is defined in a parallel fashion with a phonetic diphthong, viz. as a homosyllabic sequence of two vowel phonemes, the phonetic diphthongs in Danish therefore cannot be considered phonological diphthongs too. But can any other sense be assigned to the term 'phonological diphthong' so that it becomes a functionally relevant concept in Danish phonology?

If a phonological diphthong can only be defined as a sequence of one or more phonemes which is manifested by a phonetic diphthong, this is tantamount to denying the phonological relevancy of the term 'diphthong'. If we consider the falling and rising diphthongs in Danish together, this definition seems to be the only possibility, i.e. the class of all phonetic diphthongs in Danish is not a natural one in any phonological sense.

If we consider only the class of all "genuine" falling diphthongs in Danish, in the sense discussed in section 3, these diphthongs can be defined phonologically as homosyllabic sequences of a short vowel phoneme plus one of the phonemes /v, r, j/ (and maybe /ɣ/, depending on the variety of Standard Danish used as material as well as on the principles of analysis chosen). The class of consonant phonemes in question constitutes a phonologically natural class. But the very fact that the phonetic diphthongs can be defined, phonologically, in a non-circular manner, i.e. without referring to their manifestation as diphthongs, does not, of course, show that the concept is phonologically relevant. At most, it shows that the class of consonants which can be 'vocalized' is a natural one. We must thus look in quite another direction (cf. Spang-Hanssen 1959).

A phonological syllable in Danish has a vowel phoneme as peak, and zero, one or more consonants in its onset and in its coda. Thus its maximal structure is the following:

$$/C_{i3}C_{i2}C_{i1}V C_{f1}C_{f2}C_{f3}\dots/$$

(i means "initial" and f "final", whereas the numbers indicate distance from the syllabic peak; the number of final consonants depends on which inflected and derived forms are included in the material, but this problem is irrelevant in the present context).



When we consider any homosyllabic sequence of two consonants, either belonging to the onset or to the coda, i.e. /CC/, the paradigm in each consonant position depends on the choice of the other consonant. E.g. if we have chosen /s/ as the first consonant of the sequence /CC/, the other consonant could be /b/, /m/, /l/, etc., but not /r/ or /f/. And if we have chosen /v/ as the second consonant, the first one could be e.g. /d/, /k/ or /s/ (if the sequence is in the onset), but not e.g. /l/, /p/ or /n/; or it could be /l/ or /r/ (if the sequence is in the coda), but not e.g. /t/, /j/ or /m/. The restrictions of choice are much heavier if we know the position of the consonant sequence in the syllable, e.g. if the sequence is given as /C<sub>i3</sub>C<sub>i2</sub>/ or /C<sub>f1</sub>C<sub>f2</sub>/, etc. (The actual restrictions can easily be constructed from the existing phonotactic studies of Danish, such as Vestergaard 1968 and Basbøll 1973b.) It should be emphasized that the relevant restrictions are all structural, i.e. accidentally missing clusters should be considered part of the material (for some discussion of connected problems, see Fischer-Jørgensen 1952).

If we consider the sequence /CV/, the situation is quite different: the choice of a specific consonant does not restrict the possibility of choice of the vowel, and vice versa. It should be mentioned here that we speak about phonemes, not allophones, in this context. If, for example, we choose the consonant phoneme /r/, the following vowel will be realized as an "r-coloured" allophone, i.e. as a lower and more retracted vowel in comparison to its non-r-coloured counterpart (and the situation with /r/ is only one particularly striking instance of a quite general phenomenon). The only apparent example in Danish where a possible initial consonant cannot be freely combined with a possible vowel phoneme is /j/ plus /i/. This restriction (i.e. the non-occurrence of /ji/) does not seem to be a structural one, however, since words like sjippe 'skip', chick, chili, jiddisch are always given a phonemic structure

/..ji../ and seem to be completely acceptable to Danes. Thus it can be concluded that homosyllabic /CV/-sequences in Danish do not exhibit any combinatory restrictions.

Let us, finally, turn to the /VC/-sequences, and let us, for the moment, disregard the phoneme sequences which are manifested by genuine (in the sense discussed in section 3 above) phonetic diphthongs (see below).

Since we are concerned with structural (as opposed to accidental) occurrence and non-occurrence of combinations, we ought not to use morphemes as our frame of reference. This follows from the fact that we are interested in the restrictions mastered "productively" by the native speaker, together with the hypotheses (if they are correct) that new monomorphemic words can be freely introduced without phonotactic modifications if they conform to the structure valid for polymorphemic native words (cf. Basbøll 1973b) and the more general hypothesis explored by Linell (1974) that psychologically central invariant structurings correspond (by and large) to the maximally distinct word forms. We take this criterion of maximally distinct word forms to imply that stylistic shortening (i.e. the optional shortening of long vowels (particularly high vowels and stød-vowels) before the non-consonantal non-syllabic phonemes, i.e. the "glides" [j, u, ʌ, ø, (ɥ)]) should be disregarded for the purpose of this investigation. I.e., since this shortening is not obligatory, the maximally distinct (with "maximal structuring") word forms will be those with long vowels, for the words in question. On the other hand, it is clear that word forms having undergone morphological shortening, i.e. the (generally) obligatory shortening of underlying long vowels, e.g. in the first part of certain compounds and in stems before certain suffixes, should be included in the material (cf. the fact that the vowel quality in morphologically shortened forms most often is identical to that of "genuine" short (as opposed to long) vowels, in contradistinction to the stylistically shortened vowels).

It is an empirical question which type of words (and thus which word-definition) we should use here (if we are concerned with the productively mastered phonotactic restrictions). I shall tentatively employ words not containing any # (cf. my paper "Grammatical boundaries in phonology" in this volume), i.e. disregard compounds (and certain productive pre- and suffixes, but this has little impact on phonotactics).

If the vowel is long, there is free combinability with the following consonant, except for the fact that /j/ does not occur after long vowels, and that /æ:/ can only be followed by /r/ or /n/ (and by /l/ in the word brøle 'roar', but this only applies to the conservative language, the [æ:] in brøle in younger standards having been coalesced with the (original) r-coloured /ø:/).

When the vowel is short, the only restriction which might be systematic is the non-occurrence of high front vowels before nasals (short [u] occurs before /n/: hun 'she', hund 'dog', pund 'pound'). As regards (stressed) /i/, the restriction is probably not structural: The name Kim today is often pronounced [kim?], and the foreign word pinje 'stone pine' is usually pronounced [pinjə].<sup>1</sup> As regards /y/, words like kymrisk 'Cymric', hymne 'hymn' [kym?ʊisg/køm?ʊisg, hymnə] suggest the same thing; and in pretonal syllables short [y] freely occurs before homosyllabic nasals (e.g. syntese 'synthesis', gymnastik 'gymnastics' [synté:sə, gymnasdʰg]. (But if the non-occurrence of short (stressed) [y] before nasals should have turned out to be systematic, a rule could be set up to the effect that round front vowels are lowered one degree before nasals (cf. Spang-Hanssen 1949 and Basbøll 1972b), and in that case the phoneme /y/ would in fact occur before nasals.) If short [y] is structurally allowed before homosyllabic nasals, which seems to be the case, the non-occurrence of short [æ] in other positions than before a homosyllabic nasal or after /r/ is probably to be considered systematic. This restriction is best conceived of as concerning

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1) The word trin 'step' is often pronounced [tʁin].

the vowel phoneme /æ/ (cf. the restricted occurrence of long /æ:/ mentioned above) and not the consonants. This restriction must be borne in mind in the following.

It can thus tentatively be concluded that there are no secure structural restrictions, apart from the restricted occurrence of the phoneme /æ/, for the combination /VC/ within the syllable, disregarding the sequences manifested as phonetic diphthongs (this may, in fact, be seen as one of the characteristics of the distinction between the classes of functional vowels and consonants, respectively).

Let us now turn to the /VC/-sequences which are manifested as genuine phonetic diphthongs. As regards the [ɶ]-diphthongs, one restriction is generally mentioned in the literature: the non-occurrence of the short mid-close vowels /e, ø, o/ before /r/. However, a few words with /or/ are found (e.g. sort (adj.), hurtig, mor, some of which have alternating pronunciations); also compare the name Per [pe(:)ɶ] (cf. section 3.4.2 above). Furthermore, the phonetic diphthongs [eɶ, øɶ, oɶ] are quite common in the first part of compounds and certain derivatives, where they occur by morphological shortening (e.g. lerguly 'earthen floor', mørbanket 'beaten black and blue', stormand 'magnate' [lɛɶgðl, møɶbãŋ?gð, sdøɶmãŋ?]). (Finally, [eɶ, øɶ, oɶ] frequently occur as a result of stylistic shortening (e.g. ler 'clay', mør 'tender', stor 'great' [lɛɶ?, møɶ?, sdøɶ?]), but this can be disregarded at present, cf. above.) Within the present context, the alleged non-occurrence of /e, ø, o/ before /r/ should thus not be considered structural (but see below), and the phonetic [ɶ]-diphthongs are not systematically deviant from other /VC/-combinations in this respect.

Concerning the [ɤ]-diphthongs, the over-all picture (which will only be sketched here) does not differ much from that of the [ɶ]-diphthongs just mentioned. The diphthongs [iɤ, eɤ, øɤ, yɤ, øɤ, œɤ, ɯɤ, aɤ] (e.g. stivne, levret, levne, syv, løvfald, støvle, bov, hav) all seem to be readily acceptable to Danish

speakers, and they are all found in native words, although some of them only occur as a result of morphological shortening or in isolated roots; the [ɥ]-diphthongs with open first vowel freely occur in monomorphemic native words (see below). Thus the [ɥ]-diphthongs do not exhibit any structural phonotactic restrictions (with the possible exception of [uɥ] and [ɔɥ], but cf. fog), in the sense used at the moment, and they must be considered phonotactically non-deviant /VC/-combinations.

Finally, let us consider the [ɨ]-diphthongs. Here the picture is different. The diphthongs [aɨ, ʌɨ] are perfectly acceptable, and the diphthong [uɨ] is found in one native stem, viz. huj. The diphthong [ɛɨ] is the most general pronunciation in English loanwords like baby [beɨbi] (where the older generation often has [ɛ:]: [be:bi]). But diphthongs like [eɨ, yɨ, øɨ, œɨ, oɨ] are clearly excluded. (As mentioned above, we disregard the stylistically shortened diphthongs which may occur in words like neg 'sheaf', syg 'ill', besøg 'visit' [neɨ?, syɨ?, besøɨ?] (together with non-shortened forms as well as forms without the glide); note, however, that e.g. [oɨ] never occurs as a result of stylistic shortening (nor as a result of any other phonological process).) Let us, therefore, define a phonological diphthong in Danish in the following way: If there are (heavy) systematic restrictions on the choice of different vowel phonemes that can precede a given consonant phoneme belonging to the same syllable, then the /VC/-combinations in question are phonological diphthongs; or, in other words: phonological diphthongs are homosyllabic /VC/-combinations exhibiting (heavy) systematic phonotactic restrictions of (internal) combinability.

This definition implies, as already mentioned, that the Danish [ɨ]-diphthongs can be considered phonological diphthongs (quite independently of their manifestation as phonetic diphthongs), in contradistinction to the [ɥ]- and [ɧ]-diphthongs. It should be added here that the so-called [ø]-diphthongs (see section 2.3 above), clearly do not satisfy this

definition of a phonological diphthong: [ð] is freely combinable with the preceding vowel. This definition recalls earlier phonological definitions suggesting that a phonological diphthong is a phonetically complex vowel behaving like a single phoneme (cf. Pike 1947a, pp. 62 and 149); the two definitions have in common that they emphasize the tight connection (phonologically speaking) between the two parts of the diphthong. The latter definition does not cover any Danish diphthongs, however (whereas it seems more appropriate to languages like English). It may be added that the result of these considerations, viz. that [i̯]-diphthongs can be considered phonological diphthongs in contradistinction to the other phonetic diphthongs in Danish, agrees well with certain aspects of Danish graphemic structure, cf. Spang-Hanssen 1959, p. 191 ff).

If we now restrict the view to phonotactic regularities of underlying morphemes, another picture emerges, viz. that the phonetic diphthongs generally, i.e. also [ɥ]- and [ɤ]-diphthongs, exhibit a more restricted internal combinability than other /VC/-sequences. It should be emphasized, however, that underlying morphemes are highly abstract entities which seem to be of a dubious psychological relevancy (as opposed to concrete word forms). It may nevertheless be interesting briefly to survey the distributional facts from this point of view, too. When we are so restrictive as to exclude morphologically shortened forms from consideration, we shall also be allowed to exclude a few isolated monomorphemic forms as exceptions, by Spang-Hanssen's criterion of generalizability (op. cit.). We are here, in other words, concerned with the core of non-alternating diphthongs (cf. section 3.4.1 above).

The core of [ɤ]-diphthongs are derived from a short high or low vowel phoneme plus /r/, i.e. the combinations /er, ør, or/ do not belong to the core.

The core of [ɥ]-diphthongs all have a low vowel as their first component: [ɛɥ, œɥ, ɤɥ, aɥ]. Thus these diphthongs, too,

are deviant from other /VC/-combinations under the present pre-suppositions (viz. that we disregard morphologically shortened forms).

The core of the [i̥]-diphthongs consists of only [ʌi̥] and [ḁi̥], as already mentioned.

When we consider the [Vð]-sequences, on the other hand, even the core of these represent the quite ordinary free combinability typical of non-diphthongal /VC/-combinations (e.g. bið 'bite', beð '(flower) bed', með 'with', mað 'food', spyð 'spear', løð 'hue', buð 'messenger', løð 'weight' [bið, beð, með, mað, sbyð, løð, buð, løð]; the combination of short /o/ plus ð is missing, but such an isolated gap is not peculiar of the /Vð/-combinations).

We have argued throughout this section that, whereas normal (homosyllabic) /VC<sub>f1</sub>C<sub>f2</sub>/-sequences had a loose connection (i.e. free combinability) between /V/ and /C<sub>f1</sub>/, and a tight connection (i.e. restricted combinability) between /C<sub>f1</sub>/ and /C<sub>f2</sub>/, 'phonological diphthongs' could be defined by the fact that they had a tight connection between /V/ and /C<sub>f1</sub>/ . It should now be investigated whether the counterpart of the tight connection between /V/ and /C<sub>f1</sub>/ in a phonological diphthong is a loose connection between the second component of such a 'diphthong' (i.e. /C<sub>f1</sub>/) and a following consonant (/C<sub>f2</sub>/), according to the following scheme:<sup>1</sup>

	tight      loose
'phonological diphthong': <sup>2</sup>	V      C <sub>f1</sub> C <sub>f2</sub>
other homosyllabic /VCC/-sequences:	V      C <sub>f1</sub> C <sub>f2</sub>
	loose      tight

1) I am indebted to Henrik Holmboe and Jørgen Rischel for having called my attention to this question.

2) It follows from the arguments to be given below that the [y̥]- and [ɤ̥]-diphthongs in fact constitute a third category, viz.:

V	C <sub>f1</sub>	C <sub>f2</sub>
└──┘	└──┘	
loose	loose	

According to the findings of Basbøll 1973b (p. 127 f), there is, in fact, one respect in which the connection between /C<sub>f1</sub>/ and /C<sub>f2</sub>/ is looser if /VC<sub>f1</sub>/ is manifested by a genuine falling diphthong, i.e. by a [i̥]-, [u̥]- or [ɤ̥]-diphthong, in comparison with the case where /C<sub>f1</sub>/ is manifested by a phonetic consonant. This is the restriction that non-dental consonants do not combine in the final part of the syllable.<sup>1</sup> However, /r/ combines freely with following non-dental consonants (e.g. mørk 'dark', sværm 'swarm' [mœ̥ɤ̥g, svæ̥ɤ̥m]), presupposing, of course, that the general order restrictions are not violated. And, although genuine falling [i̥]- and [u̥]-diphthongs generally do not occur before homosyllabic non-dental consonants within the native vocabulary, sequences like [ḁɤ̥g, ḁi̥f, ḁi̥g] are certainly not (structurally) excluded, compare the names Hauch, Leif [hḁu̥?g, lḁi̥?f] and imperatives like strejk! 'strike!' [sd̥ɤ̥ḁi̥?g].

By way of conclusion, we can just say that the [i̥]-diphthongs are phonological diphthongs in the sense that they exhibit heavy internal combinability restrictions, in contradistinction to other /VC/-combinations, including the [ɤ̥]- and [u̥]-diphthongs. And further, that also the [u̥]- and [ɤ̥]-diphthongs can be considered phonological diphthongs in the much weaker sense that the corresponding /VC/-sequences exhibit (heavy) internal combinability restrictions within (the core of) abstract morphemes (i.e. when morphologically shortened forms have been excluded from the material, as well as certain exceptional root morphemes). Also,

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1) This formulation presupposes that the nasal in the homorganic sequences [mf, mb, ŋg] be considered a manifestation of the phoneme /n/. This interpretation agrees well with the facts that a final [n] in the first part of compounds etc. may be assimilated as to place of articulation to a following obstruent (e.g. tandkød 'gingiva' [tánkø̥ð/tánkø̥ð]), in contradistinction to [m, ŋ] (e.g. tangæs 'domestic geese', ungdom 'youth', sangbog 'songbook' [tḁ̃ngæs/\*tḁ̃ngæs, ŋ̥nd̥l̥m?/\*ŋ̥nd̥l̥m?, sḁ̃ŋbð:ʔu/\*sḁ̃mbð:ʔu]), and that monomorphemic [md, ŋd] are not assimilated (e.g. amt 'county', punkt 'point' [am?d/\*an?d/\*an?d, pɔ̥ŋ?d/\*pɔ̥n?d]).



the falling [i̯]-, [u̯]- and [ɤ̯]-diphthongs can be considered phonological diphthongs in the sense that they represent a particularly loose connection to a following homosyllabic consonant. Finally, it was noted that Vö-sequences, although they can be considered phonetic diphthongs, are not to be classified as phonological diphthongs in any of the senses discussed above.<sup>1</sup>

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1) Notice that the restrictions between /ö/ and the following consonant phoneme are particularly heavy (cf. Basbøll 1973b) so that Vö cannot, by any means, be considered a phonologically "tight" VC/-sequence.

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