Prosody, Productivity and Word Structure: The Stød Pattern of Modern Danish

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**Abstract**

Parts of a new model of phonology-morphology-lexicon interplay is presented to account for the complex distribution of the Modern Danish stød (a syllabic prosody). Stød, which is sometimes productive for speakers, is analysed as a signal of the second mora of bimoraic syllables not subject to the Non-Stød Principle (NSP). The author’s cross-language model for Systematically Graded Productivity of Endings (section 3) is shown to account for the application of NSP (section 4), and a detailed typology of lexemes with respect to stød-alternations, derived from the model, is presented (section 5). In section 6 a simple case of stød-alternations in inflection, viz. regular plurals of nouns, is given, and section 7 exemplifies stød and non-stød as a key to morphology for the addressee.
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1. Introduction

The Danish stød is a syllabic prosody, a laryngealization -- a kind of creaky voice -- often beginning somewhere near the middle of certain syllables (Fischer-Jørgensen 1987), but with large individual variation in onset time for stød (see Grønnum & Basbøll 2001). Stød is historically and systematically related to the "word accents" in Swedish and Norwegian (cf. Gårding 1977, Riad 1998, Rischel 2001). Table 1 displays the four prosodic syllable types -- with primary or secondary stress -- in Modern Standard Danish (see Basbøll 1999):

Table 1 here

There are widespread, systematic and partly productive stød-alternations, which can be illustrated by the single root morpheme stød 'push, n.' itself: in the sg. indef. stød it is without stød: [sdɔ∅d]. {note 1} In the sg. def. stødet and the pl. def. stødene, there is stød: [sdɔ∅dˀd], [sdɔ∅dˀn̥o]. In the derived verb form stødne ('push, inf.'), støder (pres.), etc., there is no stød, except in the imperative stød!: [sdɔ∅dˀ], [sdɔ∅dˀ], [sdɔ∅dˀ]. But when a complex verb is formed from støde by prefixing or compounding, as in e.g. tilstøde 'befall' (composed with the preposition til 'to') [t̥eˀl̥sdɔ∅dˀ], the root stød has stød in all forms, regardless of whether these forms would have stød in the simplex verb, and whether the root syllable has primary or
secondary stress. That is just one random example of the morpho(no)logical complexities of stød.

That stød cannot always be acquired with the grammatical forms in question, but in some cases must be formed productively by the speaker, is shown by examples like Clinton which Danes pronounce [ˈklenˈtɔn]. In the pl. "Clintonner" ("there are too many/few Clintonner in American politics") it is pronounced [ˈklenˌtɔnˌnər], a form which cannot have been acquired as such. {note 2} This pattern is obligatory, and according to my analysis, due to the interplay between sound structure and fully productive morphology.

One of the best illustrations of the phonological aspects of the stød-mechanism is found in the Danish pronunciation of words from the classical languages, e.g. as manifested in the traditional Danish school pronunciation of Latin. Main stress is determined by Latin rules, whereas vowel length generally follows rules of Danish and does not conform to the quantities of Latin. The main stød principle covering such words is the following: Stød occurs in a (primarily or secondarily) stressed ultimate and antepenultimate syllable, if its sound structure permits stød -- if it has "stød-basis", traditionally speaking -- whereas a stressed penultimate syllable is stød-less. {note 3} {note 4} Obviously, such a rule has not been formulated as part of the teaching of Latin, and nobody would claim that this stød has any relation to the Latin spoken in Ancient Rome; Danish simply was, and is, like that. Examples of the traditional Danish school pronunciation of Latin: insula, insulae, insularum 'island (nom. sg., dat./gen. sg. or nom. pl., gen. pl.)' [ˈɛnˈsula], [ˈɛnˈsuˌle], [ensuˈlərum].

The main phonological principle contributing -- together with morphological and lexical information -- to the occurrence of stød in bimoraic syllables, thus seems to be that stressed ultimate and antepenultimate syllables have stød, stressed penultimate ones do not. This observation was combined with the moraic principle resulting in something which I called "the main stød-rule": Stød is a signal for the second mora in ultimate and antepenultimate syllables (Basbøll 1988: 123).
According to Hansen’s (1943) classical treatment, stød essentially signals (128ff) that its syllable is the final one of the word, but throughout the monograph he gives a detailed treatment of grammatical and lexical complexities governing the stød-picture. I conclude that ultimate and antepenultimate bimoraic syllables tend to have stød when the purely phonological mechanism is isolated, as it is in the traditional Danish pronunciation of Latin. {note 5}

One new principle for the description of stød is a natural consequence of considering stød a signal of the second mora of its syllable, viz. that stød in a bimoraic syllable is the unmarked case, so that principles are formulated for the absence of stød in bimoraic syllables, rather than for its presence. Even more radically new is the use of graded productivity of morphological endings as furnishing an independent criterion for the integration of endings with the stem, which is a crucial parameter in my account of the grammatical distribution of stød. {note 6}

I adhere to the principle that for non-alternating lexemes, the lexical representation is their surface form, except for certain phonetic details. This means that lexemes which do not enter into stød-alternations are lexically specified as having stød or not having stød (as [-stød] or [stød], respectively, but this is an arbitrary lexical indication and not to be interpreted in parallel with features of segments). This is the null-hypothesis within my framework. Lexemes without such a specification end up with stød in bimoraic syllables unless they are subjected to the Non-Stød Principle. In general I operate with “principles” rather than “rules”, and focus upon “output-and-structure” rather than “input-and-procedure”. Problems to be accounted for in this paper are, e.g., why is there no stød in the sg. indef. (French loan) balkon ‘balcony’ [baλkɔn], but stød in the sg. def. and the pl. (indef. and def.) forms balkonen, balkoner, balkonerne [baλkɔn], [baλkɔn], [baλkɔn]? Why is there stød in the ad-hoc pl. form of Saddam but not of Hussein when both of these in the (basic) sg. indef. form is stød-less: [saˈdam], [saˈdam], [huˈsain], [huˈsain]? And which lexeme types can undergo which stød-alternations?
The focus of the paper is the lexical and grammatical distribution of stød, particularly stød-alternations in relation to lexeme types. Thus the phonetic and phonological representation of stød is not a central topic here, even though it is an important aspect of the stød-issue in general. Regardless of whether one operates with morae in the analysis of stød or not, the crucial condition for being a potential stød-syllable is a certain sonority-length in the syllable rhyme, and this is related to the phonetics of stød. I do not consider stød a tonal phenomenon, and this is a major difference from the Swedish and Norwegian word accents which are tonal. Modern Danish is in my view very different from the modern peninsular Scandinavian languages phonetically and phonologically, also with respect to prosody (cf. Grønnum 1995), but exhibits many relevant similarities to those closely related languages lexically and grammatically.

2. **Stød, morae and stød-basis**

Stressed syllables in Danish are here analysed as monomoraic or bimoraic, unstressed syllables as monomoraic. *In Danish, only sonorants can be moraic* (in contrast to Swedish and Norwegian, for example). Thus a monosyllable ending in a short vowel, or in a short vowel plus an obstruent (like nu, bus 'now, bus' [nu], [bus]), is monomoraic and has no stød. Natural predictions from the structures just proposed are: (1) the *stød-phase proper starts where the second mora begins*, viz. at a point in time roughly corresponding to the duration of a short vowel, and in words like pen, around the beginning of [n]; (2) a *stød-consonant will be longer than a similar non-stød consonant*, presupposing that morae are units of quantity. {note 7} The first prediction by and large agrees with the results of Fischer-Jørgensen (1987, 1989). Concerning the second, Elert (1964) has found the same order of magnitude for lengthening of long consonants in Swedish as Riber Petersen (1973) and Fischer-Jørgensen (1987) for Danish stød consonants.

More recent data relevant for both predictions reported by Grønnum & Basbøll (2001) cast doubt on the generalisability of the earlier results. And our most recent research in this area (see Grønnum & Basbøll 2003) shows that speakers are not able to identify a cut-off point in
stød-vowels any more than in long stød-less vowels. In the following I shall therefore not presume that the particular mora analysis of this paper is psychologically real, but treat it as a convenient linguistic description, where morae are what bind vowel length and stød together (e.g. with respect to mora-drop in pretonal syllables); what accounts for schwa-assimilation and its relation to "productive stød-addition" (cf. note 23); and what lies behind extra-prosodicity-effects on the stød-pattern (cf. section 5). {note 8}

The consequences (2a) through (2c) naturally follow from my analysis:

(2a) the notion "stød-basis" can be dispensed with;
(2b) the only possible type of stød-rule is: a certain (heavy) syllable has no stød;
(2c) light syllables cannot have stød.

The two main problems which then have to be addressed are:

(3a) how are alternations like Clinton, Clintonner or tal, tallet 'number, the number' [təl], [təløːr] -- where a monomoraic syllable in the undeclined singular form has stød in the plural and definite forms, respectively -- to be accounted for?

(3b) which heavy syllables have no stød?

Thus, when all stød-syllables are bimoraic, the necessity of the notion "stød-basis", which is found in practically all other careful analyses of the Danish stød, can be dispensed with. All general rules ascribing stød (such as "verbs with a prefix have stød", or "get stød", when compared to the verbal root in question, cf. spise, bespise 'eat, feed' [sbiːsə], [beɪsbiːːsə]) presuppose that the conditions for "stød-basis" are fulfilled. Thus in a parallel pair of related verbs like takke, betakke (sig) 'thank, decline with thanks' [təʔə], [beʔəʔə] where the condition of "stød-basis" is not met, there can be no stød in the prefixed verb form.
But when *stød* is a signal of the second mora of a syllable, *stød*-syllables must by necessity have two morae -- Danish not allowing trimoraic syllables -- i.e. they must have either a long vowel or a short vowel followed by a sonorant consonant, because only sonorants can be moraic in Danish. Thus all syllables ending in a short vowel, or in a short vowel followed by one or more obstruents, are monomoraic according to my analysis, and they are precisely the syllables that do not have "*stød*-basis".

3. **Word Structure and Graded Productivity of Endings**

I have proposed (Basbøll 1998, 2001) a grading of productivity of morphological endings that can be used in cross-language comparisons, i.e. in language typology. Such a scale must be operationalized in terms of a small number of steps, defined in a way which is independent of each specific language. The criteria employed should be important linguistically and psycholinguistically. The principle underlying the scale thus defined and the word structure model derived from it I have called Systematically Graded Productivity of Endings.

According to this model, there are five degrees of productivity of morphological endings, defined cross-linguistically, i.e., independently of any specific language. They are illustrated here with examples from Danish:

**Endings of the highest productivity grade** are added to new words as default, and are always added to a normal word form (e.g. past -*ede*/ɛd/ in *elskede* 'loved' [ɛlskø] as against certain imperatives, cf. note 9).

**Endings of neither the highest nor the lowest productivity grade** are of different types:

- some are added to new words, but not always to a normal word form (this is true of the infinitive ending schwa /ə/ in *fæstne* 'fasten' [fæsə], cf. an imperative like *fæstn!*)
some are added to a limited subgroup of new words (e.g. "Ø" as sb. pl. in mus 'mice' [mu:r's], pl. of mus [mu:r's], but "Ø" is interpreted here as nothing but the absence of an ending, cf. Occam’s Razor);

some are not added to new words; phonological generalizations across lexemes do not always apply to a lexeme plus such an ending (e.g. ptc. -t/t/ as in the past participles ment, målt 'meant, measured' [me:tnd], [mɔ:tld], both with a long vowel which in this position signals that the word form must have a morphological ending, due to a restriction on vowel length before consonant clusters).

Endings of the lowest productivity grade are not added to new words; phonological generalizations across lexemes (throughout the vocabulary) always apply to combinations of a lexeme plus such an ending (e.g. neuter -t/t/ in adj. lyst 'bright' [lys]}, with vowel shortening -- cf. the non-neuter form lys with a long vowel, with stød: [ly:t}s] -- which makes the neuter form indistinguishable phonologically from single lexemes, cf. øst 'east' [øs]} with a short vowel).

This five step scale of systematically graded productivity of morphological endings can be grammaticalized differently in different languages. I claim that Danish, in contrast to many other languages, has grammaticalized each of the two extreme grades of productivity, as separate steps, but has no distinction between the three intervening steps. For Danish, I shall use the following specific terminology, thus presupposing the particular grammaticalization just mentioned:

(4a) **Fully Productive Endings**, abbreviated **FPE**.

(4b) **Semi-Productive Endings**, abbreviated **SPE**.

(4c) **UnProductive Endings**, abbreviated **UPE**.

Thus I shall use Semi-Productive Endings (SPE) as a specific term for Danish, covering both endings which are genuinely of “medium productivity” (in the sense that they are not added to
new words as default, even though they are added to some new words), some endings which are “productive” in the sense that they are added to new words as default, and some endings which are “non-productive” in the sense that they are not added to new words. *SPE in Danish is thus a heterogeneous category.*

The conception of productivity argued for here implies that fully productive endings are "additive" both semantically and phonologically -- with a high degree of transparency -- whereas low-productivity endings will be akin to lexicalisations. The model of word structure based upon graded productivity of endings -- where the integration of an ending in the word is inversely proportional to its degree of productivity as defined here -- means that one should not expect continuing restructurings of the mental lexicon when speakers/listeners become more language conscious, e.g. as a consequence of higher education (since the morphological segmentation of unproductive endings of which such speakers gradually become aware, has no phonological consequences anyhow).

The structure of a word with a monomorphemic stem (root) and its inflectional endings can be symbolized as follows, with just one representative of each of the categories UPE, SPE and FPE. What is inside the innermost (round) parentheses, i.e. a monomorphemic stem = min-stem, plus its immediately following UnProductive Ending (UPE), if any, is called a min-word.

(5) **WS 1:** \[ ( \text{min-stem UPE} ) \text{ SPE } \text{FPE} = [ (\text{min-word}) \text{SPE } ] \text{FPE} \]

The phonological consequences of this model are explicated in section 4 below. We shall first disregard the internal structure of the **Basic Word**, i.e. the part of the word to which a Fully Productive Ending (FPE) is added. It follows from my definition of FPE that the Basic Word can occur in isolation, i.e. without any (expressed, i.e. “non-zero”) ending. The word structure can then be indicated as follows (the Basic Word plus its Fully Productive Ending is called a **max-word**):
(6) WS 2: \[ \text{Basic Word} \] FPE = max-word

It is an important hypothesis behind the model of word structure presented here that there is a basic distinction between fully productive morphology which is just added to the Basic Word, and not fully productive morphology which is lexically specified and has phonological consequences within the Basic Word only. {note 10} The Non-Stød Principle only concerns (“applies within”) the Basic Word, see section 4 below. My hypothesis of the grammaticalization in Danish of the cross-language model with five degrees of productivity of morphological endings implies a distinction between two different kinds of not fully productive endings in Danish, viz. UnProductive Ending and Semi-Productive Ending. This does not mean that lexically specified morphological endings must generally be specified for whether they function as Semi-Productive Ending or UnProductive Ending if we strictly follow the principle of Occam´s Razor when operationalizing model, i.e. reduce the structural complexity as much as possible.

It follows from the formula of Word Structure WS 1 above that a Semi-Productive Ending can be distinguished from an UnProductive Ending only if the base to which the ending is added is not coextensive with the Basic Word. And the only word class in Danish where the morphological base (the min-stem) does not always occur as an independent word, is verbs: in all other cases, the base is also an independent word (as sg. indef. non-genitive in nouns and sg. indef. non-neuter in adjectives). Therefore, the following two cases must be distinguished when we establish the hypothesis to be tested:

(7a) simplex words other than verbs

(7b) (simplex) verbs and complex words

(7b) forms one category different from (7a), since a distinction between stem and Basic Word is significant for both simplex verbs and complex words.
(8) HYPOTHESIS: All lexically specified morphological endings function as UnProductive Endings for simplex words other than verbs, and as Semi-Productive Endings for simplex verbs and complex words. Thereby the whole issue of internal parenthesis structure within the Basic Word is phonologically irrelevant for simplex non-verbs, but it is relevant for verbs (where the morphological base is the stem which is not always a Basic Word) and for complex words (where stems play a non-trivial role).

4. Danish word structure and the Non-Stød Principle

As stated, Danish has grammaticalized the universal five-point-scale of productivity, so that Semi-Productive Endings (SPE) are distinguished from the endpoints, viz. Fully Productive Endings (FPE) and UnProductive Endings (UPE). By this grammaticalization in Danish, three phonological domains are defined. This amounts to the following formula of structure (in fig. 1) for a simplex word, viz. a word which contains just one min-stem, but with one of all three types of morphological (inflectional) endings (UPE, SPE, FPE). The min-word is in round parentheses, the Basic Word in square brackets, and the max-word in curly brackets.

This is a theoretically maximal formula for the simplex word, expressing a combination of the two typical situations for such words, viz. simplex nouns and adjectives with no Semi-Productive Ending (SPE), and simplex verbs with no UnProductive Ending (UPE). All three types of endings occur together in many complex words.

The syllable is also a phonological domain, cf. Basbøll (1999). However, the min-stem is not a separate phonological domain from the min-word, and neither is the lexeme. And there are phonological domains larger than the max-word (phonological phrases).

Fig. 1 here
This model of word structure not only defines domains for segmental phonology (cf. Basbøll 2001), but it also allows a simple account of the basic distributional facts of Danish stød. In my approach, any stød-principle must be of the type: *such-and-such a syllable has non-stød*, and it follows from my model that such rules ignore a Fully Productive Ending. The following two subparts of the Non-Stød Principle do the job:

(9) **Non-Stød Principle (part (i))**: The penultimate syllable of the min-word has non-stød

The traditional Danish school pronunciation of Latin and Greek illustrates part (i) of the Non-Stød Principle (9): *insula, insulae, insularum; amant, amare, amatur* ['en′sula], ['en′su′læ], ['ensu′lærəm]; ['æmənt], ['a′mæə], ['a′mæət′əm']: the penultimate syllable is stød-less, other syllables with primary or secondary stress have stød if their sound structure allows it, cf. section 1.

(10) **Non-Stød Principle (part (ii))**: A monosyllabic stem has non-stød before a syllable (domain: Basic Word)

(10) can be illustrated by examples like *lånte* 'lent' ['lɔnðæ], past tense of *låne* 'lend' ['lɔnæ], Word Structure [(lɔn m) tɔ] (tɔ is not the fully productive ending in the past form -- which is oðæ -- and as any other lexicalised ending in verbs, it is a Semi-Productive Ending (SPE), see section 3). (10) also covers complex words, e.g. *dydig* 'virtuous' ['di′dɪi], derived from *dyd* 'virtue' [di′dɔ] ~ [di′dɔi], Word Structure [(di′dɔ) i].

The effect of the two subparts of the Non-Stød Principle together can be seen in the stød-distribution of the ordinal numbers: Some endings are unproductive and the whole word form is thus treated phonologically as a lexeme, e.g. *tredje, fjerde* 'third, fourth' (it is a min-word). Their only heavy syllable is the penultimate, and they should therefore (cf. (9)) not have stød, and they don’t: ['tɾe′də], ['fjɛrə]. The fully productive formation is by means
of -ende /əndː/: fyrrende, firsende '40th, 80th', etc. (which are replacing the conservative forms fyrretyvende, firsindstyvende). My model predicts that these ordinal numbers should have stød or non-stød in parallel to the corresponding cardinal numbers fyrre, firs [ˈfjrə], [ˈfirs] -- because -ende is a Fully Productive Ending -- which is also the case: [ˈfjrəmø], [ˈfirsnø]. The form -te /te/, finally, is used in a limited subset of new forms, and should therefore be a Semi-Productive Ending; predictably, monosyllabic stems lose their stød before -te (e.g. femte 'fifth' [ˈfemdø], Word Structure [(fem) tɔ], polysyllabic stems do not (billionte, etc. [bili(i)ɔ:nˈdø], Word Structure [(biliɔm) tɔ]).

In contrast to all other proposed analyses of the grammatical distribution of the Danish stød, the Non-Stød Principle does not refer to different parts of speech. E.g. the difference between udtale 'pronunciation' [ˈudtæːlɔ] and udtale 'pronounce' [ˈudtæːlː] is -- according to the literature -- a prototypical example of a difference in stød that can only be accounted for by reference to parts of speech. In my model they have the following Word Structure which predicts exactly this stød-difference:

(11) N: [(uːd) (təlɔ)]; V: [(uːdtalː) ɔ] (= [((uːd) (təl)) ɔ]).

The noun tale is a min-word and is therefore subjected to subpart (i) of the Non-Stød Principle, hence no stød on the syllable /tæː/. In the verb there is no min-word tale, but the stem is polysyllabic -- utdal being the stem (cf. past utdtalte [ˈudtæːlː] and past ptc. utdalt [ˈudtæːliː]) occurring before the ending schwa -- and there is therefore no stød-loss on the syllable /tæː/. (note 11) In both the noun and the verb, the first part ud 'out' [uðd] loses its stød as do most other monosyllabic well-established first parts of compounds.

That a compounded noun like guldring 'gold ring' [ˈɡʊlˈkræŋ] loses its stød on the second part in the pl. guldringe [ˈɡʊlˌkræŋ], follows from my definitions (schwa as an ending in the pl. indef. form of nouns is not added to new words, and it is not signalled phonologically that schwa is an ending): ɔ is an UnProductive Ending in sb. pl. and must be so since the Fully Productive Ending is ɐr and the option Semi-Productive Ending is not available for simplex nouns (section
3). Thus the pl. ending forms a min-word together with the lexeme *ring*, therefore there is no
stød in *-ringe* just like in the non-compounded pl. *ringe* (because the penultimate syllable has
non-stød in a min-word) and in the morphologically simple adverb *ringe* 'badly', both
pronounced [ˈvæŋə]. {note 12}

I shall now give a formal representation of the Non-Stød Principle. The formalism should allow
us to capture the linguistically significant similarities of the subparts and state these subparts in a
common format. {note 13} According to my model, the Non-Stød Principle only takes effect
within the Basic Word, and the relevant elements in my formalism here of the Non-Stød
Principle are syllables and parentheses around the min-word. The formalism thus makes crucial
use of the parenthesis structure of my word structure model.

Concerning part (i) of the Non-Stød Principle (9), we have to depart from the right edge of the
min-word in order to identify the syllable undergoing the Non-Stød Principle since it is the
penultimate syllable of the min-word. According to these notational conventions, subpart (9) of
the Non-Stød Principle can be formulated as follows:

(12) *Non-Stød Principle (part (i)):*  \( \sigma \quad \sigma \)  
\([-\text{stød}]\)

*Domain: Basic Word*

The second syllable, counting leftwards from a closing parenthesis, has [-stød].

No other parenthesis than the one indicated in the formula is allowed to occur in the input string
to be scanned. According to my conventions, this principle requires non-stød in any syllable
satisfying its structural discription (unless it has a lexical stød). If the morpheme in question has
a lexical [stød] or [-stød], it follows from my methodological principles that it will not enter into
any stød-alternations, lexical specifications encompassing features which are present in all forms
(apart from certain phonetic details), cf. section 5.1.
must, according to the notational conventions used here, be divided into two parts: (13) and (14). 

(13) accounts for stød in morphology involving Semi-Productive Endings, i.e. in cases where a stem is a significant proper subpart of the Basic Word, as is the case with verbs and complex words. It is formulated as follows:

(13) Non-Stød Principle (part (iia)): 

\[
\begin{align*}
\sigma & \quad \sigma \\
[-\text{stød}] 
\end{align*}
\]

Domain: Basic Word

According to this subprinciple, [-stød] will be required in a syllable which alone constitutes a min-word (a “( … )”-domain) if it is followed by a syllable (i.e. at least one syllable) within the Basic Word. Same conventions as above.

(14) accounts for stød in words having more than one “( … )”-domain, viz. compounds and some derivatives (not discussed in this paper). I shall formulate it as simply as possible, with the same conventions as those used in the two previous cases, viz. as follows:

(14) Non-Stød Principle (part (iib)): 

\[
\begin{align*}
\sigma & \quad \sigma \\
[-\text{stød}] 
\end{align*}
\]

Domain: Basic Word

This part of the Non-Stød Principle covers the core of native monosyllables which are well established as first part of compounds, when they occur in that function. Monosyllables which generally have stød in the different word forms they enter into -- i.e. which do not participate in [stød]: [-stød]-alternations (except as a consequence of stress reduction) -- have lexical [stød], and they will thus not be affected by any part of the Non-Stød Principle. An example of such a lexically specified [stød]-monosyllable is the noun å ‘river/stream’ which keeps its stød throughout, cf. åer, åbred ‘rivers/streams, bank of a river/stream’ [ˈœɹ], [ˈœɹˌæɹðɹ] (as against
ske, skeer, skefuld ‘spoon, spoons, spoonful’ [skeˈ], [skeːr], [ˈske,fuld], or bro, broer, broklap
‘bridge, bridges, leaf (of bridge)’ [броˈ], [броːɾ], [ˈбро,klæp]).

The three parts of the Non-Stød Principle have this in common:

(15) Non-Stød Principle (general): σ σ [-stød]

Domain: Basic Word

It follows from the formula that non-stød in a bimoraic syllable is a signal of a following syllable within the Basic Word, or in other words: a bimoraic syllable can only be without stød if it is non-final in the Basic Word (except for words with lexically specified [-stød], e.g. loan words from English like team, knockout [tˈiːm], [ŋoʊˌkʌt]). Thus a following syllable within the Basic Word is a necessary condition for non-stød of a bimoraic syllable, whereas the parentheses in the three parts of the Non-Stød Principle define the sufficient condition.

5. Stød and the lexicon

5.1 Lexical specifications with respect to stød

Three degrees of stress must be distinguished on the surface for Danish “neutral speech”, i.e. not including emphasis. Secondary stress is a heterogeneous category, which covers primary stress reduced by one degree in compounds (such as the second syllable of hunkat 'female cat' [ˈhunkˈad], composed from hun 'she' [hun] and kat 'cat' [kˈad]), as well as non-reduced non-primary stress of syllables having stød and/or vowel length (such as the second syllable of sofaen 'the sofa' ['so,fe:ŋ], def. form of sofa ['sɔfa]), cf. Basbøll 1988, 1999.
Lexically, either a syllable is stressed, or it is not, as long as we consider only simplex words, i.e. do not include complex words. Thus I consider lexical stress to be a binary category, in distinction to surface-phonological stress. Within this framework, a syllable of a lexeme can therefore have the feature [stress] in the lexicon, or not have it. As far as lexemes are concerned, one syllable has [stress], either lexically specified or through the Default stress rule. {note 15}

Concerning lexical specifications for stød (i.e. [stød] and [-stød]), the relevant cases to look at are those where the lexeme would exhibit a stød-alternation according to my model, had it not been lexically specified for constancy with respect to stød or non-stød. That a lexeme is specified for such constancy is not a particular or costly ad-hoc principle, but a natural consequence of the approach I take to the lexicon: the lexical representation encompasses features which are present in all forms, except for certain phonetic details.

A lexical specification concerns the lexeme as a whole (I have taken the strongest position available, cf. Occam's Razor). Phonologically speaking, however, stød is a property of a particular syllable, and the syllable where a lexical specification of [stød] or [-stød] is located, is the syllable with [stress] (of which every single lexeme has one). The only stød-alternations a lexeme which is specified for [stød] or [-stød] can undergo, are those that involve suppletion and -- in the case of [stød] -- those that are due to mora-drop in unstressed position (since unstressed syllables cannot be bimoraic). The effect of a lexical specification [stød] is to exempt a syllable so specified from being subjected to the Non-Stød Principle.

Since the occurrence of either stød or non-stød is only relevant for bimoraic syllables (monomoraic syllables being trivially stød-less), the lexical specification of [stød] or [-stød] only concerns bimoraic syllables, even though such a lexical specification per definition is a property of the lexeme as a whole. I therefore propose that the feature [stød], just like the feature [-stød], ends up as a property of the second mora of a syllable only. This feature of [stød] or [-stød] will thus end up as belonging to either a long vowel (i.e. the second mora of a long vowel), or to a sonorant consonant or glide immediately following a tautosyllabic short full
vowel. Thus the syllabic-moraic structure, with [stress] specified on the relevant syllable, must be available before the feature [stød] or [-stød] can be placed in the phonological chain (the string of segments). According to this approach mora-drop necessarily and immediately leads to stød-drop in the syllable concerned.

5.2 Extra-prosodicity and lexically specified moraic consonants: a system in change

How can the difference in stød between lexemes ending in a stressed short vowel followed by a single sonorant consonant be accounted for, cf. pen 'pen' [pʰɛn⁴], ven 'friend' [vɛn], bal 'ball (dance)' [bal¹], tal 'number' [tʰal]? The first observation is that the difference is of a lexical nature: nothing in the sound structure (note 16) or in the phonological context allows us to predict which words of this structure have stød and which do not (we cannot resort to diachrony in this context). But how should this lexical difference be coded?

A distinction between lexemes specified as [stød] (pen, bal) vs. unspecified in that respect (ven, tal) would violate my basic principle that lexical specifications apply to all morphologically different (non-suppletive) forms of that lexeme, cf. the pl. indef. form penne [pʰɛnə]. And similarly, a distinction between lexemes specified as [-stød] (ven, tal) vs. unspecified in that respect (pen, bal) would violate the same basic principle, cf. the sg. def. form vennen [vɛn²n].

Within my syllabic-moraic analysis, the difference between the lexemes pen and ven when pronounced as monomorphemic words must reside in the /n/ of the former lexeme being moraic and of the latter non-moraic, and this distinction must be lexically coded. Since a sonorant consonant immediately following a tautosyllabic short full vowel is moraic according to the main principles followed here, the /n/ of ven will here be analysed as not being integrated into the syllabic-moraic structure in distinction to the /n/ of pen.

This is in agreement with the markedness relation between the two sonorant consonants, at least as far as consonantal sonorants are concerned (but see just below on the old vs. new
norm): the integrated moraic /n/ of pen appears to be linguistically less marked than /n/ of ven (according to Grønnum (2001: 180) there are 100 words without stød of this type, but 596 words with stød, cf. Heger 1980). Therefore the /n/ of ven should be lexically specified for non-moricity rather than the /n/ of pen lexically specified for moricity, everything else being equal.

How can non-moricity of a consonant which would normally be moraic in a given position, be specified lexically? The most natural and restricted way is through extra-prosodicity: that a segment is extra-prosodic just means that it does not participate in the creation of prosodic structure, here (syllabic-) moraic structure in particular, i.e. it cannot be moraic (cf. Kristoffersen 2000: 118, 147). It is a restricted way since only a small subset of sonorant consonants can be extra-prosodic: it presupposes that such a consonant is at the edge of the relevant prosodic domain (cf. Hayes 1995). As far as simplex words are concerned, I claim the relevant prosodic domain to be the maximal word-domain, viz. the max-word (including morphological endings of different types and different productivity, but excluding the clitical genitive clitic $s$). And since onsets do not play any role for the stød, the extra-prosodic consonant must be final in the max-word, otherwise its lexical extra-prosodicity is irrelevant (ignored in the phonology). Since obstruents are never moraic in Danish, only sonorant consonants can be lexically specified for extra-prosodicity.

This characteristic of extra-prosodic consonants in Danish makes three predictions concerning the stød:

(16a) a sonorant consonant followed by yet another consonant (in the same max-word) cannot be extra-prosodic, i.e. words ending in a stressed short vowel followed by a sonorant consonant plus another consonant, should have stød;

(16b) a sonorant consonant followed by a vowel within the same max-word cannot be extra-prosodic, i.e. stød or non-stød in lexemes of the marked “ven-type” when followed by a syllabic ending can be accounted for independently of the lexical specification of the lexeme-final consonant;
(16c) a sonorant consonant is extra-prosodic or not regardless of what precedes its
(short stressed) vowel to the left, therefore the stød-conditions of a syllable with a
phonological structure which allows extra-prosodicity, should be independent of all
syllables before it.

All three predictions are fulfilled:

(17a) words of the phonological structure *damp* 'steam' (i.e. ending in a short stressed
vowel followed by a sonorant consonant plus yet another consonant) always have
stød: \[\text{dam}^{b}\];

(17b) stød in *vennen* 'the friend' and non-stød in *venner* (pl. indef.) \[\text{ven}\]\ are accounted
for independently of the non-stød of *ven* (cf. *sum, summer* 'sum, sums' \[\text{s}\)]
\[\text{o}\]);

(17c) examples like *metal, metallet* 'metal, the metal' have stød-conditions exactly in
parallel with *tal, tallet* 'number, the number' \[\text{me}^{\text{t}^{\text{a}l}}\], \[\text{me}^{\text{t}^{\text{a}l}^{\text{t}}}\], \[\text{t}^{\text{a}l}\].

Furthermore, this interpretation can perhaps be brought into accordance with some durational
results of Grønnum & Basbøll (2001), viz. that no length difference between sonorant
consonants with and without stød was found intervocally, whereas there was a tendency
towards longer stød consonants in word-final position utterance-medially (i.e. in a position
where extra-prosodicity is phonologically relevant), although reaching a level of statistical
significance in some speakers only. \{note 17\}

Since I consider extra-prosodicity to be a more restricted notion than lexical specification of
[-stød], I shall account for lack of lexically conditioned stød by means of extra-prosodicity
*whenever this notion is phonologically relevant*, and by means of lexical specification of [-stød]
*elsewhere*, i.e. in cases where extra-prosodicity is irrelevant. This can be generalized to the
following **Hypothesis of Lexical Non-Stød** (18):
(18) Lack of stød in a lexeme pronounced as an isolated word ending in a short full vowel plus a sonorant consonant is due to extra-prosodicity, other stødless cases are lexically specified for [-stød].

The descriptive priority of extra-prosodicity over lexical specification of [-stød] is motivated by principles for lexical structure and phonology-lexicon interplay within the model, see section 5.4. According to the Hypothesis of Lexical Non-Stød, lexemes which end in a short stressed vowel immediately followed by a single sonorant consonant should not be lexically specified as [-stød], since extra-prosodicity is relevant in this position. According to this approach we should expect significant differences in stød patterning (stød distribution in different word forms belonging to a certain lexeme) depending on whether extra-prosodicity is relevant or not.

As stated above, according to my analysis, pen [pʰe'n̩] is bimoraic and ven [ve'n̩] monomoraic, and this difference is analysed in terms of extra-prosodicity, the /n/ of ven being extra-prosodic. Underlyingly, the lexical coding of extra-prosodicity could either be indirect, pen having an underlyingly moraic /n/ and extra-prosodicity being general; or direct, ven being underlyingly extra-prosodic. The choice between these two options depends on a diachronic evolution, and the Modern Standard Copenhagen taken as norm here is in the middle of this change which now approaches its completion. {note 18}

I shall compare two states of the language relevant here, called the old and the new. The phonological rule crucially involved is vowel shortening before glides: a long vowel is shortened before a non-syllabic vocoid, i.e. a glide (viz. any of ŋ i ŋ u ŋ). The glides in question are derived from obstruents by Consonant Gradation, but for all phonological purposes here, they are sonorant, can be moraic, can carry the stød, etc. In the old language norm used here, the rule of vowel shortening before glides is stylistic, i.e. variable dependent on style level, non-application of the rule characterizing a high level of distinctness. Thus the word hvid, hvide 'white' (sg. indef., def./pl.) is in a high level of distinctness pronounced [viːˈd̥i], [ˈviːd̥oʊ], in lower (more normal) levels [við̥ˈi], [ˈvið̥oʊ]. Underlyingly, the words which can undergo stylistic shortening have a long vowel. The noun vid 'wit' is always pronounced with a short vowel and
with no stød: [viðː]. Stød-lessness is marked for syllables ending in a stressed short vowel plus a single consonantal sonorant (a nasal or /l/), but not for glides (non-syllabic vocoids), especially not /Ø/ or /v/ where stød-lessness prevails.

The simplest and most insightful way to describe this situation is by the following general principle:

(19) Old norm: A lexeme-final consonant is extra-prosodic

Extra-prosodicity is relevant when the syllabic-moraic structure is being created, and the domain for this creation, as far as simplex words are concerned, is the max-word (i.e. including Fully Productive Endings but excluding genitive clitic s).

Consonants lexically specified as moraic are (necessarily) exempted from being extra-prosodic.

{note 19} The way to lexically account for the distinction between pen and ven in this language norm is thus to have /n/ in pen [пе̱н] be lexically specified as moraic, whereas ven, vid (sb.) [ве̱н], [виð] are unspecified in this respect.

In the new norm, vowel shortening before glides has been lexicalised, i.e. the highly distinct pronunciation with long vowel has disappeared as a relevant option. Thus the vowels of hvid, hvide, and similarly of stor 'big' (in the old norm pronounced [сужо̂р] when highly distinct) are consequently short phonetically: [виð], [виðʊ], [сужо̂] (obligatory), and will thus be short also lexically according to my methodology. This change has far-reaching consequences concerning the distribution of qualitatively different vowels with respect to syllable types and thus for the phonemic system.

Now a markedness reversal has occurred, since short-vowel syllables ending in a moraic (rather than non-moraic) glide have become most frequent, rather than exceptional as they were in the old norm. Extra-prosodicity thus can no longer be a general rule applying to all final consonants,
but must be lexically specified, at least as far as native lexemes are concerned. Therefore the following change has occurred:

(20) New norm: Extra-prosodicity is lexically specified (viz. on the individual lexemes)

It follows from the model that only sonorant consonants following a short full vowel and being final in the max-word can be lexically specified for extra-prosodicity. See table 2.

Table 2 here

5.3  Stød in lexemes: the native core (monosyllables, and disyllables ending in schwa)

In this section, I shall consider only the core of native lexemes here defined as monosyllables, and disyllables ending in schwa. Lexemes with more than one full vowel are generally loan words, apart from a few old compounds and derivatives which have come to resemble -- and phonologically be treated as -- monomorphemic lexemes. Words with more than one schwa are most often inflected, or they have an alternative pronunciation with just one schwa. This limitation to the core means that stress is not an issue in this section: there is only one stressed syllable in the words to be considered, so lack of stød due to lack of stress is not relevant here.

When lexemes are pronounced as isolated words, the prediction according to my model is:

(21a) penultimate bimoraic syllables do not have stød (unless they are lexically specified as [stød]);

(21b) non-penultimate bimoraic syllables have stød (unless they are lexically specified as [-stød]);

and in general (both for lexemes and polymorphemic words):
(21c) monomoraic syllables never have stød.

(21d) A bimoraic syllable which is lexically specified with respect to stød (for either [stød] or [-stød]) does not participate in stød-alternations.

The following seven types of native lexemes belonging to the core, defined on the basis of surface phonological structure, must be distinguished when the occurrence of stød is accounted for. Lexeme types whose entry form has the same type of stressed rhyme, cf. the tables below, have the same number. Apart from that, the numbers are arbitrary.

(i) **Monosyllables ending in a short vowel plus one or more obstruents** are *monomoraic* and thus do not have stød, e.g. *hest, kat* 'horse, cat' [hɛːsd], [kʰəd]. They cannot enter stød-alternations. No possibility of lexical specification of [stød] or [-stød] (since they are not bimoraic).

(ii) **Monosyllables ending in a short vowel** are *monomoraic* and thus do not have stød, e.g. *ja, nu* 'yes, now' [ja], [nu]. Before an ending beginning with phonological schwa, the (lexically short) stem vowel alternates with a long vowel and is thus eligible for stød, cf. *jaet, nuet* 'the yes, the present moment' [ˈjaːʔɛː], [ˈnuːt]. {note 20} No possibility of lexical specification of [stød] or [-stød] (since they are not bimoraic).

(iii) **Monosyllables ending in a short vowel plus one sonorant** fall into two types:

   (iiia) The final sonorant is *extra-prosodic* and the monosyllable is thus *monomoraic* and therefore does not have stød, e.g. *ven, tal* [vɛn], [t’a:l]. In positions where extra-prosodicity is irrelevant (i.e., for simplex words, when a segment follows within the max-word), the syllable alternates with a bimoraic syllable and is thus eligible for stød, cf. *vennen, tallet* [ˈvɛn̩nɛ], [ˈt’ælɪˈtæl]. There is no possibility of any lexical specification of [stød] or [-stød] (since they are not bimoraic). For consonantal sonorants, this is the marked situation compared to iib as explained in section 5.2.
(iiib) The final sonorant is not extra-prosodic and the monosyllable is thus bimoraic and therefore has stød, e.g. pen, bal 'ball (dance)' [pʰɛn̩], [bɑl̩]. Some such monosyllables enter into alternations involving stød (i.e. stød-loss), others do not. No possibility of lexical specification of [-stød] is foreseen by my model and methodology (since extra-prosodicity is relevant for this phonological structure and hits the syllable with [stress]).

(iv) Monosyllables ending in a short vowel plus a sonorant and yet another consonant are bimoraic and therefore have stød, e.g. damp, bænk 'steam, bench' [dɑm̩b], [bɛn̩ə]. Some such monosyllables enter into alternations involving stød (i.e. stød-loss), others do not. In this type of lexemes extra-prosodicity of the post-vocalic sonorant is not an option, since the sonorant is not final in the lexeme, and thus lexical specification of [-stød] is foreseen as a possibility by my model and methodology.

This is relevant in two common Danish Christian names, viz. Jens, Niels [jɛns], [nels]. These two forms are always pronounced without stød, with no tendency to stød-addition diachronically. Although their sound structure is exceptional as far as native lexemes are concerned, it is found in genitive forms of words of type iiia above, e.g. vens, spils, genitive of ven 'friend' and spil 'play, n.' [vɛns], [sbɛls]. This agrees with the hypothesis that if a certain sound structure is found in polymorphemic words, it is easier to introduce or keep it also in monomorphemic words than if this is not the case.

A more general type of lexical exception to type iv is due to the sound change whereby the obstruent /t/ is vocalized, i.e. turned into a glide. {note 21} In words like vers, skærfs 'verse, scarf' [værs], [scærfs] ~ [sɡærsf], /t/ was devoiced (in the nineteenth century) by regressive assimilation from /s, f/ -- and similarly /p, t, k/ -- and the syllable thus did not satisfy the phonetic conditions for having stød. Now the sound structure of such lexemes permits stød, and stød is in the process of entering many of them, but slowly, this process being far from completed today. According to my model, the lexemes without stød like vers, skærfs must be lexically specified for [-stød], thereby predicting that all forms of these lexemes are without stød. This is also generally true. The ongoing diachronic evolution thus consists in the dropping of a lexical marker, which is an expected kind of process. This state of affairs is in sharp contrast to
the stød-behaviour of words with postvocalic /r/ belonging to type iii above, like *baør, høør* 'berry, flax' [ʰbaэр], [ʰhøэр] which have also undergone r-vocalization historically: there is no parallel tendency to stød-addition diachronically, but on the other hand, these lexemes participate in obligatory “stød-additions” just like words of the type *ven, tal* (iiiia), cf. sg. def. *baørret, høørren* [ʰbaэрɾ], [ʰhøэрɾən]. All this is exactly what is expected from the model, and it corroborates the distinction between lexical specification through extra-prosodicity and through the feature [-stød] as well as the priority between them. From these very principles, I will predict that words having undergone the diachronic change which is mirrored synchronically in “r-fusion”, resulting in the long pharyngeal vowels [ɑ̝ː], [ɒː], have stød-conditions like type iv and not type iiiia, cf. just below on lexeme type v.

(v) **Monosyllables with a long vowel** are *bimoraic* and thus have stød, e.g. *træ, lås* ‘tree, lock’ [tʰra̝ː, lɔːs]. They are expected to have stød when stressed unless they are subjected to the Non-Stød Principle. Lexical specification for [-stød] is an option for this type of words. For the core of native lexemes such lexical specification must take place for a number of lexemes which earlier had a short vowel phoneme /a, ø/ followed by an /r/ which was devoiced due to regressive assimilation, e.g. *spark, sport* '(a) kick, sport' [sbɑʁɡ], [sbɔɾd] (old distinct before pause: [sbɑɾkʰ], [sbɔɾtʰ]). Such lexemes have the lexical specification [-stød] and are therefore expected not to participate in stød alternations, but to be stød-less throughout, what is also generally true. Some lexemes of this type (and of this historic source) are acquiring or have acquired stød, e.g. *sort* 'sort' [sɔʁt(ʰ)d]. This is accounted for as dropping of a lexical marker, a well known kind of regularization. As predicted from my model, such lexemes do not exhibit morphological stød-alternations.

The noun *spark* just mentioned may be taken to illustrate the relation between nouns and verbs foreseen by my model. The imperative *spark!* is more liable to have stød than the noun, and in general, imperatives go first in the evolution from non-stød to stød in forms with a sound structure that earlier did not allow stød but has now been changed in that respect. This is in full agreement with my model: the lexical marker [-stød] belongs to the lexeme, and a lexeme is always word class specific, so the noun can be lexically specified for [-stød] without the verb
being so. If the verb is not so specified, its imperative form will be alone among the fully productive inflectional forms (where the infinitive is base) in getting stød, the imperative being identical to the (bimoraic) stem. Thus it will be an expected evolution for such a verb, viz. a regularization, to get stød in the imperative. \{note 22\} This can be compared to the situation with verbs whose stem belongs to type iii above. Why are imperatives of such verbs generally with stød, e.g. spær!, tør! 'block!, dry!' [sbɔ̃̄], [tɔ̃], whereas nouns of this type (i.e. with short vowel plus /t/ historically, and not with a long vowel which undergoes stylistic shortening) are generally without stød? The answer within my analysis lies in the relation between extra-prosodicity and lexical specification for [-stød]: if a form ending in a phonologically short vowel plus an /t/ which is now manifested as a glide, shall be exempt from having stød, it must be through extra-prosodicity; and extra-prosodicity cannot apply to verbs since verbal lexemes (i.e. the lexeme entry form) are in the infinitive, and extra-prosodicity, which only concerns consonants, is irrelevant for the infinitive since it always ends in a vowel. Thus spær! tør! have obligatory stød. But extra-prosodicity is a normal, i.e. non-exceptional -- even if (for some syllable structures) lexically (statistically) marked -- situation for nouns.

(vi) Disyllables ending in schwa with bimoraic first syllable will be expected generally not to have stød. Their final syllable is necessarily monomoraic and thus not eligible for stød. If the first syllable is bimoraic, the lexeme is subjected to the Non-Stød Principle since the bimoraic syllable is penultimate in the lexeme (e.g. næse, danse 'nose, dance, v.' [nɛ̃sə], ['dansə]). The only possibility for stød in such a lexeme is through lexical specification of [stød]. The following words are exceptions to the principle that a disyllabic word ending in schwa does not have stød: ordre 'order' [ɔː̃dʁ], asie 'large cucumber' [ɔːʃə], bolsje 'sweet drop' [bɔ̃lʃə], staude 'perennial' [sduˈdə]; the example etage 'storey, floor' [ɛtæʒə] has optional stød. These exceptions can thus be lexically specified for [stød] which makes the prediction that they will not enter any morphological stød alternations; this is also the case.

(vii) Disyllables ending in schwa with monomoraic first syllable. Since neither syllable is eligible for stød, such lexemes are stød-less (e.g. kasse 'box' [ˈkɑ̃sə]). Since their first vowel
is short and followed by an obstruent (cf. lexeme type i), they cannot enter any morphological
stød-alternations, their first syllable remaining monomoraic throughout. No lexical specification
with either [stød] or [-stød] is possible (since there is no bimoraic syllable).

The following table 3 summarizes the stød conditions of the lexeme types i through vii that have
been dealt with in this section. No examples with lexically specified [stød] or [-stød] are
included in table 3.

**Table 3 here**

As stated above, the lexeme types i through vii are not lexically specified with respect to stød. In
table 4 I shall exemplify some lexeme types which do have such a specification for lexical
constancy with respect to stød. Only lexeme types iiib through vi, with their bimoraic syllables,
are candidates for such a lexical specification. Furthermore, according to the hypothesis of
Lexical Non-Stød (cf. section 5.4) only lexemes for whose stressed syllable extra-prosodicity is
irrelevant, can be specified for [-stød]; thus lexeme type iiib is excluded.

Table 4 illustrates three lexeme types, viz. iv-1, v-1 and vi-1, where the specification with regard
to stød has consequences for the pronunciation of the lexeme in isolation, i.e. as a
monomorphemic word form. The examples have all been mentioned above, under their
corresponding not lexically specified lexeme types, viz. iv, v and vi, respectively.

**Table 4 here**

In the following table 5, three lexeme types are illustrated which have a lexical specification with
regard to stød that has consequences for stød-alternations (preventing the lexemes in question
from undergoing stød-alternations), but not for the pronunciation of the lexeme in isolation. In
all three cases the lexical specification is one of [stød], and must be so according to the model
since there are no rules introducing stød in Danish (and there is thus no potential “stød-rule” which the lexical specification for [-stød] could exempt lexemes from undergoing). {note 24}

The effect of this specification of [stød] is to exempt the lexemes in question from being subjected to the Non-Stød Principle, and particularly relevant for these lexemes is (14) applying to compounds.

The examples given are hal, alt, å 'hall, alto, river/stream' [halʰ], [alʰd], [ɔː], cf. their occurrence as first parts of compounds in halbal, altstemme, åbred 'ball (dance) in a hall, alto voice, river bank' [halˈbɑl], [alˈdʒœmɛ], [ɔːˈbʁœdˀ]. The lexemes are numbered with an appended “2” {note 25} relative to the corresponding lexemes in tables 2 and 3.

Table 5 here

The full inventory of lexeme types belonging to the native core (as defined at the outset of 5.3) dealt with in this section has now been established according to the criteria indicated in the tables.

I have only included monosyllables, and disyllables ending in schwa, in the presentation, and disregarded examples with one or more syllables before the stressed syllable. Such words with pretonic syllables will be included in section 5.4.

Thus I have not followed Poul Andersen’s (1954) classification of word types which systematically disregards pretonal syllables, nor Nina Grønnum’s (1998/2001) basic classification of lexemes into oxytone and paroxytone, even though stød is in many respects distributed in parallel in words that differ only in the presence or absence of pretonal syllables. The reason for my choice is that in some respects, pretonal syllables do have consequences for the stød behaviour (stød alternations), viz. in the cases where the Non-Stød Principle makes a crucial distinction between monosyllabic and polysyllabic stems. In other cases, e.g. concerning extra-prosodicity, this distinction is irrelevant. Some predictions of my model are therefore sensitive to the presence or absence of pretonal syllables, others not, and this must be spelled out in the concrete cases.
For reasons of space the difficult group of monomorphemic phonetic disyllables ending in a syllabic consonant or in the pharyngeal neutral vowel [v] cannot be dealt with in this paper.

5.4 Stød in loanwords and foreign words: Lexical Non-Stød

The basic division of the vocabulary as far as stød in lexemes is concerned, is a bipartition into two major parts:

(1) the part where the native stød system obtains

(2) the part where Lexical Non-Stød applies.

Part (1) consists of native lexemes, old loans from the Classical languages (Latin and Greek), and loans from German, both Low German (very strong in the later medieval period) and High German (very strong since the Reformation, 16th century onwards). Old loans (regardless of linguistic origin, including ecclesiastic words from the beginning of Christianity), as well as many foreign names which have been used by Danes through generations, belong here. In short, this is the unmarked part of the vocabulary.

Part (2) will be characterized here as foreign words and names, expressly excepting established old loans as those mentioned above. Loans from French and English in general belong here, as well as recent loans from other languages, and many names. {note 26}

I now describe how Lexical Non-Stød works. It is an empirical issue to which degree there is identity or overlapping between the sets of lexemes which are described as undergoing Lexical Non-Stød, and the different subgroups mentioned in the characterization of part (2), and similarly, how good or bad a match there is between lexemes not undergoing Lexical Non-Stød, and different subgroups of part (1). Departing from the phonology, i.e. from the formulation of
Lexical Non-Stød, predictions can be derived which can be tested against the vocabulary and the historical lexical knowledge.

Lexical Non-Stød (LNS) is a general principle which lexemes of certain categories are subjected to. All lexemes undergoing LNS

(22a) are subjected to [-stød] AND
(22b) are subjected to extra-prosodicity

This means that in either respect where lack of stød can be lexically specified, it is so for lexemes undergoing LNS.

Ad (22a): All lexemes undergoing LNS will thus have their syllable with [stress] specified for [-stød], a specification that will end up, after the syllabic-moraic structure has been created, as belonging to the second mora of the stressed syllable. The implication is that lexemes where the syllable with [stress] is monomoraic, will not be affected by part (i) of LNS, and that lexemes where the syllable with [stress] is bimoraic, will not participate in stød-alternations involving their stressed syllable.

Ad (22b): The final consonant of all lexemes undergoing LNS will be extra-prosodic. This will only effect lexemes ending in a short full vowel plus a single sonorant consonant, since in all other cases, the final consonant will be extra-prosodic (non-moraic) anyhow. Syllabic-moraic structure presupposes information about extra-prosodicity (since extra-prosodicity defines a condition for syllabic-moraic structures, not the other way round). Thus [-stød] cannot be assigned to a syllable which satisfies the condition for extra-prosodicity. This accounts for the inherent priority of extra-prosodicity over lexical [-stød] in section 5.2. The implication of (22b) is that if the final syllable of a lexeme undergoing LNS has [stress] and satisfies the condition for extra-prosodicity, the latter takes effect, with the consequence that such lexemes do undergo stød-alternations, viz. before a Fully Productive Ending (FPE) beginning with schwa (just like lexemes of type iia like tal [tal], see section 5.3). This is true for the many French
lexemes which end in a short vowel plus a single sonorant consonant, such as *perron, satin*, etc.

[\text{p\textipa{ɛ}ʁ\textipa{n}\textipa{ɲ}}, \text{sa\textipa{t}\textipa{ɛ}\textipa{n}}], cf. their def. forms [\text{p\textipa{ɛ}ʁ\textipa{n}\textipa{ɲ}ʰ}], [\text{sa\textipa{t}\textipa{ɛ}\textipa{n}ʰ}].

The following predictions derive from this bipartition of the effect of Lexical Non-Stød:

(23) Lexemes undergoing Lexical Non-Stød show extra-prosodicity properties where phonologically possible (leading to stød-alternations).

More specifically:

(24) For lexemes subjected to Lexical Non-Stød where the final syllable has [stress] (such as most French lexemes): if they show extra-prosodicity properties, they are not lexically specified as [-stød]. For lexemes undergoing Lexical Non-Stød where another syllable than the final one has [stress]: the stressed syllable is lexically specified as [-stød] (and thus does not participate in stød-alternations); the other syllables may have stød or non-stød according to the usual principles (and are thus unaffected by the lexical specification [-stød], which only concerns stressed syllables). {\text{note 27}}

The names of the Iraqi dictator *Saddam Hussein* [sədˈdam huˈsæin] illustrate the predictions of this model. The last name, if pluralized in a Danish context, would be without stød: *Hussein’er* [huˈsæinp]. This follows from the bimoronicity of the syllable with [stress] (which excludes extra-prosodicity effects in this syllable). If the first name were pluralized instead, it would get stød: *Saddam, Saddam’er* [səˈdɑm], [səˈdɑmˈɛr]. The French names *Beaune, de Gaulle* [bøn], [dəɡøl]~[dəɡøl] have a bimoraic stressed syllable which requires [-stød] according to LNS. These names have also been "danified" to some extent, both regarding consonants (the plosives being voiceless) and vowels (also with respect to letter-sound relation).

LNS is thus the strongest specification of non-stød available in the system here. But lexemes can be specified for [-stød] without extra-prosodicity being involved. This is the case for (the
stressed syllable of) \textit{januar} 'January' ['jan\textsuperscript{u}\textSlice{\textsuperscript{\textael}}']\textsuperscript{,} for example. But whenever extra-prosodicity is relevant, it will apply, according to the hypothesis on Lexical Non-Stød.

Extra-prosodicity can have a different scope depending on parts of the lexicon and different norms:

(i) Extra-prosodicity applies without exception, i.e. everywhere possible; this is what we have as part of LNS. The implication is that lexemes undergoing LNS cannot have final consonants specified as underlyingly moraic. Thus French lexemes, and other recent loans and names etc. of types undergoing LNS, cannot be exempted from the effects of extra-prosodicity. Extra-prosodicity can therefore be considered a more phonological, and less lexical, mechanism than the lexical specification for [-stød].

(ii) Extra-prosodicity can be the unmarked case for lexeme-final syllables ending in a short full vowel and a single sonorant consonant (see section 5.2 on the “old norm”).

(iii) Extra-prosodicity can be the lexically specified and thus marked case for lexeme-final syllables ending in a short full vowel and a single sonorant consonant (see section 5.2 on the “new norm”).

(iv) Extra-prosodicity can be non-applicable, which is not the case for any general lexeme types, but it can be said to cover more specific sub-types, such as native lexemes ending in the non-alveolar nasals /m, n/ (as in \textit{sum, lang} 'sum, long' [\textit{s\textsuperscript{o}m}], [\textit{l\textael}]), with few exceptions (mainly interjections, like \textit{bum!}, \textit{bang!} [\textit{b\textsuperscript{om}}], [\textit{b\textael}], or (with /m/) personal pronouns which most often occur in unstressed position, like \textit{ham, dem} 'him, them' [\textit{h\textael m}], [\textit{d\textael m}]).

The following table 6 summarizes the stød conditions of the lexeme types in this section.

\textbf{Table 6 here}

Basically, three types of lexemes must be distinguished with regard to stød specification, according to this model:
(25a) Lexemes subjected to Lexical Non-Stød ([stød] on the syllable with [stress], and extra-prosodicity)
(25b) Lexemes specified for [stød] (on the syllable with [stress])
(25c) Lexemes not specified with respect to stød

This is a highly restricted hypothesis in comparison to the many logically possible combinations which result if one freely combines the criteria.

6. **Stød-alternations in morphology: a simple example**

6.1 **Sources of stød-alternations**

Basbøll (e.g. 1985, followed in the 1st ed. of Grønnum 1998/2001, but not the 2d) proposed the following general restrictions to give a coherent and comprehensive account of the grammar of stød: (a) Only adjacent morphemes can influence each other's stød (or non-stød); zero does not count as a morpheme for this purpose. (b) Stød or non-stød may be changed only once during a derivation.

In my present analysis the first part of (a) is not necessary, and zero is not considered an ending at all. (b) has now been generalized to the much stronger constraint that what is lexically specified may not be changed during the derivation. Psycholinguistically speaking this means: if a morpheme always has the same form, that form is the lexical representation, apart from certain phonetic details. Accordingly the central topic to be accounted for is partly the sound structure, partly stød-alternations in inflection etc., not the distribution of stød and non-stød in non-alternating lexemes (when pronounced as monomorphemic words).

Within the present framework, there are three possible sources of stød-alternations, i.e. alternations between a form with and a form without stød in the same morpheme.
(i) Linguistically least interesting are cases of suppletion, i.e. cases where at least one of the forms entering the stød-alternation is lexicalised as a whole word form. Such alternations are sometimes isolated, sometimes part of more or less systematic sub-paradigms.

The definition I have just given is a broad and inclusive one which covers both cases which everybody would term suppletive (such as lille 'little', pl. små ['lilø], [smɔː]; through more or less systematic subparadigms (from fà, gà 'get, walk', past tense fik, gik [fɔk], [gɔk]; [feg], [gig] and barn 'child', pl. børn [bɔrn], [bərn], cf. datter 'daughter', pl. døtre ['dɑtr], [dɔdør]); to more regular but small and closed subparadigms (like byde 'request', past tense bød; or bede 'ask', past tense bad ['byd'], [boʊd]; [beːd] ~ [boʊd], [beːd]); These are all cases of lexicalised whole word forms, according to my model, and the regularities which can be observed should be described through lexical redundancy rules since they exhibit regularities across the vocabulary among inflectional forms belonging to different lexemes.

(ii) More interesting linguistically are cases involving a systematic alternation between an otherwise identical bimoraic and monomoraic syllable at the same position in the lexeme (or morpheme). Such an alternation can have different sources in my system:

First, it can be due to an alternation between stressed and unstressed position, the latter allowing only monomoraic (i.e. light) syllables. E.g. the present tense form of the verb gå 'walk' has stød when pronounced under stress (han går 'he walks' [han 'ɡɔː] ~ [han 'ɡɔː]), but not when it is unstressed in unit accentuation: han går hjem 'he goes home' [han ɡɔː i ɛm] ~ [han ɡɔː i ɛm]. {note 28} This is due to the general restriction that only stressed syllables can be bimoraic. Loss of stød on går in går hjem is but a consequence of this principle and has no intrinsic connection with stød.

Second, it can be due to an alternation between a sonorant consonant which is extra-prosodic and one which is not, in the same position in an otherwise identical lexeme. When the lexeme ven 'friend' is pronounced in isolation (i.e. as a monomorphemic word), it has no stød. This is encoded in the lexical representation by its final /n/ being extra-prosodic, an option that is only relevant for a lexeme-final sonorant consonant which follows a short full vowel. An extra-prosodic segment is ignored when the moraic-syllabic structure is created. Extra-prosodicity can
have no consequences when a segment follows within the relevant domain (for creating syllabic-moraic structure), which is, as far as simplex words are concerned, the max-word -- thus disregarding the genitive clitic s. In this way the alternation between the sg. indef. form *ven* and the sg. def. form *vennen*, without and with stød, respectively: [vɛn], [vɛnˀn], is due to the difference between the word-final, extra-prosodic and thus non-moraic /n/ in *ven* and the word-medial moraic /n/ in *vennen*.

(iii) The final source of stød-alternations is the interplay between the Non-Stød Principle and *lexicalised endings*. E.g. a word like *hus* 'house' has stød in the sg. indef. form, but not in the pl. indef.: [huːs], [ˈhuːsə]. This is because the syllabic ending, like all lexically specified morphology, has phonological consequences within the Basic Word (only), in this case making the bimoraic syllable of *hus* in the plural form *huse* penultimate in the min-word and therefore subject to the Non-Stød Principle.

### 6.2 Stød in inflection: regular plural forms of nouns (an example)

Here follows, as an illustration of the model, a table for nouns, with Fully Productive Endings (FPEs) as well as UnProductive Endings (UPEs) indicated. The table shows that only in *plural* (*indefinite*) do we encounter endings which are not fully productive. Thus in no other category of nouns than PL are morphological endings lexicalised, in all other grammatical categories default endings occur (outside the Basic Word, viz. not integrated). That PL is the nominal category most subject to lexicalisation should come as no surprise: *definite* is both pragmatically and distributionally expected to be less prone to lexicalisation. The redundancy that PL is the only inflectional ending for nouns that can be lexically specified, is part of the lexical structure of Danish. In addition to the endings listed in the table, *fully lexicalised word forms, i.e. forms that are lexicalised as wholes*, occur, like e.g. *mænd* ‘men’ [mɛnˀ]. All the endings in the table can be termed “regular” (but not “productive”, obviously). {note 29}
How do we get from the lexical representation of a (grammatically specified) word form to its WS-form (WS = Word Structure)? In an example like HUS+PL, the lexeme HUS 'house' is lexically specified as taking the inflectional ending schwa, and the WS-form in the plural must be [hūs ø] (the space before schwa, indicating the morpheme boundary, is only there to increase readability, it has no phonological consequences). When ħus occurs in the PL+DEF, the Fully Productive Ending (FPE) in the pl. def. nø is added at the end, outside the Basic Word: [hūs ø nø]. To take another example, BIL+PL+DEF would have the WS-form [bīl] ø nø, the order of the two FPEs being determined by the canonical scheme STEM PL DEF. When we compare an input form BIL+PL+DEF with its output form [bīl] ø nø, the latter has undergone a linearization and segmentation on the expression plane.

I do not accept any "positive" zero ("Ø") ending, I just distinguish between manifested endings, and the absence of an ending. Thus I cannot accept a lexical specification Ø, in parallel fashion to ø, etc. But a lexical specification is needed to account for the fact that e.g. ÅL, MUS 'eel, mouse' are used in the plural without an expressed ending. I have chosen the lexical specification “*” in such cases, the asterisk signifying (by definition) that the grammatical category in question, here PL, cannot be segmented (morphologically), i.e. it cannot occur by itself as a segment in the string of morphemes. Thus I say that e.g. PL in ÅL does not, in the linguistic expression, have an ending (whereas PL has content, i.e. is not semantically empty). "ÅL+PL" is therefore identical, as far as expression is concerned, with "ÅL" in the singular.
In the pl. def. form, PL+DEF can be segmented together, manifested (by fusion) by the Fully Productive Ending (FPE) ənə, as in ālne 'the eels' ['ɔːlənə], WS [ɔːl] ənə. {note 30}

Consider the plural formation of simplex (non-derived non-compounded) native nouns. The following pairs exemplify the possibilities of alternations involving stød with what is normally considered the regular endings:

<table>
<thead>
<tr>
<th>(27) Orthography</th>
<th>Gloss</th>
<th>IPA sg.</th>
<th>IPA pl.</th>
</tr>
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<tbody>
<tr>
<td>(27a) hal</td>
<td>hall</td>
<td>ʰahl̩</td>
<td>ʰal̩v</td>
</tr>
<tr>
<td>(27b) han</td>
<td>male</td>
<td>ʰan̩</td>
<td>ʰan̩v</td>
</tr>
<tr>
<td>(27c) gade</td>
<td>street</td>
<td>ˈgæːd̩</td>
<td>ˈgæːd̩v</td>
</tr>
<tr>
<td>(27d) sum</td>
<td>sum</td>
<td>ʰɔm̩</td>
<td>ʰɔm̩v</td>
</tr>
<tr>
<td>(27e) ven</td>
<td>friend</td>
<td>ʰvɛn̩</td>
<td>ʰvɛn̩v</td>
</tr>
<tr>
<td>(27f) hus</td>
<td>house</td>
<td>ʰuːs̩</td>
<td>ʰuːs̩v</td>
</tr>
<tr>
<td>(27g) mus</td>
<td>mouse</td>
<td>muːs̩</td>
<td>muːs̩v</td>
</tr>
</tbody>
</table>

(In addition, there are endings restricted to loan words, in particular the English -s and some learned Latin and Greek forms, and furthermore a few old inherited dualis forms like øjne [ˈʌɪnə], pl. form of øje 'eye', [ˈʌiː]. Such foreign and irregular endings are ignored here.) I propose the following representations in order to account for this pattern. {note 31} The hypothesis is that within the square brackets, the string is treated phonologically as a morphological unit would be. Therefore it does not matter for phonology whether a morphological analysis can be argued for or not in the case of unproductive morphology. From a psycholinguistic and methodological point of view, this is a nice consequence of the model since it escapes many implausible claims of earlier generative phonology where highly controversial morphological segmentations were often decisive for the application of phonological rules.
First let us look at the forms proposed which are *formed productively*:

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<tbody>
<tr>
<td>(28)</td>
<td>WS sg.</td>
<td>WS pl.</td>
</tr>
<tr>
<td>(28a)</td>
<td>[hal]</td>
<td>[hal] ər</td>
</tr>
<tr>
<td>(28b)</td>
<td>[ha&lt;ŋ&gt;]</td>
<td>[han] ər</td>
</tr>
<tr>
<td>(28c)</td>
<td>[æːdə]</td>
<td>[æːdə] ər</td>
</tr>
</tbody>
</table>

Corresponding to *hanner* one could mention forms like *som'er*, pl. of *som* (relative pronoun 'who/which/that') [ˈsʌmə], [sʌm] (as when a school teacher would say of a pupil's written work: "you use far too many *som'er*"). For forms with stød in the singular, stød is always retained in the productive plural form, e.g. *Kent'er*, plur. of the first name *Kent* [ˈkɛntə], [kɛntə].

Concerning *gade*, finally, the plural is clearly productive. If you take a very common first name like *Ole*, its plural form could only be *Ole'r* ("there are too many Ole's on this committee"): [ˈoːlə], [ˈoːlə]. In cases of true analytical ambiguity -- which is not the case of *gade* -- I choose the productive ending since it is the default case. Stød is accounted for by the fact that there is no penultimate syllable -- which would be subjected to the Non-Stød Principle and thus have [-stød] -- within the square brackets. Schwa is dropped after a schwa, leaving no trace of syllabicacy.

Now consider the forms which are *not formed productively* (*i.e.*, the endings are *lexicalised*):

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<tr>
<td>(29)</td>
<td>WS sg.</td>
<td>WS pl.</td>
</tr>
<tr>
<td>(29a)</td>
<td>[som]</td>
<td>[som ər]</td>
</tr>
<tr>
<td>(29b)</td>
<td>[vɛ&lt;ŋ&gt;]</td>
<td>[vɛn ər]</td>
</tr>
<tr>
<td>(29c)</td>
<td>[huːs]</td>
<td>[huːs ə]</td>
</tr>
<tr>
<td>(29d)</td>
<td>[mʊis]</td>
<td>[mʊis]</td>
</tr>
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</table>
The occurrence of stød vs. non-stød in these forms is straightforward: the stem plus the unproductive ending is treated as a unit, and the Non-Stød Principle assigns [-stød] to the penultimate syllable of this unit.

That the plural ending schwa for nouns is unproductive, and therefore phonologically inseparable from the stem of the word -- in accordance with the very notion of productivity -- makes an interesting prediction: Since the Non-Stød Principle (part (i), see (9)), which assigns [-stød] to the penultimate syllable of a string within (round) parentheses, i.e. a min-word (section 4), is insensitive to anything preceding the penultimate syllable, it follows that a stem ending in a syllable which has stød in isolation, should lose its stød before the noun plural ending schwa, regardless of the number of syllables in the stem. This is in stark contrast to the behaviour of the fully productive ending schwa, as found in adjectives. Examples like *betjent, betjente; genstand, genstande* 'policeman, policemen; object, objects' [beˈtɛnˌd̥] [beˈtɛnd̥]; [ˈgeθˌsdˌan], [ˈgenˌsdˌanə] corroborate this analysis. The first of these examples has an older pronunciation with stød in the plural (e.g. Spore 1965: 66). But this pronunciation is hardly possible in the Modern Copenhagen speech described here. The diachronic change of the plural form from [beˈtɛnˌd̥] to [beˈtɛnd̥] is thus a well known kind of simplification: earlier, *betjent* would be lexically specified for [stød], it has now lost this marking.

Previous detailed and explicit attempts to account for the distribution of stød in the plural formation of nouns have involved either a distinction between endings specified for stød-addition or stød-loss (most detailed in Basbøll 1985), or between endings either with or without an underlying schwa although these endings are segmentally identical (Basbøll 1988, the 1st ed. of Grønnum 1998/2001), or between endings preceded by boundary symbols of different strength (Basbøll 1972). The present account is clearly superior to all of these -- and to all other accounts known to me -- because the productivity of an ending is an independent and in itself important criterion, whereas all the other proposals involve an unwelcome degree of arbitrariness. This account also solves one of the hardest stød-problems in the analysis of derived and compounded words, viz. the difference in stød distribution between nouns and verbs (see section 4).
7. **Stød and non-stød as an aid to the addressee**

The dialects of the southern part of Denmark have no stød, and many native speakers have a well functioning Danish mother tongue without stød (representing a regional standard). But there is no diachronic tendency towards the disappearance of stød, on the contrary: in a number of cases, stød is expanding to new types in Modern Standard Copenhagen Danish (see Grønnum 2001: 196-197 for many interesting observations).

If stød were dysfunctional or just afunctional, such an evolution might appear surprising: why would Danes continue to bother with such a difficult and typologically rare linguistic feature? Danish stød can fulfill an important communicational function, however, in that it is a potential key to morphological structure and identification of the grammatical morphemes of the phonological string.

In table 7 I give some typical examples of cases where stød and non-stød may function as an aid to the addressee in the segmentation of the sound chain (the input) into grammatical building blocks. In the column "Boundary?", I indicate which actual or potential grammatical boundaries are signaled by stød or non-stød in the phonetic examples given, according to my model of Word Structure. “{“ and “}” delimit the max-word, the clitic genitive morpheme occurring after “}”.

(30a) \}: grammatical boundary after the max-word, i.e. after (the last) FPE
(30b) II: potential grammatical boundary after the max-word, i.e. after (the last) FPE
(30c) ]: grammatical boundary after the Basic Word, i.e. just before (the first) FPE
(30d) l: potential grammatical boundary after the Basic Word, i.e. just before (the first) FPE
The function of stød is not exclusively one of morphological segmentation and grammatical identification, however (in addition to its role in phonological contrasts). The sociolinguistic function of stød, as a marker of linguistic identity, should not be taken to be of any less importance. Deviations in the manifestation and distribution of stød is something speakers of Standard Danish often notice (even though the average speaker cannot describe it properly from a linguistic point of view); but despite its importance and intrinsic interest, that issue cannot be dealt with in this paper.

8. Concluding remarks

Many important aspects of the stød-issue are treated only briefly or not at all in this paper. This is true of the history of stød, including the relation between stød and the tonal accents in peninsular Scandinavian; of stød and other word accents in Danish dialects (which exhibit a range of different types); of the phonetics of stød; of the phonology of stød; and of stød-alternations in complex words. All these topics are important for constructing a total coherent stød-picture.

What I have done, then, is to focus upon stød-alternations in relation to lexeme types. The Non-Stød Principle, which accounts for which bimoraic syllables (not lexically specified with respect to stød) are stød-less, presupposes the model of Word Structure built upon Systematically Graded Productivity of Endings. A number of predictions on the stød pattern of different lexeme types were derived from my model. The degree of integration of the endings with what precedes is a key to the stød distribution, but extra-prosodicity effects contribute to complicate the stød pattern.
Acknowledgement

I am indebted to Nina Grønnum and three anonymous reviewers for many useful critical remarks pertaining to both content and style. I have followed most of their advice, but many interesting comments (from one reviewer in particular) concern the phonological representation of stød, a topic which must be left outside the focus of the paper. All remaining flaws are of course the sole responsibility of the author.
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Notes

1. As indicated in the phonetic transcription, /b d g/ are realized as voiceless unaspirated and /p t k/ as voiceless aspirated stops (/t/ is also affricated). /θ/ is a sonorant (a glide), which is indicated by means of the diacritic lowering symbol (levator) in the phonetic transcription. Vowel symbols are used without diacritics here. See Grønnum 1998.

2. A single intervocalic consonant before schwa (also before the neutral vowel [a]) which is a realization of schwa plus /r/ belongs to the coda of the preceding syllable, either final or ambisyllabic (see Basbøll 1999). Thus stød in Clintonner is in the penultimate syllable, i.e. in the last syllable before the ending -er (this form will be accounted for in section 5.4 below).

3. Many disyllabic words ending in -el, -en, -er have stød, however (e.g. liber 'book (nom. sg.), free (nom. sg.)' [liːˈbɛr]) in line with the stød-behaviour of native disyllabic words ending phonetically in a syllabic sonorant consonant or a neutral pharyngeal vowel.

4. There are at least two reasons why it is difficult to find hard evidence for stød or non-stød in syllables before the antepenultimate syllable in such words: First, stød presupposes at least secondary stress, and generally, pretonal syllables in Danish are unstressed; second, very long (distributional) words tend to be broken up prosodically into smaller words.


6. In a forthcoming monograph (Basbøll 2003), a stød analysis in terms of both prosodic structure and word structure is developed in great detail that permits a simpler account of
its extremely complicated pattern of distribution than has hitherto been given, both for simplex and complex words. The present paper is built on parts of this work.

7. Morae are primarily units of weight, but I also claim that in Danish they are subsidiarily units of quantity -- viz. for vowels but not for consonants -- in the same way as other prosodic units, like syllables, are units of quantity as well. This allows us to make predictions on phonetics from the phonological representations, and to test them e.g in measurements of consonant length (for example in schwa-assimilation, see Grønnum & Basbøll 2001). It would be an even stronger -- and more interesting -- claim that morae are units of quantity in Danish also for consonants, therefore I have tested this position first.

8. Whether the mora in Danish has any kind of psychological reality -- and if so, which kind of psychological reality -- we cannot know. But in the investigation reported by Grønnum & Basbøll 2003, there is no evidence at all for the cognitive reality of any biphasalness of a stød-syllable (as might be expected from earlier investigations and analyses, in particular Fischer-Jørgensen 1987, 1989).

9. An imperative form like *fæstn!* in the first pronunciation has neither the structure of a normal word nor of a normal syllable. This situation can be remedied either by devoicing the word-final nasal (as in the second pronunciation given), thereby removing the conflict with the sonority slope of the syllable; or by making the nasal syllabic (as in the third pronunciation given), thereby giving the word a structure found in normal disyllabic words. These strategies are in fact followed by speakers, which is psycholinguistically significant. No other inflected forms are like this, and verbs are alone in having stems which are not always normal words in this sense. The Danish situation has a parallel in Norwegian (cf. Kristoffersen 2000: 221f), whereas Swedish is quite different in this respect.
10. E.g. vowel shortening before (certain) consonant clusters, and \( /\delta/-\)dropping before /s/, presupposes that the consonant cluster in question and /s/, respectively, occurs within the Basic Word (i.e. is not part of a Fully Productive Ending), cf. Basbøll 2001.

11. Stem is a recursive category, and the stem of the infinitive form *udtale* is *udtal*, which is again composed from the two min-stems *ud* and *tal*. There is no use of cyclical rules in my analysis: the verb *udtale* is not subjected to the Non-Stød Principle because this principle does not match the structure of *udtale* (in either of the two representations given), as will be clear from the following formula. Nor is there any loss of stød (or "delinking"), stød is just a signal for a bimoraic syllable which is not subjected to the Non-Stød principle nor lexically specified as [-stød].

12. There is no stød in *guld* spoken in isolation: [gul], so lack of stød in the first part of the compound is not an issue here.

13. I give the Non-Stød Principle in a syllable-format here; in Basbøll 2003 chapter 16 I give the final version of the rule in a V-format ("V" for "Vowel").

14. This distinction is necessary in the formalism chosen because of the convention that no other parentheses are allowed to occur in the string to which the Non-Stød Principle applies, than those explicitly stated in its formulation.

15. E.g. the pair *august, August* ‘August (month), August (name)’ is minimally contrastive with respect to placement of primary stress: [au\(\ddot{u}\)\(\ddot{g}\)\(\ddot{a}\)\(\ddot{d}\)], [\(\ddot{a}\)u\(\ddot{g}\)\(\ddot{a}\)\(\ddot{d}\)], cf. Basbøll 1995 on degrees of stress in Danish.

16. If stød consonants are systematically longer than similar consonants without stød in similar positions, and if the latter consonants are not moraic, consonant duration will be a
key to moricity. Such a situation could be expected from the investigations of Riber Petersen (1973) and, in particular, Fischer-Jørgensen (1987, 1989) when compared to the phonological analysis of Basbøll 1998. But this was not corroborated by the recent investigation by Grønnum & Basbøll 2001. In particular, no length difference was found in intervocalic position. Eli Fischer-Jørgensen's speakers were older than ours and not all from Copenhagen, but a more decisive difference may have been that her examples were pronounced under focus, see Grønnum & Basbøll 2001: 245-246.

17. The much shorter stød consonants in utterance final position is a quite particular phenomenon, cf. the discussion in Grønnum & Basbøll 2001: 241-2.

18. In general, sonorant consonants occurring immediately after a short stressed vowel are moraic (their length is not an issue here, tautomorphic Danish consonants being short except for results of schwa-assimilation). If this is weight by position -- and I have no problems accepting that -- then word-final sonorants in words like bid 'bite' [bjoðː] and ven in my stød-analysis must be exempted from being moraic, and this exemption is of a lexical nature, as shown by contrasts like pen, ven.

19. This follows from my general approach to the lexicon: a lexical specification is true of all different forms of the lexeme in question (except for results of low-level phonetics).

20. According to my analysis, there are three types of monomoraic Danish words (a typologically unexpected type, cf. McCarthy & Prince 1995: 321), viz. types i, ii and iiiia in section 5.3. Only type ii, viz. those consisting of an open syllable with short vowel (like ja, nu), is not represented by normal content words. Only special cases of type ii are found, e.g. French loans, like (et) vue, vuet '(a) view, the view' [vy], ['vyːdː], or particular short-forms (found alongside with more regular long-forms) of verbs, like gi(ve), ta(ge) 'give, take' [gi(ː)] ~ ['giːu] ~ ['giːvə], [təː] ~ [təːi] ~ [təːeː] ~ [təːeːə]. The other two types are well documented as normal content words.
21. The historical evolution of the complex sound changes under the heading of r-vocalization is detailed in Brink & Lund (1975: 261-284). They posit the start of the evolution at around 1800.

22. An anonymous reviewer suggests that the inherently emphatic character of the imperative might be the reason for the prevalence of stød, pointing to a possible parallel in occasional stød in Central Swedish dialects (Sörmland, Mälardalen) which typically occurs in emphatic utterances. Stød as a manifestation of emphasis in fact also occurs occasionally for some speakers originating from the stød-less (southern) area of Denmark, and they may exhibit a parallel to the dialectal Swedish speakers mentioned, whereas stød in the imperative for speakers of standard Danish is in my view a non-occasional linguistic feature (as it is according to my analysis).

23. The particular analysis of words ending in a short stressed vowel before an ending with obligatory schwa assimilation cannot be discussed in this paper (it is treated in Basbøll 2003 chapter 11), but I have included words of the relevant type in order to give as full a picture as possible of the kinds of stød-alternations which are possible in Danish.

24. There is thus no type vi-2 (which would be indistinguishable from type vi in its phonological consequences anyhow). In word forms like vennen, cf. ven [ˈvɛnˀn], [vɛn], stød is not introduced by any rule or principle, it is just the normal realization of a bimoraic syllable: the first syllable of vennen has never been [-stød].

25. Even though there is no lexeme type iii-1, I have appended iii with “2” in this case, for reasons of systematicity (the distinction between types iiia and iiib is irrelevant here).

26. I do not want to claim that the distinction between these two parts of the lexicon has any psychological reality to the child acquiring his/her Danish mother tongue (just as I do
not claim that speakers must be aware of the existence of a "French stress rule" or of the existence of a French part of the lexicon, accounting for words like *pate* (French *pâté*) [pʰaˈtɛː]: for non-alternating lexemes stress is part of the lexical representation, with a possibility of lexical redundancy principles). But it is an interesting question when and how such patterns can be acquired, and there is probably an extremely high degree of individual variation at stake here.

27. For the part of lexicon where Lexical Non-Stød is relevant, the stød pattern follows from the principles here, with no specifications with respect to stød on any individual lexemes: any second mora of a stressed syllable has [-stød], and extra-prosodicity is relevant allover.

28. In order to have unit accentuation between *går* and *hjem*, those constituents need not be adjacent, cf. *går han hjem* 'does he go home?' [gœ han ˈœm] and *han går ikke hjem* 'he does not go home' [hæn ˈœm] (both examples in non-emphatic speech). In other words, the relevant phonological phrases can be discontinuous, see Rischel 1983.

29. Both the Fully Productive Ending in PL and in DEF has an underlying schwa, according to my analysis, and both these forms may be controversial. Concerning PL, there is a contrast to the present tense ending of verbs, cf. å, åer; gå, går; se, ser; le, leer 'river, rivers; walk (inf.), walk(s) (pres.); see (inf.), see(s) (pres.); scythe (n.), scythes (n.)': [œ:], [œː]; [gœː]; [seː]; [leː]. Concerning DEF, there is also a phonological contrast between e.g. syllabic and non-syllabic /n/: lyn 'light' does not rhyme with byen 'the town' [byːn], [ˈbyːn], and the sg. def. ending is always syllabic in positions with a possible contrast in syllabic. This leaves no possibility for an analysis with non-syllabic endings in these cases according to my methodology. Concerning the def. article, Danish and Swedish are interestingly different, cf. Swedish *sko, skon* 'shoe,
the shoe´ [sku:], [sku:n] where the def. form is monosyllabic (which is impossible in Danish: sko, skoen [sgoˀ], [sgoˀn] ~ [sgoˀon]).

30. An analysis dıl-e-ne where the morpheme in the middle should be an alternant of the pl. ending Ø (indef.) would miss the generalization that the absence of an expressed pl. ending in the indefinite form systematically co-occurs with the ending /ń\n/ in the def. pl., and that this latter ending is irrelevant for stød. (I see the rejection of a morpheme Ø as being in agreement with Occam's razor, thereby avoiding sequences of Øs, Øs delimited by different boundaries, etc., as structural possibilities that are not distinguished in the expression.)

31. In the following tables, square brackets in the WS-notations are put around the Basic Word (always in boldface), whereas the phonetic transcriptions (not in boldface) have no square brackets around them. The angle brackets for extra-prosodicity are only indicated where they are phonologically relevant, i.e. if the extra-prosodic consonant is the last segment of the max-word.

32. The genitive form of hals has an optional variant [halˈsøs], which is strongly preferred in casual speech.

33. An example of similar sound structure but with no grammatical boundary is the adjective åben 'open' [ˈɔːbm] (lexically specified as [-stød]). The imperative åb(e)n! 'open!' is regularly with stød: [ɔːbm] ~ [ɔːbŋm] ~ [ɔːbŋm] ~ [ɔːbŋɔn].

34. An example of similar sound structure but with no grammatical boundary is våben 'weapon' [ˈɔvɔːbŋm] with stød (not lexically specified with regard to stød).

35. An example of similar sound structure but with no grammatical boundary is fanden 'the devil' [ˈfɑnŋ]. Historically, it is a def. form (cf. the translation), but synchronically it is
indivisible (there is no *fande it could be derived from) (not lexically specified with regard to stød).

36. An example of similar sound structure but where the " | " occurs after the stød is bunden 'the bottom' [bɔn̩], cf. bund 'bottom' [bɔn̩] with stød (not lexically specified with regard to stød).
\{ \text{(min-stem UPE) SPE} \mid \text{FPE} \} \\
\begin{align*}
\text{min-word} \\
\text{Basic Word} \\
\text{max-word}
\end{align*}

*Domain below the min-word: the syllable*
*Domains above the max-word: phonological phrases, etc.*

*Fig. 1.* Domains in phonology. The min-word and the Basic Word are lexical domains, the max-word postlexical.
## Table 1. Stressed syllables cross-classified with respect to stød and vowel length.

<table>
<thead>
<tr>
<th></th>
<th>With stød</th>
<th>Without stød</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(1a) Long vowel</strong></td>
<td>pæn [pʰæː'n]</td>
<td>paene [pʰæːnə] (1ˢᵗ syllable)</td>
</tr>
<tr>
<td></td>
<td>a [æː]</td>
<td>ane [æːnə]   (1ˢᵗ syllable)</td>
</tr>
<tr>
<td><strong>(1b) Short vowel</strong></td>
<td>pen [pʰæn]</td>
<td>ven [væn]</td>
</tr>
<tr>
<td></td>
<td>bal [bal]</td>
<td>tal [tʰal]</td>
</tr>
<tr>
<td></td>
<td>telt [tʰɛlˈd]</td>
<td>kat, ja [kʰad], [ja]</td>
</tr>
<tr>
<td>Example</td>
<td>pen 'pen'</td>
<td>ven 'friend'</td>
</tr>
<tr>
<td>---------</td>
<td>-----------</td>
<td>-------------</td>
</tr>
<tr>
<td><strong>Pronunciation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>old norm</td>
<td>pʰe:nʲ</td>
<td>v e:n</td>
</tr>
<tr>
<td>new norm</td>
<td>pʰe:nʲ</td>
<td>v e:n</td>
</tr>
<tr>
<td><strong>Lex. Repr.</strong></td>
<td>(underlyingly)</td>
<td></td>
</tr>
<tr>
<td>old norm</td>
<td>µ µ µ µ</td>
<td>n e µ µ µ µ</td>
</tr>
<tr>
<td>new norm</td>
<td>µ µ µ µ</td>
<td>n e µ µ µ µ</td>
</tr>
<tr>
<td><strong>General Extra-prosodicity</strong></td>
<td>(old norm only)</td>
<td></td>
</tr>
<tr>
<td>old norm</td>
<td>µ µ µ µ</td>
<td>n e µ µ µ µ</td>
</tr>
<tr>
<td>new norm</td>
<td>µ µ µ µ</td>
<td>n e µ µ µ µ</td>
</tr>
<tr>
<td><strong>Morae</strong></td>
<td>(surface)</td>
<td></td>
</tr>
<tr>
<td>old norm</td>
<td>µ µ µ µ</td>
<td>n e µ µ µ µ</td>
</tr>
<tr>
<td>new norm</td>
<td>µ µ µ µ</td>
<td>n e µ µ µ µ</td>
</tr>
</tbody>
</table>

Table 2. Aspects of the representations in the old vs. new norm at different levels of four different monosyllables. The filling of all cells of the two last rows is predicted from the model.
<table>
<thead>
<tr>
<th>Lexeme type</th>
<th>Phonemes in rhyme</th>
<th>Example</th>
<th>Extra-prosodicity</th>
<th>Moricity</th>
<th>Non-Stød Principle (applying to lexeme)</th>
<th>Stød - predictions (a) isolated</th>
</tr>
</thead>
<tbody>
<tr>
<td>i</td>
<td>Short V + obstruent(s)</td>
<td><em>hest</em>  <em>kat</em>  <em>hød</em>  <em>kød</em></td>
<td>monomoraic</td>
<td>no stød</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>ii</td>
<td>Short V</td>
<td><em>ja</em>    <em>nu</em></td>
<td>monomoraic</td>
<td>no stød</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>iii</td>
<td>Short V + single son. C</td>
<td><em>ven</em>  <em>hør</em>  <em>ver</em></td>
<td>yes</td>
<td>monomoraic</td>
<td>no stød</td>
<td>1</td>
</tr>
<tr>
<td>iiiib</td>
<td>Short V + single son. C</td>
<td><em>pen</em>  <em>bal</em></td>
<td>no</td>
<td>bimoraic</td>
<td>stød</td>
<td>1</td>
</tr>
<tr>
<td>iv</td>
<td>Short V + sonorant C + consonant(s)</td>
<td><em>damp</em>  <em>bænk</em>  <em>døn</em></td>
<td>bimoraic</td>
<td>stød</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>v</td>
<td>Long V + optional consonant(s)</td>
<td><em>træ</em>  <em>lås</em>  <em>bro</em></td>
<td>bimoraic</td>
<td>stød</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>vi</td>
<td>As in iii, iv or v (followed by schwa)</td>
<td><em>næse</em>  <em>danse</em>  <em>næse</em>  <em>dønse</em></td>
<td>bimoraic (first σ)</td>
<td>applies</td>
<td>no stød</td>
<td>1</td>
</tr>
<tr>
<td>vii</td>
<td>As in i (followed by schwa)</td>
<td><em>kasse</em>  <em>kød</em></td>
<td>monomoraic</td>
<td>no stød</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Stød-conditions of different types of native lexemes, classified with respect to rhyme. Not lexically specified with respect to stød. Filled cells in all columns after ”Extra-prosodicity” are predicted by the model.
Table 4. Stød-conditions of different types of native lexemes which are lexically specified with respect to stød in a way which has stød-consequences for their pronunciation in isolation.
Columns with no filled cells are omitted here. Numbers refer to table 3.
<table>
<thead>
<tr>
<th>Lexeme type</th>
<th>Phonemes in rhyme</th>
<th>Example</th>
<th>Moricity</th>
<th>Lex. spec.</th>
<th>Stød-predictions</th>
<th>(a) isolated</th>
<th>(b) stød-alternations</th>
</tr>
</thead>
<tbody>
<tr>
<td>iv-2</td>
<td>Short V + sonorant C + consonant(s)</td>
<td>hal</td>
<td>bimoraic</td>
<td>[stød]</td>
<td>stød</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>v-2</td>
<td>Short V + sonorant C + consonant(s)</td>
<td>ald</td>
<td>bimoraic</td>
<td>[stød]</td>
<td>stød</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>vi-2</td>
<td>Long V + optional consonant(s)</td>
<td>å, ò</td>
<td>bimoraic</td>
<td>[stød]</td>
<td>stød</td>
<td>no</td>
<td></td>
</tr>
</tbody>
</table>

**Table 5.** Stød-conditions of different types of native lexemes which are lexically specified with respect to stød in a way which does not have stød-consequences for their pronunciation in isolation, but only for morphological stød-alternations. Columns with no filled cells are omitted here. Numbers refer to table 3.
<table>
<thead>
<tr>
<th></th>
<th>IPA, sg. IPA, pl.</th>
<th>WS, sg. WS, pl.</th>
<th>Vocabulary</th>
<th>French stress rule</th>
<th>Lexical Non-Stød (LNS), result:</th>
</tr>
</thead>
<tbody>
<tr>
<td>paté</td>
<td>p'at'ē p'at'ē</td>
<td>[pate] [pate]</td>
<td>erg</td>
<td>French yes</td>
<td>LNS irrelevant: no stød in sg. since syl. with [stress] is monomoraic; stød in pl. due to &quot;prod. stød-addition&quot; (cf. note 23)</td>
</tr>
<tr>
<td>satin</td>
<td>sat'ẽ̞n sat'ẽ̞n</td>
<td>[sateŋ] [sateŋ]</td>
<td>erg</td>
<td>French yes</td>
<td>LNS leads to extra-pros. of /ŋ/ in sg.; stød in pl. because extra-prosodicity is irrelevant here</td>
</tr>
<tr>
<td>Clinton</td>
<td>klent'ẽ̞n klent'ẽ̞n</td>
<td>[klentẽ̞n] [klentẽ̞n]</td>
<td>erg</td>
<td>English no</td>
<td>LNS leads to extra-pros. of final /ŋ/ in sg.; stød in pl. because extra-prosodicity is irrelevant here</td>
</tr>
<tr>
<td>de Gaulle</td>
<td>dɔ̃gɔl/ dɔ̃gɔl/ dɔ̃gɔl</td>
<td>/[dæ̃ɡɔl]/ [dæ̃ɡɔl]</td>
<td>/erg/</td>
<td>French yes</td>
<td>LNS assigns [-stød] to the bi-moraic syllable with [stress] (both in sg. and pl.)</td>
</tr>
<tr>
<td>Hussein</td>
<td>hu'sain hu'sain</td>
<td>[husajn] [husajn]</td>
<td>erg</td>
<td>Recent foreign no (but same result)</td>
<td>LNS assigns [-stød] to the bi-moraic syllable with [stress] (both in sg. and pl.)</td>
</tr>
</tbody>
</table>

**Table 6.** Stød-conditions of lexemes not belonging to the native core.
Table 7. Examples of phonetic forms where stød and non-stød can be an aid to identify the grammatical structure for the addressee.

<table>
<thead>
<tr>
<th></th>
<th>IPA</th>
<th>Boundary?</th>
<th>Actual word form</th>
<th>WS of actual word form</th>
</tr>
</thead>
<tbody>
<tr>
<td>(31a)</td>
<td>t’als</td>
<td>t’al{s</td>
<td>sg. indef. gen. of tal 'number'</td>
<td>{[ta&lt;]&gt;} s</td>
</tr>
<tr>
<td>(31b)</td>
<td>hal’s</td>
<td>hal{l}s</td>
<td>sg. indef. gen. of hal 'hall' sg. indef. of hals 'neck' sg. indef. gen. of hals (optional)</td>
<td>{hal} s {hals} {hals} s</td>
</tr>
<tr>
<td>(31c)</td>
<td>t'anæ/t’anæ</td>
<td>t’anøn {note 33}</td>
<td>sg. def. of tanke 'thought' gerund of tanke 'refuel'</td>
<td>{[танкø] ён} {[(танк) ø] ён}</td>
</tr>
<tr>
<td>(31d)</td>
<td>t’an’ø/t’an’ø</td>
<td>t’an’øn {note 34}</td>
<td>sg. def. of tank '(petrol) tank'</td>
<td>{[танк] ён}</td>
</tr>
<tr>
<td>(31e)</td>
<td>ve’n’ø</td>
<td>ve’øn {note 35}</td>
<td>gerund of vente 'turn'</td>
<td>{[(ве) ø] ён}</td>
</tr>
</tbody>
</table>
| (31f) | ve’n’ø     | ve’n’øn, ve’n’øn {note 36} | sg. def. of ven 'friend' | {[вен] ён} (cf. [в<]>)
| (31g) | kle’dø     | kle’dø     | past tense of klæde 'dress' | {(kle:) тø} |
| (31h) | kle’õdø    | kle’õdø    | past ptc. pl./def. of klæde 'dress' | {(kle:) т] ø} |