DANISH LONG VOWELS.

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Contents.

1. Introduction.

A classic question in the analysis of vowel systems is whether long vowels, [V:], should be analysed as one length unit of a kind different from (longer than) the length unit of short vowels, i.e. /V:/ vs. /V/, or as two length units, each of which corresponds to that of a short vowel, i.e. /VV/ vs. /V/.

In the analysis of Danish long vowels, there is evidence for both one and the other solution. The facts concerning stød, discussed in section 3, seem to favour long monophthongs and diphthongs both being analysed as two units, and only short vowels as one unit. The facts concerning lowering in the environment of /r/, discussed in section 4, go the other way, favouring both short and long monophthongs being one unit, and only diphthongs being two units.

With its independently motivated system of representing different sets of features of segments (i.e. autosegments) on different tiers, autosegmental phonology provides a framework that can accomodate both sets of facts, as opposed to earlier theories, including that of Chomsky & Halle (1968), where an analysis was forced to adopt either one or the other solution. Autosegmental phonology is introduced in section 2, and an autosegmental analysis of stød and /r/-lowering is given in section 5.[1]

2. Autosegmental Phonology.

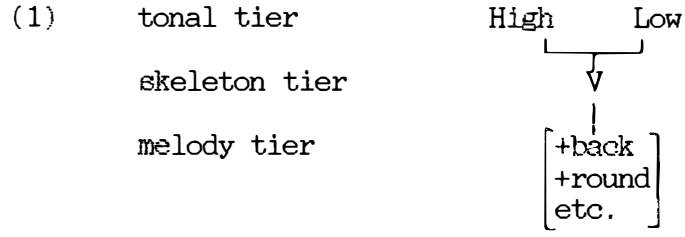
In classical generative phonology, as discussed in Chomsky & Halle (1968), distinctive features are organised into segments and each segment has one and only one feature specification (+/-) for each feature. This view allows neither that one segment contains more than one specification for a feature, nor that one feature (and its specification) is shared between segments, and thus it represents what Goldsmith (1976) calls "the absolute slicing hypothesis": the data are cut up into slices which are all no larger and no smaller than a segment.

However, there are many areas of phonology where a segment turns out to be either too small or too big a unit. Two or more segments share the same feature in analyses of e.g. long monophthongs, geminate consonants, and vowel harmony (cf. Goldsmith (1976), McCarthy (1979), Leben (1980), Schein (1981), Steriade (1982)). One segment has more than one specification for the same feature in analyses of e.g. contour tones (where one segment is associated with both a high and a low tone, cf. Leben (1973), Goldsmith (1976)), and affricates (where one segment is associated with both [-continuant] and [+continuant] in Halle & Clements (1983)).

In the autosegmental framework, different features or sets of features are represented on different tiers, and multiple associations between (sets of) features on different tiers are allowed, as long as association lines do not cross. The central tier is the so-called skeleton tier, to which all other sets of features are attached, much like all pages in a book are attached to its spine. Some analyses see the skeleton tier as consisting of C-slots and V-slots determining the consonant or vowel status of the segment, e.g. Clements & Keyser (1983), whereas others see the skeleton tier consisting only of time slots (noted as Xs), e.g. Levin (1985).

Whatever the constituents of the skeleton tier are, there is a not inconsiderable amount of information to be found on the other tiers, e.g. on the tonal tier, on the laryngeal tier, or on the melody tier, the latter containing information about e.g. vowel quality. To take a constructed example of contour tones, one slot on the skeleton tier may be associated with two slots on the tonal tier, and one slot on the melody tier:

(1)



Thus one slot on the skeleton tier may be associated with several (sets of) features on the other tiers. The inverse is also possible: that two slots on the skeleton tier are associated with the same set of features on another tier, and this is what the analysis below of long monophthongs in Danish will suggest.

3. Stød.

Stød is often described as a glottal stop superimposed on a vowel or on a sonorant, as can be seen from the translations into English as "glottal catch" or "glottalisation". However, as shown in various studies, incl. Petersen (1973) and Smith (1944), it rare that stød involves a total glottal obstruction at any point. In fact, Petersen (1973) shows that there may be great differences between various manifestations of stød, and that a unified description of what stød is is therefore difficult to give, except that syllable nuclei with stød differ in both pitch and intensity from ones without stød. In certain dialects (Thorsen & Thorsen (1980:66)), as well as generally in emphatic pronunciations (Ege (1965:22)) stød is manifested as a glottal stop.

Stød occurs in three different environments, (stød is here transcribed as [?] immediately following the sound which it affects):[2]

(2) a. on the second element of a diphthong

stød	[dɑi̯?]"dej"=dough	[hɔu̯?]"hov"=hoof
no stød	[dɑi̯] "dig"=you	[hɔu̯] "hov"=hey!

b. on a sonorant following a short monophthong

stød	[man?]"mand"=man	[sɛl?ə]"sælger"=sells
no stød	[man] "man" =one	[sɛlə] "celler"=cells

c. on a monophthong

stød	[fø?də]"fødte"=born ones
no stød	[fø:də]"fødte"=gave birth
	[nødə] "nytte"=use (noun)
stød	[sɛ?lə] "sæler" =seals
no stød	[sjɛ:lə]"sjæler"=slow song
	[sɛlə] "celler"=cells

Monophthongs with stød do not show any phonological distinction long/short, whereas stødless monophthongs do. There are however, two good reasons to classify monophthongs with stød as long monophthongs (both from Martinet (1937)):

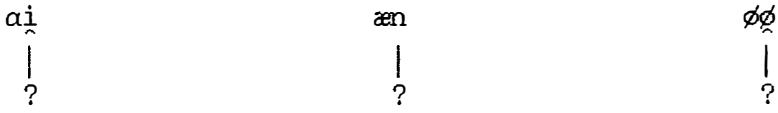
1) In the cases where there is a difference of quality between a long and the corresponding short vowel, vowels with stød always have the same quality as the long vowel. Thus there is no vowel quality found among long stødless monophthongs which is not also found among monophthongs with stød and vice versa. There are, however, at least two vowel qualities found among the short monophthongs which are not found among the ones with stød (nor among the long ones): [a, ʌ] as in [kat, sʌk] "kat, sok" = cat, sock. Also, there is at least one vowel quality found among monophthongs with stød (and long monophthongs) which is not found among the short ones: [æ] as in [væ:ð̩,

væ?l] "vade, hval" = wade, whale.[3]

2) monophthongs with stød have the same distribution as long vowels, e.g. neither occur before the velar nasal.

Let us therefore suppose, as supported by the two arguments above, that monophthongs with stød are long monophthongs in the underlying representation. Then there is a simple way of stating the contexts in which stød may occur, provided long monophthongs and diphthongs are considered to be two length units, each of which correponds to the length of a short vowel: Stød may occur on the first unit after the syllable nucleus unit:

(3) a. diphthongs b. sonorants c. (long) monophthongs



As stød does not occur on the syllable nucleus unit itself, this accounts for why stød never occurs on the first element of a diphthong, or on a short monophthong. The latter is only discernible in the two cases mentioned above, where there are short monophthong vowel qualities which differ from the corresponding long monophthong vowel qualities.

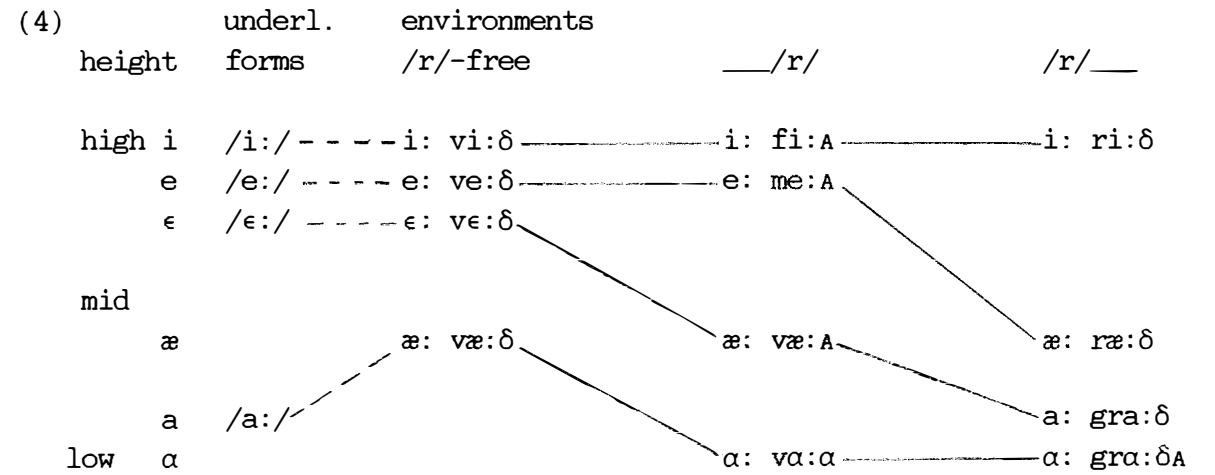
As stød does not occur on the second unit after the syllable nucleus, this accounts for why stød never occurs on sonorants that follow long monophthongs or diphthongs.[4]

4. Lowering next to /r/.

Disregarding length and stød distinctions, Danish has sixteen different monophthong sounds (phones). If, however, it is taken into account whether the vowel in question occurs in the immediate environment of an underlying /r/, these sixteen sounds may be reduced to (or derived from) ten underlying forms. Besides thus reducing the underlying inventory, taking the occurrence of /r/ into account also gives an account for certain morphological alternations.

For reasons of exposition, I shall discuss only long front unrounded monophthongs below. For the other five groups (short front unrounded, long/short front rounded, long/short back rounded) the situation is if not the same, at least very similar (cf. e.g. Ege (1965:27-32), Thorsen & Thorsen (1980:138-139)).

(4) illustrates the different realisations of the long front unrounded monophthongs in three different environments: "/r/-free" = the vowel is not next to an /r/, "___/r/" = the vowel immediately precedes an /r/, and "/r/___" = the vowel immediately follows an /r/.



(Orthography and gloss:

"hvide"= white "fire"= four "ride" = to ride

"hvede"= wheat "mere"= more

"væde" = moisture

"vade" = wade "være"= be[5] "rede" = a nest

"græde" = to cry

"vare"= to last "grader"= degrees)

As shown in the leftmost column, there are six sounds in this long front unrounded monophthong group (even though [α] is actually a back vowel sound, it interacts with the front series in the fashion described here, and not with the back series, which only contains rounded vowel sounds). These six sounds can be reduced to the four underlying forms in the second column, when the three environments are taken into account, as illustrated by the fact that in each of the last three columns, only four of the six sounds occur.

The vowel sounds are therefore assigned to underlying forms as indicated by the lines in (4): The underlying form /a:/ has the two realisations [æ:, α:], which occur in the lowest example in each of the three environments. /i:/ has [i:] as this is the only sound that occurs in the highest example in each of the three environments. Similarly /e:/ has [e:, æ:], and /ɛ:/ has [ɛ:, æ:, a:]. This view thus has the consequence that the sound [æ:] may be derived from one of three different underlying forms, dependent on its environment: /r/-free it is derived from /a:/, ___/r/ it comes from /ɛ:/, and /r/___ it is a form of /e:/.

We can now attempt to describe the distribution of the vowel sounds discussed above in terms of a rule of vowel lowering in the environment of /r/ (/r/-lowering). The process can be described very informally in the following manner, taking the /r/-free environment as point of departure (which is

in agreement with the historical evolution of these sounds, as illustrated by their orthography):

(5) a. Vowels lower next to /r/.
b. Vowels following /r/ lower relatively more than vowels preceding /r/.
c. Low vowels lower relatively more than high vowels.

Various remarks qualifying (5) are in order: (5) is very much an idealisation, as in some cases vowels do not lower at all (e.g. /-i:r-/, /-ri:-/, /-e:r-/), in some cases the two /r/-environments are the same (e.g. /-a:r-/, /-ra:-/), and in two cases in the back rounded series the effect of an /r/-environment seems to be a raising rather than a lowering (/-rɔ:/ is higher than /-ɔ:r/, [ɔ:] vs. [ʊ:], and /-ɔr-/ is higher than /-ɔ/, [ʊ] vs. [ʌ]). For the sake of the argument of this article, the exact formulation of /r/-lowering is not absolutely crucial. What matters is that the process can be identified, and that its effects on three different types of vowels, short monophthongs, long monophthongs, and diphthongs, can be compared as will be done below.

/r/-lowering also accounts for morphological alternations like [hæ - hɑ], which are respectively infinitive and present tense of the verb to have, spelled "have" - "har".

The reason why /r/-lowering is interesting in the discussion of the status of long monophthongs is that whereas long and short monophthongs lower both preceding and following /r/, diphthongs only lower when the /r/ is adjacent to the first element of the diphthong. Thus /ɛ/ has [ɛ] /r/-free but lowers to [æ] ___/r/ and to [a] /r/___, exactly parallel to /ɛ:/, cf. (6a) and (4). /ɛu̯/, however, stays [ɛu̯] both /r/-free and preceding /r/ (where the /r/ is not adjacent to the vowel nucleus), and lowers only following/r/, to [au̯], cf. (6b).

(6) a.	/ɛ/	/r/-free	[ɛ]	[vɛsə]	"hvæsse"	= sharpen
		___/r/	[æ]	[væʌ]	"værre"	= worse
		/r/___	[a]	[rakə]	"række"	= to reach (for)
b.	/ɛu/	/r/-free	[ɛu̯]	[ɛu̯nə]	"evne"	= ability
		___/r/	[ɛu̯]	[bɛu̯ʌ]	"bævre"	= to quiver
		/r/___	[au̯]	[rau̯nə]	"revne"	= a crack

Provided that long monophthongs are analysed as one unit, just like short monophthongs (although the two kinds of units have different length), and diphthongs are analysed as two units, then the facts discussed above are easy to account for: /r/-lowering applies to the vowel unit immediately next to /r/.

Diphthongs (i.e. falling diphthongs) are therefore only affected when the

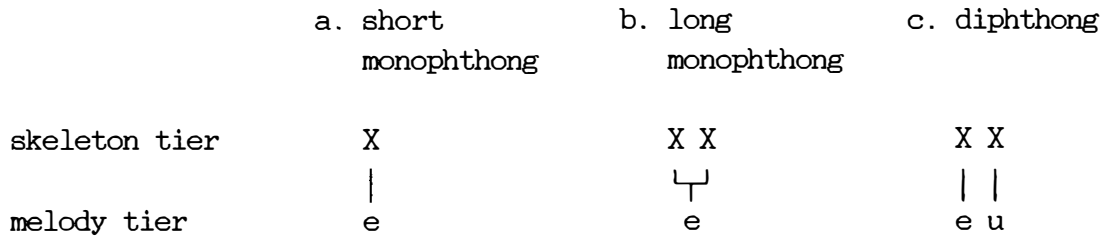
diphthong follows /r/. When preceding /r/, only the second element of the diphthongs could be affected, and as it is a high vowel sound, it is not affected (cf. (4) and the qualifications of (5)).

Maintaining the view from the discussion of stød that long monophthongs consist of two units, parallel to diphthongs, is not possible w.r.t. to the facts concerning /r/-lowering: Either /r/-lowering should affect two preceding/following vowel units (giving the right prediction for long monophthongs, but predicting incorrectly that diphthongs should lower preceding as well as following /r/), or it should affect one preceding/following vowel unit (giving the right prediction for diphthongs, but predicting incorrectly that long monophthongs should turn into dipthongs).

5. Autosegmental Analysis.

Given the different tiers of autosegmental phonology, as introduced in section 2, we can reconcile the facts concerning stød and /r/-lowering in one analysis. Long monophthongs can now be seen as two slots on the skeleton tier associated with only one set of features on the melody tier, whereas a short monophthong is one skeleton slot associated with one set of melody tier features, and a diphthong consists of two skeleton slots associated with two sets of melody tier features:[6]

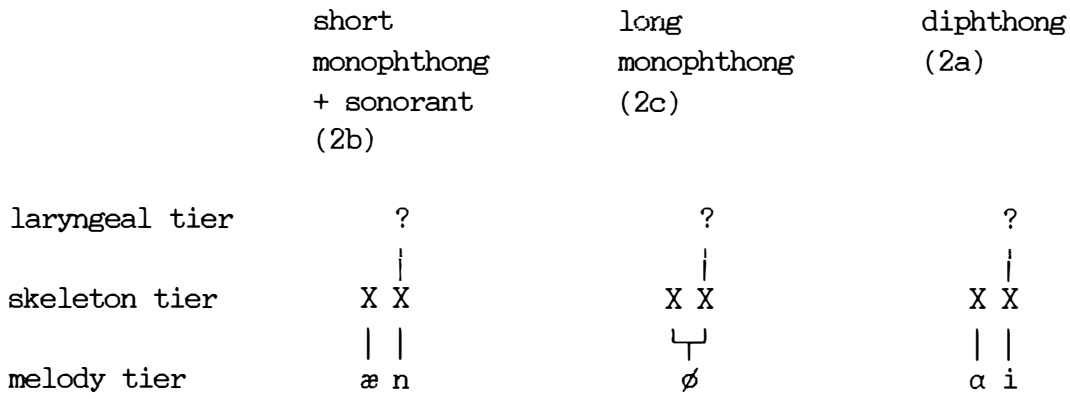
(7)



It is to be expected that /r/-lowering applies on the melody tier itself, as this is where information about the vowel quality is represented, and vowel quality is what is affected by /r/-lowering. Stød-assignment on the other hand is a constraint on the associations between the skeleton tier and the laryngeal tier (where stød itself is represented, following Clements & Keyser (1983:84)).[7]

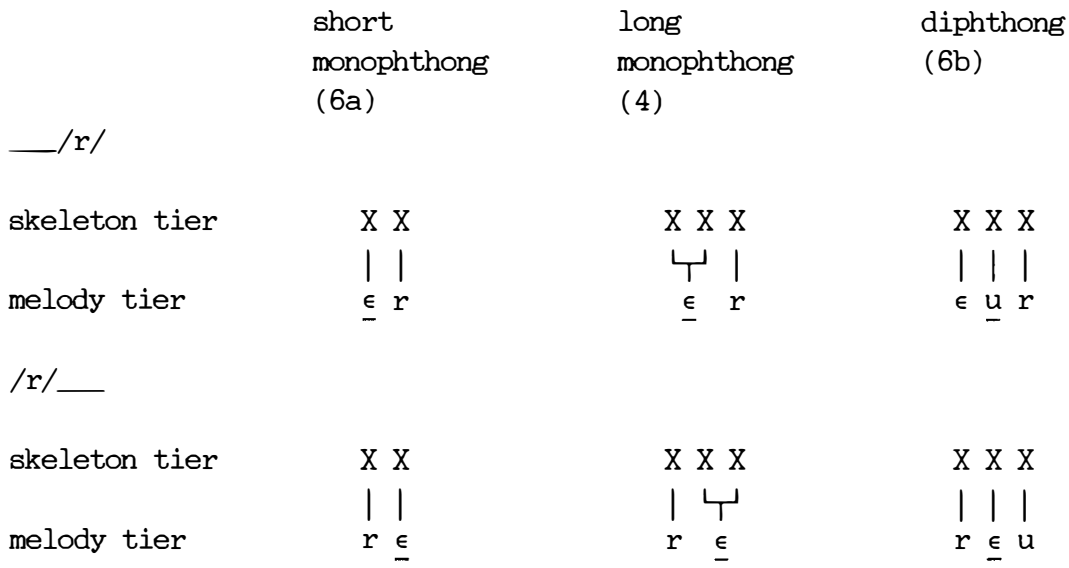
Stød can thus only be associated with the first slot on the skeleton tier after the syllable nucleus, accounting for all and only potential occurrences of stød (cf. (2)):

(8)



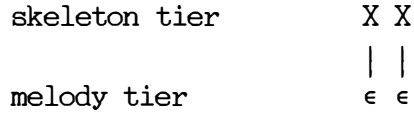
/r/-lowering can now be seen as applying to the set of features immediately next to an /r/ on the melody tier, accounting for all and only occurrences of this lowering (the sets of melody tier features that undergo /r/-lowering are underlined) (cf. (4) and (6)):

(9)



Danish thus illustrates the so-called Obligatory Contour Principle (originally suggested in Leben (1973), and much discussed since then, most recently in McCarthy (1986)), which states that two completely identical sets of features may not be adjacent to each other on any tier. This rules out the alternative representation of a long monophthong:

(10)



The impossibility of (10) explains why when the /r/-lowering applies to a long monophthong it always applies to all of it. Had (10) been possible, /r/-lowering should have been able to apply to only the set of melody features closest to the /r/, resulting in diphthongisations which do not

actually occur:

(11)

___/r/

skeleton tier	X X X	
	¦ ¦ ¦	* /-ɛɛr-/ > [-ɛæA-]
melody tier	ɛ ɛ̲ r	

/r/___

skeleton tier	X X X	
	¦ ¦ ¦	* /-rɛɛ-/ > [-raɛ-]
melody tier	r ɛ̲ ɛ	

6. Conclusion.

If it is assumed that long monophthongs either consist of two units or of one, the two phenomena in Danish discussed above, stød and /r/-lowering, present an insoluble dilemma.

If, however, suggestions made in the framework of autosegmental phonology, in particular concerning representation of phonological information on multiple tiers, are followed, this dilemma may be solved, in that long monophthongs can remain one unit on one tier (the melody tier), but consist of two units on another tier (the skeleton tier).

Notes.

1. Material from this paper was presented at University College London and at the University of Geneva in the autumn of 1985. I am grateful to the following for their comments: Hans Basbøll, Niels Davidsen-Nielsen, Morris Halle, John Harris, Juliette Levin, Al Mtenje, and Kelly Sloan.

2. Adapted IPA transcription, following Thorsen & Thorsen (1980). For printing reasons the following signs have been substituted:

ɵ = ɘ, ʊ = ɒ, ɑ = ɑ, ð = ð, r = ɾ, and ʌ = ʌ

Note that, in this adaptation of IPA, [ʊ] has approximately the value of cardinal vowel 6 (half-open back rounded), and that [ʌ] is a slightly lower and slightly less back than this, but it is also a rounded vowel.

Even though stress is not fixed in Danish, it is initial in all examples of this paper, and has therefore been omitted.

3. This statement does not take into account occurrences of short monophthongs in the environment of /r/, where [æ] actually is found, e.g. [værɵ] "værre" = worse.

4. It should be noted that the above is only an account of where stød may occur, and not of where it actually does occur. The latter is much more complicated to account for, involving not only phonology, but also morphology, as shown in a.o. Basbøll (1972) and (1985).

5. Words of this type are given with a different pronunciation in Ege (1965:28), viz. [ɛ:], and Thorsen & Thorsen (1980:138-139)) notes a free variation between [ɛ:] and [æ:]. However, according to Basbøll (p.c.) and Davidsen-Nielsen (p.c.), for most younger speakers of "Advanced Standard Copenhagen" these words always have [æ:] now.

"Advanced Standard Copenhagen" is the dialect discussed in this paper, originally defined by Basbøll (1969), and described by Thorsen & Thorsen (1980:2) as the dialect "spoken by young middle-class speakers from the Cophenhagen area".

6. As is customary, sets of features on the melody tier are here abbreviated to their corresponding IPA symbol.

7. An alternative view of the representation of laryngeal features is given in Sagey (1986). Here the set of features on the melody tier are seen as consisting of two subsets: laryngeal and supralaryngeal. It is possible for two skeleton-slots to share either of these two subsets witout sharing the other, as would be required by a long monophthong with stød: The two slots would share the supralaryngeal features (vowel quality), but not the laryngeal features, as only the second of the two slots has stød (cf. (3)).

References.

Basbøll, Hans (1969): "The Phoneme System in Advanced Modern Copenhagen" in ARIPUC, vol. 3. (Annual Report, Institute of Phonetics, University of Copenhagen).

Basbøll, Hans (1972): "Some Remarks Concerning Stød in a Generative Grammar of Danish" in Derivational Processes, Proceedings of KVAL Spring Seminar, April 1972.

Basbøll, Hans (1985): "Stød in Modern Danish" in Folia Linguistica, vol. 19, pp. 1-50.

Chomsky, Noam & Morris Halle (1968): The Sound Pattern of English. New York: Harper & Row.

Clements, G. Nick & S. Jay Keyser (1983): CV-Phonology. Cambridge, MA: MIT Press.

Ege, Niels (1965): "The Danish Vowel System" in Gengo Kenkyu, Journal of the Linguistic Society of Japan, vol. 47, pp. 21-35.

Goldsmith, John (1976): Autosegmental Phonology. Bloomington, IN: Indiana University Linguistics Club.

Halle, Morris & G. Nick Clements (1983): Problem Book in Phonology. Cambridge, MA: MIT Press.

Leben, William (1973): Suprasegmental Phonology. Ph.D. thesis, MIT. Published in 1979, New York: Garland.

Leben, William (1980): "A Metrical Analysis of Length" in Linguistic Inquiry, vol. 11, pp. 497-509.

Levin, Juliette (1985): "A Metrical Theory of Syllabicity". Unpublished Ph.D. Thesis, MIT.

McCarthy, John (1979): Formal Problems in Semitic Phonology and Morphology. Bloomington, IN: Indiana University Linguistics Club.

McCarthy, John (1986): "OCP Effects: Gemination and Antigemination" in Linguistic Inquiry, vol. 17(2), pp. 207-263.

Martinet, André (1937): "La phonologie du mot en danois" in Bulletin de la Société linguistique de Paris, vol. 38, pp. 169-266.

Petersen, Pia Riber (1973): "An Instrumental Investigation of the Danish 'Stød'" in ARIPUC, vol. 7, pp. 195-234.

Sagey, Elizabeth (1986): "The Representation of Features and Relations in Non-Linear Phonology". Unpublished Ph.D. Thesis, MIT.

Schein, Barry (1981): "Spiratization in Tigrinya" in Hagit Borer & Yosef Aoun (eds.): Theoretical Problems in the Grammar of Semitic Languages, MIT Working Papers in Linguistics, vol. 4, pp. 32-42.

Smith, Svend (1944): "Bidrag til løsning af problemer vedr. stødet i dansk Rigssprog". Dissertation, University of Copenhagen.

Steriade, Donca (1982): "Greek Prosodies and the Nature of Syllabification". Ph.D. Thesis, MIT.

Thorsen, Nina & Oluf Thorsen (1980): Fonetik for Sprogstuderende. Copenhagen: Institute of Phonetics, University of Copenhagen.