DIPHTHONGIZATION IN THE MALMÖ DIALECT

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1. Definition of the Malmö dialect. The dialect under examination in the present study constitutes a part of the Scanian dialect ("skånska"), the kind of Swedish used in the very south of Sweden. Malmö is the principal town of the province of Scania ("Skåne") with about 250 000 inhabitants, i.e. one fourth of the population of Scania. Scanian itself exhibits in certain important respects phonetic characteristics quite different from those of Standard Swedish. This is in part due to the fact that the province is former Danish territory and only in the 17th century – after the conquest of Scania by Sweden – did Swedish become the official language. The particular dialect used in this part of Sweden can thus be said to be Swedish on Danish substrate. This means that, with some over-simplification, the "code" is identical or quasi-identical with that of Standard Swedish, while some of the habits of pronunciation are Danish, or to be more precise, East-Danish. Since the conquest Scania has become increasingly Swedish. According to Witting (1959) the following general remarks can be made about the Scanian dialect from a phonetic point of view: "Its three chief characteristics of pronunciation are, briefly: (1) the exceptionless use of the uvular (or velar) r instead of Central Swedish alveolar r; (2) a tendency towards a pervading diphthongization; (3) an almost complete inversion of the intonational pattern of tonal accents, "acute" (accent I) versus "grave" (accent II) as found in Central Swedish". The present study will be confined to the examination of point 2, i.e. the diphthongization. (A brief discussion of the definition of the concept of diphthong will be given below. So far I use the term 'diphthong' operationally in the sense of diphthongized vowel.)

2. The status of the diphthongs. To avoid misunderstanding I will make a distinction between two types of diphthong in Scanian. The Malmö diphthongs (as well as those of other towns in southern and western Scania) are very recent developments. They are opposed to the diphthongs found in northern Scania both in pronunciation - although they have certain common features - and in historical development. These north Scanian diphthongs developed in the 15th century (Wessén). It is the latter type of diphthong that is usually referred to in the literature as typically Scanian. In the present Study I will concentrate upon the Malmö type.

When examining the diphthongs one notices a social distribution in their use. Generally speaking, the diphthongization of the vowels is regarded as socially substandard and is avoided in the "educated" dialect, where there is a tendency to approach the Standard Swedish norm by using more or less "pure" vowels. It is, however, outside the scope of this study to penetrate this "vertical" dimension too deeply. The diphthongs in the Malmö dialect are regarded merely as surface manifestations of single underlying phonemes. The diphthong has no direct distinctive function (See for further discussion p. 5: 'short vs. long vowels'). Each of the diphthongs is represented in orthography by one single grapheme. The "naive" speaker of the dialect - and indeed often the educated speaker - is not usually conscious of his own diphthongized vowels.

3. The vowel system in the Malmö dialect - i.e. the relations between the vowels contained in the system (disregarding the physical manifestation) is very similar to that of Standard Swedish. There are 9 vowel phonemes

in opposition to each other, all 9 of which appear long and 7 short (cf. Stand. Sw. 9 long vs. 9 short). Vowel length rather than vowel quality is considered to be distinctive in Stand. Sw., although there may be simultaneous differences in vowel quality. (See Hadding-Koch - Abrahamson, Elert, Lindau for discussion.) For the moment we accept this view for the Malmö dialect too. The following vowels are found (the same symbols are used for long and short vowels, ignoring at this level any quality differences between a long-short vowel pair):

long = /i:/ /e:/ /ɛ:/ /y:/ /ø:/ /ʉ:/ /u:/ /o:/ /ɑ:/

short = /i/ /e/ /y/ /ø/ /u/ /o/ /ɑ/

As shown above there are gaps for short /ɛ/ and /ʉ/. The choice of the symbol /e/ instead of /ɛ/ to cover the gap is arbitrary. It does, however, reflect the phonetic reality. The coalescence of short /e/ and /ɛ/ is a common phenomenon in Swedish dialects. The short /ʉ/-gap, however, is less common. Modern Swedish /ʉ/ has developed from an earlier back /u/-vowel. This fronting has also taken place in the Malmö dialect, giving long /ʉ:/, but the short counterpart has never been fronted.

4. The vowel target. So far I have used diphthong in the sense of diphthongized vowel. As mentioned above there are assumed to be no underlying or phonemic diphthongs in the Malmö dialect. The diphthongized vowels are the physical manifestations of single phonemes.

Generally speaking the vowel phoneme - in any language - can be said to represent the vowel target, the ideal phonetic value at which the speaker aims. Each vowel, - syllable nucleus - has at least one target. The target can be manifested differently in the time dimension; (i) as one steady state throughout the vowel (monophthong, i.e. a more or less static vowel), (ii) in the initial part only, followed by an off-glide from the target steady state or (iii) in the final part only preceded by an on-glide to the

target steady state. Type (ii) and (iii) (Lehiste-Peterson [1961] "glide" but often in every day usage referred to as "diphthongs" or "diphthongized vowels") are dynamic as opposed to the first type. Further, there are (iv), two-target vowels or diphthongs, ideally manifested as two steady states linked by an intermediate glide. I shall not go further into the problem of defining the concept of diphthong at this superficial level, as the question does not seem to be crucial for the present study.

In the diphthongal realizations of the long vowel phonemes in the Malmö dialect, it is the second part of the syllable nucleus that constitutes the target; i.e. the target is reached with a time delay (type iii). The diphthongization lies so to say in the initial part of the vowel; there is usually a relatively long on-glide, sometimes even beginning with a steady state position (See fig. 1!). Whether to classify the diphthongized vowels in the Malmö dialect as diphthongs or glides - with reference to the above definition - is an open question. Some of them may be interpreted as having two targets, others seem to have just one. If you claim that a steady state is a manifestation of a target, then some of the vowels in the Malmö dialect could no doubt be called diphthongs (type iv). It is probably futile to make this decision on phonetic grounds only. ["Glide" according to the definitions (ii) and (iii) given above is from now on included in the term "diphthong".]

5. Effect of speaking rate. I believe that it is a question of speaking rate, whether the targets are manifested as steady-states or not. One must take into account that it is only in optimal situations, that a diphthong is realized substantially as two steady states with an intermediate glide connecting them. This optimum is seldom reached in spontaneous speech. Thomas Gay (Haskins) has recently investigated the effect of speaking rate on diphthongs in American English. In JASA (Dec. 1968) he writes: "Results

indicate that onset target position and second formant rate of change are fixed features of the diphthong formant movement, while offset target positions are variable across changes in duration." If this statement proves to be true not only for American English it would be possible to describe a diphthong acoustically in terms of onset steady state position and especially second) formant rate of change with an indication, whether it is a plus- or minus-transition. At a fast speaking rate the offset target is never reached. In articulatory terms: the tongue is moving at the same rate from one vowel position towards another independently of speaking rate. The accuracy of hitting the target positions is just a question of the speaking rate.

6. Thriphthongs. It has been suggested that there are triphthongs in the Malmö dialect. Malmberg (Svensk fonetik 1968) makes the claim that triphthongs are common in the southern Swedish dialect and that it is possible to discern even more vowel hues within one syllable nucleus. This statement is however not supported by any experimental data available to me for the Malmö dialect. Of course this may depend upon the definition of "triphthong". Malmberg has used a perceptual definition: three clearly descernable vowel qualities in one syllable nucleus. Thus when the vowel (diphthong) is for some reason being lengthened, e.g. in emphatic pronunciation, there is a greater chance to descern more vowel qualities. But in my opinion it is just complicating the description of the dialect in question to introduce the concept of triphthong on perceptual grounds only.

7. Short versus long vowels. So far I have discussed the diphthongization of the long vowel phonemes. With respect to their phonetic manifestation the 7 short vowels in the Malmö dialect can be transcribed as [i] [e] [Y] [ø] [u] [o] [æ][1] (See fig. 2). The short vowels - at least the more close

1 The short vowels in Malmö speech are not entirely identical in quality with the Stand. Sw. counterparts, which I have tried to express by the use of other phonetic symbols for some of them. For example [Y] is less palatalized and [æ] is more front.

ones, are also sometimes diphthongized. In the short vowels the diphthongization lies in the final part of the vowel (type ii) as opposed to that of the long vowels. The target is reached at once, after which there is, or may be, a gliding off the target towards a more open and central vowel psition.

Preliminary measurements of the quantity of "short" and "long" vowels suggest that in the Malmö dialect there is little or sometimes no difference in length between them (cf. for Stand. Sw. - Elert 64). I would say that the difference - in the substance - lies rather in the diphthongization: the "long" vowels are manifested as diphthongs - with an initial onglide to the target; the "short" vowels are manifested as monophthongs or may be diphthongized with an offglide from the target, which is in the initial part of the vowel. In this sense the diphthong (diphthongized long vowel) may be attributed a distinctive function versus the monophthong (or differently diphthongized short vowel - See page 2 -). A minimal pair bot /bu:t/ (= penance) ---> [bêut] - bott/but/ (= lived ---> [bʉ̂ʊt] may exemplify the statement. The difference in the Malmö dialect is thus primarily one of diphthongization.

Another striking fact - obvious from the spectrographic analysis - is that the short vowels compared to the long vowels are usually more "extreme", their position on the vowel diagram is further away from the neutral vowel position than those of their long counterparts. (I am referring to the second part of the long diphthongized vowels.) Tense - lax (See Jakobson-Fant-Halle 1952) reversed in the Malmö dialect? Further investiagtion of this point may show whether this is due only to the speaking-rate causing undershooting of the target. It may shed some light o the definition of the tense - lax concepts.

8. Diphthongization. As has been mentioned above all of the long vowel phonemes are more or less diphthongized - at least in the "broad" dialect.

(In the "educated" speech the diphthongization is reduced, but even if people try to reduce the diphthongization in accordance with the Stand. Sw. norm, it is striking that the vowels /u:/ and /o:/ very often remain diphthongs in their speech.) If we look more closely at the actual diphthongization of each vowel, we will easily find some regularities. Spectrograms of the diphthongized vowels are shown in figure 1. The speaker is a high school student (aged 19) and can be said to be representative of the common Malmö dialect, i.e. neither the extremely broad nor the "educated" dialect. From the spectrographic data a vowel diagram - F1-F2 plot - (figure 2) has been made. Each diphthong is marked with an arrow indicating the direction in which the diphthong glides. The short vowels are used merely as references and are marked with a small cross, the crossing-point of F1-F2. The findings are also supported by studies of spectrograms - kindly put to my disposal by a colleague - of about 50 Malmö subjects with a similar background.

One regularity apparent from the spectrograms is that the first component of each diphthong is more compact than the second component. (The terms used here are defined in Jakobson et al. 1952.) A further observation is that the more diffuse the diphthong ends the more diffuse is the beginning. A third observation is that the first part of the diphthong is always acute, independently of the features of the second part. When comparing the two groups of acute vowels - the first group having a plain target, and the second having a flat target - the latter group also starts flat compared with the former group. If we reinterprete these findings in articulatory terms, they would be as follows: the first component of each long diphthongized vowel (diphthong) in the Malmö dialect is (i) more open than the second component - the opening degree being dependent of that of the second part, (ii) non-back and (iii) usually non-round with the exception of the front rounded vowels.

9. Grave vowels. You will make an interesting discovery if you examine the vowel diagram (fig. 2) a little more closely. The diphthong that is the realization of the phoneme /u:/ has an F2 that starts higher than that of any other vowel (F3, however, is comparatively low). This observation is evident from the overwhelming majority of spectrograms I have examined. The originally grave vowel has a more acute starting-point than any of the acute vowels, In accordance with Gay's theory of the effect of speaking rate on diphthongs mentioned above, the vowel /u:/, produced at a fast speaking rate would not reach the offset target, consequently loosing some of its grave (or velar) quality. Thus the vowel will become even more acute. How much of its velar quality can /u:/ loose without the perceptual result being affected? The same question is applicable to /o:/, which also has an acute starting-point. It is plausible that a rather insignificant glide from the onset target towards the offset target is sufficient for a perceptual identification of /u:/ or /o:/. It would be of great interest to make perceptual tests in order to see how much of the final component of the diphthong be eliminated without the perceptual identification being lost. A transcription - to a great extent supported by the spectrographic data available - of the diphthongized /u:/ and /o:/ would give [e͡u] and [ɛ͡o]. The interpretation of the diphthongization of the vowel /ɑ:/ as [a͡eɑ] or even extremely [a͡eo] is in my opinion more adequate than the traditional [a͡u]. (Malmberg 1968.)

10. Acute vowels. The vowel /i:/ is usually diphthongized [e͡i]. A fricativation of the final element of the diffuse vowels /i:/, /y:/, /ʉ:/, and /u:/ is sometimes found, but is not as emphazised in Malmö speech as in Stand. Sw. (See Lindblom). The diphthongized /i:/ found in fig. 1 displays

a pattern that is more representative of the "educated" Malmö dialect than of the common dialect. The vowel is somewhat "Viby-coloured" (for definition see Malmberg). The vowel /e;/ can be transcribed phonetically [ɛ͡e]. The final component has a very high F2 and is sometimes interpreted as [i]. The vowel /ɛ:/ is less diphthongized than the other acute vowels and may be transcribed [æ͡ɛ]. The vowel in question exhibits a vowel quality that is peculiar for Malmö (and Southern Scanian) speech: a flattening that might be due to pharyngeal constriction. It would be interesting to use X-ray film to investigate this question. Some of the same quality as in /ɛ:/ is present in /ø:/, diphthongized as [œ͡ø]. This latter vowel ends more compact than Stand. Sw. /ø:/. The transcription of the diphthongized /y:/ should be [ø͡y]. The final part of the diphthong is not necessarily [y], but may also be [i] or [j]. The initial part, however, must be [ø] (flattened) to give a correct identification of the vowel. The vowel /ʉ:/, finally, has about the same starting-point as /y:/, i.e. the transcription is [ø͡ʉ]. To sum up the transcriptions:

/i:/ → [e͡i]	/y:/ → [ø͡y]	/u:/ → [e͡u]
/e:/ → [ɛ͡e]	/ʉ:/ → [ø͡ʉ]	/o:/ → [ɛ͡o]
/ɛ:/ → [æ͡ɛ]	/ø:/ → [œ͡ø]	/ɑ:/ → [æ͡ɑ]

11. Neutral vowel theory. An explanation of the historical development of the diphthongs in the Malmö dialect is not easy to give and will be only speculative. I will point to a few facts that may be interesting in this connection. Regarding the vowel diagram (fig. 2) it is apparent that each diphthong (with perhaps one exception: the diphthongized /ø:/) starts at a fairly neutral position and ends at a more extreme position. This is a further generalization of what has been said above about diphthongization. I believe, however, that it is reasonable to say that all Malmö diphthongs theoretically start at a neutral position (schwa).

This statement implies that the more extreme the vowel the greater will the difference be between the first and the second component of the diphthong. This seems to be supported by the spectrographic data to a certain extent. In fact, then an adaptation of the first to the second component has taken place, reducing the risk of perceptual confusion; i.e. the close vowels have a relatively closer beginning than the open vowels and the front rounded vowels are rounded not only in the final part but already in the beginning of the diphthong to contrast more effectively with their unrounded equivalents. But the back vowels - redundantly rounded because they have no back unrounded equivalents - do not run this immeidate risk of confusion, so the first part is not necessarily rounded. The existence of an epenthetic vowel before the target in the long vowels, resulting in a diphthong, might be regarded as a coarticulation phenomenon. The vowel gesture is quite different in the Malmö dialect compared with Stand. Sw., where we find a well developed coarticulation within the syllable. Prevocalic consonants in the Malmö dialect are not appreciably influenced by following long vowels; in other words a non-synchronizing of the consonantvowel gesture might have contributed to the development of the Malmö diphthongs. It, should, however, be noted that even in a V(C)-syllable, i.e. when a vowel is syllable initial, this vowel will become a diphthong. Therefore if the diphthong is regarded as a product of coarticulation, this fact can only be explained by analogy. The CV(C)-syllable is more common, so the V(C)-syllable has adopted the same pattern.

12. Diphthongization rules. Finally I will try to formalize in phonological rules within the general framework of generative phonology the observations about the diphthongization in the Malmö dialect presented

above (See for explanation of formal devices 'Sound Pattern of English' ch. 8). The generalizations to be captured in the rules should express at least the following facts (to repeat what has been said above).

First: the diphthong consists of a glide segment - it may also be called a semi-vowel or a non-syllabic vowel ρ that is inserted before the original (long) vowel segment -- the vowel phoneme, i.e. the syllabic vowel:

$$\text{(i)} \qquad \emptyset \longrightarrow \begin{bmatrix} - \text{ syl} \\ - \text{ con} \end{bmatrix} / \text{ ——} \begin{bmatrix} + \text{ syl} \\ - \text{ con} \\ + \text{ long} \end{bmatrix}$$

The feature [+ long] here implies the feature [+ stress]. In an unstressed position the long vowels are not diphthongized. Rule (i) may also be formulated in an alternative way, namely:

$$\text{(ii)} \qquad \begin{bmatrix} + \text{ syl} \\ - \text{ con} \\ + \text{ long} \end{bmatrix} \longrightarrow \begin{bmatrix} - \text{ syl} \\ - \text{ con} \end{bmatrix} \begin{bmatrix} + \text{ syl} \\ - \text{ con} \end{bmatrix}$$

The content in rule (i) and (ii) is almost the same. Rule (ii) expresses that the long vowel splits up into two segments, where the feature [+ long] appears as the segment $\begin{bmatrix} - \text{ syl} \\ - \text{ con} \end{bmatrix}$, which may be a more elegant way of expressing the facts. To recapitulate: a diphthong - in the Malmö dialect - is defined as a semi-vowel + a vowel.

The next step is to find a proper framework for the description of the different vowel segments that are contained in the diphthongs. Languages that use four opening degrees for vowels (Malmö speech included) are not easily described either within the Jakobsonian (1952) or the Chomsky-Halle (1968) feature system. Wang (Language, 4 1968) uses only two features - $\begin{bmatrix} \pm \text{ high} \end{bmatrix}$ and $\begin{bmatrix} \pm \text{ mid} \end{bmatrix}$ to account for four/ tongue heights. Accepting Wang's feature framework, the description of the "front" group

of vowels will be as follows:

(iii)

	i	e	ɛ	æ
high	+	+	−	−
mid	−	+	+	−

To account for three places of production (front, central and back vowels) Wang uses the features palatal and velar with the redundancy rules:

(iv) [+ palatal] ⟶ [− velar] and
[+ velar] ⟶ [− palatal]

If we choose for example the vowels [y] [ʉ] [u] that represent three different places of production, a matrix would have the following appearance:

(v)

	[y]	[ʉ]	[u]
pal	+	−	−
vel	−	−	+

I believe, however, that it would be correct to have an alternative version of Wang's redundancy rules, yielding instead:

(vi) [− pal] ⟶ [+ vel] and
[− vel] ⟶ [+ pal]

and thus the matrix:

(vii)

	[y]	[ʉ]	[u]
pal	+	+	−
vel	−	+	+

The treatment $\begin{bmatrix}+\text{ pal}\\+\text{ vel}\end{bmatrix}$ to account for the Swedish [ʉ]-vowel has been proposed by B. Lindblom (QPSR 1, 1969).[2] I will adopt this analysis here. In this connection it should be noted that the inserted vowel segment – the Semi-vowel – always has the feature [+ pal], or even [− vel] to restrict it even more. This is the second generalization to be made about

2 The Swedish [ʉ] is phonetically a "front" vowel, but might at this level of representation be defined as $\begin{bmatrix}\pm\text{ pal}\\+\text{ vel}\end{bmatrix}$ (for further discussion see Lindblom op. cit).

the diphthongization process.

I will use the feature [± labial] to distinguish between the two groups of vowels that are produced with protruded or spread lips respectively.

A binary matrix of the vowel segments that are part of the Malmö diphthongs - using Wang's features - is given below:

(viii)

	[i]	[e]	[ɛ]	[æ]	[y]	[ø]	[œ]	[ʉ]	[u]	[o]	[ɑ]
pal	+	+	+	+	+	+	+	+	-	-	-
vel	-	-	-	-	-	-	-	+	+	+	+
high	+	+	-	-	+	+	-	+	+	+	-
mid	-	+	+	-	-	+	+	-	-	+	+
lab	-	-	-	-	+	+	+	+	+	+	+

As there are only three different tongue heights for the velar vowels in the dialect, I have defined the vowel [ɑ] as $\begin{bmatrix} - \text{ high} \\ + \text{ mid} \end{bmatrix}$, which would have been the definition of [ɔ] if four tongue heights were represented for the back vowels.

Now in combining the vowel segments in the matrix to form diphthongs, the following third generalization can be formulated: An assimilation process with respect to tongue heights is taking place. The inserted half-vowel adopts an opening degree that is one degree higher than that of the original "mother" vowel, It is possible to formalize this process using either binary or n-ary features, The binary model is formulated in (ix):

(ix)
$$\begin{bmatrix} + \text{ syl} \\ - \text{ con} \\ + \text{ long} \end{bmatrix} \longrightarrow \begin{bmatrix} - \text{ syl} \\ - \text{ con} \\ + \text{ pal} \\ -\beta \text{ high} \\ \alpha \text{ mid} \end{bmatrix} \quad \begin{bmatrix} + \text{ syl} \\ - \text{ con} \\ \alpha \text{ high} \\ \beta \text{ mid} \end{bmatrix}$$

For example if /i:/ is the original vowel with the features $\begin{bmatrix} + \text{ high} \\ - \text{ mid} \end{bmatrix}$ the glide segment goes to $\begin{bmatrix} + \text{ high} \\ + \text{ mid} \end{bmatrix}$, i.e. [e], giving the diphthong [e͡i] (we assume so far that the glide becomes [- lab]). Using graded

features – n-ary features[3] – instead of binary features to account for the tongue heights the rule would appear alternatively as (x):

$$(x)\quad \begin{bmatrix} +\text{ syl} \\ -\text{ con} \\ +\text{ long} \end{bmatrix} \longrightarrow \begin{bmatrix} -\text{ syl} \\ -\text{ con} \\ +\text{ pal} \\ (n+1)\text{ high} \end{bmatrix} \quad \begin{bmatrix} +\text{ syl} \\ -\text{ con} \\ n\text{ high} \end{bmatrix}$$

Replacing the features [± high] and [± mid] by graded height, such that 1 refers to the highest vowel, 2 to the next highest and so on, we have

		[i]	[e]	[ɛ]	[æ]	[y]	[ø]	[œ]	[ʉ]	[u]	[o]	[ɑ]
(xi)	high	1	2	3	4	1	2	3	1	1	2	3

So if the mother vowel has tongue height 1, the instrusive element has height 2; for example [e] – height 2 – will be preceded by [ɛ] – height 3 –, [ɛ] by [æ] etc.

The n-ary treatment to account for the tongue heights of vowels seems to be a simpler and more direct way than the corresponding binary treatment. The "one step up"-principle that is present in the Malmö diphthongization process does illustrate this. A complement to the genuine binarity – / binary treatment at the systematic phonemic level (for terminology see Harms 1968), then rewriting of the binary units into integers in the low level rules at the systematic phonetic level. It is not clear, where in the hierarchy of phonology to insert the diphthongization discussed above. Is it a superficial rule close to the final phonetic output, ir is it a deeper-lying process? A correct evaluation of the methods of treating tongue heights of vowels for the Malmö dialect presupposes an answer to this question.

Four: regarding the labialization of the vowels there is an assimilation process going on too. The front mother vowels influence the inserted semi-

3. In the rules (x) and (xiii) [n] may assume one of the values 1, 2, 3.

vowels with respect to the labialization, whereas their back equivalents do not. Therefore we will have to divide the vowels into two groups: a front (palatal) and a back (velar) group. Taking into account the labialization process (disregarding the vowel height for the moment) the rule appears as (xii):

$$\text{(xii)} \quad \begin{bmatrix} -\text{ syl} \\ -\text{ con} \\ +\text{ pal} \end{bmatrix} \longrightarrow \begin{cases} [\alpha\,\text{lab}] \;/\; -- \begin{bmatrix} +\text{ syl} \\ -\text{ con} \\ +\text{ pal} \\ \alpha\,\text{lab} \end{bmatrix} \\ [-\text{ lab}] \;/\; -- \begin{bmatrix} +\text{ syl} \\ -\text{ con} \\ -\text{ pal} \end{bmatrix} \end{cases}$$

This labialization process may, however, be expressed otherwise by saying that before an unmarked $\begin{bmatrix} \alpha\,\text{vel} \\ \alpha\,\text{lab} \end{bmatrix}$ vowel, e.g. [e] or [o], the glide becomes unmarked, i.e. [- lab], because the glide has the feature [- vel]. In contrast a marked vowel, for example [ø], influences the glide to become marked too, i.e. [+ lab] in this case.

In rule (xiii), which is an attempt to compress in one rule all general facts concerning the diphthongs expressed so far, we find that:

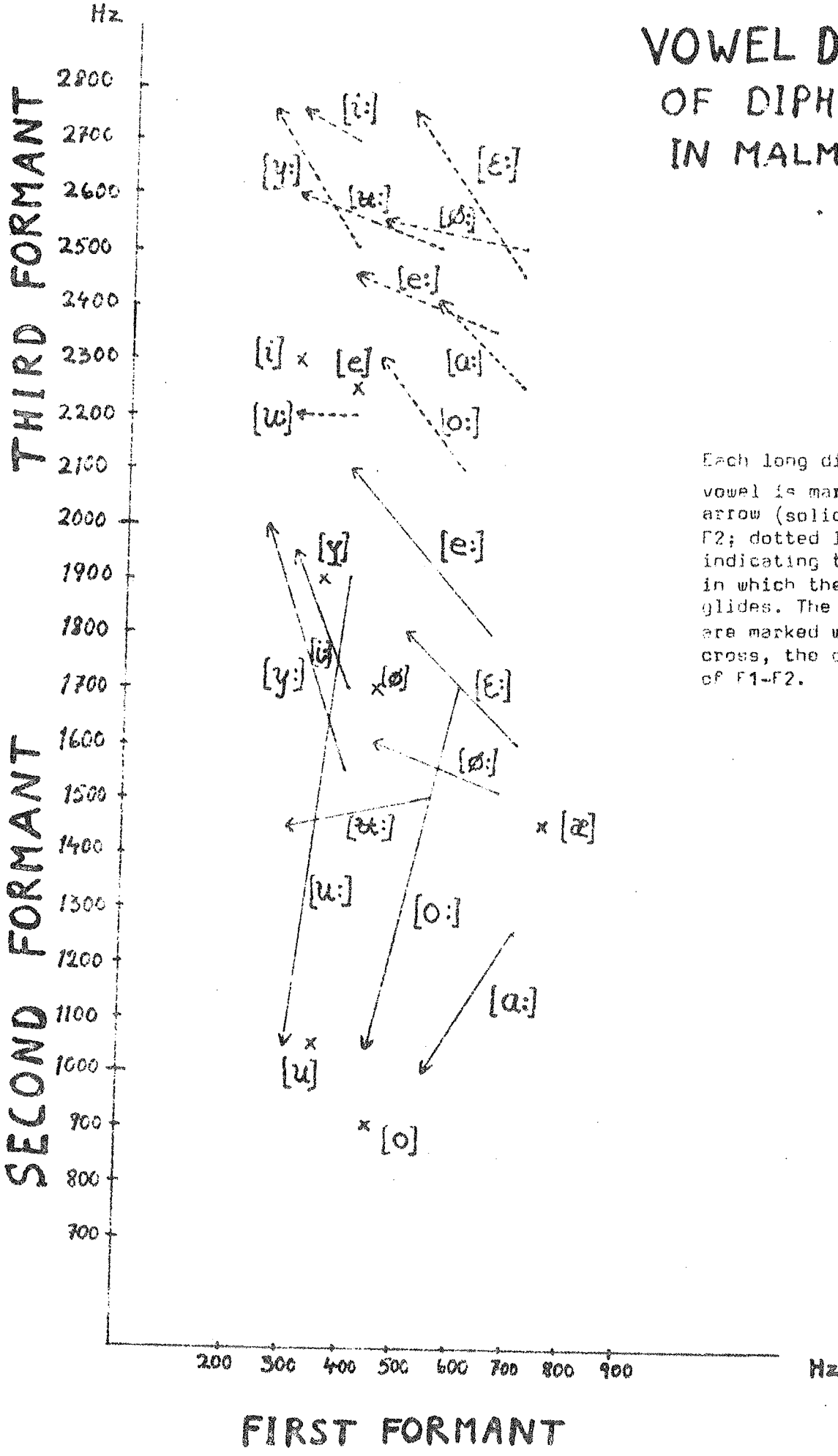
$$\text{(xiii)} \ldots \emptyset \longrightarrow \ldots \begin{bmatrix} -\text{ syl} \\ -\text{ con} \\ +\text{ pal} \\ (n+1)\text{high} \end{bmatrix} \Big/ \begin{cases} \begin{bmatrix} \text{---} \\ \alpha\,\text{lab} \end{bmatrix} \;/\; \text{---} \begin{bmatrix} +\text{ pal} \\ \alpha\,\text{lab} \end{bmatrix} \\ \begin{bmatrix} \text{---} \\ -\text{ lab} \end{bmatrix} \;/\; \text{---} \begin{bmatrix} -\text{ pal} \end{bmatrix} \end{cases} \Big/ \begin{bmatrix} \text{---} \\ +\text{ syl} \\ -\text{ con} \\ +\text{ long} \\ n\text{ high} \end{bmatrix}$$

This rule generates the optimal diphthongs [e͡i], [ɛ͡e], [æ͡ɛ], [ø͡y], [œ͡ø], [ø͡e], [e͡u], [ɛ͡o], [æ͡ɑ], which seems to be correct. Output constraints (not yet formulated) will then operate on this rule to give the final phonetic product. Further, it will be required that the diphthongization process be related to other rules in the phonological component (e.g. stress and quantity rules), which may affect some of the features in the rule (xiii).

It should be emphazised that the present study is only preliminary. It will be used as a working hypothesis for further research. Therefore comments will be much appreciated.

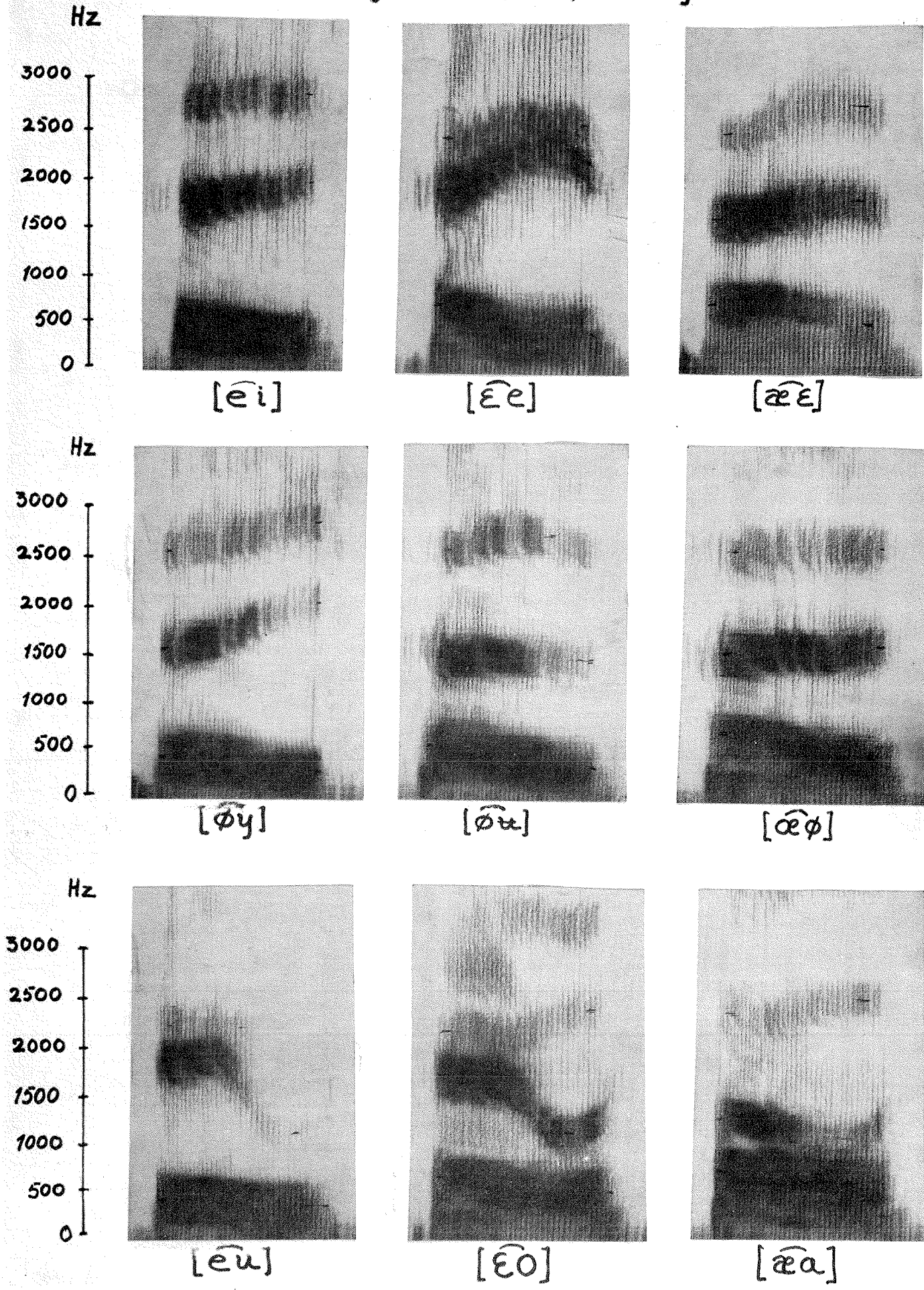
Fig. 2

VOWEL DIAGRAM OF DIPHTHONGS IN MALMÖ SPEECH



Each long diphthongized vowel is marked with an arrow (solid line = F1-F2; dotted line = F1-F3) indicating the direction in which the diphthong glides. The short vowels are marked with a small cross, the crossing-point of F1-F2.

Fig. 1 Spectrograms of diphthongized vowels.



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