ON THE RELATION BETWEEN VOWEL HEIGHT AND FRONT-BACK:
A COMMENT ON ELI FISCHER-JÖRGENSEN'S PAPER "SOME
BASIC VOWEL FEATURES, THEIR ARTICULATORY CORRELATES
AND THEIR EXPLANATORY POWER IN PHONOLOGY"

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Eli Fischer-Jørgensen (1983) has given an interesting contri­bution to the symposium on "Phonetic Explanation in Phonology" during the Tenth International Congress of Phonetic Sciences, Utrecht, August 1-6, 1983. In this comment, I shall refer to the extended and revised version of her contribution, which is printed on the preceding pages of this volume.

Eli Fischer-Jørgensen in her contribution (to which the reader is referred for general references) argues in favour of what is basically the traditional front-back and high-low distinction in vowels, cf. the following quotation:

"if tenseness is considered a separate dimension and height is taken to mean the relative distance between the articulating part of the tongue and the palate within each series of rounded or unrounded, tense or lax, front or back vowels, most of the inconsistencies between these traditional labels and the articulatory facts disappear" (this volume, p. 261).

While I agree on almost every point with Eli Fischer-Jørgens­sen's criticism of alternative proposals which have been ad­vanced, and also find her general conclusions convincing, I shall in this comment briefly consider the relation between the two traditional articulatory features for the vowel space, viz. vowel height and front-back. I shall use (primarily) Danish r-colouring and (secondly) Nordic ï-Umlaut as evidence for what I take to be a slightly different conception of the distinctive feature front-back, viz. for the way I have used it in a description of Modern Danish (cf. Basbøll and Kristens­en 1975: 273ff, Basbøll 1981:48f).

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Eli Fischer-Jørgensen argues:

"There are, however, a few cases where the feature pharyngeal for vowels might perhaps give a simpler and more explanatory formulation, i.e. in the cases of assimilation of vowels to pharyngeal or uvular consonants, as found in Greenlandic before /u/ and /q/ (mentioned by Wood). However, as /ɔ/, which becomes [a] in this position, is considered by Wood to be pharyngeal already, whereas this is not true of /i/ and /u/, the formulation will not be simple. The same reasoning is valid for the u-colouring of Danish vowels... Perhaps it is just as acceptable to say that vowels may be retracted and lowered before pharyngeal consonants" (this volume, p. 265).

This formulation could be made even more precise: the feature pharyngeal must be multivalent if r-colouring in Modern Danish should be accounted for by means of this feature since this term in Danish covers a whole productive and systematic (and, of course, language specific) series of changes in vowel quality, both before and after /u/ (cf. Basbøll 1972:202ff, and Basbøll and Wagner, forthcoming: ch. IV, sect. 7). The conception of the feature pharyngeal as multivalent seems inconsistent with Wood's proposals according to which it should denote articulation at a certain (although not completely invariable) point. On the other hand, nor do I see any reason to treat r-colouring of /ɔ/ (i.e. [ɔ] → [a]) as backing, and all other cases of r-colouring (i.e. [e] → [ɛ], [ɛ] → [æ], [ɛ] → [a], [o] → [a], [o] → [e]) as lowering, as the normal use of the feature front-back would force one to do (cf. Colman and Anderson (1983:187): "the proposals we are aware of would all assign the [a] → [ɔ] and [ɔ] → [œ] shifts to different dimensions (backness vs. height)").

The problem is, of course, whether [a] (or [ɔ]) should be considered as a maximally low and maximally front vowel (as expressed in the placement of [a] at the lower left corner of Daniel Jones' Cardinal vowel quadrangle, cf. the fact that just four X-ray pictures have determined the geometrical shape of the Cardinal Vowel Diagram). I do not think any phonetician would like to argue for a particular "corner" at [a]. Acoustically and perceptually this is rather clear, I think, and as far as articulation is concerned, [a] cannot be considered a phonetically "extreme" vowel - able to become a phonetic consonant in one little move, so to speak - like [i u a] (this is not to deny that different configurations of muscles may be involved, however). I would describe the situation so that, phonetically speaking, the "horizontal aspect" of front-raising has much more relative weight, as compared to the "vertical aspect", when we go from [a] to [ɔ], and that the relative weight of the "horizontal aspect" is continually diminishing when we go further towards [i] (so that the "vertical aspect" is clearly most important in the distinction between [e] and [i]). The important thing to me is that no "corner" at [ɔ] or [a] can be argued for on general grounds, in contradistinc-
tion to [i], [a] and (partly) [u] (it should be remembered that Cardinal Vowels [i] and [u] are the highest possible vowels at their place of constriction, and Cardinal Vowel [a] the lowest possible one, whereas the notion "lowest possible front vowel" has no precise meaning in phonetic terms). It seems to me that some consequences for the feature system must be drawn from this fact. I therefore use the feature label "front" as referring to vowels which lie on the (curved) (i.e. elliptic, cf. Jones' earlier drawings of the Cardinal Vowel Diagram) line from [i] to [a] (and, similarly, "back" for the vowels from [u] to [a], but this is less controversial, of course). After this slight re-definition of the distinctive feature term front-back, r-colouring can be described as simply consisting in moving one step in the direction towards [a], and it seems to me that this account of the whole set of systemic and productive r-colouring effects is phonetically and phonologically more adequate than any alternative account one can think of. Notice that this description presupposes that the vowel-height feature is multivalent (I have used the feature "distance" instead (see Basbøll and Kristensen 1975:273ff with figure 1 (reproduced here)), expressing distance from (an extreme) [a] towards either (an extreme) [i] (in "front"-vowels) or (an extreme) [u] (in "back"-vowels).

What exactly is the difference, if any, between the traditional use (or uses) of the feature front-back, including Eli Fischer-Jørgensen's use, as far as I have understood her, and my use of it? Phonetically, I think there is none. Phonologically, the traditional use might be illustrated by the following quotation from Eli Fischer-Jørgensen (this volume, p. 261), a propos Jones' primary cardinal vowels:

"But from the point of view of a general system of vowel features, [a] does not belong in this series ((viz. [u o ø a]/HB)), but in the series of unrounded back vowels [u Y ø a]".

I draw from this the (not logically necessary!) inference that [a] does not, according to Eli Fischer-Jørgensen, belong to the series of unrounded front vowels [i e ø a] (in any case, this is the view encoded in traditional feature systems). On the other hand, I would rather say that [a] enters into two series of unrounded vowels, viz. both the "front" series (in a perhaps not too felicitous terminology) [i e ø m a a] and the back series [u Y ø a] (notice that only the dimensions are crucial, not the individual symbols for non-extreme vowels). According to the traditional conception, [a] is phonologically a back vowel (not a front vowel), and the difference [a]-[ø] is, phonologically, one of "backness" and not of height (although, phonetically, it is both). According to my conception, on the other hand, the phonological distinction front-back is in a broad sense "neutralized" in, i.e. does not apply to, [a], and the difference [a]-[ø] is, phonologically, one of "height" and not backness (although phonetically it is both). (By the term 'phonological' I do not refer to contrasts in any specific language but only to a certain level of abstractness encoded
Figure 1
Schematic drawing showing the relationships between the vowels in terms of the features [back] and [distance] (...)
by means of distinctive features with discrete values; this cannot be discussed here, however.) In my view, one could even say that [a] might be raised in two directions, viz. "front-raised" (towards [ɐ]-[i]) and "back-raised" (towards [ʌ]-[u], cf. [ɔ]-[u]). (In a sense, this view corresponds to some types of "vowel triangle", so the tradition is still there, of course!) Notice that if the change [æ] → [a] is seen as involving backing phonologically, the same reasoning could also be applied to the change [e] → [æ], for example.

At this point, a brief informative note on r-colouring in Danish might be useful. Diachronically, it appears at first sight to be the result of two different changes, viz. a lowering of certain front vowels adjacent to /r/, and a "front-raising" of a except when adjacent to /r/. This does not really change the unity of r-colouring, however, since there has been a general "front-raising" of long a (and of certain cases of short a), which has been prevented, however, by an adjacent /r/ (cf. Brink and Lund 1975:67ff, 96ff). Thus the adjacency of /r/ is in the former case of r-colouring a positive condition, in the second a negative one, but apart from this difference the effect of r-colouring is similar. Synchronically it is, as far as I can see, a productive process which - certainly without being innate - is normally unconscious, but which sometimes can become conscious, and be subject to hypercorrections and stigmatizations. In sum, I find the process of r-colouring in Modern Danish very well suited as an illustrative case of phonological vowel features.

I thus conclude that a unified and explanatory description of r-colouring in Modern Danish, by means of distinctive features, necessarily leads to considering [i e æ æ a] as one phonological dimension, one argument being that any account in terms of [æ] → [a] as backing will necessarily lead to a "corner" at [æ] or [a], as far as I can see; and this consequence I find phonetically as well as phonologically unsound. In the basic phonetic vowel system [a] is, within the framework argued for here, necessarily the lowest unrounded vowel (in actual vowel systems this need not be the case, however, since a language-specific [a] need not be so low as cardinal vowel [a]). Furthermore (still within this system), the movement from [a] to [æ] is (as already noted) just the first step of a "front-raising" and therefore of the same basic type as the "front-raising" from [e] to [æ], etc. According to such an interpretation, a quadrangular vowel system will thus be "less natural" than a triangular one, everything else being equal, since a triangular vowel system in the sense used here does not presuppose the specification of a "lowest front vowel", viz. of a "corner" at [æ] or [a]. Nevertheless, the two elliptic lines seem to allow such a specification (based upon phonological arguments), for a specific language, as a codification of the fact that the "front-raising line" becomes increasingly less vertical when we move from [i] towards [a], and ends by being nearly horizontal.
The explicit rule for \( r \)-colouring in Modern Danish, within a framework such as the one which has been argued for here, is given in Basbøll and Wagner forthcoming (ch. VI, sect. 7; basically: "front-vowels are lowered" or, alternatively!: "vowels are "front-lowered"", i.e. lowered along the dimension \([i]-[a] \)). Its simple formulation is there compared to the much more complex formulations which are necessary within alternative frameworks of distinctive features-analysis, both the traditional use of front-back and an analysis by means of the features palatal, velar and pharyngeal (which are used in that work within a consistent binary framework related - but not identical - to Wood's use of them).

Now, it seems to me that this way of looking at the feature front-back may perhaps also contribute to an interesting account of Nordic \( i \)-Umlaut. I should emphasize that there are several crucial differences between the evolution of \( i \)-Umlaut in different Germanic languages/dialects, so what I suggest for Nordic is not necessarily relevant outside Scandinavia (which is of course not a homogeneous area either). Furthermore, the status of the so-called \( i \)-Umlaut of short \( /e/ \) is highly controversial. One reason to choose Nordic \( i \)-Umlaut as an example is that "Norse developed vowel mutation very extensively, virtually to the limit ..." (Prokosch 1938:110, cf. 107ff).

If we start with a purely descriptive statement, the main pattern of Nordic \( i \)-Umlaut seems to me to be the following: Rounded vowels are fronted, and unrounded vowels are "raised" in the sense that they move away from \([a]\) along the line on which the front vowels are placed, i.e. towards \([i]\). In this way the raising of \([e]\) to \([i]\) is placed on the same footing as \([a]\) to (say) \([m]\) or \([e]\). (The change from \([e]\) to \([i]\) certainly also involves fronting, in the usual phonetic sense, but the traditional feature-analysis cannot capture its relation with other cases of \( i \)-Umlaut. Anderson and Jones (1977:53ff) argue in the same direction, although within another theoretical framework, viz. dependency phonology.) It should be emphasized, however, that rounding in itself has of course nothing to do with the underlying mechanism of \( i \)-Umlaut, but that it only serves to define the set of back vowels which do not lie on the "front-raising" line, viz. the one between \([i]\) and \([a]\).

I think one clear reason can be given for the phonological naturalness of the description of \( i \)-Umlaut proposed here: \( i \)-Umlaut is a kind of assimilatory process between vowels, and the vowels which lie on the line from \([i]\) and down - and that is exactly the unrounded vowels - move in the direction of \([i]\), which is the conditioning factor. The rounded vowels, on the other hand, lie on the line between \([a]\) and \([u]\), and if they follow that line this will not take them anywhere near \([i]\). So they move in the other - i.e. "horizontal" - dimension, which means that they are being fronted (both phonetically and phonologically). In short, the rule accounting for the effect of Nordic \( i \)-Umlaut may be stated informally like this: "front-raise" or front ("horizontally") the vowel in question! (since
the sets of vowels which are a priori eligible for "front-raising" and ("horizontal") fronting are non-overlapping, the rule does not have to be specified as to priority between its two parts). Chronologically, the order was probably front-raising first rather than last (i.e. e was not affected later than a, and a not later than rounded back vowels).

What is common to all the cases of i-Umlaut, under the present interpretation, is thus that the vowel to be changed is assimilated to [i], but only with respect to one single feature (and only one phonological degree, in the case of multivalent features). The vowels on the "front"-line must assimilate in the only feature in which they differ from [i] (i.e. in "distance", as I say, or in height, traditionally speaking). The rounded vowels, on the other hand, differ from [i] in two features: rounding and front-back. Rounding is a separate dimension which classifies the vowels into two, in the old Germanic languages at least, basic series, it seems, and the vowels thus adjust in vowel-space-position (or in place of articulation in its broadest sense) just like the unrounded vowels.

Of course, I do not claim that this in any way explains the mysteries of the i-Umlaut (for my personal view, see Basbøll 1982, further cf. Skomedal 1980 and Benediktsson 1982). It seems to me, however, that the conception of the feature front-back as presented here, indeed allows an interesting account of one aspect of its phonology, and that it is by no means inferior to other alternative accounts, by means of distinctive features, of which I am aware.

One final remark. I do not want to deny that e.g. Turkish and Finnish vowel harmony, as argued by Eli Fischer-Jørgensen, speak in favour of considering the distinction between [a] and [a] as one of front-back in those languages (although the treatment of loanwords suggests that these cases of vowel harmony are - at least to-day - not productive processes in the same strong sense as Danish r-colouring). How can this be conciliated with the conclusions of the present comment? If we are not to simply accept the weak (but not unreasonable!) position that two different sets of features may both be relevant in such cases, I shall again point to the fact that the back vowels which cannot be ("horizontally") fronted are exactly those which can be front-raised", i.e. "front-raising" may be considered a complementary way of fronting which takes place instead of ("horizontal") fronting in certain well-defined cases, by convention. This is at present nothing but an airy suggestion, of course.

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