J. Linguistics **26** (1990), 183–187. Printed in Great Britain

Vowel sets: a reply to Kaye[1]

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(Received 2 August 1989)

Kaye has addressed a number of the criticisms of Charm theory which I raised in Coleman (1990). However, all of his responses are either contradictory to published principles of Charm Theory or problematic for other reasons.

1. Right-branching expressions

In my paper, I pointed out that the definition of fusion given in Kaye, Lowenstamm & Vergnaud (1985) (henceforth KLV-85) did not say what happens when a derived category A · B acts as an operator. I considered each of the four logical possibilities in turn. One of my claims was that the set of segments defined by Charm theory is too small to be realistic, but I generously allowed KLV-85 the option in this case which would produce the LARGEST set of categories consistent with the stated principles of Charm theory. In his response, Kaye (1990) 'now stipulates' that derived categories A · B may not be operators. The result of this new restriction is to remove [ə], [e], [o], [ʌ], [ɐ], [ö], [ø] and [œ] from the set of positively-charmed segments, that is from the set of nuclear governors. This means that [ə], [e], and [o] must be governed, and therefore may not occur as the head of a branching nucleus or as the nucleus of an open syllable unless they are governed in some other way, and [ʌ], [ɐ], [ö], [ø] and [œ] are not permitted at all in Charm theory.

2. Elements vs. binary features

Kaye compares Charm theory with 'a binary feature system using twenty features (a modest estimation) which is capable of expressing over one million different segments!' (1990: 177). The purpose of Kaye's comparison is to show Charm theory to be very much more restrictive than feature theory. The comparison is pernicious, however. Each element of Charm theory is defined by a single feature. In feature theory, the addition of a single feature doubles the number of segments which may be defined. Fusion is not quite as free as simple combination (i.e. unification) of features, but in Charm

[1] I would like to thank John Local for suggesting several good alterations to this note.

theory, the addition of a single element increases the number of segments which may be defined by a factor IN THE ORDER OF two. In fact Charm theory uses only five binary features to define vowels: ATR, BACK, RND, HIGH and low. The number of categories defined by free combination of five binary features is $2^5 = 32$. The number of categories defined by Charm theory (given Kaye's new prohibition of left-branching expressions) is 17, so Charm theory is indeed moderately restrictive. If Charm theory employed 20 features, it is reasonable to predict that the number of permissible categories would be less than 2^{20}.

Kaye's comparison of 5-feature Charm theory with 20 features under free combination is improper, because he has not yet shown that when the full picture is revealed, Charm theory will be any more than moderately restrictive. The proponents of Charm theory have not yet made it clear how many elements they will in fact require. In addition to the five vocalic features employed in KLV, non-vocalic elements H(igh tone), L(ow tone), N(asality), H (Expanded Glottis), Z (Slack Vocal Cords) P (labiality), T (coronality) and K (velarity) have been mentioned at one time or another within the canon of Government and Charm literature. If each of these is characterized by a single marked feature. Charm theory will define every segment in terms of just 13 features. Free combination of 13 features yields $2^{13} = 8192$ segments, and it is not yet known whether the set of categories defined by 13-element Charm theory will be significantly fewer.

KLV's goal – a theory which defines only a highly constrained set of phonological categories – is laudable, and perhaps their proposals to this end will eventually be made workable. But KLV face a much greater problem – their theory, like almost every other variety of generative phonology, is intended to define not only just the right set of segmental PHONOLOGICAL categories, but also just the right set of segmental PHONETIC categories. They state: 'The primary unit of segment constitution is the ELEMENT, which is a *fully specified matrix*, phonetically interpretable as in *SPE* theory or some equivalent formulation'.

But the number of categories defined by Charm theory is much less than the number of phonetic categories needed to describe minor but linguistically significant inter- and intra-speaker variation. Therefore, the set of phonetic categories made available in Charm theory is greatly OVER-restricted.

3. COMBINATIONS OF CHARMLESS SEGMENTS

The alterations to Charm theory made since 1985 prompt the question 'What is meant by "charmless"?' There are just two possibilities. The first is that segments may bear the property 'zero-charm' in just the same way as they may bear the properties 'plus-charm' or 'minus-charm'. In other words, charm is like a three-valued feature with values +, −, or 0. The second possibility is that charm is like a two-valued feature, and that charmless

segments do not bear a value for this feature. In other words, segments may be underspecified as far as charm is concerned. Both of these possibilities are untenable. If the first possibility is adopted, then zero-charmed segments cannot be combined with each other, since 'elements with like charm are repelled' (KLV–85: 311). A segment such as [ʏ] could not be represented in Charm theory, because the segments which contribute frontness and roundedness, I^0 and U^0, are elements with like charm. Turning to the second possibility then, it seems that Charm theory must permit underspecified elements. Yet KLV state (KLV–85: 311) that elements are 'autonomous pronounceable elements defined as *fully specified* feature matrices', and Charette (1989: 172) states that 'an element may be thought of as a *complete* matrix of features' (my emphasis), a view that Kaye has promoted in no uncertain terms on several occasions. Charmless elements cannot be combined with each other without abandoning either one or another basic principle of Charm theory, and thus lax front rounded vowels such as [ʏ] cannot be represented.

4. Charm and syllabic position

Kaye quite properly points out that it is wrong to equate 'positively charmed' with 'non-syllabic' or 'non-nuclear'. However, the two instances of my employment of the terms 'non-syllabic' and 'non-nuclear' are not germane to my criticisms. In the first case, I was considering the interpretation of the expression $(U^- \cdot A^+) \cdot I^-$ if the marked features of both U and A were to be 'hot', a possibility which Kaye and I both agree does not arise. In the second case, I was referring to the charm of [ö] and [ʏ]. Since it is now clear that these two segments cannot be defined by Charm theory, it is irrelevant what they are called.

The charmlessness of [ɪ] and [ʊ] commits Charm and Government phonologists to the following two positions:

(i) [ɪ] and [ʊ] cannot occur utterance-finally in unbranching nuclei bearing the main stress of the utterance. In such a position, [ɪ] and [ʊ] would not be governed in any of the three ways described by Charm and Government phonologists. Specifically, in unbranching nuclei, [ɪ] and [ʊ] cannot be governed by Syllabic government (Charette, 1989: 165), since it only holds within constituents (Onset, Rhyme, or Nucleus). Utterance finally, [ɪ] and [ʊ] cannot be governed within the terms of Transsyllabic government, since it operates from right to left, yet nothing follows which could act as a governor. Likewise, in main stress position, Projection government is inapplicable, since stressed nuclei are Projection governors, yet charmless elements are governees.

(ii) Neither can [ɪ] and [ʊ] occur as the head element of a branching nucleus, since nuclear governors have positive charm (Charette, 1989: 164).

However, instances of the occurrence of [ɪ] and [ʊ] in just these two positions are easy to find. For example, in Twi, a language with ATR harmony, [−ATR] [ɪ] and [ʊ] may occur utterance finally with main stress, e.g. [tʊ] 'uproot it!'. In the negative imperative form, [ɛn tʊ] 'don't uproot it!', the nucleus of the negative morpheme is also [−ATR] [ɛ], harmonizing with the verb [tʊ]. In many languages, including English, [ɪ] and [ʊ] occur as the head (i.e. governor) in branching nuclei, e.g. [ɪj] and [ʊw].

5. Unmarked vowels and vowel systems

In my paper, I pointed out that the set of basic elements in Charm-theory is odd for two reasons. Firstly, in three-vowel systems of the form /i u a/, two of the three segments, /i/ and /u/ are derived expressions $(I^{-} \cdot ɪ^{+})^{+}$ or $(ɪ^{+} \cdot I^{-})^{-}$ and $(U^{-} \cdot ɪ^{+})^{+}$ or $(ɪ^{+} \cdot U^{-})^{-}$. Kaye's response proposes that the LEXICAL representation of /i/ and /u/ is I^{0} and U^{0} i.e. [ɪ] and [ʊ]. The ATR (ɪ) component of /i/ and /u/ 'can be added' during the derivation from lexical to surface representations in order to satisfy the charm requirement that such highly unmarked systems allow 'only positively charmed segments in nuclei' (Kaye, 1990: 179). Truly, this is an ingenious proposal, but it does not overcome my former criticism. It simply displaces it in the form of the new problem – WHY is an ATR component added to high vowels in the least marked three-vowel systems? Kaye concedes that this is a problem, though he relegates this admission to a footnote, and states 'discussion of this issue would take us beyond the scope of this note'. If he has an explanation for why an ATR component must be added to high vowels in the least marked three-vowel systems, we await its publication. Until then, my criticism stands.

Secondly, it seemed odd to me that the five most unmarked vowels, according to Charm theory, are [ɪ], [ʊ], [ɪ], [a] and [i], and not, say [i], [u], [e], [o], and [a]. [ɪ] and [ʊ] were considered above, and [a] is not contentious. This leaves [ɪ] and [i] among the most unmarked vowels, according to Charm theory. Kaye claims that [ɪ] is in fact extremely common, but that not many people have noticed it because it is usually mistranscribed. I do not question Kaye's claim that [ɪ] is common. My objection is that of the five maximally unmarked elements of Charm theory, four of them denote high vowels, three of them denote BACK high vowels, and two of them denote back, high UNROUNDED vowels. In conventional markedness theory, maximally unmarked five-vowel systems include only two high vowels (Lass, 1984: 143), and back unrounded vowels are relatively marked. If the primitive elements of Charm theory are meant to accord with a universal theory of markedness, it certainly does not appear to be conventional markedness theory. I look forward to the publication of KLV's new theory of systemic markedness.

Kaye's response has clarified a few of the areas in which I showed Charm

theory to be inexplicit. However, it leaves my central criticisms of Charm theory unanswered, and gives rise to several new and even greater problems.

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