Journal of West African Languages XII, 1 (1982)

THE FEATURE LINGUAL AND THE AKAN CONSONANT SYSTEM[1]

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In a number of languages alveolars, palatals, velars and the so-called "glottal" fricative /h/ undergo similar phonological processes. Yet, there is no adequate distinctive feature to define them as a natural class; even standard phonological models maximally oppose alveolars and velars as if they had nothing in common.

This paper suggests the feature Lingual as a possible label for the consonants in question. The relevance of the feature to Akan and its related languages is demonstrated. It is equally demonstrated that phonetically and phonologically /h/ is not a glottal but an unmarked member of the lingual class of consonants.

Dans beaucoup de langues les alvéolaires, les palatales, les vélaires et la prétendue constrictive "glottale" /h/ subissent des processus phonologiques similaires. Cependant, il n'existe pas de trait distinctif permettant de les identifier comme une classe naturelle de sons. Chose surprenante, les alvéolaires et les vélaires sont même opposées d'une façon absolue dans des modèles phonologiques standards comme si elles n'avaient aucun élément articulatoire en commun.

Il est proposé dans cet article que le groupe des consonnes en question peut être identifié par le trait Lingual. La pertinence de ce trait en ce qui concerne l'Akan et des langues qui lui sont apparentées y est démontrée. Il est également établi que, de par sa nature phonétique ainsi que de par son comportement phonologique, le /h/ ne peut pas être une glottale mais plutôt un membre non marqué des consonnes linguales.

Introduction

A major problem often encountered in the "natural" classification of Akan consonants is the absence of a common articulatory feature for alveolars, palatals, velars and the so-called 'glottal fricative' /h/. Indeed, in this language, as well as a few related ones, where these consonants are affected by similar phonological processes there is not only the need to set them up as a distinct class of sound segments but also to show that this distinction is phonetically motivated.

The object of this paper is to suggest that the consonants in question form a natural class of what could be phonetically identified as linguals and that the traditional label "glottal fricative" for the /h/ is a misnomer.

Using the Chomsky and Halle (1968:307) Feature System, and disregarding for the time being the glottal fricative, one could specify the main places of articulation of the consonants of the language as follows:

	labial	alveolar	palatal	velar
anterior	+	+	-	-
coronal	-	+	-	-

From a "naturalist" point of view, one of the oddities about this matrix is that labials, palatals and velars potentially constitute a class (i.e. [-coronal]). Whereas there is an obvious justification for this categorisation of labials and velars (they correspond to the Jakobsonian feature [+grave]), the inclusion of palatals in this class is quite unnatural as it is hard to see what phonological process would affect this group of consonants in a general way.

The other oddity about this matrix is that it seems rather strange to oppose alveolars against palatals and velars (2). The inclusion of the vowel features High and Back does not help much either as indicated by the following matrix:

	alveolar	palatal	velar
anterior	+	-	-
coronal	+	-	-
high	-	+	+
back	-	-	+

If the naturalness principle were to be applied here, then one would not expect alveolars to undergo the same phonological process as velars, yet the examination of some language processes point to the contrary. In the Akan language there is an important dialect variation rule well known to speakers and students of the language that regularly replaces Fante word final alveolar nasal with velar nasal in the Akuapem Twi dialect (see Schachter, P and Fromkin, V, 1968:73-75), thus:

Fante	Akuapem Twi	
din	diŋ	"name"
man	maŋ	"nation"
abɛn	abɛŋ	"horn"
kɔn	kɔŋ	"neck"

The alveolar/velar alternation is also manifested in various forms in a number of languages and language processes. For example, /k/ and /t/ are known to merge in the early stages of child language acquisition as well as in the phonologies of many languages (3). Furthermore, it is the case that alveolars and velars tend to be palatalised in quite a different way from labials: alveolars and velars tend to become complete palatals while labials can only be partially palatalised. The use of the feature for the consonants in the above matrix only aggravates the situation as it includes labials in the class of [-low] segments together with alveolars, palatals and velars in an unnatural way.

A related and intriguing problem found in the Akan language and a number of languages of the world is the fact that alveolars and velars can become palatals in the context of vowels other than front high ones. That is, completely palatalised alveolars and velars occur with back or central vowels irrespective of the relative tongue heights of the latter (4). It would appear therefore that the palatality of the vowel (or for that matter of the semivowel) is not a necessary condition for the palatalisation of these consonants and that there may be some other factor affecting the syllable on the whole that might account for the process. In a previous paper (Mensah 1977) we have tried to show that palatalisation could be explained in terms of an increase in the force of articulation of the active articulators. But what we left unanswered and would now like to examine is why alveolars and velars behave the way they do in respect of palatalisation and not labials.

Linguality and Palatalisation

Articulatorily, what alveolars, palatals and velars have in common, as against say labials or glottals, is that they are all actively produced with the tongue; in other words they are all linguals (5). This assertion may appear rather obvious but we feel it is crucial to the understanding of the particular behaviour of these consonants in relation to the hard palate. In the articulation of all linguals - and this term also covers vowels - the tongue body is raised from its rest position with the simultaneous arching of the front part which gives its characteristic convex shape. Also, it is interesting to note that the hard palate has a concave shape, similar to that of an arch. While the shapes of these two organs could be said to be biologically unrelated there is the significant fact that they match each other. It would therefore seem normal for reasons of articulatory ease for the front part of the tongue to want to move towards the centre of the hard palate in speech. This tendency of the tongue to move towards a focal point in the hard palate may explain why consonantal linguals frequently become complete palatals whereas labials and other non linguals hardly do (6). The causes of the actual movement may be more complex and, as we have already suggested elsewhere (Mensah op. cit.), they may be directly related to the relative energy applied to the tongue muscles.

The Feature Lingual

From the foregoing, it would therefore appear necessary to set up the feature Lingual to cover consonants like alveolars, palatals and velars. In a natural classification of consonants this feature would then replace the Chomsky and Halle feature Coronal as a major-cavity feature. But in addition to this, it would be necessary to add the Jakobsonian feature Grave in order to show the similarity between labials and velars. The revised matrix for consonants would then be the following:

	labial	alveolar	palatal	velar
anterior	+	+	-	-
lingual	-	+	+	+
grave	+	-	-	+

The obvious advantage of this matrix over the Chomsky and Halle one is that it does not only indicate more appropriately the differences between all the segments but it also clearly shows the relationships between the various places of articulation in a more natural way: all consonants articulated from the lips to the alveolar ridge form a class, those that are articulated with the tongue are clearly distinct from those that are not and those that are formed on the periphery of the mouth cavity equally form a different class. These major articulatory divisions would then allow for a better interpretation of the principal phonological processes that affect these consonants.

As already suggested, all vowels are also lingual and therefore this is a redundant feature for them; however, we believe it is this feature that may explain why potentially any vowel may trigger palatalisation irrespective of its relative tongue position. In other words, a vowel conditions palatalisation (partially, at least) not primarily because of its articulatory position but because it is inherently lingual.

Similarly, before a consonant can become a palatal it has to be a lingual. This principle of palatalisation expressed in terms of the linguality of the palatalising segment (vowel or palatal semi-vowel) with or without a lingual consonant can now help us differentiate more clearly between partial and complete palatalisation. For partial palatalisation to occur the segment following the affected consonant has to be vocalic and therefore lingual, but for complete palatalisation to occur the affected consonant also has to be a lingual. These two conditions would then allow for the radical change of alveolars and velars to palatals but would restrict the palatalisation of labials to secondary articulations only.

The feature Lingual is not without problems of its own however. For example whereas labials and the glottal stop are clearly non

lingual, we are not as yet certain whether to include pharyngeals or even uvulars since the front part of the tongue is appreciably lower in their articulation. Furthermore, we have not as yet come across cases of complete palatalisation involving these sounds; nevertheless our own hunch is that uvulars are more likely to behave as linguals than are pharyngeals. Articulatorily, at any rate, there seems to be some justification in including uvulars among linguals if one takes the place of articulation of uvulars to be within the mouth cavity where all the other linguals are also produced. This latter point probably needs further investigation but for the time being, we would simply assume that linguals extend from the teeth to the velum, their active articulator being exclusively the tongue.

Palatalisation of Akan Consonants and the Problem of /h/

Having discussed the relevance of linguality to the natural classification of consonants and palatalisation in particular, we are now in a position to examine the latter process in Akan and some of the problems that arise as a result of the traditional classification of /h/ as a glottal fricative. As already indicated earlier on, we shall argue that the label "glottal fricative" is misleading and that it is more appropriate to consider /h/ as a lingual.

In the Akan language the following consonants regularly become palatals in the context of a front vowel: k,g,w,h.
Thus:

Underlying Form		Surface Form	
/kɛ/	.....>	[cɛ]	"share"
/ginã/	.....>	[ɟinã]	"stand"
/ewi/	.....>	[eɥi]	"thief"
/hɛ/	.....>	[ɕɛ]	"wear"

In addition to these, some Akan sub-dialects like Agona and Elmina varieties of Fante palatalise alveolars. For example:

Akan		Agona/Elmina sub-dialects (7)	
/ti/	.....>	[icir]	(Fante:itsir) "head"
/dɩ/	.....>	[ɟɩ]	verbal particle

Also, in the Fante dialect as a whole, there is the partial palatalisation of labials before front vowels:

Akan	Fante	
/ɔpɛ/	[ɔpjɛ]	"he likes"
/abɛ/	[abjɛ]	"palm nut"
/mĩn/	[mjĩn]	"swallow"

The complete palatalisation of velars and alveolars on the one hand and the partial palatalisation of labials on the other clearly follow the normal pattern laid out earlier on. However, the complete palatalisation of /h/ seems to contradict the complete palatalisation condition, that is, if one assumes, as it is traditionally done, that /h/ is a glottal consonant. In other words, if the /h/ is not a lingual, then it can only be partially and not completely palatalised. Indeed, in order to reconcile the behaviour of the /h/ with that of the velars in Akan, both types of consonants are usually labelled as [+Back] and the conventional rule used to account for their complete palatalisation is the following one:

$$\begin{bmatrix} C \\ +back \end{bmatrix} \longrightarrow \begin{bmatrix} C \\ palatal \end{bmatrix} / \_\_ \begin{bmatrix} V \\ -back \end{bmatrix} \quad (8)$$

As can be seen, the feature Back is a convenient way of grouping the velars and the /h/ in a natural class without losing the presumed glottalicness of the latter. Now, whereas we believe that the /h/ does form a natural class with velars (and even alveolars) we do not think that the feature Back nor the label "glottalic" is a very useful one here. On the contrary we contend that /h/ is a lingual and not a glottal and therefore its violation of the palatalisation principle is only apparent and not real. In the following we attempt to demonstrate the non-glottalicness and the linguality of /h/ both phonetically and phonologically.

Phonetically, if /h/ is a glottal fricative, then one would expect a narrowing of the glottis during its articulation so as to produce an audible friction. But since /h/ is a voiceless sound the glottis can only assume an open state during its articulation in which case the passing pulmonary airstream cannot be impeded at this level in any way so as to produce the characteristic "audible friction". The behaviour of the glottis for /h/ can further be inferred from instrumental studies on aspiration the latter being phonetically no different from /h/; the only difference between the two is essentially phonological. In a cineradiographic study of Korean stops Chin-Wu Kim (1970) discusses the movements of the glottis during aspiration. He asserts that in all the realisations of the latter the glottis assumes an open state similar to that of all voiceless consonants and, in Korean where there are three phonological degrees of aspiration, there is a direct relationship between the length of aspiration and the degree of glottal opening to the extent that the degree of opening is much larger than normal in heavy aspiration.

It is clear from these phonetic facts that, contrary to what is often claimed in standard phonetic literature, the glottis cannot be the place of articulation of /h/ and that the latter is no more glottal than are say, /f/, /s/ or even /k/. This then leaves the glottal stop as the only consonant that is entirely produced in the glottis. Kim expresses a similar opinion in respect of aspiration and says: "Traditionally, aspiration has been defined as a glottal friction. That this definition is completely misleading is obvious, since the more aspiration, the more open the glottis is, and if a 'glottal friction' presupposes some sort of glottal constriction then it is simply not there" (op. cit:111).

If the friction is not produced in the glottis then the only place it can be produced for it to be audible is the mouth. Indeed, a cineradiographic study of the movements of the tongue during the articulation of consonants indicates a relative raising of the tongue during the production of /h/ (Mensah 1973) creating a constriction in the mouth and it is obviously this narrowing that accounts for the friction. The actual position of /h/ varies of course with that of the following vowel. The main conclusion that can be drawn from this, however, is that the tongue is the main articulator of /h/ and therefore the latter is to be classified as a lingual. If it is a lingual then it is natural for it to become a palatal, as it does in Akan.

This classification of /h/ as a lingual is further supported by some phonological evidence from Akan as well as some related Volta-Comoe languages like Nzema.

As stated at the beginning of the paper, the Akan consonant system consists of four main articulatory positions: labial, alveolar, palatal and velar. Below is a full representation of the consonants of the language:

labial	alveolar	palatal	velar	
p	t	c	k	
b	d	ɟ	g	
m	n	ɲ	ŋ	
f	s	ɕ	-	h

It can be seen that whereas the plosives and nasals are represented in each place of articulation, there is an apparent imbalance with the fricatives: there seems to be no velar fricative although there are fricatives in all the other places of articulation. But this imbalance can easily be rectified if one considers /h/ to be a velar. (9)

It is also interesting to note that in a language like Nzema, which is closely related to Akan, in addition to these consonants there is also a set of voiced fricatives, one of which is the velar [ɣ] which follows the normal distributional pattern among the various places of articulation. In Nzema therefore there would be a greater justification for considering /h/ as a velar and therefore a lingual.

The velar nature of /h/ in Nzema is further demonstrated by the phemomenon of consonant mutation where, in addition to other mutations between different consonants, there is a regular mutation between stem-initial /k/ and intervocalic /h/ as a result of grammatical alternations between different classes of the same word. For example:

kila	'mouse'	/	ahila	'mice'	
kaʔ	'bite'	/	ɛhalɛ	'biting'	
kua	'gather'	/	kuohua	(reduplicated form)	
kã	'say'	/	mibahã	'I shall say'	(10)

What is remarkable here is that with the alternations between the other consonants there is no change in place of articulation but rather in manner of articulation. For example:

f/v:	fɷʔ	'climb'	/	ɛvɷlɛ	'climbing'	
s/z:	silɛ	'father'	/	mizi	'my father'	
t/d:	tuʔ	'dig'	/	tudu	'uproot'	
kp/gb:	kpa	'bed'	/	mgba	'beds'	(10)

On the basis of these examples it would be more appropriate, at least in cases of consonant mutation, to derive the /h/ from an underlying /k/ and specify the change in terms of variation in stricture and not place of articulation (11). Indeed, it is quite possible that this /h/ is immediately derived from an interceding /x/ which is then further weakened to /h/ as a result of its close acoustic affinity to the latter and especially by analogy to the /h/ which exists freely in Nzema and other Volta-Comoe languages. Interestingly enough, in a number of West Atlantic languages where consonant mutation is also well attested there are h/k alternations for some languages and x/k for others. However /x/ and /h/ do not co-exist in any of the languages and this would lend further support to our claim that /h/ is phonetically related to /x/.

Conclusion

In this paper we have tried to show the relevance of the feature Lingual in the phonological classification of consonants. This feature appears to be more appropriate not only in defining alveolars, palatals and velars but also in providing a more realistic articulatory base for /h/. Although we have suggested that in Akan and some Volta-Comoe languages, phonologically /h/ is more specifically a velar, we hesitate to propose this an a universal feature. It is possible that in some other languages /h/ functions more as a palatal or alveolar (12) than a velar, the ultimate criterion would depend on the phonologies of independent languages. But what needs to be stressed is that /h/ is a lingual and not a glottal (13). In a sense, this propensity of /h/ to alternate with the different types of consonants would seem to suggest that within the class of lingual consonants it is the least marked member and hence the most productive one with the unique capability to reflect the different articulatory positions of other consonants.

FOOTNOTES

(1) Earlier versions of this paper were presented at the 13th Congress of West African Languages held in Freetown in 1978 and the Ninth International Congress of Phonetic Sciences held in Copenhagen (1979). Akan here refers specifically to the Twi-Fante language spoken in Southern Ghana.

(2) This unsatisfactory state of affairs has also been observed by a number of linguists. See for instance Schane, S. (1973:30) who states: "Dentals and velars are maximally opposed in the Chomsky and Halle Feature System and... it is not certain that (they) should be excluded in this way."

(3) This is a well known feature of some Romance languages. Also, see Bazell (1956) on the neutralisation of /k/ and /t/ in English.

(4) Palatalisation commonly occurs before /a/ in a number of languages. For example, most present-day French forms with word initial palatals followed by /a/ derive from Latin forms with initial /k/ e.g. carrum > char; camera > chambre; cattus > chat etc. Examples of palatals with back vowels in Waci and Aja provided by Capo, H:

Waci			Aja		
*eso > eco	'yesterday'		*tu > cu	'gun'	
*so > co	'cut'		*du > ju	'god'	
*Asu > Acu	Proper name				

These alternations are quite common among various dialects of the Ewe language.

(5) The term Lingual figured prominently in 19th century phonetics but it appears to have been mainly used for vowels. See discussion in Ladefoged, P. (1967:62).

(6) Posner, R. (1961) reports of dissimilatory changes from /p/ to /c/ in some Spanish dialects but these changes appear to be marginal on the whole.

(7) In Fante there is also the affrication of alveolars before front vowels.

(8) The feature Back is also used by Schachter, P. and Fromkin, V. (1968).

(9) It is interesting to note that Christaller, J. (1875) and Welmers, W. (1946) classify /h/ among velars.

(10) We owe these examples to Chinebuah, I. (see bibliography).

(11) Generally speaking, the alternations between the different consonants are attributable to a weakening process which is accounted for more specifically in terms of voicing or widening of stricture.

(12) See Sapir, D. (1971) data on Kobina where alternations between /h/ and /t/ as well as /h/ and /k/ occur. Marchese, L. (1979) also derives /h/ from an underlying /s/ in a number of Kru languages. The /h/ and /f/ that occur in some languages such as Hausa can be explained in terms of the feature Grave. In thesese cases /h/ may be treated as a velar and this would not only be compatible with the linguality of /h/ but also similar to the well attested k/p alternations that occur in a number of languages of the world.

(13) The non-glottalicness of /h/ appears to be attested in some Chadic languages as well. In an interesting paper on the origin of Hausa /h/ Newman, P. (1976) mentions a regular restriction rule in the language and some related ones that blocks the co-occurrence of a [+glottal] consonant with another one in the same word. The striking thing in this phenomenon is that /h/ belongs to the class of [-glottal] consonants i.e. consonants that occur with glottalised ones as well as with each other.

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