UNIVERSALS OF LABIAL VELARS AND DE SAUSSURE'S CHESS ANALOGY

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In the Cours de linguistique generale de Saussure compares language to a chess game and the units of the linguistic code to the individual chess pieces. He remarks that

> If I use ivory chessmen instead of wooden ones, the change has no effect on the system ... The respective value of the pieces depends on their position on the chessboard just as each linguistic term derives its value from its opposition to all the other terms ... [A single] move has a repercussion on the whole system [1916 (1966:22; 88-89)].

The choice of the chess analogy was a brilliant piece of exposition. Justifiably, it is frequently cited, especially by teachers in linguistic courses, and has become one of the favorite images of the structuralist basis of linguistic analysis.

The structuralist approach in phonology means analyzing a given problem by taking the whole phonological system into consideration, e.g. all the phonemic oppositions, especially those which are symmetrical or asymmetrical, the functional load of the sounds involved, etc. It focuses, therefore, on system-internal relations between the 'pieces', i.e., the speech sounds. For example, the structuralist account of the introduction of [ʒ] into English would point out that it filled what was up to that time a gap in the English fricative system:

f	θ	s	ʃ
v	ð	z	◌

Generative phonology, a recent offshoot of structural linguistics, also focuses on system-internal relations between the 'pieces' although in this case the pieces are the rules of grammar and the entities which make up the lexicon.

In fact, almost any post-Saussurean "school" of phonology one might cite, e.g., the Prague school, glossematics, functional phonology, natural generative phonology, etc. -- all have adopted the structuralist method of looking within the system for the solution to their problems. Occasional explorations outside the system -- into anatomy, physiology, physics, psychology, etc. have never been

pursued seriously or intently.[1]

I would maintain that this emphasis on system-internal relations in phonology is counter-productive. This point is especially evident when we examine and seek explanations for phonological universals. We frequently find speech sounds behaving in very similar ways across languages even though those languages exhibit remarkably varied structure. The phonological behavior of labial velars, i.e., [u, w, ɯ, k͡p, g͡b] etc. illustrates this rather dramatically.[2]

It has been claimed by generative phonologists that labial velars, although possessing two more or less equal constrictions, labial and velar, nevertheless, must be represented at the underlying (lexical) level as having only one primary articulation -- the other constriction being relegated to a secondary articulation (Chomsky and Halle 1968, Anderson 1976). The phonological behavior of a segment is supposedly a function of its underlying representation, not its surface phonetic character. Thus Anderson, in reviewing a number of West African languages, argues that Temne which has a /k/ but no /g/, must classify its /g͡b/ as a velar, filling the gap in the voiced velar stop position. Similarly he argues that since Nkonya has both /k/ and /k^{w}/, the second sound thus preempting the classification: 'primary articulation: velar; secondary articulation: labial', the sound /k͡p/ in that language must be primarily a labial with a secondary velar articulation. Efik, he notes, not only has a /k/ vs. /k^{w}/ contrast but also lacks a /p/, so it has two reasons for classifying its /k͡p/ as a labial.

One of the problems with such structural or functional accounts of phonological facts is that they attach undue significance to sound patterns which may commonly arise due to chance or at least due to factors unrelated to the particular phenomena under investigation. Attention to phonological universals would be some insurance against this problem. As it happens, /p/ and /g/ are often missing from languages' stop inventories (Gamkrelidze 1975, Sherman

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(1) Notable exceptions, however, are the fields of sociology, cultural history, and anthropology, which have been pursued seriously by many phonologists with structuralist orientation.

(2) The research on labial velars was done in collaboration with James Lorentz and published in Ohala and Lorentz (1977). Limitations of space prevent extensive documentation of the sound patterns discussed; however, the article cited may be consulted for numerous cross-linguistic examples.

1975). Moreover, there are many languages in West Africa that have /k͡p/ and/or /g͡b/ (Ladefoged 1964). Why therefore assume there is a special relationship between these two patterns in those few languages in which they both appear? A very preliminary statistical analysis of the co-occurrence of these patterns by Ohala and Lorentz (1977) found no disproportionate incidence of labial velar stops in languages which also have gaps in their stop inventory.

The most serious problem with such structuralist arguments, however, is that they often as not conflict with the evidence one can obtain from phonological alternations, including allophonic variation:

1) In spite of the double motivation mentioned above for assigning the Efik /k͡p/ to the <u>labial</u> slot (as well as an additional reason, cited by Welmers 1973, namely, that /k͡p/ sometimes is realized as the allophone [p]), Cook (1969) reports that a nasal assimilating to it sometimes appears as the <u>velar</u> nasal [ŋ].
2) According to Bearth (1971:18), Toura has both /k/ vs. /k^{w}/ and /g/ vs. /g^{w}/ contrasts, which, following the logic presented above, would force us to characterize /k͡p/ and /g͡b/ as <u>labials</u>. Nevertheless, these latter two sounds can be realized as [ŋ͡k͡p] and [ŋ͡g͡b], respectively, before nasal vowels.

Maybe one could still salvage the practice of looking only to system-internal relations in phonological analysis by abandoning the 'fill-the-gap' criteria and relying more heavily on how segments pattern in phonological rules. Unfortunately this escape route is not open either because labial velars can pattern in seemingly inconsistent ways in phonological rules.

3) The Yoruba labial velar glide /w/ (along with the labial velar stops /k͡p/ and /g͡b/) patterns with the <u>labials</u> /b, f, m/ in that it causes the merger of following /ã/ with /ɔ̃/; nevertheless, the nasal assimilating to /w/ shows up as the <u>velar</u> [ŋ] (Ward 1952).
4) In Kuwaa (Belleh), word initial /w/ is occasionally realized as [ŋ^{w}], i.e. a labialized <u>velar</u> nasal, but may become <u>labial</u> [ɱ] before unrounded vowels (Thompson 1976).
5) In Tenango Otomi /h/ becomes labial fricative [ɸ] before /w/ but /n/ assimilating to /w/ appears as [ŋ] (Blight and Pike 1976).

Additional such cases are not difficult to find (Ohala and Lorentz 1977).

The seeming confusion of these patterns is cleared up when system-external evidence is obtained, viz., data on phonological universals and the physical phonetic causes of the universals. I offer the following four statements of universal tendencies to account for the observed data:

A. When affecting the quality of adjacent vowels, labial velars behave primarily as labials. (Specifically, they cause vowels to shift in the general direction of [u].)

In addition to the evidence in 3, above, there is that from Tigre where, due to assimilatory action, certain short vowels are more back in the environment of labials, especially /w/ (Palmer 1962).

The phonetic basis of this pattern is the fact that labial velars achieve very low 1st and 2nd formant frequencies -- even lower than those of plain labials in most cases (Ladefoged 1964, Lehiste 1964) -- and thus are acoustically unlike sounds at any other than the labial place of articulation. This fact is itself capable of being explained by reference to acoustic phonetic theory (see Ohala and Lorentz).

B. When assimilating to adjacent vowels, it is the labial velar's labial place of articulation that remains unchanged; the place of the lingual constriction may shift or disappear under the influence of the vowel's lingual configuration.

Besides the evidence in 4, above, there is in addition the pattern from Dagbani in which the phonemes /k͡p, g͡b, ŋ͡m/ have the allophones [t͡p, d͡b, n̪͡m], respectively, before front vowels and the palatal glide /j/ (Wilson and Bendor-Samuel 1969).

There is no mystery about the causes of this tendency. Of the two constrictions of labial velars, only the lingual constriction is free to (partially) assimilate its place of articulation to that of adjacent vowels. The shift of the lingual constriction in such a case is exactly comparable to its shift in other velar consonants, e.g., [k, g, ŋ, x], whose lingual constriction -- as is well known -- is also influenced by neighboring vowels. The labial constriction, for obvious anatomical reasons, is not likely to shift its place of articulation via assimilation to that of the lingual constriction of adjacent segments.

C. When becoming a fricative or determining the place of articulation of adjacent fricatives by assimilation, [w] shows itself primarily as a labial.

In addition to the evidence in 5 (and possibly in 1) above, there are supporting statements such as the following by Heffner (1964: 160):

> The fricative noises produced by the articulation of [French] [w] are slight, but such as they are, they come rather from the labial than from the velar constriction.

Assuming that there are both labial and velar sources of fricative noise during these sounds, there are a number of possible phonetic reasons why the labial noise source should predominate. The most important is probably the fact that the configuration of the vocal tract anterior to the velar noise source (the airspace and the small labial constriction) constitute a low-pass filter that effectively attenuates the predominantly high frequency noise produced at the back constriction. The noise source at the labial constriction, of course, suffers no high frequency attenuation.

D. When becoming a nasal or determining the place of articulation of adjacent nasals by assimilation, labial velars behave primarily like velars.

Alongside the evidence in 1 through 5, above, there are many cases such as the dialectal variants for the word for "child" in two Melanesian languages: in Sa'a it is /mwela/ (which is more representative of the original form) but in Kwara 'Ae it is /ŋela/ (Ivens 1931).

The explanation for this pattern requires reference to the vocal tract configurations for the nasal consonants [m, n, ŋ] and [w̃] (to pick a common labial velar), which are represented schematically in Figure 1. Essential to the acoustic characteristics of nasals are the pharyngeal-nasal airway and the oral cavity branching off from it. 'Oral cavity' here refers to that air space extending from the pharynx to the point of constriction. The oral configuration

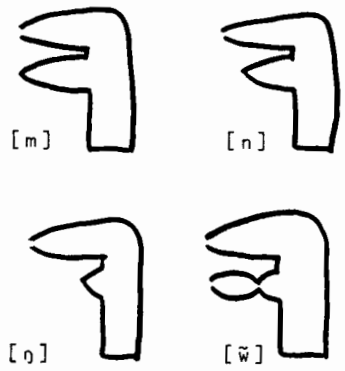

Figure 1.

anterior to the point of the rearmost constriction has no effect. It can be seen, therefore, that the acoustically relevant configuration of [w̃] is essentially similar to that of [ŋ].

It would seem from these data that the behavior of speech sounds is better understood by reference to system-external factors than system-internal factors. These are not isolated examples. A more appropriate analogy to offer as an image of language would be the game of football (American-style football). At any given time during a football game when the ball is in play, it is still the case, as in chess, that there is "significance" to the game in the special arrangement of the players, e.g. it is advantageous to the side possessing the ball to have an eligible receiver downfield. However, of more importance to the outcome of the game is the inherent ability of the individual players. It may not matter in chess whether one substitutes an ivory chess piece for a wooden one, but does matter in football if one substitutes a 50 kg tackle for one weighing 100 kg.

Conclusion

Observations of universal phonological tendencies -- for example, those found for labial velars, as in the present paper -- force us to the conclusion that the inherent physical constitution of speech sounds, i.e., how they are made and how they sound, have as much or more importance than system-internal relations, in determining the behavior of speech sounds. The emphasis most schools of phonology put on the study of system-internal factors is therefore a mistake.

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