TYPOLOGICAL UNIVERSALS, ASPIRATION, AND POST-NASAL STOPS

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Introduction

Probably the least marked type of consonant cluster found among the world's languages is Nasal + Oral Consonant (NC). The unmarked status of this sequence is demonstrated by a number of factors, including their occurrence in many languages otherwise characterized by CVCV structure. Perceptually, such a sequence is easily exploited since nasal consonants, although easily confused within the class, are quite distinct from oral consonants. The confusion within the class accounts, in part, for the fact that NC sequences are very frequently homorganic. Articulatorily, the sequence of gestures required to produce a NC cluster is relatively simple, involving only a raising of the velum for the sequence nasal plus voiced stop (ND).[1] For other types of NC clusters other gestures are necessary such as a cessation of vocal fold activity and a reduction in the degree of stricture. Further, the optimal opposition within NC sequences is demonstrated by its frequent exploitation in unit sound types, the so-called "half-nasal consonants", pre- and postnasalized consonants.[2]

The degree of articulatory and perceptual complexity is mirrored in the relative markedness of NC types. Thus, the least marked type of cluster is ND. Other types occur, even among the half-nasals, but these are less common[3] and many derivational processes, both synchronic and diachronic, conspire to produce NC inventories of the least marked type.

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(1) The following symbol abbreviations will be used within the text: Nasal + Voiced Stop (NƉ), Nasal + Voiceless Stop (NT), Nasal + Voiced Fricative (NZ), etc. Other symbols employed have their standard phonetic values.

(2) The half-nasal consonants are distinguished from NC clusters by a number of factors, the most essential being that of duration. The two components of a half-nasal will exhibit the combined surface duration equivalent to a single consonant.

(3) This frequency is demonstrated in both cross-language frequency of occurrence and text frequency. In a 1000 phone count of a Rundi text, the following statistics were obtained: NC (30): ND (21), NT (4), NZ (4), NS (1).

A typological survey of the processes affecting either component of a NC sequence provides two inventories of process, one affecting the nasal and one the oral consonant. Among the former, only homorganicity assimilation is common whereas positional assimilation of the oral consonant is rare. Perhaps the most common process affecting the oral consonant is post-nasal voicing of voiceless consonants. In such a sequence, there are two primary motions which distinguish the two components: (1) raising of the velum, (2) cessation of vocal fold vibration. If the two are not coordinated the following sequences obtain: (a) NC̥C̥, or (b) NN̥C̥. In many languages the former tendency has been phonologized so that all post-nasal consonants are voiced.

Another common process is post-nasal hardening which, in conjunction with voicing, accounts for some of the many inventories containing only ND. Hardening actually involves two subtypes, but since many languages exhibit these in conjunction, it is perhaps best to view this situation as a continuum:

continuant → affricate → stop

In many cases, the hardening effect of nasals is evident even after the nasal is lost historically.

Other processes not of relevance to the present paper include post-nasal de-implosion (Shona /N+ɓ/→[mb]), ejectivization (Zulu /N+ph/→[mpʼ]), etc. The situation with regard to aspiration of voiceless stops is problematic. On the one hand, some languages exhibit clear patterns demonstrating the loss of aspiration in this environment. However, other languages show aspiration developing in this context. Thus, there are conflicting tendencies which exist with regard to aspiration. This is not a felicitous situation since it is otherwise possible to determine a general direction of evolution. While changes of the sort NC̥ → NC, NT → NTS occasionally occur, they are rare and other factors are found which explain these anomalous developments.

Loss of Aspiration

In Zulu, aspiration is lost in contact with nasal consonants. Doke (1926) reports the development of ejectives from aspirates in this context, but not all speakers exhibit this tendency. Aspirated clicks are replaced by simple nasal clicks when they are brought under nasal influence in Zulu whereas they merely lose their aspiration in Xhosa. Tarascan (Foster 1969) has two series of underlying non-nasal obstruents /p t c č k/ and /p^h t^h c^h $č^h$ k^h/. In contact with nasal consonants, the plain consonants are voiced, and the aspirates become plain voiceless consonants, e.g. /N+p/ → [mb], /N+p^h/ → [mp]. Devine (1974:19) notes that it may be best to regard this as a sliding scale of complexity and that the normal state for voiceless consonants in contact with preceding sonorants is unaspirated.

Development of Aspiration

In his useful survey of the noun class system of Bantu, Kadima (1969:63-5) notes that the most common developments of NT sequences are:

/N + p t k/ → [p t k]
[p^h t^h k^h]
[mp^h nt^h $ŋk^h$]

Other developments also occur, e.g. [mb nd ŋg], [m̥ n̥ ŋ̥]. The present concern is with the development of aspiration. In Venda (Ziervogel and Dau 1961), Bantu nasal compounds develop as follow:[4]

*mb > mb	*mp > p^h
*nd > nd	*nt > t^h
*ŋg > ŋg	*ŋk > k^h

When the simple stops are not under nasal influence, they undergo spirantization:

*p t k > Φ r h
*b d g > β l Ø (j)

However, not all languages which develop aspiration exhibit a weakening of stops otherwise; it is therefore not possible to attribute aspiration to any general weakening process.

Hinnebusch (1975) attempted to reconstruct the phonetic processes in Swahili by which *mp nt ŋk became p^h t^h k^h. He proposed a two-stage process, the first of which is nasal devoicing, followed by deletion. It is proposed that native speakers reinterpreted the period of initial noisiness as post-aspiration rather

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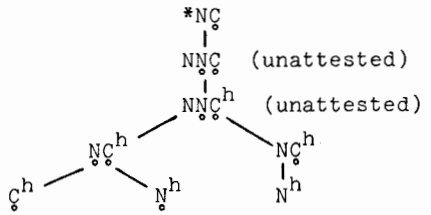
(4) However, the nasal is retained in both series with monosyllabic stems although it comprises a separate syllable: $ŋk^hɔ$ 'large pot', $nt^hɔ$ 'louse'. Further, the nasal is retained if it represents the first person singular object marker.

than preaspiration. The following is attributed to John Ohala:



Givon (1974) explains the development of aspiration by reference to three facts

i) assimilatory devoicing of nasals before voiceless stops
ii) voiceless nasals tend "to be perceived as breath"
iii) voiceless stops tend to be universally aspirated

A perceptual confusion arises and there is a metathesis in which nasal breath is interpreted as post-aspiration. Ignoring for the moment the assertion that aspiration is the natural state for voiceless consonants universally, a universal of doubtful validity, the metathesis analysis seems plausible.

The two unattested stages above represent periods of variation before any phonetic tendency is phonologized. Wide variation in the realizations of NT sequences are found in many languages, e.g. in Malagasy /mp/ may be [mp, m̥p, m̃p, p, pɦ, ph].

Further Development of the Aspirates

Aspirated stops derived in this manner are liable to other developments after the nasal has been lost. Frequently, they develop into fricatives or affricates. There is much comparative evidence to support this, e.g. Tswana mhaxɔ, Pedi mpʰaɣɔ, Sutho mofaɔ 'provisions'. (Cf. also the development of postnasalized stops into aspirates and fricatives in many New Caledonian languages (Haudricourt 1964, 1971).) Languages frequently pass through an affricate stage before the fricative inventory is established. Hyman (1974) argues that even when there is no evidence for such a stage we may assume a "telescoping" of process. The important point here is to note that these developments occur only after the nasal has been lost; this explains why correspondences such as *mp nt ŋk → f θ x do not violate the universal of hardening discussed above. Similarly, Sango *ŋk > ŋx must have passed through an intermediate stage *ŋkx (<*ŋkh) which derives from aspiration being interpreted as a velar fricative due to the acoustic similarities between the two. This seems plausible when we view the rest of the NT series: *mp̥ > mh, *nt > nh. In fact, the aspiration of velars in many languages is often phonetically [x], e.g. Scots Gaelic (Ternes 1973).

Another seemingly anomalous situation is presented by languages in which stops are voiced except after a nasal. This is certainly a preferred environment for voicing, yet there are correspondences such as Bulu:

*p > v	*mp > f
*t > l	*nt > t
*k > Ø	*ŋk > k

It is necessary to explain the non-voicing of /f t k/ as resulting from previous aspiration, which prevented voicing in this position.

A complete inventory of processes affecting the derivation of NC sequences is beyond the scope of this short paper. Although there are relatively few processes which operate on ND sequences, really only simplification in favor of the oral or nasal consonant, a number of processes conspire to produce NC inventories which include only ND sequences. These include both direct and indirect processes, i.e. those which change feature specifications and those which eliminate one component of the sequence. Apart from the universal primacy of ND sequences, there may be language-specific variation in terms of the relative weightings of other types, e.g. NT, NZ.

Typology and Reconstruction

Part of the value of surveys of evolutionary processes is that they serve as useful tools in diachronic linguistics. This idea is far from novel. Jakobson (1958) noted that such studies form the touchstone of validity for all reconstructed systems. The interaction of processes of change as well as the directionality of change itself often provide insight into problems of reconstruction. Studies of this sort point not only backwards to possible sources of origin, but also forwards to future directions of possible change.

Bennett (1967), in discussing the voicing of post-nasal stops in several Eastern Bantu languages, reconstructs the phonetics of change as:

*mp > *mΦ > *mβ > mb
*nt > *nθ > *nð > nd

Nasality is lost in certain cases and *mp > Φ or f. However, there are several serious problems with the proposed reconstruction. Specifically, the change *mp > mΦ is unlikely to the extent that consonants tend to harden in this environment. In fact, the sequences [mΦ mβ nθ nð] are all uncommon. Although [mβ] occurs, it always represents /mβ/, never /mb/, and the more common realizations of such a sequence are [mb, β, b]. Ladefoged (1968:47) reports the existence of [nθ] in Sherbro, a surprising fact since Sherbro also exhibits /f v s/, none of which appear after a nasal. Kamba exhibits [nð]. On the whole, however, this is a restricted class of sounds.

Further, the fact that intervocalic voiceless stops lenite cannot be cited as evidence that post-nasal stops behave similarly. There are numerous examples where the two develop differently. For example, Londo *mp nt ŋk > p t k whereas p t k > β t x. In Mbɔlɛ, *mp nt ŋk > f t k and *p t k > Φ t Ø. A crucial fact in cases exhibiting the development of a fricative from a voiceless stop is that nasality is lost. In such a case, intermediate stages are attested elsewhere, e.g. Lwena *mp nt ŋk > p^h t^h k^h and p t k > h t k. Also, the existence of nasal and fricative series generally implies the existence of nasal and stop series, which condition is not met by Bennett's system. Thus, the proposed reconstructed chronology cannot be accepted, especially in view of the frequency and naturalness of the process whereby consonants are voiced after a nasal consonant.[5] The point here is that although it is necessary to make inferences about the phonetics of prehistory, these inferences must be solidly grounded in a theory of universal processes and phonetics. There are definite limitations to be placed upon the importance attached to such studies for other purposes,

(5) Cases such as Makua *mb nd ŋg > p t k must involve two distinct stages: (1) nasal loss, (2) later devoicing. There is no neutralization of NC series since *mp nt ŋk > p^h t^h k^h. One step neutralizations of NC series always favor the voiced series, e.g. Yao *mp, mb > mb; *nt, nd > nd; *ŋk, ŋg > ŋg.

e.g., genetic classification, linguistic subgroupings, etc.

Conclusion

This brief paper has attempted to demonstrate how various claims made by Jakobson, Greenberg, and others may be applied to the study of NC sequences. This included an examination of the relationship between synchronic universals and diachronic processes and between typology and universals. Greenberg (1970a:61) points out that the former follows logically from the fact that no change can produce a synchronically unlawful state and that all states are the outcome of diachronic processes. The distinction between state and process is an important one. The general direction of NC evolution toward the least marked ND sequence again supports the generalization that diachronic process explains frequency in phonology. The predictive power of typological studies demonstrates this complex interaction between the shape and patterning of phonological systems.

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