

APPENDIX II. STIMULI USED IN THE IMITATION TASK

Order	Target
1.	dúnča
2.	labím
3.	dufé η
4.	bánte
5.	gúmdi
6.	tonpa
7.	páńso
8.	póndi
9.	bixon̄
10.	tánwi
11.	sámpa
12.	dá ŋga
13.	sagán
14.	fesín
15.	kínbo
16.	fónča
17.	rapún
18.	tánja
19.	démxo
20.	če ŋka
21.	re η ti
22.	tasám
23.	bá ŋ fe
24.	čatan̄
25.	tí ŋ jo
26.	xángo
27.	čámka
28.	fémbo

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1. Introduction

In this paper I would like to focus on a particular approach to the study of sound systems. The central idea of this approach is that it is necessary to distinguish between static constraints and processual constraints in language, and that in the absence of such a distinction, generalizations will either be unaccounted for, or worse yet, will be missed entirely. While some aspects of this framework can be inferred from the works of other linguists, especially that of Joseph Greenberg, my intention here will be to systematically investigate these two realms of explanation and demonstrate their applicability to different phonological problems. Thus, when faced with a linguistic problem in need of an explanation, the following considerations are relevant: 1) does the problem require a synchronic or a diachronic explanation? 2) to what does the synchronic or diachronic explanation owe its existence? In the case of phonology, explanations are usually sought in phonetics, although grammatically-based phonological generalizations (e.g. boundary phenomena) have their explanation in the meaning side of language. However, as we shall see in this paper, it is not sufficient to explain phonetically-based universals in terms of phonetics alone. An assimilatory process which may look phonetically plausible on the surface may in fact turn out to be something quite different. It is at this point that the distinction between states and processes becomes important. The relationship between the two is one of a vicious circle: phonological states are constrained (in part) by the nature of the (predominantly) phonetic processes which give rise to them; and phonetic processes are constrained by the phonological states which produce them. Given this dichotomy, it may be necessary to explain some facts in terms of states, and other facts in terms of processes.

Thus, to take a concrete example, we might ask why it is that no language has only voiced consonants? A synchronically oriented phonologist may refer to such a state as more "marked", citing perhaps the appropriate implicational universal discovered by Jakobson (1941). Or, if he is a phonetically oriented phonologist, he may refer to the greater articulatory effort required to maintain voicing in obstruents. A diachronically oriented phonologist may, on the other hand, insist that a phonological system with only voiced consonants is not found because there is no phonetic process which in a context-free fashion voices all consonants. That is, looking at the opposite situation, languages can exist with only voiceless consonants (perhaps we should limit discussion to obstruents) because we know there is a phonetically motivated tendency for obstruents to become devoiced, as has happened, for example, in the history of CHINESE. Is a system with /b, d, g, v, z/, but not /p, t, k, f, s/ to be ruled out on synchronic (static) grounds





As in KPELLE, there is a rule nasalizing vowels after nasal consonants. In the second stage of the derivation, /mb, nd, ng/ are simplified to [m, n, ŋ]. The result is that the underlying opposition between /m, n, ŋ / and /mb, nd, ŋg/ is realized on the surface as one between nasalized and oral vowels. Since SEA DAYAK does not have a contrast between V and  $\bar{V}$  after oral consonants, we would appear to have a potential violation of Ferguson's generalization. Although the simplification of /mb, nd, ŋg/ is variable at the present time, there is nothing in principle which prevents its becoming obligatory. Once this has happened, a case can be made for an underlying contrast between /V/ and / $\bar{V}$ /, which is neutralized after oral consonants.

Looking at such a state in purely synchronic terms we would be forced to say that SEA DAYAK is heading towards an undesirable situation; namely, one in which speakers will have to produce and perceive nasalization on vowels only when preceded by a nasal consonant. This complexity would be parallel to having to produce and perceive a distinction between [k] and [k<sup>w</sup>] only before [u] (and not, for instance, before [a]). Thus, although there seems to be some motivation for the statement in (4), as formulated it is not entirely adequate.

In order to determine a more appropriate way to state a valid principle concerning the neutralization of nasal/oral vowel oppositions, it is necessary to reconsider the above facts from a diachronic (processual) point of view. Given the oppositions in (7),

(7) [ta] vs. [tā] [na] vs. [nā]

we would not be surprised to find the loss of an opposition as in (8),

(8) [ta]  
[tā]  
[na] > [nā]  
[nā]

where oral and nasalized vowels have merged after nasal consonants. We would, on the other hand, not expect to find the loss of this opposition occurring only after oral consonants, as in (9):

(9) [ta] > [ta]  
[tā]  
[na]  
[nā]

In other words, if an opposition between oral and nasalized vowels were to become irrelevant, i.e. neutralized, we would expect it to occur in the context of a nasal consonant, as in Ferguson's assumption.

Since there is nothing forbidden about the synchronic state which would result from (9), as we know from SEA DAYAK, there must be something universal about the process involved. We can therefore amend the generalization in (4) to read as in (10):

(10) When in a given language oral and nasalized vowels neutralize (merge) historically, i.e. as a process, this occurs next to nasal consonants

What this says is that given the inventory in (7), the nasalization tendency in (8) will be greater than the denasalization tendency in (9). This fact is clearly only an instance of a more general principle having to do with the nature of phonetic assimilations. Thus, given the inventory in (11),

(11) [ku] vs. [k<sup>w</sup>u] [ka] vs. [k<sup>w</sup>a]

we expect neutralization to occur (as a process) first as in (12a), rather than as in (12b):

(12) a. [ku] > [k<sup>w</sup>u] b. [ka] > [ka]  
[k<sup>w</sup>u] > [ku] [k<sup>w</sup>a] > [ka]

However, as in the nasalization case, we would not want to say that synchronic neutralization of labialized and nonlabialized consonants always takes place before rounded vowels, since a language violating this synchronic constraint can arise as follows:

(13) [ku] > [k<sup>w</sup>u] (k → k<sup>w</sup>/ \_\_ u)  
[kəu] > [ku] (əu → u)

First labialization takes place before rounded vowels, and then the diphthong [əu] is simplified to [u]. The result is a contrast between [k] and [k<sup>w</sup>] before rounded vowels, but not necessarily before nonrounded vowels.

Perhaps we can generalize as follows. A neutralization process can take place in two logically distinct environments: 1) a position where there is a universal tendency to "phonologize" an intrinsic variation arising from the coarticulation of two segments; and 2) a position where there is no such tendency to phonologize. A vowel will tend to be somewhat nasalized when adjacent to a nasal consonant, just as a consonant will tend to be somewhat labialized before a rounded vowel. Thus, the processes in (8) and (12a) represent neutralization by phonologization. That is, these neutralizations are the result of assimilation; in (8), neutralization occurs when oral vowels are nasalized after nasal consonants, and in (12a) neutralization occurs when consonants are labialized before rounded vowels. In (9) and



(12b), on the other hand, it is not appropriate to speak of oral vowels assimilating to the orality of a preceding consonant, or labialized consonants assimilating to the nonlabiality of a following vowel. Instead, neutralization takes place by removing complex segments from the phonetic inventory. In Praguian terms, the first kind of neutralization is syntagmatically motivated, while the second kind is paradigmatically motivated (cf. Vennemann's (1972) distinction between I-rules and D-rules).

In summary, we have seen that a complex nasal state may best be understood in terms of the nasal process which gives rise to it. It is important to emphasize, however, that the "unusual" SEA DAYAK situation does represent a synchronic complexity, as other facts presented in section 3 illustrate.

### 3. Denasalization of Nasal Consonants

In this section I would like to discuss three kinds of consonant denasalization: 1) syllable-initial; 2) syllable-final; and 3) post-consonantal. The first kind of denasalization will illustrate the converse of section 2; namely, the argument will be advanced that syllable-initial denasalization as a process can only be accounted for in terms of the nasal state which produces it.

3.1. Syllable-initial denasalization of consonants can take at least two forms, as seen in (14):

(14) a.	m	>	$\widehat{mb}$	b.	m	>	b
	n	>	$\widehat{nd}$		n	>	d ~ l
	ŋ	>	$\widehat{ng}$		ŋ	>	g

In (14a) partial denasalization occurs, converting nasal consonants into prenasalized voiced stops; in (14b) complete denasalization occurs, converting nasal consonants into voiced stops (with [l] being a frequent realization of the denasalization of [n]). As pointed out to me by Matthew Chen (personal communication), partial denasalization characterizes Southwestern MANDARIN dialects of CHINESE as well as some dialects of CANTONESE (e.g. TAISHAN); complete denasalization is found in the Southern MIN dialects of CHINESE. The question which naturally arises is: why do languages undergo syllable-initial denasalization?

Recalling the distinction between syntagmatically vs. paradigmatically motivated processes from section 2, we can easily dismiss the latter as a possible explanation. That is, since it is generally agreed that the changes represented in (14a) produce segments which are more complex than their corresponding source segments, we cannot speak of denasali-

zation as a paradigmatic simplification. Some may wish to argue that the changes in (14b) may be interpreted as segmental simplifications (we are reminded of the so-called "marked" status of nasality); however, one possibility which we may wish to consider is that (14a) necessarily represents an intermediate stage on the way to (14b). That is, [m] first becomes partially denasalized to  $\widehat{mb}$ , and then  $\widehat{mb}$  becomes completely denasalized to [b]. If it is correct to speak of the changes in (14b) as involving an intermediate stage with prenasalized voiced stops, then the change from  $\widehat{mb}$  to [b] can be seen as paradigmatically motivated. This does not, however, explain how denasalization initiates.

The most significant fact about initial denasalization is that it only takes place in languages which contrast oral vs. nasalized vowels. Thus in the CHINESE dialects in question, denasalization takes place only before oral vowels, and not before nasalized vowels (which derive historically from the loss of a final nasal). As a result, earlier [ma] will be pronounced  $\widehat{mba}$ , and earlier [man], for instance, will be pronounced  $\widehat{m\bar{a}}$ . It will therefore never be the case that initial denasalization will completely remove all nasal consonants from the phonetic inventory, since [m, n, ŋ] will remain unchanged before nasalized vowels.

Let us propose writing the rules of partial and complete denasalization as follows:

(15) a.	[+nasal]	→	$\widehat{[+nasal] [-nasal]}$	/	_____	[-nasal]
	C				V	
b.	[+nasal]	→	[-nasal]	/	_____	[-nasal]
	C				V	

In (15a) nasal consonants become prenasalized voiced stops before oral vowels (these are represented as single segments with an internal change in nasality; see Anderson 1975); in (15b) nasal consonants become voiced stops before oral vowels. Since the important conditioning factor is the orality of the following vowel, it is not necessary to include an initial boundary in the formulation of these rules. The question now is, why do the rules in (15) apparently not occur in languages without a nasalization contrast in vowels?

The answer has to do with the fact that initial denasalization is not an articulatorily motivated process, but rather is perceptually motivated. If an articulatory assimilation is to occur to a sequence [ma], it will become  $\widehat{m\bar{a}}$ , and not  $\widehat{mba}$ . This is presumably because of the sluggishness of the velum, which either lowers too soon or stays lowered too long--but which does not have a corresponding tendency to raise too fast (Jean-Marie Hombert, personal communication). Thus, the only reason







place only in the case of the velar nasal. While in the FE<sup>?</sup>FE<sup>?</sup> village of Babouantou there is also denasalization of the Am and An resulting from (19) to Ap and At, respectively, there is no question of where the denasalization first hit in FE<sup>?</sup>FE<sup>?</sup> in general. Thus, whether the notion that denasalization first occurs to final \*m as a general tendency can be salvaged is not clear (it would be nice to have documented cases of final denasalization from other languages). There are, however, two other facts which should be mentioned here. First, of all villages experiencing final denasalization of one kind or another, Batcha is geographically closest to FE<sup>?</sup>FE<sup>?</sup> country. Since I have shown in my earlier work that it is necessary to look at these changes in terms of waves, it is possible that first \*m became [p] in Batcha (and elsewhere in NDA<sup>?</sup>NDA<sup>?</sup> country), then it was generalized to \*ŋ which became [k] (recall the difficulties involved in ordering the possible denasalization of \*n). And this second part of the denasalization process was then diffused by contact into FE<sup>?</sup>FE<sup>?</sup>. In this view FE<sup>?</sup>FE<sup>?</sup> did not initiate the denasalization process, and therefore the generalization that denasalization should take place first in the case of the labial nasal can be maintained.

A second fact is that FE<sup>?</sup>FE<sup>?</sup> is located in Eastern MBAM-NKAM territory, where the weakening of final velars is much more prevalent than elsewhere. Thus, the proto velar oral stop, which I reconstruct as \*g, although it is usually pronounced as a final [k] in other dialects, becomes [h] in FE<sup>?</sup>FE<sup>?</sup>, and is ultimately lost entirely (leaving no trace). Two other dialects in the Eastern part of MBAM-NKAM territory also experience considerable velar loss: in Bangangte \*ŋ is lost after nonhigh vowels, and in Bamoun both \*ŋ and \*g are lost after all vowels. No corresponding tendency for labials to drop is noted in these dialects. It may therefore be the case that the prior denasalization of \*ŋ in FE<sup>?</sup>FE<sup>?</sup> can be partially attributed to the weakening of final velars in general -- and not just nasal ones.

It seems, then, that if we are to make any valid generalizations about final denasalization, we will have to gain some understanding of why it takes place to begin with. I regard denasalization as the result of a strong tendency in MBAM-NKAM not to release final consonants. In Hyman (1972b) I mentioned that final [m] and [n] were sometimes (partially) devoiced in FE<sup>?</sup>FE<sup>?</sup>, and that the denasalization of these consonants in the village of Babouantou takes place as follows:

- (20) \*Vm > Vm̥ > Vp  
 \*Vn > Vn̥ > Vt

The devoicing of final nasals naturally lends itself to a later denasalization

process, since [Vm̥] and [Vn̥] become perceptually confused with [Vp] and [Vt], which are usually not released.

One interesting fact about this denasalization process is that it does not leave behind a nasalized vowel; nor does the partial denasalization in (16a) create "compensatory" vowel nasalization. Finally, neither the partial nor the complete initial denasalization in (14) create nasalized vowels. The derivations in (21) are therefore all unattested, as far as I have been able to determine:

- (21) a. ma > m̄bā                      b. am > ābm̄  
           ma > bā                                      am > āb

The only time we can get a transfer of nasality to a neighboring vowel is when a nasal consonant is effaced rather than denasalized. The derivation of ŵ from \*VN is well-known. The nasalization associated with the morpheme 'first person singular' in TERENA (Bendor-Samuel 1960, as discussed in Leben 1973) is observed in (22):

- (22) [owoku] 'his house'                      [ōwōŋgu] 'my house'

Since the nasalization starts at the beginning of the word and spreads until checked by a nonlow obstruent, we are justified in reconstructing 'my house' as \*Nowoku, perhaps even going as far as \*ŋowoku. When the initial nasal is lost, nasalization becomes distinctive, a prosodic feature in this language.

Whether the generalization that compensatory nasalization does not accompany denasalization will hold up will of course be determined by examining more language data. Anderson (1975), for example, mentions the case of certain CELTIC languages, where \*m lenites as [ṽ] (from earlier [w̄]?). It is interesting that in this case the result is a continuant rather than a stop, a fact which may turn out to have some bearing on the issue. However, even isolated cases of denasalization, as when \*n becomes [l] in PALAUAN (Foley 1975), do not develop compensatory nasalization. In the case of partial denasalization this makes great sense, since we have seen that (14a) and (16a) are motivated by a perceptual reinforcement of the orality of a neighboring vowel. The purpose of denasalization is thus to protect adjacent oral vowels and to shield them from impending nasal assimilation. The cause of nasal effacement, on the other hand, can be quite different. Thus, when \*VN becomes [ṽ], the primary motivation is an articulatory one -- the tendency to develop general open syllabicity. Thus, since this change is not motivated by the need to remove the nasality of the final N, but rather its consonantality, the dropping of N can be (but is not necessarily) accompanied by compensatory nasalization.



3.3. There is, however, a kind of denasalization which frequently is accompanied by vowel nasalization, namely the change from \*CNV to [CṼ]. As argued by Hyman (192a) and generally accepted and further exemplified by Williamson (1973), vowel nasalization most frequently arises in KWA languages in the following way:

(22) \*CVNV > CNV > CNṼ > CṼ

First, CVNV becomes CNV by syncope of the first vowel; then the vowel becomes nasalized, and finally the nasal consonant (or, equivalently, the nasal release on the oral consonant) is lost. Thus, Gwari [gòà] 'to say' is related to PROTO-MBAM-NKAM (non-KWA) \*gamə, and the form [gṽ] of closely related NUPE is derived, as it were, from the Gwari form by means of the sound changes in (22).

As just presented, (22) does not represent a denasalization process. However, in IGBO, the following changes are observed:

(23) \*pVNV > pNV > phṼ > phV > (pV)  
\*fVNV > fNV > fṼ > fV

In (23), \*p stands for a stop or affricate, while \*f stands for a continuant. As in (22), the first vowel is syncope, yielding CNV sequences. At this point two different derivations are obtained. Noncontinuants become aspirated with the nasalization of \*N being transferred onto the vowel; in most dialects, nasalization is then lost from the vowel. Continuants, on the other hand, do not become aspirated, but rather transfer nasalization to the vowel, dropping \*N; here too, nasalization is sometimes lost, although many "central" dialects have a system with [phV] and [fṼ]. (In other dialects aspirated consonants are not found, although it is not clear whether these dialects went through an aspirated stage or not). This same process of CN developing into Ch (where Ch represents aspiration in the case of \*pN and breathiness in the case of \*bN) is observed in several languages of New Caledonia (Haudricourt 1962), as seen in (24):

(24) Nemi	Hyéngghène	Voh-Koné	
pmu	fū	hmu	'bean'
pm <sup>w</sup> aa-	fwā	hm <sup>w</sup> a-	'son-in-law/father-in-law'

In (24) we can take the Nemi forms to be proto, i.e. \*pm-. Haudricourt specifically mentions that some forms with CN come from an earlier CVNV (e.g. \*tama > tna 'father'), which makes these examples look even more like the KWA examples. The question is whether the change from \*pmV to [phṼ] (and later to [fṼ]) should be seen as a denasalization process? As in the FE?FE? denasalization cases in (20), we can hypothesize an intermediate CN stage (cf. Williamson 1973). This does not, however, ex-

plain how \*bN develops into breathy voice. It thus probably makes better sense to speak of both \*p and \*b "obstruentizing" the following nasal, which then develops into the appropriate laryngeal fricative: [h] after voiceless noncontinuants and [ɦ] after voiced noncontinuants. (A similar process can be proposed for the change from \*NC to Ch in certain BAN-TU languages (see Givón 1974), although this apparently is limited only to combinations of nasal + voiceless noncontinuants).

The proposed chain of events are therefore as shown in (25):

(25) \*pNV > pNV > pNṼ > phṼ > phV  
\*bNV > bNV > bNṼ > bhṼ > bhV

The first and most crucial change is the obstruentization by which \*N becomes voiceless after \*p and breathy after \*b (a breathy nasal is an obstruent nasal). The other changes involve vowel nasalization, denasalization of [N] to [h] and [N] to [ɦ], and vowel denasalization.

#### 4. Conclusion

In the preceding sections we have investigated cases of neutralization of nasalized vowels and denasalization of nasal consonants. We have seen that nasal states and nasal processes interact in complex, and not always obvious ways. Much more can be said about the kinds of nasal phenomena found in various languages. Two areas which I have thus far avoided are nasal effacement syllable-finally and nasal effacement before voiceless fricatives. Both processes are particularly common in African languages in general and MBAM-NKAM in particular, and I hope to report on them in a future paper.

For the purposes of this conclusion I will restrict myself to one last point. In our search for linguistic universals, we frequently have occasion to cite data from languages which either we, or perhaps no one, knows very well. If the bits and pieces of information which we gather all point in the same direction, then there is no problem. The problem arises when a fragment of data is used as a counterexample to a generalization which has been arrived at through the examination of better-known languages. That is, fragments of data from little-known languages must be processed with respect to an independently motivated conceptual framework. The framework in which I have approached nasals and nasalization in this paper has allowed me to propose certain generalizations which in the absence of a state-process dichotomy might have been missed or obscured. One of the points which was made in section 2 was that there are generalizations which are valid when applied to processes, but not valid when applied to states. Languages have synchronic phonological rules which are sometimes different in form and substance from the kind of



"natural" diachronic processes which are often found.

I would like to conclude with a rather spectacular example of a language where the diachronic processes involved are quite different from the synchronic rules which would normally be proposed. Shimizu (1971) presents the following historical changes leading from PROTO-JUKUNOID to Wukari and other dialects of JUKUN (I have somewhat condensed the changes to facilitate the presentation):

(26)	(a)	(b)	(c)	(d)
*mab			> māb	> mā
*mam			> mām	> mā
*ma			> mā	> mā
*mbab				> m̄ba
*mbam	> mmam	> mam	> mām	> mā
*mba				> m̄ba
*bab				> ba
*bam			> bām	> bā
*ba				> ba

In (26)  $\underline{m}$  stands for any of the three final proto-nasals \*m, \*n or \*ŋ, while  $\underline{b}$  stands for any of the final proto-oral consonants \*p, \*t, \*k, \*b, \*d, \*g. PROTO-JUKUNOID, thus, was characterized by syllables which could be closed by either oral or nasal stops. The changes involved in going from these proto syllable structures to those in Wukari and other dialects are as follows: (a) the unit phonemes / $\underline{mb}$ ,  $\underline{nd}$ ,  $\underline{ŋg}$ / were converted to geminate nasals if there was a nasal later in the word (an equivalent change, known as "Meinhof's Law" occurred in BANTU); (b) these geminate nasals are degeminated; (c) vowels are nasalized both before and after nasal consonants; and (d) all final consonants drop.

The result of these changes is that in a dialect such as Wukari, nine proto syllable types are reduced to the four reproduced in (27):

(27) [ba]	[ $\underline{mba}$ ]
[bā]	[ $\underline{mā}$ ]

Because of the complementary distribution of [ $\underline{mb}$ ], which occurs only before oral vowels, and [m], which occurs only before nasalized vowels, it is possible to phonemicize [ $\underline{mba}$ ] as /ma/ and [ $\underline{mā}$ ] as /mā/. We then need the rule in (28):

(28)	$\begin{bmatrix} m \\ n \\ \eta \end{bmatrix}$	$\rightarrow$	$\begin{bmatrix} \underline{mb} \\ \underline{nd} \\ \underline{ŋg} \end{bmatrix}$	/	_____	[-nasal]
						v

However, if we look at the historical changes in (26) we see that in the

history of JUKUN no such diachronic process took place. The possibility of representing synchronic Wukari dialect with the rule in (28) results from the interaction of the several sound changes represented in (26). (Welmers 1968 recognizes /ba/, /bā/, /ma/ and /m̄ba/ with an implicit rule nasalizing vowels after a nasal consonant.) Luckily the rule in (28) is attested as a diachronic process, as we saw in (14a) and (15a). However, cross-linguistic searches for phonological universals must always attempt to isolate "specious" processes which falsely appear to contradict well-motivated static and processual constraints in language.

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RHINOGLOTTOPHILIA: THE MYSTERIOUS CONNECTION  
BETWEEN NASALITY AND GLOTTALITY

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1.0. Introduction

Rhinoglottophilia--an affinity between the feature of nasality and the articulatory involvement of the glottis--is more prevalent than is generally realized. Although it sounds like a disease, or even a perversion, rhinoglottophilia is actually quite a benign and natural condition. It is of interest chiefly because it is not obvious why there should be any such affinity at all. At first glance there does not seem to be any particular relationship between the lowering of the velum and the articulation of such laryngeal sounds as [h] or [ʔ]. Yet we can document this connection with evidence from a variety of genetically unrelated languages, both synchronically and diachronically.

After partially surveying some synchronic data from TAI, TIBETO-BURMAN, INDO-EUROPEAN, SEMITIC, and NIGER-CONGO [section 2], we take a look at some articulatory explanations that have been offered, both impressionistically (Matisoff) and scientifically (Ohala) [section 3]. We then go on to focus on the nasal/glottal interrelationship as it has been manifested in the history of TIBETO-BURMAN, especially with regard to the phonetic interpretation of the controversial prefix "h-" of Written TIBETAN [section 4].

In section 5, we consider an apparent paradox: if nasality and glottality are so closely related syntagmatically (co-occurring on the same or neighboring segments), how has it happened that the two features have come to be opposed paradigmatically to each other at various stages in the history of TIBETO-BURMAN?

2.0. Nasalization of vowels in the environment of "laryngeals"

Nobody is surprised to find that a vowel has become nasalized before or after a nasal consonant [mV̄-, nV̄-, ŋV̄-; -Vm̄, -Vn̄, -Vŋ]. This is a classically simple sort of intersegmental assimilation, whereby the lowered velum perseverates into the articulation of the following vowel, or is lowered during the articulation of the vowel in anticipation of the following consonant. A matter of the timing of the velar gesture. No such explanation can account for vowel nasalization in the environment of [h] or [ʔ], since no laryngeal segment has an "intrinsic" nasal component to be "assimilated to". Yet many languages display this phenomenon.

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