NASAL REPLACEMENT IN WESTERN AUSTRONESIAN: AN OVERVIEW

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1. INTRODUCTION

Western Austronesian languages often show an alternation between root-initial oral consonants and homorganic nasal consonants as part of the derivational morphology of the language [1] Details of the phonological changes and the functional significance of the changes vary from one language to another, but the following examples from Malay[2] typify the changes which one can expect to find:

(1)

Transitive root	Active form
pukul 'to hit'	memukul
tendaŋ 'to kick'	menendaŋ
kunyah 'to chew'	meɲunah

The changes, and other ones like them, will be referred to as 'nasal replacement' throughout the present discussion, which will be an overview of the various forms nasal replacement takes in Western Austronesian languages. The particular meanings which attach to the morphemes triggering the nasal replacement vary considerably and include: active transitive forms of a verb in Malay, agentive nouns in Malay, plural subject marking with intransitive verbs in Chamorro, indefinite object marking with transitive verbs in Cuyunon (Sulu archipelago). These semantic aspects, though interesting in their own right, will be largely ignored here (but see section 6.3).

2. THE NATURE OF NASAL REPLACEMENT

Basically, there are two positions which have been adopted in the literature on the phenomenon of nasal replacement. One approach, found for example in Dempwolff (1934-8:2.15), sees a derived form like Malay *memukul* as made up of a prefix *me-* and a change from oral to nasal in the initial consonant of the root *pukul* 'to hit'. This can be schematized as follows:

(2) me + pukul 'to hit'
↓
m

It is this conception of the structure which gives rise to the term 'nasal replacement'. The alternative approach prefers to see the prefix as containing a nasal ending, often written as a morphophoneme N, with some subsequent process accounting for the single nasal consonant in place of N + root-initial consonant, as schematized below:

(3) meN + pukul 'to hit'
↘ ↙
m

[1] I would like to thank Robert Blust and Ted Llamzon for helpful discussions on the present topic. I will not concern myself here with Eastern Austronesian (Oceanic), but the reader is referred to Lynch (1975) for some discussion of oral/basal alternations in Oceanic.

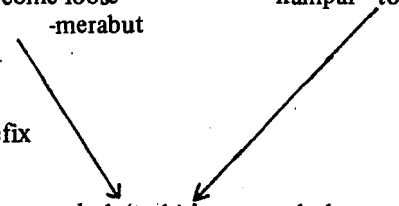
[2] I will use the term 'Malay' here to refer to shared properties of Bahasa Malaysia and Bahasa Indonesia. Schwa will be represented simply as e.

Each of these positions can be supported by additional data in Malay. Thus, with root-initial *l, r,* the shape of the prefix is *me* (supporting the position in (1)), whereas with root-initial vowels and *h,* the prefix is *meŋ* (supporting (2)):

(4) lepas 'free' - melepas ajar 'to teach' - mənajar

rabut 'to come loose' -merabut

hampar 'to spread out' -menhampar



suggests me- as prefix

suggests men- as prefix

pukul 'to hit' - memukul
(prefix is arguably me- or men-)

Either of these approaches can be elaborated in order to accommodate the relevant facts. The particular approach adopted is determined more by the linguist's orientation and the kinds of goals he has in mind than by any peculiarities of the data. A familiarity with the literature on Austronesian, in which Dempwolff's work has been so influential, would naturally incline one to the approach outlined in (2). Even if one has not been influenced by Dempwolff, one may opt for the approach in (2) on the basis of morphological alternations like those in (5), taken from Iban, where the oral/nasal alternation can be most plainly seen.

(5) Iban (Asmah 1979)

peda?	to see
meda?	sees
tiki?	to climb
niki?	climbs
dilat	to lick
nilat	licks
ketaw	to harvest
ŋetaw	harvests
gagay	to chase
ŋagay	chases

Similar oral/nasal alternations can be found in other languages of Borneo, such as Bajau and Kadazan, and also in Javanese. Although one could still insist on an underlying analysis of such data in terms of a prefix N, on the face of it the data would be most naturally described in terms of an oral/nasal alternation. Once Iban is analyzed in this way, then a linguist with comparative interests would be inclined to adopt a parallel analysis for, say, Malay - in other words adopt position (2). If, on the other hand, one's interest lies more in phonological theory, then one will be more concerned with fitting one's description into the theory. Since the replacement of an oral segment by a nasal segment is not a familiar phonological process, there would be a tendency for a phonologist to avoid an analysis which appeals to such a rule. Positing a nasal ending in the prefix would be more appealing within a phonological orientation, since there would then be a source for the nasality which surfaces in the initial consonant of the root.

3. ALTERNATIVES TO DEMPWOLFF's APPROACH

It is worthwhile looking at the approach embodied in (3) more carefully to see just how the phonomenon is accommodated in such an account, since a number of interesting issues arise which are not always given the attention they deserve.

In a systematic phonemic framework, one needs to identify an underlying systematic phoneme in place of the morphophoneme N. The usual basis for selecting the underlying phoneme is the shape of the nasal before a root-initial vowel or h, resulting in the choice of /ŋ/ in most cases (as, for example, in Malay). In Chamorro, however, it is /n/, as evidenced in the data below:

(6) Chamorro (Topping 1973)

Intransitive root	Used with plural subject
tohge 'to stand up'	manohge
kuentos 'to talk'	manguentos
estudia 'to study'	manestudia
hanao 'to go'	manhanao

The Chamorro morphology is remarkable not only for the appearance of n before root-initial vowels, but also on account of the unusual functional significance of the prefix. An underlying /n/ has also been argued for in Keley-i on the basis of alternations like those shown in (7).

(7) Keley-i (Hohulin and Kenstowicz 1979)

Root	Active, perfective form
duntuk 'to hit'	nenuntuk
gubat 'to fight'	nenjubat
hulat 'to cover'	nenulat
inum 'to drink'	nenjinum

Here we see the form *nen-* when the root begins with *h*, but *neŋ-* when the root begins (phonemically) with a vowel. The authors choose /nen/- as the underlying form of the prefix and account for the alternate neŋ- as the result of (approximate) nasal assimilation before the phonetic glottal stop which appears initially in [ʔinum] 'to drink'. To facilitate this account, the authors in fact posit an underlying initial glottal stop in such forms, although the glottal stop is completely predictable in this position.[3]

In Toba Batak, too, one can find evidence for underlying prefixes /man-/ and /pan-/, even though these have the shape *maŋ-* and *paŋ-* before vowel-initial roots. The morphophonemic changes affecting root-initial stops with these prefixes are shown in (8):

(8) Toba Batak (Nababan 1966 and Percival 1964)

N + p → m
N + t → n
N + k → kk
N + b → bb
N + d → dd
N + g → ŋg

The changes affecting root-initial *k, b, d* are characteristic of the word-sandhi changes

[3]The alternation of *hulat* with *nenulat* can be explained historically since the *h* of the root derives from an earlier *s. Robert Blust has informed me of the following developments in Keley-i: *susu > *huhu?* 'breast', *tanis > nanih 'weep' *qasawa > ʔahwaʔ 'wife'. *nenulat* would be the expected outcome of a *nen-* prefix combining with an earlier *sulat root.

which occur when an underlying /n/ , not /ŋ/, comes to stand before such stops. Consequently, the first step in Nababan's derivation of the derived forms is converting an underlying /ŋ/ (so chosen because it appears with vowel-initial roots) to an intermediate *n*, thereby allowing the independently required sandhi rule to bring about the observed changes. One could just simply posit underlying /man-/ and /pan-/ and attribute the appearance of the velar nasal with vowel-initial roots to replacement by a nasal of an initial glottal stop.

In languages like Iban exemplified in (5), one could still posit an underlying nasal prefix to handle the alternation in forms like *peda?* 'to see' – *meda?*, as explained above. Again, one would look to vowel-initial roots to determine the underlying form. In the case of Iban, this means positing an underlying /ŋ/. For Kadazan, which also shows simple nasal replacement of stops like Iban, one would posit an underlying /m/, *m* being the form of the nasal prefix before vowel-initial roots, as illustrated in (9).

(9) Kadazan (Asmah 1979 and my notes)

Root	Active form
patai 'to die'	matai
buntuŋ 'to rot'	muntuŋ
insi 'to move'	minsi
indau 'to come down'	mindau
uhi 'to go home'	muhi
odop 'to sleep'	modop

I know of no other cases where /m/ must be posited as the underlying form of the prefix. Possibly, both the Kadazan *m* prefix and the Iban *n* prefix result from reductions by different processes of an earlier *mVN prefix, consistent with what is found in other Western Austronesian languages. In both languages, the initial *mV was lost, but only after the N was assimilated to *m* in Kadazan.

Adopting position (3) also requires some account of how the sequence of nasal + root-initial consonant comes to be simply one nasal consonant. Where there is an attempt to formalize the change in terms of phonological rules, the approach almost invariably followed is to posit two rules: a rule of nasal assimilation followed by a rule deleting the root-initial consonant. This is the approach followed, for example, by Onn (1980) in the analysis of the Malay forms like those in (1). The strategy is not altogether satisfactory. The deletion of the root-initial consonant is typically introduced without any comment, as though it were as phonetically natural as, say, the nasal assimilation rule. But while nasal assimilation in some form or other is indeed widespread, the deletion of a consonant between a nasal and a following vowel is certainly not on a par in terms of phonetic naturalness. The only discusion of the naturalness or otherwise of such a deletion that I know of is in Foley (1977:125-6). In Foley's theory, the postnasal position is one of the positions identified as strong, from which it follows (in Foley's theory) that an element in this position will undergo strengthening, rather than weakening. The Austronesian example Foley considers is Javanese, where one has alternations such as *pačol* 'hoe' vs. *mačol* 'to hoe'. In the approach being considered here, the *m* of the derived verb results from the deletion of *p* from a more abstract *mpačol*. At first glance, a deletion like this would appear to be weakening, counter to the predictions of the theory. Foley's way around this difficulty is to appeal to the 'closure property': 'A special case of manifestation of strengthened elements arises when the element is already the strongest element and cannot appear phonetically as a stronger element. In this case, maintaining the closure property (that operations on elements in a set yield an element in that set), the strengthened strongest element undergoes modular depotentiation, appearing phonetic-

ally as the weakest element' (123). In other words, since Javanese does not have anything stronger than single voiceless consonants in its phonological system, these consonants revert to the weakest element possible, i.e. they delete. While Foley's ideas are interesting, the crucial notions of 'closure property' and 'modular depotentiation' are in need of much further elaboration and substantiation before they can provide a real explanation of the consonant deletion.[4]

Even the appeal to a rule of nasal assimilation in accounting for nasal replacement is not always as straightforward as it might first appear. Apart from the difficulties involved in correctly specifying what the particular changes are (discussed in section 4) there can be more complex issues which arise. Hohulin and Kenstowicz (1979) discuss one such issue in connection with nasal replacement in Keley-i, already illustrated above in (7). The authors account for the nasal replacement by involving a rule of nasal assimilation in which underlying *n* assimilates to *ŋ* before a glottal stop. As the authors point out, there is in addition a rule of nasal assimilation in Keley-i, illustrated below with the prefix *ʔ in-*:

(10) Keley-i (Hohulin and Kenstowicz 1979)

Root	'Accessory past' form
pehal	ʔimpehal 'crack bamboo'
tweik	ʔintewik 'prick'
gitek	ʔiŋgitek 'cut'
heged	ʔinheged 'wait'
ʔala	ʔinʔala 'get'

Notice that the *ʔ in-* prefix has the form *ʔ in-* before the root-initial glottal stop, unlike *nen-* (which takes the form *neŋ*). Apparently, then, one cannot use the 'free-ride' principle to make one rule of nasal assimilation work in all cases, at least not without making modifications to the rule. In other words, the nasal assimilation part of nasal replacement can not always be simply equated with independently justified rules in the language. A similar situation is found in Tigwa Manobo (Mindanao). In this language, the derivative prefixes *paŋ-*, *maŋ-*, and *naŋ-* trigger nasal replacement. If one analyzes such replacement as involving nasal assimilation, then this assimilation is distinct from the nasal assimilation found with a prefix *ʔ in-*. There is in fact a third type of nasal assimilation which occurs at a word boundary, affecting word-final *n*. These three types of assimilation are summarized below:

(11) Tigwa Manobo (Strong 1979)

paŋ- maŋ- naŋ-	ʔin-	word-final n	Before a following
m	m	m	p
m	m	m	b
n	n	n	t
n	n	n	d
ŋ	n	ŋ	k
ŋ	ŋ	n	g
ŋ	n	n	h

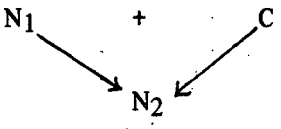
Clearly, neither of the independently required rules of nasal assimilation can be carried over to the nasal replacement data. Yet another example of this is found in Ka-

[4]Foley, in another section of his book (39-43), discusses an approach to coalescence of elements such as nasal + obstruent coalescing to a single nasal. Obviously, this idea is also applicable to the nasal replacement phenomenon, although Foley does not pursue this. I return to the idea of consonant coalescence later in this section.

linga, where, according to Gieser (1970), the nasal replacement replaces the glottal stop with *ŋ*, but in cases of 'common' assimilation a nasal assimilates to *n* before the glottal stop.

In spite of difficulties which arise when rules of nasal assimilation and consonant deletion are invoked, this remains the favored approach for many linguists. Probably, this approach appeals most because linguists feel so comfortable with the process of nasal assimilation. Another approach which deserves more consideration is to construe nasal replacement as the result of a consonant coalescence. The relationship between an underlying nasal + *p* and the resulting *mw* would then be comparable to the relationship which holds between, say, *x* and *f*. This means that the nasal replacement is accomplished in just one step instead of two. In schematic terms, the process can be thought of as follows:

(12)



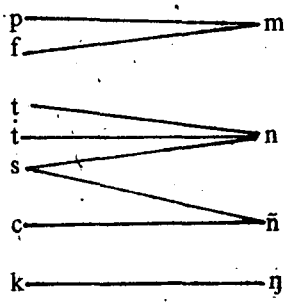
[place of articulation as for C
manner of articularion as for N1]

In this approach, there is no deletion of consonants which has to be explained away – features of the two underlying segments are simply fused to form a new segment. Some discussion of this type of coalescence can be found in Foley (1977:39-43), where the coalescence is construed as a strengthening of the 'bond' between the two underlying *segments*.

4. THE 'HOMORGANIC' NASAL

While the nasal which results from nasal replacement may roughly be described as 'homorganic', this description needs some qualification. Examination of Western Austronesian languages reveals the following matchings of oral and nasal consonants (there are some exceptions to be discussed shortly):

(13)



An interesting aspect of the nasal replacement process is that *s* is replaced by ñ in some languages, instead of the strict homorganic counterpart *n*.[5] In Philippine languages, *s* alternates with *n*, whereas in Malay languages (and Chamorro!) the usual alternate is ñ. Since the Philippine languages often lack a distinct palatal series of consonants in the phonemic system, one might look for an implicational universal such as: *ñ* replaces *s* only when the language has some phonemic palatals independent of nasal replacement.

[5] According to Forman (1971:ix), root-initial *s* and sometimes *d* alternate with *ñ* in the derivation of distributives in Kapampangan.

That is to say, nasal replacement itself will not create a palatal series. On the basis of the data I have looked at, this is true. There is, however, at least one case where the nasal replacement creates a palatal nasal though there is no palatal nasal occurring independently of the nasal replacement (I am grateful to Robert Blust for this information). Prentice (1971:298ff) gives the following phonemic inventory of the Alumbis dialect of Murut (Kalimantan and Sabah):

(14)

	p	t		k	ʔ
	b	d	j	g	
m	n		ŋ		
	s				

Although the palatal /j/ phoneme is marginal in related dialects, Prentice specifically mentions that the palatal phoneme is part of the core of the phonemic system in Alumbis and is not, for example, restricted to loanwords. *ñ* does occur, but the only source for it is the nasal replacement which takes place when the verbal prefix *aŋ* is attached to a root having *s* as the initial phoneme:

(15)

simbul 'to run'	añimbul 'will run'
sampuy 'to blow'	añampuy 'will blow'

These derived forms were also recorded by Prentice with *n* in the place of *ñ*. Here, then, nasal replacement creates a new palatal nasal alongside an existing palatal stop.

The question remains, however, why *s* should alternate with a palatal nasal when the homorganic *t* does not. It may be that in some languages, *s* is articulated closer to the palatal region ('postalveolar'). Articulatory explanations along these lines seem rather unconvincing, however, as the *s* and *t* sounds of these languages are nearly always described as having the same point of articulation. As far as I am aware, the only explanation which has been proposed to date is an historical one, first proposed by Dempwolff (1934-8: Vol. 1, I, 39). In this view, the alternation of *s* and *ñ* is seen to be the reflex of a proto alternation between a palatal stop and its true homorganic nasal. The palatal stop has changed to *s* in the modern languages, while the palatal nasal remains, giving rise to the alternations found in the Malay languages. (16) summarizes this hypothesis:

(16)

Proto-language	p - m	t - n	c - ñ	k - ŋ
Malay languages	p - m	t - n	s - ñ	k - ŋ

Dempwolff's argument for the palatal stop in the proto-language appealed, in fact, to the nasal replacement facts in Malay languages (considerations of phonological symmetry also influenced the reconstruction). In languages where *s* alternates with *n*, one would presumably say that the language has readjusted its morphophonemics to make the alternations appear more regular synchronically. Obviously, the hypothesis of a proto palatal stop is a way of accounting for the present alternations, but one may not have to resort to the historical account. I believe some light can be shed on the *s - ñ* alternation by comparing the Austronesian facts with an oral/nasal assimilation found in Fuzhou, a Northern Min dialect of Chinese. The assimilation in question affects word-initial consonants following a word-final nasal (which can only be ŋ) as illustrated below (tones are omitted):

(17) Fuzhou (Cihui 1964 and Gaiyao 1960)

Parts of compound as spoken in isolation	Compound word

iu + t'ieŋ + p'au	iu lieŋ mau	maize
touŋ + tau	touŋ nau	noon
kuaŋ + kuaŋ	kuaŋ ŋuaŋ	a tin

As can be seen, the resulting nasal is homorganic to the original oral initial consonant in these cases. With the alveolar affricate initial, however, the resulting nasal is sometimes *n* (the alveolo-palatal nasal) and sometimes *ŋ*, but never the alveolar nasal:

(18)	suoŋ + ts'uoŋ	suoŋ nuoŋ	imagine
	k'aŋ + muoŋ + ts'ouŋ	k'aŋ muoŋ nouŋ	window

I have not been able to determine the basis for the split into *n* and *ŋ* assimilation. In any case, the initials which assimilate to *n* do not derive from an earlier palatal or alveolo-palatal. The oral/nasal mappings found in Malay nasal replacement and the Fuzhou assimilation compare, then, as follows:

(19)

Malay	Fuzhou
p — m	p,p' — m
t — n	t,t' — n
s — ñ	ts,ts' — n
k — ŋ	k,k' — ŋ

In both sets of data, a difference in manner of articulation among alveolar consonants is translated into a difference in point of articulation among the nasals. The (alveolo-) palatal region is exploited in these mappings, presumably as a way of preserving contrasts between the oral consonants in the 'crowded' alveolar region. The data from Fuzhou thus shows that a functionally oriented account is surely plausible for the Malay data as well. While the comparison with Fuzhou does not establish anything more than the plausibility of this approach, I beleive this is an approach which should be more fully explored.

One case where an historical explanation does seem to offer the best explanation for synchronic irregularity is Kayan (Uma Juman) (see also the historical explanation of the Keley-i data in footnote 3). Nasal replacement in this language replaces root-initial consonants with the homorganic nasal (e.g. *bagi?* 'to divide?' *magi?*) consistent with other Borneo languages, except that some *h*-initial roots have their *h* being replaced by *ñ*: *haduy* 'to work' - *ñaduy*. According to Robert Blust (to whom I am indebted for the information on this language), the initial *h* of these roots derives from an earlier *s*, ultimately from Dempwolff's proto palatal stop, thereby explaining the otherwise bizarre alternation of the glottal with the palatal nasal.

For *h* and the glottal stop, the notion of 'homorganic' nasal can be conveniently stretched to cover cases where the resulting nasal turns up as the velar nasal, as in Javanese *handuk* 'towel' - *ŋanduki* 'to dry with a towel'. Here, it seems natural to class the velars and glottals together. For other languages, however, one needs to keep the velars and the glottals distinct to prevent glottals being treated like velars, as in the Keley-i forms cited above where we find *hulat* 'cover' - *nenulat*. *h* thus occupies an interestingly ambiguous position with respect to the nasal replacement process. Where convenient, it can be treated as a peripheral member of the velar class; otherwise it may be classified as a glottal distinct from the velars. Similarly, the glottal stop is subject to different analyses. Consider, for example, the sets of data below:

(20) Malay meŋ + /ajar/ 'to teach' → meŋajar
[ʔajar]

Keley-i nen + /inum/ 'to drink' → neŋinum
[ʔinum]

For Malay, it is quite possible to simply ignore the presence of the low-level phonetic glottal stop and account for *meŋajar* as the result of prefixing *meŋ-* to *ajar*. In Keley-i, on the other hand, the appearance of a velar variant of *nen-* suggests that we analyze *neŋinum* as the result of prefixing *nen-* to *ʔinum*. Another way to describe this difference between Malay and Keley-i is to say that, in Malay, the prefix attaches to the root in its phonemic form, whereas in Kely-i, the prefix is attached to the phonetic form of the root as realized in isolation.

Ivatan is interesting in two ways with respect to nasal replacement in derived verbal forms inolving a prefix *maN-*. Hidalgo and Hidalgo (1971), from whom the information on Ivatan is taken, segment *maN-* into two separate morphemes *ma-* and *-N*, but, for our purposes, the internal structure of *maN-* is irrelevant. With vowel-initial roots, there is an assimilation of the *N* to the VOWEL, with *ii* being used before *i* (e.g. *isek-mañisek* 'hide x in crevices') and *ŋ* with the other vowels *u,e,* and *a* (e.g. *amun - maŋa-mun* 'fish'). The distribution suggests an underlying *maŋ-*prefix and a palatalization rule changing *ŋ* to *ñ* before the high front vowel. Further support for such an approach may be found in the fact that there is a phonotactic constraint in Ivatan (Hidalgo and Hidalgo 1971:27-8) to the effect that the velar nasal is never found before *i*. The change of *maŋ-* to *mañ-* before *i* can thus be seen as an adjustment to the prevailing phonotactic pattern. As described by the authors, the occurrence of the *mañ-* form is actually wider than just indicated, being used whenever the vowel of the intial syllable of the root is *i* – not just when the root begins with *i*. Unfortunately, the only example of this part of the rule given by the authors involves a root with initial *c* (*cita - mañita* 'search') where the root-initial *c* could give rise to *ñ* in any case. Crucial examples are ones where the root begins with a *p* or a *t* and these are missing from the description. If the authors' characterization of nasal replacement can be relied upon, then the palatalization rule must apply to any nasal which comes to stand before *i*. In other words, even the *m* which one would expect to replace root-initial *p* must be changed further to *n* before *i*, as also the *n* which would normally replace root-initial *t*. Unlike the change from *ŋ* to *ñ*, however, the changes from *m* to *ñ* and *n* to *ñ* cannot be motivated on independent phonotactic grounds in Ivatan, since both *m* and *n* may occur before *i* in monomorphemic words. The appearance of the palatan nasal, then, cannot be simply explained away by appealing to independently required phonological rules of Ivatan.

A second point of interest about Ivatan concerns the matching of oral and nasal consonants in cases other than those where *i* is the vowel of the first syllable of the root. According to the description provided by Hidalgo and Hidalgo, *m* replaces *p* and *n* replaces all other consonants participating in the process. I take this to mean that the nasal replacement process includes at least the following matchings:

(21) p —— m
t ——
c ——— n
k

This would be the only case I know of where the alveolar, palatal, and velar series are all matched with *n*.

5. CONSONANTS PARTICIPATING IN NASAL REPLACEMENT

A comparison of nasal replacement processes in Western Autronesian languages reveals a restricted number of possibilities regarding which consonants undergo the process. The chart in (22) summarizes these different possibilities with respect to the major points of articulation. The chart only purports to summarize the patterns found in cases where nasal replacement is fully productive. As discussed in section 6, nasal replacement may be

constrained in a particular language by phonological or non-phonological factors, even to the point where one must simply specify for each potential input to the rule whether the form undergoes nasal replacement or not.

(22)

	Consonants replaced by nasals					
	p	t,s	k	b	d	g
Malay type	+	+	+	–	–	–
Sama Badjao (Sulu Archipelago, northern Borneo) type	+	+	+	+	–	–
Cebuano type	+	+	+	+	+	–
Kalinga (northern Luzon)	+	+	+	+	+	+

In terms of manner of articulation, the voiceless obstruents clearly take priority over the voiced obstruents, whereas in terms of place of articulation, preference is given to labial, then alveolar, and finally velar.[6] These patterns are consistent with the hierarchy of strength of elements, as proposed by Foley (1977). His hierarchy for relative strength in manner of articulation (his β parameter) is:

(23)

voiced spirants	voiced stops	voiceless stops	voiceless spirants affricates aspirates double stops
→			
1	2	3	4

The data in (22) is consistent with this gradation in the sense that the sets of obstruents which participate in nasal replacement form a continuous stretch on the continuum. There are no cases, for example, where voiceless spirants and voiced stops undergo the process, but voiceless stops do not. For place of articulation (Foley's α parameter), Foley recognizes two possible hierarchies - a Romance type and a Germanic type:

(24a) Romance type:

velars	dentals	labials
→		
1	2	3

(24b) Germanic type:

velars	labials	dentals
→		
1	2	3

The nasal replacement patterns in Austronesian are thus seen to be of the Romance type, with labials, dentals, and velars undergoing the process in this order of preference.

A consideration of /maŋ-/ and /paŋ-/ prefixes in Toba Batak allows us to make a further refinement to the above account. Nababan (1966) and Percival (1964) both limit fully productive nasal replacement with these prefixes to root-initial *p* and *t*. With root-

[6]This hierarchy contrasts with that proposed for Oceanic by Biggs (1965:384-5): 'there was probably a process whereby word-bases containing one of the proto-consonants *b,t,d,g,s alternated with forms in which the homorganic nasal preceded the oral consonant'.

initial *s* and *b*, some roots undergo nasal replacement and others do not. From the descriptions given, it seems that most cases of root-initial *s* do undergo replacement, whereas most cases of root-initial *b* do not undergo replacement. The class of *b*-initial roots participating in nasal replacement seems in fact very small (Nababan lists five words, Percival four).[7] With root-initial *c,k,d,j,g*, there is no nasal replacement. If we simply ignore the small classes of *s* and *b* roots which behave 'irregularly', then we can add a 'Toba Batak type' to the chart in (22), namely:

(25)

	Consonants replaced by nasals					
	p	t,s	k	b	d	g
Toba Batak type	+	+	–	–	–	–

As such, the Toba Batak types finds its place in the line-up of (22) as the most restricted in terms of scope of application of nasal replacement, though still consistent with Foley's strength hierarchies. On the other hand, one might NOT be so willing to dismiss the 'irregular' *s* and *b* roots, claiming instead that the *s* and *b* roots represent a transitional state in the gradually increasing scope of nasal replacement. That is, nasal replacement, already fully productive with *p* and *t*, is extending (by 'lexical diffusion') its domain of application to *s* and *b*. This view would require us to refine the implicational hierarchy of consonants participating in the nasal replacement process. A more precise model for the hierarchy among the stops, still consistent with Foley's basic claims, is shown in (26).

(26)

$$\begin{array}{ccccc} p & \rightarrow & t & \rightarrow & k \\ \downarrow & & \downarrow & & \downarrow \\ b & \rightarrow & d & \rightarrow & g \end{array} \qquad X \rightarrow Y = Y, \text{ only if } X$$

In this model, nasal replacement of *b* is dependent upon nasal replacement of *p* only (consistent with the Toba Batak data). That is, *p,t,k* do not all have to undergo nasal replacement before *b*, as suggested by the patterns in (22). (26) implicitly claims that nasal replacement could apply, at least potentially, to the sets of stops in (27a) whereas there should not be any language where nasal replacement applies only to the sets of stops shown in (27b).

(27a) Predicted possible scope of nasal replacement				(27b) Predicted impossible scope of nasal replacement			
(i)	p	t	–	(i)	–	t	–
	b	–	–		b	–	–
(ii)	p	t	k	(ii)	–	t	k
	b	–	–		–	–	–
(iii)	p	t	k	(iii)	p	t	k
	b	d	–		–	d	–
(iv)	p	t	k	(iv)	–	t	k
	b	d	g		–	d	g

[7] Van der Tuuk (1867) referred to a phonological constraint on the application of nasal replacement with *b*. The constraints is that nasal replacement with *b* 'does not occur when the syllables of the word begin with identical consonants' (95 in the English translation of 1971). His examples are ***bunu - mamunu, balbal - mambalbal, bobok - mambobok.*** Neither Nababan nor Percival gives evidence of a constraint of this sort.

(v)	p	t	–		(v)	–	–	–
	b	d	–			b	d	g

etc. etc.

While not all of the combinations predicted by the model have been documented (as far as I know, there is no language where nasal replacement applies just to *p* or just to *p* and *b*, for example), the model is consistent with the facts available and constitutes a reasonable working hypothesis about the scope of nasal replacement.

Where a voiceless palatal stop participates in nasal replacement, the replacement of the palatal may well be more restricted than the replacement of other voiceless stops. Onn (1980:62ff), reporting on his own speech, Johore Malay, distinguishes *c*-initial roots which never undergo nasal replacement (e.g. *catu* 'to ration', *colek* 'to kidnap', *cerah* 'bright') and those which may optionally undergo nasal replacement (e.g. *cium* 'to kiss', *cubit* 'to pinch', *conteŋ* 'to smear'). It never happens that the palatal stop undergoes nasal replacement more readily than any other voiceless obstruent and in prescribed Malay, c is excluded from nasal replacement altogether. The following quote from Sarumpaet (1980:131) reveals, however, the discrepancy between prescription and practice to Bahasa Indonesia: 'There is a tendency nowadays to follow Javanese morphophonemic rules when incorporating Javanese words into Bahasa Indonesia, but this should be strongly resisted. Thus we must say *cocok - mencocokkan* (not **menocokkan*) "to check that something is correct". . .'.

On an historical note, it seems that nasal replacement with both voiced and voiceless obstruents was the general rule in 16th and 17th century Malay manuscripts, and the present restriction of the process to voiceless obstruents in Malay is a relatively recent development. Brakel (1973:4) notes earlier forms such as *baca* 'to read' - *memaca,* wit with some of these forms persisting into the 19th century. One of the forms given by Brakel – *meneŋar* from *deŋar* 'to hear' – is still recognized as possible in contemporary descriptions such as Dyen (1967:35,38).

6. ADDITIONAL CONSTRAINTS

6.1. SYLLABIC CONSTRAINTS

Nasal replacement occurs most easily with disyllabic roots, with diphthongal roots counting as disyllabic for this purpose (e.g. Malay *puas* 'satisfied' - *memuaskan* 'to satisfy'). For unambiguously monosyllabic roots, nasal replacement does not occur, with different languages choosing different strategies as alternatives to nasal replacement. A comparision of some Bahasa Malaysia and Bahasa Indonesia grammars illustrates the alternative strategies possible even within Malay, where the verbal derivatives of roots like bom 'bomb' are variously given as *membom* or *meŋebom.* While Macdonald and Darjowidjojo (1967) admit both *mem-* and *meŋe-* variants, Alisjahbana (1976:29) rejects the *meŋe-* variant for Bahasa Indonesia, as does Sarumpaet (1980:131-2) in the following comment:

> The general rule about nasal connectors applies to these verbs (one-syllable words): *bom 'bomb'* - *membom* 'to bomb', *tes* 'test' - *mentes* 'to test', *rem* 'brakes' - *merem* 'to brake'. However, peoiple often incorrectly apply Javanese morphophonemic rules and insert *nge* between the prefix *me-* and the monosyllabic base... However, *mengetik* is now a correct derivative of *tik* 'type' and the present base is the two-syllable *ketik: juru ketik* 'typist', *diketik* 'typed'.

For Bahasa Malaysia, on the other hand, Agas (1975), Hassan (1980), and Iskandar (1970) recognize only the *meŋe-* variant as correct.

For roots of three or more syllables in Bahasa Malaysia, there also appear discrepancies as to what the correct form should be. Hassan (1974:52) says the nasal replacement with such roots is optional (e.g. *peraŋkap* 'trap' - *men(p)eraŋkap* 'to trap'). Abas (1981), on ther other hand, allows nasal replacement with some trisyllabic roots, but not with others, as illustrated in (28).

(28) Bahasa Malaysia (Abas 1981)

peranat 'to heat up rice which is cold'	memperanat 'to heat up rice which is cold'
perangkat 'trap'	memerangkap 'to capture by a trick'
peringkat 'grade, rank'	memperingkatkan 'to classify, grade'
perintah 'command, order'	memerintah 'to order'

In none of these words is *per* synchronically analyzeable as a prefix. *p*, as part of the prefix *per-*, never undergoes nasal replacement.

6.2. NATIVE VS. NON-NATIVE VOCABULARY

Nasal replacement, applies most felicitously with native vocabulary. With words of non-native origin, it is quite variable whether nasal replacement applies or not. This can be seen, even within one dictionary of Bahasa Malaysia (Abas 1981), where one finds some non-native roots undergoing the nasal replacement but not others:

(29) Bahasa Malaysia (Abas 1981)

faham 'idea, opinion'	memahamkan 'to understand'
fikir 'to think, guess'	memikirkan 'to think deeply'
but	
fitrah 'alms in the form of rice'	memfitrahkan 'to carry out the giving of the obligatory tithe'
fail 'file'	memfailkan 'to file in'
kartu 'card'	menjartukan 'to note down on a card'
but	
kafir 'non-Muslim'	menkafirkan 't to regard as a pagan'
syair 'piece of writing in verse'	meñairkan 'to recite as a poem'
but	
syarat 'condition'	mensyaratkan 'to state as a necessary condition'

(Non-native) words beginning with a consonant cluster never undergo the nasal replacement process (e.g. Bahasa Malaysia *klasifikasi* 'classification' - *menelasifikasikan* 'to classify'). Such words may undergo the replacement process if the initial cluster is broken up with an epenthetic vowel (e.g. *kelasifikasi* - *menelasifikasikan*), though this alternative has not been adopted as the standard. Loan words beginning with written < kh > are also immune to the nasal replacement, though here the two letters stand for one sound, variously *x, h,* or *k*. Stated in terms of graphemes, the set of words presents no problms, but phonologically, the derived forms of these words can present complications. Some speakers, for example, show the following alternation:

(20) < khabar > 'news, report' /kabar/ < mengkhabarkan > 'to inform' /menhabarkan/

(30)

Here, the non-native voiceless velar fricative has been replaced by native phonemes – /k/

word-initially and /h/ in the post-consonantal position. The result is that there is on the surface an alternation between /k/ and /h/ in the derivation of the verbal form.

6.3 FUNCTIONAL CONSTRAINTS

It has been claimed that nasal replacement may be blocked in order to avoid a clash of homonyms. Onn (1980:61ff.) argues that nasal replacement of *c* in this variety of Malay is blocked if there exists a phonologically similar (and semantically distinct) root beginning with *s*. The claim is based upon observations such as the following:

(31) Johore Malay (Onn 1980)

catu 'to ration'	mencatuwi 'to cause to ration'
	*meñatuwi 'to cause to ration'
cf.	
satu 'one'	meñatuwi 'to cause to unite'
cium 'to kiss'	mencium 'to cause to kiss'
	meñiumi 'to cause to kiss'
cf.	
*sium	———

Similar observations have been made for other languages. Mintz (1971:183) reports of Bikol that nasal replacement causes *h* to be replaced by *ŋ*, except if this leads to confusion with another base beginning with *k*. Thus, *h* is not replaced in *hapot-maŋ-hapot* 'to ask around' so that the derivative is not confused with the *man-* form of *kapot - maŋapot* 'to grasp'. For Cuyunon, Lackowski (1968:99) notes that both voiced and voiceless obstruents are subject to nasal replacement, but 'when there is a chance of ambiguity due to the existence of a corresponding root beginning with a voiceless counterpart, the voiced consonant is usually retained'.

Somewhat related is the case where one root can give rise to semantically differentiated derivatives through nasal replacement operating in different ways. This can be seen in the case of Bahasa Malaysia *kaji* 'to study' which is the root underlying *meŋaji* 'to learn the Koran' (in which nasal replacement applies) as well as *meŋaji* 'to do research' (in which nasal replacement is blocked) as discussed in Hassan (1974:52). For Tagalog, de Guzman (1978) gives the following examples, (89) of optional versus obligatory nasal replacement with the prefix *paŋ* depending on whether the derived noun is genuine instrumental or not. [8]

(32) Tagalog (de Guzman 1978)

tanim 'plant'	pananim 'aggregate plants in a garden'
	pan(t)anim 'something used for planting'.
pasko 'Christmas'	pamasko 'a Christmas present'
	pam(p)asko 'something for use/wear at Christmas time'

Despite the existence of some instances of apparent avoidance of homonyms, it should be said that it is not unusual for nasal replacement to yield a number of hononyms among derivatives. In Bahasa Malaysia, for example, such homonyms come about through derivational processes affecting roots beginning with nasals and voiceless stops, as illustrated in (33).

[8] Not all informants agree with de Guzman's data. Even for some true instrumental forms, Ted Llamzon allows only obligatory nasal replacement in the forms *panakot* 'something for frightening' (from *takot* 'fear') and *panulsi* 'something for darning' (from *sulsi* 'stitch). For some roots, on the other hand, the *paŋ* prefix may even occur unassimilated, e.g. *paŋsabit, pansabit,* and *panabit* 'something for hanging' (from *sabit* 'hang') are all possible for Ted Llamzon.

(33) Bahasa Malaysia

maŋku 'vice'	*pemaŋkuu* 'acting'
paŋku 'to superintend, to act as'	*pemaŋku* 'person who temporarily holds an office'
marak 'glow'	memarakkan 'to light up'
parak 'separation'	memarakkan 'to separate'
masak 'ripe, cooked'	memasakkan 'to cook for'
pasak 'wedge, peg'	memasakkan 'to insert a wedge'

6.4. DISSIMILATORY CONSTRAINTS

Some languages show an interesting phonological conditioning whereby the nasal replacement occurs preferentially to roots containing certain medial consonants. Dempwolff (1934-8) gives an example of regressive dissimilation, as he had already characterized it, from Ngadju-Dayak. Like Malay, nasal replacement occurs with root-initial voiceless obstruents. Root-initial *b, d, j,* and *g* do undergo nasal replacement, however, if there is a medial nasal or nasal cluster:

(34) Ngadju-Dayak (Dempwolff 1934-8:2.47)

buŋkus 'bundle'	mămuŋkus 'to wrap up'
dindiŋ 'wall'	mănindiŋ 'to build walls'
jañji 'promise'	măñañji 'to promise'
guntiŋ 'scissors'	măŋguntiŋ 'to cut with scissors'

Prentice (1971) notes a similar phenomenon for the Murut languages of Sabah in the formation of the active transitive forms of verbs. In such forms, nasal replacement is generally optional, except when there is a medial nasal + obstruent cluster when the replacement becomes obligatory. Thus we find:

(35) Murut (Prentice 1971:112-3)

tutu 'to pound'	man(t)utu	(active, transitive)
but		
tumbuk 'to thump'	manumbuk	(active, transitive)
	*mantumbuk	(active, transitive)

6.5. MISCELLANEOUS

Apart from the phonologically or functionally motivated complications to the process of nasal replacement noted above, there can be complications which have no easy explanation. In Ilokano, for example, Viray (1941) reports that nasal replacement in the derived verbs applies in two different ways – sometimes the root-initial consonant is replaced by a single nasal and sometimes it is replaced by a geminate, as illustrated below:

(36) Ilokano (Viray 1941)

kayo 'firewood'	maŋayo 'to gather firewood'
but	
kaasi 'pity'	maŋŋaasi 'to take pity'
babuy 'pig'	mamabuy 'to buy or secure a pig'
but	
baot 'whip'	mammaot 'to whip'

There seems to be no principled basis for this division of the vocabulary into the two classes and there appears no other solution than extensive lexical marking of the roots.

A striking exception to the rule of nasal replacement in Malay is *punya* 'owner' – *mempunyai* 'to posses, own'. The root is native and disyllabic and should show nasal replacement. Presumably, the Proto-Austronesian source is Dempwolff's $^{C}a(m)pu^{C}$ with

reflexes having meanings such as 'ancestor, grandfather, grandmother, grandchild'. Dempwolff himself identifies Ngadju-Dayak *t-empo* 'owner' as deriving from this root. In Sea Dayak *empu* means 'to possess' (Scott 1956). Etymologically, then, *punya* appears to derive from *(em)pu + nya* (presumably the 3rd person pronominal clitic). This historical account, if it is true, could help explain the synchronically aberrant behavior. Since the *p* of *punya* was not the initial consonant of a disyllabic root, it would not be expected to undergo nasal replacement. From a purely synchronic viewpoint, however, *punya* is simply an exception.

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