Vowel shifting and cloning in Mwotlap: historical explanation *vs.* formal description

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Abstract

In his first account of Mwotlap grammar, Codrington (1885), followed by Kasarhérou (1962), described the phonological rule of 'vowel shifting': a number of prefixes change their vowel into that of the next lexeme, e.g. *na-* + *vōy* > *nō-vōy* ('volcano'). We first show that this rule only accounts for half of the lexicon, namely CV- roots, whereas for CCV- roots no change occurs, leaving an unvarying vowel instead.

We then discuss a diachronic hypothesis in order to account for these two distinct sets of lexemes: stress rules in former stages of the language first brought about a morphological alternation between two kinds of roots (CV- vs. CCV-). Eventually, this alternation was reinterpreted as reflecting a phonological constraint just emerging from inherited forms; as a consequence, the whole system is currently undergoing some standardization.

Finally, we provide a synchronic reanalysis of these recently emerged rules, thanks to newly defined theoretical tools. For instance, our choice of a multi-linear approach allows us to take into consideration the notion of 'floating phoneme', in order to account for the behavior of these prefixes; and the same notion appears to be efficient in analyzing 'vowel transfer' (e.g. *na-* + *hinag* > *nī-hnag*), another phonological rule of the same language.

Mwotlap is an Oceanic language spoken in northern Vanuatu (Banks Is.), on the island of Mwotlap/Motalava, by approximately 1800 speakers[1]. It is geographically and historically close to Mota, a more conservative language which was first described in detail by Reverend Codrington (1885; 1896); this author also gave a first account of the grammar of Mwotlap (1885: 311-323).

Contrary to Mota, the morphology of Mwotlap is quite difficult, and seems to obey complex segmental and phonotactic rules, leaving bundles of lexical exceptions. Our aim is to show that this apparent complexity may in fact be reduced to a small set of rules and constraints, which mostly affect the quality and position of vowels within the word.

Yet, such a simplification of the analysis requires some strengthening or redefinition of our theoretical tools, which form the framework of our analysis: we will then come across such notions as syllabic template, floating vowels, and hierarchy of cognitive operations.

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[1] An earlier but more detailed version of this article was published (François 1999), relating the morphology of vowels in Mwotlap to dictionary-making issues.

~ in Marian Klamer (ed.), Proceedings of the Seventh annual Congress of AFLA (Austronesian Formal Linguistics Association), Vrije Universiteit Amsterdam. 2000, p.49-68.

1. Phonological outline of Mwotlap

1.1. Consonants

Mwotlap contains 16 distinct consonants, which may appear in any position of the linguistic chain – i.e. syllable-initial or final. Their phonological value is given below, together with their spelling when it is not obvious.

	labiovelar	*bilabial*	*alveol.*	*velar*	*glottal*
voiceless stops	$^{k}p^{w}$ |*q*|		t	k	
prenas. voiced stops		^{m}b |*b*|	^{n}d |*d*|		
fricatives		v	s	ɣ |*g*|	h
nasals	$^{ŋ}m^{w}$ |*m̄*|	m	n	ŋ |*n̄*|	
lateral			l		
glides	w		j |*y*|		

This information is being given here for the reader's convenience; but it may be useful to underline the fact that, synchronically speaking, there is no morphological rule in Mwotlap involving the quality or position of consonants, such as assimilation.

Let us only underline the fact that the two glides /w/ and /y/ strictly behave as consonants in this language: they never form diphthongs, and follow the same rules as other Cs when filling in the syllable template. Note also that the phoneme /v/ surfaces as [p] at the end of a syllable, and this phonetic allophone[2] is spelt *p* in the orthography: e.g. *na-pnō* 'country' corresponds phonologically to /*na-vnō*/.

1.2. Vowels

However complex the rules involving vowels may be, the vowel system in itself is quite simple, since it contains no diphthongs, nor long or nasalized vowels, but instead seven oral, short vowels, represented below.

i		u
ɪ |*ē*|		ʊ |*ō*|
	e o	
	a	

Codrington (1885: 311) only mentioned six vowels, while other analyses (Crowley forthc.; Kasarhérou 1962) proposed a seven-element system, but with different vowel qualities. In another article (François 1999: 443), we have claimed that the two mid-high vowels should be better described as being [-ATR], both on phonetic and phonemic grounds: the [ATR] feature is involved in the morphological process of vowel harmonization, which we will not deal with here.

[2] In his grammar sketch of Mwotlap, Terry Crowley (forthc.) considers the phoneme /p/, although it shows no phonological contrast with /v/.

1.3. Phonotactics

Mwotlap only accepts one type of syllabic pattern, i.e. |**(C)V(C)**|. Since both consonants are optional here, the phonology of Mwotlap actually contains four patterns: V, CV, VC, CVC; but the essential point here is to underline that there is no allowance for consonant clusters within a syllable, and that -C_1C_2- sequences may only show at the syllable boundary.

As a consequence, a CCV- morpheme will only surface as such if its first consonant can attach to a preceding open-syllable (CV-) prefix. For example, the radical *mtiy* 'sleep' will stay unchanged in *ni-mtiy* '(s/he) sleeps', because it may be segmented into two CVC syllables |*nim*|*tiy*|; whereas an unprefixed form, as the one for imperative 'Sleep!', will have to undergo a process of vowel epenthesis, with the vowel of the radical cloning between the first consonant cluster: **mtiy* → *Mitiy!*, segmented |*mi*|*tiy*|. We won't detail this rule here[3], but understanding it gives a first notion of the kind of phonotactic constraints defining Mwotlap morpho-phonology.

We can characterize the notion of phonological *word* in Mwotlap, as a segmental unit including one or several morphemes, which are together bound to a strict [CVC|… |CVC] pattern. Incidentally, this definition makes it possible to distinguish *prefixes* from *clitics* on phonological grounds: a prefix is integrated to the phonological word, and as such takes its position inside the syllabic pattern thus defined – e.g. *le-* is a prefix in /*le-p*|*nō*/ 'in the country', without epenthesis. Whereas a clitic only integrates into the *stress-defined* word[4], but never into the *phonotactic* word: e.g. *ne* is a clitic in /*ne*||*vō*|*nō*/ 'of the country', because it remains without the word boundary defined on phonotactic grounds.

2. Distribution of vowels within the word

The four main phonological rules involving vowels in Mwotlap are designated below:

VOWEL HARMONIZATION:	*iplu-k* 'my fellow' → *ēplō-n* 'his fellow';
VOWEL EPENTHESIS:	*mtig* → *mitig* 'coconut';
VOWEL SHIFTING:	*na-* + *wōl* → *nō-wōl* 'moon';
VOWEL TRANSFER:	*na-* + *hinag* → *ni-hnag* 'yam'.

The first two rules have already been alluded to, and won't be detailed here; this paper will deal mostly with vowel shifting, and will eventually present the operation of vowel transfer (§5).

2.1. Evidence for vowel shifting

The phenomenon of vowel shifting was first acknowledged by Codrington (1885: 311), and focused upon by Jacqueline Kasarhérou (de la Fontinelle), in her short presentation 'Les changements vocaliques de trois préfixes en motlav' (1962). Both authors presented this rule as involving a series of prefixes consisting of one single consonant (C-): e.g. the noun article *n-*, the verbal prefix *n-* (considered by Kasarhérou to be the same as the article), the perfect marker *m-*, would either surface as such (C-) before a root beginning with

[3] See François (1999: 475-479).

[4] Mwotlap words receive stress on their last syllable: see fn.9.

a V, or else would borrow their vowel from the root, through a cloning / shifting operation:

Table 1 - *Rules for vowel shifting, with noun article* n-

radical	*n- + radic.	*radical*	*article+rad.*	*meaning*
V_i-	n-V_i-	*ulsi*	*n-ulsi*	summit
CV_i-	nV_i-|CV_i -	*bē*	*nē-bē*	water
CCV_i-	nV_i-C|CV_i -	*qti*	*ni-qti*	head

Further evidence of this phenomenon include the following items, among thousands. The first rows involve the noun article (supposedly *n-*), the last one uses a numeralizer of the form *v-*:

Table 2 - *Sample evidence for vowel shifting*

ni-git	louse	*nē-sēm*	money	*ne-qet*	taro
no-gom	disease	*nō-vōy*	volcano	*nu-kumay*	sweet potato
na-lañ	(a) fly	*ni-qti-k*	my head	*nē-qtē-n*	his head
vō-yō	two	*ve-vet*	four	*vē-vēh*	how many ?

This insertion of a shifted vowel can be analyzed as an epenthesis rule to avoid consonant clusters at the beginning of a word. This is exactly what happens with another of the phonological rules in Mwotlap, which we have labeled 'vowel epenthesis': a CCV- root like *mtig* 'coconut' needs to copy its vowel into the consonant cluster, to avoid it at the beginning of a word (*mtig* → *mitig*). This recalls also what happens in Kalam, a non-Austronesian language from Papua New Guinea (Pawley 1993: 91):

> In the context C_CVC, the release vowel may be a very short, unstressed near copy of V or a short, unstressed central or high central vowel, e.g., *mlep* 'dry' is [meɬép] or [miɬép].

In Mwotlap, no central vowel is heard, and the epenthetic vowel is always clearly a clone of the following V. These prefixes "seem not to have a proper vowel, but instead to borrow it from the radical" (Kasarhérou 1962). This evidence should suffice for positing suffixes of the form C-, i.e. with a single consonant, and no specific vowel.

2.2. Exceptions to vowel shifting

Despite the obviousness of the latter analysis, we have to face a quantity of irregular forms, whose prefix vowel is different from that of the radical. A few of them are presented in *Table 3*, where irregular forms are underlined:

Table 3 - *Some exceptions to vowel shifting*

+ article	*meaning*	*+ locative*	*meaning*
na-naw	sea	*le-naw*	in the sea
na-sm̄al	rain	*le-sm̄al*	in the rain
na-he-k	my name	*le-he-k*	in my name
na-gmel	men's house	*le-gmel*	in the men's house
na-lo	sun	*le-lo*	in the sun
na-pnō	country, island	*le-pnō*	in the country

We have chosen only a few radicals among those which show at least one irregular form; each radical is presented here with two different prefixes, the noun article *n-* and the locative preposition *l-*. A regular pair for both prefixes would be *nō-vōy* 'volcano' – *lō-vōy* 'on the volcano'. *Table 3* does show regular forms too, like *na-naw* or *le-gmel*; but the rest is not, and falls among the 'exceptions' pointed at by both Codrington and Kasarhérou.

The trouble is, such 'exceptions' are not few, but represent up to 50% of the data. Such observation obviously needs to be accounted for, unless the rule for vowel shifting appears to be just a weak random trend in Mwotlap phonology. In fact, another sort of regularity appears in *Table 3*, provided it is not read in rows, but in columns. For a given prefix, all the irregular forms will show the same vowel; e.g. every noun preceded by the article *n-*, will have as a first vowel either a copy of the radical vowel (e.g. *nō-vōy*), or the vowel /*a*/ (e.g. *na-gmel*, *na-lo*); as for the locative *l-*, the 'default vowel', as it may be called, is an /*e*/ (e.g. *le-naw*, *le-lo*).

2.3. Shifting prefixes vs. *unvarying prefixes*

Evidently, Mwotlap does not have just one neutral vowel which could be assigned at the system-level, like Indonesian Pendau does with /o/ (Quick 2000); instead, each shifting prefix is provided with its own 'default vowel'. The quality of this vowel is assigned to the prefix in the lexicon, and cannot be predicted through any phonological rule: it is thus necessary to represent it in the citation form of each morpheme. From now on, we will choose to speak about the noun article *na-* or the locative preposition *le-*, instead of *n-* and *l-* respectively, since this is the only way to know what their default vowel is. This is a first difference with former accounts which were given of Mwotlap phonology, since we now consider shifting prefixes to be of the form CV-, with both C and V being specific.

Nevertheless, one improvement has to be made in our representation of these CV-prefixes. Talking about an article *na-* would make it necessary to posit an extra rule of deletion / assimilation for this /a/ before certain radicals, e.g. *na-* + *qōn̄* → *nō-qōn̄* 'night'. This rule would have a form like

$$< C_0V_0\text{-} + C_1(C_2)V_1C_3\ldots \rightarrow C_0\boxed{V_1}\text{-}C_1(C_2)V_1C_3\ldots >$$

However, an argument against such a generalization is given by other prefixes of the form (C)V-, which never change their vowel:

- verb prefix *ni-* (3rd singular + present): e.g. *ni-in* 'drinks', *ni-et* 'sees', *ni-van* 'goes', *ni-gen* 'eats', *ni-qōn̄* '(it) becomes night';
- locative prefix *a-*, showing in several place names: *a-Pnōlap* 'Vanua Lava', *a-Gō* 'Gaua', *a-M̄ew* 'Maewo', *a-M̄sēn* 'Mosina', *a-M̄ot* 'Mota'.

As a consequence, vowel shifting in Mwotlap cannot be described by the general rule stated above. Some CV- prefixes are unvarying, while others do show a 'weak' vowel, which is likely to assimilate to the vowel of the radical. This is why the best representation is to oppose these two kinds of CV- prefixes, typographically, by contrasting:

- prefixes of the form /CV-/ which never shift their vowel, e.g. *ni-* (3SG:PST); they will be called 'unvarying prefixes';
- prefixes of the form /cV-/, which are sensitive to vowel shifting, e.g. *nA-* (noun article); they are the 'shifting prefixes'.

The uppercase letter codes for the special status of this 'default vowel', i.e. a vowel which sometimes surfaces and sometimes does not; the exact theoretical status of this vowel will be the main issue of §4. Mwotlap has eight shifting prefixes, which are listed below:

Table 4 - *The eight vowel-shifting prefixes of Mwotlap*

FORM	MEANING	PREFIXED TO
nA-	Article ('a / the')	nouns
bE-	Purposive ('for')	
lE-	Locative ('in')	
mE-	Perfect	verbs, adjectives, (nouns)
nE-	Stative	
tE-	Future	
tE-	Ablative	locatives
vE-	Numeralizer	numbers

Incidentally, notice that some of these prefixes can combine. This is mainly the case for *tE-* ('Ablative'), which is prefixed to locative words, be they directly locative –e.g. *to-M̄otlap* 'from Mwotlap'–, or derived by means of the preposition *lE-* ('Locative'), thus bringing about a sequence *tE-lE-*. In this case, the preposition which is adjacent to the root (*lE-*) is sensitive to vowel shifting, and its vowel is always reproduced on the first prefix (*tE-*):

tE- + lE- + ēm̄ → *tē-l-ēm̄* 'from the house'
tE- + lE- + vōy → *tō-lō-vōy* 'from the volcano'
tE- + lE- + naw → *te-le-naw* 'from the sea'

At this stage of the presentation, it is impossible to know whether the vowel /*e*/ on the first prefix (*te-*) is an instance of its own 'default vowel' –which would mean that no vowel shifting occurred at all–, or if it is a copy of the following vowel –which means that vowel shifting only affects the second prefix (*lE-*). Further demonstration will show the second assumption to be correct.

2.4. Permeable vs. *blocking lexemes*

One of the conditions for vowel shifting, obviously, is that the prefix must belong to the limited list of shifting prefixes (*Table 4*). But what about the radical? Is there any restriction on the set of radicals that can shift their vowel, and is that restriction systematically predictable?

Table 3 above had already provided a set of exceptions to the vowel-shifting process. However, only the underlined forms (e.g. *le-naw*) were supposed to be irregular, while other forms, including for the same radical (e.g. *na-naw*), were considered to follow the rules. But now that we know the underlying form of each prefix, it becomes ambiguous whether the first /a/ in *na-naw* is really a clone of the vowel in the radical (*naw*), or if it is the default vowel of the noun article (*nA-*). Now, there is strong evidence pointing at the latter solution: *whenever a given lexical root blocks the vowel-shifting process with one prefix, it does so with all other prefixes*. Conversely, whenever a lexeme shifts its vowel to one prefix, it will do so with any other (shifting) prefix. *Table 5* gives further evidence of this claim:

Table 5 - *Permeable* vs. *blocking lexemes*

	trans.	bare root	article *nA-*	Pp *bE-* for	Stative *nE-*	Perfect *mE-*
permeable lexemes	cold	*momyiy*	*no-momyiy*	*bo-momyiy*	*no-momyiy*	*mo-momyiy*
	night	*qōn̄*	*nō-qōn̄*	*bō-qōn̄*	*nō-qōn̄*	*mō-qōn̄*
	think	*dēmdēm*	*nē-dēmdēm*	*bē-dēmdēm*	*nē-dēmdēm*	*mē-dēmdēm*
blocking lexemes	work	*mgumgu*	*na-mgumgu*	*be-mgumgu*	*ne-mgumgu*	*me-mgumgu*
	sleep	*mtimtiy*	*na-mtimtiy*	*be-mtimtiy*	*ne-mtimtiy*	*me-mtimtiy*
	want	*myōs*	*na-myōs*	*be-myōs*	*ne-myōs*	*me-myōs*

This means that all lexical items of Mwotlap, without exception, fall into either of two morphological categories, defined in relation with the vowel-shifting process. It is a '*permeable*' lexeme, if it allows its first vowel to be copied onto the preceding shifting prefix: e.g. *qōn̄* → *nō-qōn̄*, *bō-qōn̄*, *mō-qōn̄*, but never **na-qōn̄*. Conversely, a lexeme will be labeled '*blocking*' if it is incompatible with vowel shifting; in this particular case, the prefix can only take its own default vowel: e.g. *myōs* → *na-myōs*, *be-myōs*, *me-myōs*, but never **nō-myōs*. The feature [permeable] *vs.* [blocking] is carried by each lexeme in the lexicon – unless it can be predicted by the theory; the latter issue will be discussed in 2.5.

At this point of the discussion, two remarks may be made. First, this rule definitely helps answer the question about the nature of the vowels in a word like *na-naw* 'sea' (*Table 3*). Since we are no longer dealing with irregular 'forms', but with irregular lexemes, then a word like *le-naw* 'in the sea', which has blocked the vowel-shifting process, proves the root *naw* belongs to the set of 'blocking lexemes'; as a consequence, the *a* of the article on *na-naw* cannot be due to vowel assimilation, and is necessarily an instance of the default vowel of the prefix. The same logic applies to another ambiguous form like *le-gmel* 'in the men's house': since the test with the article *nA-* gives *na-gmel* instead of **ne-gmel*, then it becomes obvious that the root *gmel* is blocking, and that the first *e* in *le-gmel* comes from the prefix itself. Thanks to this test, all the ambiguous forms of Mwotlap can easily be solved.

Second point: only blocking lexemes can show the underlying form of each prefix; and this turns out to be essential even to morphosyntactic analysis, since they help distinguish between the noun article *nA-* and the stative prefix *nE-*. As is clear in *Table 5*, these two prefixes always have the same surface forms when they are combined to permeable roots. This point led J. Kasarhérou to a confusion, when she presented a prefix *n-* as an "actualizing prefix" ('préfixe actualisant') which is "compatible with all full words of this language", regardless of their syntactic category. In fact, deeper morphological evidence reveal that there are two distinct morphemes, one of which is compatible exclusively with nouns (*nA-*), whereas the other mainly goes with adjectives and stative verbs (*nE-*). Far from challenging the noun-verb opposition, this pair of prefixes confirms that it is quite strong in Mwotlap[5].

[5] *Table 4* suggests that *nE-* is also compatible with nouns, though this is only true of a dozen items. On the other hand, the fact that all nouns be predicative (if they bear the article *nA-*) is not a sufficient argument to say that verbs and nouns are not separated in Mwotlap; and the existence of a few 'precategorial roots' like the ones presented in *Table 5* (e.g. *qōn̄*, *myōs*…) is not a good argument either, as long as the major part of the syntax continues to contrast nouns and verbs.

2.5. Is the [blocking] feature predictable?

In summary, we have demonstrated that the process for vowel shifting only occurs in one case, i.e. the combination of a permeable lexeme + a shifting prefix:

Table 6 - *Combination <permeable lexeme + shifting prefix>*

	blocking lexeme (°*myōs*)	permeable lexeme (*qōn̄*)
unvarying prefix (*ni-*)	– (*ni-myōs*)	– (*ni-qōn̄*)
shifting prefix (*mE-*)	– (*me-myōs*)	+ (*mō-qōn̄*)

Now, the next question would be to find out whether this feature of the lexeme [blocking] *vs.* [permeable] is predictable from the form of the root, or not. This would make it clearer whether vowel shifting belongs to the domain of phonology –if it is predictable– or of morphology –if it is not. A first answer to our question is 'No', i.e. the form of a root is not sufficient to predict with certainty if it will shift its vowel or not. The evidence for this claim is the following (morphological) minimal pair:

– *nē-lēt* 'pudding': permeable lexeme /*lēt*/
– *na-lēt* 'firewood': blocking lexeme /°*lēt*/.

Two homophonous roots /*lēt*/ show two divergent behaviors in relation with vowel shifting: one is permeable, while the other belongs to the set of blocking lexemes. Although there are few minimal pairs like this one, it should be enough evidence to draw the following conclusion: *It is not 100% possible to predict the feature [± blocking] from the root itself; its value is assigned to each root within the lexicon*. In our presentation of Mwotlap lexemes, a blocking root will be preceded with a small symbol (°).

However, though there may not be a systematic rule for this prediction, we can find at least a very strong tendency in Mwotlap lexicon. It appears that permeable lexemes are generally roots *beginning with only one consonant*, whereas blocking lexemes normally *begin with two*. *Table 7* illustrates this contrast between 'CV roots' and 'CCV roots':

Table 7 - *Regular correlation between root structure and vowel shifting*

permeable lexemes: CV-		blocking lexemes: CCV-	
wis	owl	°*dyē*	wait
lēt	pudding	°*twoyig*	easy
siseg	play	°*myōs*	want
vēytitit	fight	°*mtig*	coconut
yō	two	°*vnō*	country
vap	say	°*hyo*	long
M̄otlap	Mwotlap	°*blekat*	play cards

This table means that all CV- roots (first column) are regularly permeable, i.e. allow their first vowel to copy onto the prefix: e.g. *ni-wis* 'owl', *vō-yō* 'two', *to-M̄otlap* 'from Mwotlap'; conversely, CCV- lexemes normally block the process of vowel shifting, thus being always associated with the default vowel of the prefix: e.g. *nE-* + °*twoyig* → *ne-twoyig* 'is easy'; *nA-* + °*vnō* → *na-pnō* 'country, island'.

2.6. A new sort of exceptions

This list could go on with thousands of lexemes: the tendency we have just mentioned is true for 100% of the verbs, adjectives and numerals, and about 95% of the nouns. In this case, it makes sense to speak about a phonological *rule*, for which there are a certain number of exceptions (< 5% of the nouns). But it must be clear that we are not following the same logic as previous authors, such as Codrington and Kasarhérou, who considered as 'exceptions' all roots which did not shift their vowel. These roots, which represent half of the lexicon, are now integrated in a newly-defined rule, under the name of 'blocking roots'.

Now, what we consider to be exceptions, is a much smaller set of nouns, which do not correspond to the correlation between phonotactic structure of the root (CV- *vs.* CCV-) and compatibility with vowel shifting. These exceptions can be either permeable roots, which have the unexpected form CCV- (a dozen nouns); or blocking roots, which start with only one consonant (up to forty nouns). The most common of these irregular lexemes are presented in *Table 8*:

Table 8 - *A few exceptional nouns: CCV- permeable & CV- blocking roots*

permeable lexemes: CCV-		blocking lexemes: CV-	
qti-	head	*°he-*	name
vni-	skin	*°lo*	sun
qñi-	destiny	*°lēt*	firewood
tqē	garden	*°tō*	mountain
ñyuñyu-	snout	*°yeñ*	turmeric
blēit	plate	*°hōm̄*	Wrasse fish
skul	school	*°lo-*	inside

For instance, the word for 'garden' *tqē*, with the article *nA-*, does not give the expected **na-tqē*, but an unpredictable form *nē-tqē*; in the other direction, the word for 'mountain' is not **nō-tō*, as would be normal for a CV- root, but *na-tō*. Incidentally, we notice that among the morphological pair *nē-lēt* / *na-lēt* mentioned above, the first root is regular, whereas the second one belongs to the set of exceptional blocking lexemes (see *Table 8*).

The origin of most of these exceptions will be discussed in §3.3. What we would like to develop right now, is a historical hypothesis which would account for the major morphological split between permeable and blocking roots, and for its regular correlation with phonotactic structure. After this diachronic approach, we will focus on a synchronic representation of vowel shifting in Mwotlap.

3. A diachronic account for vowel shifting in Mwotlap

3.1. Historical stress and syllable loss in Mwotlap

The question is: what historical processes can account for vowel shifting in Mwotlap; and especially, why do CCV- roots systematically block this rule, while only CV- roots allow it? To answer this question, it is useful to remember that former linguistic stages of Mwotlap followed Proto Oceanic in having mainly open syllables of the form (C)V (Ross 1998: 17). The closed (CVC) syllables of Mwotlap are obviously an innovation, and were evidently formed through the loss of unstressed vowels. Basic stress rules of pre-Mwotlap

included a primary stress on the penultimate syllable of the phonological word, and secondary stresses on every second syllable towards the left of the word, e.g. **M̄ótaláva*.

In more recent times, all post-tonic syllables were deleted, causing closed (CVC) syllables to appear. Here are a few place names:

**M̄ótaláva*	*> M̄otlap*	'Mwotlap island'
**á-Lakóna*	*> Alkon*	'Gaua island'
**á-Ravéñna*	*> Ayveñ*	'Ravenga islet'
**á-M̄osína*	*> Am̄sēn*	'Mosina village'
**á-Valúwa*	*> Aplōw*	'Valuwa village'
**á-Vanúa-láva*	*> Apnōlap*	'Vanua Lava island'

These examples show how words with four open (CV) syllables were eventually reduced to two closed (CVC) syllables, or from six to four. Other words shorten from two to one syllable (*CVCV > CVC); other cases will be discussed below. In all these examples, only stressed syllables were retained in Mwotlap, while unstressed post-tonic vowels were definitely lost.

3.2. Historical stress and vowel shifting

Now, as far as prefixes are concerned, there were two possibilities. In a given prefixed word, either the stress would strike this prefix, or it would strike the following syllable – in which case the prefix would be in a pre-tonic position. The first case can be illustrated by a phrase in Pre-Mwotlap meaning '(the) country', **ná vanúa* (< POc *panua); in Mwotlap we have:

**ná vanúa*	*> na-pnō*	'country, island, village'

This example shows that when the prefix was accented, it maintained the quality of its own vowel, without any copy occurring: in modern Mwotlap, this corresponds to what we have been calling the 'default vowel' of the prefix. On the other hand, since the first vowel of the radical was in a post-tonic position, it regularly lost its vowel, thus defining a new root of the form CCV-. This hypothesis is the most powerful to explain why CCV- roots systematically block the process of vowel shifting: the genesis of such roots implied necessarily a stressed prefix, and hence no vowel assimilation at all.

The second case, i.e. the unstressed prefix, occurred whenever the phonological word (including the prefix) had an odd number of syllables, e.g.

**na vánuá-na*	*> nē-vēna-n*	'his country[6]'

In this situation, the stress on the first syllable of the root (*-*va*-) caused it to survive in the modern form (-*vē*-)[7], and this evolution is the origin of all CV- roots in Mwotlap. On the

[6] Notice that these two words are considered by speakers to be totally distinct from one another; the translation of 'his country' uses now the alienable pattern *na-pnō no-no-n*, and the word *nē-vēna-n* is a poetic word for 'his fatherland'. We have discovered up to eight etymological 'doublets' of this kind in Mwotlap (François 1999: 456), all of which are opaque to the speakers.

other hand, the unstressed (pre-tonic) vowel of the prefix, after maybe becoming a schwa, proved its articulatory weakness in assimilating totally to the next syllable. Notice that the total deletion of the prefix vowel (**nvēnan*) was impossible, because of the phonotactic rules applying in Mwotlap (see §1.3). In a way, vowel shifting could be considered as a special case of vowel epenthesis involving prefixes: an underlying form like **n-vēna-n* surfaces as *nē-vēna-n*, following **mtiy* → *mitiy* 'sleep'.

Further evidence of both evolutions are presented in *Table 9*:[8]

Table 9 - *Former stress accounts for vowel shifting*

	POc etymon	*Pre-Mwotlap*		*Mwotlap*	*meaning*
blocking lexemes	*kasupe	**ná gasúwe*	>	*na-ghōw*	rat
	*kuʀita	**ná wuríta*	>	*na-wyēt*	octopus
	*tob^{w}a	**ná toqá-ku*	>	*na-tqe-k*	(my) bell
	*^{n}daʀaq	**ná dará-ku*	>	*na-nye-k*	(my) blood
permeable lexemes	*b^{w}awe	**na qóe*	>	*no-qo*	pig
	*piʀaq	**na vía*	>	*nē-vē*	k.o. taro
	*suʀi	**na súri*	>	*ni-hiy*	bone
	*kawil	**na gáu*	>	*ne-ge*	fish-hook

To sum up, we have demonstrated that *the process of vowel shifting is historically a consequence of former*[9] *stress*: a radical would become 'permeable' whenever the word stress would strike its first syllable, leaving its prefix unstressed. This historical explanation accounts for the correlation, on the one hand, between permeable roots and CV- structure, and on the other hand, between blocking roots and CCV- structure in modern Mwotlap.[10]

3.3. Accounting for exceptions

Our hypothesis proves its explanatory power in accounting not only for regular processes, but also for many exceptions. Several (modern) CV- roots which unexpectedly block vowel shifting, actually used to bear stress on their very prefix, but have recently lost an extra mora. This happened when both consonants of the root were identical, causing a geminate cluster to be shortened (*$C_iC_iV > C_iV$):

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[7] The syllable itself remains, but the quality of the vowel may change, according to the one in next syllable. Among the many possible combinations, our examples involve **á_u* > *ē* (word-internally), **á_u* > *e* (word-finally); **á_i* > *e*; **ú_a* > *ō*; **ú_e* > *ō*; **ú_i* > *i*; **í_a* > *ē*; **í_o* > *ē*.

[8] Notice that we spell Pre-Mwotlap and Mwotlap according to the conventions shown in §1: thus *q* = /^{k}p^{w}/; *d* = /^{n}d/; *n̄* = /ŋ/; *g* = /ɣ/; *ē* = /ɪ/; *ō* = /ʊ/. In Mota, a language using the same conventions, the lexical items of *Table 9* are *gasuwe*, *wirita*, *toqa-k*, *nara-k*, *qoe*, *via*, *sur*, *gau*, with no article (Codrington 1896).

[9] Modern Mwotlap words are systematically accented on the last syllable, not on the penultimate, contrary to what has been stated in other articles (Crowley forthc.). The evolution of stress from penultimate to final syllable is easy to understand from the deletion rules presented here; the same path was taken from Latin to French, e.g. L *cīvitāte(m)* [ˌkiˑwiˈtaˑte] > F *cité* [siˈte] 'city'.

[10] More examples and reflections have been proposed in a former paper (François 1999).

**ná reréña*	> **na-rreñ*	> **na-reñ* > *na-yeñ*	'turmeric'
**ná loló-na*	> **na-llo-n*	> *na-lo-n*	'the inside of it'
**ná sasá-ku*	> **na-sse-k*	> **na-se-k* > *na-he-k*	'my name'

This happened, too, when either the first or the second syllable of the root happened to have no consonant (*V instead of *CV), thus bringing about a 'pseudo' CV root which contained an 'invisible' consonant. Examples of [C]CV roots include:

**ná alíto*	> *na-lēt*	'firewood'
**ná alóa*	> *na-lo*	'sun'
**ná añári*	> *na-ñey*	'Canarium almond'
**ná awúa*	> *na-ō*	'turtle'

while examples of C[C]V roots would be as follows:

**ná taúwe*	> *na-tō*	'mountain'
**ná saúm̄a*	> *na-hōm̄*	'Wrasse fish'
**té Roúa*	> *te-Yō*	'from Roua island'

3.4. Emergence of a phonological rule in synchrony

As would be expected, the same process happened to verb roots, bringing about blocking CV lexemes:

**mé maúri*	> **me-mir*	'(it) lived, grew' (POc **maqurip*)

But remarkably, all resulting lexemes were felt to be exceptions to the regular (just emerging) correlation between phonotactics and vowel shifting: as a consequence, all verbs and adjectives underwent a morphological standardization, which created non-etymological permeable CV- lexemes:

**me-mir*	→ **mi̲-mir*	> *mi-miy*	'(it) was in bud'

This process of standardization has been affecting all roots, except the most common nouns, which is not so surprising. However, the pressure of the phonological correlation here under discussion is still so strong, that even these exceptional noun roots are now beginning to conform to the norm, showing it to be still lively and productive. For instance, the 'correct' form *te-Yō* (see above) is sometimes heard *tō-Yō*, despite the etymology.

Parallel to this ongoing standardization, it is worth noticing that loanwords are often – though not always– forced into the same correlation between phonotactic structure of the root and compatibility with vowel shifting. For example, a CV- words like *doctor*, when combining with *nA-* article, will have its vowel copied onto the prefix: *no-dokta*; conversely, the word *policeman* gets its first vowel deleted to form a CCV- root, which will block the process of vowel shifting: *na-qlismen*.

The latter evidence suggests that the historical explanation, however powerful it may be to account for present data, must always be completed by a synchronic presentation. Present-day speakers of any language do not just make a passive use of inherited paradigms, which would only find their logic in diachrony. Instead, each generation endeavors to figure out formal similarities and constant correlations out of the amount of forms they are supposed to be using. This is how productive rules emerge, either in phonology,

morphosyntax or semantics, in such a way that the diachronic path leading to the present situation is totally ignored. Because of functional constraints in memory and ease of processing, a new consistent system is built up, slowly but surely.

Most of the time, however, this kind of standardization process is still ongoing in the language, in such a way that only a part of the lexicon –normally the less commonly used– has already been conformed to the emergent rule, whereas several items are used frequently enough to resist for a longer period. This is what happens with about fifty nouns in Mwotlap, which have not yet undergone the same overall revision that verb or adjective roots have.

4. Synchronic account of vowel shifting: a multilinear approach

The aim of next paragraph is to give a synchronic description of the most productive rule for vowel shifting in modern Mwotlap.

4.1. Distinguishing tiers

In order to achieve a formal representation of vowel shifting in Mwotlap, it makes sense to distinguish between at least two layers, one for consonants and one for vowels. Indeed, it has already been shown that Mwotlap phonology allows only vowels, not consonants, to copy, assimilate or migrate from one place to another within the phonological sequence.

This idea recalls the presentation that Nick Clements made about Kolami, a Dravidian language in which such words as *kinik*, *suulup*, *melep*, *ayak*, are supposed to follow a "rule for propagation of vowel nodes" (Clements 1991). For this purpose, Clements makes use of what a famous article by McCarthy (1989) called *planar V/C segregation*, to account for data in some Semitic and American Indian languages. Here is Clements' presentation of McCarthy's conceptions:

> When [the template] is introduced derivationally, consonants link to it on one family of planes and vowels link to it on another (non-intersecting) one. At this point, consonants and vowels are entirely segregated in phonological representations, and are brought together only by the later process of tier conflation which 'folds' the consonant and vowel planes together.

Vowels and consonants organize into two different tiers, where they first follow their own specific rules; then both tiers eventually 'conflate' to conform to the *syllabic template* of the language, if there is one. Mwotlap template has already been presented in §1.3: the basic syllabic pattern of this language is |CVC|, with both Cs being optional.

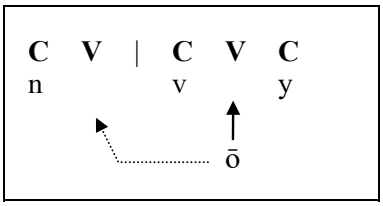
Now, as far as vowel shifting is concerned, let us sum up the rule which affects more than 95 per cent of the lexemes:

- roots beginning with one C ('CV roots') are permeable, i.e. allow their vowel to migrate to a shifting CV- prefix;
- roots beginning with two Cs ('CCV roots') are blocking roots, i.e. prevent their vowel from migrating to the prefix.

An elegant way to represent this phonological process, would be to say that a "vowel node" can propagate to the left of the word boundary, provided it has only a single C to cross

over; conversely, a cluster of two consonants behaves as a "blocking node" (Clements 1991), which hinders this vowel propagation.

Let us contrast the behavior of two nouns regarding vowel shifting: one is permeable *nA- + vōy* → *nō-vōy* 'volcano'; the other one is a blocking lexeme *nA- + °mtig* → *na-mtig* 'coconut'. In the first case, the vowel of the radical surfaces not only in its own position, but copies also to the left; in the second case, a cluster of two Cs makes the cloning process impossible:



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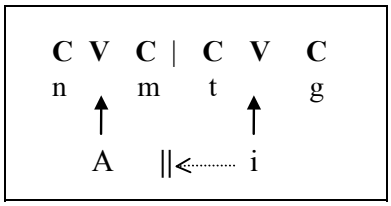


In the remainder of this paper, our main point of interest will be the theoretical nature of the 'default vowel' of the prefix. What kind of phoneme is this, which sometimes surfaces and sometimes doesn't? The point is to escape from the feeling of having a *deus ex machina* phoneme which only exists when needed.

4.2. French 'liaison' and the notion of floating phoneme

Some help may be found thanks to a typological insight on similar processes in other languages. French 'liaison' is a rule which governs surfacing *vs.* non-surfacing of certain word-final consonants, according to the phonotactic structure of the following word. For example, the feminine form of adjective 'small' is spelt *petite*, phonologically /pətit/ with a final /t/ which must always be pronounced –we shall call it a 'true' phoneme; two synonymous phrases meaning 'my girlfriend' are

– *ma petite copine* /mapəti t kopin/
– *ma petite amie* /mapəti t ami/.

Conversely, the masculine form *petit* shows a special /t/, which will surface only if the second word begins with a vowel: e.g. two phrases for 'my boyfriend' are

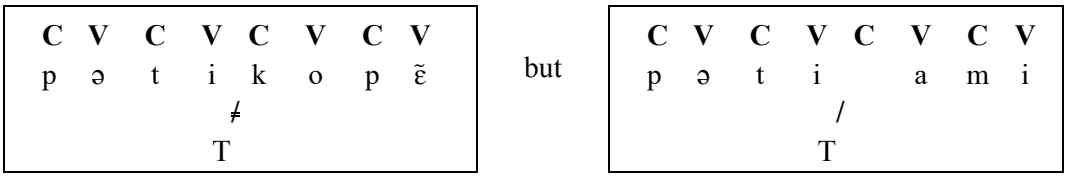
– *mon petit copain* /mɔ̃pətikopɛ̃/ without a /t/,
– *mon petit ami* /mɔ̃pəti t ami/ with a /t/.

The rule for liaison, which concerns the masculine form in the last example, has been described, in a multilinear framework (Encrevé 1988), as involving two fundamental notions:

– first, the notion of *syllabic template*, which consists of a (more or less constraining) string of Cs and Vs;
– second, the notion of *floating phoneme*, whose main property is to surface only on the condition that a slot has been left empty in the template, after other phonemes have taken their place.

In the case of our word *petit*, we can consider there is a *floating consonant* T at the end of the underlying masculine form /pətiT/ – *vs.* feminine /pətit/. This means that this T will

only surface if a Consonant slot has been left empty by other 'true' phonemes, within the syllabic template. The latter situation occurs when the next word begins with a vowel, thus leaving an empty C-slot, for the final T to slide into:



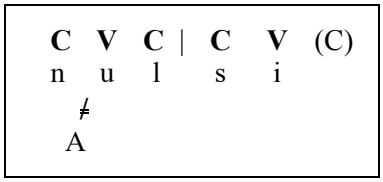
4.3. Floating vowels in Mwotlap

Our aim is not here to discuss French liaison, but to show how relevant Pierre Encrevé's assumptions are for Mwotlap data. The behavior of this 'floating consonant' in French, which sometimes surfaces and sometimes does not, makes it indeed very similar to the 'default vowel' of shifting prefixes in Mwotlap. The vowel /a/ of noun article, and /e/ of other prefixes (see *Table 4* in §2.3), can be described here as *floating vowels*. This means that these vowels will surface only if a V-slot is left empty in the syllabic template, once all other phonemes have been realized.

Three situations are possible:

The V-slot has already been taken by a full vowel

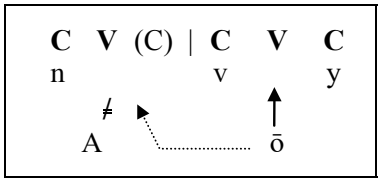
This is typically the case when the radical begins with a V, e.g. *ulsi* 'summit':



All full-right phonemes start taking their position into the CVC|CVC pattern; then no room is left for the floating vowel. This example helps underline an essential point regarding theory: a floating phoneme may take empty slots in a given syllabic template, but it cannot create one; thus **na-ulsi* is excluded. This is precisely what opposes them to 'true' phonemes, which necessarily have a slot of their own. The following examples will help us further build on this theory.

The floating vowel of the prefix is superseded by a vowel shifted from the root

Another situation is when the radical is 'permeable', i.e. normally starts with one consonant. In this case, the first V of the radical migrates to the prefix(es), and supersedes the floating vowel.

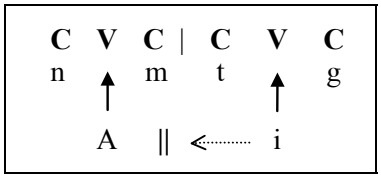


What has happened here is best represented in terms of a chronology of cognitive operations:

1. consonants (here *n-v-y*) take their own slot into the syllabic template CVC|CVC, leaving V-slots empty.
2. the (first) radical vowel (here *ô*), which is a true phoneme, automatically comes into its own slot, between *v* and *y*; only one slot is now left empty, the prefix V.
3. the lexeme vowel has priority over any other V, to fill in the empty V-slot on the prefix; yet, this happens only if it is allowed by phonotactic structures, i.e. if it is not hindered by a cluster of two Cs ('blocking node').
4. if the leftward propagation of the radical vowel was blocked during stage nb. 3, then the floating vowel eventually fills the empty V-slot (see below).

The slot is free

If operation number 3 above has failed, then the vowel-slot on the prefix is still empty when the floating vowel comes in. This is the only way the 'default vowel' of each shifting prefix may surface:



The notion of floating phoneme is therefore very useful in order to account for a vowel which belongs to the lexicon, but shows intermittently. The last section of this paper will confirm how useful this notion is to describe another phonological rule of Mwotlap, namely *vowel transfer*.

5. Vowel transfer: floating vowels on lexemes

Without going into too much detail, it is worthwhile looking at another phonological rule of Mwotlap, which we have labeled 'vowel transfer' (see first lines of §2). This rule involves the same eight prefixes which were listed in *Table 4* (§2.3), but different lexemes, which are not concerned with vowel shifting. These lexemes can be either nouns, adjectives or verbs, but are not more than twenty in all: the process of vowel transfer is much more limited than what we have been studying so far.

5.1. A mobile and intermittent vowel

The principle of *vowel transfer* is that when a (shifting) prefix is added to one of these lexemes, the first vowel of the radical does not only copy to the prefix –which corresponds to ordinary vowel shifting–, but also has a rule for deletion:

nA- + *hinag* → **ni-hinag* → *ni-hnag* 'yam'

A simpler way of presenting the same process, would be to consider that the radical vowel directly migrates to the prefix, with no need for an extra deletion rule: *nA-* + *hinag* → *ni-hnag*. This presentation implies that the V of the radical has the particular property of being mobile, which is new in our system. In order to show its special status, we will write it with an uppercase letter, e.g. *hInag* 'yam'.

A short list of the lexemes involved by the latter rule, which we may call 'transferable roots', include the following:

Table 10 - *Some lexemes involved in the rule for vowel transfer*

lIwo	big	*mĒnay*	clever
hInag	yam	*vĒhog*	flesh
sIlatēmē	centipede	*lĒwo-*	tooth
tIwag	one	*dĒlo-*	neck

Table 10 shows that the 'mobile vowel' (MV) involved is always /i/ or /ê/, i.e. high and mid-high front vowels. Consequently, former accounts of Mwotlap morphology were erroneous, when they considered[11] a vowel like /a/ on the article (e.g. *na-gmel* 'men's house') to come from the deletion of this vowel on the radical (**gamel* < POc **kamaliR*); actually this never happens for /a/ or /e/, which are never more than the default vowel of the prefix itself.

'Transferable roots' have other uncommon properties with regard to their mobile vowel. When the prefix is unvarying, e.g. *ni-* '3rd singular + present', the MV just doesn't appear:

ni- + *mĒnay* → *ni-mnay* '(he) becomes intelligent'

Conversely, this MV will surface on the right of the first consonant, when the lexeme is unprefixed, or when its prefix has the form CVC-. *Table 11* gives a summary of these rules, with the root *mĒnay* 'intelligent, clever'. The last column shows whether the 'mobile vowel' (MV) appears before or after the first consonant of the radical (C_1).

Table 11 - *Rules involving the 'mobile vowel' of transferable roots*

prefix	*prefixed word*	*meaning*	*MV / C_1*
nA-	*nēmnay*	cleverness	**before**
nE-		is clever	**before**
mal-	*mal-mēnay*	is already clever	**after**
Ø	*mēnay*	clever	**after**
ni-	*nimnay*	gets clever	**no**

5.2. Floating vowels in lexemes

This property, for a phoneme, to surface or not according to its phonological environment, reminds us again of the *floating vowels* carried by our shifting prefixes (§4.3). The

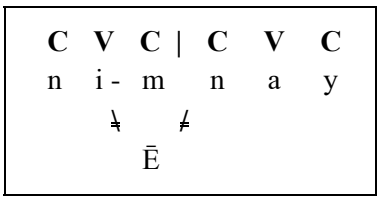
[11] See Codrington (1885: 311) with words like *na-bte* (Mota *patau*) 'breadfruit'; and Crowley (forthc.) with words like *na-tm̄an* 'man'.

'mobile vowels' of transferable roots could well be analyzed the same way, since they can be shown to share exactly the same properties. One of these, is the impossibility for floating vowels to create a slot of their own in the syllabic template: all they can do is take V-slots that have already been created by the phonological structures of the language, and which are left empty after preliminary operations have taken place.

Once again, three cases are possible:

(a) All slots have been taken by true phonemes

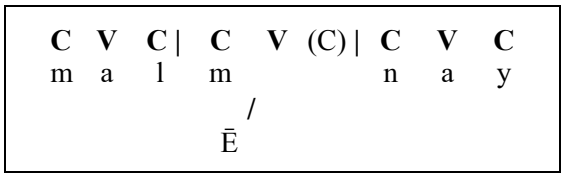
If the prefix is not a shifting prefix, but has the form CV- (e.g. *ni-* 'Third singular present'), then both C and V, which are 'true' phonemes, take the first two slots of the |CVC|CVC| sequence. Afterwards, the first two consonants of the radical (*m* and *n* in our example) take their own slot, in such a way that there is no room left for the floating vowel of the lexeme to surface:



Floating vowels, by definition, cannot create their own position in the template; if they did, we would have a form like **ni-mēnay* instead of *ni-mnay*, and there would be no difference between this *Ē* and a 'true' *ē*.

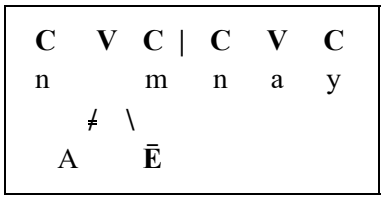
(b) A V-slot is left empty on the right of C_1

If the first |CVC| syllable has already been filled in by a CVC- prefix (e.g. *mal* 'Complete aspect'), or if there is no prefix at all, then the first consonant of the radical (C_1= *m*) has to begin a new |CVC| syllable. Now, we know that phonotactic rules in Mwotlap exclude consonant clusters within the syllable; as a consequence, C_2 (here *n*) takes the next C-slot, leaving a V-slot empty in the middle. This gives the floating vowel an opportunity to surface on the right of C_1:



(c) A V-slot is left empty to the right of C_1: competition between two floating Vs

The third case is when the lexeme takes a C- prefix (which does not exist in Mwotlap) or a shifting CV- prefix. In this case, the first three 'true' phonemes involved are three consonants (here *n*, *m*, *n*), which automatically fit into the syllabic template |CV-C|CVC|. The V-slot on the prefix is left empty again, allowing for a floating vowel to surface on the left of C_1:



nA- + *mĒnay* → *nēmnay*
'cleverness'

The latter example provides us with some new information. First, floating vowels in Mwotlap have the property of being mobile, which was not visible in the previous discussion; a good representation would be to say that this MV (e.g. *Ē*) is 'attached' to the first consonant of the lexeme (e.g. *m*).

Secondly, in a situation where two *floating vowels* are competing for the same empty V-slot, the vowel of the radical has priority over that of the prefix, excluding a form like **na-mnay*. This kind of hierarchy LEXEME > PREFIX is instructive about the way morphology is cognitively perceived.

Conclusion

As far as the vocabulary is concerned, Mwotlap can be said to be a conservative language, since it shares many items with neighbouring Mota or with Proto Oceanic. However, historical effects of former stress have largely modified not only the shape of the words, but also the very mechanisms of the whole phonological system. Inherited structures have recently undergone several processes of standardization and reanalysis, bringing about novel phonotactic constraints –a CVC syllabic pattern– and morphophonemic rules, including vowel shifting. Moreover, we have demonstrated that a special sort of phoneme was created through history, namely our 'floating vowels'; these are present in less than thirty items of the language, but their frequence makes them crucial to understand the whole morphology and grammar of the language.

Finally, we would like to put forward the idea that formal analysis is not there to confirm or invalidate a theory defined *a priori*, but must help build this theory out of the very data. Linguistic structures are already present in the way people talk, and it is neither necessary, nor scientifically satisfying, to hypothesize them out of the blue, '*more geometrico*'. Theory and formalism in linguistics must serve the empirical observation, and not the reverse.

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