

The Segmental Sound Patterns of Sye^{*}

(1) Phonetic description of 20 surface consonants

	Labial			Dento-alveolar			Palatal			Velar			Glottal
	+voi	-voi	+asp	+voi	-voi	+asp	+voi	-voi	+asp	+voi	-voi	+asp	-voi
Stop		[p]	[p ^h]	[d]	[t]	[t ^h]					[k]	[k ^h]	
Fric	[β] [v]	[f]			[s]			[ʃ]			[ɣ]		[h]
Nas	[m]			[n]						[ŋ]			
Lat				[l]									
Tap				[ɾ]									
Trill				[r]									

(2) Phonetic description of 7 surface vowels

	Front	Central	Back
High	[i]		[u] [ʊ]
Mid	[e]	[ə]	[o]
Low		[a]	

Syllable structure

The language allows complex syllable structure, with codas and clusters, = CV, CVV, CCV, CVCC, CCVCC, but there are several restrictions on codas, clusters and adjacent vowels (to be discussed).

Vowel distribution

The vowels show very little variation. The changes that are found are restricted to the lowering of /u/ to [ʊ] word finally before a velar fricative, epenthesis of [o] to break up consonant clusters in limited morphological contexts, and a variety of simplifications in VV sequences. The former two are exemplified in (3) and (4).

(3) [nendʊy] ‘garden’

(4) [ten.mi] ‘bury him/her!’ ~ [te.nom.jau]¹ ‘bury me!’

Vowel-vowel combinations

All vowels but [i] show co-occurrence restrictions in vowel sequences. The following charts provide the distribution of vowels in vowel-vowel sequences as discussed by Crowley (1998).

^{*} Based on the description of Crowley (1998). Sye (a.k.a. Sie) is a Eastern Malayo-Polynesian language spoken on Erromango in southern Vanuatu in Melanesia.

¹ Phonetic glides are predictable from context and are analyzed here as onset vowels. Thus, this form is phonologically [te.nom.iau].

(5) VV sequences

	/i/	/u/	/e/	/o/	/a/
/i/	ji	ju	je	jo	ja
/u/	wi	u	we/wo	wo	wa
/e/	ej	u	e	o	a
/o/	oj	ow	o	o	a
/a/	aj	aw	a	a	a

Note: Non-nuclear vowels are transcribed here as glides to distinguish them from nuclear vowels.

The following observations can be made:

- A sequence of two identical vowels (except /ii/~[ji]) is not allowed.
- Non-high vowels [e, o, a] are necessarily nuclei in sequences including high vowels.
- High vowels [i, u] are necessarily non-nuclei in sequences including non-high vowels.
- Underlying sequences of non-high vowels are resolved by deletion, with the following preference for retention: [a] > [o] > [e].
- /eu/ is resolved as [u].
- /ue/ is resolved as [we] morpheme internally, but [wo] across a morpheme boundary.

Vowel behavior in morphology

In addition to the simplifications of VV sequences just discussed, there are several other alternations that take place across morpheme boundaries.

Morpheme-final /u/ deletes before another vowel if it is preceded by either a consonant cluster or /m/. (CHECK THE FACTS HERE!)

(6) /CCu+V/ --> [CCV]
 /mu+V/ --> [mV]

Word-initial vowels can optionally delete if there are three or more syllables in the word. This suggests that the last two syllables foot and that unfooted initial vowels may delete. The nature of the optionality (i.e. inter-speaker, intra-speaker, fast speech, etc.) is not clear from Crowley's description and I leave it to future research.

(7) /Vσσ(+)/ --> [Vσσ(+)] ~ [σσ(+)]

Schwa

Although Crowley (1998) analyzes the language as having an underlying schwa that never surfaces as such but as [o] in particular morphological contexts, I analyze these same facts as indicating epenthesis to break up clusters in particular morphological contexts. The only place in which schwa appears on the surface is as the result of "optional" epenthesis. There are two classes of this type of vowel epenthesis. These are shown in (8) and (9).

- (8) /ehCV/ --> [eh.CV] ~ [e.hə.CV] ~ [e.he.CV]
 /ohCV/ --> [oh.CV] ~ [o.hə.CV] ~ [o.ho.CV]
 /eyCV/ --> [ey.CV] ~ [e.ɣə.CV] ~ [e.ɣe.CV]
 /oyCV/ --> [oy.CV] ~ [o.ɣə.CV] ~ [o.ɣo.CV]
 /ayCV/ --> [ay.CV] ~ [a.ɣə.CV]

- (9) /VCCŋV/ --> [VCC.ŋV] ~ [VC.Cə.ŋV] or [V.CCə.ŋV]

The pattern in (8) suggests that a vowel (schwa or copy of the preceding mid vowel) is optionally epenthesized between /h/ or /ɣ/ when that segment would otherwise syllabify as a medial coda consonant.

The pattern in (9) suggests that a vowel is optionally epenthesized between a consonant sequence and a velar nasal when that consonant sequence would otherwise syllabify as a medial coda cluster.

Because of the optional nature of this epenthesis and the fact that I do not have enough information about the nature of the optionality (i.e. intra-speaker, inter-speaker, fast speech, etc.), I will leave schwa to future research.

Vowel behavior discussed thus far leads to the following hypotheses:

- /i/ and /u/ are high vowels.
- /i/ is phonologically minimal (only high) since it is the only vowel allowed to be in an identical sequence - thus may not have the features subject to the OCP in this language.
- /a/, /o/ and /e/ all have a low feature because they are preferred as nuclei over high vowels.
- /u/ and /o/ are round vowels because they interact with other labial segments, trigger labial assimilation and/or are the result of labial assimilation.
- /e/ and /o/ are both high and low because they are more sonorous (phonologically) than high vowels (have a low feature), but are less sonorous (phonologically) than the low vowel (have a high feature).
- /e/ and /o/ differ only in rounding because /e/ becomes [o] as the result of labial assimilation.

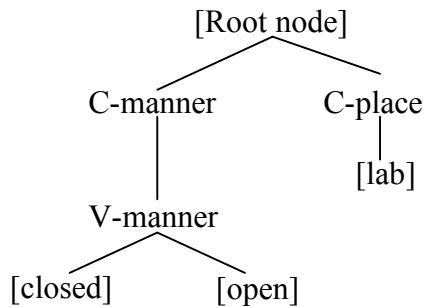
Given the distribution of the vocalic segments and the tenets of the Parallel Structures Model, a likely interpretation of Sye vowels is given in (10).

- (10) PSM feature chart for Sye vowels

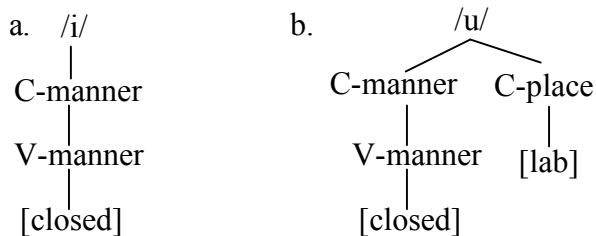
		C-place [lab]	V-manner [closed]	V-manner [open]
High	/i/		✓	
	/u/	✓	✓	
Mid	/e/		✓	✓
	/o/	✓	✓	✓
Low	/a/			✓

The fully specified representation is given in (11) and the representations for individual vowels given in (12) through (14).

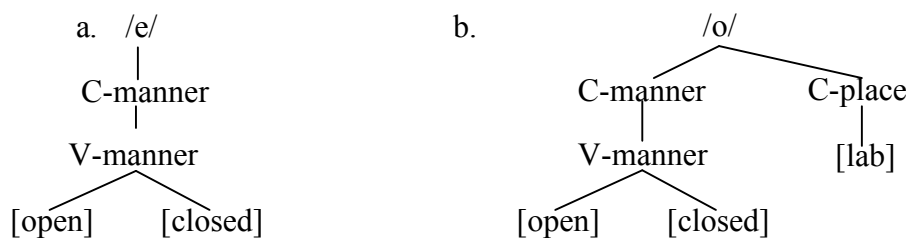
(11) Sye PSM Vowel Geometry



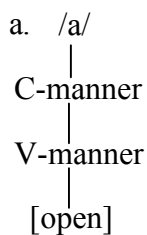
(12) Sye high vowels



(13) Sye mid vowels



(14) Sye low vowel



Consonants

The contrastive segments and their allophonic variations are given in (15). There are only 12 contrastive consonants but 20 surface consonants.

(15) Phonetic description of 20 surface consonants with the most basic allomorph in //.

	Labial		Dento-alveolar		Velar	Glottal	
	+voi	-voi	+voi	-voi	+voi	-voi	-voi
Stop		/p/~[p ^h]		/t/~[t ^h]		/k/~[k ^h]	
Fric	/v/~[β]~[f]			/s/~[ʃ]	/ɣ/		/h/
Nas	/m/		/n/		/ŋ/		
Lat			/l/				
Tap			/r/~[r]~[d]				

The allophonic alternations are conditioned as follows:

- Stops are aspirated in word-final position.
- The labial fricative is invariantly [v] for some speakers, but it varies freely or by context for other speakers. For those with a contextual preferences, [f] tends to occur word-initially, [β] tends to occur inter-vocalically, and [v] occurs elsewhere.
- The tap is realized as a tap or “light trill” in most environments, but it is invariably a voiced stop following a homorganic nasal.
- The palatal fricative occurs following /t/, as shown in (16).

(16) /itsɔŋku/ [itʃɔŋku] ‘whole’
 /ntsəɣ/ [ntʃəɣ] ‘uphill slope’

Initial consonants

All contrastive consonants may appear in word-initial position before a vowel (CHECK /ŋ/).

Final consonants

All contrastive consonants except /v/ appear in final position. However, recall that the stops aspirate here.

Initial and final consonant clusters

Consonant clusters allowed at the beginning of words are quite limited. Two member initial clusters are given in (17). The first member must be a non-coronal stop followed by [r], or a non-velar nasal followed by most consonants.

(17) Initial CC clusters

	/p/	/t/	/k/	/v/	/s/	/ɣ/	/h/	/m/	/n/	/ŋ/	/l/	/r/
/p/												pr
/t/												
/k/												kr
/v/												
/s/												
/ɣ/												
/h/												
/m/	mp	mt	mk		ms	mɣ	mh		mn	mŋ	ml	mr
/n/	np	nt	nk	nv		nɣ		nm		nŋ	nl	nd
/ŋ/												
/l/												
/r/												

Initial CCC clusters are restricted to /nrɤ/=[ndv], [ntr] and /nts/=[ntʃ].

Final clusters are restricted to [nt] and /nr/=[nd]. Note that these are the first two members of allowable initial three member clusters.

(18) Final CC sequences

	/p/	/t/	/k/	/v/	/s/	/ɣ/	/h/	/m/	/n/	/ŋ/	/l/	/r/
/p/												
/t/												
/k/												
/v/												
/s/												
/ɣ/												
/h/												
/m/												
/n/		nt										nd
/ŋ/												
/l/												
/r/												

Medial consonant sequences

There are a larger number of medial sequences than initial and final clusters combined. This strongly suggests that at least some of these sequences are not full clusters but are split by a syllable boundary. They are given in (19) and (20). The sequences found both medially and initially are bolded and alternations taking place over a morpheme boundary are given in square brackets (with shading).

(19) Medial CC sequences

	/p/	/t/	/k/	/v/	/s/	/ʃ/	/h/	/m/	/n/	/ŋ/	/l/	/r/
/p/	[p]	[vt]	[vk]	pv	[vs]	[vʃ]	ph	pm~[vm]	[vn]	[vŋ]	pl~[vl]	pr~[vr]
/t/	tp	[t]	tk	tv	tʃ	tʃ	th	tm	tn	tŋ	tl	tr
/k/	[ʏp]	[ʏt]	[k]	[ʏv]	ks~[ʏs]	???	kh~[ʏh]	[ʏm]	[ʏn]	kŋ	kl~[ʏl]	kr~[ʏr]
/v/	???	vt	vk	[v]	vs	vʃ	???	???	vn	vŋ	vl	vr
/s/	[hp]	[ht]	[hk]	[hv]	[s]	sʃ~[hʃ]	???	[hm]	[hn]	sŋ~[hŋ]	[hl]	[hr]
/ʃ/	ʃp	ʃt	???	ʃv	ʃs	[ʃ]	ʃh	ʃm	ʃn	[kŋ]	ʃl	ʃr
/h/	hp	???	hk	hv	hs~[s]	hʃ	[h]	hm	hn	hŋ	hl	hr
/m/	mp	mt	mk	[mp]	ms	mʃ	mh	[m]	mn	mŋ	ml	mr
/n/	np	nt	nk	nv	ns~[#ntʃ]	nʃ	nh	nm	[n]	nŋ	nl	nd
/ŋ/	[ʏp]	[ʏt]	ŋk	ŋv~[ʏv]	ŋs~[ʏs]	???	ŋh~[ʏh]	[ʏm]	[ʏn]	[ŋ]	ŋl~[ʏl]	ŋr~[ʏr]
/l/	lp	lt	lk	lv	ls	lʃ	lh	lm	ln	lŋ	[l]	lr
/r/	rp	rt	rk	rv	rs	rʃ	rh	rm	???	rŋ	rl	[r]

Note: “???” means that I found no mention of this sequence in Crowley (1998).

Most of the medial CC sequences that are only found across morpheme boundaries, however, they often undergo changes on the surface. As we can see in (20), once syllable boundaries are added (where we have evidence for it), we see that onset segments never change, but there are several coda neutralizations.

(20) Medial CC sequences with syllable boundaries indicated when known

	/p/	/t/	/k/	/v/	/s/	/ʃ/	/h/	/m/	/n/	/ŋ/	/l/	/r/
/p/	[p]	[v.t]	[v.k]	p.v	[v.s]	[v.ʃ]	p.h	p.m~[v.m]	[v.n]	[v.ŋ]	p.l~[v.l]	pr~[v.r]
/t/	t.p	[t]	t.k	t.v	tʃ	tʃ	t.h	t.m	t.n	t.ŋ	t.l	t.r
/k/	[ʏ.p]	[ʏ.t]	[k]	[ʏ.v]	k.s~[ʏ.s]	???	k.h~[ʏ.h]	[ʏ.m]	[ʏ.n]	k.ŋ	k.l~[ʏ.l]	kr~[ʏ.r]
/v/	???	v.t	v.k	[v]	v.s	v.ʃ	???	???	v.n	v.ŋ	v.l	v.r
/s/	[h.p]	[h.t]	[h.k]	[h.v]	[s]	s.ʃ~[h.ʃ]	???	[h.m]	[h.n]	s.ŋ~[h.ŋ]	[h.l]	[h.r]
/ʃ/	ʃ.p	ʃ.t	???	ʃ.v	ʃ.s	[ʃ]	ʃ.h	ʃ.m	ʃ.n	[k.ŋ]	ʃ.l	ʃ.r
/h/	h.p	???	h.k	h.v	h.s~[s]	h.ʃ	[h]	h.m	h.n	h.ŋ	h.l	h.r
/m/	.mp	.mt	.mk	[.mp]	.ms	.mʃ	.mh	[m]	.mn	.mŋ	.ml	.mr
/n/	.np	.nt	.nk	.nv	.ns~[#ntʃ]	.nʃ	nh	.nm	[n]	.nŋ	.nl	.nd
/ŋ/	[ʏ.p]	[ʏ.t]	ŋ.k	ŋ.v~[ʏ.v]	ŋ.s~[ʏ.s]	???	ŋ.h~[ʏ.h]	[ʏ.m]	[ʏ.n]	[ŋ]	ŋ.l~[ʏ.l]	ŋ.r~[ʏ.r]
/l/	l.p	l.t	l.k	l.v	l.s	l.ʃ	l.h	l.m	l.n	l.ŋ	[l]	l.r
/r/	r.p	r.t	r.k	r.v	r.s	r.ʃ	r.h	r.m	???	r.ŋ	r.l	[r]

Allowable medial CCC sequences are given in (21). These are quite limited, but seem to show more variety than would be expected given the allowable onset and coda clusters allowed in this language. A full discussion of these is left to future research.

(21) Medial CCC sequences

	/p/	/t/	/k/	/v/	/s/	/ɣ/	/h/	/m/	/n/	/ŋ/	/l/	/r/
/pm/	p.mp											
/tp/								tpm				
/tn/												t.nd
/vn/	vnp	vnt	vnk	vnv	vns	vny	vn.h	vnm			vnl	vnd
/ɣn/												ɣ.nd
/hn/												h.nd
/mp/					[.ms]	mp.ɣ	[.mh]		mp.n	mp.ŋ	mp.l	mpr
/mn/												m.nd
/nt/	nt.p						nt.h	nt.m		nt.ŋ		nt.r
/nr/				nd.v		nd.ɣ	nd.h	nd.m		nd.ŋ		
/ŋk/	[ɣ.p]	[ɣ.t]		[ɣ.v]	[ɣ.s]		[ɣ.h]	[ɣ.m]	[ɣ.n]		[ɣ.l]	ŋ.kr
/lp/								lp.m				
rn												r.nd

The discussion in Crowley (1998) suggests that the only medial CCCC sequences found are those involving /vn/ followed by all allowable initial CC sequences. This is shown in (22), but further research is needed to verify this claim since these clusters only involve the “plural prefix /ovn-/” (p. 25) and potentially results in sequences of identical nasals not allowed elsewhere in the language.

(22) Medial CCCC sequences (??)

[vnpr], [vnkr], [vnmp], [vnmt], [vnmk], [vnms], [vnmy], [vnmh], [vnmn], [vnmg],
[vnml], [vnmr], ([vnnp]?, [vnnt]?, [vnnk]?, [vnnv]?, [vnny]?, [vnnm]?, [vnng]?,
[vnnl]?, [vnnd]?)

Summary and representational/featural analysis

To summarize the consonant neutralizations seen in the above data:

- /p/ --> [p^h] word-finally
- /t/ --> [t^h] word-finally
- /k/ --> [k^h] word-finally
- /p/ --> [v] in non-final codas
- /k/ --> [ɣ] in non-final codas
- /s/ --> [h] in non-final codas
- /ŋ/ --> [ɣ] in non-final codas
- /ɣ/ --> [k] in non-final codas before a homorganic nasal [ŋ]

The phonetic characteristics of the consonants combined with the tenets of the Parallel Structures Model and distributional facts (including phonological alternations) lead to the following hypotheses:

- Given that many languages use laryngeal features (i.e. tones, aspiration, glottalization, etc.) to indicate the edges of morpho-phonological constituents, word-final aspiration provides evidence that there is a spread glottis gesture used in this language as a laryngeal feature (as opposed to a continuant feature).
- All the plain stops aspirate word-finally; therefore, we might conclude that they are a phonological class.
- Since the only initial consonant clusters allowed that do not contain a nasal are [pr] and [kr], we might conclude that /p/, /t/ and /k/ are the least sonorous segments in the language (i.e. phonological stops), while /r/ is the most sonorous (i.e. phonological sonorant consonant), and that /t/ and /r/ are phonologically similar enough to be subject to the OCP.
- If Sye is quantity-insensitive (this is a guess because there is no information in Crowley (1998) about the stress system), then coda neutralization patterns suggest several featural/structural markedness relationships between segments:
 - [p] is more marked than [v]
 - [k] is more marked than [ɣ]
 - [ŋ] is more marked than [ɣ]
 - [s] is more marked than [h]

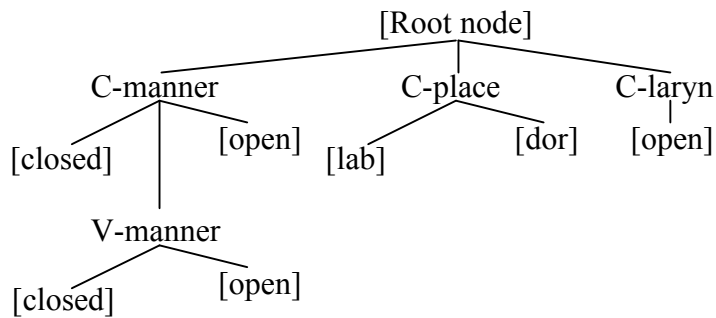
A likely interpretation of Sye consonants is given in (23).

(23) PSM feature chart for Sye

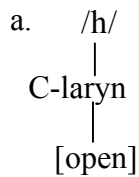
			C-place		C-manner		V-manner		C-laryn
			[lab]	[dor]	[closed]	[open]	[closed]	[open]	[open]
Spread glottis	/h/	[h]							✓
Mannerless	/v/	[v,β,f]	✓						
	/ɣ/	[ɣ]		✓					
Stop	/t/	[t]			✓				
	/p/	[p]	✓		✓				
	/k/	[k]		✓	✓				
	/t/	[t ^h]			✓				✓
	/p/	[p ^h]	✓		✓				✓
	/k/	[k ^h]		✓	✓				✓
Stop+ Continuant	/n/	[n]			✓	✓			
	/m/	[m]	✓		✓	✓			
	/ŋ/	[ŋ]		✓	✓	✓			
Continuant	/l/	[l]				✓			
	/s/	[s,tʃ]				✓			✓
Stop+High	/r/	[r]			✓		✓		
High	/i/	[i]					✓		
	/u/	[u,ʊ]	✓				✓		
Mid	/e/	[e]					✓	✓	
	/o/	[o]	✓				✓	✓	
Low	/a/	[a]						✓	

The fully specified representation for Sye segments is given in (24) and the representations for individual consonants given in (25) through (32).

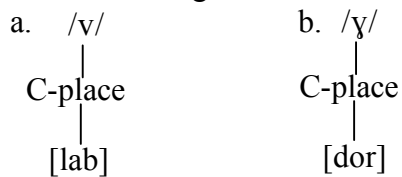
(24) Sye PSM Feature Geometry



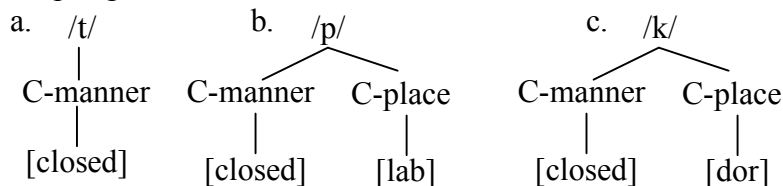
(25) Spread glottis segment



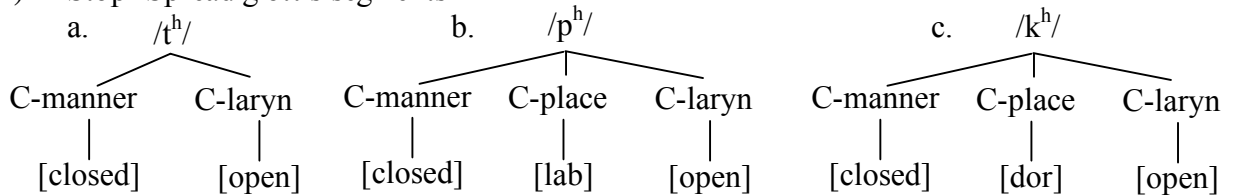
(26) Mannerless segments



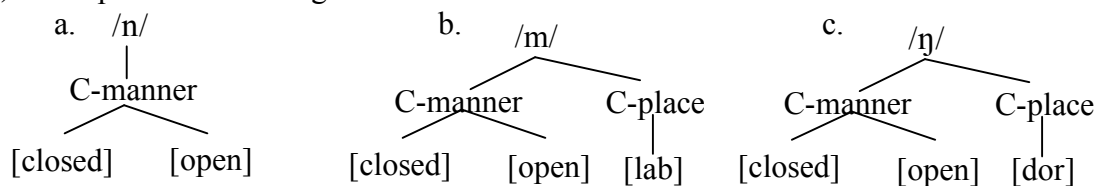
(27) Stop segments



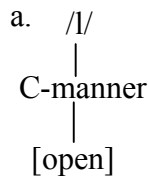
(28) Stop+Spread glottis segments



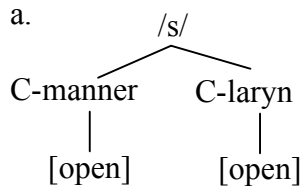
(29) Stop+Continuant segments



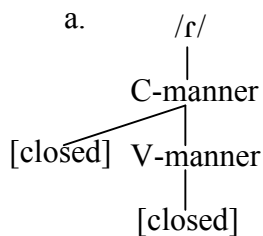
(30) Continuant segment



(31) Continuant+Spread glottis segment



(32) Stop+High segment

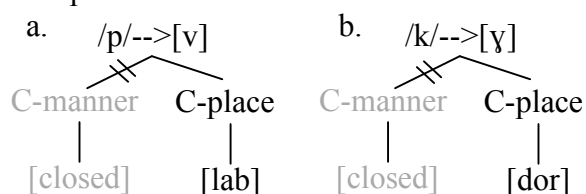


The distribution of consonants in codas may be described as the following set of conditions and repair strategies:

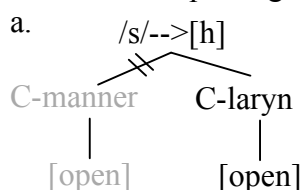
- [v] - C-place[lab] is OK in coda
- [ɣ] - C-place[dor] is OK in coda
- [t] - C-manner[closed] is OK in coda
- [l] - C-manner[open] is OK in coda
- [h] - C-laryn[open] is OK in coda
- [n] - C-manner[closed]&C-manner[open] is OK in coda
- [r] - C-manner[closed]&V-manner[closed] is OK in coda
- [m] - C-place[lab]&C-manner[closed]&C-manner[open] OK in coda
- /p/ --> [v] - C-place[lab]&C-manner[closed] is prohibited in coda --> lose manner
- /k/ --> [ɣ] - C-place[dor]&C-manner[closed] in prohibited coda --> lose manner
- /s/ --> [h] - C-manner[open]&C-laryn[open] is prohibited in coda --> lose manner
- /ŋ/ --> [ɣ] - C-place[dor]&C-manner[closed]&C-manner[open] is prohibited in coda --> lose manner

The coda neutralizations are shown representationally in (33) through (35).

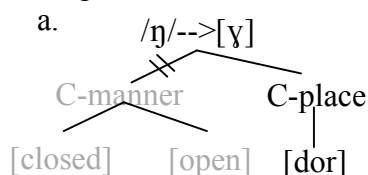
(33) Stop-to-Mannerless coda neutralization



(34) Continuant+Spread glottis-to-Spread glottis coda neutralization



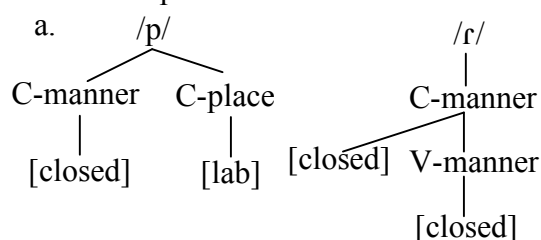
(35) Stop+Continuant-to-Mannerless coda neutralization

**Initial CC clusters revisited**

Recall that the only initial clusters in this language are non-coronal stop+rhotic and non-velar nasal+C. While the stop+rhotic clusters are not particularly surprising, the nasal+C clusters are somewhat more surprising - particularly in lieu of the fact that other “more reasonable” clusters are not allowed (e.g. *[pl] and *[st]). We must ask ourselves how this selection of onset clusters is allowed, while others that we might expect to occur do not.

I suggest that the [p,k]+rhotic clusters are licit because [p,k] are preferred/unmarked onsets since they are phonological stops (least sonorous segments) and [r] is the most sonorous non-vowel (sonorant consonant). By invoking the sonority sequencing generalization, then a stop+sonorant cluster is actually quite well-formed and is that preferred by many languages allowing onset clusters. Representationally, the labial stop-sonorant cluster is given in (36).

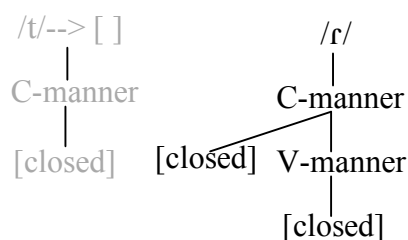
(36) Labial stop+Sonorant cluster



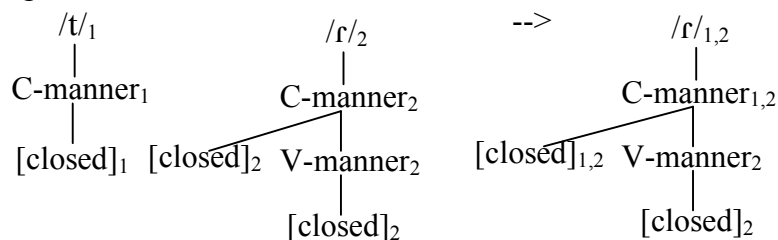
Under this analysis, [tr] onsets are missing because they are both placeless and are identical along the C-manner dimension. I suggest that these segments are too similar and one either deletes in response to an OCP, or the stop merges with the sonorant. These options are depicted in (37). Note that the similarity of these segments is captured straightforwardly in this model and it is more difficult to account for the restriction against this cluster in more traditional models.

(37) Coronal stop+Sonorant sequence and possible repairs

a. Deletion scenario



b. Merger scenario

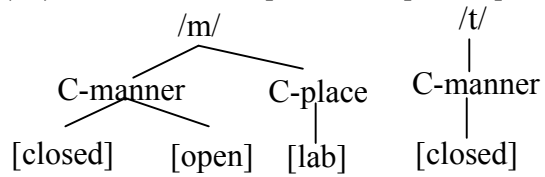


The issue of the nasal clusters is much more interesting and suggests that the mapping between phonetic characteristics and phonological features is not as universal as is usually assumed. That is, nasals are not necessarily phonologically sonorant in all languages. This is one of the (core?) claims of the PSM.

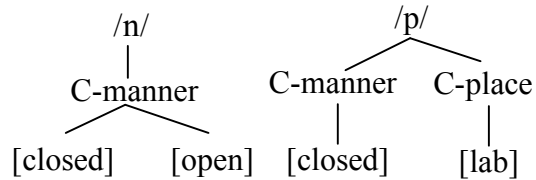
According to the typology of obstruent clusters of Morelli (1999), the cross-linguistically most common and least marked sequence of onset obstruents is fricative-stop. In fact, she claims that there is a universal implication such that stop-stop or fricative-fricative implies the presence of fricative-stop. If we translate this into the PSM sequence of C-manner[open]-C-manner[closed], then Sye obs-obs sequences should begin with [n, m, ŋ, l, s] according to the analysis above. However, if CC clusters must begin with a phonological stop as suggested by the stop-sonorant clusters discussed above, then only obs-obs clusters beginning with [n, m, ŋ] should be allowed. The absence of [ŋ]-obs clusters is readily accounted for if we acknowledge the general dispreference for velar nasals in the language (recall that they are the only nasals subject to coda neutralization) and it is unclear from Crowley's data if velar nasal are allowed in initial position as a singleton. Thus, the absence of this type of initial clusters may be principled. Sye is left with only obs-obs clusters beginning with [n, m].

The representations of [mt], [np], [nl], [ms] and [mr] are given in (38), and the prohibited clusters *[pl], *[st] and *[sn] given in (39).

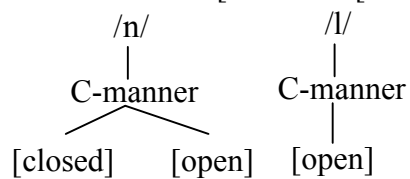
(38) a. Satisfies σ [C-manner[closed] & C-manner[open]-obstruent



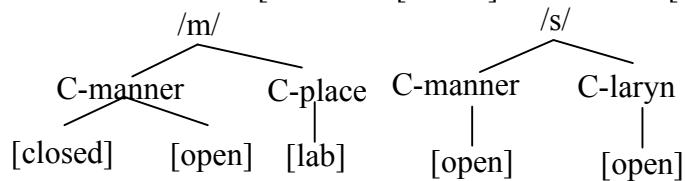
b. Satisfies σ [C-manner[closed] & C-manner[open]-obstruent



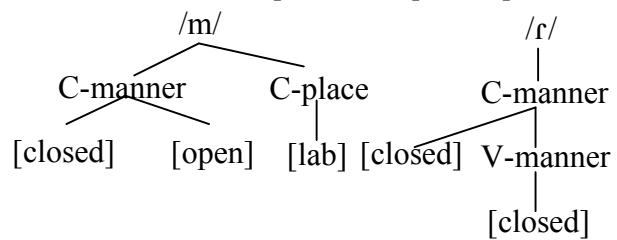
c. Satisfies σ [C-manner[closed] & C-manner[open]-obstruent



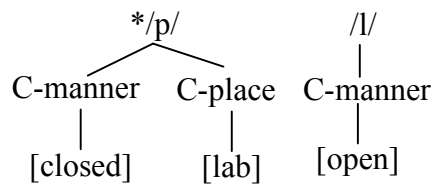
d. Satisfies σ [C-manner[closed] & C-manner[open]-obstruent



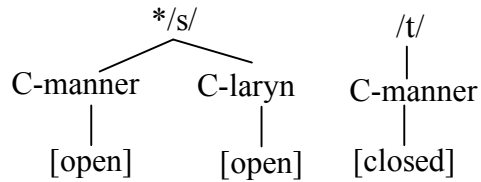
e. Satisfies σ [C-manner[closed] & C-manner[closed]-sonorant



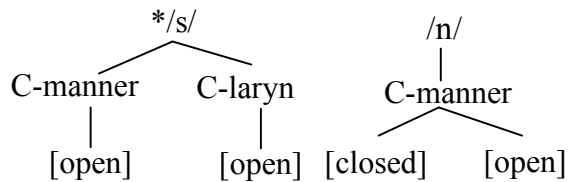
- (39) a. Satisfies σ [C-manner[closed]] but not C-manner[open]-obstruent



- b. Does not satisfy σ [C-manner[closed]] but does satisfy C-manner[open]-obstruent



- c. Does not satisfy σ [C-manner[closed]] but does satisfy C-manner[open]-obstruent



So, the somewhat unexpected preference for initial CC clusters to begin with a nasal in this language is seen as the interleaving of two cross-linguistic preferences: 1) the first member of an onset is preferably a stop (i.e. C-manner[closed]) and 2) obstruent-obstruent clusters should begin with continuant obstruents (i.e. C-manner[open]). Only nasal-consonant clusters in this language satisfy both of these conditions.