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Phonology at the Interface of Morphology and Phonetics: On the Distinct Synchronic Origins of Creaky Vowels in Two Mon-Khmer Languages

Introduction:

1. Phonological systems function to optimize the acoustic salience of their contrastive values.

   The optimal phonology is that which results in the salient encoding of its contrasts: **acoustic transparency**.

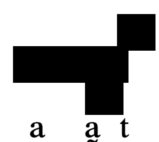
   In situations where contrasts run the risk of neutralizing, phasing rules manipulate gestural timing relationships in order to ensure the perceptual salience of these values.

2. Kingston (1985, 1990) and Bladon (1986) observe that voiceless plosives usually realize laryngeal gestures *on their release*.

   There are exceptions to this generalization (Steriade 1993): Chong.

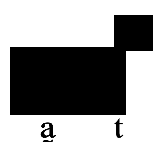
3. Chong creaky vowels are not associated with a laryngeal constriction. Their creakiness is derived from a lexically laryngealized tautosyllabic coda stop--the laryngeal constriction *precedes* the oral closure.

   SL (supralaryngeal): coronal stop:
   low vowel:
   L (laryngeal): constriction:



   Sedang creaky vowels are true creaky vowels: the laryngeal constriction is nuclear in affiliation:

   SL: coronal stop:
   low vowel:
   L: constriction:



4. There are phonetic, phonotactic, and morphological reasons for the Chong and Sedang patterns.

Chong:

5. Chong is a Mon-Khmer language spoken by approximately 5500 people in Cambodia and Thailand (Huffman 1985, Thonkum 1987a,b).

6. Chong vowels may be phonetically creaky and/or breathy.
   Vowel creakiness is derived from laryngealized word-final stops
   Breathiness is derived from a nuclear phonation contrast.

7. segment inventory:

p	t	c	k
pʰ	tʰ	cʰ	kʰ
b	d		
m	n	ɳ	ŋ
	s		
	l,r		
		j	w

h,ʔ

i(ː) ɯ(ː) u(ː)
e(ː) ə o(ː)
ɛ(ː) ɤ(ː) ɔ(ː)
a(ː)

8. Chong contains four "registers".

R(egister) 1:	clear voice, high pitch, higher F1
R2:	clear-creaky voice, high-falling pitch, higher F1
R3:	breathy voice, lower pitch, lower F1
R4:	breathy-creaky voice, low-falling pitch, lower F1

examples of Chong registers:

R1:	chih^1	[chih]	to dry in the sun
	puk^1	[puk]	rotten smell
	sii^1	[sii]	head louse
	pʰoʔ^1	[pʰoʔ]	to dream
R2:	kəsut^2	[kəsuṵt]	to come off
	tham^2	[thaḿ̰]	crab
	kəpʰaŋ^2	[kəpʱaŋ]	scraps, chips
	suuc^2	[suṵc] ˜	ant
R3:	puut^3	[pṳṳt]	to speak
	kəlaa^3	[kəla̤a̤]	ear
	pɔh^3	[pɔ̤h]	ashes
	kəcaai^3	[kəca̤a̤j]	nine
R4:	luuc^4	[lṳṵc]	soft
	kəlaai^4	[kəla̤a̰j]	loose
	cam^4	[ca̤m̰]˜	bruised
	peet^4	[pe̤ḛt]	hips

9. Chong codas:

stops:	p	kəkɛɛ̰p^1	[kəkɛɛp]	to cut (with scissors)
	t	peet^3	[pe̤e̤t]	plague
	c	kənooc^2	[kənooc̰]	nipple
	k	lɛɛk^1	[lɛɛk]	chicken
nasals:	m	cum^4	[cṳm̰]	vine, climber
	n	khiin^2	[khiin̰]	guard
	ɲ	(no examples given)		
	ŋ	kəlɛɛŋ^2	[kəlɛɛŋ]	floor
glides:	j	luj^4	[lṳj] ˜	earthworm
	w	wɛɛ^2	[w̃ɛɛ̰]	curved
laryngeals:	ʔ	rəkoʔ^1	[rəkoʔ]	tips (of climbers and creepers)
	h	pah^3	[pa̤h]	dry

10. Generalizations regarding the distribution of Chong laryngeals:

1) In creaky registers, creakiness always *follows* clear or breathy phonation.
2) While /ʔ/ and /h/ codas may co-occur with the clear and breathy registers, /ʔ/ and /h/ codas may not co-occur with clear-creaky and breathy-creaky registers.

[Vʔ]	but	*[VV̰ʔ]
[V̤ʔ]		*[V̤V̰ʔ]
[Vh]		*[VV̰h]
[V̤h]		*[V̤V̰h]

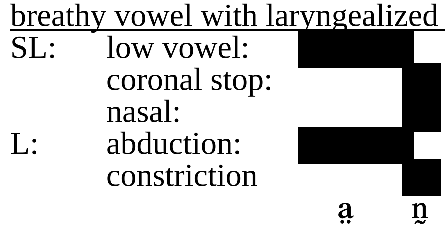
3) Creaky registers co-occurring with sonorant codas are realized as laryngealization on the coda only, not on the vowel.
4) Creaky registers may only occur in *closed* syllables.

11. All of these generalizations may be accounted for if the laryngeal constriction is ordered to *follow* the nucleus. That is, the constriction is part of the coda, lexically coextensive with a coda supralaryngeal constriction, if one.

12. 1) In creaky registers, creakiness always *follows* clear or breathy phonation.

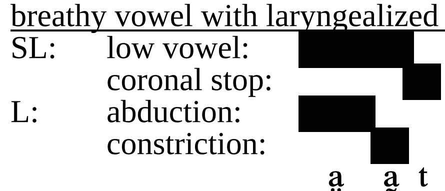
Creaky phonation *follows* breathy phonation because codas follow stops.

a. breathy vowel with laryngealized sonorant:



examples:	cam^4	[ca̤m̰]	bruised
	cɔɔŋ^4	[cɔ̤ɔ̤ŋ̰]	we

b. breathy vowel with laryngealized stop:



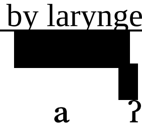
examples:	luuc^4	[lṳṵc]	soft
	lɔɔp^4	[lɔ̤ɔ̰p]	gadfly

13. 2) While /ʔ/ and /h/ codas may co-occur with the clear and breathy registers, /ʔ/ and /h/ codas may not co-occur with clear-creaky and breathy-creaky registers.

Incompatible laryngeal states may not be simultaneous (Halle and Stevens 1971): */ʔ̤/, */h̰/, */V̤̰/.

a. <u>plain vowel followed by laryngeal constriction</u>:

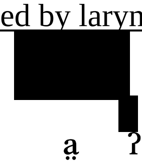
SL: low vowel:
L: constriction:



examples:	kəloʔ^{1}	[kəloʔ]	skin
	leʔ^{1}	[leʔ]	kind of hat

b. <u>breathy vowel followed by laryngeal constriction</u>:

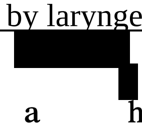
SL: low vowel:
L: abduction:
constriction:



examples:	klɔʔ^{3}	[klɔ̤ʔ]	to vomit
	peʔ^{3}	[pe̤ʔ]	delicious

c. <u>plain vowel followed by laryngeal abduction</u>

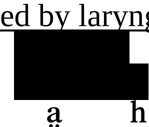
SL: low vowel:
L: abduction:



examples:	kəpɔh^{1}	[kəpɔh]	thread
	ʔih^{1}	[ʔih]	not

d. <u>breathy vowel followed by laryngeal abduction</u>:

SL: low vowel:
L: abduction:



examples:	pɔh^{3}	[pɔ̤h]	ashes
	kɔh^{3}	[kɔ̤h]	to knock

14. 3) Creaky registers co-occurring with sonorant codas are realized as laryngealization on the coda only, not on the vowel itself.

Creaky registers co-occuring with sonorant codas realize their creakiness on the coda because the laryngeal constriction is lexically associated with this position.

Creaky registers co-occuring with stop codas realize their creakiness on the preceding vowel.

If laryngealization were phonetically coextensive with the oral occlusion, no acoustic energy would be present to encode this contrastive information. Therefore, the laryngeal gesture is sequenced to *precede* the stop closure, and acoustic transparency is achieved.

15. 4) Creaky registers may occur only in closed syllables.

Creaky registers occur only in closed syllables because the laryngeal constriction is phonologically associated with coda position. When this gesture stands alone in coda position, it is phonetically realized as a post-vocalic glottal stop.

16. **Glottalized coda stops in Chong are realized as pre-glottals in order to achieve acoustic transparency.**

17. Morphological and phonotactic influences:

- Chong words are very short: most roots are monosyllabic.
- Bisyllabic roots possess [kə] or [rə] as the first syllable.
- Syllable structure is quite simple: C(C)V(C)

Laryngeally augmenting root-final consonants serves to expand the inventory of contrastive root types, albeit in a non-optimal fashion.

- Chong coda stops are unreleased, as is the norm for related Mon-Khmer and areal languages.
- Mon-Khmer languages are strictly non-suffixing (Nghia 1976).

In root-final position, a laryngeal gesture that is endangered by acoustic opacity must be sequenced to *precede* the opacity-inducing supralaryngeal gesture if it is to survive, despite the noted preference for realization on release.

As no lexical morphological complex involves material following the root, and as root-final stops are unreleased, there is no lexical environment in which contrastive information may be phonetically realized *following* the root. So contrastive laryngealization in root-final plosives is realized on its tautosyllabic, or, more to the point, tauto*morphemic* vowel.

18. Chong formalized:

a morphological constraint prohibits suffixation, allowing only left-edge alignment.

<u>Chong morphological constraint</u>:
😐 **align affixes to the right of the root/stem**

<u>Chong phonotactic constraint</u>:
☹ **optimal: codas released**
☺ **sub-optimal: codas unreleased**

<u>Chong laryngealized stop phasing constraint</u>:
☹ **optimal: sequence constriction at stop release**
☺ **sub-optimal: sequence constriction to precede stop closure**

19. **Sedang:**
Sedang is a Mon-Khmer language spoken by approximately 40,000 people in Vietnam (Grimes 1988,Smith 1968).

20. segment inventory:

p	t	tʃ	k
b	d	dʒ	g
	s	ʃ	
m	n	ɲ	ŋ
	l,r		
		j	w

h,ʔ

i		u
e/ɛ		o
ɛ/æ		ɔ
	a	

21. syllable structure: C(C/G)V(C)

22. permissible codas: p,t,k,m,n,ŋ,y,w,h,ʔ

23. phonotactics:

a. Sonorants, as well as the voiced stops, which are redundantly prenasalized, may be preglottalized. When voiced stops are preglottalized they lose their nasal component.

lo	to go out	ʔlo	there also
mot	to enter	ʔmot	to hunt with a dog
mbo	opening	ʔbok	honorific address

b. Sonorants may be pre-aspirated.

rei	root	hre	small animal in sewage
no	mango	hno	village name

c. Voiceless stops may be post-aspirated

kia	grave	khi	wind

24. Vowels in Sedang may be either plain or creaky. (With nasalization cross-classifying, this results in four vowel classes.) Smith: "a laryngealized vowel is a vowel during which there is simultaneous voicing and trillization," and that "(i)n closed syllables, the trillization continues through the final consonant" (p.60).

25. Creaky vowels may be present in either open syllables, or syllables closed by sonorants (see (15)), and, most significantly, "final glottal stop contrasts with [vowel--D.S.] laryngealization in open syllables"(p.60).

plain:		creaked:		checked:	
o	young sibling	o̰	very	oʔ	daughter's husband
cha	basket	cha̰	wild cat	chaʔ	gate

26. Sedang formalized:

<u>phasing constraint</u>:
☺ **optimal:** **realize the nuclear constriction simultaneously with the vowel**

Sedang creaky vowels are optimally realized.

Conclusion:

2. --Creaked vowels in Chong and Sedang have distinct synchronic origins.

--Sedang creaky vowels are true laryngealized segments.

--Chong creaky vowels are derived from phonologically laryngealized coda stops.

--Vowels possess sufficient acoustic energy to simultaneously encode supralaryngeal and laryngeal gestures; stops do not.

--Stops must sequence contrastive laryngeal gestures in order for them to achieve acoustic transparency.

--This phonetic realization is intimately bound to morphological and phonotactic structure. Chong is not a suffixing language. Unreleased root-final stops which possess contrastive laryngealization must realize this laryngeal feature on a tautomorphemic vowel, if it is to survive.

--As Chong roots are short, all possible contrasts are best maintained.

--Although stop releases are best suited to accommodate laryngeal contrasts, particular morphological constraints may make this optimal realization site unavailable.

--In Chong, the tautosyllabic/tautomorphemic vowel bears the burden of acoustically encoding contrastive laryngeals in this environment.