

#hèě-#hèě !ṅàĩ-!ṅàĩ Clicks, Concurrency and the Complexity of Khoisan

Julian Bradfield
University of Edinburgh

The click consonants of !Xóǒ, per SoWL

k@	k	k	k!	k‡
g@	g	g	g!	g‡
kO ^h	k ^h	k ^h	k! ^h	k‡ ^h
gOh	g h	g ^h	g! ^h	g‡ ^h
kO ^x	k ^x	k ^x	k! ^x	k‡ ^x
gOkx	g kx	g kx	g! ^x	g‡kx
kO'q'	k 'q'	k 'q'	k!'q'	k‡'q'
gOq'	g q'	g q'	g!'q'	g‡q'
q@	q	q	q!	q‡
c@	c	c	c!	c‡
cOh	c h	c ^h	c! ^h	c‡ ^h
qO'	q '	q '	q!'	q‡'
ṅO ^h	ṅ h	ṅ ^h	ṅ! ^h	ṅ‡ ^h
ṅO	ṅ	ṅ	ṅ!	ṅ‡
ṅ@	ṅ	ṅ	ṅ!	ṅ‡
?ṅ@	?ṅ	?ṅ	?ṅ!	?ṅ‡
kO?	k ?	k ?	k!?	k‡?

Khoisan clicks – pre-1970s

Descriptions of Nama etc. viewed each click onset as a distinct sound. Different click places and efflux/accompaniment types used as classificatory mechanism (like place/manner).

This is unsatisfactory, especially in !Xoo ...

Even more than usual, notations for the click consonants carry (not necessarily correct) phonological and phonetic baggage. I'll mostly use SoWL notation for clicks, though this is (IMHO) inappropriate in places; I'll also use Traill's notation for !Xoo words *in slanted*, though he acknowledged deficiencies.

I'll use @ for a generic simple click, and @C* for any of the click consonants.

Too many phonemes, not enough words

Basic word shape in !Xoo is @C*V(C)V (and C*V(C)V, which we ignore).

- ▶ With phonotactic constraints, about 13000 possible such words
- ▶ of which ca. 2000 are attested

If each @C* is a 'phoneme':

- ▶ many of them bear a tiny functional load: indeed,
- ▶ several of them occur in only a few words.

What about minimal pairs?

- ▶ 3403 potential minimal pairs to find:
- ▶ remarkably, more than half of them exist; almost 3/4 if we ignore tones.
- ▶ The biggest minimal set has size 31, with àa. (Or size 49, tonelessly.)

The click consonants of !Xóǒ, per SoWL

k@	9	k	60	k	103	k!	107	k‡	69
g@	6	g	57	g	74	g!	70	g‡	58
kO ^h	6	k ^h	28	k ^h	30	k! ^h	21	k‡ ^h	39
gOh	2	g h	5	g ^h	7	g! ^h	7	g‡ ^h	11
kO ^x	2	k ^x	15	k ^x	28	k! ^x	19	k‡ ^x	19
gOkx	1	g kx	10	g kx	13	g! ^x	9	g‡kx	10
kO'q'	1	k 'q'	7	k 'q'	17	k!'q'	15	k‡'q'	8
gOq'	3	g q'	9	g q'	13	g!'q'	4	g‡q'	10
q@	5	q	16	q	28	q!	15	q‡	35
c@	3	c	29	c	29	c!	35	c‡	42
cOh	0	c h	4	c ^h	7	c! ^h	3	c‡ ^h	0
qO'	3	q '	16	q '	25	q!'	12	q‡'	5
ṅO ^h	7	ṅ h	13	ṅ ^h	18	ṅ! ^h	24	ṅ‡ ^h	15
ṅO	1	ṅ	5	ṅ	8	ṅ!	11	ṅ‡	3
ṅ@	9	ṅ	60	ṅ	82	ṅ!	103	ṅ‡	48
?ṅ@	2	?ṅ	33	?ṅ	41	?ṅ!	37	?ṅ‡	15
kO?	5	k ?	23	k ?	32	k!?	28	k‡?	35

Traill: Clustering

Traill (1985) proposed viewing many accompaniments as clusters, for example:

- ▶ g@kx: g@ and x (*sic*) exist independently, so g@kx = /g@/ + /x/
- ▶ k@? = /k@/ + /?/, for similar reasons

Analysis not completely unproblematic, and in (1993) he drew back from wholesale clustering.

Maybe 1/3 of the accompaniments can easily be explained away thus. Still 50-odd phonemes ...

Grawunder & Naumann (unpub) also propose clustering (but they start from a claim of 21 accompaniments!).

Miller: new features

Miller et al. (2007) study Njuu. Much simpler than !Xoo, but does share a @ vs @q distinction.

Miller et al.

- ▶ dislike clustering (“prosodically problematic”);
- ▶ don’t believe in velar–uvular contrasts in clicks;
- ▶ propose ‘airstream contour’ features, just as affricates are a manner contour (stop→fricative). So @ is ‘lingual’, and @q is ‘lingual→pulmonic’, etc.;
- ▶ extension to !Xoo etc. expected: future work.

Doesn’t reduce number of phonemes, but does put them into a nice IPA-like chart. (That is, increases the number of dimensions, but decreases the number of points on each axis.)

A quote to bear in mind: “/ʔ/ is to /l/ as /b/ is to /p/”.

The click problem: a phonological perspective

Phonology is a science.



“All science is either physics or stamp-collecting.”

Phonology is not physics.

The click problem: a philatelic perspective



Value: \$300 000



Value: \$1 000

The click solution

Take the click to be a segment *per se*, running **concurrently** with a velar/uvular stop or nasal segment.

E.g.: @ is k – two segments. @g is g. @q is qq. Etc.

Consequences:

- ▶ reflects articulatory reality;
- ▶ reflects acoustic reality;
- ▶ reflects perceptual reality (at least for me . . .);
- ▶ reduces the number of phonemes to 22 (or fewer with clustering);
- ▶ brings the functional load per phoneme to something reasonable, and gives us most of the minimal pairs;

Digression: what makes distinct accompaniments?

According to Traill (and Ladefoged), !Xoo has:

- ▶ ŋ@^h – also found in, e.g., Nama and Ju|’hōansi, but particularly phonetically complex in !Xoo
- ▶ ŋ@ – not found in other languages

Traill is quite explicit that these are phonologically distinct. There is no minimal pair for these two accompaniments. Moreover, they are in complementary distribution in Traill’s data:

- ▶ ŋ@^h occurs only before a plain (nasalized) vowel;
- ▶ ŋ@ occurs only before a pharyngealized and/or creaky (nasalized) vowel.

Are [ŋ@^h] and [ŋ@] ‘phonetically different’ enough to justify two ‘phonemes’?

(If we lose ŋ@, 115 of 120 accompaniment minimal pairs exist, and the other 5 exist tonelessly.)

The click solution

Take the click to be a segment *per se*, running **concurrently** with a velar/uvular stop or nasal segment.

E.g.: @ is k – two segments. @g is g. @q is qq. Etc.

Consequences:

- ▶ reflects articulatory reality;
- ▶ reflects acoustic reality;
- ▶ reflects perceptual reality (at least for me . . .);
- ▶ reduces the number of phonemes to 22 (or fewer with clustering);
- ▶ brings the functional load per phoneme to something reasonable, and gives us most of the minimal pairs;
- ▶ supports cluster analysis; doesn’t go well with Miller et al. new features;
- ▶ even appears to match !Xoo psychological reality:

ʃhèě-ʃhèě !ŋàĩ-!ŋàĩ

From Traill's (1994) dictionary of !Xoo:

- ▶ *Onúũ* to make the sound of the [O] click
- ▶ *!hèě* / *!'èè* make the sound of the [!] click
- ▶ *!hèě* make the sound of the [!] click
- ▶ *!ŋàĩ* to make the sound of the [!] click; to talk about
- ▶ *||hèě* / *||nàa* / *||'àã* to make the sound of the [||] click
- ▶ *ʃhèě* / *ʃ'èě* to make the noise of the [ʃ] click; to talk about

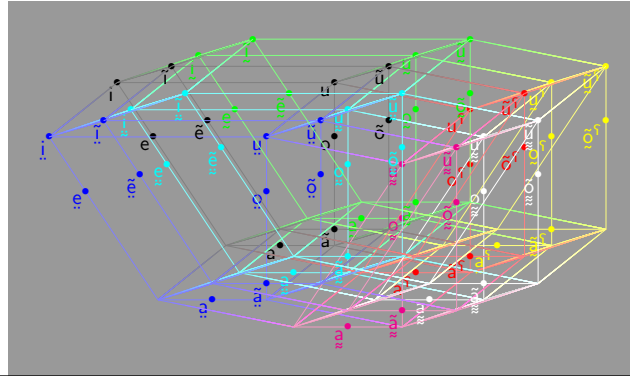
all these stems are used reduplicated: *Onúũ-Onúũ* etc.

Traill's *ǂ* means [a^ʃ].

!h is [h̥^ʃ] which is really [h̥^ʃh̥].

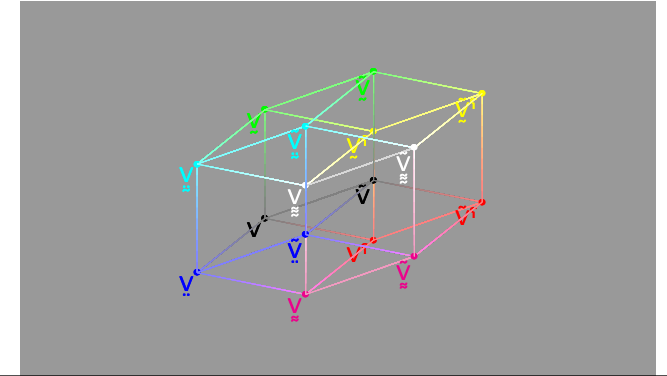
The vowel space of !Xoo

Five basic vowels /a e i o u/ – in stems usually in pairs.
Vowels may have several 'colourings'.



The vowel space of !Xoo

Five basic vowels /a e i o u/ – in stems usually in pairs.
Vowels may have several 'colourings'.



The vowels of !Xoo

Five basic vowels /a e i o u/ – in stems usually in pairs:
aa ae ai ao au ee ii oa oe oi ou ua ue ui uu.

Vowels may have several 'colourings'. In Traill's 'phonological' transcription with [IPA value], for aa:

plain	aa	[aa]	+nasal	aã	[ãã]
breathy	aha	[ãã]	+nasal	ahã	[ãã]
creaky	a'a	[ãã], [ãʔa]	+nasal	a'ã	[ãã], [ãʔã]
pharyngealized	ǂa	[a ^ʃ a]	+nasal	ǂã	[ã ^ʃ ã]
breathy creaky	ah'a	[ãʔa]	+nasal	ah'ã	[ãʔã]
creaky pharyngealized	ǂ'a	[a ^ʃ ʔ]	+nasal	ǂ'ã	[ã ^ʃ ʔ]
strident	ǂha	[ãã]	+nasal	ǂhã	[ãã]
strident creaky	ǂh'a	[ãʔa]	+nasal	ǂh'ã	[ãʔã]

where [ã] = [ããã], [a^ʃ] = [ãã^ʃã] etc.
e i do not carry the pharyngeal colourings.

How many vowel phonemes?

Clear phonological reasons to put ~ with the second vowel, and other colourings with the first, as notated by Traill.

That still gives $3 \times 8 + 2 \times 4 + 5 = 37$. But ...

- ▶ Colourings are transparent to vowel concord rules.
- ▶ Colourings combine freely ...
- ▶ provided, as phon(et/olog)ically plausible, we analyse \approx as $\dots + \text{ʃ}$.
- ▶ ʃ and \approx are arguably consonantal articulations (ʃ and ʔ) superimposed on the vowel;
- ▶ ... normally seen as phonation type (i.e. feature), but could be seen as superimposed consonant f .
- ▶ ~ could also be seen as such.

so why not just view the colourings as segments *per se* concurrent with the vowels?

Concurrent segments in phonological theory

A few remarks:

- ▶ In intent, almost theory-neutral.
- ▶ Full autosegmental phonology *not* required ('autosegments-lite'?).
- ▶ Technically routine to incorporate in your favourite theory.
- ▶ Reduces complexity for both phonologists and speakers!
- ▶ Disadvantages?

Predictions?

Science is supposed to be about making predictions ...

Really should be true:

- ▶ *ʕOqhàa* and *ʕ!qhàa* are both unattested. They will both be considered possible words.
- ▶ *!qòo* and *!qò'o* likewise.

(of course, gaps *could* be accidental).

Would be impressive if true:

- ▶ [ǁǁ] will be heard as /ǁ/ (*ah*').

A number of more significant psychophonetic experiments could be considered.

Avoiding Khoisan exceptionalism

I (we?) don't want to introduce a new concept just for !Xoo, or even just for Khoisan. Where else might one use these concurrent segments?

Anywhere a secondary articulation combines freely, perhaps? Or even not so freely?

In roughly descending order of plausibility:

- ▶ !Xoo (and friends) clicks
- ▶ !Xoo (and friends) vowels
- ▶ Secondary articulation in Caucasian consonants
- ▶ Clicks in Nguni?
- ▶ ...
- ▶ Nasalization in French (now?? 500 years ago? in an L2 learner?)

Summary

The notion of concurrent segment is

- ▶ a modest technical investment
- ▶ giving a generous return
- ▶ by reducing notorious inventories to something reasonable
- ▶ and better reflecting several faces of reality.

It doesn't, however, make it any easier actually to pronounce

ʔhèè-ʔhèè !ṅǎĩ-!ṅǎĩ.

References

- Grawunder, Sven and Christfried Naumann. The segment inventory of West !Xoon. Unpublished handout.
- Ladefoged, Peter and Ian Maddieson. *The Sounds of the World's Languages*. Oxford: Blackwell (1996).
- Miller, Amanda. L., Johanna Brugmann, Bonny Sands, Levi Namaseh, Mats Exter and Chris Collins. The sounds of N!uu: place and airstream contrasts. Lee, H.S. and P. Pittyaporn, Eds., Working papers of the Cornell Phonetics Laboratory 19 (2007).
- Traill, Anthony. *Phonetic and Phonological Studies of !Xóǒ Bushman*. Hamburg: Buske (1985).
- . The feature geometry of clicks. In: *Festschrift for E. B. van Wyk*, ed. P. von Staden. Pretoria: Via Africa (1992). 134–140.
- . *A !Xóǒ Dictionary*. Köln: Köppe (1994).