Chapter 7

Where do labial-velars go?

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The historical development of labial-velars, not being Indo-European, has not been addressed except for individual language families; larger cross-linguistic tendencies have gone largely unnoted. A survey of a larger sample reveals two common and clear tendencies of historical change. First is the "decay" into simple labials /p, b, m/, symbolically *KP > P. I propose this is due to the fact that the two articulations of KP are not precisely simultaneous; KP has a labial release. Second is the merger of voiceless /kp/ and voiced /gb/ into the voiced /gb/. Even the voiceless /kp/ often has phonetic characteristics commonly associated with voiced obstruents. These processes are thus both shown to have clear phonetic motivations.

1 Introduction

The term "labial-velars," as used in this paper, refers to the near-simultaneously doubly articulated sounds k͡p, g͡b, ŋ͡m and their modifications (often abbreviated KP here, with no tie-bars). In discussing the diachronic development of labial-velars, two major topics are the *origins* of labial-velars and the *changes* that labial-velars undergo. Here I focus on the latter – if a *KP undergoes regular sound change, what are the most common reflexes? Since labial-velars are only known in non-Indo-European languages, their development is not discussed in most historical linguistics books, with the notable exception of Dimmendaal 2011. So rather than discussions of labial-velars as a general type of sound, the attention to labial-velars in the literature is largely restricted to specific individual language families (e.g. Edoid in Elugbe 1989, Guang in Snider 1990, Northern Mande in Long 1971, Mande in Dwyer 1989, Lower Cross in Connell 1995), and

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larger cross-linguistic tendencies have gone largely unnoted, with the exception of some of Connell's work (e.g. Connell 1994), and more recently, areal considerations (Clements & Rialland 2008, Güldemann 2008, Idiatov & Van de Velde 2021).

Labial-velars exhibit two common and clear tendencies when they undergo regular sound change. First, / k͡p, g͡b, ŋ͡m/ simplify to the simple labials /p, b, m/, losing their velar component. Second, an independent tendency is that /kp/ and /gb/ not infrequently merge into the voiced counterpart /gb/. These are the most common sound changes that *KP undergoes, and will be discussed below. For each of these, relevant data will be presented from a number of languages and language families, and phonetic motivations for these patterns will be discussed. Most of the studies have been on African languages, where indeed the bulk of KP's are found, but we will show a similar case from the Pacific. Other less frequent cases will be mentioned briefly as well.

2 Labial-velars tend to have labial reflexes (*KP > P)

2.1 Data

Here are sample cases of reconstructed labial-velars yielding reflexes of plain labials.

Snider (1990: 50) notes the "clear innovation" of *kp > p in Coastal Guang. (For both Guang and the Lower Cross languages discussed below, /kp/ is the only labial-velar; there is no voiced or nasal counterpart.)

Connell (1991, 1994, 1995) notes that Proto-Lower-Cross (PLC) *kp has evolved most commonly into [p]. In a list of PLC languages in the table below, we see that only Ebughu, Enwang, and Okobo below don't have [kp]; in each of these it has been replaced by [p] (Connell 1991: 161) (Table 1).

The Kwa languages of Cote d'Ivoire and Ghana also illustrate the tendency to lose the velar portion, as Abron (a close kin of Akan) did in Table 2.

Reinforcing this, Dolphyne & Dakubu (1988: 62) note one sign of a split in central Volta-Comoé languages is that "Nzema-Anyi-Baule and Chakosi have /kp/ where Akan has /p/."

Williamson (2004), in a publication which has since been criticized, asserts Proto-Igboid had *kp, *gb, and the velar gesture eroded, leaving implosives in most Igboid languages, which correspond to plain labials in Bantu. "It thus appears likely that an earlier common proto-language had *gb, retained in PI but simplified to *b in Bantu and Akan." (2004: 436)

Table 1: Connell 1991: 200 (abbreviated list) Lower Cross languages

Gloss	bag	bone	leopard	die
Anaang	ɛ̀-kpàt	á-kpɔ́	ɛ́-kpè	kpá
Ebughu	è-pè	ɔ́-pɔ́	é-píè	pé
Efai	è-kpè	ɔ́-kpɔ́	ɛ́-kpɪ̌	kpá
Efik	è-kpàt	ɔ́-kpɔ́	ɛ́-kpè	kpá
Enwang	è-pè	ɔ́-pɔ́	é-pè	pá
Ibibio	è kpàt	á-kpɔ́	ɛ́-kpê	kpá
Iko	ɛ̀-kpà	´ ú-kúp	ɛ́-kpɛ̀	kpá
Obolo	à-kpà	ú-kúp	ɛ́-gbè	k^{w}ù / g^{w}ù
Okobo	è-pà	ɔ́-pɔ́	é-pɪ̌	pá
PLC	*e-kpàt	*ɔ́-kpɔ́	*é-kpè / i-	*kpá

Table 2: Kwa correspondences (Mensah 1983)

Abron	Agni (Anyi)	Baoulé	Nzema	
pám	kpá	kpá	kpá	coudre ‘stitch’
àpàràá	kpààlɛ́	kpàlɛ̄	–	pangolin
pɔ̀rɔ̀	kpɔ̀lɔ́	kplɔ̀	kpɔ̀lɔ̀	pourrir ‘rot’
pùsù	kpùsú	—	kpùsù	secouer ‘shake’

Table 3: Bantu b=PPAB *ɓ = PI *gb

CB	Akan	PPAB	PI		Ekpeye	Owere	Onicha
64. *=bʊ́d-	‘break’, ‘smash’, ‘hit’, ‘kill’ -bʊrʊ	*-ɓʊlʊ	*-gbú	‘cut’, ‘hit’, ‘kill’	-gbú	-ɓú	-ɓú
*-báb-	‘sting’		*-gbá		-gbá	-ɓá	-ɓá
*-báŋgá	‘jaw’		*-gbǎ̀		à-gbà	à-g^{wh}ǎ̀, à-b^{h}ǎ̀	à-ɓà
*-báŋg-	‘open up’		*-gbǎ́á	‘open’	–	-ɓá	-ɓá

Ohiri-Aniche (2004) reconstructs *kp, *gb, *'kp, *'gb for "Pre-Lower Cross Igboid Yoruboid-Edoid." Her *kp and *gb as well as the lenis *kp' and *gb' have labial-velar reflexes and labial ones in the daughter families, but no velars (2004: 412), with the single exception of a few g^{wh} cases in Igboid.

In Ikwere (Clements & Osu 2002), what is now written as <kp, gb>, in some dialects, including that of the second author, have no velar contact at all, but have a purely labial closure. They say "These sounds are reflexes of older labial-velar stops, and may still have labial-velar realizations in some varieties of Ikwere. However, in the variety described here, they are realized as bilabial sounds with no velar contact at any point in their production. We transcribe them as [ḅ] and ['ḅ], respectively." (2002: 314)

Nasal as well as stop labial-velars can undergo this sound change. In his reconstruction and study of Proto-Yoruba-Igala, Silverstein (1973) reconstructs */ŋm/as a proto-segment which changed to /m/ not only in Yoruba, but also in several dialects of Igala.

Olson (2024 [this volume]) demonstrates a recent set of sound changes where the Luto dialect of Lutos has changed all its labial-velars to plain labials Table 4.

Table 4: Sample cognates

Nduga dialect	Luto dialect	gloss
[kpā.ɾù]	[pā.ɾù]	'poison'
[gbā.gū]	[bā.gā]	'wing'
[ŋgbā.ɽā]	[mbā.ɽā]	'assegai (spear)'

Turner (1974) notes several cases of KP in African languages having labial reflexes in the North America Creole Gullah. For example, Mende *gbalɛma* > Gullah *balɛma* 'a sore, ulcer', Yoruba *gbewa* > Gullah *bewa* 'to put on,' Yoruba *akparo* > Gullah *aparo* 'bush fowl, quail,' Yoruba *arukpɛ* > Gullah *arupɛ* 'dwarf', and Yoruba *ikpete* > Gullah *ipete* 'intention.'

A few of these, such as Williamson's proposal, have been noted as somewhat controversial, but the prevailing crosslinguistic tendency is clear. Some languages have been reported to have K or other sounds as a reflex of KP (e.g. Boyeldieu 2006 posits Central Sudanic *KP having reflexes of kp, k, p, etc., depending on the language); these are distinctly in the minority. In some cases, this reflex could be due to sociolinguistic pressures. Sometimes the direction of a putative *KP > K change is open to alternate interpretations: which is actually the proto-segment?

For the languages considered in this section, the question also naturally arises as to the direction of the sound change. Is it *KP > P or *P > KP? Though there are proposals of labials giving rise to labial-velars (e.g. Demolin 1995 noting the development of /gb/ from /ɓ/), these are a minority. For the languages considered here, which are by far the more prevalent pattern, a general change of *P > KP would require a specific environment for some, but not all, cases of *P to change, since /p/ does occur in these languages, and such conditioning is absent. By contrast, conditions for the change *KP > P are present and we turn now to these.

2.2 Motivation for change – why a labial reflex, not velar?

/k͡p/ is usually written in the linear order [kp] and not [pk]. This is no accident; the labial component slightly trails the velar one, producing a distinctively labial release. A labial release is supported by spectrograms from a multiplicity of languages, including Dedua (PNG) and Efik (Ladefoged & Maddieson 1996) as well as Ibibio in Figure 1.

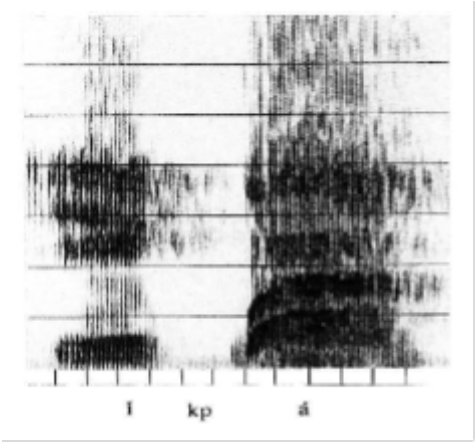

Figure 1: Ibibio – Connell 1994. Note the "velar pinch" of F2 & F3 going into the [kp], and steep F1 & F2 transition out of the [kp].

This is also supported by electromagnetic articulography from Ewe (Maddieson 1993) (Figure 2).

The *release* of a consonant is more salient to the hearer than the onset; so a KP is more likely to be perceived as P than K (noted as far back as Westermann & Ward 1933). What is perceived is what is pronounced, and so *KP > P.

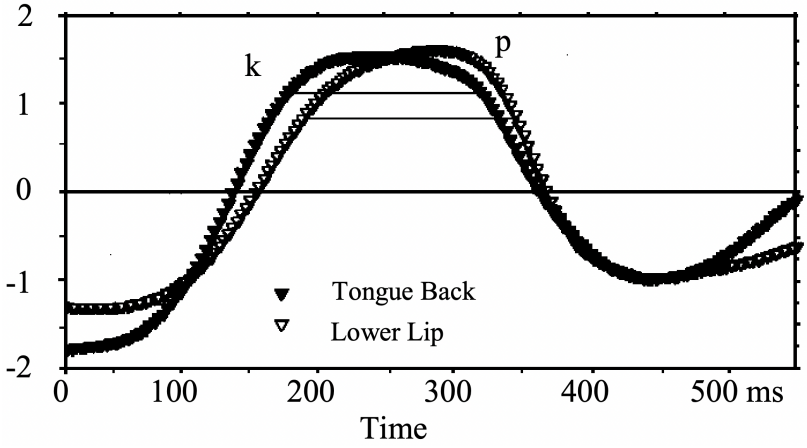

Figure 2: Coordination of lower lip and tongue back moveements in the Ewe word *akpa*. Y-axis is vertical displacement; horizontal lines indicate the likely duration of actual contact of the articulator.

3 Labial-velars /kp/ and /gb/ often merge to the voiced /gb/

3.1 Data

In the clear majority of cases, when *kp and *gb merge into one reflex, the result is synchronic /gb/, not /kp/ (Cahill 2008). This is somewhat surprising, since typologically, a language is more likely to have a voiceless series of stops than a voiced series (Maddieson 2013). Cahill 2008 lists 29 languages which have /gb/ but not /kp/. The mere absence of /kp/ in current languages, of course, does not guarantee that it was in the proto-language. However, the families of the languages below have either been specifically reconstructed with both *kp and *gb, or the bulk of the languages in the family have both /kp/ and /gb/, rendering reconstruction with *kp and *gb quite plausible. A sample is shown in (1), including one language from outside Africa:

(1)	Jiru (Jukunoid [jrr])	p/b, t/d, k/g, -/gb	(Shimizu 1971)
	Kar (Senufo [xrb])	p/b, t/d, k/g, -/gb	(Wichser 1994)
	Manya (W. Mande [mzj])	p/b, t/d̪, k/g, -/gb	(Manessy 1964)
	W. Sisaala (S. Gur [ssl])	p/b, t/d, k/g, -/gb	(Moran 2006)
	Tepo (W. Kru [ted])	p/b, t/d, k/g, -/gb	(Thalmann 1980)
	Ono (W. Huon, PNG [ons])	p/b, t/d, k/g, -/gb	(Phinnemore 1985)

Languages with only /k͡p/ but no /gb/ do exist, but thus far in my investigations, such languages always have other related gaps in the segmental inventory. This

suggests strongly that the reason for the lack of /g͡b/ is because it never developed, or that there was a simultaneous historical devoicing of all stops having a velar component (Cahill 2008).

3.2 Motivation for change – why voicing?

Several phonetic details of the pronunciation of a typical /kp/ are also those which are more typically characteristic of voiced rather than voiceless stops. Here I list three; further research may uncover more, but these are well-established.

The first similarity of a /kp/ to a /gb/ is that typically, /kp/ is either unaspirated or has a distinctively shorter VOT than the other voiceless stops in the language. Some particular examples:

- Smith (1967) reports aspiration on all voiceless stops in Nupe [nup] except labial-velars, which he specifically states are unaspirated.
- In Konkomba [xon] (Steele & Weed 1966), Vagala [vag] (Crouch & Smiles 1966), Tampulma [tpm] (Bergman et al. 1969), Kusaal [kus] (Spratt & Spratt 1968), Nafaara [nfr] (Jordan 1980), Dilo [ntr] (Jones 1987) and Sisaala-Pasaale [sig] (Toupin 1995), /kp/ alone among voiceless stops is not aspirated.
- Phwien [pug] has a phonemic contrast between aspirated and unaspirated voiceless stops (p, t, c, k), with the exception of the labial-velar stop (K. Warfel, pc).
- Gangam [gng] (Dye) has aspiration on all voiceless stops except for labial-velars (Reimer 2020).
- The Lɔɔma [lom] /kp/ is specifically noted as unaspirated, while other stops are labeled aspirated (Sadler 2006: 12-14).
- In Kɔnni [kma], "voiceless stops are generally lightly aspirated, except for the labial-velar [kp], which is unaspirated." This is illustrated by wave forms (Cahill 2007).
- Westermann & Ward (1933: 58) in talking about African labial-velars, state flatly that "There is no aspiration in kp."

The second similarity of /kp/ to voiced stops is that /kp/ often has an ingressive air mechanism (implosion), which typologically is much more common with voiced stops.

- Ladefoged (1968) notes three mechanisms for producing labial-velars, two of which involve ingression (31 of 33 languages).
- Labial-velars in the Tyebaara dialect of Senufo [sef] are pronounced "with noticeable suction in the oral cavity, and with a pop upon release." (Mills 1984).
- Dan (Santa) [dnj] is described as having "bilabial implosion" for /gb/ and "strong bilabial implosion for /kp/ (Bearth & Zemp 1967).
- Engenni [enn] /kp/ and /gb/ are specifically listed as "ingressive," in contrast to the other "egressive" stops (Thomas 1978).
- Wilhoit (1999) labels /kp/ and /gb/ as "implosive" in Loma [lom].
- Labial-velars are not implosive in all languages, however. Besides Ladefoged's notes above, Painter (1970) specifically notes that Gonja [gjn] has a simple pulmonic airstream. Kɔnni also has a simple pulmonic airstream for labial-velars (Cahill 2007).
- Ega [ega] evidently has both; it is, quite unusually, reported as having a contrast between implosive and non-implosive voiced labial-velars, symbolized as /g͡b/ and /g͡ɓ/ (Connell et al. 2002).

The third similarity of /kp/ to /gb/ is that there is often partial voicing even of the "voiceless" /kp/. This is similar to the lack of aspiration (both relate to VOT), but with some crucial differences. First, the languages noted here have an actual *negative* value of VOT, not just a zero VOT. Next, some of the world's languages, such as Thai and some Indian languages, contrast voiceless aspirated stops, unaspirated stops, and voiced stops; in these, there is a *categorical difference* between an essentially zero VOT and a negative VOT. So these can be regarded as distinct phenomena. Finally, partial voicing can also occur at the *left* edge of the stop, a continuation of voicing from a preceding vowel into the stop ("voicing tail") – which simple stops generally lack (Connell 1994 and references therein, Shryock, Ladefoged & Williamson 1996). Some specific cases of partial voicing of /kp include the following.

- Connell (1994) reports on specific voice onset times for phonemically voiceless stops in Ibibio, with average VOTs of +6 ms for /p/, +21 ms for /k/, but −26 ms for /k͡p/.

- Olson (2005: 141) measured VOTs for Mono [mnh] as +10.2 ms for /p/, +27.6 ms for /k/, but −10.0 ms for /k͡p/.
- Rolle (2013) measured VOT for Urhobo [urh] voiceless stops. /p/ was slightly aspirated (13–36 ms), as were /t/ (60–100 ms) and /k/ (45–66 ms), but /kp/ actually had negative VOT (-18 to -109 ms).
- Shryock et al. (1996) note that /kp/ in Defaka [afn] has the onset of voicing prior to its release, similar to that of /b/ in English.
- Innes (1964) notes specifically that in Loko [lok], the voiceless counterpart of /gb/ is "initially voiceless, but with slight voicing finally," and even transcribes this as /kb/.

In summary, these three phonetic tendencies – lack of aspiration, ingression, and negative VOT – are characteristics which would nudge a proto-sound *kp toward a reflex that is categorically voiced.

4 Both labial and voiced reflexes

These two tendencies are both concretely illustrated in the development of Supyire (Gur, Senufo subgroup). Supyire has no labial-velar stops, unlike most Senufo languages (Carlson 1994). The labial-velar stops in northern Senufo languages (Cebaara in the table in (2)) first merged *kp and *gb into /gb/ (e.g. Sucite and Shenara in Garber 1987), then Supyire changed this /gb/ to /b/.

(2)	Cebaara	Shenara	Sucite	Supyire	gloss
	kpāʔā	gbaʔa	gbāxā	bāgā	'house'
	gbāʔālāgà	gbaʔalaga	—	bàhàgà	'bedbug'

Correspondingly, the Supyire /b/ is disproportionately common, the results of combining the frequencies of words with *b, *gb, and *kp.

Mande languages offer another possible example of both patterns. In Table 5, we see the correspondence k͡p ~ g͡b in the left five columns, and the correspondence g͡b ~ b in the right two columns.[1]

In Table 5, Vai and Ligbi alone have k͡p, and most of the other languages have corresponding g͡b. (Kurankɔ, Kɔnɔ, and Wasulunka also have other correspondences with 'skin.')

[1]A reviewer has noted that some of the cognates here may be false correspondences, e.g. Vai *kpala* and Ligbi *gbarɛ* because of the l/r disconnect, and some or all of the gb/b matches for 'all.'

Table 5: Northern Mande (Long 1971, re-ordered)

Language	'skin'	'hit'	'white'	'hot'	'big'	'all'	'cry'
Ligbi	-kpolo-	—	kpiɛ	—	gbon-	gbo	gbarɛ
Vai	kpolo	kpasi	kpɛi	kpandile	—	gbi	kpala
Kɔnɔ	boo	gbasi	gbɛ	gban	—	gbɛ	gbai
Kurankɔ	bole	gbɛsi	gbɛ	—	—	—	gba-
Maninka	gbolo	gbasi	gbɛ	—	bon	bɛɛ	—
Wasulunka	golo	gbɛsɛ	gbɛ	—	bo	bɛ	—
Konyanka	gbolo	gbasi	gbɛ	gban	—	bɛ	—
Marka	gboo	gbasi	gba-ni	gban	bo	ba	—

Connell (1995: 60) also discusses Proto-Lower Cross *kp > Usaghade [usk] /b/.

Most KPs are found in Africa, but there appear to be similar historical processes at work in the Pacific. On first glance, both of the main processes discussed here could have happened in the Solomon Islands language of Owa and the related languages of Malaita Province. Owa [stn] has a /gb/ where cognate words in the Malaita languages have /p/ (Greg Mellow, pc). For example, we see /gb/ and /p/ in cognate words in Owa and the Are'are [alu] language of South Malaita (data from Ron Gebauer, pc):

(3)	Owa'	Are'are	gloss
	gbotagia	potaria	'break'
	gbore	pore	'stare'
	gboo	poo	'pig'
	gbiu	piu	'dumb/stupid'
	gbauna	pauna	'head'
	gbahegbahe	pahe	'walk' (Owa form means 'play-walk')

At first glance, a proto-form of *kp could account for these, invoking both the processes previously discussed. If so, then in Owa, *kp > gb, and in the Malaita languages, *kp > p. However, a fuller picture emerges when we note that 'Are'are has no voiced stops in its consonantal inventory (Roxanne Gebauer, pc, also Naitoro 2013); all voiced stops became voiceless at some point in its history. This raises the probability of only *gb being present even in the proto-inventory (no *kp), with 'Are'are undergoing the sound changes *gb > b > p (or possibly *gb > kp > p), and Owa remaining unchanged. More research is needed into the comparative phonologies of languages of the area.

5 Other

The patterns highlighted here are not universal. Dimmendaal (2019: 150), for example, briefly states that labial-velars, present in Katla [kcr], have become labialized velar stops in the closely related Tima [tms] (*gb > *g(w) > k(w)). /g/ is very rare (http://tima-dictionary.mine.nu) even though /b, d/ are common.

(4)	Katla	Tima	gloss
	gb-ɘlana	kə̀-láánə̌	‘elder’
	gb-àjàŋ	k-àràŋ	‘leopard’
	g-û	k-úù	‘dog’
	g-ɔ́nɔ̌	k-ɔ́nɔ̀	‘ear’

Patterns like these, though they exist and should be accounted for in a more detailed look at historical reconstructions, are again, definitely in the minority.

6 Summary

These patterns (*KP > P and *kp > gb) are not the only reflexes of *KP, but they are by far the most common, and are perhaps the most amenable to systematic explanations. Both patterns connect to phonetic explanations, especially to perceptual ones:

- *KP > P because the labial gesture lags and is more perceptible than the velar gesture.
- *kp > gb because even a “voiceless” /kp/ often has characteristics commonly found in voiced stops.

It’s helpful when researchers note the phonetic details that I’ve alluded to above. But many do not. There is usually a chart of phonemes, which is valuable, but it would be even more valuable if phonetic details like aspiration and implosion were noted, even measured. For example, if the airstream mechanism were more commonly noted, its effect on historical development could be clarified, even quantified.

This paper has focused on the basic three labial-velars: /kp, gb, ŋm/. However, other variants exist, such as prenasalized labial-velars, and fortis and lenis labial-velars. As usual, there is more to investigate.

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