The typology of velar coronalisation and its consequences for grammar

New generalisation: Velar stops may be fronted due to several phonological or morpho-phonoligical processes, most prominently among them palatalisation. They front to a coronal place of articulation and may change additional features, becoming an affricate or a fricative. If they become a [+anterior] coronal, however, the additional changes are obligatory: /k/ does not front to [t]. **Claim:** The absence of a process that turns /k/ to [t] is a challenge for both ordered rules and conventional constraints. I argue that the adoption of containment (Prince & Smolensky 1993,2004) gives us the necessary tools to formalise a constraint that can account for the generalisation. **Data:** In three typological surveys of palatalisation (Bhat 1978, Bateman 2007, Kochetov 2011, the latter two are genetically and areally balanced) there is not a single case of fronting a velar to an anterior, plain stop ([t] or [t̪] with any laryngeal specification). The surveys are not easy to compare: Bhat (1978) includes both synchronic and diachronic processes and does not always clearly distinguish between palatal [c] and palatalised [kʲ]. Kochetov does not compare languages or patterns, but genetic genera that show the patterns. He is the only one that explicitly mentions the absence of /k/→[t]. Among the processes in the P-base database (Mielke 2008), there are (excluding complete assimilation) 115 processes that change a velar consonant to a coronal one. The two apparent counterexamples are discussed below. In the MAMPF database on featural affixation (Gleim et al. 2019), in 14 morphological contexts velar consonants turn into coronals, however, in none of them they turn into plain, anterior stops, see Table 1. The minimally different patterns – a velar stop that turns into a plain [-anterior] coronal stop [c], or into [+anterior] sibilant stop [ts] – are both abundantly attested.

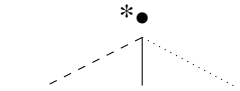
Survey	Sample		Vel →COR		k→t
Bhat (1978)	95	languages	at least	20	0
Bateman (2007)	117	languages		23	0
Mielke (2008)	4560	processes		115	2
Kochetov (2011)	25	genera	at least	7*	0
Gleim et al. (2019)	548	featural affixes		14	0

*/k/→[c] 7 genera; */k/→[tʃ] 6 genera; */k/→[ts] 4 genera

Table 1: Surveys on velar coronalisation

Implications: This data is problematic for both rule- and constraint based approaches. A necessary rule for /k/→[ts] patterns, [DOR]→ [COR, +ant, +str] / __X entails a simpler rule [DOR]→ [COR, +ant] / __X. Even if such a rule is excluded by stipulation, a derivation with an attested intermediate step (e.g. k→c→t) allows us to emulate the banned rule with ordering of independently required rules. For constraints, the problem is equally severe: constraints penalise marked output structures and cannot refer to processes. A plain anterior coronal stop can hardly be considered as marked. In addition, faithfulness predicts [t] to be a more optimal output for underlying /k/ than [ts] or [s] – except for the place features, *k* and *t* are featurally identical. **Analysis:** While standard constraints cannot capture the generalisation, it can be captured with the assumption of containment (Prince & Smolensky 1993,2004; Trommer 2011) and the *cloning hypothesis* (Trommer 2011). The former means that the Generator GEN cannot delete material, just mark it as invisible (uninterpretable for phonetics; = dotted association line). The latter entails that constraints come in two editions, one that sees only visible material (Standard surface markedness) and one that sees the 'deleted', phonetically uniterpretable material as well. The constraint in (1) is such a constraint: it is violated by a plain coronal stop that is underlyingly associated to a [DOR] feature – a /k/ that surfaces as [t]. With this analysis, it is necessary to assume binary features for [±cont] and [± str(ident)], otherwise the constraint could not differentiate between anterior stops, affricates and fricatives.

(1) *Constraint against k→t*



If the generalisation is truly a universal and not just a strong tendency, the constraint in (1) cannot be a regular violable constraint, it must instead be a constraint on GEN. Full assimilation (/kt/ → [tː]), a well attested pattern, is not excluded by this constraint – I assume that here it is the mora that associates to the adjacent root node.

Two cases of repair: The constraint shows itself not only in the typological distribution, but it also constrains repairs in several languages. In Acoma (Keresan, New Mexico, all data from Miller 1965) certain affixes trigger anteriorisation/laminalisation (2-a,b). If such an affix is adjacent to a velar stop /k, k^{h}, k'/ it changes to an anterior, [+distributed] affricate (2-c).

(2)
a.	/ k-áítsẹ̃ẹ̃s̻'a-$^{[+ant,+distr]}$áát'an/	→	[káítsẹ̃ẹ̃ʃ'áát'a]	'he is dreaming'	p.74
b.	/ʈʂɨtʂ-$^{[+ant,+distr]}$éécʰu/	→	[cɨcéécʰu]	'did you two arrive?'	p.77
c.	/k'-$^{[+ant,+distr]}$i?ipee/	→	[ts'i?ipee]	'his ear'	p.75

Syllable structure in Acoma is largely CV(V), with the exception of SC clusters. The second consonant in such a cluster is restricted to non-strident stops, i.e. affricates are banned in this position. If a post-strident velar stop appears in a palatalising context, it cannot turn into [ts] due to this constraint on well-formed clusters. The velar is nonetheless fronted. However, it does not become [t], the stop-counterpart of [ts], but the palatal stop [c]. This cannot be because [t] is an undesired outcome of the process: as (1) shows, [t] is yielded by underlying /c/ (as well as /t/).

(3)
a.	/ʃk-$^{[+ant,+distr]}$áámúʃa/	→	[ʃcáámúʃa]	'his beard'	p.74
b.	/s'--isi̯u̯ʃcan-$^{[+ant,+distr]}$a̯a̯jan/	→	[s'isiuʃta̯a̯ja]	'I am roping him'	p.75

The constraint in (1) is thus responsible for triggering affrication of /k/ in cases like (2-c) and blocking anteriorisation in (3-b). In Wakimbee (Nubian, Sudan), the voiced velar stop /g/ assimilates to the place of articulation of a preceding non-rhotic sonorant (4). However, there is one exception: /ng/ does not result in the expected [nd], but neutralises with /ŋg/ and turns into [ŋɟ] (4-b). The same without spreading of the palatalisation is observed with the lateral (4-d).

(4) Kauczor 1920 p. 20

a.	/am-gi/	→	[ambi]	'buck-ACC'
b.	/hun-gi/	→	[huŋɟi] *[hundi]	'lineage-ACC'
c.	/aren-tuŋ-gi/	→	[arenduŋɟi]	'horizon-ACC'
d.	/kal-gi/	→	[kalɟi]	'bread-ACC'

Potential counterexamples: In P-base (Mielke 2008), there are two potential counterexamples to the generalisation: Oromo/Orma (Stroomer 1987) and Kiowa (Watkins 1980). For the former, I was sadly not able to consult the original sources. Kiowa has a peculiar distributional restriction, the high front vowel *i* and the palatal glide may not be preceded by coronal stops, while the mid front vowel *e* may not be preceded by velars (and *j*). For two morphemes, Watkins claims that they alternate synchronically and have an underlying /g/ (g→d / __ e). I argue that reanalysing these morphemes as /dj/ yields the correct outputs without introducing processes that are otherwise unattested in the language: /j/ deletes before non-low front vowels, yielding [de]. If the glide is not deleted in time, /d/ neutralises with /g/ just as it does elsewhere if followed by *i* or *j*. **Discussion:** From a perspective of language acquisition, the almost complete absence of plain velar fronting in adult language is staggering. In child language, replacing velar stops with anterior coronal stops is a very frequent processes (Vihman 1987, Inkelas & Rose 2007). This process might be context-free or conditioned by prominence, adjacent vowels or adjacent consonants. The fact that such patterns are therefore clearly learnable and phonetically natural but nonetheless absent in adult language should inform considerations on the question of what we can learn from typological distributions about the make-up of phonology.