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Towards a typology of velar processes

1 Introduction

Velars have long been argued in the literature to be special phonologically. Contemporary discussions revolve mostly around the status of velars: whether they are the unmarked place of articulation, whether they are empty, or is it rather the coronals that have these properties. What is undebated is that velars show diachronic processes and synchronic alternations which have long been observed and accurately described, but no unified, overarching theoretical (or even descriptive) account has been proposed for this specific class of sounds. This is all the more surprising since there is plenty of testable (and attested) data to try and set up a typology of these processes, either diachronic or synchronic. Such a typology helps bring out properties of velars and the processes they take part in, which they have in common with other processes. This step will eventually help determine what the possible representation of velar segments can be.

The purpose of this paper is to set up such a typology of various velar phenomena collected from a number of languages. There are five or six groups of velar phenomena—depending on whether or not some palatalization phenomena are taken separately. The position to separate them is put forward in this paper, which means that velar phenomena will be ordered into six groups. Group (i) and (ii) are those exhibiting palatalization. Velars show, on the one hand, effects of PALATALIZATION BY AN ADJACENT SEGMENT and, on the other hand, PALATALIZATION CAUSED BY VELARS through their becoming glides. What unites these two sets is the actual disappearance of the velars themselves. What still tells the two apart is the fact that only in the first case is there direct velar involvement, the second type is ultimately due to the glide. In actual fact, there is a middle state in the latter process where velars show effects of PURE VOCALIZATION—justifying the proposal for another type of process (iii). An additional group of phenomena (those in (iv)) are various REDUCTIONS TO VELARS. There are two further cases where velars are the surprising *result* rather than the trigger of sound changes. On the one hand, there are VELAR AND PALATAL INTERACTIONS where a palatal glide /j/ comes to alternate with or turn into a velar stop in certain environments, an unusual step indeed (v). (This case can be seen as the mirror image of velar vocalization in (iii).) On the other hand, there is important communication between velars and labials, where labio-velars turn into plain labials or occasionally labials turn into some plain velar (vi). What is peculiar about the latter two groups is that these alternations seem to be synchronically active in some systems. Furthermore, if it is assumed that a number of today's velars do indeed descend from glides, this might shed new light on and open up further possibilities for etymological and historical research. In want of concrete stories to tell, this line of investigation, though an alluring and promising line of research, is not treated in any more detail here.

The phenomena briefly mentioned above can be nicely accommodated in a VC Phonology framework, which provides a theoretical account for, and a typology of, various types of velar processes (cf. Dienes & Szigetvári 1999). In spite of the role of theoretical analyses, this paper is predominantly data-biassed rather than theoretical — most importantly, nothing will be said about the actual make-up (elemental structure) of velars (although Backley 1995 is tacitly assumed).

The proposed typology can be summed up like this:

(i) PALATALIZATION AFFECTING VELARS (with affrication) (§**2.1**)
e.g., effects of i-mutation in Old English, certain Romance initial clusters

(ii) PALATALIZATION CAUSED BY VELARS (indirectly, through velar vocalization) (§**2.2**) e.g., developments of *sk*-clusters in Old English, *ks*-clusters in Iberian Romance languages

(iii) VOCALIZATION AFFECTING VELARS (§**2.3**)
e.g., development of preconsonantal velars in Old English and Spanish

(iv) REDUCTION TO VELARS (§**2.4**)
e.g., Latin /kul/ and /li/-sequences, development of Dutch *-ft*-clusters

(v) VELAR–PALATAL INTERACTION (§**2.5**)
e.g., irregular Spanish verbs

(vi) VELAR–LABIAL INTERACTION (§**2.6**)
e.g., Dutch labial reductions, occasional Old English word-final developments

Some of these proposals will be reconsidered as the argumentation enfolds, and the number of types will ultimately be cut down to four (not only) to match the theoretical possibilities of a VC framework.

2 Describing the processes, justifying the typology, reconsidering the typology

The groups introduced above are fleshed out in the following passages, giving both examples of the phenomena and a descriptive account of them as well. It is the aim here not only to justify the typology proposed but also to point out possible problems and therefore to revise that typology.

2.1 Palatalization affecting velars

In this section Germanic languages are cited to bear on velars becoming palatals under the influence of a palatal (vocalic) segment. Such palatalized velars might naturally alternate with unaffected velars in synchronic systems — these morphological alternations are disregarded here, though.

The reflexes of the Germanic voiceless velar stop /k/ in English show an interesting distribution between palatalized reflexes and velars left intact. Without going into the details of the distribution, the reflex depended on whether the following vowel was an original front (palatal) vowel, or it was itself the result of

palatalization. In the latter case reflexes remain velars, while in the former palatalization is observed (data from Lass 1994).[1]

(1) PALATALIZATION:

cinn '**ch**in'	cf. MoHG ***K****inn*
cild '**ch**ild'	cf. Go ***k****ilđei* 'womb'
ceosan '**ch**oose'	cf. D ***k****iezen*

NO PALATALIZATION:

Cent '**K**ent'	<Latin ***C****antia*
cene '**k**een'	cf. OHG ***k****uoni*
cylen '**k**iln'	<Latin ***c****ulina*
cyssan '**k**iss'	cf. OS ***k****ussian* and MoHG ***k****üssen*

The reflexes of the Germanic voiced velar fricative /ɣ/ in English show a clear distribution according to whether the velar was simple (short) or geminate. As the data below illustrate, only geminate velar fricatives resulted in (geminate) affricates (which were bound to shorten in due course), much like the well-known Romance reflexes of Latin voiced velar stops (not treated in this paper). However, simple Germanic voiced velar fricatives turn up uniformly as palatal glides when they used to stand before a palatal vowel. This is shown below.

(2)

ENGLISH	DUTCH	GERMAN
GEMINATE:		
bri**dg**e	bru**g**	Brü**ck**e
e**dg**e	e**g**, e**gg**e	E**ck**e
ri**dg**e	ru**g**	Rü**ck**en
BEFORE AN ORIGINALLY FRONT VOWEL:		
da**y**	da**g**	Ta**g**
na**i**l	na**g**el	Na**g**el
mi**gh**t 'power'	ma**ch**t 'power'	Ma**ch**t 'power'
si**gh**t	zi**ch**t	Si**ch**t
WORD-INITIALLY:		
yellow	**g**eel	**g**elb
yester(day)	**g**isteren	**g**estern

What can be observed is that the modern reflexes of the simple voiced fricative merge with other sets (*might* and *sight* above) of velars. In *hail*, *nail*, etc, there used to come a palatal vowel after the velar (still alluded to by the orthography in Dutch and German). The two examples, *might* and *sight*, are indeed related to forms where there is an intervocalic velar, but these actual forms are not due to a palatal vowel following them. In fact, *might* and *sight* face the fate of *eight*

[1] The following abbreviations are used for the various languages: D = Dutch; Gmc = Germanic; Ga = Galician; Go = Gothic; L = Latin; MoHG = Modern High German; OHG = Old High Greman; OS = Old Saxon; Po = Portuguese; Sp = Spanish.

and *night*, where the preconsonantal voiceless velar fricative is lenited from /k/ (cf. Latin *octo*, and *noctis*)—both groups turning up with a palatal glide eventually. Furthermore, the nominative of *day* and *way* did not actually end in any vowel, they were consonant-final. Clearly it is hard to maintain that their vocalization is due to a following front vowel. This seems to suggest that the same process is actually happening in cases of *night*, *might*, *day*, which finally leads to reconsidering the place of this process in the typological chart of the introduction. The suggestion is then that these developments should be classified as velar vocalizations rather than palatalization proper. This issue is taken up now.

If the development of the voiced velar fricative after non-palatal vowels or sonorants is examined, it is immediately seen that even these velars turned into a glide, /w/, which later became part of the preceding vowel and resulted in diphthongs or developed a vowel to precede it.

(3)

ENGLISH	DUTCH	GERMAN
AFTER A BACK VOWEL:		
bo**w** 'arch'	boo**g**	Bo**g**en
dra**w**	dra**g**en	tra**g**en
ma**w** (of a bird)	ma**g**en 'stomack'	Ma**g**en 'stomack'
AFTER A SONORANT:		
(to)morro**w**	mor**g**en	mor**g**en
sorro**w**	zor**g**	Sor**g**e
swallo**w** (verb)	zwel**g**en	schwel**g**en 'to wallow in sg'
willo**w**	wil**g**	Wil**g**e

These examples show that velar vocalization also occurred in environments with no palatal influence. The distribution of /j/ and /w/ reflexes depends on the context, but it went through anyway. There is nothing to prevent a similar analysis of the palatal reflexes above. This strongly suggests that all the instances of velar vocalization, either due to i-mutation or to later developments, should be treated as such: velar vocalizations and hence belong to group (iii). True palatalizations are only observed in the case of the voiced geminate velar in onset positions.

2.2 Palatalization (indirectly) caused by velars (through velar vocalization)

The phenomena in (ii) (cf. p. 1) illustrate a situation where a voiced velar stop becomes a palatal glide, which in turn palatalizes the preceding or following segment. This lenition went through a stage of being a velar fricative as testified by reflexes of word-inital *sk*-clusters in Dutch and spellings in earlier Spanish documents which preserved the record of the process through the velar fricative [x] (spelt ⟨ch, ci⟩) possibly also dropping in on [ɣ] towards the glide (cf. Menéndez-Pidal 1973). The reason why this type of process is problematic is that clearly the velar is not directly responsible for the various palatalizations and as the Iberian examples illustrate the glide reflex might merge with "original" glides and glides of yet a different origin (say, /l/). Velars on their own do not cause palatalizations, they only vocalize.

In the Germanic data below, the behaviour of *sk*- and *ks*-clusters is shown (data from Lass 1994). It can be observed that in *sk*-clusters the velar came to be a palatal glide turning /s/ to /ʃ/. However, in the reverse order, they conspicuously leave a following /s/ intact—Germanic *ks* survives. (In Dutch the velar in word-final *sk*- as well as *ks*- clusters simply vanished, leaving /s/ behind.)

(4)

	OLD (AND MODERN) ENGLISH	MODERN HIGH GERMAN	DUTCH
a.	word-finally /ʃ/	/ʃ/	/s/
	fi**sh**	Fisch	vi**s**
	wa**sh**	wa**sch**en	wa**ss**en
	wi**sh** (< OE wy**s**can)	wün**sch**en	wen**s**en
	word-initally /ʃ/	/ʃ/	/sx/
	ship	**Sch**iff	**sch**ip
	†**sh**rive	**sch**reiben 'write'	**sch**rijven
	shoe	**Sch**uh	**sch**oen
b.	/ks/	/ks/	/s/
	a**x** 'axle, axis'	A**chs**e	a**s**
	fo**x**	Fu**chs**	vo**s**
	o**x**a 'ox'	O**chs**e	o**s**
	wea**x**an 'to wax, to grow'	wa**chs**en	wa**ss**en

As for the Iberian development of Latin *ks*-clusters, (where Galician illustrates what is important now, the velar reflex of Spanish being only secondary), the examples show the same pattern as observed in Germanic *sk*-clusters: /s/ becomes /ʃ/ (the data below are from Ferreiro 1999). This clearly indicates that the position of a velar with respect to some other sound, /s/ in these examples, does not matter as for palatalization: both orders are attested.

(5)

SPANISH /x/	GALICIAN /ʃ/	
e**j**e	e**x**e	'axe'
di**j**o	di**x**o	'he said'
tra**j**o	trou**x**o	'he wore'

The purpose of examining these data was to show that the same tendencies may stop at various stages in related languages, but from a typological point of view only direct changes count, the first steps, so to speak. This consideration motivates then that the immediate vocalization should be treated as such, just like in the section above.

2.3 Vocalization affecting velars

This group has already been referred to in (i). The English data below (6) are cases of preconsonantal velar vocalization. It can be concluded that velar vocalization occurs also in the coda. What is still remarkable about velars is that they lenite not only before another stop, but also before /l/ and either before or after /s/ (as

in (3b)). This is truely noteworthy and it will prove crucial in determining the elemental make-up of velars.

(6)

ENGLISH	DUTCH	GERMAN
fi**gh**t	ve**ch**ten	fe**ch**ten
mi**gh**t 'power'	ma**ch**t 'power'	Ma**ch**t 'power'
si**gh**t	zi**ch**t	Si**ch**t
ni**gh**t	na**ch**t	Na**ch**t
ei**gh**t	a**ch**t	a**ch**t

2.4 Reduction to velars

The processes in this category illustrate various reductions to velars. Although the data below show only that velars can be the result of the lenition of /ʃ/ (or /ʒ/), in fact data could be cited from German and the history of Spanish that sometimes they come from /r/ or even from labials.

The following Latin examples are extremely intriguing in the history of Spanish (data from Ferreiro 1999).

(7)

	LATIN	SPANISH /x/	GALICIAN /ʎ/	
a.	acu**cul**a	agu**j**a	agu**ll**a	'needle'
	auri**cul**a	ore**j**a	ore**ll**a	'ear'
	o**cul**um	o**j**o	o**ll**o	'eye'
b.	fi**li**us	hi**j**o	fi**ll**o	'son'
	mu**li**er	mu**j**er	mu**ll**er	'woman'
	fo**li**a	ho**j**a	fo**ll**a	'leave'
c.		SPANISH /x/	GALICIAN /ʃ/	
		e**j**e	e**x**e	'axe'
		di**j**o	di**x**o	'he said'
		tra**j**o	trou**x**o	'he wore'

As the data reveal, Spanish shows massive neutralizations in a voiceless velar fricative. The question is whether the fricative /x/ of Spanish came from the palatal /ʎ/ or the palatal fricative /ʃ/, or rather /ʒ/, is not precisely clear. That fact that the /ʎ/ sounds from Latin /lː/ (cf. *ga/ʎ/o*) systematically failed to undergo this lenition to /x/ suggest a different origin. Thus an origin in /ʃ/ (or rather earlier /ʒ/) is more likely. In the third set of examples clearly /ʃ/ became /x/.

2.5 Palatals strengthening to velars

A very peculiar type of irregularity in the paradigm of certain Spanish verbs bears closely on velar phenomena and helps highlight the close relationship between I-elements and velar sounds. First, (8) shows the regular conjugations in the three verb classes. The verb stem is followed, except for the 1Sg, by the class-marker morpheme and, except for 3Sg, the agreement morpheme.

(8)

habl-a-r 'speak'	*com-e-r* 'eat'	*viv-i-r* 'live'
habl-_-o	com-_-o	viv-_-o
habl-a-s	com-e-s	viv-e-s
habl-a-_	com-e-_	viv-e-_
habl-a-mos	com-e-mos	viv-i-mos
habl-á-is	com-é-is	viv-í-s
habl-a-n	com-e-n	viv-e-n

The irregularity under investigation affects verbs that belong to the *-er* and *-ir* classes, that is, where the verb-class marker contains a palatal **I** element. The deviance simply consists in the retention of the class marker even in the first person singular form. However, when the ending itself contains a non-palatal segment such as *-a* (in the subjunctive paradigm) and *-o*, the palatal segment of the marker, it is argued here, surfaces as a velar. This observation accounts for why *-ar* verbs do not fall victim to this process: their class-marker lacks a palatal element which could be retained irregularly. Below is an illustration of the phenomenon for *salir* 'go, leave', *poner* 'put', *conocer* 'know sy', and *caer* 'fall':

(9)

sal**g**o	pon**g**o	conoz**c**o	ca*i***g**o
sales	pones	conoces	caes
sale	pone	conoce	cae
salimos	ponemos	conocemos	caemos
salís	ponéis	conocéis	caéis
salen	ponen	conocen	caen

There are two independent pieces of evidence for claiming a palatal–velar connection here. In the closely related Galician, much the same verbs rather overtly show the presence of **I** before a non-palatal ending. The paradigms of the verbs *saír* (=Sp *salir*), *pór* (=Sp *poner*) and *caer* are as follows (equivalents of Sp *conocer* are regular in Galician):

(10) GALICIAN:

sa**i**o	po**ñ**o	ca**i**o
saes	pos	caes
sae	pon	cae
saímos	pomos	caemos
saídes	pondes	caedes
saen	pon	caen

The second piece of evidence comes from Italian (11) (see the next page).

Again, the velar insertion took place when a non-palatal vowel ending followed. On closer examination a further peculiarity can be detected by the attentive eye: in the first person plural no velar is observed, though it is exactly in the position to show the deviance. This can be captured by the stress pattern of the forms: in all the examples above (including the Spanish data, that is) stress happens to fall on the syllable *before* the insertion site; on the other hand, in this Italian form

(11) ITALIAN:

sal**g**o	pon**g**o
sali	poni
sale	pone
saliamo	poniamo
salite	ponete
sal**g**ono	pon**g**ono

stress falls on the syllable *following* the class-marker *-i-*: *pon-i-ámo*, whereas *pón-g-ono*. What unites these processes is that the velar occupies (or rather, comes to occupy) an onset position. These phenomena might have an impact on the interpretation of syllable structure in these instances, an issue which is put aside for future investigation. However, these cases also motivate assuming a new type of process: strengthening to velars.

2.6 Velar–labial interaction

There is in reality a two-way communication between labials and velars, conspicuously "skipping" coronals. Either a labial reduces, that is, loses its place specification as observed in Dutch reductions, or a labio-velar activates its labiality element. These are rather straightforward cases since the origin, so to speak, of the labial element is clear. There is a more peculiar case, however, when a plain velar acquires labiality, a problematic case indeed since labiality should be available from a neighbouring segment only. In Dutch, synchronically irregular past tense verbs show alternations of the type below:

(12)

zoe**k**en	zo**ch**t	'to search'
bre**ng**en	bra**ch**t	'to bring'
de**nk**en	da**ch**t	'to think'

It is all normal thus to find [xt] clusters at the end of a word in Dutch. What is peculiar about Dutch, though, is that not only [k] is reduced to [x] in this position, but labials as well:

(13) ko**p**en ko**ch**t/*ko**f**t

a**ch**ter	'behind'	∼E *a**f**ter*
gra**ch**t	(type of channel)	< D *gra**v**en* ∼ E *gra**v**e* /G *gra**b**en*
kra**ch**t	'power'	∼E *cra**f**t*/G *Kra**f**t* 'power'
lu**ch**t	'air'	G *Lu**f**t* 'air', ∼E *lo**f**t*
sti**ch**ting	'fund'	G *Sti**f**tung*
za**ch**t	'soft'	E *so**f**t*/G *san**f**t*

It can then be said that Dutch regularly reduces (or rather used to reduce) all labial fricatives to [x], which means that the fricatives of Dutch in coda position came to be [x] and [s] only. (Remember that Dutch also neutralized heavily into /s/.) This change is best analyzed as an instance of reduction to velars, that is, group (iv).

The development of Old English word-final /x/ also shows effects of the labial-velar connection. Normally, this velar fricative turned into a palatal glide /j/ and came to form a diphthong with the preceding vowel just like in the developments of /ɣ/ discussed above. Examples are: *high*, *sigh* (cf. D *hoog* and *zucht*). In certain cases, undoubtedly on a highly haphazard lexical basis, word-final velar fricatives did not disappear, but "strengthened" into [f], while retaining the ⟨gh⟩ spelling:

(14) clou**gh** D *kloof* as well *klucht*; Scots *cleuch* /kluːx/
cou**gh** D *kuchen*
enou**gh** G *genug*; D *genoeg*
lau**gh** G/D *lachen*
trou**gh** G Trog; D trog
as well as *chou**gh**, rou**gh**, slou**gh** (of a snake), tou**gh***, and a few others.

These words are interesting because here the velar had no labiality linked to it, yet there had to be a source for it. Even the spelling ⟨ou⟩ suggests that the preceding vowel was a labial (or could have a labial variant as in *laugh*), a potential promoter of labial interests.

To summarize: based on the discussions above, the following reduced set of processes is suggested:

(i) palatalization affecting velars
(ii) vocalization affecting velars
(iii) reduction to velars
(iv) strengthening to velars

3 The theory: VC enters

This section looks at the predictions of a phonological theory with respect to the typology set up above. VC theory gets its name from its basic tenet that the skeleton is made up of strictly alternating VC units where V and C are claimed to have inherent properties: vowels are inherently loud and "want" to be pronounced, whereas consonants are inherently mute and remain so unless an external force intervenes, such as being lexically linked to melodic primes. The only forces that are allowed to operate between the VC units of the skeleton are GOVERNMENT and LICENSING. These terms are not new to phonology, but they get a slightly different interpretation in this theory. While government is seen here as a force which intends to destroy the inherent properties of V's and C's, licensing helps support melodic structure. It is important to point out that government and licensing are not antagonistic forces, they have different duties to carry out. Obviously, this step greatly enhances the amount of lexical stipulation, which, however, might not be such a repellent side-effect on closer inspection.

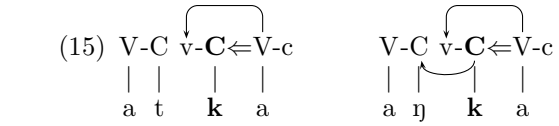
Having these assumptions, the following picture emerges for an account of lenition phenomena. A consonant is predicted to undergo vocalic lenition when its inherent property, muteness, is destroyed by government emanating from the

following V or C (this latter only when the preceding *v* is buried). Typical vocalic lenitions include vocalization of /p/ to /w/, *l*-darkening as well as flapping, cases where a consonant becomes more vowel-like. While a licensed consonant may strengthen (or at least maintain its strength), an unlicensed one is predicted to undergo consonantal lenition, a change where it loses, for instance, its buccal (place) properties. Since government and licensing are two independent forces, there is nothing in principle to rule out their interaction in a given skeletal position. The following positional relations can then be distinguished (Dienes & Szigetvári 1999 : 11): a given position can be (i) licensed but not governed; (ii) licensed and governed; (iii) not licensed but governed; and (iv) not licensed and not governed.

Once there is a typology of velar phenomena, an attempt can be made to sort them out with respect to which occurs in which environment. It turns out that each of the stipulated types is the instantiation of one of the cases predicted by the theory. However, it is wrong to think that there is a unique correspondence between the types and the possibilities offered by the theory. While it is true, for instance, that all palatalization (affrication) of velars happens in traditional onset positions, some velar glidings occur in intervocalic as well as in pre-consonantal positions. Let us see the possibilities one by one.

A licensed (double arrow) but ungoverned consonant (either empty or non-empty) appears to be the case in the second consonant (shown in boldface below) of bogus and coda clusters—no lenition is predicted, but strengthening is possible (in traditional onset position):

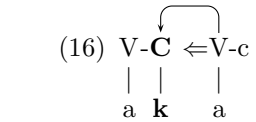
(15)



This corresponds in the first place to type (i) palatalization affecting velars. But also, since the consonant is licensed, type (iv) strengthening to velars figures here.

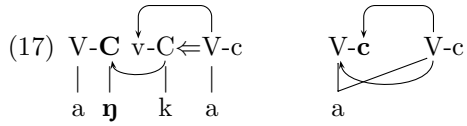
A licensed and governed (single arrow) consonant both precedes and follows a full, that is, pronounced vowel (traditional intervocalic position). Vocalic lenition is then predicted in this configuration (e.g., Spanish spirantization of voiced stops):

(16)



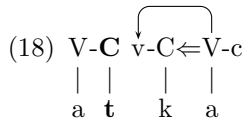
This corresponds to (ii) vocalization affecting intervocalic velars. Additionally, some type (iii) reductions from **I**-containing segments also belong here (Spanish developments of *filius-hijo*.) The fact that velar palatalization (type (i), that is) also occurs in this environment suggests that this process only depends on licensing, since government does not seem to block it.

Either vocalic or consonantal lenition (or both) is expected when the consonant is unlicensed and is governed (traditional coda position):

(17) 

This corresponds to type (ii) preconsonantal glidings (vocalic lenition) and type (iii) preconsonantal labial reductions to velars (consonantal lenition).

The fourth possibility, when a C slot is neither licensed nor governed, accounts for cases of consonantal lenitions (glottalization in English, word-final reductions to velar nasals in Galician or dialectal Spanish; traditional word-final position):

(18) 

This configuration does not seem to correspond to any of the types stipulated. However, more problematic cases of various velar-labial developments seem to match the representation: most notably in the direction from velars towards labials. The various other velar-labial interactions show various affiliation with the possibilities offered by the theory, which renders their further analysis indispensable.

4 Conclusions

This paper set up a typology of various velar phenomena attested in various languages and tried to relate them to possible lenition trajectories offered by VC Phonology. The four types of velar processes set up are: palatalization affecting velars, vocalization affecting velars, reductions to velars and strengthening to velars. They comply with the expectations of VC Phonology. Matters for further research include why and how velar-labial interactions are special and why some types, for instance, velar gliding (vocalization), have the same result along various trajectories.

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