

Internal structure of Consonants and why affricates exist

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- (1) Element-based internal structure of consonants: 6 ideas
- same set of phonological primitives for vowels and consonants, cf. Clements (1993)
 - velarity and roundness are two independent phonological primitives, cf. Lass (1984), Rennison (1990,187)
 - three-leveled organization of constituents: Place, Manner, Voice/Tone cf. Feature Geometry
 - "Sonority hierarchy" is an observation due to the distribution of the Element A in consonants
 - ? and A cannot coexist within a given internal structure
 - one-to-one relation between phonological representations and phonetic outputs

(2) Inventory of Elements

a. Place

A - RTR = Retracted Tongue Root

glottality pulls towards low tongue body position

I - palatality pulls towards high front tongue body position

U - velarity pulls towards high back tongue body position

(U_{UV}=U+B)

v - unmarkedness=centrality

B - roundness/labiality

b. Manner

ɸ - ATR = Advanced Tongue Root

N - nasality

B - roundness/labiality

? - constriction

h - noise

T - trill ([r,ʀ])

c. Voice/Tone

H - stiff vocal cords

L - slack vocal cords

- (3) B is a Place- and a Manner-Element:
labiality = Place-contribution
roundness = Manner-contribution
- (4) Only Place-Elements can be head of an expression: only A, I, U, v can in vowels, there is no reason to believe that the situation is different for consonants
- (5) Linguistic expressions are asymmetric
- any linguistic expression is headed
 - objects without head as well as those with more than one head are ill-formed, cf. Syntax
 - the head contributes more to the output than the operator(s)
- (6) Fusions of Elements
- I is an expression defining an articulation that is located between I and A. It is closer to I because I is its head. Result: [e,ɛ]
 - I is an expression defining an articulation that is located between I and A. It is closer to A because A is its head. Result: [æ]

U and B in consonants and vowels

(7) U is present in labials and velars

a. german tsviliŋ
english twin

b. Swahili (Bantu)

/N+limi/ → [ᵐdimi] l → d

/N+wati/ → [ᵐbati] w → b

c. Fulani (african West-Atlantic)

g-w		p-f	
gor-ko	"a man"	pul-lo	"a peul"
wor-'be	"men"	ful-'be	"peuls"

d. Ge'ez (Classical Ethiopian) cf. Ségéral (1995)

there are no regular short high vowels. Only if one of the neighbouring consonants is velar or uvular [k,g,x,ɣ,q,G,ʁ,χ]. a short [u] can exist

e. Czech Vocative-suffix:

	NOM	VOC	
-i / C _{pal} —:	kuuř	koř-i	"horse"
	Tomaaš	Tomaaš-i	"Thomas"
	lhaař	lhaař-i	"liar"
	zloděj	zloděj-i	"thief"
	sleď	sleď-i	"herring"
-u / C _{vel} —	hoř	hoř-u	"boy"
	příběh	příběh-u	"story"
	gonk	gonk-u	"gong"
	Zdeňek	Zdeňk-u	name
-e / elsewhere	pes	ps-e	"dog"
	doktor	doktor-e	"doctor"
	holub	holub-e	"pigeon"
	hrad	hrad-e	"castle"
	šev	šev-e	"seam"

(8) velarity and roundness are two independent phonological primitives

a. any system with an unbreakable primitive representing both roundness and velarity (such as U^{KL} or Dependency Phonology) is unable to deal with back unrounded vowels [ɤ, ɯ, ɯ, ʌ, ɤ, ɑ]: the velarity-primitive must be absent from them in these accounts.

The velarity-primitive is present in back unrounded vowels: german: any short vowel is -ATR an unrounded

fɪʌs	floß	"flow"
floos	Floß	"raft"

b. if the velarity-primitive is present in velar consonants [k, g, x, ɣ] as suggested in (7d,e), any system with coupled velarity/roundness makes the wrong prediction that these articulations are rounded ((k^V, g^V...) are not rounded but a velar [k, g, ...] followed by a rounded secondary articulation)

c. systems like KLV (1985) with coupled velarity/roundness represent front rounded vowels as a fusion of I and U. Languages lacking such articulations: I + U reside on the same line and thus cannot combine. Languages provided with front vowels: I + U reside on different lines and can fuse.

Such systems wrongly predict that the number of generable objects is littler in languages lacking [y, Y, ø, ɤ]=where I + U share a line. The opposite often is the case: e.g. Semitic languages lack front rounded vowels but have a much richer consonantal inventory than, say, French.

(9) systems coupling roundness/velarity were led to do so by the observation that in many languages neither occurs without the other. This observation is correct:

- a. in languages lacking back unrounded vowels, neither U nor B occurs without the other. They are always bound together: U=B
- b. in languages provided with back unrounded vowels, U and B occur independently

(10) vocalic representations with independent U and B

	I		v		U	
		B		B		B
ɤ	i	y	ɤ	ɤ	ɯ	u
	ɪ	Y	ð	θ	ɤ	ɯ
ɤ	e	ø			ɣ	o
	ɛ	ɛ			ʌ	ɔ

	æ	ɛ			ɤ	
					a	ɔ

a

A



Palatals = I, velars = U

(11) palatals [j, c, ʃ, ç, ʝ] and velars [k, g, x, ɣ] are the direct translation of I resp. U

I	I	I	I	I	U	U	U	U
	?	?	h	h	?	?	h	h
	H	L	H	L	H	L	H	L
j	c	ʃ	ç	ʝ	k	g	x	ɣ

[t,d] are nothing: consonantal unmarkedness/ the "cold consonant"

(12) [t,(d)] are classical epenthetic consonants:

a. french: intervocalically

/a+il dit/ → a-t-il dit

b. Middle-High-German "Sproßkonsonant"/"Dentalwuchs"

MHD	actual german
iergen	irgend
iemān	jemand
wīlen	Weiland
vollen	vollends
totzen	Dutzend
anderhalb	anderthalp
ackes	Axt
obeſ	Obst
sus	sonst
bābes	Papst
habech	Habicht
bredige	Predigt
saf	Soft
werf	Werft

(13) unmarkedness (frequency, transparency: cf.

Paradis/Prunet (1991)

the littlest possible degree of markedness is zero: [t,d] are Place-undefined

Nasals and Liquids

(14) A is present in Nasals: Nasals lower

Middle High German actual German

sunne	Sonne
sumer	Sommer
kumen	kommen
münech	Mönch
sun	Sohn
künec	König
gewunnen	gewonnen
geswummen	geschwommen

(15) [r] is A-headed: german (similar in engl.):

[r] > [ʀ] / V _{back} —	foop	vor
	nuʀ	nur
	hʀRʀ	Horror
	mawʀ	Mauer
[r] > [æ] / V _{front} —	bæ	Bär
	biæ	Bier
	leeæ	leer
	fʀjæ	Feuer
[r] > [R] / C__	dRaj, *dæaj	drei
	kraam, *kæaam	Kram
[r] > [a] / a__	baat, baRt	Bart
	baaf, baRf	Barsch

(16) [l,n,r] are variations of the same phonological object:

a. Chaha: [n,r] are allophones

[n] word-initially and when followed by an Obstruent

[r] elsewhere

	Perfect	Present	Jussive		
1°sg	nädäf-x ^v +m	ä-räd+f	n+-nd+f	Rdf	"sting"
1°sg	näk ^v äm-x ^v +m	ä-räk ^v +m	n+-rāk+m	Rk ^v m	"mount"

b. Middle-High-German doubles Paul (1881,144):

Herke	Helche	marmor	marmel
smieren	smielen	marter	martel
prior	priol	mörter	mörtel
murmern	murmeln	turter	turtel
Canterbury	Candelberc		
dörper	'Bauer' > dörpel	> törpel	> Tölpel 'dolt'

(17) [n,l,r] contain I: german allophones [ç,χ]

a. [χ] after u,o,a [ç] after y,ø,i,e

absence of I presence of I

buuχ	"book"	byyçæ	"books"
kʌχ	"cook"	kæçð	"cooks"
baχ	"brook"	beçð	"brooks"
		iç	"I"

b. [ç] also after [n,l,r]

mılç	"milk"
mançð	"some"
durç	"through"

(18) [l] contains I, [i] does not: Bulgarian

[i] /__#,a,o,u	bjai-ø	"white" masc.sg	iak	'polishing lotion'
	bjai-o	"white" neut.sg	iuk	'onion'
	bjai-a	"white" fem.sg	iøk	'bow'
[l] /__e,i	bel-i	"white" masc.pl	lek	'medicament'
	bel-eja	"being white"	lik	'face'

(19) [s,z] are "consonantal Liquids": Rhotacism

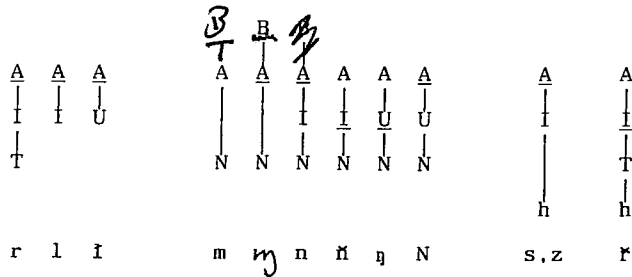
[z] becomes [r] intervocalically

latin infinitives /lege+se/ → lege-re
 /ama +se/ → ama-re
 /audi+se/ → audi-re
 /es +se/ → es-se
 /fer +se/ → fer-re (assimilation)
 /vel +se/ → vel-le (assimilation)

english I was
 you were

(20) Liquids are A-headed, Nasals contain A

Liquids Nasals "consonantal Liquids"



Explanation of Sonority-effects by the distribution of A

(21) a. Sonority hierarchy: an *observation*

a > e,o > i,u > j,w > Liqu > Nas > s,z > Gutturals > Fricatives > Stops

b. Sonority hierarchy: an *explanation*

sonority-effects are the results of three parameters:

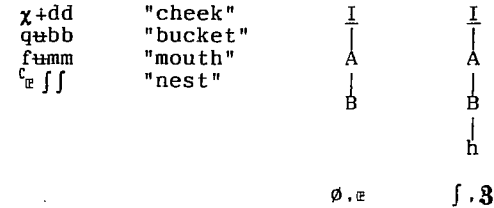
- the role A plays within a segment:
Head > Operator > absent
- the role the consonantal Elements ? and h play within a segment:
absent > present
- the kind of constituent a segment is linked to:
Nucleus > Onset ?,h cannot exist in Nuclei

(22)

vowels = Nucleus a = [A Head,?,h absent, Nucleus]
 > e,o = [A Operator,?,h absent, Nucleus]
 > i,u = [A absent, ?,h absent, Nucleus]
 conson.= Onset > r,l = [A Head, ?,h absent, Onset]
 > Nas = [A Head/Operator, ?,h absent, Onset]
 > s,z = [A Head, h present, Onset]
 > Gutt= [A present, h or ? present, Onset]
 > Fric= [A=??, h present, Onset]
 > Stop= [A=??, ? present, Onset]

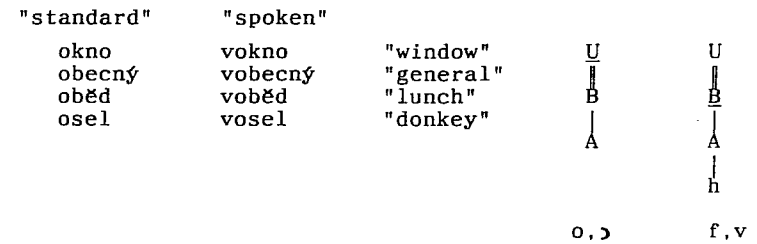
A in Fricatives

(23) [ʃ,ʒ] are the consonantal versions of [ø,ɛ]: I—A—B
 [ʃ,ʒ] (=unrounded [ʃ,ʒ]) are the consonantal versions of [e,ɛ]: I—A
 Southern Moroccan Arabic: Geminate influence on preceding [+s]



(24) [f,v] are the consonantal versions of [o,ɔ]: U(B)—A

Czech: actual evolution of #o... > #vo...



Fricatives without homorganic stops

(25) there are no stops for the following fricatives (in the sense
'[p,k] are the stops related to the fricatives [f,x]':

- labio-dentals [f,v]
- interdentals [θ,ð]
- alveolo-palatals [ç,ʒ]
- palato-velars [ʃ,ʒ]
- pharyngeals [ħ,ʕ]

(26) [f,v] and [ʃ,ʒ] both contain A: that might be the reason
for the absence of related stops

==> **A and ? cannot coexist within the same
expression**

They are complementarily distributed

(27) major class-definitions can be entirely derived from the
internal structure:

- a. vowel <=> object linked to a Nucleus
- b. consonant <=> object linked to an Onset
- c. sonorant <=> object lacking ?,h linked to an Onset
- d. Liquid <=> A-headed object linked to an Onset from which
h is absent
- e. Nasal <=> A- and N-provided object linked to an Onset
from which h is absent
- f. Fricative <=> h-provided object
- g. Stop <=> ?-provided object

Predictions made by the incompatibility of A and ?

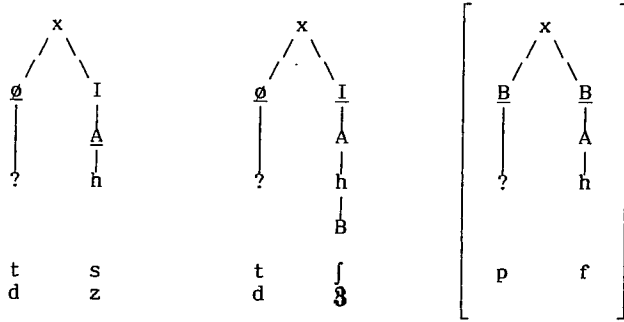
- (28) a. [t,d] are not the stops related to [s,z]
ok: [t,d] are nothing, cf.(13)
- b. there is no A in the glottal stop [ʔ], i.e. [ʔ] is no
Guttural
cf. Harris (1990): [ʔ]=? ??
- c. Gutturals are known in Semitic languages for their affinity
with A. They are commonly supposed to share this Element (cf.
Angoujard (1992), McCarthy (1991)).
The incompatibility of A and ? predicts that the uvular stops
[q,G] contain no A.
ok: [q,G] are the *only* post-velar consonants absent from
"Gutturals"=[χ,R,h,^ch,ħ,ʕ,ʔ]
they do not behave as Gutturals in
Hebrew: Gutturals can't geminate, [q,G] can
Classical Arabic: Gutturals block apophony (=alternation of
V₂ in perfective/imperfective forms), [q,G] do not

Why (at least a part of) Affricates exist

- (29) true affricates: [ts,dz,tʃ,dʒ,(pf)] = the first part is a
[t,d]
other affricates: [ks] = cohesion between two formerly
independent segments.
latin: NOM rek-s
GEN reg-is
- (30) In Indo-european, Affricates are not primitive: absent from
the ie consonantal inventory, their existence is commonly
described as an intermediate (and unstable) stage on a
spirantisation-trajectory.
The same could be said of Fricatives: apart from [s], there are
no Fricatives in ie. Any Fricative in ie languages (but [s,z])
is the result of a spirantisation/palatalization.

(31) true Affricates exist because an A was projected onto a Stop. Two solutions in such a case:

- a. ? is ejected completely, the result is a Fricative
- b. ? is ejected from the main structure but remains in a contour to the left. Its identity then must be empty, i.e. [t,d]:



(32) Czech palatalization illustrates both (31a) and (31b):

- a. ? is ejected completely nata: ř, ť are palatal stops

infinitive	past passive participle		
uklid-it	ukliz-en	d → z	"clean up"
osvobod-it	osvoboz-en	d → z	"liberate"
narod-it se	naroz-en	d → z	"be born"
- b. ? is ejected to the left part of contour

plat-it	plats-en	t → ts	"pay"
zatk-nout	zattf-en	k → tf	"arrest"
- c. s+C: palatalization affects [s], and C on its way

tisk-nout	tift-en	sk → ft	"print"
čist-it	čift-en	st → ft	"clean"
jezd-it	ježd-en	zd → žd	"drive"
- d. other (Fric → Fric)

pros-it	prof-en	s → f	"beg"
ohroz-it	ohrož-en	z → ž	"threaten"
nadx-nout	nadj-en	x → j	"delight"
táh-nout	taž-en	h → ž	"pull"

(33) Latin > French palatalization triggered by a following [a]:

lat	French		
caballus	ʃəval	cheval	"horse"
cantare	ʃāte	chanter	"sing"
gamba	ʒābə	jambe	"leg"
gaudia	ʒəa	joie	"joy"

Explicit internal structure of consonants

(34)

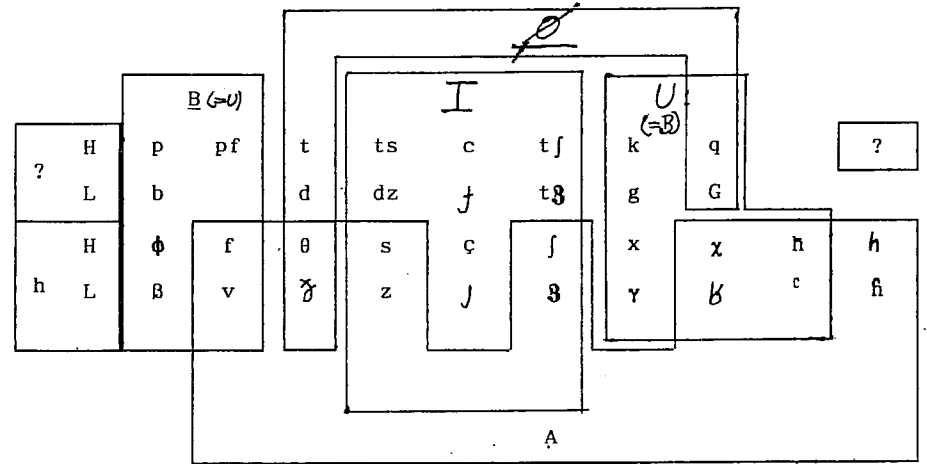
Fricatives	Stops
= h-version	= ?-version
p, b	ϕ, β
f, v	θ, ð
t, d	ʈ, ɖ
s, z	c, ɟ
ç, ʝ	k, g
ʃ, ʒ	
x, ɣ	

do [f,v], [s,z] and [ʃ,ʒ] have no related stops?

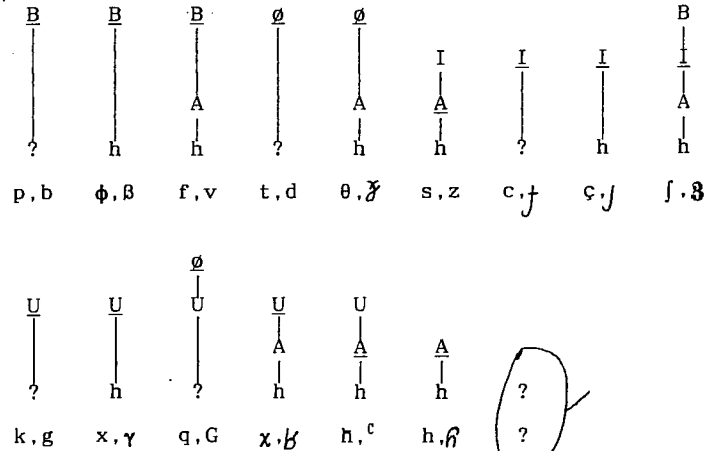
They have: [ts,dz] are the ?-version of [s,z]

[tʃ,tʒ] are the ?-version of [ʃ,ʒ]

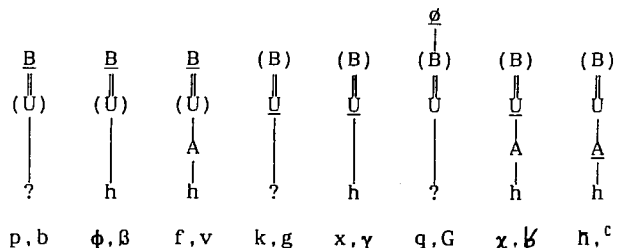
([pʃ] is the ?-version of [f,v])



(35)



(36) in languages where back vowels are always rounded: B=U



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(37) Alphabet (French, German, similar in other languages):

letter	VC = A-activity	CV = no A-activity
a		a a
b		be be
c		se tse
d		de de
e		e e
f	ef ef	
g		ge ge
h	aʃ	ha ha
i		i i
j		jot jot
k		ka ka
l	el el	
m	em em	
n	en en	
o		o o
p		pe pe
q		ky ku
r	er er	
s	es es	
t		te te
u		u u
v		ve vaw
w		d-ve ve
x	iks iks	
y		i grec ypsilon
z		zed tset