Internal structure of Consonants and why affricates exist

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(1) Element-based internal structure of consonants: 6 ideas
b. velarity and roundness are two independent phonological primitives, cf. Lass (1984), Rennison (1990,187)
c. three-leveled organization of constituents: Place, Manner, Voice/Tone cf. Feature Geometry
d. "Sonority hierarchy" is an observation due to the distribution of the Element A in consonants
e. ? and A cannot coexist within a given internal structure
f. 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
   \( l_v = U + B \)
   v - unmarkedness = centrality
b. Manner
   ? - ATR = Advanced Tongue Root
   N - nasality
   B - roundness/labiality
   ? - constriction
   h - noise
   T - trill \([r, n]\)
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
   a. any linguistic expression is headed
   b. objects without head as well as those with more than one head are ill-formed, cf. Syntax
   c. the head contributes more to the output than the operator(s)

(6) Fusions of Elements
   a. \( \text{I} \) is an expression defining an articulation that is located between I and A. It is closer to I because I is its head. Result: \([e, e]\)
   b. \( \text{I} \) is an expression defining an articulation that is located between I and A. It is closer to A because A is its head. Result: \([m]\)

U and B in consonants and vowels

(7) U is present in labials and velars
   a. german tsvelich
      english twin
   b. Swahili (Bantu)
      /N=limi/ \( \rightarrow [\text{dimi}] \) \( l \rightarrow d \)
      /N+mati/ \( \rightarrow [\text{bati}] \) \( w \rightarrow b \)
   c. Fulani (African West-Atlantic)
      g-w
      gor-ko "a man" pul-lo "a peul"
      wor-be "men" ful-be "peuls"
   d. Ge'ez (Classical Ethiopian) cf. Segal (1995)
      there are no regular short high vowels. Only if one of the neighbouring consonants is velar or uvular \([k, g, x, y, q, q, b, x]\), a short \([u]\) can exist
e. Czech Vocative-suffixes:

NOM  VOC
kuum  kon-ı  "horse"
Tomaš  Tomaš-ı  "Thomas"
lhář  lhář-ı  "killer"
zloděj  zloděj-ı  "thief"
hox  hox-u  "boy"
príšebx  príšebx-u  "story"
gonk  gong-u  "gong"
Zdeněk  Zdeněk-u  "name"

-e / elsewhere pes  ps-e  "dog"
doktor  doktor-e  "doctor"
holup  holub-e  "pigeon"
hrat  hrad-e  "castle"
Seř  Sv-e  "seam"

(8) velaricity and roundness are two independent phonological primitives

a. any system with an unbreakable primitive representing both roundness and velarity (such as U* or Dependency Phonology) is unable to deal with back unrounded vowels [#,r,γ,Λ,ε,a]: 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
flAs  flAs  "flow"
fløs  fløs  "raft"

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

b. 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 litter with languages lacking [γ,y,ε,α]—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

<table>
<thead>
<tr>
<th>B</th>
<th>Y</th>
<th>U</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>i</td>
<td>y</td>
<td>u</td>
<td>i</td>
</tr>
<tr>
<td>e</td>
<td>ø</td>
<td>o</td>
<td>e</td>
</tr>
</tbody>
</table>

Palatals = L, velars = U

(11) palatals [j.c, góc, j] and velars [k,g,x,γ] are the direct translation of I resp. U

<table>
<thead>
<tr>
<th>I</th>
<th>I</th>
<th>I</th>
<th>I</th>
<th>I</th>
<th>U</th>
<th>U</th>
<th>U</th>
<th>U</th>
<th>U</th>
<th>U</th>
<th>U</th>
</tr>
</thead>
<tbody>
<tr>
<td>?</td>
<td>?</td>
<td>h</td>
<td>h</td>
<td>h</td>
<td>?</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>H</td>
<td>L</td>
<td>L</td>
<td>L</td>
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<td>H</td>
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<td>H</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>j</td>
<td>c</td>
<td>f</td>
<td>c</td>
<td>f</td>
<td>j</td>
<td>k</td>
<td>g</td>
<td>x</td>
<td>γ</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
[t.d] are nothing: consonantal unmarkedness/ the "cold consonant"

(12) [t(.d)] are classical epenthetic consonants:
   a. French: intervocalically
      /as-t-il/ → a-t-il dit
   b. Middle-High-German "Sproßkonsonant"/"Dentalwuchs"

<table>
<thead>
<tr>
<th>MHD</th>
<th>actual German</th>
</tr>
</thead>
<tbody>
<tr>
<td>iergen</td>
<td>irgend</td>
</tr>
<tr>
<td>leman</td>
<td>jemand</td>
</tr>
<tr>
<td>wilten</td>
<td>Weiland</td>
</tr>
<tr>
<td>vollen</td>
<td>vollends</td>
</tr>
<tr>
<td>totzen</td>
<td>Dutzend</td>
</tr>
<tr>
<td>anderalph</td>
<td>anderalph</td>
</tr>
<tr>
<td>ackes</td>
<td>Axt</td>
</tr>
<tr>
<td>obeß</td>
<td>Obst</td>
</tr>
<tr>
<td>sus</td>
<td>sonst</td>
</tr>
<tr>
<td>bäbes</td>
<td>Papst</td>
</tr>
<tr>
<td>habeck</td>
<td>Habicht</td>
</tr>
<tr>
<td>bredige</td>
<td>Predigt</td>
</tr>
<tr>
<td>saf</td>
<td>Saft</td>
</tr>
<tr>
<td>werf</td>
<td>Werft</td>
</tr>
</tbody>
</table>

(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

<table>
<thead>
<tr>
<th>Middle High German</th>
<th>actual German</th>
</tr>
</thead>
<tbody>
<tr>
<td>sunne</td>
<td>Sonne</td>
</tr>
<tr>
<td>sumer</td>
<td>Sommer</td>
</tr>
<tr>
<td>kumen</td>
<td>kommen</td>
</tr>
<tr>
<td>münchec</td>
<td>Mönch</td>
</tr>
<tr>
<td>sun</td>
<td>Sohn</td>
</tr>
<tr>
<td>künecc</td>
<td>König</td>
</tr>
<tr>
<td>gewunnen</td>
<td>gewonnen</td>
</tr>
<tr>
<td>geswummen</td>
<td>geschwommen</td>
</tr>
</tbody>
</table>

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

[r] > [ʂ] / Vₜₜ- — foog vor
      nuq  nur
      ʂaŋp  Sanger
      mawŋ  Mauer
[r] > [m] / Vₜᵢᵢ — bæm  Bär
      bliŋ  Bier
      leem  leer
      fʃim  Feuer
[r] > [R] / Cₜ — dRaj. *dmaj  driel
      kraum. *kraum  Krum
[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

<table>
<thead>
<tr>
<th></th>
<th>Perfect</th>
<th>Present</th>
<th>Jussive</th>
</tr>
</thead>
<tbody>
<tr>
<td>1'sg</td>
<td>nAŋdʒ-ŋɐm</td>
<td>ɐ-rAŋdʃ</td>
<td>n+nd+ʃ</td>
</tr>
<tr>
<td>1'sg</td>
<td>nAŋkR-ŋɐm</td>
<td>ɐ-rAKR</td>
<td>n+RAK+R</td>
</tr>
</tbody>
</table>

b. Middle-High-German doubles Paal [H.1.H.1]:

<table>
<thead>
<tr>
<th>Herke</th>
<th>Helche</th>
<th>marmor</th>
<th>marmel</th>
</tr>
</thead>
<tbody>
<tr>
<td>smieren</td>
<td>smielen</td>
<td>marter</td>
<td>martel</td>
</tr>
<tr>
<td>prior</td>
<td>priol</td>
<td>mörter</td>
<td>mörtel</td>
</tr>
<tr>
<td>murmern</td>
<td>murmeln</td>
<td>turter</td>
<td>turtel</td>
</tr>
<tr>
<td>Canterbury</td>
<td>Candelberc</td>
<td>dörper 'Bier'</td>
<td>dörpel &gt; törpel &gt; Töpel '6lt'</td>
</tr>
</tbody>
</table>

(17) [n,l,r] contain I: german allophones [ɕ,ɻ]

   a. [ɕ] after u, o, a [ɻ] after y, ø, i, e
      absence of I       presence of I
      buৰ g "book"    byৰ g "books"
      koɕ "cook"       kɔɕ "cooks"
      baɕ "brook"      beɕ "brooks"
      iɕ "I"           iɻ "I"

   b. [ɻ] also after [n,l,r]
      mলচ  "milk"
      mানচ  "some"
      dৰচ  "through"

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

[I] /_e,i/  bjat-s  "white" masc.sg  tak  'bekhir lebar'
bjat-o  "white" neut.sg  luq  'poln'  
bjat-a  "white" fem.sg  laq  'puw'

[I] /_e,i/  bel-i  "white" masc.pl  lek  'medenat'
bel-eja  "being white" lik  'fez'
(19) [s.z] are "consonantal Liquids": Rhotacism
    [z] becomes [r] intervocally
    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

<table>
<thead>
<tr>
<th>Liquids</th>
<th>Nasals</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>A</td>
<td>A</td>
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<tr>
<td>A</td>
<td>A</td>
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<td>I</td>
<td>I</td>
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<td>U</td>
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<td>A</td>
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<tr>
<td>A</td>
<td>A</td>
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<tr>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>Z</td>
<td>Z</td>
</tr>
</tbody>
</table>

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

(22) vowels = Nucleus  a
    > 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]
    > Fric= [A present, h or ? present, Onset]
    > Stop= [A=??, ? present, Onset]

(23) [s.o] are the consonantal versions of [θ, ʃ]: I—A—B
    [ʃ, z] (=unrounded [ʃ, ʒ]) are the consonantal versions of [ʃ, ʒ]: I—A
    Southern Moroccan Arabic: Geminates influence on preceding [+]s
    z.a'dd "cheek"  I   I
    q什b "bucket" A   A
    f.a'mm "mouth"   B   B
    s.f "nest"       B   B

(24) [ʃ, v] are the consonantal versions of [θ, ʃ]: U(B)—A
    Czech: actual evolution of No... > #vo...
    "standard"    "spoken"
    okno   vokno    "window"  U   U
    obecný   vobecný  "general"  B   B
    oběd   voběd  "lunch"  B   B
    oseľ   vosel  "donkey"   A   A

v.e      f.v
Fricatives without homorganic stops

(25) there are no stops for the following fricatives ([s] is the sense
'[p,k] are the stops related to the fricatives [f,v]:
labio-dentals  [f,v]
interdentals  [θ,ʃ]
alveolo-palatals  [ʃ,ʒ]
palato-velars  [ʃ,ʒ]
pharyngeals  [h,ɣ]

(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]=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"=[x,R h,ʔ,h,R,ʔ]
   they do not behave as Gutturals in
   Hebrew: Gutturals can't geminate. [q,g] can
   Classical Arabic: Gutturals block apophony (=alternation of
   V₁ 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-trajecotry.
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]:

\[
\begin{array}{c|c|c|c|}
\hline
\text{X} & \text{X} & \text{X} \\
\hline
\phi & \phi & \phi \\
\hline
? & ? & ? \\
\hline
\text{h} & \text{h} & \text{h} \\
\hline
d & s & t \\
\hline
d & z & \text{p} \\
\hline
\text{d} & \text{z} & \text{g} \\
\hline
\end{array}
\]

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

a. ? is ejected completely w/ [i, u] in initial stops

<table>
<thead>
<tr>
<th>infinitive</th>
<th>past passive participle</th>
</tr>
</thead>
<tbody>
<tr>
<td>uklid-it</td>
<td>ukлиз-en d --&gt; z</td>
</tr>
<tr>
<td>osvobodit</td>
<td>osвобод-en d --&gt; z</td>
</tr>
<tr>
<td>narod-it se</td>
<td>narоz-en d --&gt; z</td>
</tr>
</tbody>
</table>

b. ? is ejected to the left part of contour

<table>
<thead>
<tr>
<th>plat-it</th>
<th>plats-en t --&gt; ts</th>
</tr>
</thead>
<tbody>
<tr>
<td>zatk-nout</td>
<td>zattf-en k --&gt; tf</td>
</tr>
</tbody>
</table>

\text{c. s=C: palatalization affects [s], and C on its way}

<table>
<thead>
<tr>
<th>tisk-nout</th>
<th>tifl-en sk --&gt; [f]</th>
</tr>
</thead>
<tbody>
<tr>
<td>чист-it</td>
<td>чест-en st --&gt; [t]</td>
</tr>
<tr>
<td>jezd-it</td>
<td>jezd-en zd --&gt; [zd]</td>
</tr>
</tbody>
</table>

d. other (Fric --> Fric)

<table>
<thead>
<tr>
<th>pros-it</th>
<th>prof-en s --&gt; [s]</th>
</tr>
</thead>
<tbody>
<tr>
<td>ohoz-it</td>
<td>ohoz-en z --&gt; [s]</td>
</tr>
<tr>
<td>nafr-nout</td>
<td>nafr-en x --&gt; [s]</td>
</tr>
<tr>
<td>tâh-nout</td>
<td>tах-en h --&gt; [s]</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Latin</th>
<th>French</th>
</tr>
</thead>
<tbody>
<tr>
<td>caballus</td>
<td>cheval</td>
</tr>
<tr>
<td>cantare</td>
<td>chanter</td>
</tr>
<tr>
<td>gamba</td>
<td>jambe</td>
</tr>
<tr>
<td>gaudia</td>
<td>joie</td>
</tr>
</tbody>
</table>

(34) Explicit internal structure of consonants

<table>
<thead>
<tr>
<th>Fricatives</th>
<th>Stops</th>
</tr>
</thead>
<tbody>
<tr>
<td>= h-version</td>
<td>= ?-version</td>
</tr>
<tr>
<td>p, b</td>
<td>f, b</td>
</tr>
<tr>
<td>t, d</td>
<td>t, d</td>
</tr>
<tr>
<td>s, z</td>
<td>s, z</td>
</tr>
<tr>
<td>c, j</td>
<td>c, j</td>
</tr>
<tr>
<td>f, s</td>
<td>f, s</td>
</tr>
</tbody>
</table>

\text{do [f, v], [s, z] and [f, s] have no related stops? They have: [ts, dz] are the ?-version of [s, z] [tf, zf] are the ?-version of [f, s] [tsf] is the ?-version of [f, v]}
(36) in languages where back vowels are always rounded: B—U

References


