

## Spirantisation and its implications for the internal structure of consonants

(1) purpose

- a. show that there are two kinds of spirantisations.
- b. define their properties.
- c. show that aspiration triggers one of them.
- d. propose a reason for this fact.
- e. evaluate the consequences for consonantal representations.
- f. propose a representational model where Place-primitives make the difference between those fricatives that result from the contact with aspiration and those that contract no relation with aspiration.

(2) GRIMM's law

- a. data (Greek and Latin forms witness the IE stage; Gothic spelling:  $p=[\theta]$ , Germanic spelling:  $d=[\delta]$ )

1. spirantisation

IE	> germ	>	got	lat	got
p, p <sup>h</sup>	f		f	pater	fadar
	v		b	septem	sibun
bh	v		b	fero	bairan
t, t <sup>h</sup>	þ		þ	tres	*þreis
	d		d	pater	fadar
dh	ð		d	gr ῥύρα	daur
k, k <sup>h</sup>	χ		h	cornu	*haurn
	ʰ		g	gr ῥάχου	*tagt
g <sup>h</sup>	ʰ		g	hostis	gasts

2. devoicing

b	p	p	(s)lubricus	*sliupan
g	k	k	ego	ik
d	t	t	edo	itan

b. abstraction

	non-aspirated		aspirated	
	voiced	voiceless	voiceless	voiced
IE stops	b, d, g ↓	p, t, k	p <sup>h</sup> , t <sup>h</sup> , k <sup>h</sup> ↓	b <sup>h</sup> , d <sup>h</sup> , g <sup>h</sup> ↓
Germanic	↓	↓	→ p <sup>h</sup> , t <sup>h</sup> , k <sup>h</sup>	b <sup>h</sup> , d <sup>h</sup> , g <sup>h</sup>
1st consonant shift	p, t, k		↓ / f/v, θ/ð, χ/ʰ	

(3) Sesotho (Bantu language spoken in Eastern Africa)

non-prefixed	form with	
form	nasal prefix	alternation
a. haha	ŋ-k <sup>x</sup> ahela	h - k <sup>x</sup>
seŋa	n-tseŋa	s - ts
ʃapa	n-tʃapa	ʃ - tʃ
b. rata	n-t <sup>h</sup> ata	r - t <sup>h</sup>
ʃapaŋa	m-p <sup>h</sup> apaŋa	f - p <sup>h</sup>
tatswa	n-t <sup>h</sup> atswa	t - t <sup>h</sup>
c. lisa	n-tisetsa	l - t
d. bona	m-pona	b - p
dʒa	n-tʃa	dʒ - tʃ

(4) sum Grimm and Sesotho

- a. Grimm's law: aspiration triggers the spirantisation
- b. relationship between fricatives and **aspirated** stops in Sesotho, too

the Place of articulation of the related stops and fricatives is never the same:	
stop	fricative
bilabial	labio-dental
dental	interdental
velar	uvular

(5) Spanish: spirantisation of voiced stops

a. fricatives

1. intervocalically V\_\_V

la <i>ba</i> nka	<i>la banca</i>	"the bank"
la <i>de</i> mora	<i>la demora</i>	"the delay"
la <i>ga</i> na	<i>la gana</i>	"the desire"

2. after vowels before liquids V\_\_L

a <i>dmira</i> ble	<i>admirable</i>	"admirable"
pa <i>dre</i>	<i>padre</i>	"father"
a <i>gricola</i>	<i>agricola</i>	"agricultural"

3. word-finally after vowels V\_\_#

siu <i>da</i> ð	<i>ciudad</i>	"city"
siu <i>da</i> ð katalana	<i>ciudad catalana</i>	"catalan city"
*siu <i>da</i> ð katalana		

b. stops elsewhere, e.g.

1. word-initially #\_\_V

<i>ba</i> nka	<i>banca</i>	"bank"
<i>de</i> mora	<i>demora</i>	"delay"
<i>ga</i> na	<i>gana</i>	"desire"

2. after liquids before vowels L\_\_V

<i>ambos</i>	<i>ambos</i>	"both"
<i>onda</i>	<i>onda</i>	"wave"
<i>aldea</i>	<i>aldea</i>	"village"
<i>tengo</i>	<i>tengo</i>	"I have"

(6) Tiberian Hebrew: spirantisation of [p,b, t,d, k,g]

perfective    imperfective    alternation(s)

√zkr	zaaxar	yi-zkor	x-k	"remember"
√kpr	kaaφar	yi-xpor	k-x, φ-p	"cover"
√bdl	baaθal	yi-βdal	b-β, θ-d	"separate"
√pth	paaθah	yi-φtah	p-φ, θ-t	"open"
√pgf	paaγaf	yi-φgof	p-φ, γ-g	"meet"

(7) sum Spanish and Tiberian Hebrew

- a. the triggering context is defined in terms of sonority/ vocalicity
- b. apart from [t,d],

the Place of articulation of the related stops and fricatives remains stable

(8) a. correspondences stops - fricatives

	stops	p,b	t,d	k,g
fricatives resulting from the spirantisation	Grimm's law, Sesotho	f,v	θ,ð	χ,μ
	Spanish, Tiberian Hebrew	φ,β		κ,γ

b. spirantisation triggered by

	triggering context
Grimm's law, Sesotho	aspiration
Spanish, Tiberian Hebrew	sonority

(9) complementary distribution:

- a. if a spirantisation is triggered by sonority, the Place of articulation remains stable and vice versa.
- b. if a spirantisation is triggered by aspiration, the Place of articulation changes and vice versa.

(10) evaluation and questions

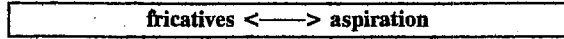
- a. no surprise in observing that the minimally sonorant stops become more sonorant in a highly sonorant environment. Ordinary assimilation.
- b. by contrast, there is no obvious reason why spirantisation should occur under the influence of aspiration.
- c. approaching the problem under another angle: the shift in the Place of articulation correlated to spirantisation triggered by aspiration.
- d. what does the neutralisation of [t,d] to [θ,ð] mean, no matter of which kind the triggering context is?

(11) necessary elements for the inquiry:

- a. what is aspiration?
- b. which is the identity of the involved consonants?

(12) consequences:

- a. a model of consonantal representation is needed.
- b. the challenge constitutes a good test for the different models in competition: any of them must be able to express the relation



(13) model of consonantal representation Scheer (1996) dealing with Elements (KLV 1985):

a. Place definers

A - RTR = Retracted Tongue Root  
low tongue body position

I - palatality

U - velarity

B - labiality (roundness)

∅ - cold vowel = relaxed tongue body position

b. Manner definers

I - ATR = Advanced Tongue Root, buccality

N - nasality

B - roundness (labiality)

? - occlusion

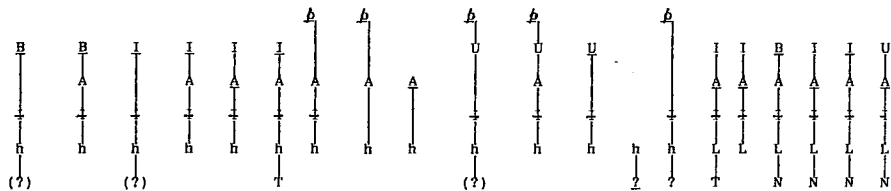
h - noise

T - trill of the apex

L - relaxed vocal cords

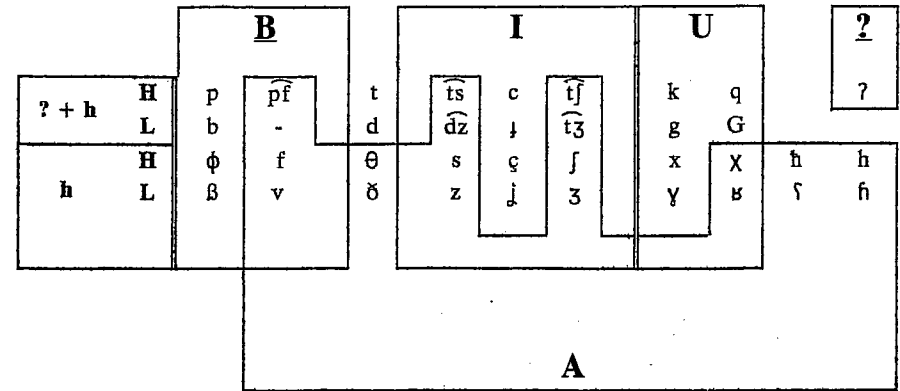
H - stiff vocal cords

(14) Heads are underscored



[p,b,φ,β] [t,d] [c,ɟ,ʑ,ʒ] [ʃ,ʒ] [s,z] [ʃ] [θ,ð] [h,ɦ] [h,ɦ] [k,g,x,ɣ] [x,ɣ] [q,ɢ] [ʔ] [t,d] [r] [l] [m] [n] [r] [ɣ]

(15) sum obstruents



(16) a. relations between fricatives and stops according to this model:

	A (=Retracted Tongue Root)	
	absent	present
labials	p,b φ,β	f,v
dentals	t,d	θ,ð
velars	k,g x,ɣ	q,ɢ χ,ʁ

b. according to this model, the inputs and outputs of Grimm's law are complementarily distributed with respect to A:

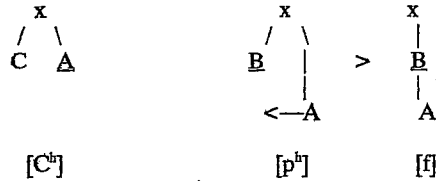
	A
stops = input	-
fricatives = output	+

c. hence, the model predicts that throughout Grimm's law,

A joins the initial stops
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(17) aspiration is a glottal friction. The identity primitive of the glottal zone is A:

$$C^h = C^A$$



(18) sum

- a. incorporation of A into the stop provokes a change in the Place of articulation.
- b. non-aspirated stops don't spirantise because they don't carry the trigger A.
- c.

why does the stop spirantise?

(19) what would be the result if there was no spirantisation?

input-Place	output-Place	stop corresponding to the predicted output-Place
bilabial	labio-dental	-
dental	interdental	-
velar	uvular	q, G

(20) the non-existence of corresponding stops for the fricatives of a given Place of articulation is a more general phenomenon (but there is no stop for whose Place no fricative exists):

Places of articulation without stops		
	fricatives: presence of A	stops
labio-dental	f, v	-
interdental	θ, ð	-
postalveolar	ʃ, ʒ	-
pharyngeal	ħ, ʕ	-
Places of articulation provided with stops		
	fricatives: absence of A	stops
bilabial	ɸ, β	p, b
palatal	ç, ʝ	c, ɟ
velar	x, γ	k, g

WHY?

(21) one answer for two questions

- a. why aren't there any stops for some Places of articulation?
- b. why do the stops of Grimm's law spirantise?

because

A and ? are incompatible

they cannot coexist within a given structure

they are complementarily distributed, cf. table (15)

(22) The incompatibility of ? and A seems very natural.

They are antipodal to every extent:

- a. they represent both extremities of the sonority-scale.
- b. they represent maximal (A) and minimal (?) aperture.

- (23) "true" and "false" spirantisations
- "true" spirantisations = Spanish, Tiberian Hebrew: assimilation concerning the Manner-primitive ?.
  - "false" spirantisations = Grimm's law, Sesotho: no assimilation, transfer of a Place primitive, A, which causes a change in the Place of articulation. The spirantisation is secondary.

- (24) why are the fricatives associated to [t,d] invariably [θ,ð] with any kind of spirantisation?
- according to the above analysis, [θ,ð] = carriers of A are the regular result of "false" spirantisations (Grimm's law).
  - "true" spirantisations (Spanish) should have resulting dental fricatives lacking A.
  - according to the consonantal representations assumed, there are no such fricatives in the dental region.
  - under the above analysis, [θ,ð] are thus an irregular result of a "true" spirantisation. [t,d] are the most hostile stops to "true" spirantisations.
  - Tigrinya, an Ethio-Semitic language, presents a "true" spirantisation occurring after vowels that concerns exclusively labials and velars/uvulars. [t,d] do never spirantise.

- [b] \*nābīru > \*nāβīru > \*nāwīru > nāyru √nbr "he was"  
 \*gābīru > \*gāβīru > \*gāwīru > gāyru √gbr "he did"  
 \*sābīru > \*sāβīru > \*sāwīru > sāyru √sbr "he broke"

- [m] teβat "basket"  
 yθβallōsal "he will comme back"  
 tāβarā "study"  
 saβā "kiss"  
 sālaβta "greetings"  
 aβsa "fifty"  
 šθβbōra "chickpea"

- [k] kāfātā "open" perfective  
 yθ-xāffōt "open" imperfective  
 dōxam "weakness"  
 zāxti "now"

- [q] qābārā "bury" perfective  
 yθ-xābbōr "bury" imperfective  
 bāxli "donkey"

- (25) apart from [θ,ð], the opposition "fricatives carrying A" vs. fricatives lacking A" corresponds to the Jakobsonian terms strident vs. mat.

fricatives	Jakobsonian term	phonological identity
f,v	strident	presence of A
s,z		
ʃ,ʒ		
x,ɣ		
h,ɦ		
θ,ð		
φ,β	mat	absence of A
ç,j		
x,ɣ		

References

KLW 1985 = Kaye, J.D., J. Lowenstamm, J.-R. Vergnaud: The internal structure of phonological representations: a theory of Charm and Government. In: Phonology Yearbook 2, 305-328.  
 Scheer, Tobias 1996: Une théorie de l'interaction directe entre consonnes. Contribution au modèle CVCV, alternances e-ø dans les préfixes tchèques, structure interne des consonnes et la théorie X-barre en phonologie. Doctoral dissertation, Université Paris 7.