

STRUCTURE IS A SOVEREIGN REFEREE: THE CODA MIRROR

(1) in a nutshell

- a. Nature is made of objects and events. The former exist independently of the latter and experience their action. No grammar, and most probably no natural science at all, can be thought of as **only** structure or **only** process.
- b. OT is computation (= process) alone. In this respect as in many others, it embraces SPE and circumvents the 80s, i.e. autosegmentalism = representations. Representations are only decorative inasmuch as they are not allowed to make a sovereign and unoutrankable arbitral award.
- c. I argue for an alternative where both structure and processes fall into possible and impossible items. For example, the universal and unmodifiable arbitral award of structure divides the linear string into strong and weak positions. Lenition and fortition are consequences of structure, not of process.

I. In OT, structure is only decoration

(2) OT denies the dichotomy structure vs. process¹

- a. in OT, **computation is king**, all the rest is irrelevant
there is only one way to do refereeing in OT:
the **only** device that decides on (a)grammaticality are constraints and their interaction.
This appears to be the very essence of OT, in-built and unalterable [really?].
- b. consequences:
 1. OT is computation alone, structure could not be an independent referee. Independent means "which owes nothing to any computation and whose arbitral award cannot be overridden by some constraint".
Or, in other words, OT conflates structure and computation in subordinating the former to the latter. Structure does not exist in its own right, and does not rule out anything in complete absence of the intervention of constraints.
Example: "ok, line-crossing is bad, but X is worse, so line-crossing will 'win'".
 2. representations are interchangeable and decorative
"The tenets of OT, regarding constraint violability and ranking, make no particular claims about phonological representations. We could, for example, do OT with any kind of feature theory: SPE feature bundles or feature geometric representations, privative or binary features, and so on." Lombardi (2001:3)
 3. the only structure that OT recognises is "emerging", i.e. the result of a process.
The irrelevance of representations in OT has a direct graphic translation: representations sometimes appear in the candidate column, but never in the head-line that features the constraints. In other words, constraints select representations, but not the reverse.

¹ Disclaimer: when I say "OT" here, I only refer to features which I believe are shared by all versions of OT. The "dialectal variation" within OT is growing these days, and one cannot be so sure anymore that all proponents of OT agree on the founding statements of this theory such as its non-derivational character, Richness of the Base and the like.

4. objects do not exist in absence of competition (= computation)
Nothing IS. Things are only better or worse than other things.
Therefore, OT is fine with monsters, on the condition that there is a more horrible monster around.
There is no such thing as an **impossible structure**.
Structures are only more or less likely to occur. A monster Coda that branches 23 times is a possible natural and human object; it only happens not to be produced by particular constraint rankings.
In the same way, there is no such thing as an **impossible process**: $m \rightarrow \eta / __t$ is a possible natural and human event; it only happens not to be produced by particular constraint rankings.
- c. therefore, there is growing uncertainty within OT as to the role played by representations: interchangeable, decoration...
"One less desirable consequence [of the rise of constraint-based phonological theories] has been an increasing uncertainty regarding such fundamental questions as: What is a lexical representation? What is a phonological representation? Of what features or feature specifications do they consist? How do these features combine? What is the trade-off between constraints and representations in understanding phonological regularities?" Clements (2001:71)
"A consequence of the shift away from representational questions [...] is that there is at present much uncertainty concerning certain fundamental questions pertaining to [...] phonological representations [...]. With respect to features, the most obvious question [...] is: What featural representations (e.g. feature geometry, underspecification) are necessary in a phonological theory?" Hall (2001:1)

II. Alternative: structure contributes a sovereign arbitral award

- (3) an alternative:
representations exist in their own right, and their arbitral award is absolute
 - a. representations have an intrinsic power on grammaticality. Their rule is an absolute instance; it is **independent** of any computational event and cannot be "outranked".
 - b. (a)grammaticality is the result of the tension between two poles that are necessarily different and autonomous:
 - structure (= representations)
 - computation (= (ordered) rules, constraint interaction, whatever)computation is NOT king. Its power is limited by representations.
"Formally-grounded phonology: from constraint-based theories to theory-based constraints" (Brandão de Carvalho's 2002)
 - c. representations are primary phonological objects. They are not the result of the computational module.
 - d. note that this does NOT mean that
 - there are no constraints
 - there is no constraint ranking
 - there is no competition in grammar
 - that there are no extra-phonological causes for phonological events ("grounded" constraints)it just means that there are representations, and that they are central, rather than decorative.

III. Example: lenition and fortition are the result of structure, not of process

- (4) there are two (and only two) families of processes in phonology:

assimilation vs. lenition/ fortition

assimilation (due to process)	lenition/ fortition (due to structure)
a. non-positional the position of the target is irrelevant (no such thing as "palatalise X everywhere except in word-initial position")	positional the position of the target is crucial (lenition in Coda etc.)
b. melodic properties of other segments are crucial ("palatalise non-front consonants only before front vowels")	melodic properties of other segments are irrelevant (no such thing as "X lenites in Coda, but only after front vowels")
c. there is an exchange of melodic primes between segments (palatalisation = "the prime responsible for frontness penetrates into the consonant")	there is no exchange of melodic primes between segments (the melodic modification of the target owes nothing to any exchange of melodic primes)
d. typically causes the acquisition of a melodic prime: assimilation (linking) is frequent, dissimilation (delinking) is rare	typically causes the loss of a melodic prime: lenition (delinking) is frequent, fortition (linking) is rare

- (5) what lenition/ fortition is

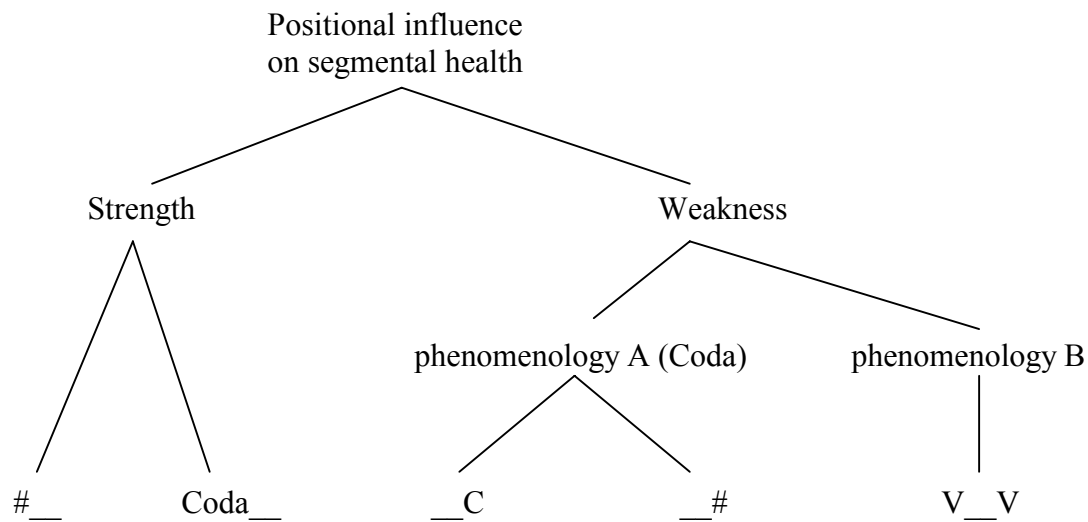
the structure (= the position) alone determines the event. The effect observed is a consequence of the structural organisation of the linear string.

[BIG disclaimer: lenition may also be influenced by stress. But there is a natural hierarchy: many lenition systems pay no attention to stress at all, but systems where stress decides alone do not appear to exist. Hence, phonologists should first come up with a positional theory that disregards stress completely, and then implement a stress module.]

- (6) pre-theoretical description: what any theory of lenition/ fortition must be able to do

- a. there are five relevant positions for a consonant

	position	usual name	
1.	#__V	word-initial	} Strong Position
2.	VC.__V	post-Coda	
3.	V__.CV	internal Coda	} Coda
4.	V__#	final Coda	
5.	V__V	intervocalic	
			} Weak Positions



- b. ==> there are three major disjunctions:
1. the Coda = __{C,#}
"word-finally and before a (heterosyllabic) consonant"
 2. the Coda + intervocalic
 3. the Coda Mirror {C,#}__ (Strong Position)
"word-initially and after a (heterosyllabic) consonant"
- c. any theory must be able to reduce the disjunction of the Coda and the Coda Mirror to a non-disjunctive statement.
- d. the Coda and its Mirror are perfectly symmetrical:
1. in their structural description: __{C,#} vs. {C,#}__
 2. in their effect: the Coda induces weakness, the Coda Mirror induces strength.
This can hardly be accidental.
- e. therefore, any theory must not only be able to reduce the two disjunctions, but also to come up with two non-disjunctive identities that
1. are in some way the mirror image of each other and
 2. tell why the Coda produces weakness, rather than strength, and the Coda Mirror strength, rather than weakness

(7) some illustration: evolution of Latin obstruents in French

- a. Coda Mirror {C,#}__ no damage at all
- b. Coda __{C,#} total loss (only velars leave a palatal trace)
- c. intervocalic V__V spirantisation (labials), total loss (dentals and velars, the latter may leave a palatal trace) or voicing ([s])

	a. #__		b. Coda__		c. Coda				d. V__V	
					__C		__#			
p	<u>p</u> orta	porte	<u>t</u> alpa	taupe	<u>r</u> upta	route	<u>l</u> up(u)	[lu]	<u>r</u> ipa	rive
b	<u>b</u> ene	bien	<u>h</u> erba	herbe	<u>c</u> ub(i)tu	coude	<u>u</u> b(i)	où	<u>f</u> aba	fève
t	<u>t</u> ela	toile	<u>c</u> antare	chanter	<u>p</u> lat(a)nu	plane	<u>m</u> arit(u)	mari	<u>v</u> ita	vie
d	<u>d</u> ente	dent	<u>a</u> rdore	ardeur	<u>a</u> dvenire	avenir	<u>n</u> ud(u)	nu	<u>c</u> oda	queue
k	<u>c</u> or	cœur	<u>r</u> ancore	rancœur	<u>f</u> acta	faite	<u>*v</u> erac(u)	vrai	<u>l</u> actuca	laitue
g	<u>g</u> ula	gueule	<u>a</u> ngustia	angoisse	<u>r</u> ig(i)du	raide			<u>*a</u> gustu	août
f	<u>f</u> ame	faim	<u>i</u> nfern(u)	enfer	<u>s</u> teph(a)nu	Etienne			<u>d</u> eforis	dehors
s	<u>s</u> erpente	serpent	<u>v</u> ersare	verser	<u>m</u> usca	mouche	<u>n</u> os	[nu]	<u>c</u> ausa	chose [z]

IV. Brief introduction to CVCV: lateralisation of structure and causality

(8) CVCV

(Lowenstamm 1996, Scheer 1999,forth, Szigetvári 1999) is an outgrowth of Government Phonology (Kaye et al. 1990, Charette 1991, Harris 1994 etc.)

- a. syllabic constituency boils down to a strict consecution of non-branching Onsets and non-branching Nuclei

[R = any sonorant, T = any obstruent]

closed syllable

O N O N
| | | |
C V C ø

geminate

O N O N
| |
C V

long vowel

O N O N
| |
C V

[...C#]

...O N
| |
C ø

- b. CVCV multiplies empty categories, and namely empty Nuclei. Therefore we need an Empty Category Principle
1. an empty Nucleus may exist only if it is governed
 2. only phonetically expressed Nuclei can govern
 3. recognition of the special status of the right edge. Word-final empty Nuclei are governed, but not by a vowel: morphology does the job.
 - [4. no time to talk about branching Onsets here: see Scheer (1999,forth)]
- c. instead of being translated into the familiar arborescence, syllabic generalisations are described by two lateral relations with opposite effect:
1. Government (destructive)
 2. Licensing (supporting)

(9) application: vowel-zero alternations

	zero C__C-V	vowel C__C-ø	vowel C__C-CV	gloss
Moroccan Arabic	kit ø -u	k ø t ib -ø	k itt ib-ø	write perf.act.3pl, 3sg, 3sg causative
German	inn ø r-e	inner-ø	inner-lich	inner+infl, inner, internal
Tangale (Chadic)	dob ø -go	dob e	dob u -n-go	called, call, called me
Somali (Cushitic)	nir ø -o	nir ig -ø	nir ig -ta	young female camel pl, sg indef, sg def
Turkish	dev ø r-i	dev ir -ø	dev ir -den	transfer ACC, NOM, ABL
Slavic (e.g. Czech)	lok ø t-e	lok e t-ø	lok e t-ní	elbow GENsg, NOMsg, adj.
Hungarian	maj ø m-on	maj o m-ø	maj o m-ra	monkey Superessive, NOM, Sublative
Hindi	kaar ø k-õõ	kaar ə k-ø	kaar ə k-nee	"case" oblique pl, NOMsg, agentive
Kolami (Dravidian)	kin ø k-atun	kin i k-ø	kin i k-tan	"break" present, imperative, past

(10) empirical generalisation

alternation sites show

- a. zero / __CV
- b. vowel / __C {

C}

(11) classical arboreal translation of these facts vs. lateral interpretation I

WHERE ?

classical arboreal

- a. alternation sites are vocalised in closed syllables.
- b. Codas are defined as a constituent that occupies a specific position in the syllabic arborescence.

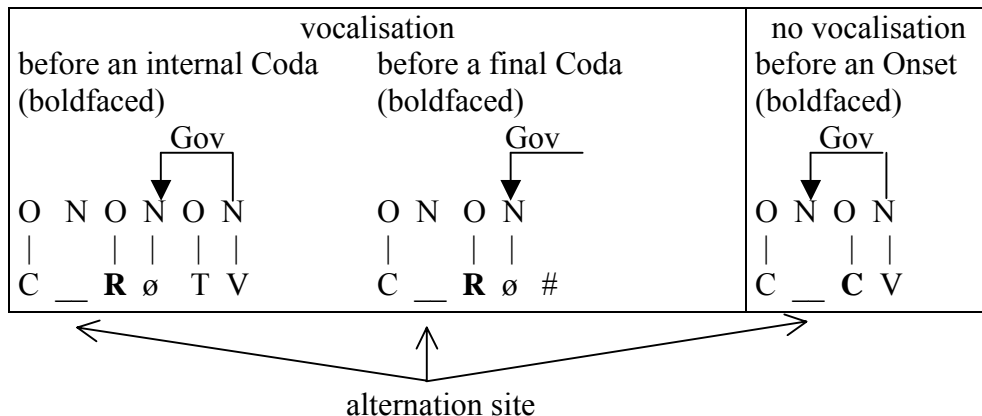
lateral

alternation sites are vocalised iff they remain
ungoverned

Codas are defined in lateral terms:
a consonant occurs in a Coda iff it is
followed by a governed empty Nucleus.

(12) illustration

recall that Government is "destructive", i.e. inhibits the segmental expression of its target. Here, its effect on Nuclei can be inspected: it reduces them to silence.



(13) \implies lateralisation of structure

Tina Turner was wrong: what you get is NOT what you see
arborescence is cut down:

- a. Codas are not defined in arboreal terms.
- b. alternation sites are there even if they are phonetically absent. Under the classical analysis, the consonant preceding an alternation site is resyllabified: it is a Coda in case the vowel is absent, **C.øCV**, but an Onset if it is present: **CvCV**. Under CVCV, it is an Onset all the time.

(14) classical arboreal translation of these facts vs. lateral interpretation II

WHY ?

i.e. why are alternation sites vocalised ?

classical arboreal

- a. because they occur before a Coda.

lateral

because they escape Government.

Cf. (12): the following Nucleus is empty itself and therefore binds the governing power of the next available full vowel. Recall that only phonetically expressed Nuclei are good governors.

(15) \implies lateralisation of causality

arborescence plays no role in the causal chain:

vocalisation of alternation sites is not due to the fact that the Nucleus in question cohabitates with a consonant in its Rhyme. Rather, it depends on whether or not it contracts a lateral relation with its following peer.

V. The Coda Mirror: extension of Government and Licensing to consonants

(16) what you need in order to run the Coda Mirror (Ségéral & Scheer 2001)

- a. Government (nothing new)
 1. only phonetically expressed Nuclei can govern
 2. inhibits the segmental expression of the target
 3. empty Nuclei require Government
(vowel-zero alternations do not represent empty Nuclei: the melody of the alternating vowel is recorded in the lexicon)
- b. Licensing (new)
 1. as Government: only phonetically expressed Nuclei can license
 2. backs up the segmental expression of the target
- c. # = CV
the phonological identity of the "beginning of the word" is an empty CV unit.
[Lowenstamm 1999, Scheer 1998, 1999, forth, Ségéral & Scheer 2001]
 1. using "#", "+" and other diacritics in phonology is nothing more than a graphic translation of "I know that morphology plays a role in phonology, and I can tell which effect it has, but I don't know about its phonological identity, nor how it is translated from higher levels into phonology."
 2. syntax manipulates syntactic objects, morphology manipulates morphological objects, but phonology manipulates phonological objects and diacritics. That must be wrong. As other modules, phonology can only interpret objects of its own world.
We don't have "#"s etc. in our brains. "#" is not any different from pink panthers, bananas, potatoes etc.

(17) the Coda Mirror disjunction {C,#}__ - a nightmare for regular syllable structure

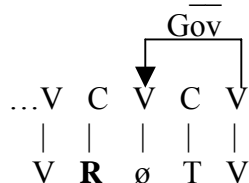
- a. how was the Coda disjunction __{C,#} reduced to a non-disjunctive statement? By (re)introducing a new syllabic constituent, i.e. the Coda.
- b. the same cannot be done with the Coda Mirror disjunction {C,#}__. It blows up regular syllable structure: ordinary syllabic constituents (Onset, Rhyme, Nucleus, Coda) cannot describe {C,#}__ as a
 - 1) uniform and
 - 2) unique
 phonological object. This is because word-initial and post-Coda consonants belong to Onsets, but so do intervocalic consonants as well. However, these are explicitly excluded from the Coda Mirror.

(18) the Coda Mirror disjunction {C,#}__ - **descriptive adequacy**

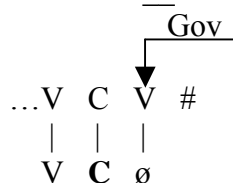
in CVCV, all three major configurations enjoy a uniform and unique description

- a. the Coda
consonants in Codas occur BEFORE governed empty Nuclei

internal Coda __.C



final Coda __#

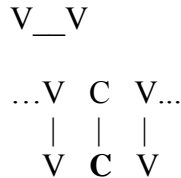


b. the Coda Mirror

consonants in the Coda Mirror occur AFTER governed empty Nuclei



c. consonants in intervocalic position are not adjacent to any empty Nucleus



(19) summary: the three positions are a function of empty Nuclei

1. Coda = before a governed empty Nucleus
2. Coda Mirror = after a governed empty Nucleus
3. intervocalic = no adjacent empty Nucleus

position	usual name		situation in CVCV
a. #__V	word-initial	} Coda Mirror	= \emptyset __ after a governed empty Nucleus
b. VC.__V	post-Coda		
c. V__CV	internal Coda	} Coda	= __ \emptyset before a governed empty Nucleus
d. V__#	final Coda		
e. V__V	intervocalic		= elsewhere adjacent to no empty Nucleus

(20) recall the two requests of (6e)

any theory must not only be able to reduce the two disjunctions, but also to come up with two non-disjunctive identities that

- a. are in some way the mirror image of each other and
- b. tell why the Coda produces weakness, rather than strength, and the Coda Mirror strength, rather than weakness

(21)	structural description		segmental effect		syllabic analysis
Coda	__ {#,C}	=	weakness	=	before empty Nuclei
	vs.		vs.		vs.
Coda Mirror	{#,C}__	=	strength	=	after empty Nuclei

the first request is satisfied. Let us now look at the other.

(22) the Coda Mirror disjunction {C,#}__ - **explanatory adequacy**

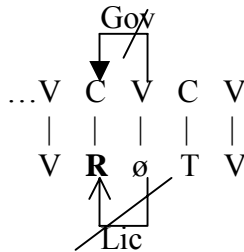
why does the Coda produce weakness and its Mirror strength, rather than the reverse?

CVCV makes the following statements that correspond to fact:

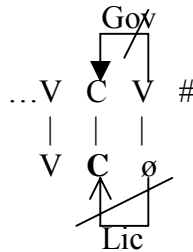
- 1) the Coda Mirror is stronger than both the Coda and V__V
- 2) the Coda and V__V are both weak, but remain different phonological objects: there are two different ways of being weak.

- a. the Coda: ungoverned and unlicensed

internal Coda __.C

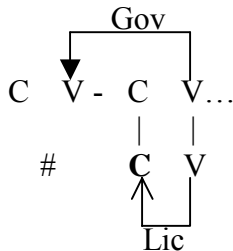


final Coda __#

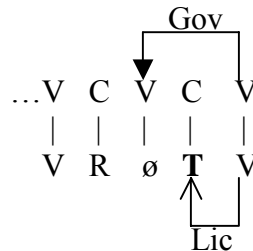


- b. the Coda Mirror: ungoverned but licensed

initial consonant #__

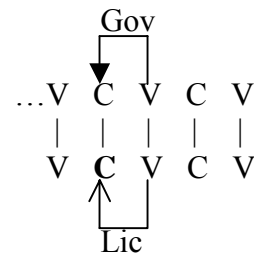


post-Coda consonant C. __



- c. intervocalic position: governed and licensed

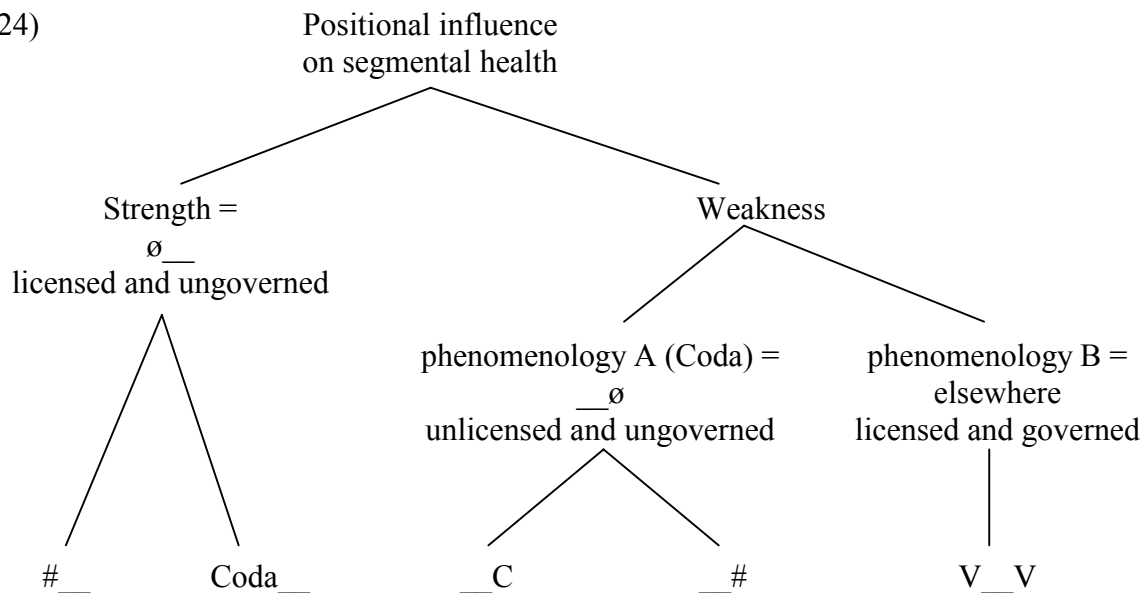
intervocalic consonant V__V



- (23) consonants in the Coda Mirror are strong because their Nucleus is called to govern the preceding empty Nucleus: they escape the spoiling effect of Government.

Licensing	Government	gloss	segmental health according to predictions
+	-	Coda Mirror	splendid
	+	V__V	unfavorable
-	-	Coda	unfavourable
	+	<i>impossible</i>	---

(24)



(25) result

- a. the second request of (6e) is satisfied as well: the Coda Mirror could no possibly be weak.
- b. at least could it not be any weaker than the Coda and V__V.
- c. the respective strength of the Coda and V__V is not immediately clear: is it more comfortable for somebody to be neither spoiled nor supported (Coda), or to be both spoiled and supported (V__V) ?
- d. in any event, the Coda and V__V must both be weak positions, but remain different phonological objects that enjoy a contrasting identity.
- e. the existence of two distinct weak positions is largely supported by fact, cf. below: "vocalic" (in V__V) vs. "consonantal lenition" (in the Coda), cf. Szigetvári (1999,2002).

(26)

process that affect a segment because
of its position in the string

devoicing
deaspiration (C ^h -->C)
velarisation (l,n-->ɭ,ŋ)
s-debuccalisation (s-->h)
liquid gliding (r,l-->j)
depalatalisation (ɲ-->n)
l-vocalisation (ɫ-->w/o)
r-vocalisation/ loss (Du [kaad] "card")
[NC] _{hom} : homorganisation of nasals
spirantisation (b,d,g-->β,ðɣ)
voicing (t-->d)
rhotacism (s,z-->r)

Coda

V__V

typical	highly improbable
typical	highly improbable
typical	highly improbable
typical	highly improbable
typical	highly improbable
typical	highly improbable
typical	highly improbable
typical	highly improbable
typical	highly improbable
less frequent	typical
highly improbable	typical
highly improbable	typical

VI. So where does this take us ?

- (27) a. to a system where structure is an "undominated referee" that does not emerge from anywhere. Structure IS, and it is a primary linguistic object. It is not the result of any computation.
You can make a photograph of it, hang it on your wall, shed light on it from different sides... it is a real object of the real world that exists all the time, not just when competition or computation is going on.
- b. The structural pressure (= the (dis)comfort) that consonants in the Coda, its Mirror and V__V experience is the same in all languages.
- c. languages may make a parameterised use of the Coda Mirror (word-initial consonants are weak, but post-Coda consonants are strong), just as only half of the Coda may react (internal Codas lenite, but final Codas do not, i.e. what is generally ascribed to the extrasyllabicity of word-final consonants).
- d. but there is no parameter on the strength scale itself: the Coda Mirror is falsified if a language is found where consonants are weaker in {C,#}__ than in either the Coda or V__V.
- e. we are also left with a system where no arboreal structure has been eliminated: syllabic trees have been replaced by lateral relations.
How could that make sense (to a syntactician)? Isn't linguistics made of hierarchically organised structure?
Consider this: syntactic and phonological representations are constructed in parallel, phonology is something very different from just narrow syntax that spells out terminal nodes (Jackendoff 1997,2002). If phonology lacks any tree-building device, a long observed core difference between syntax and phonology makes sense: there is no recursion in phonology because recursion supposes tree structure.

References

- Brandão de Carvalho, Joaquim 2002. Formally-grounded phonology: from constraint-based theories to theory-based constraints. *Studia Linguistica* **56**, 227-263.
- Charette, Monik 1991. *Conditions on Phonological Government*. Cambridge: Cambridge University Press.
- Clements, George 2001. Representational economy in constraint-based phonology. *Distinctive Feature Theory*, edited by Tracy Hall, 71-146. Berlin, New York: Mouton de Gruyter.
- Hall, Tracy 2001. Introduction: Phonological representations and phonetic implementation of distinctive features. *Distinctive Feature Theory*, edited by Tracy Hall, 1-40. Berlin, New York: 2001.
- Harris, John 1994. *English sound structure*. Oxford: Blackwell.
- Jackendoff, Ray 1997. *The Architecture of the Language Faculty*. Cambridge, Massachusetts: MIT Press.
- Jackendoff, Ray 2002. *Foundations of Language. Brain, Meaning, Grammar, Evolution*. Oxford: Oxford University Press.
- Kaye, Jonathan, Jean Lowenstamm & Jean-Roger Vergnaud 1990. Constituent structure and government in phonology. *Phonology Yearbook* **7**, 193-231.
- Lombardi, Linda (ed) 2001. *Segmental phonology in Optimality Theory. Constraints and Representations*. Cambridge: Cambridge University Press.
- Lowenstamm, Jean 1996. CV as the only syllable type. *Current trends in Phonology. Models and Methods*, edited by Jacques Durand & Bernard Laks, 419-441. Salford, Manchester: ESRI.

- Lowenstamm, Jean 1999. The beginning of the word. *Phonologica* 1996, edited by John Rennison & Klaus Kühnhammer, 153-166. La Hague: Holland Academic Graphics.
- Scheer, Tobias 1998. Governing domains are head-final. *Structure and Interpretation. Studies in Phonology*, edited by Eugeniusz Cyran, 261-285. Lublin: Folium. Downloadable at <http://www.unice.fr/dsl/tobias.htm>.
- Scheer, Tobias 1999. A theory of consonantal interaction. *Folia Linguistica* **32**, 201-237. Downloadable at <http://www.unice.fr/dsl/tobias.htm>.
- Scheer, Tobias forth. *A Syntagmatic Theory of Phonology*. Vol.1: What is CVCV, and why should it be? Vol.2: On Locality, Morphology and Phonology in Phonology. Ms, University of Nice.
- Ségéral, Philippe & Tobias Scheer 2001. La Coda-Miroir. *Bulletin de la Société de Linguistique de Paris* **96**, 107-152. Older English version downloadable at <http://www.unice.fr/dsl/tobias.htm>.
- Szigetvári, Péter 1999. VC Phonology: a theory of consonant lenition and phonotactics. Ph.D dissertation. Eötvös Loránd University, Budapest. Downloadable at <http://seas3.elte.hu/szigetva/papers.html>.
- Szigetvári, Péter 2002. Manner as a skeletal relation. Talk presented at the 9th Phonology Meeting, Vienna 1-3 November 2002.