ANTES Y DESPUÉS DEL *QUIJOTE*

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ON THE COMBINATORIAL RESOLUTIONS OF NASALITY IN MODERN SPANISH

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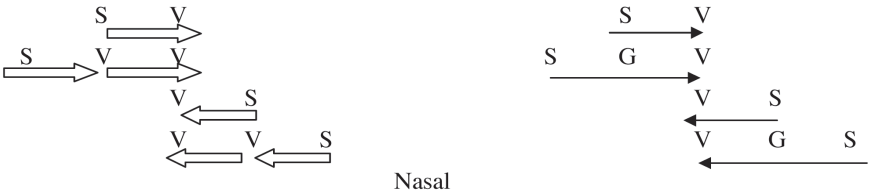
1. INTRODUCTION

One of the most important questions that current research in linguistics has to answer is how linguistic sequences are formed in the brain. I will develop here the hypothesis that combinatorial processes might be regulated by processes that integrate and stabilise the bonding of linguistic elements[1]. Different strengths of bonding could be responsible for the formation of concrete linguistic sequences. In particular I will suggest that the direction in which a distinct linguistic element is integrated may produce two different stabilisations: crucially one, called here 'interval', will be shown to trigger the formation of peripheral and non-peripheral chunks of sequencing.

Observe the following case (1) taken from Spanish:

(1) Dextro / Levo integration stabilisation

Sibilant



Nasal

If either the nasality element (N) or the sibilancy element (S) integrates rightwards with a Vowel (V) -with or without the rightwards integration of a Glide (G) co-participating in the process- then this rightward integration is stabilised allowing the vocoids (V,G) to bond together with a non-identity binding: GV. However if either S or N integrates leftwards, with the leftwards integration of G co-participating, then each behaves differently. S stabilises the sequence *seis* s[‘ejs] ‘six’, while N triggers the presence of an additional Vowel as shown in (1): *peine p*[‘ejne] ‘comb’.

Moreover the resolution of nasality integrating leftwards has two versions depending on how it stabilises: in some Spanish systems the resolution N2 will not appear in the stabilisation of N3 and viceversa. This suggests that there are two different stabilisations correlated with a levo integration.

Empirical data taken from different systems will be discussed to support the hypothesis that these processes of stabilisation whereby an increase on the sequence emerges, cannot derive from motor or sensory laws, or from the existence of a binary hierarchical template adapting sonority, but rather, I suggest, from the direction in which the element integrates with a Vocoid and from the strength with which the element can bond to it.

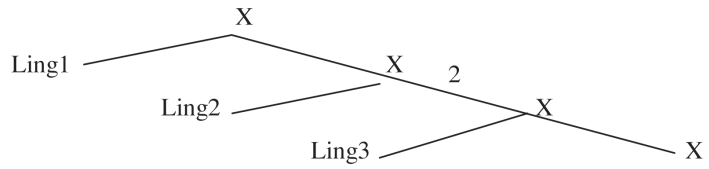
2. Structure or regulatory processes forming sequences?

One hypothesis, which I will call here ‘structuralist’, presupposes the existence of species specific binary hierarchical templates (BHTH), represented as in (2b), to which the conceptual-intentional system and the sensory-motor system have to adapt, producing language sequences (Chomsky 1965, Hauser & al. 2002).

(2) a. Structure Rule 1: X→ Ling (1,....,n) X

Structure Rule 2: X→ X Ling (1,…,n)

(2) b. Structural representation of Rule 1



(2) c. Definition

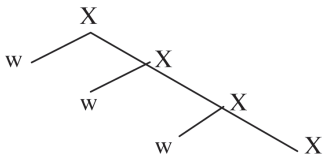
If	Ling 1	Ling 2	F	If	Ling 1	Ling2	T
Then	Ling 2	Ling 3	F	Then	Ling 2	Ling3	T

In (2), in order to articulate linguistic expressions, Ling(1,…,n), in a sequence one must count on the application of a structure rule which generates a linguistic structure, Ling1 X. This generated structure is called a 'binary structure'. The generated X in the binary structure, which is not articulated, is believed, under this approach, to be the same X which can reapply again and again (recursion) in order to create an infinite sequence of linguistic items[2].

BHTH has also been applied in the realm of phonology, to adapt 'sonority', a term given to some not well defined audibility property. X in (3) represents Strong sonority and W is Weak sonority (Liberman 1975, Liberman & Prince 1977, Kiparsky 1979).

(3) a. Structure Rule: $X \rightarrow w(1,\ldots,n)\ X$

b. Structural representation



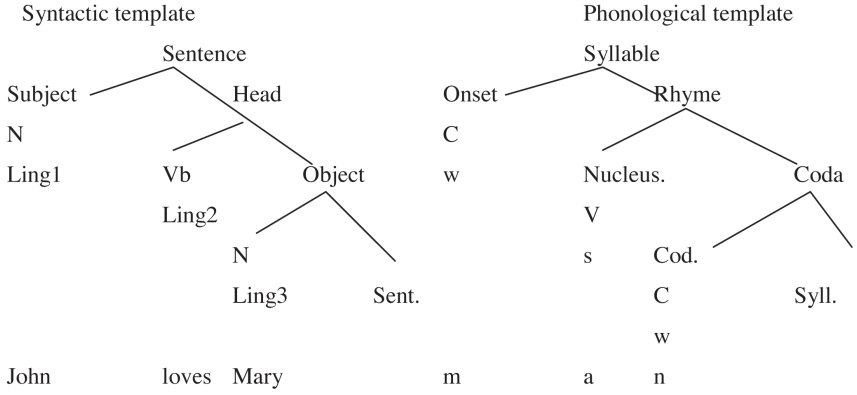
Under the BHTH, names and categories are both given to linguistic expressions and to X.[3]

(4) a. Structure rules

$X \rightarrow N\ X$ $X \rightarrow C\ X$

$X \rightarrow VbX$ $X \rightarrow V\ X$

(4) b. Template



N= Noun; Vb= Verb; V= Vowel; w=weak sonority, s=strong sonority.

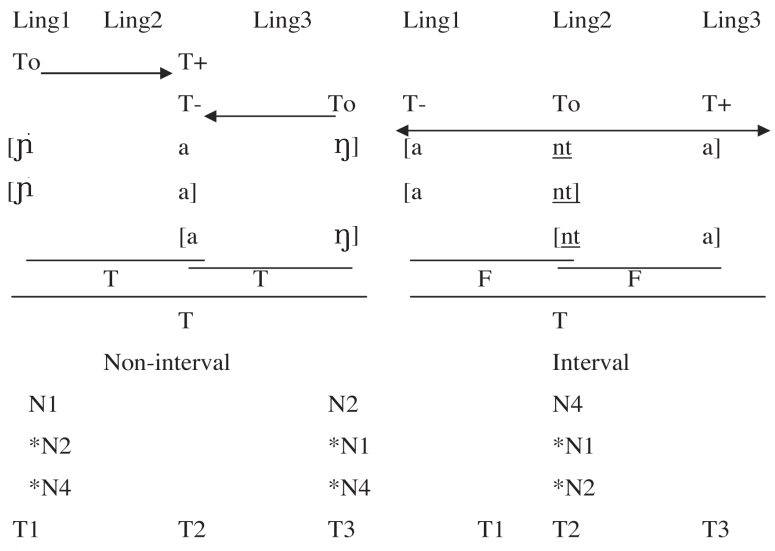
I will suggest here that empirical data taken from Spanish cannot be accounted by the BHTH[4]. Crucially, there are specific linguistic resolutions which are expressed as non-binary. I will refer to non-binary resolutions as derived from an 'interval' notion, which I define below in (5a)[5].

Ling2 is an interval iff its stabilisation with either Ling1 or Ling3, or with neither is not possible (False), yet its stabilisation with both, Ling1 and Ling3, is possible (True)[6].

(5) a. Interval definition

If	Ling1 Ling 2	F	F	T
and	Ling2 Ling3	F	T	F
and	Ling1 Ling2 Ling3	T	T	T
then	Ling2 functions as an 'interval'.			
(Non compositional well-formedness)				
If	Ling1 Ling 2	T		
and	Ling2 Ling3	T		
and	Ling1 Ling 2 Ling 3	T		
Then	Ling2 does not function as an 'interval'.			
(Compositional well-formedness)				

(5) b. Representation of the stabilisation of N1,N2,N4 in Spanish



In (5b) N is a linguistic element which stabilises non simultaneously with at least one Vowel [a] or at most a pair of them. If To stabilises, it resolves simultaneously with a complete obstruction in the vocal tract (N1,N2, N4). In Spanish, a singular N1 resolution is a palatal obstruction. This is one of two other resolutions, all of which are meaning related (9). In some Spanish systems N2 is exclusively a Back obstruction while in others it is Coronal (9). In all Spanish systems a prototypical N4 is a dependent obstruction, whose resolution is identical to that of the following non-vocoidal obstruction (10). The interval To in (5b) is a sequencing relation between ' T+' and ' T-' in imaginary Time or space. Interval To integrates with T- and T+ producing a triad effect: T1 T2 T3. This interval bonding of To with T+ and T-, stabilises as if it were one complete set or compartment. The non-interval To is a sequencing relation between either T+ or T-. This relation has a pair effect: T1T2. This pair bonding of To and T-/T+ stabilises as if it were one complete compartment. If the To relation is stabilised and resolved in a set, then this set may be expressed motorly if other levels in parallel - morphological, syntactic, semantic and pragmatic- are also stabilised and resolved. A simultaneous complex motor event of nasality with vocal tract obstruction and voicing, which is called segment, is represented here with a phonetic symbol taken from the International Phonetic Alphabet, except dentality : [t̪], and correlated with a real Time sequencing (Tn) where n is expressed with an arabic number.

Under a regulatory process hypothesis, once the To relation has been stabilised there might be no way to undo it, since this stabilisation level might be the one which triggers a motor event[7]. In a BHTH, order resolutions can be changed at will from an underlying universal template with a concrete order resolution assigned to linguistic elements, to a non-underlying language specific template, which now has either an identical or a different order. Because the template is expressing order, and because the hypothesis posits a universal template, then all deviations from the initial underlying order, have to be expressed by making these linguistic elements move from one place to another in a constructed template. This notional mechanism implies that environmental noise i.e. a motor sequence of sounds: '**John lov**es **Mary**' (an 'active' construction), is used as a non-motor sequence to form a different motor sequence '**Mary** is **lov**ed by **John**' (a 'passive' construction). This conceptualisation in the realm of phonology is equivalent to believing that the ordered phones of an utterance, as occurring in '[**m**aŋ]', can be used as phonemes to generate an utterance with a different order '[ŋa**m**]' based on human response reporting an experience of 'sameness' for both orders[8]. We cannot conclude from this response that a 'passive' sequence is constructed with an 'active utterance'. More crudely, this belief may imply that out of two environmental light waves, **L1** and **L2**, the brain uses the template of **L1**, to

generate and send back **L2** in the environment. Since the choice of template does not derive from anything independent, consequently the template for L2 could have been used equally to generate and send back L1 in the environment.

Under the SCH the level of 'utterance' is a final motor product, most likely, generated by an ultra-fast process of combination, integration, stabilisation and resolution. Under this approach, the level of combination does not have order because it is a presumptive state of combination; the level of integration initiates order relations through some orientation but is neither a stabilised nor a resolved state. The combination may be stabilised and resolved with no trace of sound (Garcia-Bellido 2000: 86-87) or with redundant sound at different levels: '**she** walk**s**'. Only when every element is integrated and stabilised can perhaps a specific resolution of a particular element take place.

The Interval To functions as an integrator which bonds non simultaneously Ling1 and Ling3. Interval bonding can co-occur with a linguistic identity binding (repetition) and non-identity binding (no repetition)[9]. This can be illustrated with the resolution of N4. There is empirical evidence to support the following generalisation for Spanish: if there is a place of articulation (PA) in a C adjacent to N, and N is adjacent to a V then, N binds with the PA of C, as shown in (6a), but not with that of C, as shown in (6b).

(6)a. Binding: forward –backward & identity stabilisation

	V	N4		C	V		
		T-	To	T+			
			? ⟶	PA: Back			
		⟵ Back					
[	a	ŋ			g	'u]*stia*	'anguish'

(6)b. Binding: Backward-forward & identity stabilisation

	V	C		N	V		
		T-	To	T+			
	PA:	Back	?				
		⟵	⟶	Back			
*[	a	g		ŋ	'o]*stico*		'agnostic'

The lack of Nasal binding in Spanish, (6b), will be discussed below under §4.

3. Linguistic nasality

The objective of this analysis is to focus on the different resolutions of nasality produced by the motor articulation of speakers. I will not discuss how the receptors of the hearing system respond to nasality present in the environment[10] I will base my data on acoustic analysis of recordings made from motor articulations of nasality (Quilis 1981 §7.2) as opposed to those made from synthesised nasality[11].

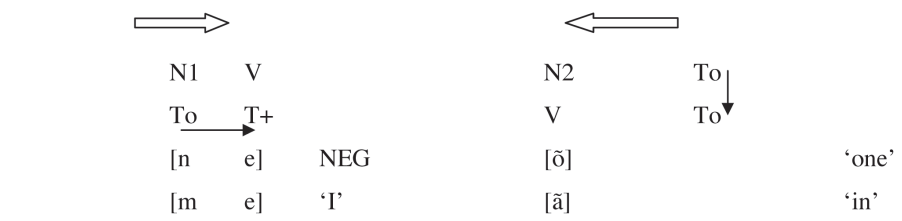
Linguistic nasality is broadly correlated, from an articulation view point, with the lowering of the velum allowing the air flow to resonate simultaneously both in the nasal cavity and in the vocal cavity (Ladefoged 1980). The degree of obstruction of the airflow in some specific region of the vocal cavity produces different nasal sounds, which range from total obstruction (nasal consonant) to partial obstruction (nasal vowel). In some languages this process is functionally asymmetrical. In French if N is integrated with dextro integration, (7a), it stabilises non-simultaneously with a V. It also stabilises simultaneously with a PA which resolves with a particular obstruction N1: labial: [me] 'me', coronal [ne] 'no' correlating with meaning resolution. Crucially, the velum is raised for the articulation of the following V. If N has a levo integration, (7b), then the stabilisation is simultaneous with that of the PA of a V, N2, (7bi). Therefore N2 will have as many different nasal sounds as different vowels it stabilises with. If N has a levo integration, it stabilises non- simultaneously with a preceding V if it can also stabilise as an interval, non simultaneously, with another vowel (7bii). This levo integration, with interval stabilisation, stabilises simultaneously N with a PA, N3, which is exclusively resolved with a coronal value [n].

(7) French N:

a. Dextro integration, non -simultaneous stabilisation

b. Levo integration, i) simultaneous stabilisation or

ii) Non-simultaneous interval



Meilleu[R] [n 'o] *ce* 'better wedding' *t* [õ f] *rère* 'your brother'

**meilleu*[R õ] ce **t*[o n] *frère*

b. ii). If levo N, then N3

V	N3	V	
T-	To	T+	
[o	n	a]	'One has'
*[o	m	a]	

La [n'o] *ce* **la* ['õ] *ce* 'the wedding' *t*[o n a]*mi* 'your friend'

[no]*ce* *[õ]*ce*

Dextro N in French is rigid and stabilises with different places of articulation depending on the meaning, not on the phonological context. Levo N shows plasticity, since it stabilises differently according to the phonological context (Marcus 2004:203).

French is therefore a good example to see how an element which has a simple presumptive combination i.e to combine with a Place of articulation, (8), has at least two different integrations and three different stabilisations. 'your' has two stabilisations neither of which mean something different. From the fact that there are two forms N2, N3 with the same meaning, we cannot conclude, under our approach, that N moves from the Nucleus to the Onset in the same way that we cannot conclude that N moves from the Coda to the Nucleus. If it had moved from the Nucleus to the Onset there is no explanation for why it does not take then all the values of N1. If it had moved from the Coda to the Nucleus, there is no evidence that it had been ever expressed in the Coda. So a BHTH is flawed.

(7) Presumptive combination in phonology and logic

Phonology: N(PA) Logic: Predicate (Argument)

The presumptive combination of N is to combine with some oral obstruction N (PA), in the same way Predication in logic has a presumptive combination which is to predicate about an Argument, but how this combination will integrate, stabilise or resolve depends on the interaction of many levels for which we have very little understanding (Edelman & Tononi 2001).

4. Nasal distribution in Spanish

Spanish has six distinct sets of nasal resolutions: One initial, one final and four medial.

(9) Spanish Nasal Consonant distribution

Initial		Medial		Final	
N1		N3		N2	
{Lab, Cor, Pal}		{Cor}		{Cor} Cast. {Back} Carib.	
*{Back, Dent}		*{Pal, Lab, Back, Dent}		*{Pal, Lab, Dent}	
C V		V C V		V C	
[m'o]*no*	'chimp'	*p*['an+e]*s*	Carib. Cast.	*p*['an]	Castilian
[n'o]*mo*	'gnome'	**p*['aŋ+e]*s*	Carib. Cast	p['aŋ]	Caribbean
[ŋ'oŋo]	'reserved'	'bread+s'		'bread'	

All Spanish N systems have three types of resolution in medial context depending on whether N is followed by a N, (10a), by a Liquid (10c) or a C (10b)[12].

(10) Medial Binding of PA

a. Non-identity between Ns

N5

{'Cor, 'Lab}

*{'Dent, 'Pal, 'Back}

V N'$_j$ N$_i$ V

?

'Cor Lab

[e n m j'e]*nda*

*[e 'Lab Lab j'e]*enda* Cast.

*[e 'Cor Cor j'e]*enda* Carib.

'amendment'

b. Identity between Cs

N4

{Dent', Lab', Cor', Pal', Back'}

V N$_{i'}$ C$_i$ V

?

Dent' Dent

['a n t e]*s*

*['a Cor Dent e]*s*

*['a Back Dent e]*s*.

' before'

(10)a				(10b)				
	‘Lab	Cor				Dent’	Dent	
[a	m	n	i]*stia*	N4	[‘a	n	t	a]*pado*
*[a	cor	Cor	i]*stia*	N2	[‘a	n	t	a]*pado* Cast.
*[a	Lab	Lab	i]*stia*	N2	[‘a	ŋ	t	a]*pado* Carib.
	‘amnesty’					‘have+ III pl		covered’

(10) c. Non identity between N +Li :NEG+ Adjective

N6

*{Cor, Lab, Dent, Pal, Back}

N Li

?

V		Li	V	V	N3	V
[i	l	e]gal		[i	n	a]ceptable
‘illegal’					‘unacceptable’	
[i	r	e]al				
‘unreal’						

Non-identity binding between Ns, ‘PA, and between N and Liquids operates exclusively in a minimal syntactic unit (Su) or utterance, while identity binding between Cs, PA’, operates in a minimal Su and if one Su combines with another unit. The PA of N4 may resolve as a dental nasal, [n̲]. This nasal sound is never present in any of the other contexts, suggesting that N4 is a different stabilisation from N1, N2, N3, N5, N6.

Medial N6 functions as neither Initial nor Final since it is a resolution which is neither of N1, Pal, nor of N2. Back nor of N3 Cor. Nor of N5 Cor or Lab. This suggests that N6 is a different stabilisation from the others.

Medial N3 functions as neither Initial nor Final. N3 excludes the resolution of N2 in Caribbean, only allows for one resolution out of the three possible ones for N1 which is not the prototypical Pal, excludes the Dental resolution of N4 and the Labial resolution of N5 and the resolution of N6. This suggests that N3 is a different stabilisation from the others.

5. Stabilising mirror image integration in Spanish

The BHTH states that a template has a head which is more sonorous than its margins. The margins are assumed to form a pre-nuclear increasing sonority (1,…,n) and a post-nuclear decreasing sonority (1,…,n) (Spanish: Harris 1981). All languages have a universal sonority hierarchy (11a). The generation of this ideal template is therefore:

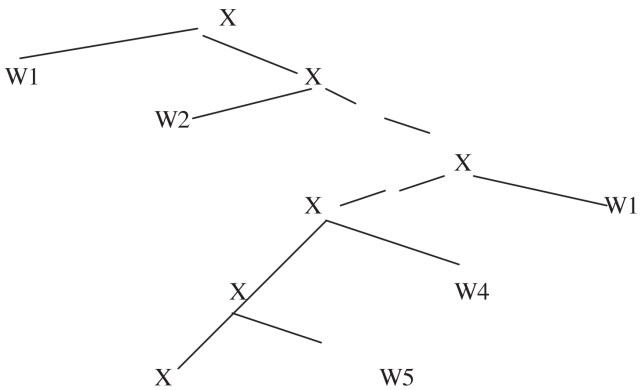
(11) a. Hierarchy of sonority:

\+ ——————————————————————————— -

V	G	Liquids (Lateral & Rhotic)	Nasal	Fricative	Stop
V:6	G:5	Li:4	N:3	S:2	P:1

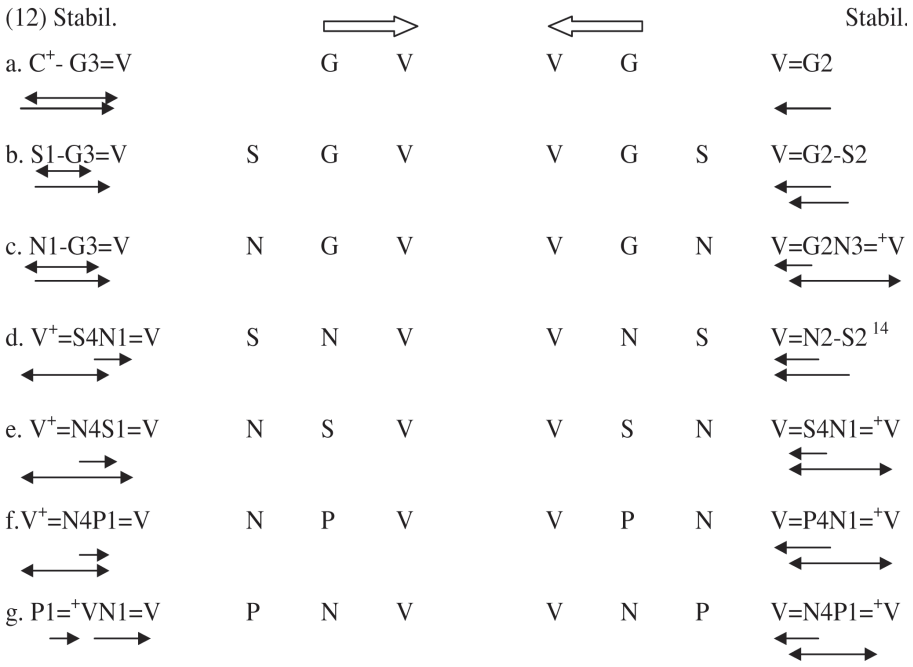
(11) b..Rules: X→ W (increasing sonority 1,…,5) X

X→ X W(decreasing sonority 5,…,1)



P	S	N	L	G		G	L	N	S	P
1	2	3	4	5	6	5	4	3	2	1

Asymmetrical stabilisations found in Spanish are evidence that a structuralist notion is flawed[13].



Firstly, the BHTH predicts that G V is a template (12a). This is empirically unattested. Dextro G stabilises as an interval with a leftwards C^+ increase in the sequence but not levo G: [‘oj]: ‘today’. C^+ is found in pronunciations of Spanish speakers trying to reproduce foreign sequences Engl.’water’[gw’o]*ter* ‘hour’ [‘agwe]*r* French: ‘oui’ [gw’i] as well as in Spanish morphological combinations *mareo mare*[g+w’e]lo ‘dizyness+Affective suffix.’ Dextro G shows how an interval stabilisation can function as sequence integrator, closing the compartment with any dextro C, or by adding one C^+. While dextro C has a weak bond (-) with V in (12a), (12b): [sj’e]*te siete* ‘seven’, (12c) [nj’e]*ve nieve* ‘snow’, dextro G in the same sequence has a strong bond (=) with V in (12a,b,c). Elements which have in Spanish a dextro integration will stabilise with the V with a weak bond (-), if dextro G stabilises with an interval (12a,b,c). Otherwise they will have a strong bond (=) with the V: N in (12d) [‘azno] *asno* ‘donkey’, S in (12e) *g*[anso] *ganso* ‘goose’, P in (12f) [‘ambo]*s ambos* ‘both’, N in (12g) [agn’o]*stico agnóstico* ‘agnostic’.

Secondly, in a BHTH the mirror image integrations in (12c) are predicted to adapt to the template, yet one of them does not. Levo N does not function like S. While levo S stabilises with the V with a weak bond, ‘stretching’ over

another levo element: *y*['ens] 'Yen+pl' (12d) , levo N or P cannot stabilise with a weak bond over a levo element to close the compartment (12c,e,f). The plasticity of the system stabilises this presumptive levo integration of N or P, (presumt-levo), as an interval which increases the sequence rightwards: $^{+}$V. An inter-vocalic interval N3 in (12c) is expressed phonologically as the one in medial (9).

Thirdly, in a BHTH the mirror image integrations in (12d) are both predicted to adapt to the template, yet this prediction is not borne out in the case of dextro N and S. Dextro S can stabilise over a dextro element if it can have a weak bonding with V. This weak bonding is possible if there is an interval G. In (12d) G's interval is not present yet the plasticity of the system stabilises presumt-dextro S as an interval increasing the sequence leftwards V^{+}. This V^{+} is attested by contrasting: hem[isf'e]rio 'hemisphere' with [esf'e]ra *[sfe]ra *[sefe]ra 'Sphere'. This V^{+} can be compared against the stabilisation of the dextro integration of P by observing its behaviour in acronyms: PSOE [pes'o]*e* *[eps'o]*e*, PNN [pen'e]*ne* *[epn'e]*ne* (Garcia-Bellido 2004:364). Here dextro P, like dextro S, can only have a weak bond with V if there is an interval G [pj'e] 'foot'. P develops a rightward additional chunk $^{+}$V in the sequence while S and N do it in the other direction. This shows that presumt-dextro P with dextro N does not trigger an interval in its stabilisation. Yet the BHTH predicts wrongly that PNV should adapt to one template not two.

BHTH also fails to predict the conditions under which N binding is activated in Spanish.

First, presumt-levo N or P does not bind with a levo element even if there is an interval:VPN1V *VPN4V (6b), *VGN4V, *VGP4V, *VSN4V, *VPN4V, *VNP4V. This presumt-levo N if stabilised, resolves as a N1 or N3.

Secondly, presumt-dextro S or N binds with a dextro element if there is an interval: PA binding VN4PV (12f), (6a); Voicing binding in Castilian: VS4N1V *a*[zn]*o* 'donkey'. Presumt-dextro P, (12g), does not form interval, since PV and NV are both true.

Thirdly, a levo element binds with a presumt-levo element if there is an interval: (12d) *VN4S2, (12f) VP4N1V Voicing binding:[edno]*logía etnología* 'ethnology'; VN4P1V (12g),. VP4P1V: Voiceless binding *a*[tki]*rir adquirir* 'acquire'.

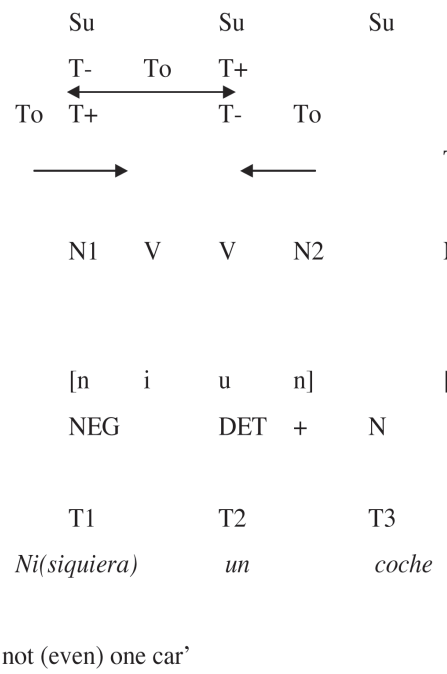
Fourthly, a dextro element does not bind with a presumt-dextro element *VSN4V (12d).

More research is needed to understand how bonding, interval and binding effects emerge from the brain.

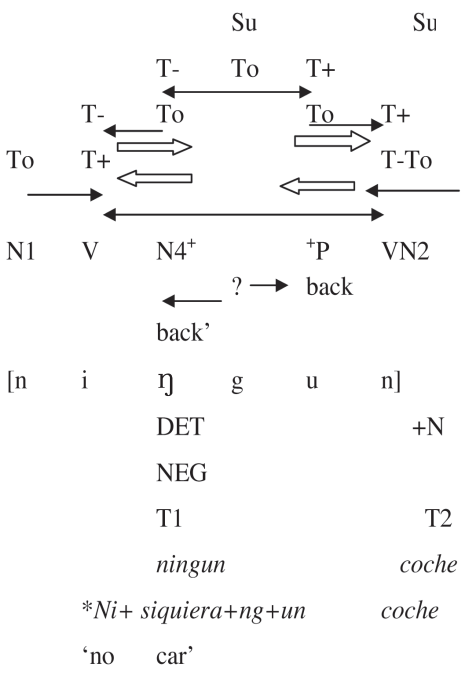
6. Intervals as noisy integrators

Observe the following data where a presumt-dextro N (copy of N in NEG?) binds with a Dextro P or a Levo N (copy of N in DET?) binds with a presumt-levo P:

(13) a. Syntactic Silent interval



b. Morphological Noisy interval



In (13) negation (NEG) modifies a Noun. In (13a) both negation and the determiner (DET) are sequenced as syntactic units (Su) preceding the Noun. The Vs are phonologically bonded with a silent intervocalic interval. NEG in (13b) takes a non simultaneous stabilisation when integrating with DET in one Su. The regulatory process which integrates NEG and DET in a compressed bond (Garcai-Bellido 2005b), uses levo and dextro integrations to create an intervocalic interval. The presumt-dextro N stabilises with an interval resolution N4 where binding operates (12f,). Neither *[Ngu] nor *[iNg] are compartments in the Spanish phonology yet [iNgu] is a possible phonological compartment making (13b) have a non-peripheral phonological interval.

7. Conclusion

It has been shown that combinatorial resolutions of N in Spanish or French cannot be explained by the BHTH. It has been suggested that N functions as a presumptive Predicate which combines with a PA argument. The combination of this Predicate is regulated to be integrated in different directions producing two main types of stabilisation. A regulatory process which stabilises intervals has been shown to trigger the formation of peripheral (12a,b,c,d,e,f) and non-peripheral (12g,13b) chunks of linguistic sequence.

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NOTES

[1] This hypothesis attempts to answer the question of whether linguistic sequencing derives from the activation of general perceptual regulatory mechanisms whose function is to integrate sensory information, Ramachandran & Hubbard 2001, Garcia-Bellido 2005b, or whether it derives from a species-specific novel mechanism, Hauser, Chomsky & Fitch 2002. I thank comments made by the audience of the XIV AHGBI conference. All mistakes are mine.

[2] An intrinsic problem of recursion is that it does not tell us anything about how once it is activated, it is stopped. See Seuren 2004 for a critique of this model.

[3] A recursive syllable notion with ternary groupings was first introduced and explored in Garcia-Bellido 1996,1999. See Smith 1999, 2003.

[4] The template, Van der Hulst & Ritter 1999, predicts wrongly that a sequence with two identical vowels (gemination) does not exist in a syllable, because the recursive rule, generates differences in sonority in the template, thus the coda has to be less sonorous than the nucleus. It also fails to make any predictions about how templates are put together. The concept of ambisyllabicity, Khan 1976, is shown to be violated in Garcia-Bellido 2000, 2003, 2005b.

[5] 'Interval' is a general bonding notion referring to both 'stereo integration' and 'non peripheral stabilisation' used in Garcia-Bellido 2005b.

[6] A similar definition is used in Garcia-Bellido 2000, 2003 to account for the behaviour of Voiced-Palatality and Rhoticity intervals in Spanish.

[7] This approach has been called the selective combinatorial hypothesis (SCH) in Garcia-Bellido 2003, 2005a.

[8] How the brain comes to the conclusion that two different noises are the same, is a fundamental problem in perception theory. This problem does not affect our argument.

[9] Since binding has a linguistic element which is the dominant (antecedent) and another which is recessive (the variable), I will assume that there is a regulatory process which switches off the presumptive resolution of the recessive element (Marcus 2004: 59-62).

[10] Very little is known about the workings of the auditory function (Karen & Corné 2001).

[11] Data from Caribbean is taken from Canfield 1988. The author is bilingual in French and Castilian Spanish.

[12] Indexes {i,j} are used to mark identity or non-identity following the linguistic practice in syntactic analysis for anaphora and disjoint reference respectively.

[13] In Garcia-Bellido 2005b it is shown that in many languages pre-vowel and post-vowel sequencing contains vocoidal sounds, svarabhakti, which function as intervals playing a very important role in integrating consonants and therefore in sequence formation.

[14] In some dialects Levo N and S stabilise simultaneously with the copy of V (O'Neill forthcoming and Garcia-Bellido forthcoming).