Małgorzata Haładewicz-Grzelak

Ecological aspects of the beats-and-binding phonology as exemplified in a comparison of word-medial clusters in English and Spanish

Acta Neophilologica 15/1, 19-47

2013

UWM Olsztyn Acta Neophilologica, XV (1), 2013
ISSN 1509-1619

Małgorzata Haładewicz-Grzelak
Studium Języków Obcych
Politechnika Opolska

ECOLOGICAL ASPECTS OF THE BEATS-AND--BINDING PHONOLOGY AS EXEMPLIFIED IN A COMPARISON OF WORD-MEDIAL CLUSTERS IN ENGLISH AND SPANISH

Key words: ecolinguistics, Beats-and-Binding Phonology, word-medial position, English and Spanish clusters

Abbreviations

Aff	–	an affricate
B&B	–	Beats-and-Binding phonological theory
B←n	–	binding going from the 'coda' consonant to a vowel − in traditional terms, occurring in a VC structure
C	–	a consonant
CV structure	–	a sequence of a consonant plus a vowel
E.	–	English
F	–	a fricative
Fr.	–	French
G	–	a glide
L	–	a liquid
N	–	a nasal
n→B binding	–	binding going from an 'onset' consonant to a vowel, in traditional terms, occurring in a CV sequence
OSD	–	Optimal Sonority Distance
OT grammar	–	Optimality Theory grammar
POA	–	place of articulation
Pol.	–	Polish
PST	–	prototypical stress timed
RP	–	Received Pronunciation (standard British English)
S	–	a stop
Sp.	–	Spanish
SSP	–	Sonority Sequencing Principle
V	–	a vowel

Brackets

/ / − phonemic notation
[ ] − phonetic notation
{ } − morpheme notation
< > − orthographic notation

Introduction

As pointed out by Marta Bogusławska-Tafelska et al. [2010: 26],

> ecolinguistics methodology proposes creative processes to be top-down processes, where higher order phenomena generate lower order phenomena […]. Contrary to formal linguistics analyses starting from the portion of language and preoccupied with the systemic study, ecolinguistics starts from and always relates all language investigations to the essential human and environmental contexts.

Hence, all studies that reflect a top-down direction in the creative processes could essentially be located in the realm of eco-linguistics, in which the direction is from the eco-system, through the human being, and finally, towards the linguistic phenomena. This is in contrast to those schools of linguistics that start with bits of language, and where often in the course of research the speaker as such is never targeted [Bogusławska-Tafelska 2010].

While acknowledging that Natural Phonology is a self-contained and fully independent linguistic model, this paper will map some aspects of its against an ecological framework. As such, the discussion will be concerned with the ecology of Beats-and-Binding phonological theory (B&B henceforth) as developed by Katarzyna Dziubalska-Kołaczyk [e.g. 1995, 2002, 2009][1]. The empirical examples come from an analysis of sonority distances in word-medial clusters in English (E. henceforth) and Spanish (Sp. henceforth). Contrasting classical generative explanations with B&B solutions brings to light conclusions about some of the processes operating in these languages.

[1] The paper uses the canonical version of B&B, that is, with sondis. Currently, the B&B has been upgraded and elaborated [e.g. Dziubalska-Kołaczyk 2002, 2010], where sondis relations has been supplanted with NAD (net articulatory distance) and where automatic calculations are possible by means of a phonotactic calculator (as developed e.g. by Katarzyna Dziubalska-Kołaczyk with cooperation with Grzegorz Krynicki and Dawid Pietrala). However, for the thematic scope of the present analysis, the canonical version from 1995 is sufficient. See also latest Natural Development in Morphonotactics [as in e.g. Dziubalska-Kołaczyk et al. 2012]. It must be also pointed out that B&B phonology, as forming part of Natural Phonology, is basically anti-generative (see e.g. Dziubalska-Kołaczyk [1995] for a detailed motivation), which also implies its dissociation from e.g. metrical phonology. However, see, for example, recent research by Anna Marczak [e.g. 2011, 2012], where an OT and metric perspective is meta-framed, so to speak, to incorporate some of Natural Phonology aspects.

1. Sonority scale versus sonority distance

A typical example of a Sonority Sequencing Principle (SSP henceforth) study of clusters are the sonority counts performed by Guffey [2002] on the Spanish syllable structure. The traditionally accepted sonority scale is: plosives – fricatives – nasals – liquids – glides – vowels. The scale was applied in Guffey's study as follows:

> According to the sonority theory, the most sonorous segment of a syllable forms the nucleus. In both Latin and Spanish vowels are the most sonorous elements in virtually every word, therefore v e i n t e is represented as 6 1 2 4 6 1. The second 1 is preceded by 6 and then 4. The 4 cannot be part of the second syllable because it is out of order (4 6 1); that is, it is more sonorous than the 6, which is closer to the nucleus [Guffey 2002: 14].

The objective of the study was, among other things, to "test both these rules [for syllable division] and the sonority theory by dividing the selected words according to the sonority number assigned to each sound" [Guffey 2002: 13]. Since Spanish is a very special case, where practically each syllable conforms to the SSP, the procedure was relatively simple. Guffey allotted each group a proper number on the sonority scale, starting with plosives (6) and proceeding down the scale. In order to divide the words into syllables, an additional reservation had to be incorporated, namely Itô's Universal Core Syllable Condition [Itô 1988: 5 (1986), as quoted in: Guffey 2002: 14]: the sequence CV must belong to a single syllable, which equates to a re-phrasing of the Maximum Onset Principle. The exemplary sonority count values for contemporary Castilian Spanish in word-medial clusters are as follows:

(1) (a) v i e n - t o ‘wind’
6 2 1 4 6 1
(b) r o m - p e r ‘to break’
3 1 4 6 1 3

However, it seems that no other explanation or synchronic conclusion can be drawn from Guffey's study apart from the fact that the SSP is vital for the Spanish syllable when relying on the SSP – the logic here is circular.

In the B&B phonology, the phonotactic preferences are also based on the inherent sonority of sounds [Dziubalska-Kołaczyk 2002: 114]:

plosives affricates fricatives nasals liquids semivowels vowels

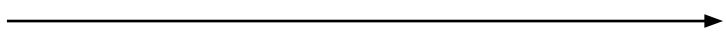


Figure 1. The sonority scale [adapted from Dziubalska- Kołaczyk 1995: 114]

However, preferences are measured according to strength-by-distance relations between segments, calculated as the respective distance among the six positions on the scale. This means that particular groups are not assigned any special, "authoritarian" value, but that what counts is the respective distance

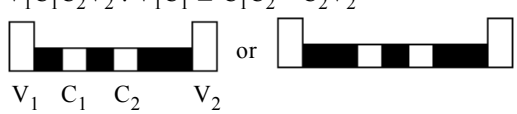
between their members. Accordingly, the key notion in discussing Level 2 preferences is "**sondis**" – sonority distance, not the SSP.

From a functional perspective, sondis can be interpreted as a force parameter counteracting binding preferences on Level 1 (the universal preference for the CV chain). In other words, it is one of the factors contributing to the retention of clusters. Its prominence is language specific, and it is a function of the status of n→B binding in a given language. For a language such as Spanish, where n→B is particularly strong, the cluster sondis forces are not strong enough to counterbalance the binding and retain more complex clusters (e.g. *record* is pronounced /rekor/ (no /d/ here; see also epenthetic accommodation strategies, as in Spanish *pasapor**te***). Conversely, in English, the preference for CV structure in not as salient as in Spanish. In addition, B←n binding is much stronger than its Spanish correspondent, and word-final clusters can easily come into being. Hence, sondis preferences, which are universal, can sustain a much wider range of clusters in English than in Spanish.

On the other hand, not all "dispreferred clusters" can survive in English. Loans such as *gnosis* can surface fully only when both members of a cluster are supported by a binding: (E.) *agnostic*, (Sp.) *agnóstico*. Languages such as Polish (Pol. henceforth) provide examples of a situation where the ratio of the sondis forces and the binding forces is set still further in favor of the sondis. This means that the sondis cohesion factor, as well as the articulatory preferences, are high and can sustain a still larger variety of consonant clusters: (Pol.) *gnostyczny* /gno'stɪtʃnɪ/ 'gnostic', *wschód* /fsxut/ 'east'.

As can be seen, strength-by-position counts as developed in B&B seem to be more coherent than traditional sonority counts. Starting from sonority distancing, they help to formulate universal phonotactic preferences by means of the Optimal Sonority Distance Principle (OSDP or sondis henceforth). Graphic representations of particular values are provided next to each type:

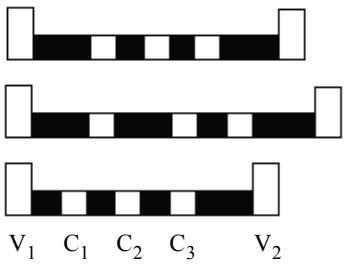
(I) $V_1C_1C_2V_2 : V_1C_1 \geq C_1C_2 < C_2V_2$



Preferred: (Sp.) *caspa*, *extranjería*, *alba*; (E.) *discomfort*, *Dinghy*, *dingy*, *jodhpurs*
Dispreferred: (Sp.) *habla*, *abra*; (E.) *hirsute*, *fibrous*

If a cluster is a dispreferred medial, nothing else usually happens except that it is traditionally parsed as initial. Dispreferred initials or finals undergo speaker- or listener-friendly alterations – lenitions or fortitions, depending on the language-specific strategy adopted.

(II) $V_1C_1C_2C_3V_2 : V_1C_1 \geq C_1C_2$ and $C_2C_3 < C_3V_2$



Preferred: (E.) *gumption*, *mandrill*, *transpire*; (Sp.) *inspirar*, *sustraer*
Dispreferred: –

Judging from the above representation, the stable parameter for medial triples seems to be the larger distance C_3V_2, i.e. maintaining a very strong n→B binding, and the small sondis between C_2C_3, which is, in fact, the reverse of initial clusters. We might venture to conclude that if these conditions were not fulfilled, the cluster might disintegrate into a preferred final plus a preferred initial under language specific conditions.

Another important point to mention is that

> [m]edial consonants of the preferred clusters tend to reduce phonostylistically (e.g. *astka→aska*, *aŋstfa→aŋsfa*), since the basic preference […] is satisfied anyway and the resulting clusters are better from the point of view of ease of articulation. *Astra* [dispreferred cluster] does not reduce, since *asra* would not constitute an improvement [Dziubalska-Kołaczyk 1995: 82].

This statement will be crucial in the discussion of various strategies for "repairing" Spanish word-medial clusters. The B&B analysis in terms of sondis seems to account for different "repair" strategies which occur. Medial doubles are a subset of medial triples, just as initial doubles are a subset of initial triples, and final doubles are a subset of final triples. Doubles (regardless of position) are less marked than triples, since they are closer to the most preferred CV sequence.

The synopsis of the main differences between the OSDP and the SSP is as follows:

– the SSP does not differentiate between "better" and "worse" clusters within the set complying with the sequencing: *tra* and *psa* or *kna* are treated equally, although within the OSDP the latter are assumed to be less stable than violators such as *sta*, or *xfa*;
– the SSP does not predict that the violators of the sequencing can be more stable than the clusters observing it;
– the SSP requires additional rules, derived from various frameworks, to explain language-specific phonotactics, while in the B&B model the behavior of the cluster does not require resorting to various parsing principles.

A very important difference between syllable theories and B&B phonotactics is that in this theory the actual shape of a sequence is the result of a language-

specific resolution of preferences on four levels: rhythmic preferences, binding preferences, sonority distance preferences and articulatory preferences:

> The preference for ease of articulation partially governs the choice of segments and thus codetermines the shape of phonotactics (together with the perceptual sonority cued preferences). So for example, too much effort in moving from one articulation to another will be avoided [Dziubalska-Kołaczyk 2002: 106].

Accordingly, lenition processes will cause a simplification of clusters to benefit the speaker, while fortitions, since they work towards the fore-grounding of the clusters, are listener-oriented.

2. Spanish word-medial doubles

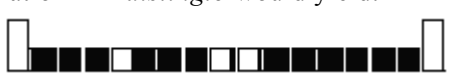
Doubles in word-internal position with the sondis disrespecting the phonotactic preferences are usually traditionally parsed according to SSP combined with the maximal onset principle. The most convenient point of departure for an analysis of Spanish medial clusters seems to be the Spanish /s/. In the word-medial position, clusters with /s/ do not entail epenthesis, being conditioned mainly by morphological boundaries: *inspirar*, *expirar*, *sustraer.* The important point to notice is that /s/ in such clusters is preceded by a consonant, not a vowel and /-ns/ does not occur word finally. This type of word could be one more counter-example for the proposed template for Spanish. Itô [1986, as quoted in: Kenstowicz 1994] has suggested collapsing three separate /e/ epenthesis rules proposed by Harris (***e****studiante*, *ab****e****rtura* and *mes****e****s*) into a right-matching template [Harris 1983]. However, since in *inspirar* there is no epenthesis, neither in *onyx* or *Felix* and optionally in *clubs*, such a template would probably require a set of additional rules to condition the instances where it does not apply. Finally, in words such as, e.g. *escultor* 'sculptor' instead of /e/ epenthesis, there is consonant deletion. It thus seems legitimate to consider word-medial preferences in the B&B model.

In words of the type *abertura*, as suggested by Harris, /r/ would become syllabic if the word was built up according to a morphological pattern: *abrir* → **abrtura*. In this case, such an explanation seems quite plausible; it does not entail mixing the concepts of acoustic and articulatory syllable, as was the case in the explanation of the proposed syllabicity of /s/ in #/sC-/ clusters. However, whether such hypothetical syllabicity would be a post-lexical or pre-lexical process, is not specified. Within B&B phonotactics, it is enough to inspect the possible resulting cluster in terms of the OSDP: */a b r t-/

The resulting cluster meets the sondis preferences for triple medials. However, /-br/ is not a preferred final cluster and neither is /rt-/ a preferred initial, and there is no way to parse the cluster to preserve the preferences. Hence, /e/ epenthesis prevents the formation of a dysfunctional cluster for this particular sondis type: *abertura*, with /-rt-/ being a preferred medial. It might be noted in passing that such a concatenation is equally disallowed in other languages where the Latinate loan is lexicalized: (E. and Fr.) *aperture*.

According to Dziubalska-Kołaczyk [1995: 82] the way of accommodating a word-medial cluster depends on the respective sondis of the cluster members and to which extent the change would amend the cluster sondis. Let us recall the quotation from Dziubalska-Kołaczyk [1995: 82]: "medial consonants of the preferred clusters tend to reduce phonostylistically (e.g. *astka→aska, aɲstfa→aɲsfa*) since the basic preference is satisfied anyway". We might extend the reasoning to posit a hypothesis that in word-medial triples the middlemost consonants is the most susceptible to deletion, since it is not supported by a binding. However, other preferences may language-specifically overrule this universal Level 1 preference. A detailed investigation of the sondis forces which may come into play in particular "repair" strategies is beyond the scope of the present work. What is important is the extent to which a given strategy will constitute an improvement for the particular cluster sondis ratio.

If we consider another Spanish medial cluster which is phonotactically repaired, we can notice the reverse strategy. For example, the verb *distinguir* 'distinguish' becomes *distinto* instead of **distingto* 'distinct'. Archangeli [1997] quotes derivations of this type as an example for positing the set of constraints for Spanish which elide the consonant in order to "repair" the medial cluster. However, the above-quoted *abrir → abertura* in fact violates the ranking of constraints, she posits, since in this derivation the winner is the form with the epenthetic vowel, not the hypothetical elided form **abtura*. Again, this testifies to the fact that OT grammar in most cases means not the language-specific ranking of constraints but the particular descriptions of constraints for each particular word. B&B phonology suggests an explanation in terms of the different sondis ratio for the two clusters in question. In contrast to [15] further on, the hypothetical concatenation in * *distingto* would yield:

[2] 

* i −3− n −3− g t −6− o

As can be seen, the ratios of the sondis for [1] and [2] are different; hence, it is quite understandable that the strategies used to repair the two concatenations could be different. The /e/ epenthesis, in this case as in **distinegto*, would again mean creating a VSSV type, which is highly dispreferred in Spanish (cf. word medial

stop fricativization). In turn, the version **distingeto* is also impossible because in Spanish vowel epenthesis is left matching.

Before starting the presentation of Spanish word-medial clusters it should be recalled that there is a certain divergence of opinion among researchers describing Spanish word-medial voice assimilation in the case of words like *isla* 'island' or *hazlo* 'do it'. Some researchers claim that the voicing is only partial [cf. Navarro 1990], but there are also elaborations assuming the fully voiced version: "Before /b/, /d/, /m/ S denotes a voiced sibilant [z] (similar to the English [z] in *zoo*), cf.: *esbelto* 'slender', *desdeñar* 'to disdain', *mismo* 'the same'" [www.orbilat.com 2003: 6; date of last access: June 2009; cf. Stockwell, Bowen 1965]. Let us conclude after Holt [p.c. 2005] that voicing in Spanish is gradient, but that it can also be total, i.e. maximum gradient. For clarity of argument, I have adopted the version that fricatives become fully voiced in the context of a voiced consonant and the resulting allophones are represented as [z], [v] and [ð]. However, it must be stressed that representations like [ʒ̬], [ѵ̬] and [θ̬] are equally possible.

According to Navarro [1990] and Nowikow [1992], in the assimilated palatalized /l/ ([ʎ]) as well as assimilated palatalized /n/ ([ɲ]) the palatalization is not complete, as is the case with the phonemic realization. For example, /l/ in *el hielo* 'ice' is not palatalized to such an extent as the phoneme /ʎ/ *llamar* 'to call', [ɲ] in *en Chile* is not palatalized as completely as /ɲ/ in *España*. However, for illustrative purposes, I decided to denote both realizations, phonemic and allophonic, with the same character.

[3] 

/-pr-/ *aprobar*, /-pl-/ *aplomo*, /-tl-/ *Atlántico*, /-tr-/ *atraer*, /-kl-/ *aclarar*, /-kr-/ *acreditar*

These clusters are, in fact, preferred initials, hence they can be parsed as such: *a·probar*. The exception is /-tl-/, which cannot be parsed as an initial due to unpropitious articulatory parameters (Harris [1983] in fact suggests parsing *atleta* as *a·tleta*). Hence, it is also parsed as medial. Voiced stops do not undergo the preference because they fricativize in such a phonotactic environment.

[4] 

/-ks-/ [ѵs] *examen*, /-(k)θ-/ *acción*, /-pθ-/ *opción*

Other examples are extremely hard to come across. In loanwords, where the two members have to be retained, the cluster can be broken: */kʃ/ → (Sp.) *rikisha* compared with (E.) *rickshaw*. In such an environment, the stops, if they do occur, tend to become lenited – /p/ is lenited even twice, since, according to Franch – Blecua

[2001], Nowikow [1992] /p/ can be realized as [β,^{β,} ø] in off-beat positions. This is usually explained by the loss of articulatory tension by consonants in off-beat position. In the B&B Phonology analysis, this fact ensues from the predominance of n→B in Spanish. As a NPBT (non prototypical beat timed) language, Spanish shows a much greater prominence of this binding compared with its prominence in English. The lenitions of consonants involved in B←n bindings are in accordance with the semiotic "rich get richer" principle: the less salient the B←n binding is, the more salient the binding n→B becomes. In English, this process is much less pronounced since English has the isochrony of a PST (prototypical stress timed) language. Similar processes occur with another Spanish large sondis span,

[5] 

V S S V

Although this is a preferred medial double sondis, such concatenation seems to be avoided in Spanish. The most productive and practically unique intact combination seems to be /-pt-/ *optar*, *voluptuoso*; /-tp-/ is practically non-existent, which may support Delattre's [1966] and Zabrocki's [1960 (1980)] findings, as well as my blueprint principle for clustering. Within the B&B phonotactics, the lack of other concatenations is explained by Level 3 articulatory preferences, as well as to mark a morpheme boundary. Potentially rich sources of combinations of voiced stops, such as /-bd-/, namely {ab-}, {sub-} prefixes, in fact, yield fricative realizations: *subcomisión* with [-βk-] or *subdelegado* [-βð-]. Similarly, in words of the type *actor*, *actividad*, /k/ is normally fricativized to [ɣ]. The double clusters with S as C_1 will always yield an overall cluster sondis of 12 measured from vowel to vowel. Within this distance, C_1 C_2 is preferred as large as possible. The meager percentage of S + F (sondis 2), S + Aff (practically nonexistent, sondis 1), and S + S (sondis 1) seems to corroborate the claim of the particular strength of n→B bindings in this language: if we recall that sondis is the force counteracting the Level 1 strength of bindings for a cluster to survive, we clearly see that a smaller sondis is not able to sustain such strength.

[6] 

V S N V

/-kn-/ *acné*, /-tm-/ *atmósfera*

This is no good medial. It occurs solely in loans. The potential source of such clusters, {sub-} as in *submarino* is realized with [-βm-], similarly to *agnóstico* [-ɣn-].

Summarizing, we may venture a conclusion that as far as Spanish double medial clusters with a C_1 = stop are concerned, such a phonotactic chain is rare in Spanish. Such clusters are represented by a fraction of combinations, of which

a considerable number are loanwords (*atmósfera*, *acne*). The stop in such cases undergoes all sorts of lenitions, which may be attributed to an enlarging OSD in the resulting cluster (diminishing V_1C_1 distance). Only a C_1C_2 distance larger than three is "safe" enough, provided C_1 is a voiceless (fortis) stop. Hence, the superiority of B&B analysis over syllable-based phonologies comes to the fore once more: traditionally, such a cluster would be split between a coda (S) and an onset (N), which would end any investigation. Analysis against sondis parameters accounts for the scarcity of such concatenation.

[7] 

This is a good final. Clusters of this type are not very frequent, since voiced stops preceding /l/ and /r/ (except /d/ preceding /l/) obligatorily undergo fricativization. Hence, practically the only combinations possible within this sondis are /-lt-, -ld-, -lk-, -rk-, -rp-, lp-/: *alto*, *aldea*, *talco*, *surcar*, *carpa*, *escalpeo.*

[8] 

/-rtʃ-/ *corchea*, /-ltʃ-/ *colchón*, *salchicha* [ldʑ]

This is, in fact, a good final: [-ldʑ-] cluster arises exclusively across words: (*el hielo* 'ice'). It must be recalled that [dʑ] in this context is an allophone of /j̯/. In other words, the process supports Dziubalska-Kołaczyk's [1995, 2002] scale for the OSD: the affricates are assigned a value greater than fricatives (most researchers assign the two groups equal sonority values). The fortitive process changes a fricative into an affricate.

[9] 

/-rθ-/ *zurcido*, *cierzo*, [-rβ-] *fervido*, /-ls-/ *falseamiento*, [-lɣ-] *colgar*, [-rð-] *nordeste*, /-lf-/ *olfato*, /-rf-/ *perfil*, /-lθ-/ *alzar*, [-lβ-] *albor*, /-rs-/ *arsénico*, /-lx-/ *aljama*, *aljibe*, /-rx-/ *perjudicar*, [-rɣ-] *alargar*

This group is quite large and variegated in Spanish. Judging by the numerous and flexible cluster members it seems to be one of the most productive medial cluster space for Spanish; this is even more so if we take into account that voiced stops clusters are "repaired" to be included in this sondis type.

[10] 

/-rl-/ *perla*, *Carlos*, /-lr-/ ([lr̄]) *alrededor*

The cluster is a preferred medial. Worth mentioning is the process of alveolar strengthening, namely, /r/ before alveolar consonants obligatorily becomes /r̄/. In terms of the alternative suggested notation: /ɾ/→ /ɾɾ/ / _ /l/, /s/, /n/. It could also be recalled that in RP such a combination is still less representative, since /r/ before a consonant is elided.

It is pertinent here to return in passing to the topic of articulatory force. According to Delattre's specifications [1966: 154], /l/ has a much superior degree of articulatory force than /r/ (2º compared with 5º for /r/). Hence, Delattre predicts that /-lr-/clusters should be more compact than /-rl-/: "but in the reverse group *r-l*, the fact is that the first consonant has the smallest articulation force contributes to separate the consonants. According to the law of the least effort, it is easier to separate the consonants than to pronounce them together" [Delattre 1966: 154]. In other words, the separation of /-rl-/ is more salient than the union of /-lr-/. The prediction is also corroborated by the fact that in rhotic dialects of English, the only permissible order for word final VLL clusters is /-rl/, as in *curl.*

[11] 

V L N V

/-lm-/ *alma*, /-ln-/ *balneario*, /-rm-/ *forma*, /-rn-/ *fornido*, /-lɲ-/ (across words) *el ñu*, possible realization with [-ʎɲ-]

[12] 

V F S V

This group comprises, among others, the lenited stops from [5]: /-sk-/ *discos*, [-βk-] *subcampeón*, /-θt-/ *hazte*, /-θk-/ *izquierda*, /-sp-/ *despachar*, /-st-/ *destino*. The /-f/ stop clusters are lacking in native vocabulary: (no syllable-final /f/): /-ft-/ *oftálmico*, [-βt-] *subterfugio*, [-βp-] *subpárrafo*, [-ɣt-] *actor*, [-zb-] *rosbif* (possible realization with the fricative allophone [β]).

As can be seen, all /s/ + stop clusters are allowed as preferred medials in Spanish, in contrast to /f/ clusters. This may be explained by articulatory preferences, alveolar being the most preferred articulatory place. Of course, the majority of allowable C_2 stops are voiceless – the voiced ones generally undergo lenitions and belong to the next category,

[13] 

V F F V

[-βð-] *subdividir*, [-βɣ-] *subgénero*, [-βs-] *subsanable*, [-βf-] *subfusil*, [-βx-] *abjurar*, /-sf-/ *esfera*, [(-ʂ*f*-) (-zð-)] *trasdós*, [(-ʂβ-) (-zβ-)] *desbordar*, /-sθ-/ *descentrado*, /-zʝ-/ *deshielo*, [-zɣ-] *desgana*, *las gambas*, /-fs-/ *offset*, [-ðx-] *adjuntar*, [-ðβ-] *adverbal*, [-ðs-] *adsorción*, [-ðʝ-] *adjacente*, [-βʝ-] *abyección*, [-vð-] *Gorbachev dice*, [-vɣ-] *Jruschef ganó*, *el áfgano*

This seems to be one of the most diversified medial sets of Spanish. The sonority distance also seems to be the most stable, since stops are lenited from sondis = 6 (vowel stop) to the fricative group. The distance is stable because the preferred C_1C_2 distance is as small as possible, and the preferences are not counteracted by articulatory preferences as may happen with other groups, for example, with C_1C_2 as nasals.

[14] 

This group also comprises the lenited stops from [7]. [-ɣn-] *agnóstico*, [-ɣm-] *pragmático*, [-ɸm-] ([-ðm-] *jazmín*, [-zm-] *esmokín*, [-zn-] *esnob*, *cisne*, [-ðm-] *admisible*, *cadmio*, [-βn-] *obnubilación*, [-ðn-] *tiznar*, [-βm-] *submarine*.
The cluster has a preferred medial sondis. In this case in particular the gradient nature of voicing should be observed: [z] and [ð] could also be realized as [ʂ] and [θ̬], respectively.

[15] 

[-ɣr-] *magrear*, [-ðr-] *adrede*, /-fl-/ *aflorar*, /-fr-/ *sufragar*, *zofra*, [-zl-] *eslavo*, [-ɣl-] *aglomeración*, [-ðl-] *hazlo*, [-βr-] *cobre*, [-βl-] *ablución*, [-zr̄-] *Israel*

The structure of this set is similar to the previous one, although it is less balanced: the distance C_1C_2 is equal to C_2V_2, where preferably it should be smaller to ensure the primacy of CV binding. Hence, the cluster qualifies better as an initial one. We should recall that the voiced stops from the previous groups are obligatorily (when allowed by articulatory preferences), relegated to this group by lenition. Hence, once more obligatory fricativization can be explained by means of the OSDP: in the case of the VSLV cluster, the group qualifies as a preferred initial.

The exclusions are /ʝ/ and /x/ as C_1 – these phonemes cannot be followed by another consonant in a cluster, although, according to Harris [1983], /xr-/ and /xl-/ are possible onset realizations but absent from the Spanish cluster inventory. We may also note here the different parsing according to the SGEL Diccionario de uso: /-sl-/ is parsed as medial and /-fl-/ as initial, which is also coherent with the regressive voicing pattern. The gradient nature of regressive voicing might be recalled once more. Moreover, some remarks are merited with respect to [-zr̄-] cluster.

Alveolar strengthening of /r/ preceding /s/ leads to a total assimilation of /s/. In other words, lexemes of the type *Israel*, *desratización* 'rodent control', *desregular* 'to deregulate' are pronounced without the fricative and with a multiple trill. The assimilation, as in the case with all Spanish assimilatory processes, proceeds irrespective of word boundaries: *puedes repetir* [pweðerrepetiɹ].

[16] 

/-nd-/ *andar*, /-nt-/ *fantástico*, [-ŋg-] *fango*, /-mb-/ *ambos*, [-ŋk-] *conque*, /-mp-/ *compunción*

This is a typical medial cluster. It should be recalled that in Spanish, unlike English, nasals in such clusters obligatorily assimilate to the articulation of the following stop, even across domains. With respect to the previous argument on the sondis of medial clusters with stops, it might be explained as the same tendency driven by the primacy of the CV over VC sequence (n→B over B←n). Recalling the argument by Delattre [1966: 155], the proximity of the place of articulation of consonants (POA) favors their union. If a nasal (C_1) tends to assimilate to the place of articulation of the following stop (C_2), which is in Spanish also an obligatory process, this means that it undergoes lenition, just like a voiced stop in such an entourage. Hence, it might be interpreted that "n" from the B←n chain is weakened to give prominence to "n" (C_2) from the n→B sequence. Additionally, articulatory preferences come into play to prevent the fricativization of, for example, the /d/ in /-nd-/.

[17] 

[-ŋx-] *zanja*, /-nθ-/ *lanzar*, /-ns-/ *considerable*, [-ɱf-] *confirmación*, *sinfín*

The situation is generally similar to the previous group: the nasal obligatorily assimilates its place of articulation to the following obstruent. Worth mentioning is also the interdental realization of /n/ in, for example, *lanzar*, and the dental realization of the /n/ in *andar*. The process of lenition can also take the reverse direction: instead of leniting /n/, the following fricative can undergo fortition to obtain the same effect. Indeed, this is the case with the cluster /nj̑/, which becomes [ɲdʑ]: e.g. *con hielo* and can be classified with the following group.

[18] 

Apart from the cluster [ɲdʑ], e.g. *en hielo*, this group comprises the cluster [ɲtʃ: *concha*, *trinchera*. [ɲ] is here a place assimilated variant of /n/ and not the phonemic realization.

[19] 

[-ɲʎ-] *conllevar*, /-nr-/ ([-nr̄-]) *sonreír*

This is a preferred medial. Since place assimilation occurs even in this configuration, the conclusion is that V_1C_1 distance is crucial in this type of cluster.

[20] 

A preferred medial like the previous groups. The assimilations are quite salient due to the proximity of articulation. Practically, both members of the cluster undergo modification; however, a complete degemination is not allowed: [-m̩m-] *conmutable*, *immune*, [-^{n}n-] *connubio*, *innegable.* Worth mentioning is articulatory preference, which is decisive in this type of clusters. Recalling Delattre [1966: 154], it should be pointed out that the direction of articulatory movement is one of the factors which determines the cohesion and survivability of the cluster. Both in *conmutable* and in *connubio*, the cluster could not survive in Spanish. /-nm-/ is articulatorily dispreferred and, as was pointed out in the previous argument, Spanish Level 3 preferences are more decisive than Level 2 sonority preferences. The /-mn-/ cluster has somewhat greater chances: although in *sonambulismo* it is assimilated even in writing, in *somnífero* /m/ can be optionally pronounced.

3. English word-medial doubles

The discussion of English medial concatenations will start, as in the case of Spanish consonants, with obstruent clusters. The point to recall here is that English obstruents in clusters do not have to agree in voicing. This might be one more argument for the primary division of English stops into fortis: lenis, not voiced: voiceless. In Spanish, such a situation does not take place: we can see obligatory regressive voicing of e.g. /s/, as in *isla*, which can even take place regardless of word boundaries, as in *pues ya esta* 'it is ready'. The lack of allophonic realizations in English can also be mentioned at this point: where Spanish obligatorily requires the allophonic realization, i.e. a fricative or a voiced allophone, as in, for example, *cobre* ([-βr-]), in English this is never the case. Neither fricativization nor voicing occur obligatorily in such phonotactic contexts. Having established these basic points, let us proceed to enumerate the medial clusters of English.

[3] VSLV
/-tr-/ *protract*, /-kr-/ *Ukrainian*, /-kl-/ *reclaim*, /-pr-/ *appraisal*, /-bl-/ *ablution*, *scribbler*, /-br-/ *abrupt*, /-dr-/ *adrenal*, /-tl-/ *atlas*, /-gl-/ *aglow*, /-pl-/ *replay*, /-dl-/ *ad lib*, *midland*, /-gr-/ *regret*

Bearing in mind the OSDP, these concatenations are dispreferred medials. Practically all combinations are possible. With a small number of exceptions, such clusters appear at word-internal morpheme boundaries.

[4] VSFV
/-pz-/ *Hepzibah*, /-ks-/ *exsect*, *exarch*, /-gz-/ *exile*, *exempt*, /-gh-/ *foghorn*, /-bh-/ *abhor*, /-ph-/ *loophole*, *sheephook*, /-kh-/ *shockheaded*, /-pʃ-/ *snapshot*, /-tf-/ *shirtfront*, /-pv-/ *grapevine*, /-bs-/ *subsection*, /-kθ-/ *pickthank*, /-kʃ-/ *fluction*, /-tʃ-/ *nutshell*, /-gʃ-/ *eggshell*, /-ps-/ *capsule*, *op. cit.*, /-pθ-/ *ophthalmology*, /-dʃ-/ *roadshow*, /-pf-/ *sheepfold*, /-bf-/ *tubful*, /-ds-/ *roadside*, /-gs-/ *jigsaw*, /-kf-/ *rockface*, /-df-/ *old-fashioned*, /-ts-/ *flotsam*, /-dh-/ *redhead*, /-pʃ-/ *sharpshooter*

This group is represented mostly by loanwords or compounds. Moreover, the pronunciation of medial <*x*> is dependent on stress placement, a fact which is not paralleled in Spanish.

[4a] 

This sondis is absent in Spanish. In English, it is represented by clusters: /-ktʃ-/ *factual*, *micturate*, /-dʤ-/ *adjoin*, /-dtʃ-/ *goodchild*, /-bʤ-/ *subject*, /-ptʃ-/ *voluptuary*, *septuagenarian*. The rest of the potential combinations seem to occur only across words: *bag chair*, *ad chain*, etc., however, there is still a relatively productive sondis.

[5] VSSV
/-bt-/ *subtitle*, /-bk-/ *subcommittee*, /-bp-/ *subplot*, /-bd-/ *subdue*, /-bb-/ *subbasement*, /-pb-/ *soapbox*, /-pd-/ *update*, /-pg-/ *scapegoat*, /-dg-/ *mudguard*, /-dd-/ *goddaughter*, /-dt-/ *soundtrack*, /-dp-/ *codpiece*, /-dk-/ *birdcage*, *vodka*, /-dp-/ *deadpan*, /-tb-/ *basketball*, /-td-/ *outdo*, /-tg-/ *shotgun*, /-tk-/ *Nat King*, /-pt-/ *reptile*, *uptown*, /-kt-/ *necktie*, /-gb-/ *drag*, *both*, /-kb-/ *backbone*, /-kd-/ *anecdote*, /-kg-/ *backgammon*, /-gp-/ *magpie*, /-gt-/ *pigtail*, /-gd-/ *begged*

It might be observed that this sondis type is highly dispreferred in Spanish, that is, both members are subject to the fricativization processes. In English, however, such concatenation seems to be very productive. This might testify to the relatively greater strength of English B←n in comparison to the one in Spanish.

[6] VSNV
/-gn-/ *agnostic*, /-gm-/ *magma*, *pragmatic*, /-tn-/ *knock-knee*, *Flecknoe*, *acne*, /-tm-/ *atmosphere*, *litmus*, /-dn-/ *Edna*, *goodness*, /-dm-/ *Edmund*, /-bn-/ *abnoxious*, /-bm-/ seems to occur across words only: *Bob may*, /-pn-/ *apnea*, /-pm-/ *deep-mouthed*, *Ripman*

Again, this type of combination is mainly seen in loanwords or across salient morpheme boundaries.

Concluding the discussion of C_1 = stop clusters, it might be noticed that the two languages differ considerably with respect to the internal organization of such clusters. The most salient difference is the freedom of obstruent grouping in English, with relatively little mutual impact. Spanish, conversely, avoids concatenations of stops, changing them into fricatives (optimizing the CV sondis).

Moreover, regressive voicing of stops occurs obligatorily in the vicinity of a voiced consonant, a process which is absent in English.

[7] VLSV
/-lb-/ *millboard*, /-ld-/ *ill-disposed*, /-lt-/ *ill-timed*, *malted*, /-ld-/ *mil-dew*, /-lk-/ *milky*, /-lg-/ *vulgar*, /-lp-/ *malpractice*

Clusters with /r/ are absent in English, since this phoneme does not occur preceding consonants in RP. Moreover, the suggestion can be forwarded here that such sondis is not particularly favored in English: most items are the result of morpheme contact.

[8] VLAffV
/-lʤ-/ *bulging*

This token seems to be the only representative of this particular sondis in English.

[9] VLFV
/-ls-/ *recalcitrant*, /-lf-/ *well-formed*, *alfa*, /-lʃ-/ *welsher*, /-lz-/ *Dalziel*, /-lh-/ *hellhound*, /-lθ-/ *Malthus*

[10] VLLV
/- lr-/ *allright*

[11] VLNV
/-lm-/ *almanach*, *helmet*, /-ln-/ *well-named*, *malnutrition*

As far as the group L + N word medially is concerned, within the coordinates of the OSDP it might be concluded that, in contrast to Spanish, in English it is not a very productive combination. The words are exclusively loanwords or compounds. In Spanish, conversely, both lexical items and compounds are found, with a considerable diversity among the constituents.

[12] VFSV
/-vp-/ *fivepence*, /-vt-/ *dovetail*, /-ft-/ *gifted*, *laughter*, /-vk-/ *dovecote*, /-fb-/ *lifeboat*, /-fg-/ *Afghan*, /-θb-/ *mothball*, /-θd-/ *birthday*, /-ðd-/ *betrothed*, /-θk-/ *death camp*, /-ðt-/ *smooth table*, /-sb-/ *baseball*, /-st-/ *establishment*, /-zd-/ *wisdom*, /-sk-/ *escalate*, /-sp-/ *espouse*, /-sd-/ *housedog*, /-sg-/ *disgust*, *disgorge*, /-ʃb-/ *wishbone*, /-zb-/ *husbandry*, *Hasbrouk*, /-zg-/ *fizgig*, /-zp-/ *hosepipe*, /-ʒk-/ *beige cap*

[13] VFFV
/-sf-/ *misfeasance*, /-fs-/ *offset*, /-ðf-/ *loathful*, /-sv-/ *Las Vegas*, /-vs-/ *lovesick*, /-ðs/ *loathsome*, /-vʃ-/ *driveshaft*, /-ʃf-/ *dishful*, /-ʃh-/ *withhold*, /-sh-/ *mishap*, /-ss-/ *misspell*, /-vf-/ *fivefold*, /-sh-/ *disharmony*, /-fθ-/ *ophthalmitis*, /-θf-/ *Bethphage*, /-sθ-/ *misthought*

[14] VFNV
/-fn-/ *deafness*, /-sn-/ *misnomer*, /-sm-/ *mismatch*, *besmear*, /-ðn-/ *breathe now*, /-ʃm-/ *fishmonger*, /-θn-/ *Bethnal*, *ethnic*, /-θm-/ *birthmark*, *ethmoid*, /-θr-/ *birthright*

The group is exclusively represented by suffixation or affixation processes, as well as by compounds.

[15] VFLV
/-sl-/ *mislay*, /-θl-/ *Bethlehem*, /-ʃr-/ *beshrew*

[15a] VFAffV 

/-sd-/ *phosgene*, *disjoin*, /-stʃ-/ *mischief*

This cluster sondis does not exist in Spanish. It is a preferred medial according to the B&B model. Comparing the specifications for English and Spanish as far as the class of C_1 = fricative is concerned, the following conclusions can be adduced. Both languages seem to favor this VC_1 sondis. However, in English, although there is apparently a greater variety of possible combinations, these are due to the relatively smaller impact on the consonants resulting from the contact: for example, in English, both /-ft-/ and /-tf-/ are possible. However, they are a result of either word-formation though compounding or borrowings. The cluster /-bd-/, as in *subdivision*, in English does not undergo many alterations, while in Spanish there is a lenition (fricativization) of both members of the cluster. Both voice-voiceless and voiceless-voiced clusters are permissible in English while in Spanish the assimilations take place even across word boundaries. No obligatory allophone has been specified for English medials thus far, while in Spanish they, in fact, occur more frequently than their stop phonemes.

[16] VNSV
/-nd-/ *endemic*, *Shandy*, /-nt-/ *dismantle*, *scanty*, /-ŋg-/ *finger*, *flamingo*, /-mb-/ *emboss*, /-mp-/ *empathy*, /-md-/ *lambda*, /-ŋb-/ *kingbird, songbird*, /-nb-/ *unbend*, /-mg-/ *Baumgarten*

[17] VNFV
/-nf-/ *spoonful*, /-ŋh-/ *wrong-headed*, /-nf-/ *unfortunate*, [-ɱv-] *conviction*, /-nv-/ *envelope*, [-ɱf-] *information*, /-ŋs-/ *songster*, /-nθ-/ *enthymene*, *capsanthin*, /-nʃ-/ *enshade*, /-ŋh-/ *Shanghai*

[18] VNAffV
/-ntʃ-/ *bunches*, /-ndʒ-/ *enjoy*

[19] VNLV
/-nl-/ *enliven*, /-nr-/ *enroll*, /-ml-/ *comely*, /-mr-/ *shamrock*, *comrade*

[20] VNNV

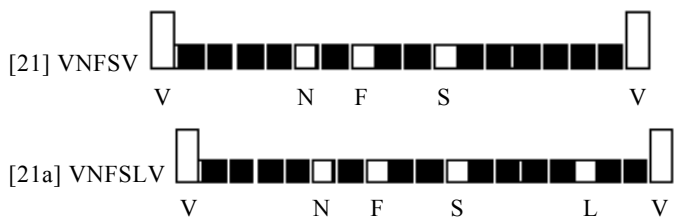
Practically nonexistent in English. It might be pertinent to observe here that Spanish does allow for some variegation within this group: [ɱm], [^{n}n] and even [nn] clusters can be pronounced. In English the sondis is resolved by almost total assimilation, which is also reflected in writing: Sp. *conmoción* versus E. *commotion*, Sp. *conmensurable* versus E. *commensurable.* The cluster is preserved when the morpheme boundary is salient /-nm-/ *inmate*.

[20a] VAff SV

This is a group nonexistent in Spanish and represented in English by sporadic compound nouns, for example: *touch-type*, *vouchsafe*. Such sondis is, however, very infrequent. The difference with Spanish ensues from the fact that in Spanish /tʃ/ is allowed only in an on-beat position, and [dz̟] as an onset fortition of /j̟/ is even more restricted. English medials also involve clusters with glides, which, as has been presented, in Spanish form part of the beat, not of the nonbeat. Since no juxtaposition is thus possible, English clusters will be left out of the discussion. It is pertinent to mention, though, that all clusters of the type VSGV, VNGV, VFGV, VLGV are dispreferred medials; in other words, they are preferred initials. The types VGSV, VGAffV (nonexistent in English), VGFV (nonexistent in English), VGNV (nonexistent in English), and VGLV (nonexistent in English) all violate the left-hand side of the OSD for medials.

4. Spanish medial triples and quadruples

One general observation with respect to Spanish clusters of this type is that they arise exclusively across morpheme boundaries. All of them respect the OSDP for triples and quadruples.



Both clusters respect the sondis for triple medials. The addition of a liquid in (a) does not prevent satisfying the basic preference. The nasal in all such clusters can be optionally deleted, which is sometimes also reflected in writing: *tra(n)sposición* 'transposition'. In terms of cluster space, it might be interpreted that the sondis type VFSV (which as we have seen is very productive is Spanish) is more preferred than the discussed triple VNFSV and tends to supplant the latter:

[21] /-(n)sp-/ *transpirar*, /-(n)sk-/ *transcurrir*, /-nst-/ *constipado*

[21a] /-nspl-/ *transplantar*, /-nskr-/ *inscribir*, /-nstr-/ *constructivismo*

It may be noticed that /-st-/ before a consonant functions without the need for epenthesis: the morphological boundary falls after {con}. This means that in /-nstr-/ type of clusters no epenthetic /e/ is permitted. For example, the empty nucleus option of Governement Phonology should yield **inescribir* instead of the realization that actually occurs: *inscribir* 'to inscribe', which is a build up of {in}

+ {scribir}. It might be argued that phonology may override morphological boundaries, but then the question arises: why does such a process not take place in, for example, *con estudiante* →**cons·tudiante*? Or why does *esferio* 'sphere' lose the prothetic /e/ in *hemisferio*, similar to the derivation *eslavo* → *yugoslavo*? Reparsing is a widespread Spanish process. The B&B phonotactics again provides an explanation by reminding us that word medially [21] and [21a] are well-balanced clusters, and hence, no need for epenthesis arises. Furthermore, the restrictions on medial clusters are less rigid than those pertaining to the word-initial position. Voiced stops, as in the case of medial doubles, are lenited to the next category,

[22] VNFFV 

The cluster is a preferred medial triple and, again, the addition of a glide does not break the preference: [-nzβ-] *transversal*, /-nsθ-/ *consciente*, /-nsf-/ *transferir*, [-nzð-] *transductor*.

[22a] 

[-nzɣr-] *transgredir*

The sondis is satisfied in this cluster.

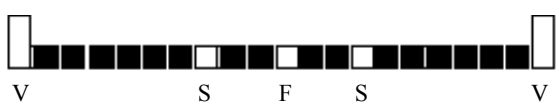
[23] VNSLV 

[-ŋkr-] *incrudencia*, [-ŋkl-] *inclusion*, [-ɱbr-] *nombradía*, *embrague*, [-ɱpl-] *complimentar*, /-ntr-/ *intríngulis*, *centrífugo*, [-ŋgr-] *engranaje*, [-ɱpr-] *impregnación*

This cluster type is a combination of both ways: NS + L or N + SL clusters. In fact, this is the first cluster where the sondis for medial triples is not satisfied on the right-hand side. Hence, this cluster type might be interpreted as the above-mentioned combination.

[24] VSFS(L)V 

/-kskl-/ *exclamar*, /-kskr-/ *excrecencia*, /-kstr-/ *extradir*, /-kspl-/ *explanar*, /-kspr-/ *exprés*

[24a] 

/-ksk-/ *excavar*, /-ksp-/ *expiar*, /-kst-/ *extender*

Both clusters respect the sondis, respectively, for quadruples and medials. The first /k/ of the cluster can be lenited – either fricatized to [ɣ] or deleted altogether. If it is deleted, [24] turns into a Spanish "canonical" medial double VFS(L)V ([13]), which is much better balanced in terms of the internal sondis ratios. The first may also be optionally lenited to the fricative, which also yield a realization much more preferred in terms of the sondis count:

[25] 

[-ɣskl-] *exclamar*, [-βstr-] *abstruso*, [-ɣspl-] *explanar*, *explanar*

[25a] 

[-βst-] *abstemio*, [-ɣst-] *extante*, [-ɣsk-] *exquisite*

The sondis is also in this cluster respected on both sides. As evidenced by the above examples, the predominant tendency in Spanish medial clusters is to fricatize the stops. With reference to general sondis specifications, the fricatization of the first stop makes the cluster more stable – it augments the preference parameter. It could be argued that these examples constitute so-called "circumstantial evidence" in that they are exclusively borrowings, but on the other hand, there are borrowings that could not survive intact in either language, such as ***pt****erodactyl*, ***ps****ychology* or *Nahuatl*, *awáca****tl***. Hence, those that remain and are still productive tell a lot about the preferences of both languages. For example, in the realization of Spanish *exigente* 'demanding', the potential VSFF cluster /-ksx-/ is broken due to articulatory preferences. The sondis as such exists in Spanish lexicon:

[26] VFFFV 

[-(ɣ)sf-] *exfoliador*, [-ɣsθ-] *excellente*

The optimal sondis is satisfied.

[27] VFSLV 

/-θkl-/ *mezcla*, /-spr-/ *desproporción*, /-spl-/ *desplazar*, /-str-/ *distraer*, /-skr-/ *descremar*, /-skl-/ *desclasado*, [-βkl-] *subclavar*

The right-hand part of the cluster has a less optimal sondis. It could be observed that clusters which are in Spanish dispreferred initially exist phonotactically as medial triples. Moreover, the only allowed English triple initials all are constituents

of that group. A tentative hypothesis might be forwarded here as far as the phonotactics of English and Spanish is concerned, namely, that the restrictions on English onsets to a large extent correspond to the restrictions on Spanish medials. In Spanish /s/ has a very special status word medially; it is the only consonant that was in traditional terms declared "extrametrical". It resists elision in larger clusters, even if it does not develop a binding. This may also solve the problem for English initial /skl-/, as in *sclerosis*. If the analogy of English word-initial /sCC-/ clusters with the Spanish word-medial /-sCC-/ can be upheld, it might be claimed that /skl-/ is an acceptable English onset cluster, although it is present only in one borrowing. The same situation is observed in /sfr-/ English cluster as in *sphragistics*. The voiced sub-constituents of fall into the next category,

[28] VFFLV

[-zɣr-] *desgraciadamente*, [-zβl-] *desbloquear*, [-zβr-] *desbrozar*, /-sfr-/ *disfraz*,

where the sondis is perfectly observed. Fricatization in this case changes the dispreferred cluster [27] into a preferred [28] in terms of the OSDP.

[29] VNFLV

[-ŋfr-] *infrarrojo*, *infraestructura*, [-ŋfl-] *inflingir*

The OSDP is satisfied in this cluster, as well. Worth noticing are the examples for the cluster [-ŋfr-]. In *infrarrojo* there is a change of spelling: *rr* instead of *r* as in *rojo*. We might compare the two environments: *está rojo* and *infrarrojo* or *pelirrojo*. In word-initial position, there is no need to stress the multiple trill pronunciation, which is denoted by the grapheme <r>. In word-medial position, in turn, the same morpheme must be signaled by the digraph <rr>. This means that this phonotactic environment is ruled by different function-conditioned preferences from the same cluster in word-initial position. As far as *infraestructura* is concerned, **infrastructura* would be quite possible and, contrary to the already presented *hemisferio*, the epenthetic /e/ is preserved in the case of this lexeme at the cost of incurring a hiatus word internally. In fact, this is an example overlooked by syllable-based phonotactics, since it can be segmented thus: *infra-* and *estructura*, both of which are correct, and nothing more can be said about the situation. The B&B explanation can proceed to the morphology-phonology interface conclusions: in *infrarrojo*, the morpheme boundary was not salient enough to suffice and support the lexical entry pronunciation; in *infraestructura*, conversely, it is salient enough to force the retention of epenthetic /e/, thus supporting the Spanish lexical entry version at the cost of the vowel contact.

[30] VLFLV 

/-lfr-/ *sulfuric*

Here it might be noticed that the left-hand side is slightly violated: the preference reads that C_1C_2 should be less than VC_1, but in this cluster these distances are equal. Partially, this might be the reason that this is the only combination allowed for this sondis, and the given example seems to be unique. However, compared with, for example, */-brt-/ combination, it can be noticed that [30] can still be parsed as L + FL, the second part being a preferred Spanish initial.

[31] VLSLV 

/-ltr-/ *faltriquera*, *peltre*

This is the strongest violating sondis among Spanish medials. Both sides of the preference are far from being satisfied. This might be the reason why the lexeme examples provided are practically the sole representatives of the lexicon undergoing the preference. It must be stressed, though, that the sondis violation is not salient enough to break the cluster. Finally, the scarcity of the lexemes representing this dispreferred sondis again testifies to the coherence of the B&B specifications for word-medial clusters.

[32] VNFNV 

/-(n)sm-/ *transmigrar*, /-(n)sn-/ *transnacional*

[33] VLFSV 

/-lst-/ *solsticio*

The basic preference for medial triples is satisfied.

The survey of Spanish medial triples and quadruples revealed the following conclusions: 16 types of clusters were singled out, no affricates participate in triples. [23] incurs a violation of the OSDP on the right-hand side. The cluster can be parsed as a preferred initial + a glide or as a preferred final + nasal at the beginning. We can contrast here the above discussed hypothetical Spanish cluster */-brt-/, which cannot be parsed this way without violating the sondis; /-brt-/ is not permitted in Spanish phonology, while, for example, /-ntr-/ is very productive.

Neither is such a concatenation admitted in other languages where the loan has been lexicalized, cf. (E.) *aperture*, (Fr.) *aperture*.

Worth mentioning is also the fact that nasals are a very peculiar category in Spanish in that they assimilate obligatorily to the following stop. Moreover, when it comes to the optional reduction of the cluster as in the type [22] and [22a], it is the nasal element that can be elided. Assimilation in this case can be perceived as a means to accommodate the dispreferred cluster. In [27], [29] the sondis for triples is slightly violated, and the consonants can be parsed as $C_1 \cdot C_2C_3$. In [31], both sides of the preference are violated; however, the second part can be parsed as an initial and no accommodation takes place.

The analysis supports the B&B model predictions as far the sondis count for medials is concerned:

– the function of the fricatization of stops in triples or quadruples is to "repair" the less preferred sondis;
– the clusters which slightly violate the OSPD (having a dispreferred sondis ratios) are represented by a slight fraction of lexemes, comparing with the optimally distanced ones;
– the optional elision of cluster members has the same function as the word-medial assimilations: the "repair" the sondis. In /-nsk-/ as in *tra(n)scurrir* 'to elapse' it is /n/ that can be elided and in /-nts-/. For example, in *Montserrat* the only possibility is to elide /t/. In the sondis type such as */-brt-/, instead of elision, vowel epenthesis applies to preserve the morphological material. In *expiación* 'expiation', it is /k/ that can optionally disappear. These processes can apply even on the careful speech level, which has no parallel in English.

5. English medial triples and quadruples

[21] VNFSV

No important differences can be discerned between the two languages within this sondis type, both in terms of types of combinations and in the exemplary lexicon, except that /ŋ/ functions contrastively in English: /-ŋst-/ *songster*, /-nst-/ *constellation*. The /n/ cannot be elided.

[21a] VNFSLV
/-nspl-/ *transplant*, /-nskr-/ *inscribe*, /-nstr-/ *construct*

[22] VNFFV
/-nsf-/ *transfer*

This consonantal concatenation appears to be the only representative of this type of sondis in English. Compared with Spanish, it is a much less frequent and less variegated type. It should be recalled that in Spanish it is one of the most favoured

sondis types. No lenition applies to other consonants to collocate them in this cluster type. Moreover, the nasal segment cannot be elided.

[23] VNSLV
/-nkr-/ *increase*, /-nkl-/ *include*, /-mpr-/ *improve*, /-mbr-/ *timbre*, /-ŋkl-/ *tinkling*, /-ngl-/ *inglobe*, /-ngr-/ *ingrain*, /-ntr-/ *central*, /-mpl-/ *imply*, /-ŋgr-/ *congress*

The sondis very similar to the Spanish correspondent, with the exception that nasal assimilation is not obligatory across domains and /ŋ/ functions both as a phoneme and as an allophone (e.g. *congress*).

[24] VSFS(L)
/-ksk-/ *Excalibur*, *excavate*, /-kskl-/ *exclaim*, /-kskr-/ *excruciate*, /-ksp-/ *expect*, /-kspl-/ *explain*, /-kspr-/ *express*, /-bstr-/ *abstract*, /-bst-/ *abstain*, /-psk-/ *sheepskin*, /-psb-/ *Sharpsburg*, /-dst-/ *toadstool*, /-pst-/ *topster*, /-tsk-/ *rathskeller*, /-bsk-/ *abscond*

Evidently there is more variegation in the English version of the cluster. It can be attributed to the fact that the C_1 = voiced stop clusters in Spanish are either relegated to the fricative group (in English the lenition in this case does not apply) or voice agreement must apply. The Spanish option of eliding or fricativizing the first stop of /-ksC-/ is equally disallowed.

[25] VFFS(L)

The type is non-existent in English word-internally.

[26] VFFFV

The type is non-existent in English. It could be noted in passing that those types are one of the most preferred in Spanish: the lenitions of other sondis types relegate the clusters to precisely those categories.

[27] VFSLV
/-str-/ *distract*, /-spl-/ *display*, /-spr-/ *mispronounce*, /-skr-/ *discredit*, /-skl-/ *disclaim*

Again, the medial set corresponds ideally to the initial group. No other fricative is allowed in this type, as opposed to Spanish, where the variegation is considerably greater.

[28] VFFLV
/-sfr-/ *disfranchise*

The only cluster allowed, to complete the alignment of allowed triple initial clusters in English. The Spanish correspondent type is much more diversified.

[29] VNFLV
/-nsl-/ *manslaughter*, *translate*, /-nfr-/ *infrared*, /-nfl-/ *inflict*, *unfledged*

[30] VLFLV

The cluster type in English can be found only across words.

[31] VLSLV
/-ltr-/ *sultr*

The situation as in the case of the Spanish correspondent type. A dispreferred type and, *ditto* the Spanish type, the lexemes are hard to encounter.

[32] VNFNV
/-nsm-/ *tinsmith*, /-nsn-/ *transnational*

The first nasal, in contrast to the Spanish version of the cluster, cannot be elided.

[33] VLFSV
/-lfk-/ *unselfconscious*, /-lst-/ *solstice*

The following types exist only in English:

[34] VNSFV 

/-nth-/ *fainthearted*

This cluster respects the sondis for medials, although the left-hand side incurs a slight violation.

[35] VLFFV 

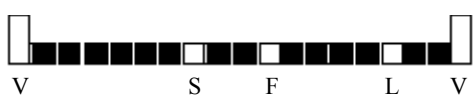
/-lsh-/ *falsehood*

The sondis is slightly violated on the left-hand side, hence it can be parsed as VLF·FV.

[36] VSSLV 

/-btr-/ *subtract*, /-bpl-/ *subplot*

The sondis is violated on the right-hand side, hence the cluster can be parsed as VS·SLV.

[37] VSFLV 

/-dfl-/ *toadflax*

[38] VNSSLV 

/-ntbl-/ *pointblank*

The right hand side is slightly dispreferred.

[39] VLSFV 

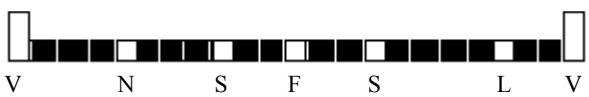
/-ltf-/ *volte-face*

The cluster has a dispreferred left-hand side – it is in fact a preferred double final; hence, the cluster can be parsed as such: VLS·FV.

[40] VNSFNV 

/-nksm-/ *Manxman*

The cluster, since the left-hand side is a preferred final, can be parsed either as VNS·FNV or VNSF·NV.

[41] VNSFSLV 

/-mpstr-/ *sempstress*

This is the largest cluster permitted medially in English. It is very well balanced, although there are some infringements on the OSDP. C_1 is too close to a vowel with respect to the following consonant, and the SL part is a "classical" initial. "F", however, since it is equidistant with respect to both parts, can be parsed either with the former and the latter. In the first case, it will form a preferred triple final plus a preferred double initial, whilst in the latter, a preferred double final plus a preferred triple initial.

One interpolation might be of merit, which could support the blueprint principle of clustering [cf. Haładewicz-Grzelak 2006]. The largest English medial cluster is quite similar with respect to its internal constitution to one of the Polish largest finals, as in *przestępstw* ('of crime', gen. pl /'pʃɛstemstf/). The sondis for the two clusters are almost identical. The only difference is the last consonant, C_5, which is distanced from C_4 by a sondis of 4, while in the Polish version by a sondis of 2. To recall, the blueprint principle states that certain dispreferred clusters tend to occur regardless of the phonotactic position in the same sequential order. In discussing the [27] Spanish type, it was mentioned that the only English allowed initial triples are a subset of Spanish medial clusters. Moreover, the representatives of English type [27] are replicas of the initials. Here we might follow the hypothesis by stating that Polish version of the word-final cluster as in *przestępstw* is repeated in the form of English word-medial; in other words, the concatenation is a blueprint version due to level 3 preferences.

[42] VNSAff 

/-ŋktʃ-/ *tincture*, *punctual*

This is the only combination possible involving an affricate. The right-hand side, as with most nasal C_1 clusters, is slightly violated. However, the parsing in terms of the constituent sondis as VN·SAffV would be much worse phonotactically, as a very dispreferred initial SAff would arise. Hence, the most optimal parsing should be VNS·AffV.

The discussion was couched in the paradigm of Beats-and-Binding Phonology and analyzed Spanish and English word-medial clusters, both morpheme internal and intramorphemic, and in the case of some English clusters, across boundaries of word-compounds. The study was mainly qualitative, although even at this point certain quantitative regularities could be observed: the more preferred the cluster, the more possible tokens could be extracted from the dictionaries consulted. Also, the gradational nature of "preference" or "dispreferrence" could be observed, which was particularly pertinent to the study of triples and more numerous clusters: sometimes a cluster violated the canonical preference only to a certain degree, that is, on its left-hand or right-hand side, and that was evidently not enough to break the cluster. That is, the study showed the difference between clusters, such as the hypothetical */-brt-/ and /-ltr-/: both are dispreferred but to varying degree in terms of the sondis count. Hence, the first type did not pass the threshold of permissibility for Spanish and the second could be retained, although it is not productive at all.

The meta-perspective for the research implied an ecological approach. I hope to have shown that the Beats-and-Binding Phonology with full justification can be called an ecological approach to phonology. It relies on differences as perceived by the human mind, in general agreement with Baudouin de Courtenay's concept of the phoneme as a mental unit. I will thus conclude with an extended quote from Gregory Bateson, who could be considered a founder of ecological communication:

> Now let me leave evolution for a moment a consider what is the unit of mind. Let us go back to the map and the territory and ask: "What is in the territory that gets onto the map?". We know the territory does not get onto the map [...]. Now, if the territory were uniform, nothing would get onto the map except its boundaries, which at the points at which it ceases to be uniform against some larger matrix. What gets onto the map, in fact, is *difference*, be it a difference in altitude, a difference in vegetation, a difference in population structure, difference in surface or whatever. Differences are the things that get onto the map [Bateson 2000 (1972): 457].

Bibliography

Alarcos, E. (1986). *Fonología española*. Madrid, Editorial Gredos.

Bańczerowski, J. (ed.) (1980). *Ludwik Zabrocki: U podstaw struktury i rozwoju języka*. Warszawa, Państwowe Wydawnictwo Naukowe.

Bateson, G. (2000 [1972]). *Steps to an Ecology of Mind*. Chicago, University of Chicago Press.

Bogusławska-Tafelska, M., Swiderska, S., Wiśniewska, K. (2010). *The Ecolinguistics of Interpersonal Communications*. New Pathways in Linguistics, 21–37.

Delattre, P. (1964). *Comparing the Prosodic Features of English, German, Spanish and French.* International Review of Applied Linguistics in Language Teaching 1, 193–210.

Delattre, P. (1966). *Studies in French and Comparative Phonetics*. The Hague, Mouton & Co.

Dziubalska-Kołaczyk, K. (1995). *Phonology without the Syllable: A Study in the Natural Framework.* Poznań, Motivex.

Dziubalska-Kołaczyk, K. (2002). *Beats-and-Binding Phonology*. Frankfurt a. M., Peter Lang.

Dziubalska-Kołaczyk, K. (2009). *NP extension: B&B phonotactics.* Poznań Studies in Contemporary Linguistics 45(1), 55–71.

Dziubalska-Kołaczyk, K., Krynicki, G. (2007). *Phonotactic Preferences in Polish, English and German: Quantitative Perspective*. Paper presented at the 38th Poznań Linguistic Meeting, 11–14 September 2007, Gniezno, Poland.

Dziubalska-Kołaczyk, K., Jankowski, M., Wierzchoń, P. (2011). *Classification of the Lexicon of Modern Polish According to the Structure of Consonant Clusters.* In: W.-S. Lee, E. Zee (eds.). *Proceedings of the 17th International Congress of Phonetic Sciences. 17–21 August 2011, Hong Kong.* CD-ROM. Hong Kong, City University of Hong Kong, 619–622.

Dziubalska-Kołaczyk, K., Zydorowicz, P., Jankowski, M., Wierzchoń, P., Pietrala, D., Orzechowska, P. (2012). *Explaining Morphonotactics: Phonological and Morphological Constraints on Clusters*. Poster presented at the International Conference Poznan Linguistic Meeting, 8–10 September 2012, Poznań, Poland.

Guffey, K. (2002). *Spanish Syllable Structure.* New York, Oxford, University Press of America.

Haładewicz-Grzelak, M. (2006). *Dispreferred Clusters in Received Pronunciation: A Beats-and-Binding Study.* Poznań Studies in Contemporary Linguistics 42, 103–122.

Harris, J. (1969). *Spanish Phonology*. Cambridge, Massachusetts, The MIT Press.

Harris, J. (1983). *Spanish Syllable Structure and Stress in Spanish*. Cambridge, The MIT Press.

Kreidler, C.W. (1989). *The Pronunciation of English*. Oxford, Blackwell.

Ladefoged, P. (1982). *A Course in Phonetics.* San Diego, Harcourt, Brace, Jovanovich.

Marczak, A. (2011). *The Perception Based Model in the Acquisition of English Word Stress: The Case of Polish Speakers*. A talk. CML, The 13th International Conference. Corfu, Greece. September 22−29, 2011.

Marczak, A. (2012). *Learning Algorithm of Polish-English Word Stress: Phonological and Morphosyntactic Motivation*. Poster presented at The International Conference Poznań Linguistic Meeting, 8–10 September 2012, Poznań, Poland. Available on-line <http://wa.amu.edu.pl/plm/2012/files/Abstracts/PLM2012_Abstract_Marczak.pdf>, date of last access: 16th January 2013.

Navarro, T. (1990). *Manual de pronunciación española*. Madrid, Consejo Superior de Investigaciones Cientificas.

Quillis, A., Fernandez, J. (1990). *Curso de fonética y fonología española*. Madrid, Consejo Superior de Investigaciones Cientificas.

Roach, P. (2005). *English Phonetics and Phonology*. Cambridge, Cambridge University Press.

Sobkowiak, W. (1996). *English Phonetics for Poles.* Poznań, Bene Nati.

Stockwell, R.P., Donald Bowen, J. (1965). *The Sounds of English and Spanish*. Chicago, The University of Chicago Press.

Zabrocki, L. (1960). *Zagadnienia fonetyki strukturalnej.* Sesja Naukowa Komisji Filologicznej. Poznań, Polskie Towarzystwo Przyjaciół Nauk, 165–185. Reprinted in: Bańczerowski, J. (ed.) (1980). *Ludwik Zabrocki: U podstaw struktury i rozwoju języka*. Warszawa, Państwowe Wydawnictwo Naukowe, 52–74.

Other sources
Collins Cobuild English Language Dictionary (1988). London, Klett.
Dicconario de uso inglés-español. Spanish-English. (1993). Madrid, SGEL-Educación.
El Diccionario Oxford. The Oxford Spanish Dictionary. (1994). Oxford, Oxford University Press.
Jones, D. (2003). *Cambridge English Pronouncing Dictionary*. 16th edition.
Longman Dictionary of Contemporary English. (1978/1981). Bath, Longman.
Oxford English Dictionary on CD-ROM. (1992). 2nd edition. Oxford, Oxford University Press.
The Oxford-Duden Pictorial Spanish and English Dictionary. (1995). Oxford, Clarendon Press.
Wells, J.C. (1990). *Longman Pronounciation Dictionary.* Harlow, Pearson Education.

Summary

Ecological Aspects of the Beats-and-Binding Phonology as Exemplified in a Comparison of Word-Medial Clusters in English and Spanish

The paper offers a study of word-medial clusters in English and Spanish according to parameters established by Beats-and-Binding Phonology [e.g. Dziubalska-Kołaczyk 1995, 2002, 2009]. The discussion shows that a syllable-less explanation allows provides insights which are not evident in syllable-based paradigms. Clusters are evaluated and discussed in two groups: Spanish and English doubles and triples (plus more). The discussion also shows that B&B Phonology is compatible with an ecological perspective towards language study.