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DIRECT EFFECT IN BEATS-AND-BINDING PHONOLOGY

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ABSTRACT

This article offers an interpretation of the theory of Direct Interface (e.g. Scheer 2005, 2006, 2008) in Beats-and-Binding Phonology (a syllable-less model developed by Dziubalska-Kołaczyk 1995, 2002, 2007, *inter alia*). The discussion aims to show that a Beats-and-binding analysis meets the criteria of Direct Interface; for example, it can remove the diacritic status of the concept of "boundary". The theoretical analysis is supported with a case study of Spanish reparsing, where an Optimality Theory analysis is compared with a Beats-and-Binding formalization. Finally, the paper offers a Beats-and-Binding interpretation of RP English /l/ velarization and /r/ deletion, involving the positional strength of consonants as proposed in Scheer and Ségéral (2001, 2005) and known as the Coda Mirror.

KEYWORDS: Natural Phonology; Direct Interface; parameterization of preferences; Beats-and-Binding Phonology.

0. Introduction

The main research question to be addressed in this paper is the compatibility of Beats-and-Binding Phonology (henceforth B&B, the theory developed by Dziubalska-Kołaczyk, e.g. 1995, 2002, 2007) with the stipulations of the Direct Effect (Direct Interface) as proposed by Scheer (e.g. 2005, 2006, 2008).[1] I follow these schol-

[1] This article originated as a follow-up of the presentations on interface dualism during the Poznań Linguistic Meetings (PLM2005, PLM2006; http://ifa.amu.edu.pl/plm) and classes at the summer school of generative grammar (EGG 2006, Olomouc; http://www.egg.auf.net).

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ars in assuming that boundaries and prosodic domains are unwarranted.[2] The discussion will be empirically substantiated by the analysis of the reparsing (resyllabification) phenomenon in Castilian Spanish and the formalization of /l/ velarization and /r/ deletion in RP English. The suggested Beats-and-Binding (B&B henceforth) interpretation will be contrasted with an Optimality Theoretic (OT henceforth) account. The purpose of such a juxtaposition is to bring out an epistemological divergence between the two phonological schools[3] and to put to life Scheer's theory. To recall, Direct Effect was intended as a means to compare particular phonological schools with respect to their behavior at the interface.

The argument posits phonology as a space which is shaped by the language-specific parameterization of the preferences which are leveled according to B&B tenets. The resulting "shape", or a calculational image of this space, is a sort of a mould that gives form to any string of segments that are submitted to it (cf. also Scheer 2006: 106). I submit that by investigating the parameters of this space, we can to some extent predict the possibility of the Translator's Office (TO henceforth) intervention (e.g. at boundaries).

A caveat is merited at this point. Both Dziubalska-Kołaczyk's paradigm of B&B and Scheer's Direct Interface theory are constantly being upgraded and updated. For example, there has been a change in attitude: the TO is the classical device of modular interface theories; hence, the TO cannot be a module since it can see into other modules. Classically, the lexicon does this for morphemic morpho-syntactic information upon lexical insertion, while the TO does it for non-morphemic information:

> according to work by Ray Jackendoff (1992, 1997, 2001) and Michal Starke, syntax, semantics and morphology on one hand and phonology on the other hand constitute two (or even three) separate worlds whose communication is not top-down. The different modules can talk to each other only via lexical access (correspondence rules in Jackendoff's vocabulary): they send and receive postcards.
>
> (Scheer 2004: xxxix)

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[2] For a discussion on why the syllable is unwarranted and why non-isomorphism is a mirage created by the analysis, and why Direct Interface is a good thing to have, cf. e.g. Dziubalska-Kołaczyk (1995, 2002) and Scheer (2005, 2007b, 2008), respectively.

[3] I am aware of the fact that including OT might be viewed as inappropriate and superfluous by some readers. As an anonymous reviewer points out, if the criterion of American phonology were to be taken as decisive, then one might also contrast the main ideas of the paper with approaches embracing e.g. ordered rules (as exposed in e.g. Vaux and Nevins 2008). Nevertheless, it cannot be denied that OT has been bourgeoning in contemporary phonological research for the past two decades (cf. Archangeli 2007). What is more important, the ease of devising subsequent constraints has not been matched by attempts at clarifying some problematic issues immanent in the theoretic underpinnings of OT (cf. also Scheer 2006: 78). Since the main thrust of the paper is investigating the epistemological strength of phonological theories, I felt justified in putting forth a discussion on the value of phonological formalizations in terms of constraints.

Translation can be thus understood as intermodular communication (cf. Scheer 2007c).

With regard to the diacritic status of phonological objects, the article evaluates the ontology of boundaries in B&B phonology. The analysis shows that boundaries in the B&B model are not a diacritic. They naturally ensue from the theoretical framework of the theory: a traditional boundary (an extra-phonological being denoted by "#") or a domain (an extra-phonological being reflected in the prosodic hierarchy) in B&B can be conceptualized as the lack of binding enforced by morpho-syntactic intervention. In other words, the lack of binding inside a morpheme may not create an environment for morpho-syntactic intervention but when it is coupled with the TO order, such an intervention is possible and it surfaces as the so-called "boundary".

Finally, I will attempt to show how the Coda Mirror (e.g. Scheer and Ségéral 2001, 2005) can be formalized in B&B. The analysis aims to show that only the intrinsic phonological entities of B&B (bindings, beats and the levels of preferences) can be used to account for phonological processes. Thus, it follows, B&B phonology, in congruence with the criteria of Direct Interface, can make predictions and it is able to provide an explanation without having recourse to quasi-phonological entities, such as prosodic structure or boundaries.

Scheer's ideas are cast within a specific variety of Government Phonology (GP henceforth): CVCV (Lowenstramm 1996), in particular the development of Lowenstramm's idea assuming that governing relations are head final. Briefly speaking, CVCV interprets syllable-based generalizations to be the consequence of lateral relations holding among segments. As a result, the resulting structure is entirely flat and only one syllable type is recognized, namely a non-branching onset followed by a non-branching nucleus (CV). As pointed out by Bendjaballah (2000: 187, the same reference for a more detailed exposition of CVCV model),

> within a CVCV analysis both syllabic types, *CCV* and *CVC*, rely on the same skeletal material: two CV units [...]. In the CVCV framework, different surface syllabic structures are not necessarily analyzed as the reflex of different phonological syllabic structures. Rather, the differences observed on the surface mirror the fact that the segments are associated to the skeletal level in a different fashion.

In contrast with the traditional school of GP, the skeletal representations of hypothetical words such as e.g. *karty* and *katry* would thus be the same, the difference in the CVCV model being formalized only in terms of lateral relations. The main theoretical underpinnings as established for standard GP, e.g. the statement that "[s]egmental inventories, if relevant at all, are secondary or derivative of the syntagmatic relations found and defined over melodies and constituents" (Gussmann 2007: 45) are of course valid for CVCV as well.

The structure of the paper reflects its epistemological thrust. Section 1 synopsizes the teleological aspect of the Direct Effect and discusses the functional effect of binding. The tenets of B&B are checked against the stipulations of the Direct Effect. Section 2 shows the Direct Effect in a case study of Castilian Spanish reparsing. For illustrative purposes, an analysis of the same phenomenon from the vantage point of OT is provided (Colina 1997; Archangeli 1997). Section 3 posits B&B preferences as the parameterization of the φ-function (cf. Kaye 1997 for an introduction to the term). Admittedly, I am not able at this stage to provide any precise technical meaning to the argument enclosed in this section, however, the point to be made is that there might be a possibility to commence phonological research in the direction of fuzzy logic.[4]

In Section 4, I show how /l/ velarization, /r/ deletion and the absence of glides and /h/ in the off-beat position in RP English can be formalized as the outcome of one synchronic process. The analysis further shows the congruity of a B&B interpretation with the parameters of positional strength (Coda Mirror). The probability of TO intervention is envisaged as a function of the parameterization of phonological space. The discussion relies on well-researched examples from English and Spanish because the empirical part serves mainly as an illustration of the adopted perspective of epistemological criticism.[5]

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[4] In fact, Dyczkowski et al. (2008) offer an inspiring example of research based on fuzzy logic in phonetics. As documented mathematically by the scholars, phones can be studied as objects in n-dimensional space. The mathematical tools offered include e.g. the Hamming distance ($Dist_H$) in n-dimensional space, and Euclidean distance ($Dist_E$). The fuzzy sets are used to model the vague nature of articulatory features.

[5] Confuting one reviewer's charge about the use of philosophy adopted in this paper, I would like to cite Michálek (1995: 28): "Slovo 'filozofie' se tradičně překladá jako láska k moundrosti. My se zde pokoušíme *φιλοσοφία* přeložit s některými mysliteli jako 'přátelství s tím, co je zamyšlení'. A zároveň nezapomínáme, že je to přátelství těch, které slojuje *το σοφόν*, kteří usilují dostát jeho výzvě. Co je 'k zamyšlení'? To budeme vědět, až se otázka filozofie stane i naší otázkou. Nad čím je třeba se zamýšlet? Co vyvolává otázku a vyžaduje odpověď'? Co se nás týká a dotýká tak zsadz, že to nemem minout a pominout? To nerozhodnuté, co musíme stále rozhodovat." [The word 'philosophy' is traditionally translated as love for wisdom. Here, we will attempt to translate *φιλοσοφία*, following some thinkers, as a 'friendship with what is reflection (meditation)'. At the same time, we shall not forget that this is the friendship of those who serve *το σοφόν*, who try to make up to its appeal. What is there to be pondered? We will learn that when a philosophical question will become also our own question. What provokes a question and demands an answer? What should be meditated upon? What concerns us and concerns so vitally that it should not be neglected? That is the unresolved, which we should keep on resolving]. I take this passage to imply that the magnificent conceptual achievements of great thinkers of the past were not meant to be treated as championship trophies, which are put in the cupboard and dusted once a month. In my understanding the terms were devised for the posterity as algorithms for thinking, which are free for anybody to apply to any realm of their life and to discover the hidden logic.

1. Theoretical underpinnings

The framework for this paper is Beats-and Binding Phonology as developed by Dziubalska-Kołaczyk (e.g. 1995, 2002a, 2007).[6] It is a syllable-less phonological model, grounded in Natural Phonology. To recall briefly, in Natural Phonology language is "a natural reflection of the needs, capacities and world of its users" (Donegan and Stampe 1979: 127). Furthermore, the underlying segments "are mental representations of sounds which are, at least in principle, pronounceable" (Stampe 1979: 35). Thus, it follows, the notion of explanatory adequacy in phonology cannot be theory internal but it must be based on phonetic facts and on the nature of human communication: "if a given utterance is naturally pronounceable as the result of a certain intention, then that intention is a natural perception of the utterance" (Donegan and Stampe 1979: 163).

As an explanatory model of Natural Linguistics, B&B necessarily presupposes a functional bias (Dziubalska-Kołaczyk 2002a: 28). The model assumes two basic functions of language – the communicative and the cognitive functions, the communicative function subsuming two main functions of phonology: perceptibility and pronunciability. The main properties of functional explanation in Natural Phonology which are relevant to the thematic scope of this paper are as follows:

- Goal conflict: mainly denoting the conflict between the tendency towards the speaker's ease of articulation (lenitions) and facilitating the processing of speech by the listener (fortitions) (Dziubalska-Kołaczyk 1995: 44).
- Multifunctionality: one function can be carried on by several operations, and, conversely, one operation can serve several functions at the same time (Dziubalska-Kołaczyk 2002: 28).
- Hierarchy of functions:priority is given to the communicative and cognitive functions of a language. All other functions , such as for example, distinctivess, are subordinate to these two.
- Functional predictions have the form of preferences, i.e. "natural linguistic universals, founded on functional and semiotic principles [...] have the form of preferences, and not of absolute statements" (Dziubalska-Kołaczyk 1995: 47).
- The use of so-called external evidence on a par with internal evidence. The main areas of substantive evidence are: first and second language acquisition, sociophonology (phonostylistics), aphasia, loan word phonology and psychophonology (Dziubalska-Kołaczyk 1995: 48).

According to B&BP tenets, the smallest functional unit of phonology is the beat:

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[6] The synopsis of B&B is taken from Haładewicz-Grzelak (2008a).

> A beat is a unit rather than a measurement or device [...] and as such needs some referent in phonetic reality. It is expected to be better accessible than the mora, on one hand, and the syllable, on the other. Its functioning in phonology in relationships with other units of structure called non-beats (these relationships are called bindings) is expected to account better for the structure than the functioning of mora or syllable. [...] In Beats-and-Binding Phonology, a beat is a *regularly recurring skeletal prosodic unit of phonological representation, of a size corresponding to that of a segment* [italics in the original, MHG].
>
> (Dziubalska-Kołaczyk 2002: 86)

Rhythmic preferences are the skeleton of phonological structures (Dziubalska-Kołaczyk 2002: 100). The primary rhythm units are feet, beats being their constituents. The universal preference is a trochaic pattern consisting of two beats, the first beat being preferably strong and the second weak. The preference for a binary foot pattern can be subsumed under the universal preference for binary paradigmatic and syntagmatic contrasts (Dziubalska-Kołaczyk 2002: 89 and references therein).

A beat ("B") is realized by a phoneme traditionally occupying the slot of the "syllable nucleus". Preferentially it is a vowel, but secondarily a consonant may acquire the function of a beat; it is then marked as "N". A vowel qualifies better as a beat due to its greater saliency, based on its sonority value plus its articulatory openness. Accordingly, consonants possessing such features to a larger degree are more likely to become beats, for example [n̩] in English, /l̩/ and /r̩/ in Czech.

Beats (B) and non-beats (n) in a sequence are joined in a binary fashion by means of sonority-based bindings (Dziubalska-Kołaczyk 2002: 94). For example, in a sequence {BnB} there may be at most two bindings: a B←n binding, where a non-beat is bound to the preceding beat, plus a n→B binding, where a non-beat is bound to the following beat, i.e. {Bn+nB}. "A beat, however, may potentially stand alone while a non-beat must be bound to a beat. Thus, in the {BnB} sequence there may alternatively be one binding only, combined with a single beat, i.e. either {B+nB} or {Bn+B}" (Dziubalska-Kołaczyk 1995: 61). Language-specific preferences determine the existence of a binding in such sequences.

The two bindings differ in strength. "The n→B binding, i.e. the binding of a non-beat to the following beat (preferentially realized by a /CV/ sequence, is always stronger than the B←n binding, i.e., the binding of a non-beat to the preceding beat (preferentially realized by a /VC/ sequence" (Dziubalska-Kołaczyk 2002: 94). It must be observed, though, that the prototypicality of the n→B binding does not necessarily presuppose the prototypicality of CV syllables (cf. Dziubalska-Kołaczyk 1995, 2002 for an overview of literature on the topic). Such a strength preference is listener-friendly, i.e. it serves the function of optimization of perceptuality, since "it is generally the case that the most salient acoustic modulations in a syllable occur near the CV interface" (Ohala and Kawasaki 1984: 117, as quoted in Dziubalska-Kołaczyk 1995: 62). The prototypicality of the n→B binding is perceptually based, but even on Level 1 other processes can arise that override this function.

The B&B notations are as follows:

– "B" for a beat;
– "n" for a nonbeat;
– "N" for a consonantal beat;
– → for the binding between a nonbeat and the beat, n→B;
– ← for the binding between a beat and a nonbeat, B←n.

The B&B scenario for the structuring of phonology involves a four-layered structure (Levels 1–3). Each level subsumes a particular type of preferences which are enumerated as follows (Dziubalska-Kołaczyk 1995: 72f):

– Level 0: These preferences constitute the most general level of phonology, the level of rhythmical preferences.
– Levels 1 and 2 which are called the levels of universal perceptual preferences (Dziubalska-Kołaczyk 1995: 60f). Level 1 is the level of underlying phonological binding preferences between beats and non-beats, i.e. how the beats combine with non-beats. It determines the existence and number of bindings in CV, VC, VCV, CVC or CVCV sequences, how bindings arise and combine.
– Level 2 is the level of phonotactic preferences based on the preferred sonority distance among vowels (V) and consonants (C), i.e. where the consonantal and vowel clustering takes place.
– Level 3: the level of articulatory preferences, realized mainly by means of assimilations and reductions (Dziubalska-Kołaczyk 1995: 72).

The diverging phonotactic preferences between languages are grounded on the level of rhythmic preferences – Level 0. Since such preferences constitute the framework of phonological structure, they are of crucial importance for the phonological analysis. According to B&B, the type of isochrony obtaining in a given language conditions the binding preferences of that language. The default unmarked rhythm is foot-timing. Particular languages diverge from it either in the direction of beat-timing or stress-timing (Diubalska-Kołaczyk 2002a: 100ff).

Level 1 is the level at which the languages adopt strategies against hiatus on a language-specific basis: non-beats act against hiatus and if vowel contact is not broken by non-beats:

– B+B is reduced to one beat (short vowel) – a change of structure on Level 1, usually through synaloepha or syneresis processes, e.g. Sp. *lo odian* 'they hate it' → /ˈloðjan/;
– B+B remains a two-beat unbounded sequence (Level 1). On Level 2, however, such a cluster may be phonemically represented either by a diphthong or a long vowel (English) or simply remain as it is, allowing hiatus. This is the case occur-

ring in Spanish, when synaloepha or syneresis does not apply – no change of structure on Level 1, e.g. E *law*, Sp. *ley* 'law'.

Level 1 is also where the "heaviness" of "syllables" is determined. In phonologically conditioned stress a diphthong or a long vowel tends to attract stress, because of their double-beat phonological representation. Moreover, a beat of the type B←n may also draw in stress, which implies that "heaviness" in the B&B model is conveyed by means of beats and binding contained within a binary foot or a phonological word boundary. Both the number of beats and bindings are counted to determine the overall weight (Dziubalska-Kołaczyk 1995: 70f).

The notion of sonority in the B&B model is based on acoustic parameters, with the reservation that there is no transparent phonetic criterion for sonority ranking. This reservation is expressed in the fact that out of 4 levels of phonological structure within B&BP, on one level only (Level 2) is sonority the driving force, never acquiring the status of the Sonority Sequencing Principle, though:

> At the level of phonological bindings (Level 1) beats are uniformly more sonorous than the nonbeats. In objective terms, it is the degree of modulation in several acoustic parameters (amplitude, periodicity, spectral shape, FO, cf. Ohala 1990a) that decides whether a {nB}-binding is uniformly stronger than a {Bn} binding.
>
> (Dziubalska-Kołaczyk 1995: 64)

It can be thus understood as a "default intrinsic property of phonological segment, i.e. a property belonging to the level of intention" (Dziubalska-Kołaczyk 1995: 64).

Level 2 then is defined by the optimal sonority distances, which for a given language determines the forms in which the clustering takes place.[7]

> Phonotactics (governed by universal principles) accommodates itself language specifically to a given timing pattern. Those clusters become stable in a language which obey universal phonotactic preferences (Level 2) and thus survive due to the sonority distance between their members. They do not succumb to the overwhelming Level 1 preference for the two nonbeat-

[7] There is a further qualification that should be added to this schematic account of the B&B theory. Dziubalska-Kołaczyk et al. (2007) and Bertinetto et al. (2007) pursue the question of how universal and language specific constraints interact. The answer is sought in the degree of phonotactic complexity. Accordingly, intersegmental cohesion is defined as the degree of cohesion between adjacent segments and the optimal shape of a particular cluster is defined by referring to the Net Auditory Distance. To wit, "[t]he measure of markedness is the overall sonority, understood as a perceptual effect brought about to the ear by manner of articulation of sounds (MOA) as well as place of articulation (POA) and distance in voicing (Lx). In fact, rather than the overall sonority, it is better to refer to a net auditory distance to which all the three factors contribute (sonority, place of articulation and voicing)" (Dressler and Dziubalska-Kołaczyk 2006: 251). In this work I chose to rely on the older version (Dziubalska-Kołaczyk 2002), i.e. sondis.

> beat bindings. Thus [...] consonants do not bind (there are no interconsonantal bindings on Level 1) but they do combine into clusters on a phonotactic preferences level (Level 2) due to the sonority distance between them.
>
> (Dziubalska-Kołaczyk 1995: 73).

Level 3 is reserved for the function of ease of articulation, in other words, for speaker-friendly preferences to achieve articulatorily easy phonotactic sequences. In contrast with Level 1 and Level 2, where contrast was an underlying principle, Level 3 is driven by similarity (proximity law). The universally favored combinations are those ruled by the principle of least effort. Since speaker-friendly processes are directed at facilitating the articulation of segment sequences, Level 3 is characterized by assimilations, reductions and all the other kinds of lenitions. If registers were to be discussed, it might be claimed that casual speech evinces mainly the processes described on Level 3, while careful speech those of Levels 1 and 2. The arising conflicts between levels, i.e. hearer-friendly and speaker-friendly preferences, are resolved language-specifically by a primary tendency towards balance (Dziubalska-Kołaczyk 1995: 72f).

The Direct Effect (Scheer 2005, 2006, *inter alia*) is understood both as a procedure whereby true phonological objects make predictions in the phonology, and also as the elimination of derived concepts, e.g. of the prosodic hierarchy. The Direct Interface implies a situation when a given theory is able to formalize all the investigated phenomena using only the terminology available through the formalization of the phonological entities by a given theory. "Boundary" and "prosodic structure" are motivated to be extra-phonological beings which serve to accommodate the data but not to explain them. The crucial conceptual dyad is *local* and *diacritic*:

> boundaries are local because they define the relation between two adjacent morphemes or words. This is the fundamental property that makes them different from domains which by definition are non-local: they span a number of elements on the linear string, thereby creating labeled clusters. That is, an individual element of the string *belongs* to a domain but it cannot *belong* to a boundary.
>
> (Scheer 2008: 149)

As Scheer concludes, if you do a non-diacritic interface, your intervention is necessarily local (Scheer 2007c).

In this paper, the version of the theory which entails the introduction of the Translator's Office is used. The TO is conceptualized as a means of transmitting higher level information into phonology. Without any orders from the TO only the domestic phonological law applies on the level of phonological processing. It means that morpho-syntax does not create any phonological process but it can condition the application of pre-existing processes (Scheer 2006: 47). To familiarize the reader with the TO, parallels might be drawn here to concepts that are akin, but more

widely known. To wit, the TO does what mapping rules in prosodic phonology and alignment constraints in OT do, or what the readjustment component did in SPE (Scheer 2008: 146). "A good reason for the existence of the Translator's Office is modularity: different modules do not speak the same language (of the brain, e.g. Jackendoff 1992 et passim) and hence can communicate only through a no man's land based translation" (Scheer 2008: 146). The TO orders can apply only locally, i.e. at morpheme boundaries to adjacent elements on a phonotactic string.

According to Scheer (2008) the Translator's Office (following Starke's research, the TO being incarnated as the lexicon) was introduced in order to build a direct interface theory − without the buffer. "Buffer" implies boundaries and any prosodic constituency, either in the form of a grid or arboreal structures. "I call this output the buffer (or sponge) because it is located in the phonological module but has no phonological origin nor carries any phonological information" (Scheer 2008: 155). Using the prosodic structure, phonological processes are interpreted to make only indirect reference to morpho-syntactic information because the latter is transformed into Prosodic Hierarchy, which lies inside the phonology: "it seems to be generally supposed that morpho-syntactic boundaries are inserted by some higher-level driven device, but then miraculously mutate into phonological boundaries" (Scheer 2006: 24). The TO is supposed to cut down on linguistic alchemy: in the absence of higher level intervention, phonology is subjected only to its own law, which happens morpheme internally and when there is no order from higher levels at morpheme edges. At morpheme edges "domestic phonological law may be forced to cohabitate with alien law, i.e. whose origin are other modules. If higher levels decide to intervene, their law outranks the domestic phonological law" (Scheer 2005: 6).

This line of reasoning entails the restriction that higher levels do not have any bearing on melodic units (on whatever happens below the skeleton). In other words in phonology there is an ontological gap between what happens below the skeleton and above the skeleton (Scheer 2007c). Thus, whatever objects the TO sends down, they have to land above the skeleton, for example, the TO cannot send for example a feature.

The TO thus presupposes strict modularity: morpho-syntax does not know that phonology exists and phonology does not know that syntax exists. The TO alone, as the decision-taking instance, knows about the general picture. The decisions in question are the following:

– which morpho-syntactic boundaries are shipped off to phonology,
– how they are grouped,
– in which specific phonological coat they are sent down (Scheer 2006: 104ff).

The Direct Effect consists in evaluating the predictive power of a given phonological theory. The outlet of the TO are true phonological objects (existing in phonology

independently of interface phenomena), which are theory-specific.[8] The true phonological objects can make predictions in the phonology because phonology reacts on them. Diacritics, on the contrary, cannot make predictions because they were introduced as the *cloaca maxima* to explain away annoying data. The theory proposed in Scheer (2008 *inter alia*) can be briefly summarized as a paradigm where

> interface information is handed down locally − in the sense of what is generally called sandhi; yet the output of the Translator's Office are only truly phonological objects. A truly phonological object is the one that exists in domestic phonology anyway and in absence of any interface related issue.
>
> (Scheer 2008: 147)

The Direct Effect stipulates the need of the direct translation of the morpho-syntactic information into the phonological level. This implies the rejection of prosodic hierarchy, which is considered to be the "black box" at the interface (Scheer 2005: 3). It should be recalled here that in B&B the prosodic hierarchy has no standing whatsoever. It means that B&B is even more consistent in anti-prosodic motivation than the CVCV framework. The Direct Effect assumes that only morpho-syntactically derived prosody is useless, that is: prosodic word, phonological phrase, small phonological phrase, etc. Phonologically derived prosody is treated differently. Accordingly, CVCV phonology rejects prosodic words but is not clear on syllables and moras. The B&B explicitly shuns any prosodic hierarchy, including phonologically derived hierarchy such as the syllable and the mora. The only prosodic element admitted by B&B is the foot, which is considered to be the unit of stress assignment (Dziubalska-Kołaczyk 1995: 69ff). Syllables are replaced by string-based phonotactics and moras ensue from the computation of the weight of the beat and binding.

I envisage the TO as a teleological meta-condition on linguistic structures, an identity which eventuates in implementing a higher order condition (morpho-syntactic, that is). In this it differs from other modules, which, as Scheer (2007c) points out, are not teleological. The reason why I call it teleological is that any invocation of meta-grammatical criteria can be considered finalistic or teleological. A quote from Lass seems to prop up such interpretation:

> I claim that there occur events in natural language which are best interpreted not intrinsically but extrinsically: there are "forces", "principles", "metaconditions" or what you will that direct or shape the actual rules that appear.
>
> (Lass 1981: 315)

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[8] "[T]herefore the general architecture that I am advocating – without the buffer – is theory-neutral. The particular implementation thereof, however, is necessarily theory-specific since the output of the Translator's Office are truly phonological categories, and these are variable across theories" (Scheer 2005: 1).

Thus the idea of rules as "agents" (cf. Venneman 1972 on Grimm's Law) has definitely a functional and Natural theoretic ring to it. To take another example, Dressler (1981: 116f) claims that "basic teleologies (or 'functions') are assigned to each language component". The goal of segmental phonology resides thus in "the double teleology of making language perceivable and pronounceable" Dressler (1981: 116f).[9] From such a perspective, the TO can be interpreted as a direct action of the conceptual system onto the phonological level.

According to these criteria, the phonological binding as proposed in Dziubalska-Kołaczyk (e.g. 1995, 2002) is a truly phonological object. Bindings, as well as beats and non-beats, make predictions in phonology precisely because phonology reacts on those objects. Furthermore, some correlations can be traced in the epistemology of phonological binding with the binding as conceptualized on other analytical levels. The correlations are bilateral, in congruence with my understanding of the function of phonology as a mooring rope for matter (transcoding the mental into the physical via interaction). Namely, a binding can be correlated not only horizontally (on the phonological level, as Level 1 preferences) but also "vertically"; both with the phonetic binding and with the syntactic (mental) binding. For example, "in a sense, the acoustic discontinuities produced by forming a constriction with the primary articulators constitute the glue that binds together the various features of a consonant to constitute a segment" (Stevens 1998: 250; cf. also Dziubalska-Kołaczyk 2002 Chapter 16 for the evidence from phonetics).

Assuming after Delattre (1966) that it is easier to separate consonants than to pronounce them together, binding can thus be conceptualized metaphysically as a cohesive factor whose function is to counteract the natural tendency of matter for chaos (separation): *cosmos* → *chaos.* The phonological binding is a resource of domestic phonology (cf. Scheer 2006 above for the definition of domestic phonology) to order and organize sequences of phonemes. The decision of what is a meaningful sound is implicated at a semantic level as the "noise" versus "sound" dichotomy. Binding can be thus seen as a higher level TO order: an implementation of mental factors onto the material chaos. In this sense, binding, just as the concept of the phoneme, is necessarily mental.

According to Scheer, TO talks only to nuclei. This is again coherent with the B&B tenets. B&B takes it as axiomatic that it is the beat that is a dominant element and it binds a neighboring non-beat. It naturally follows that TO orders are given to the beat: whether to develop a binding to the neighboring consonants, or not. Furthermore, within the Direct Effect assumptions, phonology is a passive agent. On the

[9] It might be also of merit to briefly mention at this point a parallel with general semantics by Alfred Korzybski, especially his extensional orientation (Korzybski 1933 as presented in Kamiński 2005: 69f). To wit, Korzybski proposes viewing abstracting processes from the electro-coloidal perspective which divides the experience into four levels, of which the verbal level is only the (last) fourth. Korzybski calls the abilities connected with this last level "binding-in-time".

phonological level only the domestic law is operative unless there is a TO order for local intervention. The morpheme boundaries are the only locum where such an intervention is possible. In B&B such a stipulation finds a natural explanation. The boundaries, which in generative approaches are irrefutably diacritic,[10] are not diacritic in B&B because they are the phonological result of the interplay of two factors:

– the presence versus the absence of a binding: {→} versus {¬ →};
– the morpho-syntactic intervention (Level 1 binding preferences can be violated from outside, Dziubalska-Kołaczyk, p.c.).

2. The analysis of Spanish reparsing as an example of the epistemological value of a phonological theory

This section is meant to empirically illustrate the mechanism of Direct Interface. To this aim, I chose to consider first some of the ways in which the process of reparsing in Spanish has been approached in mainstream phonology, in particular in OT[11] analyses. I will then address a number of problems associated with the analyzed account and offer an alternative view substantiated in the B&B paradigm which explains the process of Spanish reparsing versus its lack in e.g. English. The discussion shows that a classical OT account is basically the accommodation of data in the form of task-specific scientist descriptions, which in epistemological terms can be called para-theses, while the suggested beats-and binding account explains the phenomenon in a direct way, that is using only the true phonological objects of the theory.[12]

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[10] For example, according to Scheer, in OT the diacritic boundary is hidden in the Align/Wrap constraints. Since all versions of OT use the prosodic hierarchy (Scheer 2008: 9), none qualifies for Direct Interface (Scheer 2006: 93). Also, according to Yip (as cited in Scheer (2008: 8), in OT it is hard to identify "a clear dividing line between morphology and phonology. What is more, they go much further to blur the distinction than does the interleaving of phonology and morphology found in lexical phonology. In lexical phonology, each component has its own character: the entities are different, and the rules are different. In Optimality Theory, this is not necessarily the case. Alignment is the most striking example. Alignment appears to play a role in pure morphology, in pure phonology, and at the interface (Yip 1998: 219)" (Scheer 2008: 8).

[11] Due to the proliferation of theoretical paradigms within OT, which parallel the proliferation of constraints, my claims refer most of all to the paradigm I am the most familiar with: classical OT. I assume that the epistemology is constant and it is epistemology that is the focus of my attention in this paper.

[12] A potential reservation to the empirical layer could be that to illustrate that the theory does not need to recur to diacritics, I have chosen a process (in Spanish) where the consonant of a VC#V sequence behaves in the same way as in a monomorphemic VCV sequence. That is, the word boundary is invisible. That the analyst does not need to recur to something that is invisible does not really come as a surprise; in any case it does not demonstrate that B&B does not need to recur to diacritics. A better testing ground

2.1. An OT account as an example of a diacritic theory

Traditionally, Spanish reparsing is considered to be a mis-match of morphological and syllabic structure (cf. Colina 1997: 7).[13] To wit, in sequences such as *las alas* 'the wings' the last consonant is parsed in utterance with the beat of the following word: *la.salas*. The process does not apply when the second word already starts with a consonant or with a cluster: *pub lindo* 'a nice pub' is not parsed as **pu.blindo*. On the other hand, word internally the cluster is, in traditional terms, syllabified as onset: *hablar* 'to speak' (examples taken from Colina 1997). An informed overview of traditional approaches plus a detailed bibliography are provided in Colina (1997), hence it will be dispensed with here. Colina (1997) also provides an Optimality-Theoretic account which she claims is superior to a traditional rule-based account[14] because of the fact that "constraints are universal and that the constraint ranking proposed is not just valid for one process but also for the entire phonological system" (Colina 1997: 11). This analysis will then concentrate on the OT version as proposed by Colina 1997. The constraints proposed by Colina (1997) are as follows:

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would have been a phenomenon where the word boundary does have a phonological impact. There are three arguments that I believe may uphold my choice. Firstly and most importantly, as the following subsection will show, an OT formalization of this phenomenon does involve resort to a boundary (in the form of ALIGN constraint). It other words, it must be in some way formalized why the boundary is invisible. Hence, I feel justified in positing an alternative interpretation that does not involve resorting to word boundaries where a competing analysis does it. A phonological process impacted by boundaries which could serve as a potential illustration is for example contemporary Polish palatalization (cf. Rubach for a Derivational OT account and extensive references on Polish palatalization). However, as argued by Gussmann (2007), palatalizations are mostly morphophonological regularities and should not be forced into phonological straightjackets of any sort. Scheer (2007, 2008) also admits that word-final boundaries should not be in any way equaled to a word-initial boundary: that the process occurs word finally never implies that it will also occur word-finally. Accordingly, the analysis involving a word-final boundary, as is the case with Polish palatalizations, would have to be done on morphonological grounds, which is far beyond the epistemological scope of this paper. Finally, as I mentioned in the introductory section, B&B is a theory which is constantly being developed. Theories develop via small steps taken by particular contributors, either by applying existing parameters to particular sets of data or by reacting to the "standard" model and proposing sometimes quite dramatic modifications (cf. Cyran 1998: 10). Accordingly, I suggest seeing the reparsing analysis provided here as an invitation for such a step-by-step development.

[13] In might be noted in passing that the process itself is not always so straightforward and easy to describe. For example, in French, "resyllabification" entails the processes of Liaison and Truncation. Accordingly, French phonologists prefer to speak of the *Enchaînement* process and distinguish the reparsing of fixed consonants, elision of vowels and the deletion of word-final consonants. Specifically, the resyllabification of latent consonants is distinguished from the resyllabification of fixed consonants (for an overview of literature and discussion cf. Carr 1993: 236). Cf. also Harris 1985 for a classical generative explanation of Spanish reparsing).

[14] But cf. e.g. LaCharité and Paradis (2000) for an investigation of hidden rules in OT.

(1) Input: /las alas/, output: [la.sa.las] (adapted from Colina 1997: 9)

Canadidates	ONSET	ALIGN′	NO CODA
☞ (a) la.s ǀ a.las		*	*
(b) las. ǀ a.las	*!		**

In (1) the winner is (a) because (b) violates the high-ranked constraint ONSET which reads that words should have onsets. Faithfulness constraints are ranked higher than ONSET which assures the elimination of the potential candidates as **las Salas*, where the capitalized S is inserted or **las ∅las* where the initial vowel has been syncopated. Thus, we do not know at this point the relative ranking of DEP (do not epenthesize segments) versus (MAX) (do not delete elements) but they should be ranked higher than the constraint stipulating that words should have onsets: DEP, MAX >> ONSET.[15] On the other hand, when ONSET is vacuously satisfied as in *lindo*, ALIGN violations should be avoided:

(2) Input: /pub lindo/, output: [pub.lindo] (adapted from Colina 1997: 9)

Canadidates	ONSET	ALIGN′	NO CODA
☞ (a) pub. ǀ lin.do			**
(b) pu.b ǀ lin.do		*!	*

The onset maximization word-internally is accounted for in the following way:

[15] Colina uses in this part of her paper PARSE in the sense "do not delete segments" and FILL which she reads as "do not epenthesise segments". Both are faithfulness constraints (Prince and Smolensky 1993: 113; Colina 1997: 8). However, from my reading of Prince and Smolensky's seminal book (1993) I gathered that PARSE is not a constraint against deletion *per se*, as Colina (1997) assumes but it is literally a constraint requiring that all segments be associated, hence *PARSE is a penalty for each unassociated or free segment, *FILL for each unfilled syllable position – penalty for insertion. Overparsing leads to distinguishing FILL^{nuc} and FILL^{ons} (Prince and Smolensky 1993: 126). On the other hand, the function of PARSE is to forbid deletion, and that of FILL – to forbid insertion. Thus, on some analytical level, the constraints may revert to the same (cf. also the discussion in Colina 1997: 13). Nevertheless, guided by the fact that Prince and Smolensky (1993) do introduce a separate set of constraints, DEP and MAX, I assumed that in the case under analysis a hypothetical violation of PARSE would be e.g. *la. S. a.las*, the capitalized S constituting the violation of PARSE (a candidate not considered by Colina 1997), and not inserting elements. Accordingly, I prefer using the classical denotation: MAX or FAITH V/ FAITH C for Colina's PARSE, and for Colina's FILL (no insertion) I will use DEP. Nevertheless, whenever the terms PARSE and FILL occur below, they are in Colina's interpretation: "don't delete segments" and "don't insert segments". ONSET is a markedness (structural) constraint, just as NO-CODA (Prince and Smolensky 1993: 113f). NOCODA requires that syllable nodes have no CODA child. The presence of such node violates NOCODA regardless of whether it is filled or empty. Ensuing penalties: *ONS if there is no onset, *NOCODA if there is a coda in a syllable (Prince and Smolensky 1993: 127f).

(3) Input: /ablar/, output: [a. βlar] (adapted from Colina 1997: 9)

Canadidates	ONSET	ALIGN′	NO CODA
☞ (a) a. βlar			*
(b) aβ. lar			**!

Since there are no stem edges, NO CODA shows its effects and eliminates the candidate (b). To eliminate any other word-medial clusters from surfacing as winners except word-medial TR clusters (T standing for any stop plus for /f/, the only admissible C_1 in Spanish C_1C_2 onset clusters), e.g. /-pt-/ as in (Sp.) *voluptuoso* 'voluptuous', /-gn-/ as in (Sp.) *agnóstico*, 'agnostic', /-ltʃ-/ (Sp.) *salchicha* 'sausage', there is an additional constraint ONSET SONORITY which reads that "for two segments to be parsed in the onset, they must observe the maximum distance in the sonority scale, that is, the first one must belong to the set of least sonorous consonants and the second one to the set of most sonorous consonants" (Colina 1995). "Onset sonority therefore dominates NOCODA" (Colina 1997: 10).

Synopsizing, there are several constraint chains in Colina's analysis of reparsing:

ONSET SONORITY >> NO CODA >> *COMPLEX ONSET
ONSET >> ALIGN′ >> NO CODA[16]
PARSE >> FILL >> ONSET

I attempted at collapsing the three rows, with the tentative result as follows:

FAITH V/C/ >> DEP >> ONSET>> ALIGN′ >> ONSET SONORITY >>
NO CODA >> *COMPLEX ONSET

According to Colina (1997), this ranking should account for the whole phonological system of Spanish (cf. the quote above).[17]

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[16] ONSET and NO CODA in fact come from the traditional Jakobsonian typology (Prince and Smolensky 1993: 113f).

[17] It might be observed here that Morris (2000) uses a totally different set of constraints for Spanish /s/ aspiration than Colina's interpretation (1997), which might corroborate the claim that constraints are idiosyncratic, not universal. Cf. also Morris (2000: 14, footnote 8): "Boersma (1998: 259) develops the articulatory constraint *GESTURE (spread glottis) to ban the occurrence of aspiration; his constraint, however, is nonpositional. *My* [emphasis added, MHG] constraint *C/[spr] is positional in nature". Of course, the fact that there are competing analyses within a theory does not necessarily mean that the theory is inconsistent. I absolutely agree. OT is consistent in devising an infinite number of descriptive formulations called "constraints" that lack any psychological reality and that can be easily used to turn anything into their opposite.

Archangeli (1997) offers another suggestion for the constraint ranking for Spanish, which I would like to compare with Colina's ranking.

Archangeli (1997) concentrates specifically on the "lose-a-consonant option":

> In such cases, FAITH C is subordinate: in a three consonant sequence the best thing to do is to leave a consonant out. In this way, PEAK [NUC in the original version, i.e., a syllable must have a nucleus], FAITHV [do not delete vowels] and *COMPLEX are satisfied, at the cost of violating FAITHC [do not delete consonants]. An example is found in Spanish. A caveat is in order here. Even a small amount of familiarity with Spanish will reveal that the fact presented here are simplified somewhat. In particular I ignore the well known fact that Spanish inserts a vowel in front of sC clusters (e.g. *esfera* 'sphere'; compare *hemisferio* 'hemisphere', not **hemiesferio.*[18]
>
> (Archangeli 1997: 20)[19]

Next Archangeli analyzes Spanish verbs, the roots of which end with two consonants, e.g. *absorber* (-rb-) or *esculpir* (-lp-). In forming the adjective or noun, these forms lose the innermost consonant of the resulting word-medial cluster, e.g. *escultor* 'sculptor', not **sculptor*, *distinto* 'distinct' not **distingto.* The ranking she devises to arrive at the desired output is as follows:

(4) Adapted from Archangeli (1997: 21)

/absorb-to/	FAITHV	PEAK	*COMPLEX	FAITHC
☞ ab.sor.to				*
ab.sorb.to			*!	
ab.sor.be.to	*!			
ab.sor.b.to		*!		

[18] Plus other cases of recurrent vowel epenthesis in Spanish, like e.g. *árbol* + *s* → *árboles*, or the adaptation of a loanword, e.g. *rickshaw* as (Sp.) *rikisha.* Spanish vowel insertion was investigated, among others, by Harris (1983). He suggested three separate epenthetic rules for /e/: #_sC (*estudiante*), C_s# (*árboles*) 'trees' and C_r'C (*abertura : abrir*) 'opening : to open'. In each of these cases /e/ is inserted before an extrametrical consonant. Itô (1986 as quoted in Kenstowicz 1994: 271) motivated a template mapping for Spanish syllables. The right-to-left template matching to CCVC simplified all the three environments enumerated by Harris. The process thus becomes uniform: a stray consonant will enter the syllable coda because under right-to-left mapping the right edge is the first accessible position. If no vowel is present in a segmental string , the V-slot of the template is realized as /e/.

[19] The caveat is crucial since her claim is that Spanish, "just as Yawelmani, does not allow a consonant to syllabify by itself, giving *[ab.sor.b.to] [...]. Nor does it adapt the Yalwelmani option, of inserting a vowel resulting in *[ab.so.reb.to] or *[ab.sor.be.to]. Significantly, the two languages differ in their resolutions to the "extra consonant" problem. As already seen, in Yawelmani the added vowel [i] rescues the unsyllabifiable extra consonant. In Spanish, however, it is not rescued: it is simply deleted" (Archangeli 1997: 21). Phonetic transcriptions as in the original.

As can be seen, the constraint *COMPLEX (penalties for consonantal clusters) is placed before one faithfulness constraint (FAITHC – do not delete/epenthesize consonants), which runs counter to Colinas's version. What is more, one potential candidate did not get a chance to enter the elections in (4): *ab.sor.bto*. To get rid of that undesirable, the constraint *COMPLEX ONSETS would have to be placed before FAITHC,[20] but then we run into trouble with Colina's ranking again. Unless it is assumed that *COMPLEX subsumes *COMPLEX ONSET, but this defies Colina's derivation anyway: *COMPLEX ONSET is in Colina's version ranked the lowest, and here it would have to be placed before FAITHC.

To sum up, in (5) I enclose a do-it-yourself representation: find the winner according to the ranking as suggested by Archangeli in (4) for (Sp.) *abertura* 'aperture'. The cluster is a typical morphonotactic (mechanical) cluster, which came into being just as the examples of the type *absorto.* The root of infinitive *abrir* 'open' concatenates with a derivational suffix {tura}: {abr} + {tura}. The purpose of doing this is to show that we are not dealing with competitiveness in grammar but mutual exclusivity, a phonological stalemate.

(5) A do-it-yourself derivation. Input: *abrtura*, output: *abertura* [21]

/abr-tura/	FAITHV	PEAK	*COMPLEX	FAITHC
ab.tu.ra				
abr.tu.ra				
ab.er.tu.ra				
ab.r.tu.ra				

The discussion intended to show that OT is a highly sophisticated means of accommodating data, but its explanatory power is *ad hoc*. It is not able to provide a coherent description of language-specific phonology. Colina's version of constraint interaction will not, for example, account for:

– word-initial consonant syncope in Spanish, as in *ptero-* derivatives, because "do not delete segments" is placed before "no complex onsets";
– word-medial syncopation as in *escultor*;
– vowel epenthesis as in *abertura*, *rikisha*, *árboles* or *esferio.*

[20] To be absolutely frank, *ab.sor.bto* could be eliminated by introducing a constraint such as, e.g. $*_{\sigma}$[St ∧ St], which reads "A stop cannot be followed by another stop in a syllable onset" but this does not get us anywhere interesting epistemologically because in Colina's version ONSET SONORITY (cf. (i)) is also much lower than any FAITH (DEP, MAX) constraint, in fact it is lower than ONSET.

[21] *Nota bene*, you might still save the *abertura* candidate by introducing a sympathetic candidate: a deontological entity, engendered by GEN only to annihilate the most logical candidate. The question remains: how ethical is the sympathy theory.

2.2. A suggestion for a B&B account of Spanish reparsing

My interpretation starts with the assumption that, according to the B&B taxonomy, English belongs to the prototypical stress-timing category (PST) and Spanish is a non-prototypical beat-timing (NPBT) language (cf. also Dauer 1983). Languages of the former type "demonstrate both quantity-sensitive stress and lexical stress. They employ both bindings and not abound in rules enhancing the stronger binding. Since they are rich in clusters, they allow for a lot of assimilations" (Dziubalska-Kołaczyk 2002: 103). Languages of a non-prototypical beat timing, on the other hand, "demonstrate a B←n binding but at the same time they strongly favor an n→B binding. This is why they might show some quantity-sensitive stress (like Italian) and yet have phonological rules enhancing n→B bindings" (Dziubalska-Kołaczyk 2002: 102). Dziubalska-Kołaczyk (1995: 105ff) also provides a principled beats-and-binding account for Italian accentuation. The main stress rule is stated as follows:

> stress falls on a penultimate beat which binds a non-beat to its right or on an antepenultimate beat. Thus, in other words, it is a beat which binds a non-beat to its right that prevents an antepenultimate stress. In a language type like Italian [...] [and Spanish], a binding of a non-beat to the preceding non-beat is certain only if the non-beat concerned is followed by another non-beat (best guaranteed by geminates), in other words, if the other non-beat concerned does not participate in the other potentially possible binding [...]. Other aspects, however, apart from the above Level 1-based preference, also play a role in the Italian stress assignment. In particular, *muta cum liquida* clusters are phonotactically better word-initial clusters (Level 2).
>
> (Dziubalska-Kołaczyk (1995: 105ff)

I assume that the important point about the Spanish reparsing process is that the number of bindings in a sequence is the same after the reparsing change:

(1) In word-final consonantal reparsing the number of bindings of the affected chain should be preserved.

The only thing that happens is that a B←n binding is supplanted with the more prominent n→B one, in accordance with Level 1 preferences for this language type. I propose to call the phenomenon **binding shift**, since all it consists of in Spanish is supplanting a weaker and unstable B←n binding with a more prominent n→B one in a propitious phonotactic environment (i.e. before a word-initial vowel). In other words, the binding is shifted: instead of a less preferred and weaker leftward binding, a rightward one develops, which is much stronger and more preferred. This is congruent with the theoretical foundations of the model which assumes that languages of the non-prototypical beat isochrony "have phonological rules enhancing

n→B bindings" (Dziubalska-Kołaczyk 1995: 68). Functionally, Spanish reparsing buys the following assets:

– a non-prototypical beat-timed language simply practices its preference for n→B binding;
– shows how unstable and weak in this language is the B←n one;
– the overall count of bindings remains the same.

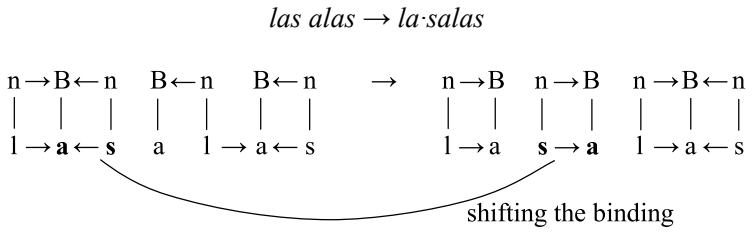

Figure 1. A binding shift in Spanish.

According to Dziubalska-Kołaczyk (1995: 72), "[t]he effect of a phonostylistic process is more noticeable the more it distorts the binding preferences of Level 1". If we formalize the reparsing as the shift of a weaker binding, it naturally follows that with the consonant at the word onset, as in *club lindo*, the process does not apply, because:

– the requirement for a salient onset has already been fulfilled since the word has already a valid CV structure at the beginning (a violation of semiotic motivation);
– it would mean the loss of one binding, namely n←B binding, an example of phonological teleology without a *telos*;
– or a situation where consonants would bind between themselves, which is incompatible with the B&B tenets (axiomatic clash).

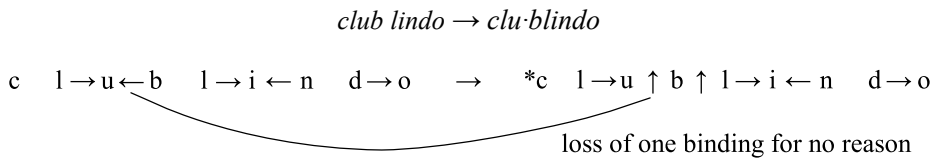

Figure 2. The B&B formalization of a hypothetical Spanish reparsing in *club lindo* with the loss of a binding.

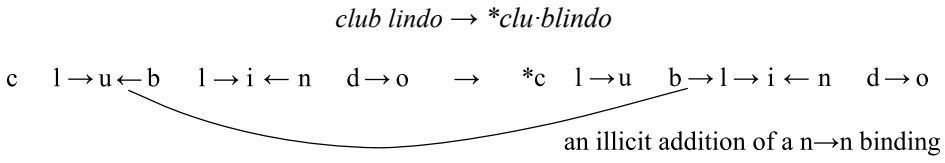

Figure 3. The B&B formalization of a hypothetical Spanish reparsing in *club lindo* with the addition of a hypothetical interconsonantal binding.

As can be seen, the above suggested B&B interpretation accounts for the process of Spanish reparsing only using the resources of the phonological theory: Level 1 binding preferences plus bindings, beats and nonbeats.

The explanation why the process does not apply word-internally is trivial in B&B. According to Level 2 (clustering) preferences (cf. the extended quote from Dziubalska-Kołaczyk 1995 above), *muta cum liquida* is a preferred word-initial cluster, and a dispreferred word-medial cluster. It stays in the word-medial position as in the word-initial.[22]

As far as vowel epenthesis and consonantal deletion are concerned, the explanation can be also formalized in terms of Level 2 preferences (phonotactically).[23] Binding shift is thus here irrelevant as Level 1 preference. What follows, the analysis in Figures 1–3 does not contradict, reinforce or preclude the subsequent analyses (Level 2 preferences). The study of epenthesis/apocope is beyond the thematic scope of the present paper which concentrates mainly on the "edge" phenomena. In this connection, it might be sufficient to remark that, 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. The sondis (sonority distance, a term coined by Dziubalska-Kołaczyk 1995) for */-iŋgto-/and */-abrtu-/ are different for the two word-medial clusters: there is a sonority peak in the cluster of **abrtura*; hence, it is quite understandable that the strategies used to repair the two concatenations could be different. A tentative suggestion for further research is presented below. First of all, all possible contexts for word-medial consonantal epenthesis should be enumerated (as suggested in (1)) and further elaborated and classified according to sondis (NED) parameters.

---

[22] What might apparently be lacking here is providing the parsing of *hablar*. As far as I am familiar with B&B, establishing parsing is not the most vital issue. The most crucial challenge is the verification of the universal binding and sonority preferences. In this respect, the binding arrangement in *hablar* can be posited as follows: /a βl→a←r/.

[23] "In a sequence $V_1C_1C_2C_3V_2$, a sonority distance C_1C_2 should preferably be smaller than or equal to a distance V_1C_1, and the distance C_2C_3 should preferably be smaller than a distance C_3V_2, for example *anspa*, *astka*, *astfa* [...]. Medial consonants of the preferred clusters tend to reduce phonostylistically (e.g. *astka→aska, a ɲstf→a ɲsfa*) since the basic preference is satisfied anyway" (Dziubalska-Kołaczyk 1995: 82).

	Spanish		English cognate lexemes	
(1a)	-l{p}[24]t-	*escultor*	-lpt-	*sculpture*
(1b)	-bVrt-	*abertura*	-pVrt-	*aperture*
(1c)	-n{g}t-	*distinto*	-nkt	*distinct*
(1d)	-(n)sC-	*transplantar*	-nsC-	*transplant*
(1e)	-(k)sC-	*extraer*	-ksC-	*extract*
(1f)	-n(t)s-	*Montserrat*	-nts-	*Montserrat*

Synopsizing the discussion in Section 3, the main epistemological differences between B&B and OT explanations are:

(1) The phonological explanation in OT can take place only in the presence of potential losers: incorrect representations. If there were no losers (no bad guys to eliminate), there would be no phonological explanation. The more losers, the better the tableau and the more concise the explanation. I call it hypothetically *negatio ad absurdum* (along these lines, see the OTed discussion on "why do we pick our nose" in Ohala and Ettlinger 2006 and also Haładewicz-Grzelak and Tendera forthcoming). The more you are able to defy what you aim to get, the better your results. Contrastively, in the presented B&B account, it really does not matter what the potential non-existing realizations might be; what matters is explaining the phenomenon using only a limited set of phonological entities.

(2) An OT account is boundary-based. Although the word "boundary" and "syllable" do not occur in this particular representation (although they can occur in other formalizations, cf. footnote 18), the boundary and syllables are implicit in ONSET constraint ("syllables must have onsets") and ALIGN′ ("every initial stem-edge matches to an initial syllable edge (Align Stem, Left, Syllable, Left)") (McCarthy and Prince 1993a: 36). "A vertical line (|) is used to mark a stem edge and syllabic divisions are indicated by means of a period" (Colina 1997: 8).
The B&B account was formalized without having recourse to the concept of syllable or boundary.

(3) OT assumes that the constraint ranking is universal and it captures the whole phonology of Spanish. I have shown that Colina's ranking for reparsing defies the ranking for vowel epenthesis and vowel epenthesis constraint ranking defies consonantal deletion constraints. The irrefutable truth is that deletion and epenthesis can cohabitate freely in one language as different cluster

[24] Braces denote obligatory elisions, parentheses –the optional ones.

> repair strategies, especially of morphonotactic clusters. Accordingly, they should be investigated most conveniently from the morphonotactic[25] perspective and not squeezed into one tableau. In B&B the phonological preferences are four-leveled. The reparsing is a Level 1 process while epenthesis/ syncope are Level 2 processes. The two can be explained independently of each other. Epenthesis and deletion are different cluster repair strategies and in their explanation many factors, such as semiotic, perceptual and position with the word have to be taken into account.[26]

Summarizing, the case at issue is not arguing against competition in grammar. If OT allows for contradictory rankings for one language, it is not competition in grammar; it is an epistemological flaw of a theory or we are dealing with nothing more but reductionist descriptions of lexemes. Epistemologically speaking, Kojève (1968: 112ff), following Parmenides, makes a distinction between thesis, antithesis and para-thesis. He argues that para-thetic ensemble is *pseudo-discursive*, lacking the logo-machie ensuing from the duel between antithesis and thesis. It would appear that OT, being constituted by partial discourses which can be mutually exclusive, can be assumed to have the status of phonological para-thesis.

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[25] As synopsized in Dressler and Dziubalska-Kołaczyk (2006: 250),"[m]orphonology has been defined in Dressler (1985, 1996) as the area of interaction between morphology and phonology with gradual synchronic and diachronic transitions from phonological rules or processes (PRs) via morphonological rules (MPRs) to allomorphic rules (AMRs). Morphonology is based on an integration of the theories of Natural Morphology and Natural Phonology (cf. Kilani-Schoch and Dressler 2005; Dressler 1996; Dziubalska-Kołaczyk and Weckwerth 2002)" (Dressler and Dziubalska-Kołaczyk 2006: 250). Morphonotactics was accordingly motivated as a distinct type of research on clustering, which was defined as "the area of interaction between morphotactics and phonotactics and to an emphasis on the transitions between morphonotactics and ordinary phonotactics" (Dressler and Dziubalska-Kołaczyk 2006: 250).

[26] Two remarks are merited at this point. I did not dismiss Colina's analysis because she could not do all Spanish phonology, I dismissed it because she claims she could cover the whole Spanish phonology using a set of constraints which, for example, defies the epenthetic phenomena. Accordingly, I do not claim that I could explain the whole Spanish phonology by a binding shift. But my analysis is consistent with Natural Phonology tenets and with B&B tenets and does not contradict possible analyses of other phonological processes which could be managed by Level 1, 2 or 3 preferences. My stand might be also potentially questioned by the stipulation that although the paper rejects the two OT analyses it discusses, it shares with them the questionable assumption that the phenomenon should be described as cross-word resyllabification (or "binding shift"). This tacitly presupposes a scenario where the speaker stores a word with one syllabification or binding arrangement and then changes it in on-line sentence production. Briefly, I have nothing to say in this paper on the elaboration of the storing and processing mechanism. My interpretation can be thought of as a tiny extension of B&B theory. There is nothing in B&B tenets that stipulates that binding arrangements cannot be changed. Finally, as Scheer remarks (2007b: 5), it is not clear why "cyclic derivation is regarded as a serial enemy *in the phonology*. Cyclicity is about chunk-submission to phonological interpretation, not about phonology itself. Hence there is no problem having a non-serial phonology but a serial interface (=cyclic derivation) plus PI [Phase Impenetrability]".

3. B&B preferences as the parameterization of φ-function

The φ-function is a term coined by Jonathan Kaye (1995). This section attempts at B&B hermeneutics of this concept. As summarized by Scheer (2006: 39), "the φ-function is the set of phonological processes that are synchronically active in a given language and computed on-line whenever speech is produced. It gives the order 'do phonology!'". The key observation resulting from such a conceptualization is that "there is no chronological application of phonological processes. Phonological processes apply all simultaneously" (Scheer 2006: 39).[27] Kaye (1995: 302) proposes that φ-function "has one argument, a phonological string, and returns the application of the phonology to this argument, also a phonological string. The expression φ(X) means, 'apply phonology to the string X'. φ(X) returns the phonological string which results from the application of phonology to its argument".

With this in mind, the explanations from the preceding sections might be extended a little further. We might recall that OT explains differences between languages through different constraint ranking, but it provides no explanation why the constraints are ranked differently. In the above reported example, the explanation that the process of word-final consonantal reparsing is nonexistent in English could be most probably explained by swapping ONSET with ALIGN′ in (1). Why they are swapped and who swapped them, nobody knows. The explanations stops after manufacturing a tableau. Accommodating the observed data in a tableau is thus the ultimate goal of a phonological explanation: the teleology of OT.

Within the thematic scope of this paper, there is a B&B explanation for the fact that there is a reparsing in Spanish and no such phenomenon occurs in e.g. English. In B&B English belongs to a PST (prototypical Stress Timed) typology and Spanish to NPBT (non-prototypical beat-timed) (cf. Dziubalska-Kołaczyk 2002 for a detailed discussion on the issue). This means that in English:

– the B←n binding is stronger than the respective B←n in Spanish;
– the tendency towards creating CV structures is much less prominent than in Spanish.

(2a) (Sp.) *las altas* 'the tall ones'
C→V←C

(2b) (E) *Martha's altos*
V←C V←C

In (2a) there is a binding shift on /s/ in utterance and no such process is reported in (2b) – *Martha's altos* does not become **Martha saltos*. The caveat must be however made here that in English the reparsing process is also operative, as evidenced by the linking /r/ and intrusive /r/ phenomenon (cf. Broadbent 1991), or the affrication

[27] An interesting parallel with Natural Phonology can be pointed out at this point: The simultaneous application of phonological processes is also one of the tenets put forth by Stampe (1972).

across word boundaries as in *can't you*. However, the process is more restricted and subjected to syntactic conditioning, e.g. there is affrication in *hit you* but not in *hit Yorick* (cf. Scheer 2006: 39f for a more detailed discussion). In Spanish, on the other hand, reparsing, just as nasal assimilation or voice assimilation is an automatic process, operating freely across words without any exceptions.[28]

B&B Phonology is conceived in terms of preferences of Level 0 (rhythmic preferences),[29] Level 1 (the level of underlying phonological binding preferences between beats and non-beats), Level 2 (the level of phonotactic preferences based on the preferred sonority distance among vowels and consonants), Level 3 (speaker-friendly preferences to achieve articulatory easy phonotactic sequences) (cf. Dziubalska-Kołaczyk 1995 for a detailed exposition of the issue). I submit that this formulation is consistent with the teleology proposed in the Direct Effect theory. To wit,

> [t]his may be compared to a chemical process that occurs when a piece of composite material is dipped into a chemical bath: based on the ingredients of the piece and the properties of the bath, a chemical reaction goes into effect which ennobles the original piece and makes it apt for its life in the real world. The architect of the ingredients of the piece, of its size and of the timing of its dipping is the Translator's Office. It cannot alter the pieces that come from the (morpho-syntactic) factory, but it may rearrange them, add some ingredients at given locations (morpheme and word boundaries) and it decides which piece is dipped into the bath, and how many times it is repeated.
>
> (Scheer 2006: 103)

In my reading of Direct Interface theory through B&B it might be thus posited that the language-specific valuation of levels 0-3 parameters produces what might be called "phonological space", which shapes particular phonotactic chains which are submitted for processing. Such an interpretation is congruent with the Direct Effect stipulations: "nothing fancy is going on in phonology: no concatenation, no ordered application of processes, no reranking of constraints – just interpretation. The only thing that phonology is able to do is to interpret whatever is stuck into its space" (Scheer 2006: 105).

A tentative suggestion for a visual representation of this phonological space is shown in Figure 4. The figure is most of all meant as a suggestion for future research within the levels of preferences. The formalization could be done in terms of fuzzy

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[28] Nespor and Vogel (1986) assume that the domain of application of the nasal POA assimilation in Spanish is within the VP. I find this stipulation highly debatable but the detailed discussion is beyond the thematic scope of the present paper.

[29] According to B&B tenets, the type of isochrony obtaining in a given language conditions the binding preferences of that language. The default unmarked rhythm is foot-timing (Dziubalska-Kołaczyk 1995).

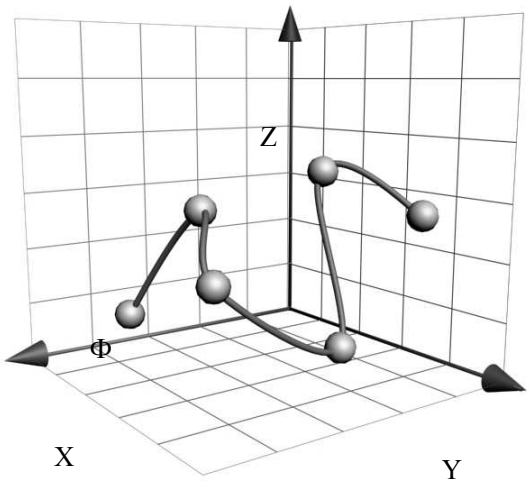


Figure 4. A suggestion for a 3D representation of the parameterization of phonological space (picture by Aleksandra Grzelak). The axes X, Y, Z stand for level 0–2 preferences. The actual shape of the string would look different if different fuzzy values for level 0–2 preferences are adopted. For example, the computed Φ values could be greater or smaller, which would make the concatenation locally more or less susceptible to TO intervention (e.g. in CVCV, the FEN needs to be silenced by the TO).

logic only and of fuzzy optimalization (cf. Zadeh 1975). Level 0–3 parameters would be accordingly interpreted as fuzzy values built into the logic. The axes in the figure can be read as denoting Level 0, 1, and 2 preferences (Level 3 preferences seem to be in some way motivated by the remaining three). The figure which is inscribed into the three axial "bath" is a visualization of a phonotactic string. The beads stand for the phonemes and the connectors (Φ) represent the cohesion forces: the dynamics of phonology.

These forces result from the parameters which are set language specifically for Level 0–2 preferences. In other words, the axes are three sets of arguments. Since the arguments are ordered, we can speak of a function. The function values are thus translated into what happens "in between phonemes". What follows, the computation and the computational image of a phonotactic string would be different across languages because in B&B Phonology each language is an idiosyncratic combination of the varying values of the four levels of preferences.

The above reasoning was aimed to show that phonology can be seen as the sort of function that ascribes different values to the arguments on the three axes; the φ-function in Kaye's formulation.

It can thus be assumed that the influence of the morpho-syntax (TO orders) is parameterized language specifically. In Spanish there is almost no TO intervention: most phonological processes occur on an equal basis morpheme-internally and

across words.[30] In English, on the other hand, there are many more TO orders that block phonological processes across words. English seems to have Level 1 (binding) preferences set lower than Spanish, which might be one of the causes of greater influence of the morphosyntax in the phonology (more TO orders to be obeyed) than Spanish. In Spanish the domestic phonological law usually wins. It means that the processes which are automatic in Spanish, are in English subjected to stress conditioning (e.g. labio-dentalization of nasals) and morpho-syntactic conditioning (e.g. reparsing, velarization of nasals, voice assimilation, cf. Sobkowiak 1996). On the contrary, English seems to have Level 2 parameters (sondis preferences) set much higher than Spanish, which results in relatively free clustering occurring in that language. Level 2 preferences in English are more likely to counteract Level 1 preferences, which is not that widespread a tendency in Spanish.

4. The Coda Mirror in Beats-and-Binding

4.1. Theoretical foundations

This section attempts to compare the tenets of B&B with the assumptions of the Coda Mirror in CVCV from the perspective of the Direct Interface. In the theoretical frame, the epistemology of weak/strong position in CVCV will be synopsized. The empirical support comprises a B&B account of:

– the phonological velarization of /l/ in RP;
– the deletion of /r/;
– the phonotactics of RP glides and /h/ in RP English.

The generalization captured in the analysis consists in treating /r/→∅ and /l/→[ɬ] as the outcome of the same phonological process affecting both RP glides and liquids. I provide an explanation in terms of B&B with the help of Zabrocki's ([1960] 1980) structural phonetics: the consonantal phonemes of RP English which have the smallest mass of aperture (/j, w, h, r, l/) are unable to propagate B←n binding, which would sustain them in an off-beat position. As a conclusion it will be shown that the bindings are true phonological entities and that the phenomenology achieved by the interrelation of bindings is compatible with the synoecism of skeletal positions in CVCV.

According to Scheer, "[d]irect interface is theory neutral: it sets a frame for the interface which may then be filled in by any specific phonological theory" and "the vocabulary of the representational device is the vocabulary of the phonological the-

[30] But cf. Hualde − Prieto 2002; Hualde 2004 for an analysis of glide strengthening to palatal voiced fricative.

ory" Scheer (2006: 103f). Furthermore, "the special behavior at edges is not due to edges but to the fact that edges are in contact with morpho-syntactic divisions". Hence, a quasi-phonological entity "#" cannot make any predictions (Scheer 2006: 112)[31].

In classical generative formalizations, (excluding the contexts TR − obstruent plus sonorant),[32] a consonant can appear in the following phonotactic chains:

(1) # _
(2) VC_V
(3) V_V
(4) V _C
(5) _#

Ségéral and Scheer (2001) observe a clash in terms of V_V (position (3)): the consonant is in the onset and yet, in this position it is susceptible to all sorts of lenitions.

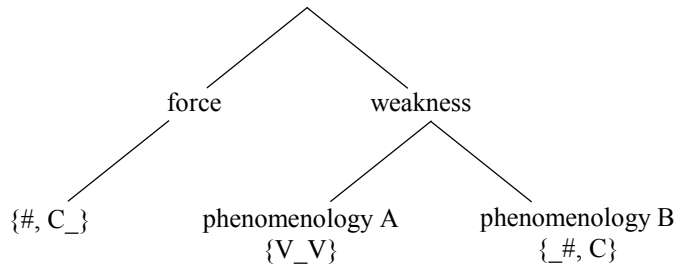


Figure 5. A summary of positional load (adapted from Ségéral and Scheer 2001: 110).

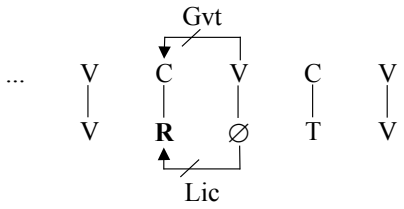
According to Ségéral and Scheer (2001: 110), a phonological theory should account for each of these three contexts as a simple object and derive the properties of each of them. CVCV achieves this by assuming only two disjunctive contexts: Coda Mirror and Coda, characterized by the property of force and weakness, respectively. These two positions are symmetrical with respect to these properties (Ségéral and Scheer 2001: 133). The phonological identities in question are represented as in (1–3).

[31] It should be pointed out here that in CVCV the word-initial boundary is formalized as a CV unit which "may" be silenced by TO. Whether there is phonology across words is not only decided by the initial CV – also by phase theory, i.e. a non-representational means (Scheer, p.c., February 2008; cf. also Newell and Scheer 2007).

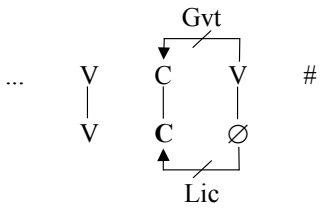
[32] For an enhanced B&B interpretation of such clusters, see Michalski (2004).

(1) Consonants in Codas: ungoverned and unlicensed (adapted from Scheer and Ségéral 2005: 243)

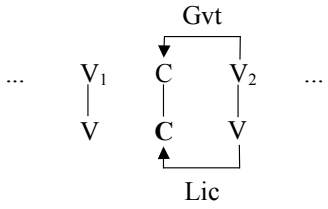
(1a) Internal Coda _.C



(1b) Final Coda _#

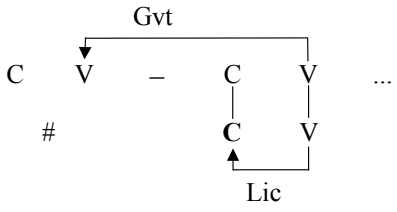


(2) Intervocalic consonants: governed and licensed (adapted from Scheer and Ségéral 2005: 244)

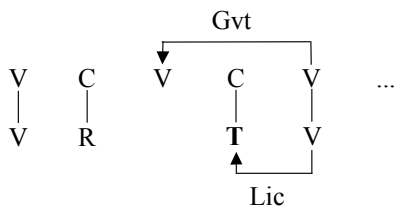


(3) Consonants in Strong Position: ungoverned but licensed (adapted from Scheer and Ségéral 2005: 244)

(3a) Word-initial consonant #_



(3b) Post-Coda consonant C._



The formalization of the above-listed positional identities relies on the category of empty nuclei: "the single angle stone for the definition of syllabic positions are empty nuclei: a consonant occurs in a Coda when it is *followed* by an empty nucleus,

it stands in the Strong Position in case it is *preceded* by an empty nucleus, finally, it is intervocalic if it is not adjacent to any empty nucleus" (Scheer and Ségéral 2005: 246). The causality is accounted for as follows:

> Why is the Coda weak and its reverse strong, rather than the reverse? The answer is contained in the table (12) [...]: the relative strength of consonants is a function of the two lateral forces that act on them. Given that the Government spoils the melodic content of its target while licensing backs it up, the most comfortable position for a consonant is certainly the Coda Mirror: this is where consonants escape spoliation (they are ungoverned), but enjoy support from licensing. The Coda Mirror is thus certainly more inviting than either the Coda or the intervocalic position: in the former environment, consonants are neither spoiled nor supported while they are both attacked and backed up in the latter.
>
> (Scheer and Ségéral 2005: 246)

Table 1. Synopsis of positional strength (adapted from Scheer and Ségéral 2005: 246).

Position	Usual name	Phonological identification	Lateral situation	Segmental health
#_V	word-initial	Strong position = ∅_	Licensed and ungoverned	splendid
VC._V	post-Coda	Strong position =	Licensed and ungoverned	splendid
V_.CV	Internal Coda	Coda = _∅	Unlicensed and ungoverned	unfavorable
V_#	Final Coda	Coda = _∅	Unlicensed and ungoverned	unfavorable
V_V	intervocalic	= elsewhere	Licensed and governed	unfavorable

4.2. Positional load in B&B formalization

Now I would like to show how B&B reflects the challenges implicated in the direct formalization of positional strength. To this aim I will use the velarization of /l/ and /r/ deletion in RP English. The processes doubtlessly have received a large amount of scholarly attention so far.[33] For example, Gussmann (2002) offers a Standard Government Phonology analysis of the /r/ deletion in English. Scheer (2004: 616) provides a detailed summary on sonorant lenition and summarizes the phenomenon as the loss of manner specifications in liquids occurring in coda positions: "the apical trill and alveolar laterals are known to sometimes decompose, leaving a palatal glide behind, while the depletion of velar laterals results in a velar glide. Another way of losing manner is observed for [r] which may reduce to an [a] colored object that contaminated the preceding vowels" Scheer (2004: 740).

[33] For an example of a phonetic perspective on /l/ velarization, cf. Recasens et al. (1995); Broadbent (1991) is a reference for a phonetic study of linking /r/.

My objective in re-presenting and re-formalizing these phonological issues is twofold:

– to show that the two phenomena can be treated as the outcome of one and the same process: I submit that both /l/ velarization, /r/ deletion and the absence of glides and /h/ in weak positions in RP can be functionally interpreted as the inability of these consonants to propagate a B←n binding;[34]
– to provide a direct explanation, that is, without a diacritic of a boundary and a syllable.

First of all, a substantive arrangement will be established basing on the substantive differences of the particular sounds in the systemic field. To this aim, Zabrocki's structural phonetics (Zabrocki 1960 [1980]) will be used because his research seems compatible with the tenets of Natural Phonology.[35]

According to Zabrocki, each sound has a corresponding acoustic substance. However, the substantive structures make use of the physiological substance. Zabrocki defines physiological substance as the mass of a given speech articulator, which articulates a given sound. Sounds can then be ordered basing on the mass of the articulator. The quantity of the physiological mass depends on the weight, so it is objectively verifiable. The physiological substance subsumes also the space between the articulating speech organs. For example, the space in articulating /s/ is smaller than in articulating /i/. Accordingly, Zabrocki (1960 [1980: 56]) introduces the parameter of substance of opening or closing of the articulators. The polarity of the phenomena is an axiom is his theory. Physiological substance thus subsumes:

– the quantity of the substance of the aperture/closure of the articulators;
– the mass (length) of the path of the articulators during the articulation;
– the mass of space between the articulators;
– (the mass of) time necessary for the articulation.

These kinds of substance are the primes. The sound is then analyzed into such primes, and basing on the differences, the substantive arrangements are created. Par-

[34] The idea that l-velarization and r-deletion reflect one synchronic process in RP is far from being uncontroversial and admittedly needs more discussion than allowed for in the thematic scope of the present paper. As one reviewer points out, there are dialects of English which lack l-velarization (Hiberno English) or which maintain velarization and r-deletion (New York, for example). There are also varieties that maintain velarization and non-deletion (most other GA dialects). I elaborate on this aspect more in what follows.

[35] Zabrocki's structural phonetics, on some analytical level, might of course be translatable into melodic primes, although the detailed analysis is orthogonal to the discussion in the present paper and hence it will be dispensed of. The detailed exposition of Zabrocki's structural phonetics is provided in Zabrocki (1960 [1980]), cf. also Awedyk (2007).

ticular criteria give rise to separate arrangements, e.g. the arrangement according to the mass of opening, or of the physiological mass. The obtained arrangements (*układy*) can be crossed with each other to eliminate systemic neutralization. For example, the crossing of the two above mentioned arrangements yields the following linear order of consonants: *k – p – t – c – s – m – n – l – r*... A schematized, simplified system based of the value of the aperture of sounds is as follows:

k
p – c – s – m – n – l – r – h – j –w – i – u – e – o – a
t

Figure 6. A simplified system based on the value of the aperture of sounds.
Adapted from Zabrocki (1960 [1980: 56]).

The hierarchy in Figure 6 should not be understood as a recapitulation of sonority hierarchy which imposes a direct or implicational scale on phonological shifts. The simplified scale I used is only a substantial arrangement based on articulatory and not acoustic features (a detailed motivation for this issue is provided in e.g. Bańczerowski 1980: 14ff).

According to Zabrocki, each process should be analyzed in the corresponding phonetic arrangement. We are dealing thus with the correspondence of a given process to a specific arrangement. The process, by its linear progress in the arrangement, has its foothold and its regular shift; it cannot produce any leaps in the system. For example, in the arrangement *rk – lk – nk*, based on system A, the fortitive process can peter out already at the *lk* cluster. If it is stronger, the progression can encompass the cluster *lk*, terminating at the *nk* cluster. However, a situation when, for example, in a given language, a fortition occurs at the *nk* cluster but not at *lk* and *rk*, is impossible (Zabrocki 1960 [1980: 64f]).

Within the traditional generative approach the /r/ deletion is represented as follows:

$$/\mathrm{r}/ \rightarrow \varnothing \; / \; \_ \left\{ \begin{array}{c} \# \\ \mathrm{C} \end{array} \right\}$$

Figure 7. An SPE-type formalization of /r/ deletion in RP.

The rule in Figure 7 can be interpreted as saying that /r/ is deleted if followed by a word boundary or a consonant. Figure 8 shows the rule representing the [l] : [ɬ] alteration:

$$/l/ \rightarrow [ɬ] / \_ \left\{ \begin{matrix} \# \\ C \end{matrix} \right\}$$

Figure 8. An SPE-type formalization for the velarization of /l/ in RP.

These two representations, called "rules" in generative grammar, have in common only one meta-linguistic aspect. Namely, they are written on an *ad hoc* basis. They only state the fact that word finally and preceding a consonant English /r/ is elided and /l/ is velarized. The "rules" are unable to provide any congruent motivation for what they describe, in other words, they only accommodate the data. However, the environment of the two alterations is exactly the same. Furthermore, both phonemes belong to the same group – both are liquids.[36]

For illustrative purposes, (6) represents a crude and schematic transcoding of the rule in Figure 7 into an OT mechanism. I do realize that my tableau is very "pedestrian" but nothing in the OT epistemology defies it. The tableau makes explicit use of the boundary, but there are not theory internal constraints on the formulation of constraints. I used the tableau as an eristic strategy to hide the description and to show the parallels of contemporary phonologies with the SPE progenitor.[37]

(6)

/kɑr/ 'car'	* /r/ _C,#	MAXV
/kɑr/	*!	
☑ /kɑː/		
/k/		*

A B&B analysis with the support of Zabrocki's structural phonetics can supply a more unified interpretation, which might be stated as follows:

[36] It must be admitted here that generative analysis has made some progress since the times of SPE: the syllable, and namely the coda constituent, were (re)introduced into the theory in the 1970s precisely because of the kind of disjunction that I am talking about. Nevertheless (cf. Introduction) the perspective adopted in this article assumes the equal diacritic ontology of both "#" and prosodic categories: "[f]inally, just like the boundaries, the units of the Prosodic Hierarchy are arbitrarily chosen and named: 'ω' (the phonological word), 'φ' (the phonological phrase) etc. are not any less arbitrary than '+' and '#'. For some reason, however, people always point out the arbitrariness out of the typewriting symbol '#' but do not react when talking about omegas" (Scheer 2008: 158f).

[37] There might of course be a variety of OT interpretations of /r/ deletion; the issue is epiphenomenal for my point.

(2) Liquids in RP require n →B binding to be realized.

At face value, this stipulation looks much like the regular syllable-based analysis: X is deleted in coda position. It must be noted here, though, that the whole enterprise of my reading of Direct Interface through B&B is that what is "reified" as "coda" or "boundary" (and "syllable" in B&B) is in fact a conglomerate of many factors, which can be singled out as axiomatic phonological entities for a given theory and which can make predictions. Coda position does not make any predictions because it is an *ad hoc* term. There is no inherent prediction in the statement "X is deleted in coda position", it is only a phenomenological description. The prediction I am motivating is finding a correlation between the so-far unrelated phenomena and trying to find the common phonological rotor for them. To the best of my knowledge, the connection between the absence of /l, r, h/ and /j,w/ as unbound cluster members in RP has not been posited or investigated so far. (2) could be for example undermined if, in RP, word-initial clusters such as, e.g. in (Pol.) *łkać* /wk-/ 'to weep' *lgnąć* 'to cling' or word-final as in *zmókł* /-kw/ 'he got wet', were licit. In other words, (2) tells something also about word-initial clusters, not only about the coda position.

In the environment of *answer* there are the following bindings:

(a) ɑ←n s→ə(←)r (b) ɑ←n s→ə r→ə←b→l̩

Figure 9. The representation of *answer* versus *answerable* in terms of B&B.

The same situation occurs in the case of /l/ with the reservation that since /l/ is stronger that /r/ as far as articulatory force is concerned (cf. Delattre 1966; Zabrocki 1960 [1980]), the lack of support of n→B does not result in the mute realization of /l/ but only in a change of quality. The underlying cause for such a change could be the fact that the change of /l/ into [ɬ] is one step towards the vocalization of /l/. In other words, it is a process aiming at achieving a canonical CV sequence:

(a) *rule* r→uː←ɬ *belfry* b→e←ɬf→r→i
(b) *allow* ə l→aʊ *all over* ɔː l→əʊ v→ə

Figure 10. The representation of the context for the vocalization of /l/ in B&B.

Further analysis of the phonotactic environment for the preference (1) yields the observation that the glides, i.e. the only consonantal group in RP which is more sonorous than liquids, do not occur at all in such contexts. The RP glides, similarly to /r/

and /l/, occur exclusively in the on-beat position. Hence, the generalization can be extended as:

(3) In RP the most sonorous consonantal groups, i.e. liquids and glides, require n→B support to be realized (or are unable to propagate B←n binding).

Let us next analyze the phonotactic environment of /h/ in RP. Just as glides and liquids, it occurs exclusively in the on-beat position. In other words, the representations and preferences specified for glides and liquids apply equally to the /h/ phoneme. In Zabrocki's taxonomy /h/ is placed between /r/ and /w/. Traditionally /h/ is described as a laryngeal fricative; however, there have been suggestions to place both /h/ and /ʔ/ in the glide category (Jakobson et al. 1951: 19). It could also be mentioned that in SPE (Chomsky and Halle 1968: 177) /h/ is classified as [−voc, −cons]. Functionally, /h/ is often compared with glides due to its function of a "hiatus breaker". Kreidler (1989: 68) paints it this way:

> Thus from one point of view /h/ is voiceless fricative like /f, θ, s, ʃ/. However, it differs from these fricatives in two respects: the friction is produced in the larynx, not in the mouth; and it has no voiced counterpart as the oral fricatives do [...]. From another point of view, if we examine a set of words like *he*, *hay*, *hat*, *hawk*, *hope*, *hoot*, we shall see that /h/ is articulated with the same tongue position and lip shape as the vowel that follows. From this point of view /h/ is the voiceless equivalent of whatever vowel comes next, and this is one reason for considering it a glide – a vowel-like phoneme which does not function as a vowel.
>
> (Kreidler 1989: 68)

Accordingly, for the RP sounds in question, we obtain a sequence /l – r – h – w – j/. Within the group of sounds in question, [l] has the smallest aperture mass (the greatest mass of closure), hence it can develop B←n binding, although it involves a change of quality of the phoneme into [ɬ], which is a more vocalized variant. A parallel explanation might maintain that RP /l/ as such is unable to propagate a binding and [ɬ] is the "default", closest "alter ego" of this phoneme that can propagate a binding, or the cost of binding is the velarization. For the remaining sounds in question, the mass of aperture is too big to enable sustaining B←n binding in the discussed phonotactic environment. Therefore in RP these phonemes in such contexts remain mute.

It might be argued here that in order for the /h/ in these words not to be pronounced, it would have to exist in the first place. The graphic presence of an /h/ should not be taken as good enough evidence to guarantee an underlying /h/. The distribution of /h/ in English is restricted to the word- (or morpheme-) initial location. There could not be any /h/ in coda position, not any more than intervocalically and it is therefore pointless to talk about a deletion process in coda position. To clar-

ify this aspect, I do not posit /h/ deletion but of the inability of the phonological system of contemporary RP to sustain the sound. My analysis aims to provide an independent motivation for the *ad hoc* enunciation that "the distribution of /h/ in English is restricted to the word- (or morpheme-) initial location and there could not be any /h/ in coda position, not any more than intervocalically", which sounds like an orthodox generative "rule". Of course, it may turn out that my analysis is flawed, due to factors of which I am ignorant at this level of analytical abstraction, and the explanation might be refuted or upgraded on a thesis/antithesis basis. Nevertheless, I claim that it is a crucial asset to posit the question *why*, why there could never be /h/ in coda position in English, and to search for an answer without a diacritic use of terminology.[38]

Moreover, without entering into diachronic debate, the so-called external evidence might be sufficient to support my suggestion. The <h> in loanword orthography usually stands for some kind of laryngeal fricative. While loanwords such as *savannah*, *cheetah* might be debatable, the lexeme *Allah*, which in the original has some version of /h/ word finally, in English is pronounced without it (*nota bene*, in Polish the word-final /x/ from the original is retained: /ˈallax/). In the words such as e.g. (E) *Hephsibah*, the initial <h> is pronounced but not the final one. A Polish intuitive reading of *Hefsibah* even without having any clue of what it stands for, would involve both /x/'s. Finally, it is widely known that the original for *Jahveh* had three consonants – JHV – which were obligatory, while there are speculations as to the quality of intervening vowels. The /h/ as some kind of laryngeal fricative is the obligatory middle one. However, in this phonotactic chain in RP reading the /h/ remains mute. It is a telling clue taking into account the cultural importance of the three consonants. On my analysis in this phonotactic position /h/ would have to propagate B←n binding, which it does not, and hence this *ipso facto* semantically obligatory /h/ cannot be sustained in RP. It is not elided in *Jehovah*, though, where the middle /h/ through vowel epenthesis is supported by n→B. Polish reading of *Jahve* is, of course, realized with the full version retained: /ˈjaxfe/.[39]

Resuming the discussion after the elenchus, the generalization captured in the analysis has so far consisted in treating /r/→∅ and /l/→[ɬ] as the outcome of the same process affecting RP glides and liquids. The consonantal phonemes of RP inventory with the smallest mass of aperture (/j, w, h, r, l/) are unable to propagate B←n binding which would sustain them in an off-beat position.

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[38] It might be noted in passing that /h/ can occur word-finally as a result of spirant coda lenition (the phenomenon which is analyzed *nomen omen* in Colina's paper as well). This fact rules out the possibility that the phonotactic restriction in question ensues from any internal property of the phoneme (cf. the widely occurring conceiving of /h/ as a voiceless onset to a following vowel).

[39] I use the symbol /x/ to differentiate the Polish realization from the English one, with full awareness of the fact that the Polish realization is still different from e.g. the Spanish /x/.

I do not imply, of course, that the provided interpretation is a unique motivation for the velarization of /l/. My analysis concerns the situation where the velarized /l/ occurs only in the coda position as a lenition, and the /r/ is not a trill-like realization. For example, in GA /l/ is velarized in all phonotactic positions, hence there is no phonological process of coda lenition of /l/ active, hence the rhotic nature of the variety coupled with the existence of the velarized /l/ does not invalidate my claim. Also, I submit that in e.g. Scottish dialects, the /r/ is phonologically a fricative not a liquid. Moreover, as pointed out by Weckwerth (p.c.), the comparison should rather be sought with the phenomenon of /l/-vocalization rather than /l/-velarization, as it is the former that seems to be the proper counterpart of /r/ deletion. In cross-dialectal studies, this does not solve the conundrum, since there are varieties that have both processes (South-East England and contemporary standard RP), or just one (Australia, Philadelphia).[40] There are also cases where indeed the phonological behavior of /r/ provides a better parallel with /l/-velarization because the full vocalization of /r/ in coda positions does not occur, which is the case with some varieties of Scottish English, Danish or Swedish. The allophonic range of /r/ in these ethnolects resembles /l/-velarization, with the more consonantal version of /r/ occurring in coda-mirror positions and less consonantal realization in coda positions (Weckwerth, p.c., October 2008).

To conclude this argumentative thread, it might be of merit to recall Scheer's motivation for the Coda Mirror epistemology

> recall that the Coda Mirror is not a theory that predicts *when* a lenition or fortitions is supposed to occur, but *where* it takes place and if so, *why*. This statement may actually have a larger scope: nobody knows when a velar will be penetrated by a following palatal agent. The only thing that we can theorize are the circumstances that allow or disallow for such a movement, and the reasons that are at its origin.
>
> (Scheer 2004: 738f)

Taking this into account my analysis is coherent: the fact that the dark /l/ may become totally vocalized in RP (cf. Cruttenden 2001: 83) as in *fill* ([fɪʊ]) or *middle* is in fact predicted as the next step of the process posited and fits in the suggested scenario of eliminating the dispreferred phonotactic position for /l/.

Now I am in a position to return to the weak/strong position dichotomy in the Direct Effect. Zooming in on the positional force, the line of investigation in (3) can be extended as:

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[40] See also the insightful discussion on l-vocalization and the occurrence of intrusive sounds (hiatus breakers) on the Linguist List at <http://linguistlist.org/issues/19/19-3236.html>.

(4) B←n binding has a weakening effect on the target consonants. Contrastively, n→B has a strengthening effect.[41]

We can now collapse the environments in Table 1 and Figure 2 in terms of the binding propagation parameter, which yields:

– The phonological identity of Coda: _# and _C; the presence of B←n and the absence of n→B.
– The phonological identity of being intervocalic (V_V): the presence of B←n and the presence of n→B. It may be noted that the destructive aspect of the B←n loading on the consonantal life seems to overrule the positive effect of n→B, which might point towards possible further theoretical reductions, namely the parameter of presence/absence of B←n binding solely.[42]
– The phonological identity of the Coda Mirror: #_, C_; the absence of B←n binding and the presence of n→B.

It must be pointed out that in B&B there is a parameterization of the probability of the weakening on the word-medial consonant depending on the Level 0 (rhythmic taxonomy) of the language. To wit, prototypical beat-timed languages do not possess B←n binding at all. "As a consequence of the lack of an internal B←n binding, one expects no weakening of an intervocalic consonant in this type of language" (Dziubalska-Kołaczyk 1995: 67). In non- prototypical beat-timed languages, on the other hand, the consonant

> may weaken in these circumstances: it now also participates in a weaker binding B←n. This accounts for the prediction traditionally expressed in terms of a position within a word: word-initial consonants are expected to strengthen, word-internal and word-final ones are expected to weaken.
>
> (Dziubalska-Kołaczyk 1995: 68)

My contribution consisted in collapsing the epistemologies of CVCV and B&B. Namely, the crucial insight of the Coda Mirror is that there might be weakening and strengthening factors contributing to the consonantal life under phonotactic loading.

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[41] Alternatively, following the formulation in Ségéral and Scheer (2001: 117), we might assume that the strong position simply reflects the lack of the weakening effect (the non-events). The force of the position translates into the fact that the consonants there are exempt from alterations (or less prone to alterations).

[42] The next detrimental factor which shortens consonantal life would be a total absence of any bindings, as in consonantal clusters featuring more than two consonants: $VC_1C_2C_3V$, but there we enter Level 2 clustering preferences.

I formalized that in B&B submitting that n→B strengthens, while B←n weakens.[43] There are also benefits to be gained in development of the Coda Mirror as such: it seems that the relative position V_V might be more propitious than _C,# as long as there is still a C→V binding apart from a V←C one.

5. Conclusions

The foregoing pages proposed to synthesize ideas from Dziubalska-Kołaczyk's Beats-and-Binding model (Dziubalska-Kołaczyk 1996, 2002, *inter alia*) and Scheer's recent work by examining the Direct Interface effect (Scheer 2005, 2008 *inter alia*) in a "meta-framework" of epistemological criticism (cf. Lehrer 2000 for the exposition of epistemological criticism).

The discussion highlighted the fact that the theoretical foundations of B&B imply the Direct Interface epistemology. The true phonological objects in the B&B are beats and bindings, which are able to make predictions in the phonology within four levels of preferences. From such a perspective, boundaries are not a diacritic in B&B: the effect of a phonological boundary is a result of two factors: the lack of a phonological binding in the phonotactic chain plus the TO order, which transmits morpho-syntactic information. Such an order constitutes the violation of phonological preferences by the morphology.

The paper grounded its claims in the empirical study of Spanish reparsing, comparing the analysis with the scenario suggested by classical Optimal Theoretic research. Using only the true phonological entities of B&B, I bypassed the need to recourse to quasi-phonological beings such as "a syllable" or "a boundary". The empirical support came from the B&B interpretation of /l/ velarization and /r/ deletion in RP English, which was interpreted as part of a single synchronic process affecting RP's most sonorous consonants. The study also showed the possibility to formalize Coda/Coda Mirror positional identities in terms of beats and bindings. My final contribution to the development of B&B comprised the formulation of a binding reordering (in accordance with the predictions of the theory with respect to beat-timed languages) which I suggested to denominate "binding shift". In this way, the reported study hopes to both contextualize the B&B theory within mainstream phonological schools and to enhance some of its epistemological assets.

[43] A discussion whether the bindings correspond to the government and licensing is beyond the thematic scope of the present paper.

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