

New Laryngeal Realism meets Polish voicing

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ABSTRACT

Polish voicing data have long been in the centre of the phonological debate as they present a formidable puzzle which requires theoretical decisions concerning representation, computation, as well as the relation between phonology and phonetics. Recent findings in experimental phonetics further complicate the discussion in that now one of the central problems in phonological analyses of obstruent devoicing or voicing assimilations is whether the incompleteness of neutralisation should be formally expressed and how. As a result, it appears that approaches striving to accommodate the experimental results begin to resemble traditional Generative proposals in some respects, and thus nearly a full circle in the development of phonological theory has been made.

KEY WORDS: Polish voicing, Laryngeal Realism, neutralisation, assimilation

1. Introduction

Laryngeal phonology has witnessed a number of new theoretical developments and proposals in recent years, and the Polish data have always been central to this debate. The number of theoretical issues that relate to the problem of laryngeal phonology is impressive even if we bypass the main phonological trends such as whether sound patterns are best described by means of rules and their ordering, constraints and their ranking, or neither of the two. These major framework decisions are important and shape the analyses of laryngeal phenomena to a great extent. In this paper, however, they will not play an important role, although, for simplicity, we will refer to rules as a handy and clear descriptive tool.

No less important, however, are the questions to do with the actual phonological representation of laryngeal distinctions, but also the relationship between phonology and phonetics. The latter issue is very complex as it leads to decisions about how much phonology is needed to account for the observed sound patterns, or how much phonology actually must be there, and how much can be explained better by the phonetic theory and should not be duplicated in the phonology. The nature of the relationship between phonetics and phonology is currently a hot topic not only within laryngeal phonology. Some aspects of this interface will be raised and discussed below.

The central issue in this paper will be the representation of laryngeal distinctions. It is commonly believed that some representational systems are better than others at accounting for the phonological behaviour of segments. Here, the typical dilemmas concern the nature of sub-segmental primes and the way they can be employed. For example, to express the contrast between [b]as ‘bass’ and [p]as ‘belt’ in Polish one may use the feature [voice]. But it may be used privatively (e.g. Bethin 1992), or as part of a binary system (e.g. Keating 1984; Rubach 1996). In the former system, typically, [voice] is assigned to the voiced obstruent, while the voiceless one remains unmarked, either throughout the derivation (non-specification), or just at the lexical level (underspecification). On the other hand, in binary systems, one congener is assigned [+voice], while the other possesses [–voice]. Quite another issue is whether [voice] is the right category to speak of (e.g. Schwartz 2016).

Another, and equally important theoretical assumption concerning the representation of laryngeal contrasts is one of unity and integrity of voice. This problem concerns the representation of voice in sonorants, which are viewed by some phonologists as spontaneously voiced, that is, not requiring a laryngeal feature. This coincides with the fact that sonorants rarely exhibit voicing contrasts, and with the general inactivity of sonorants in voice related phenomena such as final devoicing or assimilations. The problem is that sometimes, sonorants seem to contradict this view. The phenomenon of pre-sonorant voicing in sandhi contexts in Cracow-Poznań Polish to be discussed below is a prime example of this. Thus, one school of thought assumes the unity and integrity of voice (e.g. Itô, Mester and Padgett 1995). This means that both obstruents and sonorants are marked by means of the same category and

in the same way. Namely, both voiced obstruents and sonorants have [+voice]. Another school of thought maintains the idea of disunity of voice (e.g. Chomsky and Halle 1968; Rice 1993; Harris 2009). Here, it is assumed that either the sonorants must have a different category which is responsible for their universally observed voicing and voice related activity (Rice 1993), or sonorants must not contain any voice specification (Harris 2009) and their voice related activity must be given an interpretation that does not rely on the presence of the feature [voice].

In what follows, we first look at the basic facts and theoretical problems concerning voicing phenomena in Polish. These will be described by means of the traditional rule-based and binary system (Rubach 1996). We will identify some problems following from the recent evidence from experimental research. Section 3 outlines the basic tenets of Laryngeal Realism, while Section 4 highlights its failures with respect to Polish data leading to Laryngeal Relativism. In Section 5, we present a new proposal which may be called New Realism and identify the main questions that it entails with respect to Polish facts. Some discussion will follow in the concluding section.

2. Polish voicing data – a traditional look

Polish obstruents contrast fully voiced congeners [b, d, g, dz, dʒ, v, z, ʒ, ʒ] with voiceless unaspirated ones [p, t, k, ts, tɕ, f, s, ɕ, ʃ, x] in non-neutralising contexts, that is, if not in pre-obstruent or word-final position. This leaves the pre-vocalic context, with or without an intervening sonorant (C(S)V), as the context in which the distinction can be observed.

(1)

[bul]/ [pul]	<i>ból/ pól</i>	‘pain, nom.sg./ field, gen.pl.’ ¹
[riʒa]/ [riʒa]	<i>ryza/ rysa</i>	‘ream, nom.sg./ scratch, nom.sg.’
[bwotem]/ [pwotem]	<i>blotem/ plotem</i>	‘mud, instr./ fence, instr.’

¹ The following abbreviations and symbols are used in this paper: ‘nom.’ – nominative, ‘sg.’ – singular, ‘gen.’ – genitive, ‘pl.’ – plural, ‘instr.’ – instrumental, ‘→’ – becomes, ‘↔’ – is interpreted phonetically as.

All the main phenomena to do with voicing in Polish occur as a result of absence of the vowel following the relevant obstruent. The phenomena we consider in this paper are briefly illustrated below and include Final Obstruent Devoicing (FOD) (2a), Regressive Voicing Assimilation (RVA) (2b), and pre-sonorant sandhi voicing (2c).² This phenomenon is restricted in occurrence to a group of dialects called Cracow-Poznań Polish (CPP), and is absent in what is often referred to as standard Polish, that is, the Warsaw dialect (WP). For simplicity, the data in (2a, b) below do not include sonorant consonants following the relevant obstruent or intervening between two obstruents involved in assimilation. Likewise, the RVA is illustrated with examples of morphological derivation, while the same effects occur both root-internally and across word boundaries.

(2)

a. **Final Obstruent Devoicing (FOD)**

[stogu]/ [stuk]	<i>stogu/ stóg</i>	‘haystack, gen.sg./ nom.sg.’
[zaba]/ [zap]	<i>zaba/ żab</i>	‘frog, nom.sg./ gen.pl.’

b. **Regressive Voicing Assimilation (RVA)**

[lʲitʃitɕ]/ [lʲidʒba]	<i>liczyć/ liczba</i>	‘count/ number’
[zaba]/ [zapka]	<i>zaba/ żabka</i>	‘frog/ dim.’

c. **Cracow-Poznań pre-sonorant sandhi voicing**

	WP	CPP
<i>krzak róży</i> ‘rose bush’	[kr]	[gr]
<i>skład leku</i> ‘medicine ingredients’	[tl]	[dl]

Let us use Rubach (1996) as an example of a traditional analysis of the Polish voicing facts.³ It is a proposal in which the laryngeal distinctions are expressed in a binary fashion, that is, by using [+voice] on voiced obstruents and [–voice] on the voiceless ones. FOD (2a) is analysed in this approach as a two-step phenomenon leading to a replacement of

² Progressive Voicing Assimilation will be left aside. For a recent analysis of this phenomenon, see Cyran (2014).

³ For other traditional accounts see, for example, Bethin (1984) and Gussmann (1992).

[+voice] with [–voice]. Firstly, the word-final obstruents lose their specification by one rule, and then, at some point of the derivation, the unspecified obstruents receive [–voice] by a default rule. Thus, at the end of the derivation a devoiced obstruent has the same representation as the lexically voiceless one. We are dealing with a neutralisation of the contrast.

In the cases of RVA (2b), the analysis is also a two-step one. In step one, the first of the two adjacent obstruents loses its specification, whether voiced or voiceless. In the second step, the following obstruent spreads its specification onto the preceding unspecified neighbour. Thus, the assimilation is symmetrical and also neutralising, like FOD.

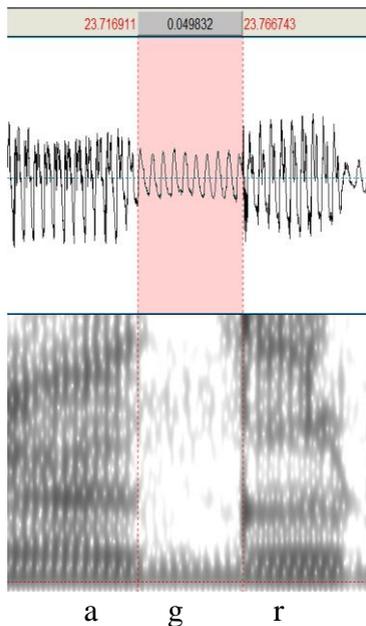
As for the phenomenon of pre-sonorant sandhi voicing assimilation in CPP (2c), a number of comments are in order. Firstly, the term ‘pre-sonorant’ covers both sonorant consonants and vowels, e.g. *brat ojca* [brad ojtsa] ‘father’s brother’. This phenomenon has attracted a lot of theoretical attention in connection with the representation of sonorants with respect to [voice], and how dialectal differences like the one between CPP and WP should be expressed. It should be noted that the voicing in the final, lexically voiceless obstruent in *krzak róży* looks the same phonetically as the voicing in the word-internal, lexically voiced obstruent in *nagród*, as shown in (3).

Like in the case of FOD and RVA the pre-sonorant sandhi voicing is also generally viewed as neutralising. Firstly, the voicing in the assimilated and the lexically voiced obstruent seems identical. Secondly, in CPP, the phenomenon not only re-voices the lexically voiced, but also voices the lexically voiceless obstruents. That is, the lexical objects are treated on a par. The same, in a sense, takes place in WP, in which neither of the series is voiced in the sandhi context.

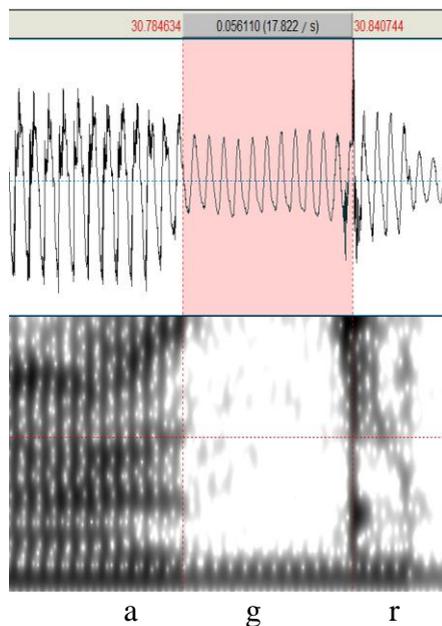
(3)

CPP *krzak róży* ‘rose bush’

/k#r/ ↔ [gr]

CPP *nagród* ‘prize, gen.pl.’

/gr/ ↔ [gr]



The phenomenon of pre-sonorant assimilation is theoretically significant as it extends the discussion on the representation of laryngeal properties in phonological segments from obstruents alone to other types of segments. While in obstruents there is a lexical distinction that requires laryngeal marking, there is no such opposition among sonorants. On the other hand, pre-sonorant assimilation in sandhi contexts seems to require, at least in some models, the presence of [+voice]. The question then is how to express the phenomenon, but also the distinction between CPP and WP. One possibility that may be entertained is that perhaps [+voice] is present in CPP sonorants, but not in WP. This representational hypothesis would predict a different behaviour of CPP sonorants in sandhi, but it would also predict such differences in other contexts, which is not the case. For example, both dialects exhibit identical behaviour of sonorant consonants trapped between two obstruents: they ensure visibility and assimilation between the flanking obstruents, e.g. *Jędrək/ Jędrka*

[jɛndrɛk]/ [jɛntrka] ‘Andrew, nom.sg./ gen.sg.’. Interestingly, if anything, this transparency of sonorants supports the view that sonorants are not marked for [+voice], because that could block visibility, and yet this property seems to be needed in pre-sonorant sandhi voicing assimilation in CPP.

Rubach (1996) solved the above-mentioned dilemmas by means of two theoretical tools that, however, have since then been largely abandoned. Since sonorants do not contrast for [voice] they are unmarked for this feature lexically and obtain it in precisely specified stages during the phonological derivation. At the same time, these stages are interspersed with ordered rules, including the one of voicing assimilation by spreading [+voice]. Thus, at the relevant stage when the Voicing Assimilation rule applies, the sonorants in words like *Jędrka* are not yet specified, while the word-initial ones, as in *róży* are already specified in both dialects. Thus the dialectal distinction is not expressed representationally, but it can be made computationally. Simply, CPP is assumed to possess a rule of spreading [+voice] from any type of segment that has this property, including sonorants, while in WP the rule has a restricted application in that it spreads [+voice] only from obstruents. Thus, the difference between CPP and WP is made in the rule component.

As signalled above, both underspecification and rule ordering, not to mention rules themselves, have been largely eschewed in current phonological theory for independent reasons, and a new look at CPP sandhi voicing is required. However, this task is made difficult by the fact that more and more theoretical models assume that sonorants must not possess any laryngeal specification. This means that it is more difficult to express the pre-sonorant sandhi effects by means of phonology alone.

A final remark concerning the Polish voicing facts refers to the problem of incomplete neutralisation (IN). Languages which exhibit FOD, for example, German, Dutch or Polish, have traditionally been described as neutralising the contrast between the lexically voiced series and the lexically voiceless one. This, in traditional frameworks, took the form of replacement of the feature [+voice] in the relevant context with [–voice], that is, with exactly the same feature that defines the lexically voiceless series. Neutralisation of contrast should mean that the distinction is lost. This, however, goes against a growing body of experimental literature since early 1980s showing that the devoiced obstruents exhibit

statistically significant differences from the lexically voiceless congeners. Such findings concern, for example, Polish (Slowiaczek and Dinnsen 1985), German (Port, Mitleb and O'Dell 1981; Port and O'Dell 1985), Dutch (Ernestus 2000), and Catalan (Dinnsen and Charles-Luce 1984). These results have been countered by some literature, e.g. Jassem and Richter (1989) for Polish, or Fourakis and Iverson (1984) for German, but the balance seems to swing in favour of the view that the neutralisation is in fact incomplete.⁴ What is more, Strycharczuk (2012a, 2012b) found that the underlying distinction between voiced and voiceless obstruents in Polish persists not only in FOD but also in RVA and CPP pre-sonorant sandhi voicing assimilation, that is, in all the phenomena described briefly in (2).

The phonological analyses of the voicing phenomena in (2), including those of similar phenomena in other languages such as German or Dutch, generally do not encode the incompleteness of neutralisation, which is partly due to the inability to express this phenomenon in formal terms.⁵ For example, in the framework used in Rubach (1996) the shift from [+voice] to [-voice] produces an identical representation to that of the underlying [-voice]. Incomplete neutralisation would seem to require some phonological difference. One possibility would be to assume that the delaryngealised obstruent remains unspecified and so is different from the underlying [-voice]. This cannot be done in Rubach's model for two reasons. Firstly, the systematic phonetic level of representation, that is, the last stage of the phonological derivation before phonetic implementation must be fully specified in that model. And secondly, the rule of delaryngealisation word-finally in fact affects both voiced and voiceless congeners in this analysis. Therefore, the neutralisation occurs regardless of whether we leave the delaryngealised word-final obstruents unspecified or fill them with the default rule supplying [-voice]. It also seems impossible to restrict the delaryngealisation rule to just [+voice], as

⁴ There are rare but quite outstanding critical voices among phoneticians themselves concerning the validity of the Laboratory Phonology programme and studies in incomplete neutralisation in particular (Kohler 2008, 2012).

⁵ Nevertheless, some attempts do exist, e.g. the 'turbidity theory' (van Oostendorp 2008), the analysis of German in Brockhaus (1995), to be mentioned below, or the Radical CV Phonology proposal which will be discussed at length in Section 5 (van der Hulst 2015).

the bare unspecified stage is needed for the application of RVA by spreading. Some of the ideas mentioned above have been entertained in other models, to which we turn below, and also in the main proposal scrutinised in this paper, that is, van der Hulst (2015).

3. Laryngeal Realism

Laryngeal Realism is a representational approach which is independent of a particular phonological model of computation in that, for example, traditional features or elements may be used (Harris 1994, 2009; Helgason and Ringen 2008; Honeybone 2002, 2005; Iverson and Salmons 1995; Beckman, Jessen and Ringen 2013; Gussmann 2007). One distinguishing characteristic of this approach is privativity of the representation of laryngeal contrasts. Thus, in a two-way laryngeal contrast system, only one series is marked phonologically, while the other is unmarked. Another characteristic trait of Realism is a close relation between phonological representation and phonetic facts. Both characteristics will be expanded on below.

It has been observed cross-linguistically that particular three phonetic categories aligned along the continuum based on the so-called VOT (Voice Onset Time) reoccur in linguistic systems ((Lisker and Abramson 1964; Keating 1984; Cho and Ladefoged 1999), namely, fully voiced obstruents, voiceless unaspirated, and voiceless aspirated ([b – p – p^h]). Additionally, it has been noted that most European languages, which have a two-way voicing contrast, utilise two out of the three categories, but each system possesses the plain voiceless [p]. One group of languages, called ‘voice’ systems, contrasts fully voiced [b] with voiceless unaspirated [p]. These systems happen to occur within the Slavic and Romance family. Exceptionally, Dutch, a Germanic language, seems to belong to this group. The other group of languages, the Germanic family, except Dutch, contrasts the voiceless unaspirated [p] with voiceless aspirated [p^h]. In these systems, the unaspirated series may be subject to passive voicing in phonetically voiced and phonologically weak positions, as in, for example, English (Kohler 1984; Harris 1994, 2009; Iverson and Salmons 1995, 2003; Avery and Idsardi 2001). At the same time, pre-contrast systems, that is, those which have no laryngeal distinction, like

Hawaiian, seem to tend to possess only the voiceless unaspirated series (e.g. Westbury and Keating 1986).

On the basis of these observations, it is assumed that the plain voiceless obstruent [p] is always unmarked laryngeally. On the other hand, the fully voiced [b] in a ‘voice’ language has a feature [voice], or element |L|, while the aspirated [p^h] in ‘aspiration’ languages is given the feature [spread], or element |H|. Thus, Realism moves away from the traditional view that all two-way systems may represent the laryngeal contrast with a binary opposition [+voice] vs. [-voice] (Keating 1984). Privativity also enforces the view that sonorants are unmarked. This is due to the fact that they do not exhibit a voicing contrast and are generally inactive in voicing phenomena.

Laryngeal Realism neatly defines a typology of languages in terms of representation alone. For example, languages with no laryngeal contrast use no laryngeal category (Ø), e.g. Hawaiian. The two types of two-way contrasts are L vs. Ø, e.g. Polish, and H vs. Ø, e.g. English. A three-way system is L vs. H vs. Ø, e.g. Thai. And finally, the two phonological categories are able to express a system with a four-way contrast, e.g. Hindi. All that needs to be assumed there is that the two categories also combine in one segment: H-L vs. L vs. H vs. Ø.⁶

The criteria for deciding whether a given system is [voice]/ |L| vs. Ø, or [spread]/ |H| vs. Ø are generally based on phonetic observation. For example, Polish is deemed a ‘voice’ language on the basis of the presence of full voicing in obstruents, as seen in (3), but also on the basis of the observed battery of phonological phenomena, that is, FOD and RVA in particular (2a, b). On the other hand, ‘aspiration’ systems contrast aspirated with plain obstruents, and exhibit no RVA, e.g. Icelandic (Gussmann 2009).

The ‘realistic’ analysis of the Polish data in (2) works very well up to a point. Since Polish voiced obstruents possess [voice]/ |L| and the voiceless series are unmarked Ø, FOD receives a very simple and elegant account as a single step phenomenon in which the marked property is lost in the relevant context: if not followed by a vowel, that is, in word-final and pre-obstruent context. In other words, the obstruent becomes laryngeally unmarked (Ø).

⁶ It is not clear how this system would define ejectives or creaky voice, though (see Section 5).

(4)

FOD

stóg /stug^L/ → /stug⁰/ ↔ [stuk] ‘haystack’*stuk* /stuk⁰/ → /stuk⁰/ ↔ [stuk] ‘knock’

It should be noted that the analysis, like in traditional approaches, must ignore Incomplete Neutralisation (IN). Phonologically speaking a devoiced obstruent is identical to the lexically voiceless, unmarked, object.

There is an analysis of German within the Element Theory (Brockhaus 1995), which attempts to rectify the situation by compromising privativity to some extent. The author marks the German voiced obstruents with |L| ([voice]), the lexically voiceless ones with |H| ([spread]), while the ones which are due to FOD, that is, loss of |L|, are unmarked (Ø). Thus, Brockhaus uses privative elements in a non-privative way: a two-way opposition is lexically represented with two categories. However, the IN finds a direct formal reflection in this analysis because the voiceless and devoiced obstruents are phonologically different. A similar idea reappears in van der Hulst (2015), to be discussed below.

Returning now to voicing assimilation (2b), Laryngeal Realism provides an interesting twist to the traditional binary analysis which, it will be recalled, was symmetrical in nature in that either [+voice] or [-voice] spread leftwards. A privative analysis of RVA in Polish *liczba* and *żabka* is asymmetrical. In the former, [voice]/ |L| spreads from /b/ to the preceding non-specified /tʃ⁰/, while in the latter, /b/ loses [voice]/ |L| and the entire cluster becomes neutral. Thus, IN is again not encoded because there is no phonological distinction between the lexically neutral and the neutralised obstruent.

(5)

RVA

liczba /litʃ⁰-b^La/ → /litʃ^L-b^La/ ↔ [lidʒba] ‘number’*żabka* /ʒab^L-k⁰a/ → /ʒab⁰-k⁰a/ ↔ [ʒapka] ‘frog, dim.’

It should be noted that this analysis of RVA has one very clear advantage over binary models. Its in-built asymmetry is neatly consistent with some typological facts. For example, Ukrainian does not exhibit FOD, e.g. [hryb] ‘mushroom’ vs. [hryp] ‘grippe’, while RVA in this language is

limited to [voice]/|L| spreading, e.g. [proz'ba] 'request' (Lombardi 1995: 54). There is no assimilation to a following voiceless obstruent, e.g. [ridko] 'seldom'. This peculiar pattern can be explained in a straightforward manner by assuming that Ukrainian simply does not have a rule of delaryngealisation – neither word-finally nor in pre-obstruent position is the laryngeal property lost from the representation.

4. From Realism to Relativism

Pre-sonorant sandhi voicing in CPP (2c) presents a serious challenge to Laryngeal Realism. There are a number of questions relating to this phenomenon such as: i. how are sonorants able to voice obstruents, as in *krzak róży* (3)? ii. why does this phenomenon occur only across a word boundary? iii. what constitutes the critical difference between CPP and WP with respect to pre-sonorant sandhi voicing?

Since for Laryngeal Realism the presence of full voicing, as observed in (3), constitutes hard evidence that we are dealing with a 'voice' language, that is, one in which the voiced series is marked with [voice]/|L|, the voicing of the word-final target must be described as: $C^o \rightarrow C^L$. The unmarked obstruent receives a specification in the pre-sonorant sandhi context. The assumption that the target is indeed unmarked is based on the fact that the phenomenon affects both types of underlying segments, of which one must be non-specified – /p^o/, while the other most probably becomes unspecified by means of FOD: $b^L \rightarrow b^o / _ \#$. At any rate, since Polish is a 'voice' language by the assumptions of Laryngeal Realism, at least the lexically voiceless obstruents must be neutral, which is why we focus on the example of *krzak róży*. Thus, the question of the source of [voice]/|L| is crucial. Sonorants are not marked with [voice]/|L|, and yet they provide this property to the word-final obstruents in CPP sandhi voicing. The paradox of assimilation from a non-specified trigger is critical. Either Laryngeal Realism compromises its representational assumption and assigns [voice]/|L| to sonorants (cf. Rice 1993), or it is wrong in general and should be abandoned. It should be noted that allowing sonorants to possess laryngeal properties takes us back to the traditional account of Rubach (1996), and, like in the traditional analysis, the distinction between CPP and WP will have to be computational: some

rule or principle would allow [voice]/ |L| to spread from sonorants to neutral obstruents only in CPP and only across a word-boundary. Since the word-final context may be considered to be neutralising, the question why the voicing occurs across word boundaries is solvable: this is the context in which a target C^o is found. In WP, on the other hand, one would have to assume that [voice]/ |L| does not spread from sonorants in any context. It will be recalled that a representational distinction assuming that sonorants are marked in CPP and not marked in WP is untenable, as explained above in relation to cross-sonorant RVA in words like *Jędrka*.

But a representational analysis of the phenomenon is still possible, except that it should concern the representation of obstruents rather than sonorants. A solution to the above paradox is provided in Cyran (2011, 2014), where it is assumed that sonorants can never possess any laryngeal specification (cf. disunity of voice). At the same time, an attempt is made to account for the CPP and WP patterns representationally rather than computationally. Contrary to the ‘realistic’ views, it is assumed that the markedness of a given series of obstruents within a phonological system is a matter of an arbitrary choice. In other words, a ‘voice’ language may mark its voiced obstruents, or its voiceless ones. The difference is merely interpretational, that is, it concerns the relationship between phonology and phonetics. The phonetic categories remain the same, that is, fully voiced vs. plain voiceless, however, the phonological marking may be reversed. Below, C^L is a WP voiced obstruent, C^H is a CPP voiceless obstruent, while C^o corresponds to the phonologically unmarked series in both systems, which, however, relates to different phonetic categories.⁷ C^o is plain voiceless in WP, but fully voiced in CPP.

(6)

Contrast: WP vs. CPP

WP	/p ^o itc/		/b ^L itc/
	↓		↓
	[p ^o itc]	pić ‘to drink’	[b ^L itc] bić ‘to hit’
	↓		↓
CPP	/p ^H itc/		/b ^o itc/

⁷ In Laryngeal Realism the ‘aspiration’ systems mark the aspirated series with [spread]/ [H]. Thus, we are assuming that CPP has the representation of an ‘aspiration’ system but it is phonetically a ‘voice’ system.

In this relativistic model CPP neutral obstruents are fully voiced unless in word-final position. In other words, C^o requires a phonetically voiced following context in order to sound voiced. On the other hand, C^o in WP is regularly voiceless in this context and in fact, cannot be voiced.

The analysis of CPP sandhi voicing is then very simple. It retains strict privativity of representation: only one series of obstruents is marked, and sonorants must not be marked. There is no phonological rule of pre-sonorant voicing, nor do sonorants trigger any voicing in a phonological way, that is, by spreading features or elements. Simply, in CPP, the neutral (and neutralised) obstruent must be phonetically interpreted as voiced in a phonetically voiced context. This interpretational or implementational requirement works in all contexts, not just word-final. In WP, on the other hand, the same phonological object C^o must be interpreted as voiceless, also in other positions within the word.

Laryngeal Relativism seems to account for CPP sandhi voicing, but it requires a redefinition of the role of phonetic evidence in proposing phonological representation. The relation between phonetic categories and phonological ones is now arbitrary. Full voicing in the spectrogram in (3) does not settle the representational decision of a given system, while plain voiceless obstruents must not be automatically assumed to be unmarked. Thus, it may be assumed that Relativism allows us to alleviate the problems run into by Realism. It should be noted, however, that both approaches still have to grapple with the problem of Incomplete Neutralisation.

In what follows, we consider a new proposal, which we will dub New Realism, which seems to have a way of incorporating IN into the privative representation. It is ‘realism’ because the decision as to which congener is marked is made at the outset, in fact, before even looking at phonetic facts. It is ‘new’ because, unlike old Realism, it always marks the plain voiceless series in the so-called voicing languages. Thus it assumes that all voicing systems are like CPP.

5. New Realism, old questions

Van der Hulst (2015) takes Laryngeal Relativism one step forward, to a proposal that should probably be called New Realism. Building on the relativist idea that voiced obstruents in a ‘voice’ language might in fact be

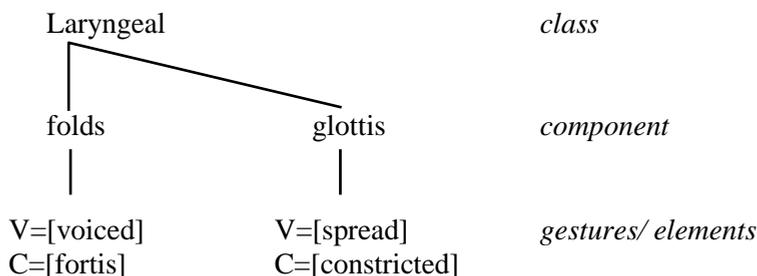
analysed as lexically unmarked for laryngeal properties, van der Hulst (2015) makes a sweeping claim that all languages with a two-way laryngeal contrast stem from one underlying representation. Van der Hulst distinguishes between what he calls ‘phonemic’ level of representation and phonological representation. This distinction echoes the one in underspecification theories in which the lexical/ underlying representation (/.../) was deprived of non-contrastive default features which were supplied by phonology to arrive at a fuller representation (/.../) which is then ready for phonetic implementation ([...]). In this respect Radical CV Phonology (RcvP) is different from, for example, the Element Theory (e.g. Harris 1994) in which phonetic interpretation is possible at all stages of derivation: a lexical form does not require any additional default properties.

It will be recalled that in Laryngeal Realism ‘voicing’ languages are defined as [voice]/ |L| versus unmarked, while the ‘aspiration’ systems are unmarked versus [spread (glottis)]/ |H|. In van der Hulst’s proposal the two systems are underlyingly the same, in that the opposition is always expressed as unmarked versus ‘fortis’ (∅ vs. [fortis]). The property [fortis] can be roughly, but to some extent aptly, defined as ‘resistance to voicing’. Thus, the phonetic correlates of this property are all or some of the articulatory gestures that inhibit vocal cord vibration (cf. Halle and Stevens 1971). The division into ‘voice’ and ‘aspiration’ types of languages, however, is due to different language specific and context dependent enhancement rules.⁸ However, unlike in Relativism, the enhancement takes the form of formal devices which belong to the phonological component, as in, e.g. Stevens, Keyser and Kawasaki (1986), and Stevens and Keyser (1989).

To fully appreciate the proposal, let us first look more closely at the model of RcvP developed by van der Hulst (2005, 2015), with special focus on the laryngeal class of the subsegmental representation.

⁸ In this sense, this proposal resembles the traditional idea of Keating (1984), where both types of languages were said to be defined as [+voice] versus [-voice], while the surface distinction is due to implementation rules.

(7)



The subsegmental representation in RcvP takes the form of a tripartite structure with Laryngeal, Manner and Place classes (cf. Clements 1985). The Laryngeal class itself is a left-headed structure containing two components: ‘folds’ and ‘glottis’ (7). These are established on the basis of phonation mechanisms, and are parallel to such proposals as, for example, the Dimension Theory (Avery and Idsardi 2001). Each component may specify two opposing gestures: V or C, of which only one can be specified within a given component, precisely due to their opposing nature. Thus, for example, the glottis cannot be spread and constricted at the same time, while in the ‘folds’ component a segment cannot be simultaneously voiced and fortis.⁹ Another principle says that, if a segment is specified, that is, it is not unmarked, the relevant gesture is specified in the head component (‘folds’). Thus, the model attempts to be privative both in the use of privative categories, but also allows for unspecified objects. As shown in (7), the actual categories used in this model are C and V, which receive particular realisations depending on their position within the laryngeal class, that is, in which component they are specified.

In our two-way systems, like Polish or English, it is always the element C/ [fortis] that is specified. On the other hand, V/ [voiced] in the ‘folds’ component comes only from language specific and context dependent enhancement rules. In other words, it is not present underlying but derived in the process of phonological computation. The specification in the head component (C/ [fortis]) may be supplemented with an additional gesture in the complement component (‘glottis’). Here too,

⁹ This point will be returned to below, as it seems to determine a particular view on voicing assimilations within RcvP.

there are two opposing gestures (V or C). In two-way contrast systems, these properties are also supplied by enhancement rules. The gestures, sometimes called elements, are unary properties, which, apart from the above mentioned [fortis], defined as resistance to voicing, are given self-explanatory labels: [voiced], [spread] and [constricted] respectively.¹⁰

All the possible combinations of the elements give a six-way phonation typology. Note that these representations leave little to phonetic interpretation of the kind observed in Laryngeal Realism and Relativism. Unlike the two models in which typology is expressed by underlying representations, in RcvP the typology is based on phonological representations which are derived by enhancement rules. They are phonological, but not underlying representations. Thus the typology in (8) below shows objects *after* the application of the enhancement rules, which, as it seems, have also taken over the function of spell-out. Thus, spell-out is now partly placed inside phonology, and not between phonology and phonetics.

(8)

Phonation typology in RcvP

<i>fol</i> s	<i>glott</i> s		
a. V/ [voiced]	-	b	<i>voiced</i>
b. C/ [fortis]	-	p	<i>voiceless</i>
c. V/ [voiced]	V/ [spread]	ɸ	<i>breathy</i>
d. V/ [voiced]	C/ [constricted]	ɸ	<i>creaky</i>
e. C/ [fortis]	V/ [spread]	p ^h	<i>aspirated</i>
f. C/ [fortis]	C/ [constricted]	p ^ɸ	<i>glottal (ejective)</i>

Firstly, it should be noticed that the categories employed in the representations of various types of phonation are phonetically real, in that one can provide a precise phonological definition of particular phonetic outcomes. This very much excludes the possibility of arbitrariness in the relation between phonology and phonetics: each given phonation type has a direct and clear phonological reference and is not based on a spell-out

¹⁰ The actual element/ gestures are V/ C in different configurations with respect to the component structure. The labels are a convenient shortcut of presentational value.

relationship. Thus, RcvP takes on board the widespread idea that the phonetic world has an unambiguous parallel in the phonological world, and that bi-directional access from one domain to the other is objectively possible, even, in a sense, independently of a given sound system in which these relations are established. This situates RcvP very close to Laryngeal Realism. This universalistic and realistic view always transpires from typologies of the kind given in (8). It remains to be seen whether this way of relating surface typological facts to particular phonological representations is correct.

It should be noted that the typology above does not contain a phonologically unmarked obstruent, which, in laryngeally realistic privative analyses, typically corresponds to the voiceless unaspirated obstruent. However, phonemically speaking, it is the object in (8a) that is unspecified, because, it will be recalled, the property [voiced] comes only through enhancement rules. The plain voiceless [p] is represented in (8) as containing the element [fortis], but this phonetic object may just as well be represented as an unenhanced unspecified object, that is, \emptyset . This will become clearer when we look at concrete ‘voice’ and ‘aspiration’ systems. In what follows, we must bear in mind two things. Firstly, phonetic interpretation of phonological objects is to some extent system dependent unlike the typology in (8), and secondly, the objects in (8) illustrate a mixture of marked and enhanced representations, which will be found in contexts where the enhancement rules do apply, typically in strong, pre-vocalic position.¹¹ In the contexts in which the enhancement rules do not apply we are dealing with the ‘bare’/ phonemic distinction [fortis] vs. \emptyset in two-way systems. In a sense, this creates a very interesting situation in which phonological contrast in ‘strong’ positions is no longer minimal and truly privative: there are always at least two gestures involved in each two-way opposition system, while in weak position it is both minimal and privative. What is more, the opposition [fortis] vs. \emptyset is not neutralised. Thus, RcvP responds to the problem of incomplete neutralisation in a specific formal way: there is no neutralisation of contrast, but the contrast cannot be used distinctively.¹²

¹¹ VOT studies typically look at plosives in word-initial/ strong position as well (see e.g. Lisker and Abramson 1964; Helgason and Ringen 2008; Beckman *et al.* 2011).

¹² This leads to a conclusion that enhancement rules must be part of all phonological systems with a two-way contrast. The rules are obligatory, as it were. This is because

Returning now to the division between ‘voice’ and ‘aspiration’ languages, the illustration in (9) provides examples of enhancement rules that are required in the two systems. It should be noted that the phonemically unmarked object, that is ‘Ø’, remains unenhanced only in the ‘aspiration’ languages (9a). For convenience, we will refer to this object as ‘lenis’ because it is literally ‘non-fortis’. Its phonetic realisation oscillates between voiceless unaspirated and passively voiced, depending on the context. Ideally, for passive voicing to occur, the ‘lenis’ obstruent should be surrounded by voiced segments. Word-initial and word-final positions are inhibitory in this respect (Kohler 1984; Iverson and Salmons 2003). The series marked as [fortis] in ‘aspiration’ languages is enhanced with [spread]. The range of contexts in which this rule applies may vary between languages. English and Icelandic will differ with respect to the scope of this rule, that is, the contexts in which it applies. It will be recalled that aspiration in Icelandic is more robust phonologically than in English, in that it is present in more contexts than in English. Thus, in RcvP, the absence of aspiration in most contexts in English will not be due to the loss of phonological properties, but rather to a limited contextual application of the enhancement with [spread]. The gestures are added in specified contexts, not deleted. It appears then that the specification in ‘aspiration’ languages turns out to be ‘over-specified’ vs. unspecified. A more complex representation is shown in (9c) and concerns Swedish. The contrast in strong positions seems to be that between a fully voiced and voiceless aspirated. The two-way contrast is expressed by three categories.

their absence leads to collapsed phonetic interpretation in which the differences can only be ascertained in experimental conditions. This concerns at least the ‘voice’ languages.

(9)

Enhanced representations in ‘aspiration’ and ‘voice’ languages in RcvP

Underlying opposition	∅	[fortis]
Enhancement rules	↓	↓
a. ‘aspiration’ p – p ^h <i>English, Icelandic</i>	∅	[fortis], [spread]
b. ‘voicing’ b – p <i>Polish, Dutch</i>	[voiced]	[fortis]
c. ‘over-specified’ b – p ^h <i>Swedish</i>	[voiced]	[fortis], [spread]

Turning now to the ‘voice’ languages in (9b), the unmarked series in Polish is enhanced with [voice] in pre-vocalic position. The actual opposition is then equipollent, even though unary categories are used. The unmarked series remains unenhanced in pre-obstruent and word-final positions.¹³ The absence of enhancement produces an opposition between the unmarked series (∅), which may not be voiced because it is not enhanced with [voice], and the [fortis] series, which is voiceless by definition. Thus, both objects end up as voiceless, and yet, they are phonologically distinct: [fortis] vs. non-fortis (‘lenis’). Thus, the language specific phonological enhancement rules coupled with their context sensitivity allow van der Hulst (2015) to provide an elegant formal description of FOD, in which the devoiced object may still be phonologically different from the lexically voiceless one, thus taking into account the experimental evidence on incompleteness of neutralisation. Polish is then, effectively, a system with the phonological opposition [voiced] vs. [fortis], where [voiced] comes through enhancement: ∅ → [voiced]/_(S)V. Polish FOD is a case of absence of enhancement.

¹³ The exact definition of the context in which the rule of enhancement does not occur may be attributed to weak licensing. In this paper we ignore this issue. A recent Government Phonology-based analysis of laryngeal licensing in Polish is given in Cyran (2014, 2017).

This neat analysis of FOD in RcvP, which formally captures the incompleteness of neutralisation, comes at a cost. The phonological representations defining laryngeal distinctions are not entirely privative or minimal. The RcvP proposal to some extent resembles Underspecification models, in that the starting point (lexical representation) is maximally simplex and privative, but in order to be phonetically interpretable, it must be supplemented with redundant properties in the phonological component. It then ceases to be privative in the last stages of phonological derivation. However, the difference between RcvP and Underspecification is that the defaults are context sensitive, and the non-enhanced objects are still phonetically interpretable, very much like in Element Theory. This RcvP proposal is also reminiscent of the one given in Keating (1984), in which the two-way contrast is universally defined as [+voice]/ [-voice], while phonetic implementation rules are responsible for what we call the division between the ‘voice’ and the ‘aspiration’ systems. The difference, again, lies in the fact that van der Hulst uses privative gestures rather than binary features, and that phonetic interpretability also concerns the non-enhanced objects.

Finally, the way in which van der Hulst captures the two-way systems is partly similar to the representation of CPP in Laryngeal Relativism. The main difference is that in Relativism all the enhancement rules belong to spell-out, that is, the interface between phonological representation and phonetic forms.

At the same time, one of the advantages of van der Hulst’s proposal is that it incorporates incomplete neutralisation by making no reference to word-final neutralisation, or indeed the weakening of obstruents with respect to laryngeal properties. Let us look at the phenomenon of RVA and CPP sandhi voicing in Polish through the lenses of RcvP.

With the return to the ‘realistic’ view on the lexical representation of a two-way laryngeal contrast,¹⁴ both WP and CPP will be Ø vs. [fortis], with a context-sensitive rule of enhancement ‘Ø → [voiced]/ _ (S)V’. We have seen above how this model would deal with FOD, which works the

¹⁴ It is realistic in the sense that given the two phonetic categories in either type of system, e.g. b-p or p-p^h, RcvP does not make an arbitrary choice as to which one is to be marked and how. It ‘knows’, as it were, that the ever voiceless object gets the property [fortis]. At any rate, RcvP is not relativist.

same way in the two dialects: it will be a case of non-application of the enhancement rule.

The data below gather together the contexts for FOD (10a, b), RVA in front of a voiced obstruent in the following word (10c, d), and pre-sonorant sandhi voicing which occurs only in CPP (10e, f).

(10)¹⁵

	<i>WP</i>	<i>CPP</i>
a. s a d ⁰ #	t	t
b. b r a t ^{fortis} #	t	t
c. s a d ⁰ # b ^{voi} abci	d	d
d. b r a t ^{fortis} # b ^{voi} abci	d	d
e. s a d ⁰ # ojca	t	d
f. b r a t ^{fortis} # ojca	t	d

The FOD effects in (10a, b) are by now clear. The final devoicing is in fact a result of the absence often voice enhancement in this particular context. Additionally, the absence of delaryngealisation guarantees the minute differences – referred to as Incomplete Neutralisation – between the two series of obstruents.

If the same words are followed by one beginning with an obstruent which is itself enhanced to [voiced], regressive voicing assimilation (RVA) occurs in both dialects involving both types of final obstruents, as shown in (10c, d). In the case of (10c), the assimilation is not problematic. It can be given two alternative and viable analyses. One can be truly phonological, that is, based on the spreading of [voiced], while the other can be purely phonetic and refer to co-articulation.

The case in (10d) is diagnostic with respect to the two alternatives. RcvP excludes contradictory specifications of segments: they may not be [fortis] and [voiced] at the same time. This eliminates the analysis based on phonological spreading and leaves us with the somewhat controversial co-articulatory analysis. Firstly, we must say that the condition on the co-articulatory assimilation is a phonological presence of [voiced] in the

¹⁵ *Sad* ‘orchard, nom.sg.’, *brat* ‘brother, nom.sg.’, *babci* ‘grandmother, gen.sg.’, *ojca* ‘father, gen.sg.’.

trigger. Secondly, we must say that the representation with [fortis] which is defined as ‘resistance to voice’ is overridden by co-articulatory effects.¹⁶ This, however, is the essence of van der Hulst’s proposal. The presence of [fortis] makes the effects of phonetic (co-articulatory) assimilation slightly different than in the case of the unmarked target (Ø), which agrees with the findings of Strycharczuk (2012a, b).

To recapitulate, we are dealing with an analysis in which there is no neutralisation of the lexical contrast Ø vs. [fortis] word-finally in Polish, and RVA is a case of phonologically conditioned phonetic co-articulation. So far, WP and CPP behave identically. We may also attempt to provide an explanation why RVA is restricted to pre-obstruent context in WP: active articulatory gestures which are responsible for the co-articulation are present in obstruents but not in sonorants (10e, f). This, as we will see below, cannot be said about CPP.

As for (10e, f), in WP, the spontaneous voicing of the sonorant beginning the following word is unable to voice the preceding ‘lenis’ obstruent in *sad ojca*, or indeed the preceding [fortis] one. Both types of final obstruents will remain voiceless in that position in WP. Interestingly, this articulation-based analysis parallels the ‘realistic’ phonological one. Recall that in Laryngeal Realism ‘voicing’ of obstruents requires L/[voiced]. Since voiced obstruents possess this property and sonorants do not, RVA is possible as spreading only in the former and not in the latter case.

Neither phonological nor phonetic analysis seems to be easily applicable to the pre-sonorant sandhi voicing in CPP (10e, f). This is because a phonological analysis would require a melodic property L/[voiced] to spread from sonorants, which would suggest that sonorants in CPP are marked for voice. A phonetic analysis would have to assume that for some reason spontaneously voiced segments may trigger co-articulation. This, however, is possible only in the case of active articulatory gestures which sonorants lack. To complicate matters a little, it should be added that it seems that while both types of obstruents are voiced in CPP pre-sonorant sandhi, there is some distinction parallel to incomplete neutralisation in FOD (Strycharczuk 2012a, b). Thus, the

¹⁶ Quite possibly the category [fortis] may need to be redefined in some way other than ‘resistance to voicing’.

dilemmas concerning CPP sandhi seem to have doubled. Not only is it necessary to retain the lexical distinction \emptyset vs. [fortis] of the word-final obstruents, but the triggering sonorants must now be given a property [voiced] which must be assumed to phonologically spread to the target and co-exist with [fortis] in *brat ojca*.

Since co-articulatory pre-sonorant voicing must be excluded because it would contradict phonetic facts (absence of active gestures to induce co-articulation), we are forced to return to the phonological (abstract) analysis of pre-sonorant voicing. Here, phonetic facts do not always dovetail with phonological ones. The cost, however, is high: we must assume that CPP sonorants are marked for [voiced]. The difference between WP and CPP is less obvious too. We may either say that WP sonorants are unmarked, unlike the CPP ones, or if they are, like in CPP, then the spreading is due to rule that is present in CPP, but not in WP. This way, we have made a full circle to the traditional analyses of CPP sandhi voicing (e.g. Rubach 1996).

Thus, in van der Hulst (2015), like in previous approaches, the burden of explanation is shifted again from representation to phonological computation, even if the central claim of the proposal is representational.

6. Summary and conclusions

Van der Hulst (2015) makes a sweeping proposal that all languages possessing a two-way laryngeal contrast should be represented as \emptyset vs. [fortis] at the phonemic (lexical) level of representation. In other words, voicing is not lexical. It can be a result of phonological enhancement of \emptyset with the category [voiced], which stands for the V element under the ‘folds’ component in RcvP. In this model, the typology of laryngeal systems is expressed partly by means of lexical representation which is privative, and partly by phonological enhancement rules, that is, via computation, whereby the representational outcome is no longer privative, or minimal. For example, the representation of the voicing contrast in Polish is effectively [voiced] vs. [fortis], which is equipollent even though unary categories are employed. On the other hand, English, in which the [fortis] series is enhanced with [spread], is an example of non-minimal contrast representation because the contrast between two series is

eventually expressed by two categories rather than one, that is, \emptyset vs. [fortis], [spread].

In this discussion, we dubbed this proposal New Realism for two related reasons. Firstly and more generally, given a two-way contrast system, it is immediately known that the phonemic distinction is that of \emptyset vs. [fortis].¹⁷ Secondly, the division into ‘voicing’ and ‘aspiration’ systems, used in Laryngeal Realism, corresponds to the necessity to possess enhancement rules adding [voiced] to \emptyset , or adding [spread] to [fortis], respectively. Thus, the final representation corresponds to the ‘realistic’ assumptions in which fully voiced obstruents in Polish must have [voiced], and aspirated obstruents in English must have [spread].

One of the most interesting aspects of this proposal is its stance on Incomplete Neutralisation. While the phonemic distinction \emptyset vs. [fortis] is never neutralised, the enhancement rules are contextually restricted on a language specific basis. Thus, FOD in Polish is not the case of sub-segmental loss (deletion) but absence of enhancement. The absence of FOD in French or Ukrainian, on the other hand, is explained as a wider application of enhancement. Thus, the two series of obstruents in word-final position in Polish cannot be voiced (lack of enhancement), but at the same time they cannot be identical. The lack of enhancement means that the contrast is not fully realised, yet not exactly neutralised.

The full consequences of the RcvP proposal are yet to be examined. It was mentioned above that one of the drawbacks is the blurred status of privativity of phonological representation. Also unclear is the status of the phenomenon of Regressive Voice Assimilation, especially with respect to such empirical intricacies as the distinction between WP and CPP regarding pre-sonorant voicing assimilation in sandhi contexts. As shown in the previous section, the persistence of [fortis] in word-final obstruents enforces a co-articulatory analysis of RVA in pre-obstruent position, due to the fact that phonological spreading of [voiced] to the target would have to involve a contradictory representation with [voiced] and [fortis] in one segment, which is not allowed in RcvP. On the other hand, the co-articulatory analysis is unable to capture the pre-sonorant voicing in CPP because sonorants are spontaneously voiced and do not involve active

¹⁷ By contrast, in Laryngeal Relativism, the marking of the two series is not immediately obvious and depends on how the entire system, that is, phonological representation and phonetic interpretation, works.

articulatory gestures which might be said to be anticipated by the word-final obstruents. Recall also that the [fortis] property, which is not deleted, is defined as ‘resistance to voice’. Thus, it appears that RcvP is not able, at this point, to express the distinction between WP and CPP in a satisfactory way.

A final issue concerning the RcvP proposal that needs to be addressed is the status of the enhancement rules. More precisely, the question is if they are rightly placed by van der Hulst (2015) in the phonology, or whether they should perhaps belong to the component that links phonology and phonetics, that is, to spell-out. This issue cannot be successfully resolved here. However, we would like to point to one aspect concerning enhancement rules which seems to suggest that it belongs outside phonology.

First of all, it seems that phonetically real rules should not belong to phonology. Recall that the phonetic categories: fully voiced, plain voiceless, and voiceless aspirated are well-dispersed quantal regions provided by phonetics. It is a pool of best categories, based on VOT, from which both contrasting categories and allophones are selected, with phonetic distance being one of the main principles of this selection, especially in strong positions. This dispersion $b - p - p^h$ seems to be duplicated by the enhancement rules in the phonology. Consequently, while the representation \emptyset vs. [fortis] may be correct, the choice of the phonetic categories might equally well be expressed by spell-out relations in given types of languages, thus retaining minimal privativity of phonological representations.

Apart from the duplication problem mentioned above, it seems that there is a relationship between the scope of enhancement rules, which is a phonological mechanism, and the phonetic interpretation of the contrasting series, which is very much a phonetic, or spell-out effect. Thus, the two – enhancement rules and spell-out – seem to interact, while clearly belonging to two different components of grammar: phonology and post-phonological, respectively. As an example of this, consider the difference between the scope of application of the enhancement rule supplying [spread] (aspiration) in English and Icelandic. While in English aspiration is limited to the pre-stressed vowel context, it is much more robust in Icelandic, in that it occurs before unstressed vowels, and in some contexts it is realised as pre-aspiration rather than being lost. These

differences are easily handled by van der Hulst (2015) in terms of the formal scope of application of the enhancement rule in the two languages. However, at the same time, English exhibits more passive voicing of the unmarked obstruents (\emptyset), while Icelandic has almost none (Gussmann 2009). Passive voicing is a phonetic effect. The question then is: how can the scope of the phonological rule be related to the scope of a phonetic phenomenon, or vice versa? Formally speaking, enhancement rules concern a particular type of segment in particular contexts, e.g. [fortis] → [fortis], [spread]/ V. The phonological rule is blind to what happens with the other series of obstruents, which are not marked with [fortis]. Likewise, phonetic interpretation of the unmarked series is unable to look into the phonological representation of the marked series. It appears, then, that the matters of phonetic distance are settled on the surface, as it were. That is, none of it takes place in the phonology. All that matters is that the two series must be distinct from each other.¹⁸ It seems that such decisions are best made within one component. We assume that this happens in the phonetics, or in the spell-out component that relates phonetics and phonology.

In conclusion, RcvP provides a potentially correct way of expressing a distinction which is found in Incomplete Neutralisation in Polish. However, the comprehensive analysis of Polish voicing facts is yet to be established within this model. In particular, it is not immediately obvious how the proposal could handle the distinction between WP and CPP concerning the celebrated phenomenon of pre-sonorant sandhi voicing.

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¹⁸ This is taken care of by the distinction \emptyset vs. [fortis] already.

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