Studies in Polish Linguistics vol. 19 (2024), issue 2, pp. 61–83 https://doi.org/10.4467/23005920SPL.24.003.21185 www.ejournals.eu/SPL

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Inherent Circularity in Laryngeal Realism? Three Levels of Explanation of the Presonorant Sandhi Patterns in Polish (Part 1)¹

The speech sound can only be defined in terms of its relation to the phoneme. But if, in the definition of the phoneme, one proceeds from the speech sound, one is caught in a vicious circle (Trubetzkoy 1939 [1969]: 38)

Abstract

The view that phonology is some form of abstraction of phonetics determines the nature of the relation between the two domains and often leads to various types of circularity that allow for descriptively adequate analyses, but do not seem to contribute to a better understanding of sound patterns. Representation-based phonological approaches, such as laryngeal realism, which adhere to privativity, restrict possible phonological mechanisms and enforce multifaceted analyses in which only some phenomena may be phonological, while others must be viewed as interpretational or phonetic in nature. This paper argues for a strict separation of the two domains and focuses on the consequences that new laryngeal realism and relativism entail with respect to the nature of the interface between phonology and phonetics as well as on the understanding of Polish voicing. This article has two parts. Part 1 sets the theoretical background concerning the phonological representation of laryngeal contrasts and provides an overview of approaches to pre-sonorant sandhi in Polish dialects through the lens of various types of representational or computational circularity. Part 2 discusses a recent proposal called new laryngeal realism pointing to its deficiencies and advantages as compared with laryngeal relativism.

¹ I would like to thank Krzysztof Jaskuła, Mateusz Urban, Sławomir Zdziebko and two anonymous Reviewers for insightful comments and suggestions.

Keywords

circularity, laryngeal realism, laryngeal relativism, levels of explanation, phonetics-phonology interface, pre-sonorant sandhi voicing, privativity

Abstrakt

Pogląd, że fonologia jest pewną formą abstrakcji fonetyki, determinuje naturę relacji między obiema dziedzinami i często prowadzi do różnego rodzaju cyrkularności, która, co prawda, pozwala na adekwatne opisowo analizy, ale nie wydaje się przyczyniać do lepszego zrozumienia zjawisk dźwiękowych. Opierające się na prywatywności reprezentacyjne podejścia do fonologii, takie jak realizm krtaniowy, ograniczają możliwe mechanizmy fonologiczne i wymuszają wieloaspektowe analizy, w których tylko niektóre zjawiska mogą mieć charakter fonologiczny, inne natomiast należy postrzegać jako mające charakter interpretacyjny lub fonetyczny. W artykule przedstawiono argumenty za ścisłym rozdzieleniem fonetyki i fonologii oraz skupiono się na konsekwencjach, jakie niesie ze sobą nowy realizm krtaniowy i relatywizm dla charakteru styku tych dwóch dziedzin oraz dla rozumienia polskiej dźwięczności. Artykuł ten składa się z dwóch części. W części pierwszej omówiono podstawy teoretyczne dotyczące reprezentacji fonologicznej kontrastów laryngalnych oraz przedstawiono przegląd podejść do udźwięcznienia międzywyrazowego w dialektach języka polskiego przez pryzmat różnych typów cyrkularności reprezentacyjnej lub komputacyjnej. W części drugiej omówiono najnowszą propozycję zwaną nowym realizmem krtaniowym, wskazując na jej wady i zalety w porównaniu z relatywizmem krtaniowym.

Słowa kluczowe

cyrkularność, interfejs między fonologią a fonetyką, poziomy wyjaśnienia, prywatywność, realizm krtaniowy, relatywizm krtaniowy, udźwięcznienie międzywyrazowe przed sonornymi

1. Introduction

The problem of sandhi voicing in pre-sonorant context in the so-called Cracow-Poznań (CPP) dialects of Polish and its absence in the north-eastern dialects – also called Warsaw Polish (WP) – has received a lot of attention from Polish linguists for over a century including insightful philological and structuralist studies (Benni 1907; Nitsch 1909, 1912; Śmiech 1961), generative and post-generative phonological analyses (Bethin 1984, 1992; Gussmann 1992; Rubach 1996, 2008, 2019; Cyran 2011, 2014; Scheer 2015a, 2015b), and more recently also experimental phonetic studies with phonological consequences (Strycharczuk 2012; Wojtkowiak and Schwartz 2018).

In short, word-final obstruents do not preserve their lexical identity in the pre-sonorant external sandhi context in either dialect group, but diverge into two opposite outcomes: voiced (CPP) and voiceless (WP).² The pre-sonorant context comprises both sonorant consonants and vowels.

 $^{^{2}}$ C = obstruent, V = vowel, R = sonorant consonant, D = voiced obstruents, T = voiceless obstruents, # = word boundary.

a. word 1		b. word boundary	c. word 2 / enclitic		СРР	WP	
C		#	(R)V	\rightarrow	D#(R)V	T#(R)V	
kwiat	/t/		jabłoni		[d j]	[t j]	'apple blossom'
ślad	/d/		jeża		[d j]	[t j]	'hedgehog traces'
kot	/t/		Ani		[d a]	[t a]	'Anna's cat'
sad	/d/		Ani		[d a]	[t a]	'Anna's orchard'
nieś	/¢/		-my		[z m]	[¢ m]	'let's carry'
wieź	/z/		-my		[ẓ m]	[¢ m]	'let's drive'

(1) Pre-sonorant sandhi context and outcomes in CPP and WP

The question is not only why lexically voiceless obstruents may be voiced in pre-sonorant position across a word boundary in one dialect group, but also why this does not happen in the other dialect group, when phonetic and phonological conditions seem to be the same. Namely, both dialects are voice systems, contrasting fully voiced obstruents with voiceless unaspirated ones (/d-t/), both exhibit final devoicing, e.g. *sad* [sat] < /sad/ 'orchard', and symmetrical voicing assimilation in obstruent clusters, including across a word boundary, e.g. *sad Piotra* [sat pⁱotra] < /d#p/ 'Peter's orchard', *brat Basi* [brad baci] < /t#b/ 'Barbara's brother', *sad Basi* [sad baci] < /d#b/ 'Barbara's orchard'.

Final devoicing constitutes a confound in the case of CPP sandhi voicing, rendering the pre-sonorant voicing less regular or optional (Strycharczuk 2012). For the completeness of the general picture, we must add, that in the Slavic languages that do not have final devoicing, e.g. Ukrainian or Serbian, the context in question produces a third pattern, in which the lexical contrast is maintained.

(2) Pre-sonorant sandhi patterns in Slavic

a. CPP $\dots D/T#(R)V... \rightarrow [\dots D(R)V...]$ b. WP $\dots D/T#(R)V... \rightarrow [\dots T(R)V...]$ c. Ukrainian, Serbian $\dots D/T#(R)V... \rightarrow [\dots D(R)V..., \dots T(R)V...]$

Descriptively the patterns are clear, but their explanatory analysis remains elusive mainly because the phenomena appear to result from the interplay between three levels of linguistic description – morpho-syntactic, phonological, and phonetic – and should therefore involve at least two kinds of interfaces. The boundaries between the three levels remain unclear in most modern frameworks, and the interfaces are largely neglected in existing analyses that range from primarily phonological to largely phonetic and ignore the fact that both views involve a degree of circularity and descriptiveness that weakens their explanatory value.

This paper argues in favour of representational frameworks based on privativity, but against some aspects of the realist enterprise as it is practiced today. The source of the various types of circularity, which lead to explanatory problems, is identified as stemming from the inherent fallacy of the view that the phonetic signal presents an analyst with direct evidence for a particular phonological representation in the same way the signal is used by speakers in the mechanisms of speech perception. The difference, however, is that speakers can identify the phonological representation on the basis of the signal because they have first acquired the system with the necessary interface mechanisms relating often multiple phonetic cues to a simple phonological representation. The question is whether any aspect of the speech signal can be a priori assumed to correspond to a particular phonological representation universally. As mentioned above, larvngeal realism answers this question positively. However, in its strict form, it fails to explain the Polish facts (Gussmann 2007). A new development, called new laryngeal realism (van der Hulst 2015; Wojtkowiak and Schwartz 2018) seems to fare much better in some respects, but it suffers from the same problems as well. One of them is circularity. Both types of realism seek explanations to sound patterns in the phonological representation, and generally adhere to privativity in the Trubetzkovan sense (Trubetzkov 1939 [1969]), but, at the same time, both seem to ignore his insights concerning the distinction between natural markedness - in which the unmarked object is closer to normal breathing or it is due to other phonetic considerations of similar type – and *logical* markedness - in which the representational decision is systemic rather than phonetically-based (e.g. Anderson 2021: 129). Realist models emphasize the former type of markedness and assume that the phonological representation can be read off the phonetic signal in one way or another. It is argued below that attempts to infer the phonological representation directly from the phonetic signal result in failure to explain, and sometimes even to describe such phenomena as, for example, the pre-sonorant sandhi patterns in Polish. This is mainly because proceeding from signal to phonological representation, as pointed out in Trubezkoy's quote above, appears to be the wrong way to go. The opposite, and rather radical, approach is represented by the so-called laryngeal relativism (Cyran 2011, 2014, 2023), which explores the consequences of the assumption that privative marking is only logical, and never natural.

This paper is also to some extent a response to a fairly recent analysis of pre-sonorant sandhi voicing in Cracow-Poznań Polish (CPP) and its absence in Warsaw Polish (WP), proposed in Wojtkowiak and Schwartz (2018), which seems to make some substantial headway in the understanding of the phenomena in question, while at the same time falling into undue theoretical problems. I will attempt to demonstrate where the analysis seems to go wrong and why. But, primarily, my aim is to look at the advantages of this proposal, and the potential of the Onset Prominence model (Schwartz 2010 et seq.) with regard to phonological theory in general and the relation between phonology and phonetics in particular. It will be shown that new realism and laryngeal relativism lead to similar general structure of sound systems, but make different predictions as to the level at which explanation of the Polish facts is located. The comparison is possible only after some modifications are made to the Onset Prominence model, and may lead to new research questions, concerning, for example, the diachronic development of Polish.

First, various types of circularity are identified in Section 2 which follow from strict logical markedness perspective assumed here. Section 3 contains a discussion of the relevant aspects concerning the context of pre-sonorant sandhi phenomena (...C#(R)V...), illustrated by reference to the most comprehensive phonological analysis of Polish voicing provided in Rubach (1996). Additionally, two pre-generative accounts that seem to have paved the way for modern theoretical proposals will be considered, that is, Śmiech (1961) and Andersen (1986). What the accounts seem to lack is a comprehensive phonological model that could capture their correct intuitions. Some remedy can be found in the privative proposals of laryngeal realism and relativism summarised in Section 4, leading to the idea of new realism. In Part 2 of the article (Cyran 2024), Section 2 features an extensive presentation of the Onset Prominence model and its new realism, as applied to pre-sonorant sandhi. This is followed by Section 3, which contains a critical examination of the proposal in Wojtkowiak and Schwartz (2018) pointing to theoretical problems and some solutions. The section also makes a comparison of predictions made by new realism and relativism. Some conclusions, predictions, and new horizons for research are discussed in Section 4 of Part 2.

2. Logical markedness and circularity

The circularity that follows from Trubetzkoy's quotation which serves as an epigraph to this article, can be defined as descriptiveness of analytical proposals and is not often mentioned in phonological debate, though it is, sometimes forcefully, pointed out in the phonetic literature as one of the arguments against autonomous phonology and its formalisms (e.g. Ohala 1990). As examples of circularity, Ohala lists phonological markedness conventions, sonority hierarchy, constraints, and binary features. In his view, they are descriptive replacements of genuine phonetic explanation of sound patterns.

Thus, in some ways, circularity concerns the overlap between phonetic explanation and phonological description. In this paper, I will try to identify some types of circularity in phonology that can be discerned from the phonological, not phonetic, perspective. However, when one looks at circularity through the lens of logical marking in its extreme form, the results seem to converge with Ohala's observations. Whether all circularity is to be avoided is an empirical question. This paper shows that new realism, which is circular in some respects, has some advantages over non-circular relativism.

While it is largely true that the phonological representation in a given linguistic system is built during acquisition on the basis of the phonetic signal from the ambient language, it is not impossible to assume that the representational decisions are made solely on the basis of purely linguistic, that is, systemic or logical criteria in which the phonetic distinctions are not directly involved. In this view, what is important is not the particular phonetic shape of contrasting objects, but the fact that the phonetic distinction fulfils the articulatory and perceptual criteria to function linguistically as a discrete category (e.g. Stevens 1972). The phonological representation of that distinction is then also a linguistic matter, subject to linguistic principles, for example, such that it deals with discrete categories rather than with gradience (e.g. Hamann 2011), that two-way distinctions are represented privatively (Trubetzkoy 1939 [1969]), that the categories are monovalent (e.g. Harris 1994), and that the decision which member of the privative distinction is marked is a logical one, that is, systemic, rather than natural (signal-based). The last condition - logical markedness (Trubetzkoy 1939 [1969]) - has a number of consequences for phonology and its relation to phonetics. The most important one is that phonology becomes radically freed from phonetics, by allowing features to be substance-free (Blaho 2008; Hale and Reiss 2008) and possibly emergent (Mielke 2008; Dresher 2015). This, in turn, will have some consequences for the computation, but also for the phonetic interpretation of phonological representations, that is, the interface between phonology and phonetics. Last but not least, freeing the phonological representation of natural markedness practically eliminates the problem of circularity, though the analytical choices are now more difficult to make because linguistic systems do not always provide overt evidence for a particular marking once phonetics is ignored.3 For these reasons, perhaps, Trubetzkoy did not exclude natural markedness and most feature models rely on some degree of phonetic grounding. However, in this paper, I will pursue the extreme view

³ This situation may have occurred in Slavic languages before the loss of final jers and the advent of new phenomena such as final obstruent devoicing, regressive voicing assimilation, as well as pre-sonorant sandhi voicing and devoicing. It may also be present in those modern Slavic languages which do not have final devoicing.

that phonological representation is never based on natural marking, in order to see the consequences of that move. One of them is avoidance of circularity and, contrary to Ohala's conclusions, a clear distinction between phonology and phonetics, without affecting the general design of the structure of sound systems that follows from privativity. The requirement of logical markedness allows us to identify the following three types of circularity that result from a mix-up between phonology and phonetics and occur not only in realist approaches, but also, most prominently, in binary feature systems.

- (3) Three types of circularity due to natural markedness
 - a. *Type 1 circularity (representation)* Phonological representation is read off the phonetic signal.
 - *Type 2 circularity (computation and representation)* Phonetically observed patterns are directly formalized into a phonological system in terms of computation, and, in consequence, also as representation presumed phonological activity.
 - c. *Type 3 circularity (cause-effect flipping)* Effects of a phonological representation or activity are mistaken for the cause.

Type 1 circularity refers to a very common situation when particular phonetic correlates in the signal are used as unambiguous evidence of an actual phonological representation. The most extreme instance of this type of circularity is the "unity of voice" principle (Itô, Mester and Padgett 1995). In this view, the presence of phonetic voicing must be reflected in the phonology by means of the feature [+voice]. As a result, all voiced obstruents as well as sonorant consonants and vowels carry this phonological property.⁴ Consequently, the representational assumption has a profound effect on possible phonological computation. For example, it deems [+voice] spreading from sonorants a viable phonological activity. This type of circularity does not only concern approaches based on binary features. It is also common, albeit in a more limited way, in privative approaches, including laryngeal realism (e.g. Harris 1994; 2009; Iverson and Salmons 1995; Honeybone 2002; Helgason and Ringen 2008; Beckman, Jessen and Ringen 2013) in which pre-voicing in obstruents is directly associated with the feature [voice].

Type 2 circularity is also common and related to the first one, as it involves a reversed perspective in which phonetically observed patterns, e.g. assimilations, are taken to represent authentic phonological activity and are directly formalized as rules with an accompanying ordering or constraints with a particular ranking to go with them. Here, the assumed phonological

⁴ For a review of arguments against marking sonorants with [voice] see, e.g. Scheer (2015a, 2015b). For arguments against the "continuity of voice" view, and in favour of "discontinuity of voice", see, e.g. Harris (2009).

activity or computation also affects the claims about the representation of both targets and triggers. For example, in Rubach (1996) and Wetzels and Mascaró (2001), the existence of symmetrical regressive voicing assimilation is used as evidence of active [-voice], and consequently, of a binary representation of laryngeal contrasts.

Type 3 circularity is a rare and rather complicated situation, predicted by realist assumptions, in which the direct translation of phonetic correlates as phonological structure leads to a reversal of the cause-effect relationship: the representation of the effects becomes a structural cause of these effects. This type of circularity in fact involves a logical fallacy. It will be further explained in Section 1 of Part 2 of the article, when I discuss the recent proposal concerning the pre-sonorant sandhi voicing in Polish.

3. Describing and explaining pre-sonorant sandhi patterns in Polish

3.1. Rubach (1996) - a comprehensive description

Linguistic analyses of pre-sonorant sandhi will differ in a number of ways, depending on their views on the representation of the laryngeal contrast, the representation of the boundary, the necessary phonological computation, and the division of labour between phonology and phonetics. As an example, let us now turn to a simplified summary of a computationally oriented, fully phonological analysis of the pre-sonorant sandhi patterns in Polish.

In Rubach (1996), the laryngeal contrast between obstruents is represented in a binary feature system. Lexically, the obstruents have either [+voice] or [-voice] (cf. "continuity of voice"). Word-finally, both features are delinked (delaryngealization) and the obstruents are "prepared" for further computation, as the resulting unspecified object (archiphoneme) must eventually be fully specified (cf. also Rubach 2019). Phrase-finally, in the absence of the following context, a default rule assigns [-voice] to the archiphoneme, yielding final devoicing, e.g. sad [sat] 'orchard'. In pre-obstruent contexts, the delaryngealized word-final obstruent receives the voicing property from the following word-initial obstruent by spreading (regressive assimilation), e.g. brat Basi [d-b] 'Barbara's brother'. Finally, in pre-sonorant contexts, CPP is said to have a similar spreading rule from sonorants, which must therefore possess [+voice] at the relevant stage of the derivation, and the spreading rule is ordered before the default mentioned above in order to avoid voiceless outcomes. WP, on the other hand, does not have the rule spreading [+voice] from sonorants, therefore, in this dialect group, the final obstruents receive [-voice] by default both phrase-finally and in pre-sonorant sandhi contexts.

In this analysis, we may identify the role of each of the individual elements of the context in (1). The final obstruent is lexically [+/–voice] and is delaryngealized in the context of the word boundary _#. Later in the derivation it either is affected by spreading of [+voice] from the following sonorant (CPP) or it is not (WP). Most generative analyses of pre-sonorant sandhi in Polish assume that the word-final obstruent is delaryngealized in this context, and then subject to further computation or interpretation depending on what follows (Bethin 1984, 1992; Gussmann 1992, 2007; Rubach 1996, 2008, 2019). The delaryngealization view is quite feasible given the existence of the typological third pattern shown in (2c), which clearly involves no delaryngealization.

The second element of this description, the word boundary, requires a comment. We have seen in (2) above, that the word boundary seems to have a uniform effect of contrast neutralization in both dialects of Polish. The other types of boundaries observed in Polish also show a uniform behaviour in all dialects, but the pattern is different: there is no neutralization. For example, in pro-clitic formation, e.g. pod-nosić [podnocitc] 'raise' or suffixation, e.g. pogod-ny [pɔgɔdni] 'sunny' vs blot-ny [bwɔtni] 'muddy' there is no neutralization of the contrast, and the sequence C+(R)V generally behaves in the same way as in regular word-internal sequences of the type Obstruent-Sonorant which involve no boundary at all (C+(R)V = C(R)V), e.g. wiatry $[v^{i}atri]$ 'winds' vs wiadra [v^jadra] 'buckets'. Thus, there are in fact only two major patterns concerning the boundaries in Polish with respect to what can happen to the laryngeal contrast in pre-sonorant context. In one, the lexical voicing distinction is neutralized (external sandhi), while in the other, it is not (internal sandhi). Both patterns act uniformly across dialects. How exactly the word boundary, which is a morpho-syntactic construct, should be represented phonologically is a theoretical question that phonological models need to answer for themselves. As mentioned earlier, we are dealing with some sort of interface between morpho-syntax and phonology here (e.g. Scheer 2011, 2012).

Rubach (1996) is a full-fledged phonological analysis, leaving little space for phonetics or phonetic interpretation. From our perspective, it suffers from two types of circularity mentioned in (3): types 1 and 2. Firstly, the phonetic values of voicing and voicelessness are directly translated into [+/–voice] in the representation. In other words, the phonological representation is fully phonetically-based, or phonetically motivated. Secondly, the existence of the pre-sonorant voicing pattern in CPP is automatically assumed to be a reflection of a phonological rule or constraint (Rubach 2019). The assimilations are phonological and for this reason they are assumed to provide additional support to the binary representation of the laryngeal contrast (cf. Wetzels and Mascaró 2001). Descriptively, this analysis is entirely adequate. Additionally, it can easily handle the third pattern found in Ukrainian and Serbian (2c), by saying that these systems simply do not have the rule of delaryngealization. However, its explanatory value is lowered by the two types of circularity involved.

3.2. Phonetic and phonological explanations

It is argued in Nitsch (1909) that the pre-sonorant voicing in CPP cannot be explained phonetically because the sonorants are pronounced in the same way in both dialects of Polish. He concluded that the phenomenon must be therefore psychological in nature. Today, we would say that it has phonological basis, but this may be a simplification. Since then, at least two proposals have appeared in the literature which must be noted as viable attempts to explain the pre-sonorant patterns in Polish. They are not normally referred to in theoretical phonological accounts, though they are acknowledged by Slavicists (e.g. Sawicka and Trawińska 2013). It will become obvious in the course of the discussion how these analyses are echoed in the recent theoretical proposals.

We begin with Andersen (1986) who looks at the sandhi phenomena from a typological and historical perspective and provides a representational, phonological account based on Trubetzkoy's neutralization. Andersen, tentatively, albeit convincingly, suggests that originally the Slavic languages had their obstruent systems based on protensity, in which the voiceless obstruents were privatively marked as tense, and were presumably pronounced longer, and with possible aspiration. Historically, the Slavic languages then changed to systems based on phonemic voicing. The difference between the two types of systems lies in the fact that the neutralization of tenseness $(C^{[tense]} \rightarrow C^{\circ})$ produced a lax obstruent corresponding to voiced lenis, while the neutralization of voicing $(C^{[voi]} \rightarrow C^{\circ})$ produces a voiceless object. Thus, Andersen assumes that Old Polish behaved like today's CPP (1986: 245) and had a voicing sandhi, but it may have looked phonetically different.⁵ He acknowledges that it is difficult to say why the shift from protensity to voicing occurred. It is also not clear how the distinction into voicing and devoicing pre-sonorant sandhi arose historically and how it is maintained between modern CPP and WP, when they are both voice systems now. The lack of clarity partly follows from the fact that Andersen associates the marking of voiceless obstruents as [tense] not only with particular sandhi types by

⁵ One argument Andersen uses in support of his view is the so-called progressive devoicing in Polish, e.g. *twój* [tfuj] 'yours', which resembles similar phenomena found in aspiration languages. The problem with such evidence is that one would expect this phenomenon to be regular at least in CPP in which pre-sonorant sandhi occurs. However, it is in this dialect group that the absence of progressive devoicing is reported, e.g. [tvuj] in the Poznań area (e.g. Dejna 1993: 99).

also with particular phonetic realization of the obstruents. In this sense, his views of the relation between phonetic correlates and phonological representation are in line with today's laryngeal realism (Section 4 below). Thus, Andersen must assume that the dialects have *somehow* grammaticalized or phonologized the distinction, but we do not know how the bifurcation arose in the first place, and how it is functioning in modern Polish.

Some twenty five years earlier, Śmiech (1961) seems to have provided a viable phonetically based explanation of the origin of the dialectal division into the two sandhi patterns in Polish. The gist of Śmiech's proposal is that the normal situation after the loss of jers in Polish was that word-final obstruents were neutralized and naturally pronounced as voiced in front of word-initial voiced obstruents and sonorants. This is in line with Andersen's proposal that Old Polish was based on protensity. Additionally, the wordinitial vowels and sonorant consonants were pronounced with the preceding obstruents as if the strings belonged to one syllable (close cohesion). The voiceless interpretation of the final obstruent was only found phrase-finally or when followed by voiceless obstruents, e.g. sad [sat] 'orchard' and sad *Tomka* [sat tomka] 'Tom's orchard'. The phonetic closeness in C#(R)V strings is also taken up by a number of linguists (e.g. Stieber 1947; Bethin 1984) and finds strong expression in the Onset Prominence model to be discussed below in Section 1 of Part 2 of the article. Stieber (1947) went as far as to claim that the phonetic closeness of C#(R)V in CPP is even stronger than that of an internal C(R)V in that dialect group.

With earlier Polish behaving in general like today's CPP, it follows that it was the WP dialect group that introduced the innovation leading to voiceless pre-sonorant sandhi, which is, interestingly, the more widespread option in modern Slavic languages today than the original voicing sandhi. According to Śmiech, the innovation was due to the way in which the word-initial vowels were pronounced in the dialect area corresponding to today's WP, and in fact most of the Slavic area. The vowels were pronounced with initial glottal constriction, for which Śmiech provides some spelling evidence based on $14^{\text{th}}-15^{\text{th}}$ century texts. He argues that the letter *h* spelt at the beginning of vowel-initial words in Mazovian dialects (WP), e.g. hugoda > modern Polish ugoda 'settlement', and its absence in the CPP texts, corresponds to the presence and absence of glottalization, respectively. The glottalization prevented phonetic voicing of the word-final obstruent, and introduced weaker cohesion between words. At that point, according to Śmiech, a division arose between vowels and sonorant consonants in sandhi contexts. Vowel-initial words produced the same effects as voiceless obstruents, e.g. *sad Tomka* [t-t] 'Tom's orchard', sad ojca [t-2] 'father's orchard', while sandhi voicing continued to occur before sonorant consonants and voiced obstruents, e.g. brat Janka [d-j] 'Janek's brother', brat byl [d-b] 'brother was'. The distinction

that arose between vowels and other sonorants was later eliminated by what Śmiech calls analogy. The glottalized vowels introduced a pause between words and this pause was extended to other pre-sonorant contexts (*sad Janka* [d–j] \rightarrow *sad Janka* [t–j]). Thus, Śmiech assumes that the original phonetic character of the WP innovation was later replaced by a systemic one, relating to the nature of the boundary, which started to behave like a phonetic pause.

From today's perspective, Śmiech's explanation is truly multifaceted. It may be described as partly phonological (accepting word-final neutralization), partly phonetic (pre-glottalization of the initial vowels in WP as the original cause of the dialectal division), partly implementational (in the sense that the neutralized obstruents are phonetically interpreted as voiced in pre-sonorant context, and as voiceless if the context is missing), and partly analogical (the process/rule of voicing or devoicing is extended to all pre-sonorant contexts, and *somehow* enters the grammar). Additionally, Śmiech considers the idea that the strength of the word-boundary in the two dialects is different, and that this difference was introduced together with the WP innovation.

To conclude, neither Andersen nor Śmiech offers a full characterization of the phonological, interpretational and phonetic aspects of the sound systems they assumed. More importantly, they do not explain how in their analyses the dialectal distinction is grammaticalized. While it seems clear that Old Polish appears to have behaved like modern CPP, there seems to be little evidence that its obstruents sounded differently. If pre-sonorant sandhi voicing is phonetically natural in modern CPP, which is a voice system, it would have been in Old Polish too. It is therefore not clear how they would represent the modern state of affairs in the Polish dialects, which do not exhibit phonetic differences between the voiced and voiceless obstruents that would warrant the protensity vs voice distinction.6 On the other hand, whatever causes the devoicing sandhi in WP today, it need no longer be related to overt glottalization of vowels or pauses. This indicates that the initial phonetic causes are now redefined and active at a different level of linguistic description. The following section demonstrates how these problems are reflected in two privative approaches: laryngeal realism and laryngeal relativism.

⁶ This dilemma is well understood and expressed in Sawicka and Trawińska (2013: 28) in their discussion of the distinction between rules and processes and the different linguistic planes involved in the sandhi phenomena.

4. From realism to relativism and back?

The proposals of Śmiech (1961) and Andersen (1986) suggest a shift or reanalysis from the former state, and seem to correctly identify the possible origins of the dialectal distinction. The question is what that systemic shift involved and how the variation should be understood synchronically.⁷ In this section, I will briefly summarize the main tenets and problems of laryngeal realism as it is practiced today and contrast it with laryngeal relativism (Cyran 2011, 2014). Both are privative models, but they differ in the way the marked segment is identified. While realism is clearly guilty of type 1 circularity and additionally cannot explain pre-sonorant sandhi voicing without falling into the trap of type 2 circularity, laryngeal relativism seems to avoid circularity and capture the synchronic state of affairs. It represents the extreme view on substance in phonology adhering strictly, if not exclusively, to Trubetzkoyan logical markedness. However, laryngeal relativism, as explained in Section 4.2, does not seem to easily predict the possibility that earlier Polish was like today's CPP, which follows from the diachronic explanations given in Andersen (1986) and Śmiech (1961). This, as well as other theoretical problems will lead us to the third type of privativity represented by new laryngeal realism (Wojtkowiak and Schwartz 2018), which seems to get round this problem.

4.1. Laryngeal realism

The terms *laryngeal realism*, *privativity*, and *representation-based* cover a number of approaches to the phonological representation of laryngeal distinctions. One of the main traits of realism is its reliance on the relation between certain phonetic cues and a particular phonological representation, which is a continuation of the traditional practice found in both privative and non-privative approaches. Phonetic motivation of the phonological representation is what I call type 1 circularity in (3a) above and it is present in laryngeal realism as defined in Honeybone (2002), as well as in binary models, including the "unity of voice" principle (Itô, Mester and Padgett 1995; Rubach 1996; Wetzels and Mascaró 2001). What makes realism distinct from the binary systems is its insistence on privativity (representation-based) and grounding in the VOT typology (Lisker and Abramson 1964; Cho and Ladefoged 1999; Cho et al. 2019). Even here, however, there is still an array of views. For example, Cho (1990) argues for privativity, but assigns the [voice] category to sonorants, based on their activity in some languages (type 2 circularity), while Helgason and Ringen (2008)

⁷ A similar problem of vagueness with respect to the nature of phonologization of phonetically-based explanations of pre-sonorant sandhi voicing can be found in, e.g. Bárkányi and Kiss's (2015) analysis of the same phenomenon in Slovak.

assume a privative, but equipollent representation of Swedish obstruents on the basis of the presence of pre-voicing and aspiration in this system.

For the purpose of further comparison with laryngeal relativism and new laryngeal realism I will briefly define the strictest version of realism, in which the representation is privative and monovalent. It is based on the phonetic categories along the VOT continuum, and assumes direct phonetic interpretation of both the marked and the unmarked series without reference to a systematic phonetic representation (Harris 1994). In addition, I will set this model in the generally understood Government Phonology framework, in which word-final consonants are in fact phonologically followed by an empty nucleus (Ø), that is, they are onsets (Kaye 1990). I will show two things. Firstly, the model still suffers from type 1 circularity. And, secondly, it is unable to explain or even describe pre-sonorant sandhi voicing in CPP without falling into circularity of type 2. On the other hand, it neatly defines the WP dialects of modern Polish, suggesting what the grammaticalization of the devoicing sandhi may have involved.

As mentioned earlier, larvngeal realism is firmly grounded in the VOT typology (Lisker and Abramson 1964; Cho and Ladefoged 1999; Cho et al. 2019), which identifies three most common and typical phonetic categories used in linguistic systems, which appear to be aligned along the VOT continuum defined with respect to the point of release of the closure. The three phonetic categories, [b]-[p]-[p^h] are described as involving pre-voicing (long negative VOT in [b]), aspiration (long positive VOT in [p^h]) and short VOT in voiceless unaspirated [p] respectively. The displacement from the neutral [p] in either direction – voicing or aspiration – is associated with the presence of a phonological category, and the absence of displacement with neutrality. This way, the three phonetic, VOT-based categories [b]-[p]-[p^h] become unambiguously represented phonologically as /b[voi]/-/pº/-/p[sg]/, where [voice] and [spread glottis] are privative and monovalent. In Element Theory (e.g. Harris 1994), the corresponding representations are respectively $/b^{L}/-/p^{o}/-/p^{H}/$. Thus the VOT typology, which is phonetic in nature, became also a phonological typology, which is the point at which the model seems to have gone wrong. Viewed in terms of the relation between marked, as displaced, and unmarked, as neutral, this method of assigning a representation could be called natural marking in Trubetzkoy's terms. It has become normal practice within laryngeal realism to treat the relation between prevoicing cues and the feature [voice] or element |L|, and aspiration cues with [spread glottis] or |H| as linguistically stable, despite the warning issued by Trubetzkoy that such a move involves circularity. This phonetically-bound phonological representation appears to be the main characteristic of realism.

Systems involving a two-way laryngeal contrast, are then divided into voice languages (Slavic) in which the representation is taken to be

An important aspect of the stricter, monovalent variety of realism described above is direct phonetic interpretation of phonological representations at all stages of the derivation. In Element Theory (Harris and Lindsey 1995; Backley 2011) and more generally in Government Phonology direct interpretability is achieved thanks to the nature of the elements which are pronounceable independently or in combinations. Thus, the obstruent p^{o} , which is neutral with respect to laryngeal marking, is fully pronounceable as voiceless unaspirated labial plosive [p] in Polish,⁸ while /b^L/ is pronounced as fully voiced, unless it loses the element |L|, e.g. in word-final position. Delaryngealization occurs in front of the word-final empty nucleus (FEN) because the latter is not a laryngeal licenser ($b^{L} \rightarrow b^{o}/\mathcal{O}$). The /b^o/ which results from delaryngealization is now the same as the lexically neutral p° , that is, a laryngeally unmarked labial plosive, and is interpreted phonetically as voiceless unaspirated $(/b^{\circ}/=/p^{\circ}/ \leftrightarrow [p])$.⁹ Thus, in laryngeal realism, final devoicing in Polish, and in other Slavic languages, receives a straightforward phonological analysis: a marked obstruent is delaryngealized and phonetically interpreted in the same way as the unmarked. This holds for the phrase-final context, as well as the following three sandhi contexts: i) when followed by a word beginning with a voiceless obstruent, e.g. sad Karola $/d^{L} \rightarrow d^{o}-k^{o}/ \leftrightarrow [t-k]$ 'Karol's orchard', ii) before a vowel-initial word, e.g. sad Ani / $d^{L} \rightarrow d^{\circ}-a^{\circ}/ \leftrightarrow [t-a]$ 'Anna's orchard', and iii) before a sonorant-initial word, e.g. sad Janka / $d^{L} \rightarrow$ $d^{\circ}-j^{\circ}/ \leftrightarrow [t-j]$ 'Janek's orchard'. This is exactly what is expected of a neutral or neutralized obstruent, because to be interpreted as voiced in this system, it would have to possess |L|, for which there is no phonological source in the three contexts - voiceless obstruents are neutral, while sonorants are laryngeally unmarked by definition in the strict version of realism.

The analysis described above happens to cover most Slavic languages, including the Warsaw Polish dialects, which exhibit no pre-sonorant sandhi voicing. In this sense, it could be said to provide a simple answer to Śmiech's dilemma as to how the non-voicing sandhi was grammaticalized.

 $^{^{\}rm 8}$ In Element Theory, this object can be defined as a compound of elements responsible for labiality |U| and occlusion |?| (e.g. Backley 2011). Earlier versions of ET (e.g. Harris 1994) would also use the noise element |h| in obstruents.

 $^{^{\}circ}$ Following Scheer (2014), I use the symbol \leftrightarrow to illustrate the spell-out relations (phonetic interpretation).

The answer given by laryngeal realism is that the WP dialects were redefined from whatever they had been to a system with the contrast /b^L/ vs /pº/. The next question that one should ask is what the previous state was and what the system of CPP is now. This is a problem for larvngeal realism, which is based on natural marking of larvngeal contrasts and must assume that CPP has exactly the same contrast system. This means that pre-sonorant sandhi voicing cannot be explained, unless the phonetic interpretation or spell-out relations are arbitrarily changed to derive the opposite effect, that is, one in which the neutral obstruents are phonetically interpreted as voiced. The only alternative, therefore, is to look for the phonological source of the element |L| or feature [voice] in the initial sonorants in CPP, which would mean a return to previous generative analyses and would contradict the theoretical assumptions concerning the representation of sonorants in this strict privative model. To conclude, laryngeal realism, in its strict form, involves type 1 circularity, and additionally, it is unable to describe, let alone explain, the CPP sandhi voicing without falling into circularity of type 2, although it perfectly describes WP.

A similar dilemma may be said to concern the analysis given in Andersen (1986). As mentioned above, Andersen assumed that earlier Polish, and in fact Slavic, were marked in the opposite way to what is understood as a voice system phonetically and phonologically in modern Slavic. He is partly realist in that he associates a particular marking system with a particular phonetic interpretation: older Slavic languages were all protensity systems with possible longer articulation and aspiration of the voiceless series of obstruents, and modern Slavic languages are systems based on voice.¹⁰ While the historical change from protensity-based to voice-based systems is feasible, it does not explain the modern situation in which all Slavic languages are voice-based but still exhibit the historically established distinction into voicing and devoicing sandhi. The question is how this distinction can be systemically formalized in languages like Polish.

In what follows, it is shown that laryngeal relativism appears to solve the problem of the diachronic switch from protensity to voice-based systems, while basically upholding Andersen's analysis of sandhi phenomena by claiming that modern Slavic languages are voice systems only on the surface, while phonologically some of them continue the earlier marking, while others might have shifted to the system described above in laryngeal realism. This means, that even at earlier stages, Slavic languages may have been voice systems on the surface, but phonologically marked as predicted by the protensity view. This is possible only if the privative marking was all

¹⁰ This seems to follow from the fact that Trubetzkoy's tense/lax and voiced/voiceless distinctions were also understood as phonetic dimensions.

along logical in nature rather than natural, and phonological categories are disassociated from inherent substance. This will later take us to the proposal of new laryngeal realism (Section 2 of Part 2), which maintains that modern Slavic languages are still all protensity-based phonological systems even though they are voice systems on the surface.

4.2. Laryngeal relativism

Laryngeal relativism (Cyran 2011, 2014) may be viewed as part of the recent trend called substance-free phonology (Blaho 2008; Hale and Reiss 2008; Samuels 2011; Volenec and Reiss 2018; Odden 2022; Cyran 2023). It descended directly from laryngeal realism described above, partly as a reaction to its inability to account for CPP pre-sonorant sandhi voicing. Phonologically speaking, in laryngeal relativism, two-way contrast systems like Slavic use one laryngeal category called |Lar|. Like elements, it is privative and monovalent, but it has no inherent universal substance, except that it marks distinctions in the laryngeal dimension for linguistic purposes. Its relation to particular phonetic correlates, that is, groups of cues found, e.g. in the phonetic categories [b]–[p], is established in acquisition on the basis of systemic and logical criteria, respecting monovalence and minimality.

The relations that the phonological distinction /C^{Lar}/ vs /C^o/ establishes with the phonetic categories [b] and [p] are arbitrary in the sense that either configuration is logically possible, that is, either /b^{Lar}/ vs /p°/ or /b°/ vs /p^{Lar}/, but there are, or must be, systemic reasons, not phonetic, for one or the other type of marking. The larvngeal system in this approach is defined as the relation between privative, monovalent categories in the phonological representation with the phonetic categories, which is established in acquisition as phonetic interpretation statements (e.g. $/C^{Lar}/\leftrightarrow$ voiced). Thus, in relativism, the choice of the marked segment has no effect on how it is pronounced in phonetic interpretation, and vice versa. The phonetic categories are prior to phonological representations. The marking merely establishes their phonological function, defining the presence of a linguistic distinction and computation to go with it, e.g. phonologically determined distribution of |Lar|. Importantly, the particular marking system becomes part of the interpretative system of a given language or dialect, and in this sense, the distribution of |Lar| is going to determine the phonetic interpretation of the phonological objects, not only in the contexts in which the lexical representation is maintained (e.g. pre-vocalic), but especially in the contexts of neutralization (e.g. word-final). It is assumed that the phonetic interpretation relations, or spell-out relations, are generally systematic and consistent within a given system. They play an important role not only in phonetic interpretation but also in perception of the signal. Once

the system has been acquired, the category |Lar| in obstruents, as well as its absence, have particular relations to particular families of cues, which can be interpreted depending on the phonetic context. It is still not the same as saying that |Lar| has substance – it is linked to substance at spell-out, that is, through an interface. We can see, that the representations in relativism avoid circularities of type 1 and 2. This is because the choice is systemic, not phonetic. It is of higher order than the mere spotting of a process. While, it is primarily based on phonetically observed patterns, it consists in the learner making linguistic sense of it by postulating phonological representations, computation, and phonetic interpretation rules.

It was mentioned above that the pre-sonorant sandhi phenomena in Polish involve at least three levels of linguistic description and two interfaces. One interface has just been described: phonology communicates with phonetics via spell-out, or phonetic interpretation (Harris and Lindsey 1995; Scheer 2014). The other interface concerns the relation between morphosyntax and phonology. Following Scheer (2011, 2012), it may be assumed that the so called word-boundary is translated, or spelt-out, into phonology as a phonological object called the final empty nucleus (\emptyset_{FEN}), or as grammatical functions of the final empty nucleus. It will be recalled that within GP and Strict CV models the FEN follows the surface final consonant also for phonological reasons (Kaye 1990; Lowenstamm 1996; Scheer 2004). It is, therefore, not a diacritic, though it may to some extent be understood as a modern theoretical incarnation of the juncture phoneme (Trager 1962). It is part and parcel of the phonological representation and it interacts with the preceding onset, for example, with respect to licensing, or lack thereof, of such properties as |Lar| in it.

The phonological explanation of the pre-sonorant sandhi patterns in Polish is restricted to two aspects: the representation of the contrast with |Lar|, which is the opposite in the two dialects, and the delinking of the unlicensed |Lar|. The rest is system-based phonetic interpretation. It is proposed that in WP the laryngeal property is present in the voiced series of obstruents (/b^{Lar}/ vs /p^o/), while in CPP the marking is reversed (/b^o/ vs /p^{Lar}/) as shown in (4).¹¹

(4) CPP and WP final obstruent in sandhi context

a.	CPP	las Ani 'Anna's forest'	$/las^{Lar}O/$	\rightarrow	/lasºØ api/	\leftrightarrow	[la z aŋi]
		<i>teraz Ania</i> 'Anna's turn'	/tɛrazºØ/	=	/tɛrazºØ aŋa/	\leftrightarrow	[tera z aŋa]
b.	WP	las Ani 'Anna's forest'	/lasºØ/	=	/lasºØ api/	\leftrightarrow	[la s aŋi]
		<i>teraz Ania</i> 'Anna's turn'	/tɛraz ^{Lar} Ø/	\rightarrow	/tɛrazºØ aŋa/	\leftrightarrow	[teras ana]

 $^{^{11}}$ The symbols /b, p/ are a mere shorthand for the corresponding phonetic categories [b, p] in prevocalic context. Phonologically speaking, /p°/ and /b°/ are the same object /C°/, but with different, dialect specific interpretation.

The opposite marking of the laryngeal contrast defines two distinct interpretational systems, which has its consequences in the context of neutralization. In CPP, the marked obstruents are pronounced as voiceless in the context of the following vowel when the consonant and the vowel are phonologically adjacent, e.g. *lasami* /las^{Lar}ami/ \leftrightarrow [lasamⁱi] 'through the forests'. When the adjacency is only phonetic, the voiceless obstruent is first delaryngealized, and the neutralized obstruent is interpreted as voiced just as the lexically neutral obstruents because phonetic interpretation operates with phonetic adjacency, e.g. las Ani /las^{Lar} \emptyset / \rightarrow /las^o \emptyset ani/ \leftrightarrow [laz ani] 'Anna's forest', $razem/raz^{\circ} \epsilon m/ \leftrightarrow [raz \epsilon m]$ 'together'. In WP, on the other hand, the marked obstruents are pronounced as voiced in the phonetic context of sonorants, but only if that context also involves phonological adjacency, allowing |Lar| to be licensed, e.g. $razem / raz^{Lar} \epsilon m / \leftrightarrow [raz\epsilon m]$ 'together', while the neutral and neutralized obstruents must be interpreted as voiceless, cf. las Ani /las^oØ ani/ \leftrightarrow [las ani] 'Anna's forest' and *teraz Ania* //teraz^{Lar}Ø// \rightarrow /teraz^oØ ana/ \leftrightarrow [teras ana] 'Anna's turn', respectively.

It is not difficult to see how this proposal blends two stages in the history of Polish, as proposed in Andersen (1986), into one synchronic state: Polish is a voice language, but only on the surface. This means that there is also no need to assume that Slavic languages had a different system on the surface. They may have been voice systems all along. This analysis also clarifies the status of Śmiech's analogical switch that distinguished WP from CPP: systemically, WP reanalysed its voiced obstruents as marked in order for the interpretational patterns to be consistent with the phonological representation. Thus, the phonetic explanation for the origin of the WP type dialects given in Śmiech is viable as a trigger of the changes, but it requires a story of reanalysis along the lines offered by laryngeal relativism.

At this point, one should note the dual nature of the context _(R)V. Phonologically speaking, this is the context in which |Lar| is licensed. For example, in *kra* vs *gra* 'icefloe / game', the vowel is phonologically adjacent to the laryngeal node of the obstruent and licenses its laryngeal marking (Cyran 2014). Phonological adjacency entails phonetic adjacency, or cohesion, that is, the context for particular articulatory planning and phonetic interpretation. On the other hand, phonetic adjacency does not automatically entail phonological adjacency. Note that in the case of external sandhi (1), the final obstruent is not phonologically adjacent to the following vowel (no licensing relation possible), but it is phonetically adjacent, allowing for the interpretation of the final obstruent as if it was word-medial (C°V = C°#V).

The role of all three elements of the sandhi context ...C#(R)V... is clear in the relativist analysis. The phonological representation of the contrast is opposite in WP and CPP. The phonological role of what we have referred to as the boundary (represented by #) is also clearly defined. It is an empty nucleus (FEN), whose final status is determined by the interaction between phonology and morpho-syntax. The FEN restricts the phonological properties of the final consonant. Delaryngealization is the only phonological computation that occurs in pre-sonorant sandhi patterns. Formally, the FEN does not seem to play any other function except that of licensing its onset, but not licensing the |Lar| property in it. The FEN, however, closes the domain of phonological activity, as it were, which makes phonological interaction with what follows impossible. Thus, it in fact plays two roles. It affects the shape of the right edge of the word and blocks cross-boundary interaction of phonological nature. If understood strictly, this means that not only phonological licensing, but also phonological assimilation across the FEN should be impossible. Only phonetic assimilation or phonetic interpretation based on phonetic adjacency, is possible. Finally, the role of sonorants in the sandhi context is limited to providing the phonetic context for phonetic interpretation of the neutral obstruent C° in both dialects. Their phonological role is none.

5. Outlook

In the second part of this article, I look at a more recent approach called new laryngeal realism (Wojtkowiak and Schwartz 2018), which provides new insights into the phenomenon of pre-sonorant sandhi voicing as a historical development. Its representational assumptions are fully compatible with those in Andersen (1986) in that, originally, Polish marked only the voiceless obstruents (/b^o/ vs /p^{Lar}/). However, new realism assumes this marking to be universal in voice languages. In this way, new realism opposes the relativist view that the division between CPP and WP concerns the representation of the contrast, while accepting the possible phonetic continuity of Polish and Slavic as surface voice systems. Also a phonetically based explanation is sought for the dialectal distinction between CPP and WP, which seems to pick up the story of Śmiech (1961) at the point where the latter had to resort to analogy.

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