Ambiguity in Phonology?

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Abstract

The paper presents a short survey of phenomena to do with sound systems, which seem to point to the conclusion that there may exist cases of ambiguity at the phonological level. On closer inspection, however, it turns out that phonology is inherently rather unambiguous. What is ambiguous is the phonetic data and phonetic interpretation conventions that link phonology to the phonetic form. If phonology provides a distinction, it is usually categorical and it serves a particular purpose. Either the phonological representations result in unambiguous phonetic data, or, if they sound the same, they show disparate phonological behaviour which is revealed in some contexts. While in other contexts the representations may produce ambiguous results, the ambiguity typically lies in the surface form. This pattern repeats at various levels of phonology. The paper looks at segmental cases of ambiguity, known in the literature as neutralization, or the so called double agents, as well as at some apparent cases of structural ambiguity to do with syllable structure. It seems that the pattern also repeats at the level which is referred to as systemic, and which involves the interaction between phonology and phonetics.

1. Introduction

This discussion should probably begin with the realization that the very phrase 'ambiguity in phonology' is extremely vague. The source of the vagueness lies in the fact that there is no precise and indeed just one view on what phonology is in the first place. Thus, the subject matter can only be discussed in a sensible way if we place it within the purview of a particular theoretical model. On the other hand, what can be safely noted pre-theoretically is that surface phonetic facts are inherently ambiguous, in that, for example, a given surface string [ABC] may be argued to have two distinct underlying sources, /abc/ or /xyz/. This concerns not only the relation of surface facts to phonology, but also to morphology and syntax.[1]

For the sake of the argument, let us begin then with an assumption that phonetics and phonology are two distinct domains, which are somehow related to each other. Then, one could make the following rather self evident observation: the more remote phonology is from phonetics, the more ambiguity can be found in the phonetic signal, and vice versa. A close integration between phonetics and phonology precludes or highly constrains the probability of ambiguity. The question is: at which point might the elimination of ambiguity begin to thwart any valid phonological synthesis and generalization allowing for the understanding of the observed sound patterns. Before we look at some concrete examples which will facilitate further discussion we should bear in mind that most cases of ambiguity will follow from particular theoretical assumptions and will be based on the analytic results of the application

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[1] Recall the textbook example: *The boy saw a man with a telescope*, which may have two distinct semantic interpretations depending on the position of the prepositional phrase *with a telescope* in the hierarchical structure of the sentence.

of a particular model to linguistic data. In other words, what is a case of ambiguity in one model, might not be so in another.

The important question is why such ambiguity arises or is analytically proposed. In the syntactic example mentioned above the ambiguity follows from the fact that different hierarchical configurations serve the purpose of expressing different semantic functions and yet they may still yield the same surface string. This, however, does not mean that syntax is ambiguous in this particular case. The ambiguity is a by-product of the linearization or phonological interpretation of these structures. In this sense, the very term structural ambiguity misses the point. It is the surface form that is ambiguous, not the structures. To a great degree ambiguity in phonology works along similar lines – it is more often than not a phenomenon concerning the interaction between phonetics and phonology, rather than phonology itself. For this reason, in what follows, I will refer to ambiguity in sound systems, a broader term which covers the aforementioned interaction.

2. Some examples of surface ambiguity

2.1. Neutralization

The first phenomenon that springs to mind in the context of ambiguity in sound systems is neutralization, which consists in the suspension of phonological oppositions in some contexts (Trubetzkoy 1939). One example of such suspension is the loss of voicing opposition among obstruents in languages like German, Russian or Polish. In Polish, the oppositions b/p, t/d, k/g, f/v, s/z, ɕ/ʑ, ʃ/ʒ, ts/dz, tɕ/dʑ, tʃ/dʒ are neutralized word-finally and in front of other obstruents. In the former case, the opposition is neutralized to the voiceless one, and the phenomenon is known as final obstruent devoicing (FOD). In the latter instance, the opposition is reduced to either a voiced or a voiceless object, depending on the nature of the following obstruents which provides or imposes the relevant property. Here, we are dealing with voice assimilation (VA). Examples of FOD and VA in Polish are given below.

(1)   a. FOD vs. lexically voiceless
           stogu – stóg 'haystack, gen.sg./nom.sg.'
           [stɔgu] – [stu<u>k</u>]

           stuki – stuk 'knock, nom.pl./nom.sg.'
           [stuci] – [stu<u>k</u>]

       b. VA
           ława – ławka 'bench, nom.sg./dim.'
           [wava] – [wa<u>f</u>ka]

           prosić – prośba 'to ask/request'
           [prɔɕitɕ] – [prɔ<u>z</u>ba]

The surface form [stuk] in (1a) is ambiguous, because the final obstruent could originally (phonologically) be a /g/ or a /k/. Final devoicing reduces the voice contrast to one type, the

voiceless one. Voice assimilation produces voiced or voiceless objects (1b), and the result mirrors the static distribution of voice in obstruent clusters in Polish, namely, voice agreement.

It should be added that the very concept of neutralization has been undermined by laboratory phonology studies, in which it is claimed not only for Polish (Slowiaczek and Dinnsen 1985, Strycharczuk 2012) but also for German (e.g., Mitleb 1981, Port, Mitleb, O'Dell 1981) that the neutralization is incomplete. However, the matter has not been proved conclusively, and arguments as well as experimental results to the contrary have also been adduced, e.g., Jassem and Richter (1989) for Polish, and Fourakis and Iverson (1984) for German.

2.2. Double agents

The term 'double agents' was coined by Gussmann (2001a, 2001b, 2002) and refers to situations where distinct phonological objects are realized by means of the same phonetic configuration (sound). The phenomenon, unlike neutralization, does not occur in particular contexts. Rather, we are dealing with a situation of surface ambiguity, where the phonetic form does not directly indicate the exact phonological object. The obvious question then is: how are we to know that we are dealing with two different representations? The main pointer here is the disparate phonological behaviour that phonetically identical sounds may exhibit.

One interesting example which is given by Gussmann is that of the voiceless velar spirant, or in fact the two velar spirants that Polish seems to have. They are called 'velar' for phonetic reasons, as they have velar articulation. However, one of them patterns with other velar obstruents, that is, /k,g/, while the other one behaves like non-velar consonants. Consider the following data in which [x] patterns with the non-velar consonants (2a).

(2)

  a. słaby [swabɨ] 'weak, masc.sg.' – słabe [swabɛ] 'fem.pl.'
    łaciaty [watɕatɨ] 'spotted, masc.sg.' – łaciate [watɕatɛ] 'fem.pl.'
    bosy [bɔsɨ] 'barefooted, masc.sg.' – bose [bɔsɛ] 'fem.pl.'
    uroczy [urɔtʃɨ] 'charming, masc.sg.' – urocze [urɔtʃɛ] 'fem.pl.'
    głuchy [gwuxɨ] 'deaf, masc.sg.' – głuche [gwuxɛ] 'fem.pl.'

  b. głęboki [gwɛmbɔci] 'deep, masc.sg.' – głębokie [gwɛmbɔcɛ] 'fem.pl.'   *kɨ/kɛ
    srogi [srɔɟi] 'stern, masc.sg.' – srogie [srɔɟɛ] 'fem.pl.'   *gɨ/gɛ

The voiceless velar spirant in (2a) behaves like other non-velar consonants in that it can be followed by the retracted [ɨ] and also remains unpalatalized before [ɛ]. However, if the stem final consonant is a velar plosive /k,g/ (2b), it must be palatalized before these endings to produce [...ci /...ɟi] and [...cɛ / ...ɟɛ] respectively. Indeed, even outside this particular context, the velar plosives, excluding some restricted exceptions, must appear as palatalized in front of the front vowels. Particularly restricted is the sequence *[kɨ] and *[gɨ]. On the other hand, [xɨ] is fairly regular, and so is [çi], as can be seen in the data below taken from Gussmann (2002: 199).

(3)
    a. chybić [xɨbʲitɕ] 'miss'
        pochylony [pɔxɨlɔnɨ] 'reclining'
        chytry [xɨtrɨ] 'cunning'

    b. chichot [çixɔt] 'giggle'
        historia [çistɔrja] 'history'
        wehikuł [vεçikuw] 'vehicle'

The situation is similar in the case of the distribution of the velar spirant in front of [ε]. Thus, next to forms like *chemia* [xεmja] 'chemistry' and *hebel* [xεbεl] 'plane', we find *hiena* [çεna] 'hyena' and *hierarchia* [çεrarxja] 'hierarchy'.

    The double nature of the voiceless velar spirant is not fully understood. Gussmann (2002: 200) suggests that two different phonological objects might stand behind the same phonetic sound [x]. One of them is a voiceless velar fricative. The other is also a voiceless fricative, possibly glottal, except that it is pronounced as velar. One problem with this analysis is that sometimes the same spirant behaves disparately depending on whether inflection or derivation takes place. Consider some examples below.

(4)
    monarcha [mɔnarxa] 'monarch'
    monarchy [mɔnarxɨ] 'id.gen.sg.'
    monarchini [mɔnarçiɲi] 'id.fem.sg.'

    podmuch [pɔdmux] 'blow'
    podmuchy [pɔdmuxɨ] 'id.nom.pl.'
    podmuchiwać [pɔdmuçivatɕ] 'id.secondary imperfective.'

Then, either one would have to assume a morphophonological replacement of $/x_1/$ with $/x_2/$, e.g. Gussmann (2007), or propose an analysis in which the 'double agent' label is given not to the velar spirant but to the vowels $/i,ɨ,ε/$ in Polish, e.g. Cyran (2010a). However, the double nature of the data involving the spirant still remains to be understood.

2.3. Phonetic variability

A mirror image of the double agents is also observed. It is a situation in which a phonological object can be manifested differently across dialects or idiolects. For example, this concerns the coronal sonorant [r]. Kaye (2005) discusses two ways in which this sonorant is pronounced in Quebec French. One realization is an apical trill while the other is a uvular one.

> The trilled variety tends to be used by older, rural and less well-off speakers whilst the uvular version is more often found amongst younger, urban and better-off speakers. From a phonological point of view however, the two are identical. Their distributions are the same. They trigger or undergo the same phonological events. (Kaye 2005: 185)

Thus, it seems that the choice of phonetic form depends on sociolinguistic factors. An interesting comment that Kaye makes here is that despite the disparate articulation, we are dealing with the same phonological object.

A similar phenomenon is also observed in Polish, albeit on a much smaller scale. It is more a property of individual speakers than a dialectal or sociolinguistic choice.

> What is found corresponding to the alveolar trill is the alveolar tap [ɾ] or alveolar approximant [ɹ], but also the much more phonetically distant, at least as far as the articulation goes, namely the uvular trill [ʀ] or the uvular fricative [ʁ]. Although articulatorily quite distinct, all these sounds behave in an identical fashion when it comes to phonological patterning in that they display the same distributional properties and are involved in the same morphological alternations. In other words, they are phonologically one and the same unity and their phonetic diversity is simply irrelevant. (Gussmann 2001: 153)

Again, it is claimed that we are dealing with the same phonological object which can receive a range of articulations.

One might ask if the phonetic variability is not a case of true phonological ambiguity. It may appear as such because given a particular phonological representation we cannot predict how it is going to be interpreted phonetically. However, the fact that the distribution and phonological patterning are the same for these phonetic objects makes this ambiguity only apparent. Similar examples of phonetic variability can be multiplied, however they prove the same observation: they are not really cases of phonological ambiguity.

2.4. Structural ambiguity in sound systems

As in syntax – recall the example in footnote 1 – sound systems also abound in a parallel structural ambiguity. Parallel also in the sense that the structures are not really ambiguous themselves. It is their phonetic shape that fulfils this criterion. The formal aspect of phonological representations is connected with the structure of the syllable. Below, one example of surface ambiguity will be mentioned. It concerns surface clusters of consonants of the branching onset type, that is, of a rising sonority profile.

The discussion is based on the model of Complexity Scales and Licensing (Cyran 2010b), which assumes after, e.g. Lowenstamm (1996) and Scheer (2004) that syllable structure is a strict consecution of onsets and nuclei (CV or ON). Consonant clusters in CV phonology always contain an empty nucleus (6). The flanking consonants can contract an interonset governing relation if they comply with the following conditions (Cyran 2010b: 183).

(5)

     Conditions on government

        a. *melodic complexity profiles* (in which the governor, symbolized as (*T*), is melodically more complex (less sonorous) than the governee (*R*).
        b. *adjacency* (the two consonants must not be separated by any melody, linked or floating).

c. *licensing* (governing relations, just as simplex segments, require licensing from the nucleus following such a segment or relation).

Given the above conditions, the surface clusters of rising sonority, often referred to as branching onsets in the traditional literature, can take the following structural representations in Polish.

(6)

    a. *true TR*   b. *false TR*

$$O \quad \underline{N_1} \quad O \quad N_2 \qquad\qquad O \quad N_1 \quad O \quad N_2$$
$$| \qquad | \quad\;\; | \qquad\qquad\qquad | \qquad\qquad | \quad\; |$$
$$T \longrightarrow R \quad \alpha/\phi \qquad\qquad\quad T \quad (\alpha) \qquad R \quad \alpha$$
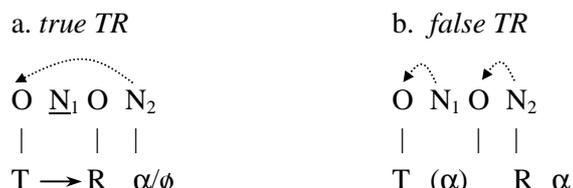
O – Onset, N – Nucleus, $\underline{N}$ – locked Nucleus, ϕ - empty nucleus, (α) - vocalic melody

Government   ⟶

Licensing   ·········➤

The representation in (6a) may be assumed for true clusters of rising sonority in words like *krowa* [krɔva] 'cow, nom.sg.', or *wiatr* [vʲatr] 'wind, nom.sg.'.[2] Technically speaking, we are dealing here with a rightward interonset governing relation (RIO), which is possible because the melodic profile of the two onsets is correct, the intervening nucleus is truly empty, and the following nucleus provides the necessary licensing. In *krowa*, this licensing comes from a full vowel /ɔ/, while in *wiatr*, where the cluster is word-final, the licenser is empty. The intervening nucleus N_1 inside such relations is underlined to express the fact that it is locked and invisible to any phonological processing.

It appears that the structure of a 'false TR' in (6b) is required in Polish phonology to account for the disparate behaviour of some TR clusters. Before we look at the relevant facts, let us add some conditions on such phonological representations.

(7)

    Conditions on false clusters

    a.   'ϕ' is a licenser of the preceding structure

    b.   'ϕ's do not occur in sequences (*ϕ–ϕ)

Firstly, since the intervening nucleus in (6b) is not locked by a governing relation, it must act as a licensor to its preceding onset. This requirement, if not fulfilled, eliminates false clusters from a given system.[3] The governing relation is absent in the structure of a false cluster either because the melodic profile is not right, or because the relation cannot be licensed, or, finally,

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[2] Note that in the traditional phonological literature, the former will be identified as branching onset, while the final cluster in *wiatr* will be referred to as, e.g., a (complex) coda. In the Government Phonology tradition both are clusters of the same formal configuration – branching onset, which, of course, gets a slightly different rendition in CV phonology, as the graphs in (6) show.

[3] It is claimed in Cyran (2010b: 131), for example, that this is the main parameter distinguishing Polish and English word-initial clusters.

because there is a floating melody in the representation of such clusters. It is postulated in such representations on the basis of vowel-zero alternations (Scheer 2004) and renders the two onsets non-adjacent. The floating melody under N_1 in (6b) is put in parentheses because it is only one of the few conditions for the false character of the cluster. The second condition allowing for the existence of false clusters in the representation is a universal ban on sequences of two empty nuclei. This condition will be crucial in the following illustration of the function of false TR clusters in Polish phonology. We assume that this structure always has an intervening floating melody [ɛ].[4]

Let us now look at two contexts in which the distinction made in (6) plays a crucial role in the behaviour of certain forms in Polish. The first context is word-final. The prediction that follows from the representation in (6b) is that a cluster of this structure will not be found word-finally (consonants and consonant clusters are followed by an empty nucleus in Government Phonology). Below, it is shown how the forms *swetra* [sfɛtra] 'jumper, gen.sg.' (8a) and *wiatru* [vʲatru] 'wind, gen.sg.' (8c) are distinguished based on their disparate behaviour before a zero ending in (8b) and (8d).

(8)

    a. *swetra* [sfɛtra]   b. *sweter* [sfɛtɛr]

    c. *wiatru* [vʲatru]   d. *wiatr* [vʲatr]
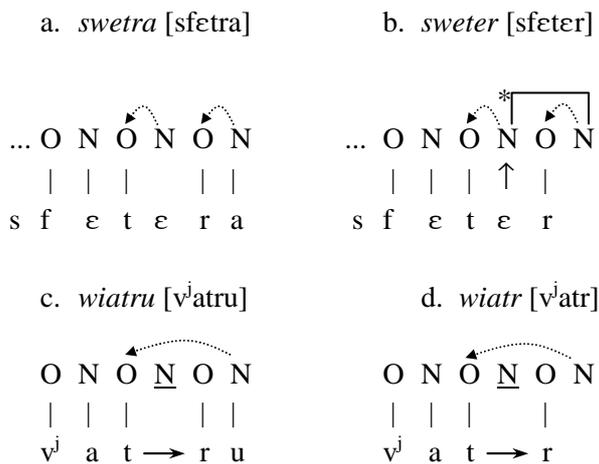
In *swetra* and *wiatru* (8a,c) the forms contain a surface cluster [tr] which to all intents and purposes sounds the same. The true identity of the clusters in question is revealed in the nominative case, in which the inflectional ending is an empty nucleus. The cluster in *swetra* is false, and contains a floating melody which disallows a governing relation of the interonset type. On the other hand, such a relation is observable in *wiatru* (8c). In the nominative case, the ban on sequences of empty nuclei enforces the association of the floating melody to its nucleus, which results in a vowel – zero alternation in the forms *swetra – sweter*. The [tr] cluster in *wiatru – wiatr* consistently maintains the interonset governing relation which locks the intervening truly empty nucleus and makes it invisible to the universal constraint on sequences of empty nuclei.

It should be noted, that the difference between the two patterns observed in (8) cannot be expressed by reference to epenthesis, because the melodic conditions and the contexts would

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[4] See however interesting arguments adduced in Scheer (2012) that some of the vowel-zero alternations in Polish might result from epenthesis.

be identical. The difference must be expressed representationally, and such an analysis is provided above.

The other context in which this distinction – between true and false TR clusters – is operative in Polish is word-initial, and the phenomena which betray it are connected with prefixation. Let us compare the behaviour of a surface cluster [gr] with respect to the prefix *od(e)–*.

The verb form *grać* 'play' frequently vocalizes the empty nucleus in the prefix, as in *odegrać się* [ɔdɛgratɕ] 'take revenge'. It is not surprising that this phenomenon of prefix vocalization is connected with the fact that *grać* is based on a noun which exhibits a vowel-zero alternation similar to *swetra – sweter*. Namely, *gra* [gra] 'game, nom.sg.' alternates with *gier* [gʲɛr] 'game, gen.pl.'. No such vocalization in the prefix is observed if we take a different verb beginning with a phonetic [gr] sequence, in which no vowel-zero alternation is found in the stem, for example, the verb *grodzić* [grɔdʑitɕ] 'to build a fence'. The prefixed form with *od(e)–* is *odgrodzić* [ɔdgrɔdʑitɕ] 'fence off'. The two prefixed forms are illustrated below ignoring the relation of licensing and leaving only the relevant aspects of the representations.

(9)

a.
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     *┌───┐
... O N O N O N ...
   |  ↑ |   | |
   ɔ  d ɛ g ɛ r a tɕ
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[ɔdɛgratɕ] *odegrać*

b.
```
... O  N  O  N̲  O  N ...
   |     |     |  |
   o  d  ɛ  g →r ɔ dʑ i  t͡ɕ
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[ɔdgrɔdʑit͡ɕ] *odgrodzić*

The main difference between (9a) and (9b) lies in the presence of a floating melody in the first nucleus of the stem. It is present in *grać* and absent from *grodzić*. The rest is due to the phonology: in *odegrać*, the illicit sequence of two formally empty nuclei is resolved by associating the one on the left with the melody – it is pronounced. On the other hand, there is no floating melody in *grodzić*. The empty nucleus inside that cluster is locked by the interonset relation and is made invisible to the ban on sequences of empty nuclei. For this reason, there is also no need to vocalize the preceding nucleus as it is not followed by an empty nucleus.

The above distinction between true and false TR clusters is as close as one can get to the phenomenon of structural ambiguity in syntax as in the example *The boy saw a man with a telescope*. As in syntax, this distinction is necessary as it is responsible for the different functioning of the forms. Below, we move to the final and most controversial example of ambiguity: systemic ambiguity.

3. Systemic ambiguity
3.1. Sandhi voice assimilation – basic facts
What is meant by systemic ambiguity here is a situation in which two systems sound the same and have the same phonological processes but some differences in the observed phenomena may suggest that we are dealing with disparate if not opposite phonological representations.

One example of this situation is the recently proposed Laryngeal Relativism (Cyran 2011, 2012) which claims that the two major dialect groups of modern Polish, namely, the Cracow-Poznań (CP) and Warsaw Polish (WP) possess opposite marking of their laryngeal systems.

Let us begin with the facts. Both CP and WP seem to have identical word phonology and phonetic facts with respect to laryngeal issues. Thus, both dialects contrast voiced vs. voiceless unaspirated obstruents, e.g., p/b, t/d, k/g, f/v, s/z, ɕ/ʑ, ʃ/ʒ, ts/dz, tɕ/dʑ, tʃ/dʒ. Additionally, the dialects have similar phenomena to do with voicing, namely, final obstruent devoicing and voice assimilation which were already mentioned in (1) above, as well as a static voice agreement within obstruent clusters.[5] Voice assimilation of the type, *ławka* [wafka] < /wav-ka/ 'bench' and *liczba* [lʲidʒba] < /lʲitʃ-ba/ produces the same kind of clusters that are found in the forms with static agreement, e.g., *kto* [ktɔ] 'who', *gdy* [gdɨ] 'when', etc.

The two dialect groups CP and WP differ markedly with respect to the celebrated phenomenon of sandhi voicing, that is, voice assimilation of the word final obstruent to the following sound.[6] It is interesting to note that in the Polish linguistic tradition, probably more ink has been spilt over the phenomenon of sandhi voicing than on the voicing distinction and its behaviour in word phonology (Baudoin de Courtenay 1894; Benni 1904; Nitsch 1909, 1957; Śmiech 1961; Górny 1956; Maciejewski 1954, etc.). Even with the advent of generative studies of the voicing complex in Polish the sandhi phenomena remain prominent, though poorly understood (Bethin 1984, 1992; Gussmann 1992; 2007; Michalski 2009; Rubach 1996). The details of sandhi voicing in CP and WP are as presented below (after Cyran 2012: 154).

(10)

		WP	CP	
a.	bra<u>k</u> <u>o</u>ceny 'lack of mark'	[k ɔ]	[g ɔ]	__ V
b.	bra<u>k</u> <u>j</u>asności 'lack of clarity'	[k j]	[g j]	__ S
c.	bra<u>k</u> <u>w</u>ody 'lack of water'	[g v]	[g v]	__ C^{+v}
d.	bra<u>k</u> <u>p</u>ieczątki 'lack of stamp'	[k p]	[k p]	__ C^{-v}
e.	obra<u>z</u> <u>a</u>nioła 'picture of angel'	[s a]	[z a]	__ V
f.	obra<u>z</u> <u>m</u>istrza 'picture of master'	[s m]	[z m]	__ S
g.	obra<u>z</u> <u>b</u>urzy 'picture of storm'	[z b]	[z b]	__ C^{+v}
h.	obra<u>z</u> <u>cz</u>łowieka 'picture of man'	[s tʃ]	[s tʃ]	__ C^{-v}

Thus, in WP the final obstruent may be voiced in the sandhi context only if the following word begins with a voiced obstruent, e.g., *brak wody* [brag vɔdɨ] 'lack of water', *obraz burzy* [ɔbaz buʒɨ] 'picture of storm'. There is no voicing in front of sonorant consonants (_S) and vowels (_V). On the other hand, in CP, the voice assimilation takes place in front of all voiced segments, including obstruents, sonorant consonants and vowels. The only context in which

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[5] Some exceptions concern the clusters of obstruent + labiodental fricative, in that dialectally the voicing agreement may be absent, e.g., *tfuj* [tvuj] 'yours' in the western dialects of Kashubia, Greater Poland and part of Silesia (Dejna 1973: 100).

[6] The phenomenon has also been observed in other languages, for example, Sanskrit (Baudoin de Courtenay 1894; Vennemann 1974), dialects of Breton, German, Italian, Dutch and Catalan (Krämer 2001; Wheeler 1986; De Schutter and Taeldeman 1986; Ternes 1970).

the consonant remains voiceless in CP is in front of a voiceless obstruent, or indeed before a pause.

There are two major theoretical issues at stake here. One of them concerns representation, while the other relates to phonological processing. The two aspects are interdependent in the sense that any description of a phonological process must take into account phonological objects (features or elements) that are present at the relevant stage in the input to the phenomenon of CP sandhi voicing. With respect to the phonological categories that are at play in the voicing systems of CP and WP, existing analyses of the voicing complex of Polish typically assume identical representation of the voicing contrast among obstruents for both dialects (Bethin 1984, 1992; Gussmann 1992, 2007; Rubach 1996). The differences lie in the way this contrast is represented and in the formulation of the sandhi rule. However, regardless of whether a binary or privative system is used, the common assumption concerning the CP sandhi voicing assimilation has been that in that dialect a feature [+voice] spreads not only from obstruents but also from sonorants. Thus, the major difference between CP and WP with respect to sandhi phenomena lies in the presence versus absence of voice spreading from sonorants. Other details, including the need for rule ordering were mere consequences of that thinking and will not be expounded on here.

3.2. Problems with privative accounts

The analysis reviewed below makes two very strong assumptions concerning rules and representations. Firstly, it is assumed that the phonological representation of the voicing contrast in languages like Polish must be privative, where one series is marked with a laryngeal category while the other is deprived of a category of this kind. Additionally, following the Government Phonology (GP) tradition, the unmarked series are non-specified rather than underspecified for voice. The difference between the two standpoints is that in traditional privative accounts using underspecification, the unmarked objects had to receive the respective full specifications by rules or default filling conventions in order to be pronounced. In the Element Theory of (GP), the phonological representations are pronounceable at all stages of the derivation without having to arrive at a more pronounceable state referred to as systematic phonetic representation. Thus, if the element {L} is responsible for voicing in Polish obstruents, then, all other things being equal, /b/ is /p+L/, where /p/ has a direct phonetic interpretation as a voiceless unaspirated [p] and /p+L/ is a fully voiced [b]. In other words, for [p] to be pronounced, /p/ does not need to receive [–voice].

One crucial outcome of this model is that sonorant consonants and vowels, which do not contrast in voicing, do not possess the element {L} lexically, and they do not receive this element at any stage of the derivation either. Sonorant consonants and vowels are spontaneously voiced, that is, for free, due to their open articulation which prevents intra-oral air pressure build-up that militates against vocal fold vibration in obstruents. Since sonorants do not possess {L}, they obviously cannot spread voicing onto the preceding obstruents in CP sandhi. This was one of the reasons why Gussmann (2007) refused to deal with CP sandhi in phonological terms, and only noted the existence of this mysterious phenomenon in a footnote. Indeed, given that obstruents must have {L} to be pronounced voiced, and the fact that sonorants do not have {L}, an explanatory phonological analysis of CP sandhi appears to

be impossible. Before the new proposal is reviewed, however, a number of comments are in order concerning phonological processing in privative models.

Final obstruent devoicing (FOD) seems to be rather straightforward under a privative account. Given the distinction between [b]</p+L/ and [p]</p/, the process can be viewed as element loss in word-final position. Simply, the voiced labial stop of *żaba* [ʒaba] 'frog, nom.sg.' loses the element {L} in *żab* [ʒap] 'frog, gen.sg.' due to a hostile prosodic environment. On the other hand, voice assimilation (VA) becomes ambiguous in that a phonetically symmetrical phenomenon must receive a disjunctive / asymmetrical phonological interpretation. While in *liczba* [lʲidʒba] < /lʲitʃ-ba/ 'number' we are dealing with element {L} spreading from /b/ onto /tʃ/ – a phonological assimilation by spreading – in the case of *żabka* [ʒapka] < /ʒab-ka/ 'frog, dim.' it is not that voicelessness spreads onto /b/, but rather /b/ loses its element {L} in the environment of the following obstruent. Thus, technically speaking, the assimilation of voicelessness is a case of delaryngealization (element {L} loss, which is similar in kind to FOD) and not a result of spreading. Phonetic assimilation, in the sense of 'observable effects in the surface forms' is therefore different from the phonological one, which must involve element spreading. Below, we will take full advantage of the observation and suggest that CP sandhi voicing is a case of phonetic assimilation. However, in order to be able to say that, one has to abandon a few cherished preconceptions about laryngeal representations.

One idea that has to be abandoned is the so called Laryngeal Realism (Honeybone 2002, 2005) which imposes particular phonological representations of laryngeal systems on the basis of observable effects. For example, Polish, like French and Russian is assumed to use the element {L} in the voiced series of its obstruents on the basis of the presence of full voicing in the so called voiced series and the absence of aspiration in the voiceless series.[7] Note, that this is what we have assumed above in our discussion of Polish. This representation allows us to understand both FOD and word-internal VA. However, if Cracow Polish is an L-system, then the CP sandhi is inexplicable. This is because the word-final obstruents in CP are toneless (non-specified for a laryngeal element) and if they allowed for phonetic voice assimilation across words, e.g., in *brat ojca* [brad ɔjtsa], then the non-specified obstruents should behave in the same manner word-internally.[8] Thus, it must be said, that such phonetic voicing of non-specified obstruents must be excluded in an L-system. If word-internal non-specified obstruents remain voiceless (which they must) then our problem with understanding the CP sandhi voice assimilation has doubled. Firstly, in such a system, only L-spreading can voice obstruents, and secondly, phonetic voicing is excluded by phonetic interpretation principles that must be postulated for such a system. Otherwise, this system would only have voiced obstruents, of which some possess {L} and the others are non-specified but voiced due to phonetic assimilation, which is counterfactual. Thus, such phonetic assimilation must be excluded from L-systems.

Incidentally, the L-system is fully consistent with the Warsaw Polish facts. In WP, sandhi voice assimilation, recall, is restricted to a context before a voiced obstruent, that is, one that

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[7] The presence of aspiration results in postulating the element {H} in the voiceless aspirated series and rendering the lenis series non-specified.

[8] This strong argument was used, e.g., in Rubach (1996) against the privative analysis of Bethin (1992).

has the element {L} and can spread it. In that dialect, predictably, there is no voice assimilation before sonorants. Thus, WP only has a phonological assimilation in sandhi, and has no phonetic voicing precisely because it is impossible in an L-system.

3.3. Laryngeal Relativism

What is Cracow Polish then? Based on the finding that there is such a thing as surface assimilation of voicing, which need not involve element spreading, but may involve element loss instead (e.g., *ławka* [wafka]< /wav-ka/ 'bench, nom.sg.'), and the fact that symmetrically looking assimilations might not be symmetrical phonologically speaking, it may be proposed that Cracow Polish does not have the same phonological representation of the voicing contrast as Warsaw Polish. To be precise, there is no reason why the phonological asymmetry should not work the same way in a mirror-image system, that is, one in which the marking is reversed. The question is, what this system is, and whether the analytic / theoretical constraints of i) privativity, ii) non-specification, and iii) non-arbitrariness can be reconciled with the fact that in terms of word phonology the two dialects behave in the same way and that they part ways only in sandhi assimilation.

Laryngeal Relativism, proposed in Cyran (2011) to deal with the above sketched analytical problems related to CP sandhi voice assimilation, assumes that Cracow-Poznań Polish and Warsaw Polish have not only different, but in fact opposite laryngeal systems in terms of phonological representation and with respect to the phonetic interpretation of the voiced and voiceless obstruents. The gist of the proposal is illustrated in the following scheme, in which the symbols 'p' or 'b' are used only for expository reasons. The phonetic interpretation depends strictly on the superscripted value, and not on which symbol is used.

(11)

		[b]		[p]
a.	Warsaw Polish	b^L	vs.	p^o
b.	Cracow-Poznań Polish	b^o	vs.	p^H

The WP system is familiar by now. The voiced obstruents possess the laryngeal element {L}, while the voiceless unaspirated ones are non-specified. This is expressed by a superscripted zero in /p^o/.

As for CP, a number of points need to be explained. Firstly, the voiced series are not voiced due to the presence of a particular category in the representation. In fact, they are neutral and their voicing is viewed as spontaneous, just like in sonorant consonants and vowels. Thus, the two systems differ not only with respect to the type of laryngeal category which is used in marking the contrast, but also in the phonetic interpretation of the non-specified series, in that a phonologically identical representation receives opposite phonetic interpretations.[9] This is, of course, due to the status of the marked series and the fact that the phonetic shape of the two series is decided system internally. To emphasize the last point, a non-specified obstruent /C^o/ in WP must be voiceless unaspirated, while in CP it will be

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[9] Whether /b^o/ of CP and /p^o/ of WP are indeed phonologically identical is an issue that cannot be decided at this stage. Here, we assume that they are.

voiced. This spontaneous voicing of obstruents is typically called 'passive voicing' in order to express the idea that, unlike in sonorants, it is conditioned by the environment. In CP, it appears that the obstruent /b^o/ will be voiced only if followed by a voiced segment, preferably a vowel. Thus, if the analysis is correct, then FOD in this dialect is not a case of phonological devoicing, through element loss, but rather a case of the absence of phonetic passive voicing because of the following pause, or silence.[10]

As for voice assimilation (VA) word-medially, the analysis need not be different from that in WP, which was discussed above. However, we will be dealing with its mirror image. In *liczba* [lʲidʒba] < /lʲitʃ-ba/ 'number' we are dealing with H-loss in the environment of the following obstruent, rather than with L-spreading, while in *żabka* [ʒapka] < /ʒab-ka/ 'frog, dim.' the element {H} is spread from /k^H/ onto /b^o/ resulting in assimilation of voicelessness.[11]

The last assumption that needs to be made at this stage in order to turn to the analysis of CP sandhi voicing is that word-finally, just as before an obstruent, CP also witnesses a process of delaryngealization: the element {H} is delinked. Thus, in both dialects (WP and CP), the word-final position can only hold a non-specified obstruent /C^o/. The importance of this assumption will become apparent presently.

Consider the following derivations which illustrate the sandhi context before a word beginning with a vowel for both WP and CP (Cyran 2011). The following symbols are used: '→' a phonological process, '>' phonetic interpretation of a particular sequence.
(12)

<div align="center">

Warsaw Polish
</div>

a. *bra<u>k</u> <u>o</u>ceny* 'lack of mark'   phonetic adjacency
                                                    and interpretation

$$C \quad V \quad C^o \quad \# \qquad V \ldots$$
$$| \quad\, | \quad\, | \qquad\qquad |$$
$$b \quad r \quad a \quad \underline{k} \qquad \underline{ɔ} \ ts \ ɛnɨ \qquad k^oɔ \quad > \quad [kɔ]$$

b. *obra<u>z</u> <u>a</u>nioła* 'picture of angel'

            L-delinking
$$C \quad V \quad C^L \ \# \ \rightarrow \quad C \quad V \quad C^o \ \# \qquad V\ldots$$
$$| \quad\, | \quad\, | \qquad\qquad\quad | \quad\, | \quad\, | \qquad\qquad |$$
$$ɔ \ b \quad r \quad a \quad \underline{z} \qquad ɔb \ r \quad a \quad \underline{z} \qquad \underline{a} \ ɲ \ ɔ \ wa \qquad z^oa \quad > \quad [sa]$$

<div align="center">

Cracow Polish
</div>

c. *bra<u>k</u> <u>o</u>ceny* 'lack of mark'
            H-delinking
$$C \quad V \quad C^H \ \# \ \rightarrow \quad C \quad V \quad C^o \ \# \qquad V\ldots$$
$$| \quad\, | \quad\, | \qquad\qquad\quad | \quad\, | \quad\, | \qquad\qquad |$$
$$b \quad r \quad a \quad k \qquad b \quad r \quad a \quad \underline{k} \qquad \underline{ɔ} \ ts \ ɛnɨ \qquad k^oɔ \quad > \quad [gɔ]$$

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[10] See, e.g., the arguments for such non-voicing of final obstruents in Harris (2009).

[11] Note that, technically speaking, H-spreading is unnecessary for this assimilation to obtain. The neutral obstruent /b^o/ will not become passively voiced in front of this voiceless obstruent anyway.

d. *obra**z** **a**nioła* 'picture of angel'

```
        C V   Cᵒ #      V...
        |  |  |          |
      ɔb r   a   z       a ɲ ɔ wa        zᵒa    >   [za]
```

In both WP and CP only a non-specified obstruent /Cᵒ/ may occur word-finally. It is either lexically non-specified, or results from delaryngealization, which takes the form of L-delinking in WP and H-delinking in CP. If the words *obraz* or *brak* are used in isolation or before a pause, the neutralized (non-specified) object is realized as voiceless in both dialects. Hence, a seeming uniformity of FOD in the two dialects. However, it should be remembered that the final devoicing is uniform only phonetically. Phonologically speaking, we are dealing with devoicing (L-delinking) in WP, and the absence of passive voicing in CP. For this reason, if the following word begins with a vowel, which provides phonetic, not phonological adjacency, the neutral obstruent in WP must still be realized as voiceless (12a,b) because the L-delinking cannot be undone, and /Cᵒ/ is always pronounced as voiceless unaspirated before vowels in that dialect, as observed within words. However, in CP, the non-specified /Cᵒ/ must be realized as voiced in (12c,d). Cracow sandhi voicing, therefore, is not a result of an arbitrary phonological rule. It is an obligatory interpretational (phonetic) effect, given the laryngeal system of that dialect. Being a phonetic effect, it is subject to variation depending, for example, on the degree of phonetic closeness.

The advantages of this analysis of CP sandhi voice assimilation over previous accounts lie in the fact that it is i) privative, not only in the representation of the voicing contrast in obstruents, but also in avoiding the postulation of laryngeal specification in sonorant consonants and vowels, ii) non-arbitrary, in the sense that the CP sandhi voicing is not due to a particular rule, but due to regular phonetic interpretation rules of that dialect, which are operational also word-internally, and iii) it predicts that in terms of word phonology the two dialects behave in the same way and that they must part ways only in sandhi contexts, which is due to two aspects: prior word-final delaryngealization and the phonetic interpretation of /Cᵒ/ in the two dialects.

The problem with Laryngeal Relativism is that it must assume that phonetic facts relate to phonological representations in an arbitrary fashion. For example, full voicing in the signal cannot be automatically taken as a cue for phonological presence of the element {L}, and the presence of {H} need not correspond to phonetic aspiration as Laryngeal Realism would have it. The relativist view is yet to be explored and verified. However, it allows for non-arbitrary representational accounts of phenomena, which so far, have had to be described by means of arbitrary rules.

Where does the ambiguity lie in the Polish voicing complex from the viewpoint of Laryngeal Relativism? It lies in the dialect-dependent choice between two types of marking of the two-way voicing contrast. The two types of marking are made available by phonology. However, at the level of phonological word the choice does not seem to produce a difference in phonetic facts. Both dialects have FOD and VA. The difference occurs in sandhi contexts, where system-dependent phonetic interpretation principles must reinterpret the final

obstruent, accordingly. The systemic ambiguity is also not properly phonological. It lies in the phonetic form and in the phonetic interpretation rules.

4. Conclusion

We have yet to find a proper case of phonological ambiguity. The short survey presented in this paper seems to point to the conclusion that phonology is inherently rather unambiguous. What is ambiguous is phonetic data and phonetic interpretation conventions that link phonology to the phonetic form. If phonology provides a distinction, it is usually for a purpose. The speech sounds (segments) or their sequences either result in unambiguous phonetic data, or they show disparate phonological behaviour of forms which may in some contexts appear to be ambiguous, thus justifying the representational distinctions. This pattern repeats at segmental level, e.g., in the cases of neutralization (2.1.), or the so called double agents (2.2.), as well as in apparent cases of structural ambiguity (2.4.). It seems that the pattern also repeats at the level which is referred to as systemic, or inter-systemic (3.). It is obvious, however, that all the claims made in this paper are highly dependent on the theoretical model assumed for the phonological analysis.

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