

Sonorant opacity without opaque segments¹

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1. Introduction

It is exactly twenty years since Jerzy Rubach's seminal paper on voicing phenomena in Polish appeared (Rubach 1996), which was couched in Derivational Theory. It by far exceeded any previous formal attempts to understand the complexity of voicing assimilations (VA) in this language (e.g. Bethin 1984, 1992; Gussmann 1992), and could not be surpassed for the next twenty years, including Rubach's own subsequent Optimality Theoretic attempts (Rubach 1997a, 1997b, 2008). The main two characteristics of Rubach (1996) are that he retains, and, in fact, strongly argues for a binary representation of voicing in obstruents, and criticizes syllable-based accounts of the voicing phenomena in Polish, retaining only some indirect reference to prosody: extrasyllabicity and word prosody. This, it should be noted, takes place in the context of then current proposals postulating privativity, especially in laryngeal phonology. The predominant view which prevails today under the general name Laryngeal Realism finds its beginnings in the early 90ties (e.g. Avery 1996, Brockhaus 1992, 1995, Harris 1990, 1994, Honeybone 2002, 2005, Iverson and Salmons 1995, Lombardi 1991, 1995). The syllable theory was then going through a turbulent time as well. In its standard version, it indeed failed to provide a uniform prosodic characterisation of the distribution of laryngeal distinctions, which led not only to the said Rubach's (1996) paper, but also to Steriade's (1999) proposal of the licensing-by-cue model.

The situation on the syllabic front had in fact dramatically changed well before 1996 with the advent of Government Phonology (GP) (Kaye, Lowenstamm and Vergnaud 1990, Kaye 1990) and especially with the proposal of Strict CV (Lowenstamm 1996, Scheer 2004). Unfortunately, the new theory of representation did not make it to mainstream Derivational or Optimality theories.² It will be shown below that, thanks to GP syllabification (without syllable as a meaningful concept), prosody is back in business when it comes to uniform characterization of the distribution of voicing. The uniform causality of delaryngealization that can now be proposed removes one of the main obstacles on the way to privativity and deflects Rubach's strongest arguments in favour of binary representation of voice. It will also be shown below that Rubach himself got very close to assuming privativity in his ensuing papers on Polish voicing assimilation which were couched within Optimality Theory (OT) (Rubach 1997a, 1997b, 2008).³

In this paper, the focus is on the behaviour of sonorant consonants with respect to voicing assimilations in Polish. At face value, they exhibit contradictory characteristics. In some prosodic contexts they appear to be transparent to spreading of laryngeal properties, while in others, they seem to be opaque and block the spreading. This behaviour may be derived from two different sources. Firstly, it may be due to some inherent property of sonorants which are part of their representation (features). Alternatively, it may be derived from the nature of the

¹ I would like to thank the anonymous reviewer for pointing to some interesting problems, and to Sławomir Zdziebko for his comments.

² A notable exception is Polgárdi (1998), in which GP and OT are combined in one analysis.

³ I will refer to the three papers collectively as Rubach (OT). This may be slightly imprecise since Rubach (1997b) contains a proposal that OT should allow some derivation (DOT). Interestingly, and predictably, the proposal is based, among others, on the analysis of transparent sonorants in Polish.

prosodic positions in which a given segment is lodged. Interestingly, both Rubach (1996, OT) and the proposal in this paper base the explanation on the interaction between prosody and subsegmental representation, although not in equal measure. I will provide an alternative view on sonorant opacity suggesting that this phenomenon is representational only in the prosodic sense and hardly in the sense that some active property like feature or element should block voicing assimilation. The two main dilemmas concerning the representation and distribution of laryngeal properties of segments, that is, binarity vs. privativity and syllable-based vs. non-syllable-based will be resolved in favour of a strictly privative and syllable-based account, that is, the exact opposite of Rubach (1996, OT), though surprisingly very close to some proposals included in Rubach (1997a). The proposal in this paper will differ in yet another crucial way. Namely, no reference will be made to rule ordering, or constraint ranking.

2. The data

The relevant context in which we observe the transparency and opacity effects of sonorant consonants reduce to the surface sequence C-S-C, that is, obstruent-sonorant-obstruent. This sequence translates as three different prosodic configurations in which the sonorant finds itself: word-internal (CSC), word-final (CS#C), and word-initial (C#SC). Note that it is a set of configurations in which the sonorant is not followed by a vowel.

(1) a. CSC

krtañ [krtɔɲ] ‘larynx’

grdyka [grɔika] ‘Adam’s apple’

mędrək / mędrka [mɛndrɛk ~ mɛntrka] ‘wiseacre, nom.sg. / gen.sg.’

Jędrək / Jędrka [jɛndrɛk ~ jɛntrka] ‘Andrew, nom.sg. / gen.sg.’

b. CS#C

wiatr zachodni [vʲadr zaxɔɔɲni] ‘western wind’

litr wody [lʲidr vɔɔɲi] ‘litre of water’

metr głębokości [mɛdr gwɛmbɔkɔɔɲci] ‘metre in depth’

c. C#SC

kwiat rdestu [kʲʌt rɔɔɲtu] ‘flower of knotgrass’

brak rdzy [brak rɔɔɲi] ‘lack of rust’

widok mgły [vʲidɔk mgwi] ‘sight of mist’

The forms in (1a, b) show the transparency of the intervening sonorant which allows for the static pattern of voicing agreement between obstruents (*krtañ*, *grdyka*) as well as clear cases of assimilation inside words (*mędrka*, *Jędrka*) and across word boundaries (1b). These forms are parallel to CC clusters without an intervening sonorant, which also show static agreement, e.g. *kto* ‘who’ and *gdy* ‘when’, as well as assimilations both inside words and across word boundaries, e.g. *wieś / wsi* [vʲɛɔ ~ ɲci] ‘village, nom.sg. / gen.sg.’, *liczyć / liczba* [lʲitʲɪɔ ~ lʲidʒba] ‘count / number’, and *brak zęba* [brɔk zɛmbɔ] ‘lack of tooth’. The forms in (1c) show the relevant facts about sonorant opacity.⁴ Unlike in *wiatr zachodni* (1b), the voicing assimilation is impossible if the sonorant is word-initial (1c).

Before we look at the way this transparency and opacity is dealt with in Rubach (1996), I would like to point to one aspect concerning the facts in (1), which is rarely mentioned. All the data in (1) are rather marginal in Polish, and some are also controversial. Firstly, the word-

⁴ Other instances of sonorant opacity, namely, that of vowels and sonorants in prevocalic and coda position, will be discussed later.

internal cases constitute a handful of examples with intervening [r] and even fewer with [l] or [w], e.g. *Siedlce* [ɕɛtlʦɛ] ‘city name’, *jabłko* [jap(w)ko] ‘apple’, *plci* [pwtɕi] ‘gender, gen.sg.’. The facts, however, are rather uncontroversial. They correspond to what happens to CC clusters, as mentioned above. The data of the type in (1b) are also rare. This time, it is because words ending in obstruent-sonorant clusters are not common in Polish. Such data are also controversial in the sense that they exhibit variation with respect to final devoicing, which is not normally mentioned in formal descriptions (Strycharczuk 2012). The most rare cases are at the same time the most important data in our discussion, that is, (1c). There are few words in Polish beginning with SC where the C is voiced. Note that it is difficult if not pointless to talk about voicelessness spreading across word-boundaries, e.g. *skład rtęci* [skwat rʦɛɲtɕi] ‘quicksilver warehouse’, because there is already final obstruent devoicing obscuring the actual causality. On top of the shortage of data, the cases of opacity concern only the so-called Warsaw dialect. In Cracow-Poznań we in fact do expect voicing assimilation, but one which is due to pre-sonorant position, e.g. *brak rdzy* [brag rdʒi] ‘lack of rust’ parallel to *brak roboty* [brag rɔbɔtɨ] ‘lack of work’. Nevertheless, experimental studies indeed show the absence of regressive assimilation between obstruents across a sonorant in the relevant Warsaw dialect (Strycharczuk 2012). The points made above are meant to throw additional light on the nature of the phenomena under discussion.

3. Transparency and opacity of sonorants – a preliminary look

The transparency vs. opacity issue concerning sonorants arises in the context of voicing assimilations, typically between obstruents. The solutions with respect to the behaviour of sonorants are very much dependent on theoretical assumptions concerning the phonological representation and are therefore amenable to various interpretations. For example, most researchers assume that sonorant opacity, that is, blocking of voicing assimilations between obstruents by an intervening sonorant, are due to the presence of the feature [+voice] in their representation, while the transparent sonorants must somehow be deprived of this property, at least at the relevant point in the derivation (e.g. Bethin 1992; Gussmann 1992; Lombardi 1991; Rubach 1996, OT).

Vowels are mentioned as the most representative and clear case of sonorant opacity. They are regular blockers and must therefore always contain [+voice], or obtain it very early in the derivation. For example, in the Polish word *ud-ek* [udɛk] ‘thigh, dim.gen.pl.’, the second vowel guarantees that the flanking consonants may differ in voicing. On the other hand, when that vowel disappears in *ud-ko* [utkɔ] ‘thigh, nom.sg.’, the adjacent obstruents must agree in voicing, with the one on the right defining the value of the entire cluster. Thus, the vowel /ɛ/, must block the assimilation by rendering the two obstruents non-adjacent, or invisible to each other in the relevant sense. Under this particular view, they are non-adjacent because their laryngeal nodes are separated by the one belonging to the vowel and specified as [+voice]. This effect also occurs when the right-hand obstruent is voiced, as in *liczebnik* [lʲitɕɛbnik] ‘numeral’, where the voicing assimilation takes place again only if the intervening vowel is not present, as in *liczba* [lʲidʒba] ‘number’. Clearly, the presence of the vowel guarantees that the opposite laryngeal values are retained on the flanking obstruents, but is the interpretation of the blocking as based on the representation of the vowel the only possible one? A viable alternative will be given in Section 6.

Syllabified sonorant consonants, which are found prevocally or in the coda, are also assumed to be opaque, and therefore specified with [+voice] in, for example, words like *plaga* [plaga] ‘plague’, or *burta* [burta] ‘ship’s side’ (Rubach 1997b, 2008). The prevocalic /l/ and the coda /t/, the argument goes, protect the forms from becoming *[blaga] and *[purta] respectively. However, given that the prevocalic onset is already protected by its melodically filled nucleus any additional reference to sonorant opacity in the case of the prevocalic /l/ and

coda /r/ is evidently spurious, not to say... opaque. Thus, we are really dealing with a legitimate problem of vowel opacity and one marginal case of sonorant consonant opacity illustrated in (1c) for Warsaw dialect.

4. Sonorant voice

The role of categories such as features in phonological representation is twofold. Firstly, they should express the existing segmental contrasts in a given system, and secondly, they should allow for a non-arbitrary formulation of phonological phenomena, that is, processes or rules. On the first count, sonorants should not possess any laryngeal category in their representation, because there is no laryngeal distinction to be made within that class of segments. Sonorants do not contrast in voicing. Thus, some theoretical models, such as underspecification approaches, went as far as rejecting the presence of [+voice] on sonorants in the lexical representation. This property was to be supplied by rules at a particular stage of derivation (rule ordering), or by default fill-in rules at the end of derivation or derivational steps. The general idea, however, was that a full specification is arrived at before implementation. This view is adhered to in, e.g. Rubach (1996). The opposing view is that no specification of sonorant voice is present lexically and none is supplied in the course of the derivation. Sonorants begin and end phonological derivation as non-specified. Their phonetic interpretation as voiced is due to spontaneous voicing which occurs in segments characterized by unimpeded air flow in production. This view will be referred to as ‘strict privativity’. It is part and parcel of, e.g. Element Theory in GP (Harris 1990, 1994, 2009; Harris and Lindsey 1993, 1995).⁵

The problem with the privative view is that there appear to be phenomena in which the supposedly unmarked sonorants are active not only as blockers of spreading in cases of regressive assimilation, but also as triggers of voice assimilation.⁶ None of the above should happen given that sonorants do not possess [+voice] and should not receive it in derivation. However, disregarding the alleged word-internal opacity of sonorants discussed in the previous section, such phenomena seem to occur in Polish, albeit always across a word boundary. One of them is the celebrated pre-sonorant voicing assimilation in sandhi contexts. It occurs in Cracow-Poznań Polish (CP). In CP, sandhi voicing occurs before all sonorants, including vowels, e.g. *brat mamy* [brad mami] ‘mother’s brother’ and *brat ojca* [brad ojtsa] ‘father’s brother’. It has been demonstrated elsewhere that this phenomenon can be accounted for without reference to laryngeal categories (Cyran 2011, 2014), and for this reason CP sandhi will be kept out of our discussion. It is also irrelevant for another reason: the opacity of the type shown in (1c) concerns the other dialect, that is, Warsaw Polish.

The opacity observed across words in, e.g. *kwiat rdestu* [kf^hat rdestu] ‘flower of knotgrass’ (1c) is an isolated case where a sonorant consonant appears to possess active marking. Yet it is a serious problem for strict privativity. Recall from the previous section, that sonorant transparency is not an issue for privative models, but an expected effect. Transparency is problematic for theoretical models in which sonorants must have or must obtain [+voice] at some point.

4. Transparency and opacity in Rubach (1996)

Rubach (1996) uses the following general theoretical set up and rules in his version of Lexical Phonology. There are three ordered levels of derivation grouping particular types of rules: (i) *cyclic* rules, which are irrelevant to this discussion, precede (ii) *postcyclic* ones, which correspond to word level rules. The last group of rules are called (iii) *postlexical* and

⁵ Privativity is also used, as a term, in, e.g. Bethin (1992), but it concerned only the early stages of derivation, that is, the lexical representation. In this sense, we should rather call it underspecification.

⁶ Rice (1993) proposes a separate feature Sonorant Voice to deal with phenomena of this type.

correspond to phrase level phonology. Crucially, voicing assimilation (VA) between obstruents is effected by a (*Warsaw*) *Spread* rule which is postlexical, that is, a late rule which may apply both inside words and across word boundaries. For simplicity, I will refer to VA rather than to *Spread*.

Central to the analysis of the sonorant opacity / transparency distinction in Rubach (1996) is the assumption that it is due to the presence of laryngeal specification in the former type and absence of such specification in the latter. Given that both types must occur in the course of the derivation – (1a, b) versus (1c) – it is assumed that sonorants are lexically unspecified, that is, initially transparent and become specified (opaque) later, but just in time to block VA in some prosodic contexts. For derivational frameworks, to which this and earlier studies mentioned above belong, all segments must end up having the laryngeal specification in order to be ready for phonetic implementation. Thus, to achieve transparency as defined above, the rules supplying [+voice] to the sonorants in (1a) and (1b) must crucially follow the rules of voicing assimilation between obstruents. On the other hand, the opaque word-initial sonorant in (1c) must have the opposite ordering relation between the two types of rules. That is, the sonorant must get [+voice] before voicing assimilation takes place. Only then, can it block the spreading in question.

The feature [+voice] is supplied by a universal fill-in rule called *Sonorant Default*. This rule is correlated with syllabification: [+voice] is assigned to prosodified sonorants. This explains why all vowels, prevocalic and coda sonorants, e.g. in *plaga* and *burta* are specified with [+voice] very early and are opaque to spreading of laryngeal features between obstruents.

The distinction between transparent and opaque sonorants in (1) is achieved by first rendering the non-prevocalic sonorants extrasyllabic on the basis of sonority violations and then ensuring that prosodification of such sonorants takes place at different stages of derivation. The word-initial extrasyllabic sonorants in words like, *rdza* ‘rust’, *rdest* ‘knotgrass’, *mżawka* ‘drizzle’, *mgła* ‘mist’, *lba* ‘head, gen.sg.’ (1c) are adjoined to the prosodic word (PW) at the postcyclic level by a rule called *Initial Adjunction*. This means that these sonorants become [+voice] at the end of that component of rules, well before VA operates. This is how the opacity effect in (1c) is achieved. Thus in *brak rdzy* [brak rdzi] ‘lack of rust’, the initial /r/ becomes opaque (a blocker) before /dz/ can spread its [+voice] onto /k/.

Word-internal extrasyllabic sonorants (1a, b) on the other hand, are adjoined to PW at the postlexical level by the *Housekeeping Adjunction* rule. This is the level at which also VA in [jɛntrka] and the *Voice Default* supplying [–voice] to unspecified obstruents apply. In the case of [jɛntrka] and [v^jadr zaxɔɖɲi], *Housekeeping Adjunction* must be ordered after VA to ensure transparency and preclude *[jɛntrka]. Additionally, *Voice Default* must also be ordered after VA to preclude *[v^jatr zaxɔɖɲi].

As mentioned in the introduction, this analysis was difficult to surpass for almost 20 years, despite the fact that ordered derivation and binary specification of voice have become almost obsolete in phonological theory as non-derivational models and privative views with respect to laryngeal phonology have become prevalent. Another, more serious reason for the lack of progress in the understanding of Polish laryngeal phonology, however, is the acute absence of clear criteria making a distinction as to which observable phenomena are truly phonological and which ones are due to phonetics or phonetic interpretation (post-phonological spell-out).

5. Non-derivational bias and phonetic interpretation in OT analyses

Despite fundamental differences between current generative theoretical frameworks, there seems to be some agreement that lexical representations may be subject to phonological computation (derivation, alteration). The output of that computation is the input to phonetic spell-out, interpretation, or implementation. One of the main moot points between current

frameworks is the nature of the post-phonological forms, that is, of the output. One extreme position assumes that the output of phonological computation is a fully specified representation (systematic phonetic representation) which is submitted for phonetic implementation. This view is represented in pre-OT derivational frameworks, e.g. in Rubach (1996). At the opposite end, there is the other extreme position which claims that there is no such thing as a systematic phonetic level. The output of phonological derivation is still a phonological representation which is equally phonetically interpretable at spell-out as it is at the lexical representation. The differences between the lexical and post-phonological representations lie only in the fact that alterations due to computation would lead to different phonetic interpretations, but both are fully interpretable. This is roughly the position taken in Element Theory and Government Phonology (e.g. Harris and Lindsey 1993, 1995). One of the consequences of full interpretability at all stages of derivation is that, for example, sonorants, which are unspecified for [voice] lexically, need not be specified for this property in the course of derivation.

Rubach's subsequent Optimality-based analyses of voice assimilations in Polish (Rubach OT), must be placed somewhere between the two extreme positions on the nature of the phonological output forms mentioned above. This, to some extent complicates the analysis. But at the same time it brings the OT analyses very close to 'strict' privativity in laryngeal phonology, which I will try to demonstrate below.

Optimality Theory (Prince and Smolensky 1993, McCarthy and Prince 1993) introduces some dramatic changes to the general philosophy of phonological representation, computation, the output of computation as well as the phonetic interpretation of the output. It gives up not only rules, but also ordered derivation, replacing them with parallel evaluation of output candidates by a system of ranked constraints. The output forms are assumed to be fully specified representations, corresponding roughly to the systematic phonetic level in previous approaches. The full specification is guaranteed by a constraint *SPEC*,⁷ which, like most constraints in OT, however, may be outranked. It is the cases of outranking of *SPEC* that will be shown to be the most interesting offshoots of the OT analyses in question, as they bring us very close to the proposals in this paper.

As for the behaviour of sonorants, Rubach (OT) maintains his views that transparency is due to the absence of [+voice]. Opacity, on the other hand, follows from the presence of [+voice] in the representation. The latter generalization covers vowels and syllabified sonorants, including the initial one in *rdzy* (1c), which is now adjoined to syllable rather than to PW. Quite what makes the initial extrasyllabic sonorants so special that they may be adjoined to the syllable, while the other ones in (1a, b) may not is not clear. The distinction between types of adjunction becomes crucial as only syllabified sonorants receive [+voice] as per phonological Sonorant Default (cf. Rubach 1997b: 562). Prosodification is no longer a uniform condition on application of Sonorant Default. In fact, Housekeeping Adjunction, now called, Default Adjunction links transparent sonorants to PW only to avoid Stray Erasure, but not to receive [+voice] by Sonorant Default. Thus, the effect of early and late application of Sonorant Default which we witnessed in the derivational analysis of Rubach (1996) is replaced by an arbitrary assignment of different status to different types of prosodification. This way, not only does the analysis become non-derivational (in the sense of avoiding rule ordering), but it introduces a new way of looking at the relation between phonology and phonetics.

⁷ One of the reasons why such constraints as *SPEC* are valued in OT is that they allow for a neat replacement of rules with constraints. *SPEC* enforces full specification of segments, so it may be viewed as the constraint that directly enforces spreading of [voice] in cases of assimilation. A direct reference to a rule *Spread* is not available in OT.

Under this view, the transparent sonorant consonants never get [+voice] in phonological computation, as this would obviously reintroduce serialism to the analysis: they would have to receive [+voice] after VA. Therefore, they must be assumed to be voiced in the phonetic implementation. This is an interesting effect of non-derivationalism in OT, and one that had the potential to initiate oft announced work on the theory of phonological representation in OT.⁸ Rubach (1997a: 300) refers to the assumption in Prince and Smolensky (1993) and McCarthy and Prince (1993) that the output representation which is subject to evaluation by ranked constraints need not be fully specified, contrary to the requirement defined as the SPEC constraint. If transparent sonorants could be viewed as non-specified throughout the phonological computation and only receive (spontaneous) voicing at spell-out, then, with a bit of consistency, we would be only one step away from saying that all sonorants may be non-specified throughout. This move would also eliminate the necessity to correlate the behaviour of sonorants to different types of prosodic adjunction, the most controversial aspect of Rubach (OT). More importantly, it would also require a different story of sonorant opacity. One that does not hinge on the presence of [+voice]. This extra step will be taken in the following section. It should just be mentioned that under strict privativity principles in phonology, a segment with a feature [+voice] should in fact contrast with one that does not possess it. Thus, it is systemically a more preferred situation that output forms which do not contrast do not differ phonologically.⁹

Turning now to assimilation between obstruents across word boundary. We remember that in the derivational analysis of *wiatr zachodni* and in cases of voice assimilation without an intervening sonorant, e.g. *brat babci* [brad bapci] ‘grandmother’s brother’, an ordering of VA with respect to Voice Default in the word-final context was necessary. VA had to precede the assignment of [–voice] to the word-final unspecified obstruent by the universal default rule, or else [+voice] could not spread to an already specified obstruent, and no assimilation would take effect. This ordering may be and in fact is thrown overboard by assuming that also Voice Default occurs in the phonetic implementation. Rubach (1997a: 310) provides precisely this type of analysis of final devoicing of the word *kod* [kɔt] ‘code’. The lexically voiced /d/ loses its laryngeal specification word-finally by virtue of a constraint Final Devoicing, which says that [voice] on an obstruent at the end of the phonological word may only be licensed parasitically. This means that the unspecified (delaryngealized) obstruent is prone to parasitic voice spreading from the following obstruent. In absence of such spreading, it will be phonetically interpreted as voiceless, but not by virtue of a phonological Voice Default.

The situation resembles the one with sonorants. If non-specified obstruents can for universal reasons be interpreted as voiceless in the phonetic interpretation component, we are just one step from acknowledging that the laryngeal contrast in Polish may be represented privatively by [voice], or some such category on the voiced series of obstruents, leaving the voiceless series always unspecified. Like with the sonorants, systemic uniformity suggests that if some unspecified obstruents are spelled-out as voiceless then maybe all voiceless obstruents are in fact unspecified. In fact, in privative models, a phonological system which has two laryngeal categories corresponding to [+voice] and [–voice] and also unmarked obstruents is a three-way laryngeal system, e.g. Thai (Harris 1994: 135). Thus, Rubach (OT) gets very close to strict privativity. What thwarts the final shift is phonological representation

⁸ This does not only concern a potential complete relegation of Sonorant Default to the post-phonological component (phonetic implementation / spell-out / interpretation), but also of Voice Default to be discussed below. Crucially, if the output candidates could indeed be understood as phonological representations rather than surface representations, they could still contain lexical information related to such objects as yers. The importance of this point will be shown in the following section.

⁹ There are exceptions to this view. See for example the discussion of the so-called double agents in GP (e.g. Gussmann 2007).

of sonorant opacity and his views on word-internal delaryngealization of obstruents in front of other obstruents.

The main argument for binary representation of [voice] on Polish obstruents in Rubach (1996) concerned the causes of delinking of the laryngeal node in pre-obstruent position, in e.g. *dech / tchu* [dɛx ~ txu] ‘breath, nom.sg. / gen.sg.’. The analysis relies on adjacency of laryngeal nodes rather than on syllabic position of the target. The rule of Obstruent Delinking proposed in Rubach (1996) says that a laryngeal node of an obstruent is delinked if adjacent to the laryngeal node of the following obstruent. For this type of rule to be effective, both obstruents must possess laryngeal nodes and consequently binary specification. The same analysis is reformulated in OT terms in Rubach (OT), where Obstruent Delinking is replaced by the constraint Obstruent License and states, like in the case of Final Devoicing, that [voice] on an obstruent before an obstruent may only be licensed parasitically, that is, via VA.

If Obstruent Delinking / License could be formulated without reference to laryngeal nodes and adjacency, the voice assimilation in Rubach (OT) could be successfully privative, as I will show below. This is thanks to the relegation of Voice Default to spell-out. Final devoicing would just involve delaryngealization of the marked (neutralization to the unmarked) followed by phonetic interpretation as voiceless. Word-internal assimilations would involve [voice] spreading in *liczba* and mere delaryngealization in *tchu*, followed by spell-out. These aims can be achieved given a different theory of phonological representation as shown below.

The main problem with OT is that it seems to have imported the old views on representation to a new theory of computation, which lead to more complex and less elegant analyses than in Derivational Theory. In this sense, the proposals in Rubach (1996) remain unsurpassed, even though binary representation of voice and extrinsic rule ordering are problematic. The problems in Rubach (OT) follow from the old assumptions not from the new paradigm. Progress is made, in my view, where OT enforces absence of serialism, which has consequences on the treatment of defaults both for sonorants and for obstruents. Progress is however thwarted by the old assumptions about syllabification.

Both derivational and Optimality-based proposals hinge heavily on the concept of extrasyllabicity. The non-prevocalic sonorants are made extrasyllabic, and transparency is due to a special (temporary) status of sonorants as extrasyllabic. It is not clear, however, what designates the initial sonorants in (1c) as prosodically special, in that they are adjoined earlier or to the correct prosodic constituent guaranteeing specification with [+voice]. The choice seems as arbitrary as the extrinsic rule ordering in derivational models. In the following section I will present an analysis of voice assimilation and sonorant transparency by reference to Laryngeal Licensing, Government Phonology syllabification, and strict privativity of Element Theory. The analysis will concern the Warsaw dialect, because the most controversial instance of sonorant opacity (*brak rdzy*) occurs in this dialect to the exclusion of the Cracow-Poznań dialect.¹⁰

6. Opacity without opaque segments

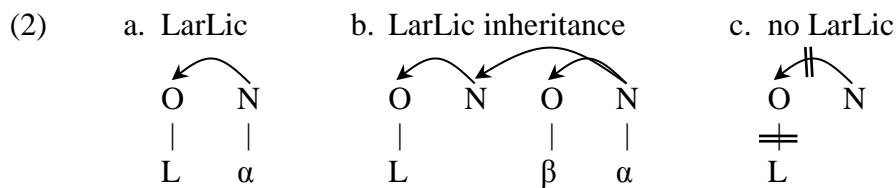
6.1. Laryngeal Licensing and syllabification in GP

In the proposal to be presented below, sonorants do not possess and never receive any laryngeal specification responsible for their voicing. They are always neutral in representation and remain neutral throughout the phonological derivation. Their voicing is spontaneous (universal phonetic interpretation), but they may be subject to some contextual unvoicing, especially between two voiceless obstruents, e.g. *krtah* ‘larynx’, or word-finally, following a

¹⁰ CP, however, features the pre-sonorant sandhi voicing in *brak rdzy*, which is used in Rubach (1996, OT) as additional evidence for [+voice] on sonorants. As mentioned before, an alternative analysis which does not involve sonorant voice is given in Cyran (2011, 2014).

voiceless or devoiced obstruent, e.g. *wiatr* ‘wind’, *bóbr* ‘beaver’.¹¹ Finally, they do not absorb inter-nuclear Laryngeal Licensing inheritance, a point which will become more clear below.¹² We predict that all sonorants should be transparent at all times, because they do not possess anything that would block spreading of laryngeal features. If there are opacity effects they will not be due to sonorant marking. As for obstruents, we will assume that the laryngeal contrast is expressed privatively. In the relevant Warsaw dialect voiced obstruents contain the element [L], while voiceless obstruents are neutral, and receive their interpretation as voiceless by universal default (e.g. Gussmann 2007). Recall that both sonorant non-specification and default interpretation of such sonorants as voiced as well as default interpretation of unspecified obstruents is also found in Rubach (OT) albeit only in the instances where avoidance of serialism was at stake.

First, let us begin with the concept of Laryngeal Licensing (LarLic) correlated with Standard Government Phonology (SGP) views on syllabification.¹³ In GP, each onset is followed by a nucleus with which it is in a licensing relation. The nucleus licenses the onset, its formal structure (single or branching) and substance (elements making up the segment) including the laryngeal category, which for Warsaw Polish is the element [L] in fully voiced obstruents.¹⁴ LarLic determines the distribution of [L] within the word. Generally, vowels, that is, nuclei with melodic content license [L]. Empty nuclei, that is, nuclear positions devoid of melody generally do not, unless they inherit LarLic from the following vowel. The arrow in the schemes below refers only to LarLic. ‘L’ stands for the element [L].¹⁵



The laryngeal category is always licensed by a full vowel (2a), e.g. *buty* [butɨ] < /b^Lut^oi/ ‘shoes’.¹⁶ Laryngeal Licensing inheritance (2b), whereby a laryngeal category is licensed by an empty nucleus, is possible only if the intervening onset (β) is a sonorant (Cyran 2014), e.g. *brnie* [brɲɛ] < /b^Lr^oɲɛ/ ‘he wades’.¹⁷ Otherwise, empty nuclei do not license [L]. This takes place in two situations: i) when the empty nucleus is final (FEN = final empty nucleus), e.g.

¹¹ It must be emphasized that sonorants are voiced in phonetic interpretation not by receiving any property [voice], but by being phonetically pronounced as voiced due to the aerodynamics in the production of vowels and sonorant consonants. This does not preclude phonetic sonorant devoicing in certain hostile conditions, for example, between two voiceless obstruents (*krtaiń*), word-finally, following a voiceless or devoiced obstruent (*wiatr*, *bóbr*).

¹² Licensing absorption has been proposed independently in the account of Scottish vowel length rule (Zdziebko 2012).

¹³ I choose SGP for reasons of simplicity of exposition. The more recent and more popular Strict CV model does not introduce anything substantially new to this discussion.

¹⁴ Thus, unlike in the syllable-based derivational models discussed and criticized in Rubach (1996), the laryngeal category (Lar) is licensed not by the onset, but by the following nucleus.

¹⁵ I omit the skeletal positions for simplicity. Let us assume that ‘N’ and ‘O’ stand for both the syllabic affiliation and an x-slot.

¹⁶ This may be viewed as parallel to prevocalic faithfulness (Rubach 2008). Note that the unmarked (neutral) obstruent has no laryngeal category, that is, it is C^o. The other symbols used below mean the following: ‘<’ interpreted phonetically as, ‘//’ phonological or lexical representation, ‘←’ turned into by phonological computation, ‘Ø’ empty nucleus, ‘C^L’ obstruent specified for voice.

¹⁷ Cyran (2014) assumes that it is the presence of truly obstruent elements [h] (noise in fricatives) and [ʔ] (stopness in plosives) that causes LarLic absorption. However, alternative hypotheses can also be entertained. For example, obstruents may be assumed to differ from sonorants in possessing a laryngeal node even if some obstruents might leave it unspecified. Then the laryngeal nodes would be LarLic absorbers.

kod [kɔt] < /k^oɔd^oØ/ ← /k^oɔd^LØ/ and ii) when the licensing inheritance is absorbed by an obstruent, that is, when β = obstruent, e.g. *mędrka* [mɛnrka] < /mɛnd^orØk^oa/ ← /mɛnd^LrØk^oa/. These are the two cases of delaryngealization in Polish. It should be added that empty nuclei are not dropped from the phonological representation. They are sent to phonetic interpretation and it is there that they are simply unpronounced. Thus, the obstruents followed by an empty nucleus are in a permanent state of being unable to host a laryngeal category. They may only receive |L| by spreading from another obstruent in which it is licensed and under some conditions, e.g. adjacency.¹⁸

Turning now to the syllabification principles in GP, there are four main reasons why empty nuclei are postulated in the representation:

- i) Sonority Sequencing Generalization, which is in fact derived from element complexity in GP. Clusters which do not form good branching onsets must be separated by an empty nucleus, e.g. *kto* [ktɔ] < /k^oØt^oɔ/ ‘who’, *rdza* [rdza] < /rØdz^La/ ‘rust’.
- ii) When the structure of an onset exceeds maximal binary structure, e.g. *brnie* [brɲɛ] < /b^LrØɲɛ/ ‘he wades’, *krtaiń* [krtaɲ] < /k^orØt^oap/ ‘larynx’, *grdyka* [grdika] < /g^LrØd^Lik^oa/ ← /g^orØd^Lik^oa/ ‘Adam’s apple’.¹⁹
- iii) When a vowel alternates with zero, e.g. *dech* / *tchu* [dɛx ~ txu] < /d^Lɛx^oØ ~ d^oØx^ou/ ‘breath, nom.sg. / gen.sg.’, *medrek* / *medrka* [mɛndrek ~ mɛnrka] < /mɛnd^Lrek^oØ ~ mɛnd^orØk^oa/ ‘wiseacre, nom.sg. / gen.sg.’.²⁰
- iv) ‘Coda’ licensing (Kaye 1990) requires that all words ending in a consonant on the surface in fact universally end in a final empty nucleus (FEN) phonologically. Thus, all words in Polish which do not end in a vowel, in fact end in a nucleus, albeit empty, e.g. *kod* [kɔt] < /k^oɔd^oØ/ ← /k^oɔd^LØ/ ‘code’, *bóbr* [bupr] < /b^Lub^orØ/ ← /b^Lub^LrØ/ ‘beaver’.²¹

One of the main features of syllabification in GP is that there is no resyllabification: the cluster /br/ is a branching onset in both *bóbr* ‘beaver’ and in *bobry* ‘beaver, pl.’. The absence of a vowel does not change the syllabic structure of the word because it ends in an empty nucleus. Thus, both *kod* and *bóbr* are subject to final devoicing because both involve an onset licensed by an empty nucleus (FEN). Likewise, there is no extrasyllabicity. Some onsets are licensed by empty nuclei, as we saw above, but each segment is prosodified by means of prosodic licensing coming from the nuclei.

The other context for delaryngealization, that is, pre-obstruent position is also pre-nuclear, except that the nucleus is empty and does not inherit LarLic from the following vowel because it is absorbed by the intervening obstruent. It must be noted that VA between obstruents has an asymmetrical analysis now. In *dech* / *tchu* [dɛx ~ txu] < /d^Lɛx^oØ ~ d^oØx^ou/ ‘breath, nom.sg. / gen.sg.’, the VA in [txu] in fact only takes the form of delaryngealization /d^LØx^ou/ → /d^oØx^ou/, and the entire cluster is interpreted as voiceless without [–voice]

¹⁸ This is parallel to parasitic licensing in Rubach (OT).

¹⁹ In the latter case, /g/ is assumed to be lexically neutral because the following empty nucleus is followed by an obstruent which absorbs Laryngeal Licensing inheritance. The stage with |L|, that is, /g^L/ is a result of |L|-spreading (VA).

²⁰ No traces of yers are assumed to be present in the output forms evaluated by OT constraints (Rubach 1997a) even though there seems to be nothing against possessing abstract aspects of representation in the output. It still contains syllable structure, for example. If OT recognized empty nuclei in the output forms the story of syllabification would be much simpler. For example, extrasyllabicity would cease to exist, and a uniform prosodic definition of the distribution of |L| (or [voice]) would be very easy to state in terms of pre-nuclear rather than prevocalic faithfulness, with a crucial distinction between empty and filled nuclei.

²¹ For more arguments against final codas see, e.g. Harris and Gussmann (1998).

spreading. In *liczba* [lʲidʒba] < /lʲitʃ^LØb^La/ ← /lʲitʃ^oØb^La/ ‘number’, on the other hand, we assume that |L| is spread.

Thus, the distribution of laryngeal contrasts now receives a uniform theoretical definition: filled nuclei license, while empty nuclei do not. Since FEN is never in a position to inherit LarLic from the following nucleus – it is not followed by a vowel – it is always causing delaryngealization of its onset.²² It will be recalled that in Rubach (1996, OT) the delaryngealization in pre-obstruent context and word-finally are due to two disparate rules or constraints. Here, the causality is uniform: presence vs. absence of Laryngeal Licensing from the following nucleus. Since licensing properties of nuclei are subject to parameterization, it is possible that in other languages they are set to license the relevant laryngeal category.

6.2. Sonorant opacity – a different perspective

A viable alternative to sonorant opacity expressed by means of [+voice] specification is not impossible to state. I would like to propose that in most cases of the alleged opacity a reference to Laryngeal Licensing can do the job. Licensing is a mechanism which, in one way or another, is used in most current phonological models. Let us assume a very simple and general application used in Government Phonology. Uncontroversially, nuclei in this model are the source of prosodic and autosegmental licensing. They also form a network of licensing distribution within the phonological word (Harris 1994, 1997). Onsets, and therefore also the melodic properties which they subsume lexically, are licensed by the following nucleus. Thus, in *udek*, the vowel /ε/ may be said to block voicing assimilation between obstruents not by virtue of possessing a laryngeal feature itself, but by licensing (protecting) the lexical representation of the preceding obstruent.²³ It will be noted, that this view is fully compatible with the widely accepted idea that assimilation follows delaryngealization of the target. Since /d/ is not in a delaryngealization context it is not affected by assimilation. On the other hand, in *udko*, the intervening vowel disappears, but the syllabic structure does not change. /d/ is still in the onset, and the two obstruents are still separated by a nucleus, albeit empty (/ud^LØk^oɔ/ → /ud^oØk^oɔ/). However, empty nuclei are weaker licensors, therefore /d/ loses its laryngeal specification and is subject to assimilation. Note that the licensing proposed here works differently from, for example, Bethin (1992) or Gussmann (1992) in which laryngeal licensing was connected with being in the onset as opposed to being in the coda or being extrasyllabic. Here, the obstruent is always in the onset and the burden of licensing is on the type of the following nucleus.

Thus, vowels are blockers of laryngeal spreading because each of them defines its own (new) impermeable laryngeal licensing domain. This concerns both marked and unmarked obstruents. That is, the first obstruent in *buty* /b^Lut^oi/ ‘shoes’ and *tuba* /t^oub^La/ ‘tube’ are equally protected. Spreading of laryngeal properties is restricted to delaryngealized (unprotected) obstruents.

To conclude, there is a viable alternative interpretation of the supposed opacity of vowels, which additionally provides a uniform and systemically coherent analysis of delaryngealization. It is uniform because the context is always the same: before an empty nucleus which is by nature a weaker licensor than one with melody. It is coherent because the parameter on licensing or not licensing a laryngeal property does not refer to disparate aspects of representation.

²² With some exceptions to do with monitored speech and homophony avoidance strategies discussed in Cyran (2014), where what is manipulated is licensing strength of FEN rather than a PW boundary, as would have to be the case under Rubach (1996), or syllabification of final obstruents in an onset, as would have to be the case in such formal accounts of Polish final devoicing as Bethin (1992) and Gussmann (1992). This argument is due to Strycharczuk (2012).

²³ This is very much parallel to the concept of prevocalic faithfulness in OT (Rubach 2008).

Syllabified sonorant consonants, it will be recalled, were also assumed to be opaque, and therefore specified with [+voice] in, for example, words like *plaga* [plaga] ‘plague’, or *burta* [burta] ‘ship’s side’ (Rubach OT). Given that the full vowel is present in these forms and it is a blocker – it begins a new LarLic domain – any reference to sonorant consonant opacity in these cases is spurious and untestable: once the vowel is not present, the sonorants are transparent too. This is particularly visible when the vowel following a branching onset is lost, as in *Jędrək / Jędrka* [jɛndrɛk ~ jɛntrka] ‘Andrew, nom.sg. / gen.sg.’. Since there is no resyllabification in GP, the phonological form of the genitive is /jɛnd^orØk^oa/, with the branching onset licensed by an empty nucleus which, however, is not a laryngeal licenser. The /d/ is therefore delaryngealized and becomes a target to assimilation or subject to default interpretation. Under the privative view, it is the latter that takes place.

All the cases of the so-called sonorant opacity and transparency within the phonological word can be thus handled without reference to [+voice] in their representation. More precisely, vocalic opacity follows from the fact that vowels define domains of laryngeal licensing, while sonorant consonants may safely be assumed to be always transparent. There is not a single word-internal situation in which [+voice] on sonorants would need to be evoked.

Thus the only situation now which appears to demonstrate sonorant opacity is the phenomenon described in (1c), e.g. *brak rdzy*. Below, I provide fuller representations of the relevant data from (1), illustrating VA, Final Devoicing, transparency and opacity.

6.3. Phonological or phonetic adjacency?

The representations in (3) are meant to illustrate the formal similarities and differences between CSC and CS#C (1a, b) on the one hand, and C#SC (1c) on the other. The structures on the left are meant to be the lexical forms with added inflection and distribution of Laryngeal Licensing for the relevant stretch of the representation. The first onset O₁ contains the lexical representations of the respective obstruents in which, however, the laryngeal distinction is not licensed in either case because the onset is licensed by an empty nucleus which is not a laryngeal licenser and there is no context for LarLic inheritance.²⁴ In (3a) the inheritance is blocked by the intervening obstruent, while in (3b, c) the relevant nucleus is a FEN and inheritance is not even possible.

In (3a) we are dealing with three different situations. In the case of *krtañ* the lexical representation is interpreted phonetically as is. There is no phonological computation other than the distribution of LarLic. The voicing agreement is lexical rather than a case of VA: two unmarked obstruents are spelled-out as voiceless. In *grdyka*, I assume that the lexical representation of /g/ is a neutral obstruent and |L| is spread from /d/. We may say, that the adjacency between the two obstruents which allows for the spreading can be defined as two onset heads being separated by an empty nucleus, a non-blocker. The sonorant consonant is transparent and does not count. Finally, in *mędrka* and *Jędrka* the lexically voiced /d/ must be delaryngealized in absence of LarLic. This is followed by phonetic interpretation as in *krtañ*. That is, no spreading is involved in this type of VA.

In (3b), O₁ is unable to hold laryngeal distinctions for the same reason as in (3a): it is followed by an empty nucleus which is not a laryngeal licenser. The adjacency between O₁ and O₂ in (3a) and (3b) is of a similar kind. However, there is a slight difference. The licensing properties of FEN can be manipulated in monitored speech. This may result in some variation in (3b) that is not found in (3a) which may also be due to the tempo of speech

²⁴ Such context is present in words like *brnie* ‘he wades’, *srebrny* ‘silver’, *krqbrny* ‘recalcitrant’, as well as *trwonić* ‘waste’, *krwi* ‘blood, gen.sg.’, *brwi* ‘eyebrows’, and *drwi* ‘he mocks’ because the third consonant is a sonorant phonologically and does not absorb LarLic from its nucleus.

(Strycharczuk 2012, Cyran 2014). As for *bóbr był* ‘beaver was’, I assume that the effect of delaryngealization is undone by VA.

(3) a. CSC

$\begin{array}{ccccccc} & & \swarrow & \searrow & & & \\ & & \parallel & \parallel & & & \\ \dots & O_1 & & N_1 & O_2 & N_2 & O & N \\ & \swarrow & & & & & & \\ & k^o & r & \emptyset & t^o & a & \eta & \emptyset \\ & g^o & r & \emptyset & d^L & i & k^o & a \\ m \ \varepsilon \ n & d^L & r & \emptyset & k^o & a \\ j \ \varepsilon \ n & d^L & r & \emptyset & k^o & a \end{array}$	Output of Delar / VA → /g ^L rØd ^L ik ^o a/ → /mɛnd ^o rØk ^o a/ → /jɛnd ^o rØk ^o a/	Spell-out > [krtaŋ] > [grdika] > [mɛntrka] > [jɛntrka]
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b. CS#C

$\begin{array}{ccccccc} & & \swarrow & \searrow & & & \\ & & \parallel & \parallel & & & \\ \dots & O_1 & & N_1 \# & O_2 & N_2 & O & N \dots \\ & \swarrow & & & & & & \\ v^j & a & t^o & r & \emptyset & z^L & a & x^o & \text{ɔ} & d & \eta & i \\ \text{ɫ}^j & i & t^o & r & \emptyset & v^L & \text{ɔ} & d^L & i \\ b & u & b^L & r & \emptyset & b^L & i & w & \emptyset \end{array}$	→ /v ^j at ^L rØz ^L ax ^o ɔdɲi/ → /ɫ ^j it ^L rØv ^L ɔd ^L i/ → /b ^L ub ^o rØb ^L iwØ/ → /b ^L ub ^L rØb ^L iwØ/	> [v ^j adr zaχɔdɲi] > [ɫ ^j idr vɔd ⁱ] > [bubr biw] ²⁵
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c. C#SC

$\begin{array}{ccccccc} & & \swarrow & \searrow & & & \\ & & \parallel & \parallel & & & \\ \dots & O_1 & N_1 \# & O_2 & N_2 & O_3 & N_3 \dots \\ & & & & & & \\ k & \text{ɫ}^j & a & t^o & \emptyset & r & \emptyset & d^L & \text{ɛ} & s & t & u \\ b & r & a & k^o & \emptyset & r & \emptyset & d & z^L & i \\ v^j & i & \text{ɔ} & k^o & \emptyset & m & \emptyset & g^L & w & i \end{array}$	> [k ^ɫ at rdɛstu] > [brak rdzi] > [v ^j iɔk mgwi]
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The structure of (3c) is markedly different from (3a) and (3b). Even though phonetically we may be talking of the same string CSC, phonologically, O₁ is not adjacent to O₃. There is only adjacency between O₁ and O₂ which in Cracow-Poznań Polish leads to sandhi voicing. Thus it seems that the only case of sonorant opacity, which only refers to Warsaw Polish, can be given an alternative analysis to the presence of [+voice] in the representation of sonorants. In terms of syllabification, the initial sonorants are not special, they are onsets licensed by empty nuclei and therefore not different in any way from obstruents in clusters like [kt] and [gd] in *kto* /k^oØt^oɔ/ ‘who’ and *gd* /g^LØd^Li/ ‘when’.

7. Conclusions

There are numerous advantages of the above analysis. Firstly, no reference to extrasyllabicity needs to be made. Full prosodification is based on nuclei, some of which may be empty. Their presence in phonological representation is justified independently. Thus, we are not dealing

²⁵ It should be acknowledged that the derivation of *bóbr był* takes two stages. First the lexically voiced /b^L/ is delaryngealized in front of FEN. This neutralized obstruent is subject to |L|-spreading from the initial /b^L/ in the following word. Thus, delaryngealization feeds VA. This, however, does not mean that we are dealing with rule ordering in the sense that the order of the two phenomena could be, for example, reversed. Both phenomena take place when the structural conditions are met. |L|-spreading cannot be thwarted by being ordered before delaryngealization. The latter, on the other hand, must take place in front of FEN.

with an ad hoc solution. Sonorants are non-specified for voice throughout the derivation and receive a phonetic interpretation as voiced by universal default. The representation of the laryngeal distinction among obstruents in Polish can be successfully privative. The distribution of the laryngeal category for voice ([L]) is given a uniform definition in terms of types of licensers that follow a given onset. No ordering is required between VA and defaults if defaults are operative at spell-out. There is also no need for an elaborate system of ranked constraints. The output forms are phonological representations which are organized on nuclear networks which are necessary independently of the laryngeal phonology.

Crucial in this analysis is the concept of Laryngeal Licensing inheritance which allows empty nuclei which are followed by a sonorant to inherit LarLic potential from the following vowel. In such cases, the underlined fragments in the following representations are protected by a laryngeal licensing domain and may therefore exhibit laryngeal contrasts, as in: /k^or^onɔmb^Lr^oni/ ‘reculcitrant’, /srɛb^Lr^oni/ ‘silver’, /k^or^ovi/ ‘blood, gen.sg.’, /d^Lr^ovi/ ‘he mocks’, etc.

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