

# Liquid Lowering in Kurpian<sup>1</sup>

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This article analyzes the process that I call Liquid Lowering which turns high vowels *i* and *ɨ* into *e* before liquids, schematically  $ii \rightarrow e/ -rl$ . The process began to operate in Polish in the 16th century. I look at the modern reflexes of Liquid Lowering in Standard Polish and in Kurpian, a dialect of Polish that dates back to the 17th century, and argue that the rule is dead in Standard Polish but not in Kurpian, where it is productive in derived environments. The modeling of Liquid Lowering as a phonological process has implications for phonological theory. In particular, it calls for the recognition of derivational levels, as envisaged by Derivational Optimality Theory. It is argued that Standard Optimality Theory, with its principle of strict parallelism, cannot account for the data because it runs into insoluble ranking paradoxes. Furthermore, the analysis bears on the issue of abstractness by positing vowels that never occur phonetically. The abstract vowels are exchanged for the actually occurring vowels before reaching the surface representation. I term this type of shift change VIREMENT.

KEYWORDS: abstractness of underlying representations, derivationalism, Kurpian phonology, Optimality Theory

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reaching the surface representation. I term this type of exchange a *VIREMENT* shift.

The research reported here is based one hundred percent on my fieldwork<sup>2</sup> since, first, in general, the literature on Kurpian is extremely small and, second, Liquid Lowering is not even mentioned in any of the sources. Apart from brief remarks in books on dialectology such as Zduńska (1965) and Dejna (1973), Kurpian, but not specifically Liquid Lowering, is discussed in Friedrich (1955), which is a survey of Kurpian as spoken in a number of villages in Kurpia in the 1930s.<sup>3</sup> The recent work on Kurpian is that of Rubach (2009, 2011a, 2014a, b) but none of these sources deals with Liquid Lowering.

This article is organized as follows. Section 1 introduces background information about Kurpian. Section 2 identifies two main classes of verbs that are relevant for Liquid Lowering. Section 3 discusses Liquid Lowering and states basic generalizations. Section 4 proposes an OT analysis of the data. Section 5 summarizes the conclusions. The development of the line of argumentation can be outlined as follows.

There are two main arguments in this article that are noteworthy from the point of view of general phonological theory: abstract vowels and a derivational step. Liquid Lowering turns high lax unrounded vowels into tense [e], so the rule appears to be:  $//i\text{ɪ}/^4 \rightarrow [e]$  before liquids. Modeling this rule in Optimality Theory (OT; McCarthy & Prince 1995, Prince & Smolensky 2004) runs into difficulty. Since the rule prohibits [ɪɪ] before a liquid, the OT's principle of minimal repair predicts that  $//i\text{ɪ}/$  should change into lax [ɛ] since then IDENT[±tense] is not violated and [ɛ] satisfies Liquid Lowering. However, this prediction is empirically incorrect because the attested output is tense [e] rather than lax [ɛ]. Since the Kurpian data do not warrant a further repair,  $\varepsilon \rightarrow e$ , it becomes evident that tense [e] can only be obtained if the input vowels themselves are [+tense]. That is the underlying vowels must be  $//i\text{ɪ}/$  rather than  $//i\text{ɪ}/$  as then the rule  $i\text{ɪ} \rightarrow e$  before a liquid works as desired. The interest of this prediction made by OT is that  $//i\text{ɪ}/$  are abstract vowels that never occur phonetically in Kurpian. The abstract  $//i\text{ɪ}/$  are changed into [ɪɪ] before reaching the surface representation, a context-free exchange that I call *virement*. For this analysis to work, OT must admit a derivational step: the *virement*  $i\text{ɪ} \rightarrow \text{ɪ}\text{ɪ}$  must take place after Liquid Lowering  $i\text{ɪ} \rightarrow e$  has taken place, so OT must admit at least two derivational levels: Level 1 at which Liquid Lowering operates and Level 2 at which *virement* is active.

[2] The fieldwork was carried out in the villages of Central Kurpia, that is, in the area between Kadzidło and Myszyniec.

[3] Friedrich's (1955) book was published posthumously, 11 years after the author's death.

[4] I use double slashes for underlying representations, single slashes for intermediate forms and square brackets for surface representations.

The derivational step argument is strengthened by the analysis of the alternation between surface lax [ɪɪ] and tense [o], as in [zɪɪtɕ] ‘to live’ – [zoɪtɪ] ‘he lived’. OT cannot deliver a direct change from //i i// → [o] because this change runs against the principle of minimal repair. The principle predicts that the output should be [u], not [o], because [uL] satisfies Liquid Lowering by removing the prohibited [iL iL], where L stands for a liquid. Saving the analysis by prohibiting [uL] will not work because Kurpian admits [uL] in an unrestricted way. The solution is to postulate that Liquid Lowering takes //i i// to /e/ at Level 1 and then, at Level 2, /e/ goes to [o]. In sum, the analysis requires a derivational step.

## 1. BACKGROUND

Kurpian is a dialect of Polish spoken in Kurpia in northern Poland. Even though Kurpia is inhabited by some 70,000 people, the speakers of the dialect are few in number and are invariably people of the older generation (70 years or older). Therefore, the dialect is on the verge of extinction. However, it should be noted that much effort is currently being made by Kurpians themselves in order to revive their culture and language.

Kurpian has a rich system of vowels, considerably richer than that of Standard Polish. In (1) I show the system of vowels that are contrastive in minimal or near minimal pairs (Rubach 2011a).

(1) (a) *Standard Polish vowels*

i	ɨ	u
ɛ		ɔ
	a	

(b) *Kurpian vowels*<sup>5</sup>

		u <sup>6</sup>
ɪ	ɨ	
e		o
ɛ	ə	ɔ
	a	ɑ

[5] I ignore nasal vowels in both Standard Polish and Kurpian. Their status is unclear. One analysis is to treat them as separate phonemes (underlying segments). An alternative analysis is to derive them from sequences of oral vowels and nasal consonants.

[6] The system is ostensibly asymmetrical. I argue in Section 4 that the asymmetry does not exist because the unrounded high vowels are the tense //i i// rather than the lax //ɪ ɨ//.

Examples of words illustrating Kurpian vowels create an opportunity to explain the spelling system. The system was devised by Rubach (2009) and is closely phonetic.

(2) *Kurpian spelling*

LETTER	SOUND	DESCRIPTION	EXAMPLE	GLOSS
ĩ	[ɪ]	front high lax unrounded vowel <sup>7</sup>	śiny	'blue'
y	[ɨ]	central high lax unrounded vowel	syn	'son'
u	[u]	back high tense rounded vowel	buk	'beech'
ó	[o]	back mid tense rounded vowel	Bóg	'God'
o	[ɔ]	back mid lax rounded vowel	bok	'side'
é	[e]	front mid tense unrounded vowel	chléb	'bread'
ë	[ə]	schwa, central mid lax vowel	sën	'dream'
e	[ɛ]	front mid lax unrounded vowel	cep	'flail'
ã	[ɑ]	back low tense vowel	pták	'bird'
a	[a]	central low lax vowel	tak	'yes'
ś	[ç]	voiceless prepalatal fricative	śano	'hay'
ż	[ʒ]	voiced prepalatal fricative	żarno	'seed'
ć	[tʃ]	voiceless prepalatal affricate	ćotka	'aunt'
dź	[dʒ]	voiced prepalatal affricate	dźâdek	'grandpa'
ń	[ɲ]	prepalatal nasal	ńebo	'heaven'

Let us add that prepalatals [ç ʒ tʃ dʒ ɲ] are always written with an accent in Kurpian, so *śiny* [ɕɪɲɨ] 'gray', *śano* [ɕano] 'hay', *żima* [ʒɨma] 'winter', *żarno* [ʒarno] 'seed', *ćichy* [tʃɨxɨ] 'silent', *ćotka* [tʃotka] 'aunt', *dźâdek* [dʒâdek] 'grandpa', *dźiwny* [dʒɨvni] 'strange', and *ńiska* [ɲɨska] 'bowl', *ńebo* [ɲebo] 'sky'.<sup>8</sup>

In terms of distinctive features, Kurpian vowels are classified as follows:

[7] The high unrounded vowels are lax, as documented in Rubach (2011a). Let me add that my consultants, Tadeusz Grec and Henryk Gadomski, who are native speakers of both Kurpian and Standard Polish, insist that the Standard Polish *i/y* [i/i] sound wrong in Kurpian. The vowels that they regard as correct are lax since the Kurpian *ĩ* in *psĩć* 'drink' sounds like the English *i* [ɪ] in *pit*.

[8] This is different from Standard Polish where prepalatals are written in another way: letters standing for prepalatals have no accent if they occur before the letter *i*, regardless of whether the letter *i* is pronounced or not; compare the first two examples in Standard Polish: *siwy* [ɕɨvɨ] 'gray' and *siano* [ɕano] 'hay'.

(3) *Kurpian vowels*

	ɪ	ɨ	u	e	o	ɛ	ə	ɔ	a	ɑ
high	+	+	+	-	-	-	-	-	-	-
low	-	-	-	-	-	-	-	-	+	+
back	-	+	+	-	+	-	+	+	+	+
tense	-	-	+	+	+	-	-	-	-	+
round	-	-	+	-	+	-	-	+	-	-

The feature [ $\pm$ tense] plays a prominent role in the classification of Kurpian vowels. The understanding of [ $\pm$ tense] follows Wood (1975), who defines this feature as a degree of constriction in the regions of hard palate, soft palate, pharynx and lower pharynx. The consequence is that upper high, upper mid and ‘backer’ (back retracted) vowels are [+tense]. Thus, Kurpian *a* [a] and *ɑ* [ɑ] contrast by [ $\pm$ tense], the former is [-tense] while the latter is [+tense]. The operation of phonological rules supports this classification (see Rubach 2014a,b).

While there is no doubt that //o// is a separate phoneme (underlying segment), there is a context in which [o] is systematically derived from //ɔ//. The context in question is that of a following nasal consonant. Rubach (2011a) has noted a systematic phonotactic generalization: only [o] and never [ɔ] is found before a nasal. This generalization leads to the following rule. Informally:

(4) *Nasal Tensing*

$$\text{ɔ} \rightarrow \text{o} / - \text{ [+nasal]}$$

The rule is entirely exceptionless, so we find [o] in, for example: *dóm* ‘house’, *tón* ‘tone’, and *kóní* ‘horse’.

A reviewer asks whether it is necessary to derive phonetic [o] from underlying //ɔ//, as envisaged by Nasal Tensing. The reason for the query is that [o] before nasals never alternates with [ɔ], so, it appears, the Alternation Condition (Kiparsky 1968/1973a) would bar any discrepancy between the surface representation and the underlying representation, leading to postulating underlying //o// rather than //ɔ//. I argue below that the Alternation Condition is not applicable to Nasal Tensing and hence //ɔ// is a licit representation.

The Alternation Condition discussed in Kiparsky (1968/1973a) but actually formulated in Kiparsky (1973b) refers to neutralization rules and those are defined as follows.

(5) *Neutralization processes* (Kiparsky1973b: 169)

Suppose we have a phonological process P:

$$(P) \quad A \rightarrow B / XC \text{ — } DY$$

where C and D represent a (phonological and/or morphological) context, and X and Y are arbitrary strings. Then [...]

P is NEUTRALIZING if there are strings of the form CBD in the immediate input to P; otherwise P is NON-NEUTRALIZING.

Let us elucidate this definition of neutralization by looking at an example from Standard Polish.

(6) *Standard Polish*

	NOM.SG	NOM.PL.	GLOSS
(a)	kod [kɔt]	kod+y [kɔdɨ]	'code'
	chleb [xlɛp]	chleb+y [xlɛbɨ]	'bread'
	raz [ras]	raz+y[razi]	'blow'
(b)	kot [kɔt]	kot+y [kɔtɨ]	'cat'
	sklep [sklɛp]	sklep+y [sklɛpɨ]	'store'
	las [las]	las+y [lasi]	'forest'

The data in (6a) exhibit an alternation between a voiced and a voiceless obstruent, for example, [d]–[t] in *kody* [kɔdɨ] 'code' (NOM.PL) – *kod* [kɔt] (NOM.SG). The examples in (6b) exclude the possibility of analyzing the alternation in terms of intervocalic voicing because voiceless obstruents occur between vowels. Consequently, the alternation must be due to the rule of Final Devoicing. Informally:

(7) *Final Devoicing*

$$[+obstr] \rightarrow [-voice] / \text{ — } \#$$

Final Devoicing takes underlying //kɔd// to surface [kɔt], *kod* 'code'. In the case of *kot* //kɔt// 'cat', the structure derived by Final Devoicing is present before Final Devoicing has a chance to apply, as the underlying //t// of *kot* occurs before a word boundary. This means that *kot* 'cat' constitutes a (C)BD, where C is an irrelevant context from the point of view of Final Devoicing. I conclude that Final Devoicing is a neutralizing rule.

This conclusion has consequences for the analysis of words that do not exhibit alternations. Typically these are words that do not occur in inflectional paradigms.<sup>9</sup>

[9] Alternations may also occur outside inflectional paradigms, for example *pod* [pɔt] 'under' but *pode* [pɔdɛ] *mną* 'under me'.

(8) *Words with no alternation*

- tak [tak] ‘yes’  
 lub [lup] ‘or’  
 obok [ɔbɔk] ‘next to’  
 jak [jak] ‘how’  
 nawet [navɛt] ‘even’  
 jednak [jɛdnak] ‘however’

The underlying representations of these words appear to be ambiguous because the final obstruent could be derived either from a voiced obstruent via Final Devoicing or from a voiceless obstruent: //tag// → [tak] or //tak// = [tak] ‘yes’ and //lub// → [lub] or //lup// = [lup] ‘or’. Since Final Devoicing is a neutralizing rule, the Alternation Condition sets in and resolves the ambiguity in favor of the underlying representations that are the same as the surface representations, so //tak// ‘yes’, //lup// ‘or’ and so forth. The resolution follows from the tenet that non-alternating forms must be entered in the underlying representation in their surface representation. The underlying representations enforced by the Alternation Condition are verified by novel formations: *po+tak+iwa+ć*[pɔtakʲivac̥] ‘say yes’ and *obocz+n+ość*[ɔbɔɟnɔɕc̥]<sup>10</sup> ‘alternation’. The new words are derived from the representations with a voiceless obstruent.

The intention of Kiparsky (1968/1973a) was, on the one hand, to limit the abstractness of underlying representations and, on the other hand, to keep underlying representations free of phonetic details that can be supplied by general rules. Kiparsky (1973b) draws the dividing line between excessively abstract and excessively phonetically detailed representations by appealing to neutralization: only neutralization rules are subject to the Alternation Condition. This requirement is fulfilled by Final Devoicing, as just discussed, but not by Nasal Tensing (4). The point is that Nasal Tensing does not meet the criterion for a neutralizing rule because, unlike in the case of Final Devoicing, there are no CBDs to speak of: all instances of [o] before a nasal in the surface representation are an effect of Nasal Tensing and there is not a single instance on record that would have a tense [o] before a nasal from an independent source. Consequently, nothing in the system mandates that the vowel in *dóm* ‘house’, *tón* ‘tone’ and *kón* ‘horse’ should be tense //o// in the underlying representation. On the contrary, the intention of the Alternation Condition is that phonetic details should not be entered in the underlying representation. There is a phonotactic generalization: lax [ɔ] cannot occur before a nasal. Classic generative phonology expresses this generalization by underspecifying underlying representations and postulating a rule (here: Nasal Tensing) that fills in predictable information, ɔ → o before a nasal. Derivational Optimality Theory, which is the framework adopted in this article (see Section 4) shares with classic generative phonology the assumption

[10] The underlying //k// of *obok* ‘next to’ palatalizes to [tʃ] due to the rule known as First Velar Palatalization; see Rubach (1984).

that phonotactic generalizations are analyzed by evoking underspecification and rules/markedness constraints that enforce the derivation of the attested surface forms. Therefore the underlying representations of *dóm* ‘house’, *tón* ‘tone’ and *kón* ‘horse’ are //dóm//, //tón// and //kɔŋ//, respectively, with Nasal Tensing making sure that the phonetic representations are [dom], [ton] and [koŋ], as required.

It might be added that Nasal Tensing is a powerful process. It is entirely exceptionless and extends to all borrowings, including foreign names, for instance *Camerón*.<sup>11</sup> Furthermore, Nasal Tensing is the source of phonological interference (incorrect pronunciation) in the speech of some Kurpians speaking Standard Polish.

## 2. *ĭ*-VERBS AND *e*-VERBS

Liquid Lowering applies to a huge number of verbs that have *ĭ* as the verbalizing morpheme (*ĭ*-verbs) but never to otherwise similar verbs that have *e* as the verbalizing morpheme (*e*-verbs). This distinction in behavior provides crucial arguments for the discussion of Liquid Lowering and the theoretical issues that it entails. Therefore, it is necessary to identify the class of *ĭ*-verbs and the class of *e*-verbs. The task is not easy because the phonological structure of these classes is masked by the effects of two processes: Infinitive Lowering and Infinitive Tensing.

Looking at the issues from a general perspective, it should be noted that verbs in Kurpian, like in Standard Polish, are of two types: inherent verbs and derived verbs. Inherent verbs are those whose root is a verb, for example, *paś+ć* ‘pasture’ and *ży+ć* ‘live’. Derived verbs are formed from other parts of speech<sup>12</sup> by adding a verbalizing suffix. The word *los+owa+ć* ‘draw lots’ illustrates the point: *los* ‘lot’ is a noun, *-owa* is a verbalizing morpheme and *-ć* is the infinitive. Kurpian, like Standard Polish, has many verbalizing morphemes and verbs are divided into classes, depending on the suffix that they use, so *los+owa+ć* is an *-owa* class (see Rubach 1984).

With this background, we look at the following verbs:

### (9) *Examples of Kurpian verbs*

- (a) *dzwón* ‘bell’ – *dzwónić* ‘to ring’  
*wóz* ‘cart’ – *wozić* ‘carry’  
*kos+a* ‘scythe’ – *kosić* ‘mow’  
*rzut* ‘throw’ (N) – *rzucić* ‘throw’  
 Likewise: *brudzić* ‘make dirty’, *głosić* ‘voice’, *śkolić* ‘educate’,  
*radzić sobie* ‘manage’

[11] The name of the British prime minister, *David Cameron*, was much in the news in 2016 in connection with the Brexit referendum.

[12] In some cases, derived verbs are formed from bound roots that are unspecified for the grammatical category, for instance, the root *pśis* in *pśis+a+ć* ‘write’, where *-a* is a verbalizing morpheme and *-ć* is the infinitive suffix.



- (b) *sum* ‘noise, hum’ – *suńéc* ‘to hum’<sup>13</sup>  
*myśl* ‘thought’ (N) – *myśléc* ‘to think’  
*ból* ‘pain’ – *boléc* ‘hurt’  
*ryk* ‘roar’ – *rycéc* ‘to roar’  
 Likewise: *lećéc* ‘fly’, *źidźéc* ‘see’, *śedźéc* ‘sit’, *śńérđźéc* ‘stink’, *krzycéc* ‘shout’

Looking at *dzwónéc* ‘ring’ (10a) and *suńéc* ‘hum’ (10b), for example, it would appear that the analysis should be as follows:

(10) *Morphological structure of verbs*

- (a) *dzvɔn*]Noun + *é*]Verbalizing morpheme + *ɕ*]Infinitive  
 (b) *sum*]Noun + *é*]Verbalizing morpheme + *ɕ*]Infinitive

Since we see *é* [e] occurring after the noun root in both verbs, it seems that, first, both verbs belong to the same class and, second, the verbalizing suffix is *é //e//*. However, closer investigation shows that none of these statements is true. The similarity in (10) is apparent and is a result of some phonological processes that mask the underlying structure.

In order to determine whether we are dealing with one or two classes of verbs in (10), we look at selected forms of the conjugation paradigm.

(11) *Selected forms of Kurpian conjugation*

(a) INFINITIVE		GLOSS
<i>dzwón+é+ć</i>	<i>suń+é+ć</i>	‘ring’, ‘hum’
(b) PRESENT TENSE: SINGULAR		
<i>dzwón+ě</i>	<i>suń+ě</i>	‘I ring’, ‘I hum’
<i>dzwón+iś</i>	<i>suń+iś</i>	‘you ring’, ‘you hum’
<i>dzwón+i</i>	<i>suń+i</i>	‘he/she/it rings’, ‘he/she/it hums’
(c) PAST TENSE: MASCULINE		
<i>dzwón+ó+ł</i>	<i>suń+â+ł</i>	‘he rang’, ‘he hummed’
<i>dzwón+é+l+y</i>	<i>suń+e+l+y</i>	‘they rang’ (MASC), ‘they hummed’ (MASC)

[13] The alternation between [m] in *sum* (noun) and [ɲ] in *suńéc* is regular and follows from the rule of Labial Decomposition (see Rubach 2014b).

(d) PAST TENSE: FEMININE AND NEUTER

dzwón+é+I+a	suń+a+I+a	‘she rang’, ‘she hummed’
dzwón+é+I+o	suń+a+I+o	‘it rang’, ‘it hummed’
dzwón+é+I+y	suń+a+I+y	‘they rang’ (FEM), ‘they hummed’ (FEM)

(e) PERFECT PARTICIPLE

za+dzwón+i+wsy za+suń+ã+wsy ‘having rung’, ‘having hummed’

The similarity of the verbs in (11) is true only in the infinitive and in the present tense. The past tense and the perfect participle are markedly different. For example, the 3rd person masculine form in the past has *ó* [o] in *dzwónót* ‘he rang’ but *ã* [a] in *suńát* ‘he hummed’. Similarly, the front vowels in *dzwónély* ‘they rang’ (MASC) and *suńely* ‘they hummed’ (MASC) are different: tense *é* [e] versus lax *e* [ɛ], respectively. These differences are found in what are ostensibly the same contexts, so they cannot be ascribed to the operation of phonological rules.

Within their paradigms the verbs exhibit alternations. Looking at the past paradigm, the past tense morpheme appears either as *-t* or as *-l*.

(12) *Morphological structure*

dzvón]<sub>Noun</sub> + é]<sub>Verbalizing morpheme</sub> + I]<sub>Past tense</sub> + y]<sub>Number</sub> ‘they rang’ (FEM)  
 dzvón]<sub>Noun</sub> + é]<sub>Verbalizing morpheme</sub> + I]<sub>Past tense</sub> + y]<sub>Number</sub> ‘they rang’ (MASC)

The verbalizing *é* [e] appears in two other shapes: as *ó* in *dzwón+ó+t* ‘he rang’ and as *-i* [i] in *za+dzwón+i+wsy* ‘having rung’. Therefore, the alternation chain is *é* [e] – *ó* [o] – *i* [i]. Given the default assumption that one of the alternating segments is the underlying segment, the question is which segment to pick for the underlying representation. This question can be answered by looking at a larger fragment of Kurpian phonology.

We argue in the next section that Kurpian has a rule of Liquid Lowering, [i ɪ] → [e] before a liquid, a descendant of the well-known process that affected Polish and its dialects in the 16th and 17th centuries. Given Liquid Lowering, *é* [e] is derivable, so it should not be posited in the underlying representation. This leaves us with the choice between the *ó* [o] of *dzwón+ó+t* ‘he rang’ and the *i* [i] of *za+dzwón+i+wsy* ‘having rung’ as the representation of the verbalizing suffix. There are two reasons that argue against postulating *ó* //o// as the underlying representation. First, *ó* [o] is contextually restricted to closed syllables: it occurs in *dzwón+ó+t* ‘he rang’, but not in *dzwón+é+t+a* ‘she rang’. Second, the verb *dzwón+é+c* takes the endings containing *i* [i] in the present tense conjugation while most verbs take the endings containing *e* [ɛ].

(13)	SELECTED PRESENT TENSE FORMS	GLOSS
	dzwón+é+ć	'ring'
	dzwón+is	'you ring', 'you hum'
	dzwón+i	'he/she/it rings'
	<i>versus</i>	
	los+owa+ć, paś+ć	'draw lots', 'pasture'
	los+uj+es, paś+es	'you draw lots', 'you pasture'
	los+uj+e, paś+e	'he/she/it draws lots', 'he/she/it pastures'

The generalization true for both Standard Polish and Kurpian is that verbs containing front vowels as verbalizing morphemes take the endings *-is*, *-i* while other verbs take the endings *-es*, *-e*, as shown in (13).

The contextual restriction of *ó* [o] to closed syllables and the distribution of the endings in (13) both argue for postulating *i* //i// as the verbalizing suffix in *dzwónić* 'ring':

(14) *Representations*

underlying representation	//dzɔn+i+tɕ// <sup>14</sup>
surface representation	[dzɔjɛtɕ]

Establishing the underlying representation of the verbalizing morpheme in *suń+é+ć* 'hum' is built on a similar line of reasoning. In surface terms, we have the following chain of alternating segments:

(15) *Alternations*

<i>é</i> [e] in the infinitive <i>suń+é+ć</i> 'hum'
<i>â</i> [a] in the past masculine singular <i>suń+â+t</i> and the past participle <i>za+suń+â+wsy</i> 'having hummed'
<i>a</i> [a] in the non-masculine past <i>suń+a+t+a</i> 'she hummed', <i>suń+a+t+o</i> 'it hummed', <i>suń+a+t+y</i> 'they hummed'
<i>e</i> [ɛ] in the past masculine plural <i>suń+e+t+y</i> 'they hummed'

Of these alternants, the back vowels *a* [a] and *â* [a] are not viable underlying representations for the same reason as in the case of *dzwón+é+ć*. In the present tense, the endings are *-is* and *-i* rather than *-es* and *-e*: *suń+is* 'you hum' and *suń+i* 'he/she/it hums'. This leaves us with the choice between the tense *é* [e] occurring in the infinitive *suń+é+ć* and the lax *e* [ɛ] occurring in the past plural form *suń+e+t+y* 'they hummed' (MASC). Both vowels are front, so the generalization concerning the endings in the present tense, shown in (13), is fulfilled in either case. That is, the question is whether *suń+é+ć* has the underlying representation //sum+e+tɕ// with tense //e// or //sum+ɛ+tɕ// with lax //ɛ//.

The answer to this question is prompted by the observation that verbs of different classes invariably have tense *é* [e], and never lax *e* [ɛ] in the infinitive.

[14] We have //ɔ// rather than //o// and //n// rather than //ɲ// in the underlying representation because [o] is derivable via Nasal Tensing (4) and [ɲ] is generated by Palatalization (not discussed here, but see Rubach 1984 for Palatalization in Standard Polish).

(16) *Classes of verbs*

*e*-verbs:

suńéc ‘hum’	myśléc ‘think’
boléc ‘ache’	rycéc ‘roar’
lećéc ‘fly’	źidźéc ‘see’
śedźéc ‘sit’	śńérdźéc ‘stink’
krzycéc ‘shout’	

*ej*-verbs:<sup>15</sup>

łyśéc ‘get bald’	drozéc ‘become expensive’
zgrubźéc ‘become fat’	

*i*-verbs:

dzwónéc ‘ring’	woźéc ‘carry’
kośéc ‘mow’,	rzućéc ‘throw’
brudźéc ‘make dirty’	głóśéc ‘voice’
śkoléc ‘educate’	radźéc sobźe ‘manage’

special verbs:

stojéc ‘stand’	łujńéc ‘know’
rozuńéc ‘understand’	pléśc ‘weave’,
pléc ‘weed’	zrzéc ‘eat’, etc.

We thus arrive at the following distributional generalization: the only type of *e*-vowel that can occur in the infinitive is tense *é* [e]. Schematically:

(17) *Infinitive Tensing*

$$\varepsilon \rightarrow e / - \text{t}\text{c}]_{\text{Infinitive}}$$

Returning to *suń+é+ć* ‘hum’, since the occurrence of tense *é* [e] in the infinitive is predictable from Infinitive Tensing, it is lax e [ɛ] that is present in the underlying representation: //sum+ɛ+tɕ//, so //ɛ// is the verbalizing suffix.

A reviewer asks why *é* [e] could not be postulated as the underlying representation of the verbalizing suffix in the *suńéc* class of verbs in (9b). The vowels alternate (11), which motivates postulating a single underlying representation.<sup>16</sup>

[15] *Ej*-verbs are different from *e*-verbs because *ej* occurs when the following suffix begins with a vowel; compare *łys+ej+ó* ‘they get bald’ vs. *suń+ó* ‘they hum’.

[16] A reviewer asks further whether the two vowels could not be analyzed as underlying allomorphs, so both //ɛ// and //e// would be present in the underlying representation. In general, allomorphy in underlying representations certainly exists. For example, *-owa* [ɔva] of *los+owa+ć* ‘draw lots’ appears as [uj] in the present tense conjugation, as in *los+uj+e* (3RD.SG). There is no way to derive [uj] from the putative underlying //ɔva// or the other way round because the relevant rules do not exist in Kurpian. Furthermore, the putative rules, *ɔva* → *uj* or *uj* → *ɔva* would not be reasonable phonologically and would have to be limited to just this morpheme. The solution proposed by Rubach & Booij (2001) is to assume that //ɔva// and //uj// are allomorphs and both

There are two reasons that point to underlying //ε//. First, as just explained, the alternation [ɛ] – [e] can be accounted for by Infinitive Tensing (17), //ε// → [e] in *suń+é+ć*. The other alternant, [ɛ] occurs in *suńely* ‘they hummed’ (MASC), which is predicted if //ε// is the underlying segment. Second, if //ε// were the underlying vowel in *suń+é+ć*, we would need a rule that would take //ε// to [ɛ] in *suńely*. A rule with that effect could not be general as Kurpian has not only [ɛ] but also [e] before liquids, for example, *télny* ‘back’ and *grdély* ‘strong men’. The putative *e* → ε rule would therefore have to be postulated just for the past tense of the masculine forms. This complication is avoided by the analysis that postulates //ε// as the underlying vowel in *suń+é+ć*. The alternant *é* [e] is derived from //ε// by Infinitive Tensing (17), a rule that exists in the Kurpian grammar anyway, regardless of how we analyze the *suńéc* class of verbs.

We are now able to answer the question of whether *dzwónéc* ‘ring’ and *suńéc* ‘hum’ belong to the same class of verbs. The answer is negative: *suńéc* is an *e*-verb while *dzwónéc* is an *i*-verb. The occurrence of tense *é* [e] in the infinitive is an effect of Infinitive Tensing. This is straightforward in the case of *e*-verbs: //sum+ε+ć// → /sum+e+ć/ by Infinitive Tensing → [sujetć] by other rules. In the case of *i*-verbs, //dzvɔn+i+ć// → [dzvojetć], we need a lowering rule.

(18) *Infinitive Lowering*<sup>17</sup>

ɪ → ε / – ć]Infinitive

A derivational scenario for *dzwónéc* ‘ring’ would thus be the following:

(19) *Informal derivation*

//dzvɔn+i+ć//	underlying representation
dzvɔnɛć	Infinitive Lowering (14): ɪ → ε
dzvɔnetć	Infinitive Tensing (13): ε → e
dzvonetć	Nasal Tensing (4): ɔ → o
dzvojetć	Other rules (Palatalization n → ɲ)

---

are listed in the underlying representation. This analysis is strengthened by the fact that nothing further needs to be said about //ɔva// and //uj//. The distribution of the allomorphs is governed by independently active constraints on syllable structure: //ɔva// occurs before consonants, as in *los+owa+ć* ‘to draw lots’ and //uj// is found before vowels, as in *los+uj+e* (3RD.SG). The distribution of the allomorphs is governed by No-COMPLEX-Coda and ONSET (see Rubach & Booij 2001 for an analysis). In the case of the [e]–[ɛ] alternation in the *suńéc* ‘to hum’ class of verbs the situation is different: [e] can be derived from //ε// by an independently motivated rule, so there is no reason to postulate underlying allomorphs.

[17] The change ɪ → ε respects the [-tense] identity between the input and the output. It is not necessary to assume that the output is [e], even though [e] occurs in the phonetic representation. The [e] is derived from /ɛ/ by Infinitive Tensing (17). I argue in Section 4.1 that the infinitive suffix must be set up as underlying tense //i// rather than lax //h//, so Infinitive Lowering takes //i// to [e], respecting the identity in [+tense] between the input and the output.

To conclude, the morphological system of Kurpian includes *inter alia* two classes of verbs: *i*-verbs, whose verbalizing morpheme is *i* //i//, and *e*-verbs, whose verbalizing morpheme is *e* //ɛ//.

3. LIQUID LOWERING: FACTS AND GENERALIZATIONS

Historical grammars, for example, Stieber (1952) and Rospond (1973), note that in the 16th century Polish developed a rule that changed *ir* [ir] and *yr* [ir] into *er* [er] and *il* [il], *ił* [ił], *yl* [il], *yl* [ił] into [el], [eł]. I will call this rule Liquid Lowering and state it informally as follows:

(20) *Liquid Lowering*

i i → e / – liquids (*r* and the laterals *l ł*)

The grammars are not clear on whether the output of the rule was lax [ɛ] or tense [e]. Both are viable because Polish made a phonemic distinction between tense and lax mid vowels, exactly as does Kurpian today. The distinction was lost in the 19th century.

(21) *Polish high and mid vowels*

16TH CENTURY			19TH CENTURY		
i	ĩ	u	i	ĩ	u
e		o	ɛ		ɔ
ɛ		ɔ			

Standard Polish today has obviously lax [ɛ] in the context of liquids because tense [e] does not exist as a sound any longer, so Standard Polish is not helpful in clarifying the query of whether the output of Liquid Lowering was lax [ɛ] or tense [e]. However, Kurpian is helpful at this point because systematically only tense [e] is found in the Liquid Lowering context in modern Kurpian (see the data below). Therefore, the odds are that the historical Liquid Lowering produced tense [e] rather than lax [ɛ], so I assume the output [e] in (22).

The data are based on Stieber (1952) and Rospond (1973) for Old Polish and on my fieldwork for Kurpian. Some representative examples, transcribed in IPA, are given in (22).

(22) *Examples of Liquid Lowering*

OLD POLISH	16TH-C. POLISH	MODERN POLISH	KURPIAN	GLOSS
sir	ser	sɛr	ser	‘cheese’
um <sup>j</sup> iratɕ	um <sup>j</sup> eratɕ	um <sup>j</sup> eratɕ <sup>18</sup>	wu <sup>j</sup> eratɕ	‘die’
tɕirp <sup>j</sup> ɛtɕ	tɕerp <sup>j</sup> ɛtɕ	tɕerp <sup>j</sup> ɛtɕ	tɕɛspɕetɕ <sup>19</sup>	‘suffer’
pastir <sup>j</sup>	pastir <sup>j</sup> <sup>20</sup>	pastɛʃ	pastɛʃ	‘shepherd’
rɔstarka	rɔsterka	rɔsterka	rɔsterka	‘indecision’
kaɕzilnitsa	kaɕɛlnitsa	kaɕɛlnitsa	kaɕɛlnitsa	‘censer’
tʃirf <sup>21</sup>	tʃɛrf	tʃɛrf	tserf	‘maggot’

The effects of Liquid Lowering are preserved today as tense [e] in Kurpian and as lax [ɛ] in Standard Polish. The vowel is lax because, as noted earlier, Standard Polish lost tense mid vowels in the 19th century.

Liquid Lowering, so perfectly productive in the 16th and 17th centuries, seems to have been lost in Standard Polish, that is, the rule does not exist any longer. This is documented by the assimilation of borrowings. The early borrowings (16th and 17th centuries) exhibit the effects of Liquid Lowering today, so Latin *subtilis* ‘subtle’ that existed as *subtylny* [suptɨlnɨ], with [i] before [l] in Old Polish, is *subtelny* in Modern Polish, with [ɛ] before [l]. In contrast, later borrowings (19th and 20th centuries) defy Liquid Lowering and have *i* [i] or *y* [ɨ] before liquids, as the following examples illustrate.

(23) *Exceptions to Liquid Lowering*

- dyrektor [dir], German *Direktor*  
 syrop [sir], French *sirop*  
 Sylwester [sil], German *Silvester*  
 cyrk [tsir], German *Zirkus*  
 spirytus [sp<sup>ɨ</sup>ir], German *Spiritus*  
 milimetr [m<sup>ɨ</sup>il] ‘millimeter’, French *millimètre*  
 kilometr [k<sup>ɨ</sup>il] ‘kilometer’, French *kilomètre*  
 syrena [sir] ‘sirene’, French *sirène*

I conclude that Liquid Lowering does not exist in Standard Polish any longer. The situation in Kurpian is different. Liquid Lowering has exerted a huge influence on Kurpian, as is evident from the following comparison.

[18] This transcription is correct for Eastern Polish today. Central Polish has decomposed palatalized labials into labials and [j], so [um<sup>ɨ</sup>jɛratɕ]. I will ignore decomposition here and below.

[19] The [ʃ] in *ćierzpéc* comes historically from [r<sup>ɨ</sup>ʃ], as in *pastéřz* ‘shepherd’ listed below.

[20] The symbol [r<sup>ɨ</sup>ʃ] stands for a postalveolar sonorant trill, as in modern Czech *řeka* ‘river’, but, unlike Czech [ř], it is a soft (palatalized) sound. The historical development of palatalized [r<sup>ɨ</sup>ʃ] in Polish and Kurpian takes soft [r<sup>ɨ</sup>ʃ] to a soft postalveolar sonorant trill [r<sup>ɨ</sup>ʃ], then the [r<sup>ɨ</sup>ʃ] turns into a soft postalveolar fricative [ʒ<sup>ɨ</sup>] that hardens to [ʒ]: r<sup>ɨ</sup>ʃ → ř<sup>ɨ</sup>ʃ → ʒ<sup>ɨ</sup>ʃ → ʒ. Since the words *pasterz* in Standard Polish and *pastéřz* in Kurpian are related to the adjectives *paster+sk+i* in Standard Polish and *pastér+sk+y* in Kurpian, where [r] occurs on the surface, the underlying representation still contains //r<sup>ɨ</sup>ʃ//. The //r<sup>ɨ</sup>ʃ// turns into [ʒ] and subsequently devoices to [ʃ] in both Standard Polish and Kurpian.

[21] The word is written *czyrw* in Old Polish and [f] in the IPA here is an effect of Final Devoicing.

(24) *Effects of Liquid Lowering*

KURPIAN [e]	STANDARD POLISH [i] OR [i]	GLOSS
kob <sup>é</sup> ła <sup>22</sup>	kobyła	‘mare’
t <sup>é</sup> ł	tył	‘back’
mot <sup>é</sup> ł	motyl	‘butterfly’
d <sup>é</sup> rdym <sup>á</sup> ty	dyrdymały	‘nonsense’
pom <sup>é</sup> łka	pomyłka	‘error’
t <sup>é</sup> rać	tyrać	‘work hard’
ż <sup>é</sup> łgotny	wilgotny	‘moist’
p <sup>é</sup> ł	pył	‘dust’
mog <sup>é</sup> ła	mogiła	‘grave’
żw <sup>é</sup> r	żwir	‘gravel’

Liquid Lowering has affected also recent (20th century) borrowings from Standard Polish into Kurpian.

(25) *Borrowings*

KURPIAN [e]	STANDARD POLISH [i] OR [i]	GLOSS
d <sup>é</sup> recht <sup>ó</sup> r	dyrektor	‘director’
ś <sup>é</sup> rany	firany	‘curtains’
sp <sup>é</sup> ś <sup>é</sup> rytus	spiryтус	‘spirits’
c <sup>é</sup> r <sup>k</sup>	cyrk	‘circus’
s <sup>é</sup> rop	syrop	‘syrup’
s <sup>é</sup> r <sup>é</sup> na	syrena	‘siren’

In spite of its huge productivity, Liquid Lowering has recently accumulated exceptions. The list in (26) is not exhaustive.

(26) *Exceptions to Liquid Lowering*

tylo ‘only’	kylometer ‘kilometer’
tyran ‘tyrant’	n <sup>í</sup> lymeter ‘milimeter’
ż <sup>í</sup> łk ‘wolf’	Ż <sup>í</sup> lyj <sup>á</sup> ‘Christmas Eve’
ch <sup>ś</sup> ílecka ‘moment’	N <sup>í</sup> rek ‘Mirek’ (name)
p <sup>ś</sup> íła ‘saw’ (N)	

Liquid Lowering does not seem to be an active process any longer. An interesting piece of evidence strengthening this conclusion comes from the Old Polish word *síła* [c<sup>í</sup>ła] that underwent Liquid Lowering and was pronounced [c<sup>é</sup>ła]. In today’s Kurpian the word has two meanings: one is ‘how many’ and the other is ‘strength’.

[22] In both Standard Polish and Kurpian, I disregard the fact that dark / [ɨ] changed into [w] in non-palatalizing contexts in the 20th century. The dark / [ɨ] is still present phonetically in Eastern Polish. In both Standard Polish and Kurpian, //ɨ// can be reasonably argued to exist in the underlying representation. The //ɨ// changes to [ɨ] before front vowels and vocalizes to [w] in the remaining contexts (see Rubach 1982), as in *śkol+a* [c<sup>k</sup>ɔwa] ‘school’ (NOM.SG) – *śkol+e* [c<sup>k</sup>ɔle] (DAT.SG).



In the meaning ‘how many’, the word is pronounced [ɕɛł̩a] with [e].<sup>23</sup> In the meaning ‘strength’, the pronunciation is [ɕɪł̩a]. The conclusion that suggests itself is that Liquid Lowering is dead as a rule of Kurpian. However, inspection of verbs shows that this conclusion is overstated.

Liquid Lowering is perfectly productive with verbs, and the evidence is of the strongest type: alternations. In (27) I look at four forms: the infinitive and the past forms: the 3rd person singular and the plural feminine forms marked as ‘she’ and ‘they’ (FEM) and the 3rd person plural masculine form marked as ‘they’ (MASC). So the glosses for the first line are: ‘live’, ‘she lived’, ‘they lived’ (FEM) and ‘they lived’ (MASC). The 3rd person singular masculine will be discussed later.

(27) *Kurpian verbs: PAST TENSE*

INFINITIVE	‘SHE’	‘THEY (FEM)’	‘THEY (MASC)’	GLOSS
zy+ć	zɛ+ł̩+a	zɛ+ł̩+y	zɛ+ł̩+y	‘live’
by+ć	bɛ+ł̩+a	bɛ+ł̩+y	bɛ+ł̩+y	‘be’
sy+ć	sɛ+ł̩+a	sɛ+ł̩+y	sɛ+ł̩+y	‘sew’
ty+ć	tɛ+ł̩+a	tɛ+ł̩+y	tɛ+ł̩+y	‘gain weight’
my+ć	mɛ+ł̩+a	mɛ+ł̩+y	mɛ+ł̩+y	‘wash’
kry+ć	krɛ+ł̩+a	krɛ+ł̩+y	krɛ+ł̩+y	‘hide’
wy+ć	wɛ+ł̩+a	wɛ+ł̩+y	wɛ+ł̩+y	‘howl’
pśi+ć	pśɛ+ł̩+a	pśɛ+ł̩+y	pśɛ+ł̩+y	‘drink’
bźi+ć	bźɛ+ł̩+a	bźɛ+ł̩+y	bźɛ+ł̩+y	‘beat’
źi+ć śɛ	źɛ+ł̩+a śɛ	źɛ+ł̩+y śɛ	źɛ+ł̩+y śɛ	‘wind’

As the data show, *ɪ* [ɪ] and *y* [ɥ] alternate with *ɛ* [e] when the suffix begins with a lateral (see footnote 21), which is exactly what Liquid Lowering predicts.

The class of inputs to Liquid Lowering is considerably larger than shown in (27) because it includes all *ɪ*-verbs, such as *dzwónić* ‘ring’ discussed earlier. The complication is that, unlike in (27), the input *ɪ* //ɪ// is masked by the action of Infinitive Lowering (18) and Infinitive Tensing (17) changing //ɪ// into *ɛ* [e], but the //ɪ// still occurs on the surface in the perfect participle *zadzwóni+ɪ+wsy* ‘having rung’.

(28) *ɪ-verbs*

INFINITIVE	‘SHE’	‘THEY (FEM)’	‘THEY (MASC)’	GLOSS
dzwónić	dzwóniɛł̩a	dzwóniɛł̩y	dzwóniɛł̩y	‘ring’
kość	kośiɛł̩a	kośiɛł̩y	kośiɛł̩y	‘mow’
woźć	woźiɛł̩a	woźiɛł̩y	woźiɛł̩y	‘carry’
rzućć	rzućiɛł̩a	rzućiɛł̩y	rzućiɛł̩y	‘throw’
brudźć	brudźiɛł̩a	brudźiɛł̩y	brudźiɛł̩y	‘stain’
śkolć	śkoliɛł̩a	śkoliɛł̩y	śkoliɛł̩y	‘educate’

[23] For example, *Śiɛł̩a chłopów bɛł̩o tam?* ‘Were there many men there?’

The question is how to reconcile the data in (26) showing that Liquid Lowering is dead with the data in (27) and (28) showing that the rule is active and productive. Inspection of the structure of the ‘exceptions’ in (26) and the undergoers in (27)–(28) shows a systematic difference: in (26) both the input *i/y* and the trigger (*r*, *l* or *l*) are contained in one morpheme. In contrast, the data in (27)–(28) show a morpheme boundary between the input *i/y* and the trigger *l* or *l*, as in the past feminine forms of *zy+ć* ‘live’ and *dzwón+é+ć* ‘ring’: *zé+l+a* ‘she lived’ and *dzwón+é+l+a* ‘she rang’.

(29) *Morphological structure*

*zé+l+a //zɪ+l+a//* → [zeła] by Liquid Lowering (see footnote 22)  
*dzwón+é+l+a //dzvɔn+l+a//* → /dzvɔneła/ by Liquid Lowering →  
 /dzvɔneła/ by Palatalization → [dzvɔneła] by Nasal Tensing (4)

The situation just described – the requirement that a morpheme boundary be present in the context – is known as the Derived Environment Condition (DE). The idea played an important role in Lexical Phonology since all cyclic rules were assumed to be sensitive to the DE Condition (Kiparsky 1982, Booij & Rubach 1987). One of the interesting claims of Lexical Phonology is that in their historical evolution rules become restricted to DE before they disappear altogether (Rubach 1984). The fate of Liquid Lowering supports this point. In Standard Polish the process has gone its complete course: from birth (rule addition) to death (rule loss). In Kurpian, Liquid Lowering is at the DE stage, so the process is active but carries a DE restriction. Interestingly, once DE is recognized as a condition, Liquid Lowering becomes a totally exceptionless rule.

#### 4. ANALYSIS

This section offers an OT analysis of Liquid Lowering, arguing that Derivational Optimality Theory but not Standard Optimality Theory is able to account for the full range of the data. Liquid Lowering is restated as a constraint.

(30) *Liquid Lowering*<sup>24</sup>

No high unrounded vowel before a liquid.

Liquid Lowering prohibits combinations of [i i ɨ] with [l ɫ] (see footnote 21), as well as with [r]. The context before *r* is in fact empty once (30) carries a DE restriction because Kurpian does not have suffixes beginning with *r*.

##### 4.1 *Underlying tense //l ɨ//*

This section constructs an OT grammar of Kurpian with a view to satisfy Liquid Lowering. Since the Kurpian high unrounded vowels are the lax [i ɨ], the effort is

[24] It is unclear how the DE restriction can be incorporated into OT and I will not pursue this issue here; for a proposal, see Łubowicz (2002) and McCarthy (2003).

to exclude the combinations \*ɪl, \*ɪɫ and \*ɪl, \*ɪɫ. The repair is to lower the high vowels and thereby eliminate the prohibited [ɪɫ] before a lateral. At this point the analysis runs into difficulty.

The principle of OT is to execute a minimal repair that is necessary to obey a high-ranked markedness constraint (here: Liquid Lowering). A minimal repair is one that is the least costly in terms of how many faithfulness constraints it violates. In the case at hand, a minimal repair is to change //ɪɫ// to lax [ɛ] rather than to tense [e], because the latter change, //ɪɫ// → [e], would violate additionally IDENT[±tense] since the input vowels are lax while the output vowel is [+tense]. The difficulty is that it is [ɛ] rather than [e] that is the attested surface form. The derivation cannot be repaired by postulating an additional constraint that outlaws [ɛɪ ɛɫ] and hence enforces the change from [ɛ] to [e]. This repair is not available because Kurpian has many [ɛɪ ɛɫ] combinations in DE contexts.

The conclusion is that it is the input rather than the derivation that needs to be fixed. The logic of minimal repair dictates that the tense vowel [e] can be obtained if the input itself is a tense vowel, so //i i// → [e] as then IDENT[±tense] is not violated. The bottom line is that it must be //i i//, and not //ɪɫ//, that are the underlying vowels in Kurpian. The phonetically attested [ɪɫ] are derived by Laxing, *i i* → *ɪɫ*. The interest of this analysis is twofold: first //i i// are abstract vowels that never occur phonetically in Kurpian and, second, it is the theoretical apparatus of OT that discovers these vowels. The scenario just outlined is fleshed out in the remainder of this section.

In preparation for a formal analysis, let us look at constraints that can potentially play a role in the evaluation of candidates.<sup>25</sup> Liquid Lowering violates two faithfulness constraints: IDENT[±high] because a high vowel lowers to a mid vowel and IDENT[±tense] because the inputs are the lax vowels //ɪɫ// and the output is the tense vowel [e]. Further, we need to make sure that //ɪr ɪr//, for example, do not satisfy Liquid Lowering by changing to [ur]. This change is outlawed by IDENT[±round].

- (31) (a) IDENT[±high]  
The value of [±high] on the input segment must be preserved on a correspondent of that segment in the output.
- (b) IDENT[±tense]  
The value of [±tense] on the input segment must be preserved on a correspondent of that segment in the output.
- (c) IDENT[±round]  
The value of [±round] on the input segment must be preserved on a correspondent of that segment in the output.

[25] I ignore IDENT[±back] that is violated by the mapping //i// → [o]. This constraint is ranked low and plays no role.

The underlying representation of  $z\acute{e}+l+y$  [zɛɫɪ] ‘they lived’, the past masculine plural form of  $zy+c$  [zɪtɛ] ‘live’, is //zɪɫɪ+i//.<sup>26</sup> As mentioned in footnote 21, the //ɪ// is motivated by the alternation between [ɪ] in  $z\acute{e}+l+y$  [zɛɫɪ] ‘they lived’ (MASC) and [w] in  $z\acute{e}+l+y$  [zewɪ] ‘they lived’ (FEM). The gender marker for the masculine form is the front vowel //ɪ//, which appears overtly in the surface representation of verbs that have //n// rather than //ɪ// in the past tense, for example,  $zac\acute{e}n+i$  [zatsɛnɪ] ‘they began’ (MASC).<sup>27</sup> The derivation of the surface representation [zɛɫɪ] from underlying //zeɫɪ+i// is complicated. As in Standard Polish, Palatalization changes dark  $l$  //ɫ// into soft (palatalized)  $l^j$ /. Unlike in Standard Polish, however, a lateral is never soft in the surface representation. This generalization is expressed as Hardening,  $l^j \rightarrow l$ . The output [ɪ] is a hard consonant and hence carries the feature [+back]. This feature spreads to the following vowel causing the retraction of the vowel from /ɪ/  $\rightarrow$  [ɪ]. Below I summarize these developments and compare the derivation of Kurpian  $z\acute{e}+l+y$  //zɪɫɪ+i//  $\rightarrow$  [zɛɫɪ] and Standard Polish  $zy+l+i$  //ʒɪɫɪ+i//  $\rightarrow$  [ʒɪɫɪ]. Informally:

(32) *Derivations*

STANDARD POLISH	KURPIAN	
//ʒɪɫɪ+i//	//zɪɫɪ+i//	
—	zɛɫɪ	Liquid Lowering, $\varepsilon \rightarrow e$
ʒɪɫɪ	zɛɫɪ	Palatalization, $t \rightarrow t^j$
—	zɛɫɪ	Hardening, $l^j \rightarrow l$
—	zɛɫɪ	Retraction, $\varepsilon \rightarrow \varepsilon$

The derivation in (32) is not a formal analysis but just a scenario showing where our analysis is going.

Forerunning the analysis, let us look at some differences between Standard OT and Derivational Optimality Theory (Kiparsky 1997, 2000; Rubach 1997; Rubach 2000a, b, 2003a; Bermúdez-Otero 1999; DOT<sup>28</sup> hereafter) that will become relevant shortly. DOT rejects the Standard OT’s principle of strict parallelism that prohibits derivation. Evaluation proceeds in steps called levels. Kiparsky (2000) proposed three levels: the stem level, the word level and the postlexical level (sentence level). Rubach (2011b and 2016) has extended this model by adding the clitic level placed between the word level and the postlexical level. The levels constitute miniphonologies: the constraints are the same at all levels, but their ranking may be different. Reranking of constraints between levels must be minimal and requires motivation (Rubach 2000a). The input to Level 1 is the

[26] It is necessary to look at  $z\acute{e}ly$  ‘they lived’(MASC) in spite of the fact that the analysis is complicated. The reason is that  $z\acute{e}ly$ , and not  $z\acute{e}ly$  (FEM), is comparable to  $su\acute{m}iely$  ‘they hummed’, and the comparison of these two forms is the crux of the argument that I develop below.

[27] The non-masculine (i.e. feminine or neuter) gender marker is  $-y$ [ɪ] and it occurs in the surface representation of both  $z\acute{e}l+y$  [zɛɫɪ] ‘they lived’ (FEM) and  $zac\acute{e}n+y$  [zatsɛnɪ] ‘they began’ (FEM).

[28] The name Derivational Optimality Theory comes from Rubach (1997). Kiparsky (1997) uses the name LP – OT while Bermúdez-Otero (1999) calls the theory Stratal OT.

underlying representation, the input to Level 2 is the optimal output from Level 1, the input to Level 3 is the optimal output from Level 2, and the input to Level 4 is the optimal output from Level 3. The domains increase in size as we move down from one level to another: the stem at Level 1, the word at Level 2, the clitic phrase at Level 3, and the sentence at Level 4.

Returning to *zɛ́+l+y* ‘they lived’ (MASC), let us look at the evaluation at Level 1 at which Liquid Lowering is active. We focus on Liquid Lowering and not on Palatalization (PAL). To have an effect, Liquid Lowering must outrank IDENT[±high]. The undesired winner is indicated by the left-pointing hand ☞. The icon ⊗ marks the desired winner that has lost in the evaluation.

(33) Level 1 //zɛ́+l+i// → /zɛlʲɪ/ (failed evaluation)

	PAL	Liquid Lowering	IDENT[±rd]	IDENT[±high]	IDENT[±tense]
(a) zɛ́ɪ	*!	*			
(b) zɛ́ɪʲ		*!			
(c) zuɪʲ			*!		*
(d) zɔɪʲ			*!	*	
☞ (e) zɛɪʲ				*	
⊗ (f) zɛlʲɪ				*	*!

Candidate (33a) fails on PAL because [ɪ] is hard, i.e. [+back], and [ɪ] is [-back], so the consonant and the vowel do not share the value of [±back].<sup>29</sup> Both (33a) and (33b) offend Liquid Lowering since they contain the prohibited \*ɛɪ. Candidate (33c) has avoided this prohibition by changing //ɛɪ// into [u], but this change violates IDENT[±round] since the input //ɛɪ// is [-round] while the output [u] is [+round]. The same objection holds for candidate (33d). The result of the evaluation is incorrect since (33f), [zɛlʲɪ], is the desired winner at Level 1. The reason for the failure is clear. An OT grammar is constructed to execute a minimal repair (the least costly change) when it is necessary to obey a higher ranked markedness constraint. In the instance at hand, the minimal repair is to flip //ɛɪ// to [ɛ]. This change satisfies Liquid Lowering as there is no high vowel before [l]. Candidate (33f), [zɛlʲɪ] satisfies Liquid Lowering in the same way but additionally violates IDENT[±tense] because the input vowel //ɛɪ// is [-tense] while the output vowel [ɛ] is [+tense], so unlike in //ɛɪ// → [ɛ], the repair is not minimal.

It appears that in order to outlaw the undesired candidate [zɛɪʲɪ] in (33e) and tip the balance in favor of the desired winner [zɛlʲɪ] in (33f), we could add a new constraint prohibiting lax [ɛ] before a liquid: \*ɛL. Ranked above IDENT[±tense], \*ɛL would eliminate candidate (33e), [zɛɪʲɪ]. This rather heavy-handed solution is not available, however. The reason is that it is precisely [ɛl] that is found in the

[29] Such sharing is what PAL requires; see Rubach (2003b) for how palatalization is analyzed in OT.

desired winner of verbs representing different classes. Some examples are the following.

(34) *Selected conjugational forms*

suń+é+ć ‘hum’	suń+e+l+y ‘they hummed’ (MASC)
leć+é+ć ‘fly’	leć+e+l+y ‘they flew’ (MASC)
łyś+é+ć ‘get bald’	łyś+e+l+y ‘they were getting bald’ (MASC)
rozuń+é+ć ‘understand’	rozuń+e+l+y ‘they understood’ (MASC)
łujń+é+ć ‘can’	łujń+e+l+y ‘they could’ (MASC)
stoj+é+ć ‘stand’	stoj+e+l+y ‘they stood’ (MASC)
lã+ć ‘pour’	le+l+y ‘they poured’ (MASC)

Since, as (34) shows, postulating a constraint that bans *el* [ɛl] is closed as an option, let us reconsider what it is exactly that Liquid Lowering does. As the name says, it lowers vowels, specifically, it lowers /l i ɪ/ to mid tense [e], crucially, not to lax [ɛ], even though lowering to [ɛ] would be more natural than lowering to [e]: the inputs /l i ɪ/ are lax, so they should lower to lax [ɛ]. Given this logic, lowering to tense [e] would be natural and expected if the input had tense vowels. This is the solution then. The inputs to Liquid Lowering are the tense vowels /l i i/ and not the lax /l i ɪ/. For this analysis to work, we need to assume that lax [l i ɪ] are not members of the underlying inventory. Rather, Kurpian has underlying /l i i/. The lax [l i ɪ] are an effect of a late process that I call Laxing. Schematically:

(35) *Laxing*

$$i i \rightarrow l i ɪ$$

In terms of OT, Laxing is implemented as a reranking of the segment inventory constraints:

(36) *Segment inventory constraints*

- (a) \*i: Don’t be tense [i].
- (b) \*i: Don’t be tense [ɪ].
- (c) \*l: Don’t be lax [l].
- (d) \*ɪ: Don’t be lax [ɪ].

We crucially need /l i i/ at the level at which Liquid Lowering is active, which is probably Level 1. At a later level, level 2, 3 or 4, Laxing sets in and /l i/, /i/ are replaced by [lɪ], [ɪ], respectively. As far as I know, there are no processes in Kurpian that would require the high vowels to be lax, that is, Laxing does not interact with other rules, and hence plays no phonological role. All Laxing does is add ‘phonetic detail’ to the system and hence can apply at the end of phonology, which, given DOT, is Level 4.

(37) *Reranking*

- Level 1: \*l ɪ >> \*i \*i, so /l i/ are preferred
- Level 4: \*i \*i >> \*l \*ɪ, so /l ɪ/ are preferred

Notice that this analysis is available in DOT but not in Standard OT, because it crucially assumes that evaluation is carried out at different levels and not simultaneously in a strictly parallel manner at one level, as Standard OT would have it. To conclude, [ɪ ɨ] are phonetic and not underlying segments in Kurpian. The corresponding underlying segments are //i i//.

One advantage of this analysis is that the inventory of underlying vowels in Kurpian becomes symmetrical because all high vowels are tense and we do not have unexplained gaps in the system, with lax //ɪ ɨ/ having no tense correspondents and tense //u// having no lax correspondent. The inventory in (1b) repeated in (38a) is now replaced by the inventory in (38b).

(38) *Underlying vowels in Kurpian*


(a) Previous inventory	u	(b) New inventory	i	i	u
ɪ ɨ					
e	o	e			o
ɛ ə	ɔ	ɛ	ə		ɔ
a	ɑ		a		ɑ

Returning to the analysis of *zy+ć* ‘live – *zė+l+y* ‘they lived’ (MASC), the underlying representations are now different and have tense //i i// rather than lax //ɪ ɨ//, hence we have //zi+tç// and //zi+l+i//, respectively. Similarly, *i*-verbs, such as *dzwón+ė+ć* ‘ring’ all have underlying //i// and not underlying //ɪ//, so they are better called *i*-verbs rather than *i*-verbs. Therefore, the infinitive and the past tense forms are the following.

(39) *Underlying representations*

<i>dzwón+ė+ć</i> ‘ring’:	//dzvɔn+i+tç//
<i>dzón+ė+l+a</i> ‘she rang’:	//dzvɔn+i+l+a//
<i>dzón+ė+l+y</i> ‘they rang’ (FEM):	//dzvɔn+i+l+i//
<i>dzón+ė+l+y</i> ‘they rang’ (MASC):	//dzvɔn+i+l+i//

Now let us return to the sample derivation *zė+l+y* ‘they lived’ that we evaluated in (33) with no success. Since the inputs are the tense vowels //i i//, the relevant IDENT constraint mandating their preservation in the output is IDENT[±tense], familiar from (33).

The failed evaluation of *zė+l+y* ‘they lived’ in (33) is now improved in (40). The icon  marks the desired winner.

(40) Standard OT //zi+l+i// → /zel'i]/ 'they lived' (MASC)

	PAL	Liquid	IDENT[±rd]	IDENT[±tense]	IDENT[±high]
		Lowering			
(a) zĭi	*!	*!			
(b) zĭli		*!			
(c) zulĭ			*!		
(d) zolĭ			*!	*	*
(e) zelĭ				*!	*
☞ (f) zeli					*

The result is correct. As shown by the scenario in (32), there are some further processes that apply in the derivation of zé+l+y. At Level 2, soft /l/ loses palatalization and is hardened to /l/, /zel'i/ → /zeli/ (Hardening). Since hard /l/ is [+back], the front vowel /i/ changes into the [+back] vowel [ĭ], /zeli/ → [zelĭ] (Retraction). Finally, at Level 4 Laxing exchanges /i ĭ/ for [ɪ ɛ], yielding the final outcome [zelɛ], which is the attested surface form.

Looking at a larger picture, the analysis that proposes an exchange of segments uses what I will term *virement* as a theoretical tool. The Kurpian *virement* takes /i ĭ/ to [ɪ ɛ], i ĭ → ɪ ɛ. It is a shift rather than a neutralization process<sup>30</sup> as no /ɪ ɛ/ exist prior to *virement*.

(41) *Virement*

*Virement* as a phonological operation is a context-free exchange of segments resulting in a new type of contrast in surface representations.

Let us look at Laxing, i ĭ → ɪ ɛ, from a diachronic perspective. Old Polish had the tense vowels [i ĭ] in both surface representations and underlying representations. Kurpian that developed from Old Polish changed the vowel inventory by adding Laxing as a rule. The analysis of Liquid Lowering shows that the newly developed [ɪ ɛ] do not play a role. Kurpian phonology still works on the now abstract assumption that the vowels are //i ĭ// rather than //ɪ ɛ//, so the underlying representations of zy+ć 'live' and dzwónić 'ring' are //zi+tɕ// and //dzvɔn+i+tɕ//, respectively. The Laxing *virement*, i ĭ → ɪ ɛ, must be pushed off to a later level than the level at which Liquid Lowering takes place. The later level may be the last level (i.e. the postlexical level) because Laxing does not interact with any phonological processes. The placement of Laxing at the postlexical level is consistent with the classic tenet of diachronic generative phonology that rules are added the end of the grammar.

[30] Thanks to a *JL* referee for drawing my attention to this fact.



4.2 *Ranking paradox*

The argument for derivational levels in OT motivated by the *virement* analysis is strengthened by the analysis of the 3rd person past forms such as *zó+ł* ‘he lived’ and *kośó+ł* ‘he mowed’. The claim is that the derivation  $//zi+ł// \rightarrow [zoł]$  and  $//kɔs+i+ł// \rightarrow [kɔɕoł]$  is insoluble without the intermediate stage  $/zeł/$  and  $/kɔɕeł/$ , which calls for a derivational level. This section motivates the need for an intermediate stage (derivational level) by pointing to a ranking paradox. The following section completes the argument by demonstrating that  $//zi+ł// \rightarrow [zeł]$  and  $//kɔs+i+ł// \rightarrow [kɔɕeł]$  occur at level 1 and  $[zeł] \rightarrow [zoł]$  and  $/kɔɕeł/ \rightarrow [kɔɕoł]$  take place at Level 2.<sup>31</sup>

The ranking paradox argument developed in this section rests upon the same principle of OT as the argument presented in the preceding section: the tenet of minimal repair. The objective is to take  $//zi+ł//$  to  $[zoł]$ . The change  $i \rightarrow o$  is different from the one discussed in the preceding section that took  $//i//$  to  $/e/$ , *zély* (40) ‘they lived’ (MASC):  $i \rightarrow o$  operates in closed syllables, as in  $//zi+ł// \rightarrow [zoł]$  while  $i \rightarrow e$  is found in the remaining contexts. The problem is that the minimal repair eliminating  $[ił]$  that is outlawed by Liquid Lowering is to change  $//ił//$  to  $[uł]$ . The change is minimal because it violates one constraint: IDENT[±round]. The desired change  $i \rightarrow o$  additionally violates IDENT[±high] and hence is judged suboptimal by an OT grammar. An attempt to force  $i \rightarrow o$  in one step by postulating an additional constraint that prohibits  $[uł]$  fails since  $[uł]$  is a well formed combination in verbs such as *zuł*  $//zu+ł// = [zuł]$  ‘he chewed’.

The derivation  $//zi+ł// \rightarrow [zoł]$  requires that IDENT[±high] be ranked low as the constraint is violated in the desired winner  $[zoł]$ . In contrast,  $//zu+ł// \rightarrow [zuł]$  (no change) calls for IDENT[±high] to be undominated because  $//u//$  cannot be permitted to change to  $[o]$  in *zuł* in response to the putative  $*uł$  constraint. We witness a ranking paradox. The remainder of this section fleshes out this analysis.

Our analysis of Liquid Lowering in Kurpian is incomplete because we have not looked at the forms of the past 3RD.SG.

[31] In what follows, I will look at  $//zi+ł// \rightarrow [zoł]$  only. The derivation  $//kɔs+i+ł// \rightarrow [kɔɕoł]$  is entirely parallel except for the fact that the change  $//i// \rightarrow [o]$  additionally violates IDENT[±back], a low ranked constraint.

(42) 3RD PERSON PAST TENSE

z+y+ć ‘live’	zó+ł ‘he lived’
by+ć ‘be’	bó+ł ‘he was’
s+y+ć ‘sew’	só+ł ‘he sewed’
ty+ć ‘gain weight’	tó+ł ‘he gained weight’
my+ć ‘wash’	mó+ł ‘he washed’
kry+ć ‘hide’	kró+ł ‘he hid’
wy+ć ‘roar’	wó+ł ‘he roared’
pśi+ć ‘drink’	pśó+ł ‘he drank’
bżi+ć ‘beat’	bżó+ł ‘he beat’
żi+ć śē ‘wind’	żó+ł śē ‘he wound’

We see that [ɨ] and [ɪ] alternate with tense ó [o]. Actually, we already know that [ɪɨ] come from underlying //i i//, so the data in (42) show the operation of a new rule that takes //i i// to ó [o]. The rule is motivated further by the alternations in *i*-verbs, for example:

(43) *i*-verbs

dzwón+é+ć ‘ring’	dzwón+ó+ł ‘he rang’
woź+é+ć ‘carry’	woź+ó+ł ‘he carried’
koś+é+ć ‘mow’	koś+ó+ł ‘he mowed’
rzuć+é+ć ‘throw’	rzuć+ó+ł ‘he threw’

The presence of //i// in (43) is masked by Infinitive Lowering that takes underlying //i// to é [e]: //dzvɔn+i+ć// → /dzvɔnetɕ/ and further /dzvɔnetɕ/ → /dzvɔnetɕ/ → [dzvojetɕ], by Palatalization, *n* → *ɲ*, and Nasal Tensing, *ɔ* → *o*. To conclude, the underlying representation of *i*-verbs has the verbalizing suffix //i//, so the occurrence of ó [o] in the 3RD.SG forms, must be an effect of a rule taking //i// to [o].

The system that we have in place now generates tense [e] by Liquid Lowering, //i i// → [e], as in //zi+ł+a// → [zełta] ‘she lived’. Consequently, if nothing is done, zó+ł ‘he lived’ will also end up with [e], //zi+ł// → \*[zeł], which is incorrect. What we need is a constraint that will ban \*[zeł] ‘he lived’, but not [zełta] ‘she lived’. The generalization is that [e] from Liquid Lowering cannot occur in closed syllables; compare zól ‘he lived’ and zéłta ‘she lived’: in the masculine form the syllable is closed, [zoł], while in the feminine form as well as in the other past tense forms that contain é [e], the syllable is open zéłta [ze.łta] ‘she lived’, zéłty [ze.łɨ] ‘they lived’ (FEM), zely [ze.łɨ] ‘they lived’ (MASC).<sup>32</sup> This generalization is expressed as a constraint banning é [e] in closed syllables. The constraint is related to Liquid Lowering in the sense that the syllable must be closed by a liquid<sup>33</sup> and the DE restriction is relevant.

[32] Recall the data in (27) and (28).

[33] It would be incorrect to generalize the constraint to all closed syllables, since é [e] occurs, for instance, in *chleb* ‘bread’.

(44)  $*eL)_\sigma$ 

No tense [e] before a liquid in a closed syllable.

We are now ready to look at the evaluation of  $z\acute{o}+t$  ‘he lived’. For the sake of an argument, I assume Standard OT in (45). Also, I ignore the fact that phonetically the high vowels are lax and dark  $l$  is represented as [w] (see footnote 21).

(45) Standard OT //zi+t//  $\rightarrow$  [zoł] ‘he lived’ (failed evaluation)

	Liquid Lowering	IDENT[±tense]	$*eL)_\sigma$	IDENT[±high]	IDENT[±round]
(a) zɨł	*!				
(b) zeł		*!		*	
(c) zeł			*!	*	
☞ (d) zuł					*
(e) zoł		*!		*	*
⊗ (f) zoł				*	*

Notice that IDENT[±round] must be low ranked because it is violated by the optimal candidate [zoł]. The result is incorrect and there is no way of repairing the evaluation by ranking the constraints in a different way because the desired winner [zoł] has a superset of the violations of the wrong winner \*[zuł].

The reason for the failure of //i+t//  $\rightarrow$  [oł] is the same as the reason for the failure of //i+t//  $\rightarrow$  [e] discussed in the preceding section: an OT grammar is wired to make the least costly repair in response to a markedness constraint. The least costly way of eliminating the [iɨ] that is prohibited by Liquid Lowering is to change //i+t// into [u] rather than into [o]. The change //i+t//  $\rightarrow$  [u] violates one constraint, IDENT[±round], while the change //i+t// into [o] violates two constraints: IDENT[±round] and IDENT[±high].

An option of introducing a new constraint that bans the wrong winner [zuł], that is, a constraint prohibiting  $*u\acute{l}$ , is not available because  $u\acute{l}$  is the attested correct surface representation of many verbs in Kurpian.

## (46) 3RD PERSON PAST TENSE

zu+ć ‘chew’	zu+ł ‘he chewed’
cu+ć ‘feel’	cu+ł ‘he felt’
tru+ć ‘poison’	tru+ł ‘he poisoned’
psu+ć ‘spoil’	ps+u+ł ‘he spoilt’

Let us assume for the moment the putative constraint  $*uL)_\sigma$  prohibiting [u] followed by a liquid in a closed syllable. The evaluation of //zu+t// ‘he chewed’ is as follows.

(47) Standard OT //zu+ł// → [zuł] ‘he chewed’

	Liquid Lowering	IDENT[±tense]	*eL <sub>σ</sub>	IDENT[±high]	*uL <sub>σ</sub>
☞ (a) zuł					*
(b) zoł				*!	
(c) zeł			*!	*	*
(d) zeł		*!		*	*
(e) zoł		*!		*	

The evaluation works correctly on the condition that IDENT[±high] is ranked higher than \*uL<sub>σ</sub> because otherwise candidate (47b), \*[zoł], would be the winner. The problem is that the ranking IDENT [±high] ≫ \*uL<sub>σ</sub> delivers the wrong result in the evaluation of zó+ł ‘he lived’ considered earlier in (45).

(48) Standard OT //zi+ł// → [zoł] ‘he lived’ (failed evaluation)

	Liquid Lowering	IDENT[±tense]	*eL <sub>σ</sub>	IDENT[±high]	*uL <sub>σ</sub>
(a) ził	*!				
⊖ (b) zoł				*!	
(c) zeł			*!	*	
(d) zeł		*!		*	
☞ (e) zuł					*

The result is incorrect because [zoł] ‘he lived’ is the attested output. We have identified a ranking paradox: in order to obtain the correct output [zuł] ‘he chewed’ in (47) we need IDENT [+high] ≫ \*uL<sub>σ</sub>, but to get the correct output [zoł] in (48), the ranking must be reversed: \*uL<sub>σ</sub> ≫ IDENT [±high]. The paradox is insoluble in Standard OT because [zuł] ‘he chewed’ and [zoł] ‘he lived’ are a minimal pair exhibiting contrast. The problem is easily solved by DOT, as the following section demonstrates.

### 4.3 Levels

As noted in Section 4.1, Derivational Optimality Theory (DOT) recognizes four derivational levels; the stem level, the word level, the clitic level, and the postlexical (sentence) level. Even though the assignment of particular affixes to either Level 1 or Level 2 is a language-specific matter, the default assumption in a Slavic language is that level 1, the stem level, contains roots plus suffixes, whereas Level 2, the word level, expands the morphological domain by including

prefixes,<sup>34</sup> so the structure subject to evaluation comprises stems (optimal outputs from Level 1) and prefixes.<sup>35</sup>

Returning to the example meaning ‘lived’, the Level 1 inputs are the inflected stems:

(49) *Inflected Level 1 inputs*

- zɛ+ɫ+a //zi+ɫ+a// ‘she lived’  
 zɛ+ɫ+y //zi+ɫ+i// ‘they lived’ (FEM)  
 zɛ+ɫ+y //zi+ɫ+i// ‘they lived’ (MASC)  
 zóɫ //zi+ɫ// ‘he lived’

These verbs admit prefixation, so, at Level 2, the evaluation is broadened by considering prefixed structures containing, for example, the prefix *do-*:<sup>36</sup> *do+zɛ+ɫ+a* ‘she lived till’, *do+zɛ+ɫ+y* ‘they lived till’ (FEM), *do+zɛ+ɫ+y* ‘they lived till’ (MASC), and *do+zó+ɫ* ‘he lived till’.

The ranking paradox identified in the preceding section is resolved as follows. At Level 1, not only *zɛ+ɫ+a //zi+ɫ+a//* ‘she lived’, *zɛ+ɫ+y //zi+ɫ+i//* ‘they lived’ (FEM) and *zɛ+ɫ+y //zi+ɫ+i//* ‘they lived’ (MASC) but also *zóɫ //zi+ɫ//* ‘he lived’ undergo the change from //i// to /e/, thereby satisfying Liquid Lowering. The [e] derived at Level 1 is the attested surface vowel in *zɛla* ‘she lived’, *zɛly* ‘they lived’ (FEM) and *zély* ‘they lived’ (MASC). The masculine singular form /ze+ɫ/ is an intermediate representation. It enters Level 2 as /dɔ+ze+ɫ/ and changes to [dɔzoɫ] in the optimal candidate, an effect of  $*eL)_\sigma$  prohibiting [e] in closed syllables (recall (44)). The constraint  $*eL)_\sigma$  outranks IDENT[±round] and IDENT[±back], so that /e/ may change into [o].

The analysis appears to be contradicted by forms such as *do+zó+ɫ+əm* ‘I lived till’. The problem is that [o] occurs in an open syllable, [dɔ.zo.ɫəm], so  $*eL)_\sigma$  has no force to induce  $e \rightarrow o$ . The problem is apparent. The affixes *-əm* (1st person singular) and *-eś* (2nd person singular) are clitics, which means that they become first available for evaluation at Level 3, the clitic level. The input to Level 3 is the optimal output from Level 2, here /dɔzoɫ/. Nothing needs to be done at Level 3. The resyllabification ensuing after the addition of the clitics *-əm* and *-eś* has no effect on the vowel /o/. The grammar generates the correct surface forms. The details of the analysis are fleshed out below.

At Level 1, the system of the constraints already in place generates all the past tense forms with /e/, exactly as shown in (40). This is the final output for *zély*

[34] Slavic prefixes come historically from prepositions, so it is not surprising that their behavior is markedly different from the behavior of suffixes. For discussion of prefixes in Standard Polish, see Rubach & Booij (1990).

[35] Needless to say, not all words can take prefixes (Level 2) or clitics (Level 3). In the extreme case, for example, in *tak* //tak// ‘yes’, the same structure occurs at all levels; *tak* is a stem, a word, a clitic phrase (potentially) and a sentence.

[36] I look at prefixed structures for expository purposes, illustrating the expansion of the morphological domains as we move from one level to another. The prefix *do-* does not entail any phonological processes.

‘they lived’ (MASC),<sup>37</sup> *zét+a* ‘she lived’ and *zét+y* ‘they lived’ (FEM). In (50), we look at *zét+a* ‘she lived’.

(50) Level 1 //zi+t+a// → [zɛła] ‘she lived’

	Liquid Lowering	IDENT[±round]	IDENT[±tense]	IDENT[±high]	*eL) <sub>σ</sub>
(a) ził	*!				
(b) zuł		*!			
(c) zɔł		*!	*	*	
(d) zoł		*!		*	
(e) zɛł			*!	*	
<sup>OP</sup> (f) zɛł				*	

The result is correct. Notice that \*eL)<sub>σ</sub> is inapplicable because none of the candidates has a closed syllable. The masculine form *zót+l* ‘he lived’ has essentially the same evaluation at Level 1 as *zét+l+a* ‘she lived’ in (50).

(51) Level 1 //zi+t// → /zeł/

	Liquid Lowering	IDENT[±round]	IDENT[±tense]	IDENT[±high]	*eL) <sub>σ</sub>
(a) ził	*!				
(b) zuł		*!			
(c) zɔł		*!	*	*	
(d) zoł		*!		*	
(e) zɛł			*!	*	
<sup>OP</sup> (f) zɛł				*	*

The winner from Level 1, /zeł/, is now the input to Level 2 at which \*eL)<sub>σ</sub> is the driver for the *et* → *ot* change. To obtain this result, we need to rerank \*eL)<sub>σ</sub> above IDENT[±round].

(52) Reranking

Level 1: IDENT [±round] ≫ \*eL)<sub>σ</sub>

Level 2: \*eL)<sub>σ</sub> ≫ IDENT [±round]

Since the Level 2 input, /zeł/, has a mid rather than a high vowel, the relevant faithfulness constraint is IDENT [±high]. The evaluation of *zót+l* ‘he lived’ from (51) continues at Level 2 in (53).

[37] It is the final output with regard to the root vowel. The consonant and the vowel of the ending are derived further at Level 2; see (32).

## (53) Level 2 /dɔ+ze+l/→ [zoł] ‘he lived till’

	Liquid Lowering	IDENT[±high]	IDENT[±tense]	*eL) <sub>σ</sub>	IDENT[±round]
(a) dɔzɛł				*!	
(b) dɔzuł		*!			*
(c) dɔził	*!	*			
(d) dɔzɔł			*!		*
(e) dɔzɛł			*!		
(f) dɔzɔł					*

The result is correct. I conclude that DOT, unlike Standard OT, can successfully account for both the *i/i* → *e* pattern and the *i/i* → *o* pattern, as seen in *zɛ+l+a* ‘she lived’, *zɛ+l+y* ‘they lived’ (fem), *zɛ+l+y* ‘they lived’ (MASC) and *zɔ+l* ‘he lived’. The success of DOT is strengthened by the final batch of the data adduced below. In (54), I look at the masculine singular forms of the past tense but I extend the data to include the 1st and the 2nd person forms, so, for example, the glosses for the first verb are ‘live’, ‘he lived’, ‘I lived’, and ‘you lived’, respectively.

(54) *Masculine past tense forms in the singular*

INFINITIVE	3RD PERSON	1ST PERSON	2ND PERSON	GLOSS
z+y+ć	zɔ+l ‘	zɔ+l+ɛ̃m	zɔ+l+eś	‘live’
by+ć ‘	bɔ+l	bɔ+l+ɛ̃m	bɔ+l+eś	‘be’
s+y+ć	sɔ+l	sɔ+l+ɛ̃m	sɔ+l+eś	‘sew’
ty+ć	tɔ+l	tɔ+l+ɛ̃m	tɔ+l+eś	‘gain weight’
my+ć	mɔ+l	mɔ+l+ɛ̃m	mɔ+l+eś	‘wash’
kry+ć	krɔ+l	krɔ+l+ɛ̃m	krɔ+l+eś	‘hide’
wy+ć	wɔ+l	wɔ+l+ɛ̃m	wɔ+l+eś	‘roar’
pši+ć	pśɔ+l	pśɔ+l+ɛ̃m	pśɔ+l+eś	‘drink’
bżi+ć	bżɔ+l	bżɔ+l+ɛ̃m	bżɔ+l+eś	‘beat’
żi+ć śɛ	żɔ+l śɛ	żɔ+l+ɛ̃m śɛ	żɔ+l+eś śɛ	‘wind’

The same pattern is true for *i*-verbs, for example:

(55) *i-verbs: masculine past tense forms in the singular*

INFINITIVE	3RD PERSON	1ST PERSON	2ND PERSON	Gloss
dzwón+é+ć	dzwón+ó+l	dzwón+ó+l+ɛ̃m	dzwón+ó+l+eś	‘ring’
woź+é+ć	woź+ó+l	woź+ó+l+ɛ̃m	woź+ó+l+eś	‘carry’
koś+é+ć	koś+ó+l	koś+ó+l+ɛ̃m	koś+ó+l+eś	‘mow’
rzuć+é+ć	rzuć+ó+l	rzuć+ó+l+ɛ̃m	rzuć+ó+l+eś	‘throw’

The troubling cases are the forms with the endings *-ɛ̃m* (1st person) and *-eś* (2nd person). Their syllabification follows the universally default pattern that syllabifies CVCV as CV.CV, where the dot marks a syllable boundary: *zɔ.lɛ̃m* ‘I lived’ and *zɔ.lɛś* ‘you lived’. Given these syllabifications the question is how it

is possible to have *ó* [o] in *zó.lēm* and *zó.łeś*. Since the syllables are open,  $*eL)_\sigma$ , which is the driver for deriving *ó* [o], is mute, so the system of the constraints predicts, incorrectly, that the 1st person and the 2nd person forms should have *é* [e] rather than *ó* [o]:  $*zélēm$  ‘I lived’,  $*zéłeś$  ‘you lived’, like we have *zéta* ‘she lived’, *zély* ‘they lived’ (FEM) and *zély* ‘they lived’ (MASC) in which the syllables are open.

The data in (54)–(55) are incomplete in one important way. It needs to be noted that the endings *-ēm* and *-eś* are clitics. As would be expected of clitics, they can move around in the sentence, attaching to parts of speech other than verbs. Consequently, we always have more than one variant of a sentence with a clitic morpheme, as (56) illustrates.

(56) *Examples of clitics*

- (a) *Jã juz wtęcncas zół+ēm ...* ‘I already lived then’  
(Literally: ‘I already then lived’)  
*Jã juz+ēm wtęcncas zół...*
- (b) *Jek ty wtęcncas zadzwónół+eś ...* ‘when you called then’  
(Literally: ‘When you then called’)  
*Jek+eś wtęcncas zadzwónół ...*

The information in (56) is important for a DOT analysis. As explained earlier, DOT recognizes four levels of evaluation: the stem level, the word level, the clitic level, and the postlexical (sentence) level. The facts of Kurpian fit the DOT model. All that we need to assume is what we have been assuming all the time along, namely, that the *do+zy+c* ‘live till’ – *do+zó+t* ‘he lived till’ pattern is derived at Level 2. The derivation proceeds as in (51) and (53). The morphemes *-ēm* and *-eś* are not processed at Level 2 precisely because they are clitics. The 3rd person form has no ending, so the Level 2 derivation is the final stage. In the 1st person and the 2nd person, the clitic endings *-ēm* and *-eś* are first available at Level 3. Therefore, the inputs to Level 3 are /dɔ zɔł+əm/ and /dɔ zɔł+eɕ/. The faithfulness constraints guarantee that the input fares through Level 3 unscathed and is the optimal output. For instance, the input /dɔzɔł+əm/ surfaces as [dɔzɔłəm], as (57) shows.

(57) Level 3 /dɔ+zɔł+əm/ = [dɔzɔłəm] ‘I lived till’ (no change)

	Liquid Lowering	ID[±high]	ID[±tense]	*eL) <sub>σ</sub>	ID[±round]
☞ (a) dɔ.zɔ.łəm					
(b) dɔ.zu.łəm		*!			
(c) dɔ.zi.łəm	*!	*			*
(d) dɔ.zɔ.łəm			*!		
(e) dɔ.zɛ.łəm			*!		*
(f) dɔ.zɛ.łəm				*!	*



This scenario is exactly what DOT has been devised to handle. Standard OT with its strict parallelism prohibiting derivational levels cannot derive the *zólëm*, *zólës* pattern.

## 5. CONCLUSION

The analysis of Liquid Lowering presented in this article provides supportive evidence for DOT and shows that Standard OT is unable to handle the relevant data. Even though DOT allows for four levels, this analysis requires only three levels. Levels 1 and 2 solve the ranking paradox that arises in the derivation of the *z+yć* ‘live’ – *zól+ł* ‘he lived’ pattern. Level 3 solves the contradictions involving clitic morphemes.

A diachronic look at Liquid Lowering shows that the process, once entirely productive, has become extinct in Standard Polish. In Kurpian, on the other hand, Liquid Lowering is still fully productive but has changed its status from a totally unrestricted rule to a rule that is constrained by DE (derived environments).

Optimality Theory makes two interesting predictions in the analysis of Liquid Lowering: first, a derivational step and, second, abstract underlying vowels. The derivational step (level) is required in the mapping of //i// to [o], as in //ził// → [zoł] ‘he lived’ discussed in Section 4.2. The //i// cannot go to [o] directly because of the Optimality Theory’s principle of minimal repair. The minimal repair here is for //i// to change to [u] rather to [o]. The problem is resolved in Derivational Optimality Theory because DOT admits derivational levels.

The principle of minimal repair leads to the discovery of underlying tense //i i// that are postulated in lieu of lax //i ɪ//. This is noteworthy because [i i] do not occur phonetically in Kurpian and hence are abstract vowels. A process that I call Laxing turns the abstract //i i// into the phonetically attested [ɪ ɪ]. There are two points worth noting in connection with Laxing. First, Laxing is a *virement* shift that exchanges segments context-freely, creating new contrasts in surface representations. Second, Laxing is a Kurpian development because the original vowels in Old Polish were tense [i i]. Kurpian phonology ignores the outcome of Laxing and works on the assumption that the high vowels are tense, that is, //i i//. Laxing does not interact with any rules and hence need not be activated before Level 4. This fact is in keeping with the well-known tenet of classic generative phonology that when new rules come into being, they are added at the end of the grammar.

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