Chains, Prec, and Icelandic Opacity*

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Lee, Minkyung. 2011. Chains, Prec, and Icelandic Opacity. *The Linguistic Association of Korea Journal. 19*(3). 109-127. If no special mechanisms are adopted, opacity is left unresolved in Parallel OT due to the lack of an intermediate level of representation between input and output. However, in OT with the regime of candidate chains obeying gradualness and harmonic improvement, opacity is not in a chaos in that the violation of faithfulness constraints in a chain is referable. Furthermore, Precedence (Prec) constraint plays a key role as a filter to get rid of the chains disobeying the violation order of faithfulness constraints. Targeting the data of Icelandic opacity where overapplication and underapplication arise in the rule relation of /ɣ/-epenthesis, it is claimed that candidate chains and Prec constraint are responsible for opacity phenomena in Icelandic and that no back-door introduction of any special mechanisms is necessary. In essence, opacity is attributed to the violation order of faithfulness constraints in a chain.

Key Words: candidate chains, Prec constraint, gradualness, harmonic improvement, counterbleeding opacity, counterfeeding opacity, OT-CC

1. Introduction

Opacity (Kiparsky 1971, 1973) resulting from a rule-ordering paradox challenges Parallel OT where there is no intermediate derivational stage between input and output. Therefore, opacity issue remains unresolved without resorting to some special mechanism like Sympathy theory (McCarthy 1997, 1999).[1] As

* This research was partially supported by the Daegu University Research Grant, 2010. I would like to thank three anonymous reviewers for their valuable comments and suggestions. All remaining errors are solely my own.

1) Also see Kirchner (1996) and Alderete (1997) for an alternative model called Locally

shown in previous literature (Davis 1997, Ito & Mester 1997, Karvonen & Sherman 1997a, b, McCarthy 1999, M. Lee 1999 and others), Sympathy theory in Parallel OT plays a key role as a remedy to patch up phonological opacity problems.

In general, opacity falls into the following two scenarios. One is counterfeeding opacity in which Rule A counterfeeds Rule B. From the surface facts, the former is underapplied since its rule environment is later created by the application of Rule B. The other is counterbleeding opacity where Rule A counterbleeds Rule B. The former is overapplied since its conditioning environment is not present on the surface, which is masked by the later application of Rule B.

Parallel OT obtains the effect of a rule-based intermediate derivation via Sympathy theory (McCarthy 1997, 1999) which requires complicated multiple processes to pick out a designated flowering candidate, a selector constraint and a Sym constraint. A designated flowering candidate is chosen by a star-marked constraint called selector and the correspondence relation between each of the remaining outputs and a designated flowered candidate is assessed by a sympathy constraint called Sym.[2)]

In OT with candidate chains (hereafter OT-CC) (McCarthy 2006, 2007), each candidate in a chain can add only a single modification at a time. Accordingly, chains are harmonically improving. OT-CC, unlike Parallel OT, stands on the serialism-oriented architecture. Furthermore, Precedence (henceforth Prec) constraint regulates the violation order of faithfulness constraints in a chain.

Conjoined Constraint (LCC) to deal with opacity in Parallel OT. As strongly criticized in Y. Lee (2006a, b), LCC is grammatically too powerful in the sense that it is unexceptionally violated if its local conjuncts A and B are both violated. Note that LCC dominates the lowly ranked two local conjuncts A and B. However, as will be discussed later in detail, as argued in McCarthy (2007:99), though Prec (A, B) is sensitive to the presence or absence of B violation, it never affects whether B is violated since it never dominates B. This is a big difference of Prec constraint from LCC.

2) As McCarthy (2006:12) criticizes, Sympathy theory wrongly allows more than one selector, resulting in more than one designated flowering candidate in a tableau. Unfortunately, this leads to overgeneration of a surface-unattested output. Furthermore, as M. Lee (2007) strongly pinpoints, Sympathy theory fails to predict the difference of opacity from transparency in Modern Hebrew where both phenomena occur at the same time. Sym constraint mistakenly chooses the same output as optimal in both opacity and transparency.

Given OT equipped with candidate chains and Prec constraint, opacity issue conforms to the violation order of faithfulness constraints in a chain.

This paper targets the data of opacity phenomena found in Icelandic in which /j, v/-deletion counterbleeds /ʏ/-epenthesis on the one hand and /ʏ/-umlaut counterfeeds /ʏ/-epenthesis on the other hand. A glide /j/ (or /v/) is eliminated when it sits between two consonants or at the end of a word. Meanwhile, a low back vowel of a stem becomes fronted and rounded as well when followed by a suffix containing the high front lax vowel /ʏ/. These two rules are opaque in the rule relation of /ʏ/-epenthesis, respectively.

To see how OT-CC with Prec handles these opacity phenomena, section 2 briefly introduces the basic tenets of candidate chains obeying the gradualness and harmonic improvement restrictions and Prec constraint. Section 3 examines and discusses the data of opacity observed in Icelandic in which both counterbleeding and countefeeding rule relations are involved. Section 4 provides an OT-CC account. It will be highlighted that Prec constraint plays a vital role in filtering out the candidate chains breaking the violation order of faithfulness constraints whereby opacity is resolved. Section 5 summarizes and concludes the paper.

2. OT with Chains and Prec Constraint

This section briefly introduces the well-formedness conditions imposed upon candidate chains and then demonstrates the characteristics and function of the Prec constraint in OT-CC. Unlike Parallel OT, OT-CC restricts Gen to produce a limited candidate set in which the first member of each chain should be input-faithful as stated in (1a). Furthermore, as gradualness in (1b) requires, each candidate in a chain can add a single faithfulness violation at a time. This implies that each candidate is more harmonic than its immediate predecessor in a chain. Therefore, chains are harmonically improving, as harmonic improvement in (1c) demands. Note that all valid candidate chains must satisfy the three well-formedness requirements as laid out in (1).[3]

3) As argued in McCarthy's (2007:61) more advanced version of OT-CC, harmonic improvement is locally achieved in that a step-wise derivation is guaranteed from the input, through the

(1) The chain well-formedness conditions (McCarthy 2006:14)
  a. All chains are faithfully initiated.
  b. Chains are gradually divergent.
  c. Chains are harmonically improving.

Suppose that there is a language with the mapping of /patka/ → [pa.də.ka]. All valid candidate chains of /patka/ are arranged in (2). Here note that, in OT-CC, a chain of forms comprises a candidate and the last member of the chain is its output (McCarthy 2007:60).

(2) Valid chains of /patka/

a. <pat.ka>	Faithful parse
b. <pat.ka, pa.tə.ka>	*Dep
c. <pat.ka, pa.tə.ka, pa.də.ka>	*Dep → *Id(voice)

Given the well-formedness conditions in (1), every chain in (2) starts with an input-faithful candidate as its initial member. In a chain, the difference of a candidate from its immediate predecessor is tantamount to the violation of a single faithfulness constraint at a time.[4] A single candidate itself comprising a chain as in (2a) has no faithfulness violation. In (2b), the target candidate <pa.tə.ka>, the last member of the chain, adds a single change of Dep violation from its immediate predecessor <pat.ka>. In (2c), the ultimate candidate <pa.də.ka> also adds just a single difference of Id(voice) violation from its immediate predecessor <pa.tə.ka>. Therefore, harmony in a chain is gradually improving. Note that the ill-formed chain like *<pat.ka, pa.də.ka> is ruled out

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intermediate stage, to the ultimate output via candidate chains. Note that OT-CC is primarily based upon the serialist version of OT. This paper, focusing on the opacity issue, does not delve into the notion of local optimality, which is a major credo of Serial OT (McCarthy 2008a, b).

4) Note that in OT-CC, the notion of 'a single modification at a time' implies that Gen can add violations of only one 'basic' faithfulness constraint such as Max (=No deletion), Dep (=No insertion) and Ident (=No change of a feature value) (McCarthy 2007:61-62, 2008b:501). For instance, in OT-CC, the chain like *<pat.ka, pa.də.ka> is invalid, thus ruled out since it violates two different basic faithfulness constraints of Dep and *Id(voice) in a single step and further harmony in a chain is not gradually ascending.

due to the simultaneous violation of two faithfulness constraints Dep and Id(voice) in a single step, thus harmonic improvement in a chain is not gradual.[5)]

On the major premise of OT-CC pursuing an intermediate derivation via candidate chains and thus referable to the violation of faithfulness constraints in a chain, we reach a natural conclusion that opacity is a matter of the faithfulness violation order in a chain via the key role of Prec constraint. Given the Prec constraint in (3), the presence or absence of Prec violation is summarized as in (4).

(3) Prec (A, B) (McCarthy 2006:25)
Let A′ and B′ stand for forms that add violations of the faithfulness constraints A and B, respectively. To any chain of the form <X, B′, Y>, if X does not contain A′, assign a violation mark, and to any chain of the form <X, B′, Y>, if Y contains A′, assign a violation mark.

(4) Presence or absence of Prec violation[6)]

	Prec (A, B)
a. *A → *B	V
b. *A	V
c. *B	*
d. *B → *A	**

To paraphrase the definition of Prec (A, B) given in (3) for easy calculation of Prec violation, every B violation is preceded and not followed by an A violation as stated in (3). To put it differently, candidates in a chain must add constraint A violation and then B violation in order as in (4a). Or there exists

5) In Parallel OT, however, one-time change from <pat.ka> to <pa.də.ka> is unproblematic though the intermediate stage of <pa.tə.ka> from <pat.ka> is omitted since optimality in Parallel OT is always global. However, in OT-CC, the intermediate stage of <pa.tə.ka> prior to the stage of the ultimate output <pa.də.ka> is obligatory and indispensable. In this respect, as McCarthy (2007:61) pinpoints, optimality in OT-CC is entirely local.

6) As argued in McCarthy (2007:109) and also briefly discussed in footnote (4), any candidate chain with the simultaneous violation of faithfulness constraints A and B at a time is illegal, thus filtered out. Even worse, it disobeys the gradualness and harmonic improvement restrictions that all valid candidate chains are obliged to satisfy.

only A violation in a chain with no B violation as in (4b). The rest but these falls on the Prec violation. (4c) has a violation mark since the presence of B violation implies the presence of A violation beforehand. Even worse, the case in (4d) where the violation order is reversed holds two violation marks in total since, as defined in (3), A violation cannot follow B violation and B violation cannot precede A violation.

Taken together, under the regime of candidate chains and Prec constraint, OT is accessible to the violation history of faithfulness constraints in a chain. Therefore, unlike in Parallel OT, opacity in OT-CC is not a challenge, as will be shown later in detail, rather it can be dealt with in a consistent and straightforward manner.7)

3. Icelandic Opacity Phenomena

This section investigates the opacity data observed in Icelandic in which /j, v/-deletion and /ʏ/-umlaut are opaque in the rule relation of /ʏ/-epenthesis, respectively. For the former, glide deletion is overapplied since its conditioning environment is not present on the surface. For the latter, /ʏ/-umlaut is underapplied though its rule environment is surface-true.

Let us first take a look at the data of glide deletion in (5) and vowel epenthesis in (6).

7) It is said that OT-CC is not different from Sympathy theory in Parallel OT and one step further, it is not OT anymore, just seemingly OT-like. This means that we must go back to the past of a rule system or simply give up explaining opacity under OT. As briefly discussed earlier, Sympathy theory in Parallel OT reveals theoretical malfunctions, thus it cannot provide a consistent and unified analysis on opacity issue. Sympathy model works for opacity sometimes but it does not some other times. However, in OT-CC, no special mechanisms adopted are necessary. As argued in McCarthy (2007:98), in OT-CC, candidate chains are outputs and Prec constraint, like all OT constraints, is violable and ranked in a hierarchy as well. Furthermore, unlike Parallel OT, OT-CC embodies a totally different architecture of serialist version of OT in the sense that gradualness and harmonic improvement are obligatorily fulfilled. Therefore, in line with McCarthy (2008b:504), this paper takes a stand that OT-CC is also a variant implementation of OT's basic ideas. Here also notice that OT-CC is different from stratal versions of OT (Rubach 1997, Kiparsky 2000, Ito & Mester 2003, and others) which posit different grammars for different strata.

(5) /j, v/-deletion (Karvonen & Sherman 1997b:2)

/bɪlj/	[bɪl]	(snow)storm, acc. sg.
/bɪlj-s/	[bɪls]	(snow)storm, gen. sg.
/krefj/	[kref]	demand, 1. sg. pres.
/mɪðj/	[mɪð]	middle, nom. sg. fem.
/mörv/	[mör]	suet, acc. sg.
/söŋgv-s/	[söjŋks]	song, gen. sg.

(6) /ʏ/-epenthesis (Karvonen & Sherman 1997b:3)[8)]

/daɣ-r/	[daɣʏr]	day, nom. sg.
/stað-r/	[staðʏr]	place, nom. sg.
/tek-r/	[tekʏr]	take, 3. sg. pres.
/skɪl-r/	[skɪlʏr]	understand, 2. sg. pres.
/snarp-r/	[snarpʏr]	rough, masc. nom. sg.
/harð-r/	[harðʏr]	hard, masc. nom. sg.

Given Karvonen and Sherman's (1997b) data observations, in Icelandic, underlying glides /j, v/ are deleted between two consonants or word-finally as in (5) while a high front lax vowel /ʏ/ is epenthesized between a consonant and the suffix /-r/ as in (6).

The data in (5) tell us that Sonority Contour (henceforth SonCon) in (7a) requires glide-deletion though Max-seg in (7b) is sacrificed. Note that the former is ranked on the top while the latter is bottom-ranked.

(7) Constraints related to glide deletion (Karvonen & Sherman 1997b:2)
  a. SonCon (Benua 1995): Complex onsets rise in sonority and complex codas fall in sonority.
  b. Max-seg (McCarthy & Prince 1995): Every segment of the input has a correspondent in the output.
  c. Dep-seg (McCarthy & Prince 1995): Every segment of the output has a correspondent in the input.

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8) Here note that, in Icelandic, the vowel /ʏ/ is a high, front, rounded, lax vowel and the suffix /-r/ is the masculine singular nominative ending for nouns and adjectives as well as the third person singular ending for verbs (Karvonen & Sherman 1997a).

Given the constraints posited in (7), we can build the valid chains of /bɪlj/ as in (8) and the tableau in (9) selects (9b) as the most harmonic chain.

(8) Valid chains of /bɪlj/ '(snow)storm, acc. sg.'

a. <bɪlj> Faithful parse

b. <bɪlj, bɪl> *Max-seg

(9) With /j/-deletion

/bɪlj/	SonCon	Max-seg
a. bɪlj < >	*!	
☞b. bɪl <*Max-seg>		*

In addition, the top-ranked SonCon also incurs /ʏ/-epenthesis as witnessed in (6), resulting in the violation of Dep-seg in (7c) as the tableau in (11) illustrates. The valid chains of /daɣ-r/ are laid out in (10).[9)]

(10) Valid chains of /daɣ-r/ 'day, nom. sg.'

a. <daɣr> Faithful parse

b. <daɣr, daɣʏr> *Dep-Seg

(11) With /ʏ/-epenthesis

/daɣ-r/	SonCon	Dep-seg
a. daɣr < >	*!	
☞b. daɣʏr <*Dep-seg>		*

9) The potential but surface-unattested chain like *<daɣr, daɣʏr, döɣʏr> is more harmonic in /ʏ/-umlaut (as will be discussed later, due to the satisfaction of Agree[pal]) than the real opaque chain in (10b) above. Unfortunately, Parallel OT cannot filter out this unwelcome chain without resorting to some special device but, as will be shown later, OT-CC can repair this analytic failure.

From the tableaux in (9) and (11), we see that SonCon ranked over Max-seg and Dep-seg gives rise to glide deletion and /ɣ/-epenthesis, respectively to make sonority in the coda well-balanced.

However, of particular interest is that, when these two rules are interrelated, glide-deletion and /ɣ/-epenthesis are in a counterbleeding rule relation as schematized in (12).

(12) Overapplication of glide deletion (Karvonen & Sherman 1997b:7)

UR:	a. /krefj+r/	b. /mɪðj+r/		c. /krefj+r/
Rule A: /j/-deletion	krefr	mɪðr	Rule B:	krefjɣr
Rule B: /ɣ/-epenthesis	krefɣr	mɪðɣr	Rule A:	______
PR:	[krefɣr]	[mɪðɣr]		*[krefjɣr]

Note that, as shown in (12c), with the opposite rule ordering where Rule B bleeds Rule A, the surface-unattested form *[krefjɣr] occurs.

In Parallel OT, opacity is in a chaos, as the tableau in (13) clearly indicates.

(13) Opacity failed in Parallel OT

/krefj+r/	SonCon	Max-seg	Dep-seg
a. krefjr	*!		
b. krefr	*!	*	
☞c. krefɣr (opaque)		*!	*
☛d. krefjɣr (transparent)			*

The transparent output in (13d) fares better since the real opaque output in (13c) unfortunately has the additional Max-seg violation. However, as will be shown later, OT-CC with Prec successfully gets rid of this analytic mishap.[10)]

10) Note that the ranking of Max-seg and Dep-seg is not crucial here, thus unranked with respect to each other, though it will be revised later. Furthermore, given Karvonen and Sherman's (1997a, b) OT analysis with Sympathy theory, Realize-M(orpheme) (Rose 1997, Gnanadesikan 1997)(=For every morpheme in the input, the output must contain at least one segment of that morpheme.) and Anchor-R(ight) (McCarthy & Prince 1995)(=Any

In comparison with the data in (6) where a stem vowel /a/ is dull in /ʏ/-umlaut, the data in (14) below involve /ʏ/-umlaut whereby the vowel /a/ in a stem turns into [ö] when followed by a suffix containing the vowel /ʏ/ across a morpheme boundary.

(14) /ʏ/-umlaut (Karvonen & Sherman 1997a:38)

/daɣ-ʏm/	[döɣʏm]	day, dat. pl.
/gat-ʏm/	[götʏm]	hole, dat. pl.
/tal-ʏm/	[tölʏm]	speak, 1. pl. pres.
/bak-ʏm/	[bökʏm]	bake, 1. pl. res.
/kald-ʏm/	[köldʏm]	cold, dat. sg. masc.
/glað-ʏm/	[glöðʏm]	glad, dat. sg. masc.

/ʏ/-umlaut results from the demand of Agree(pal) (Beckman 1999, Kramer 1999, Bakovic 2000a, b, and Bakovic & Wilson 2000) ranked over Ident(pal) as postulated in (15).[11]

(15) Constraints for /ʏ/-umlaut

a. Agree(palatal) (=Agree(pal)): A front vowel must share its [palatal] feature with its preceding back vowel.

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element at the right edge of the input has a correspondent at the right edge of the output.) play vital roles in /ʏ/-epenthesis. The former requires the realization of a morpheme on the surface, no matter where it comes from, a stem or a suffix, while the latter determines the locus of /ʏ/-epenthesis, thus /ʏ/ sits right between a stem-final consonant and a suffix /-r/. Notice that the constraints introduced here are ranked on the top along with SonCon. Therefore, the candidates like *<bɪlj> and *<bɪljrʏ> (from /bɪlj-r/ '(snow)storm, acc. sg.') are all ruled out, with the fatal violation of Realize-M and Anchor-R, respectively. For ease of exposition, this paper does not consider the candidate chains violating these two top-ranked constraints.

11) As discussed in Karvonen and Sherman (1997a:37), /ʏ/-umlaut in Icelandic is a type of front and round vowel harmony. Accordingly, I assume that a high front vowel /ʏ/ is not only coronal but palatal as well given the coronal analysis of front vowels (Hume 1992, Clements & Hume 1995). Furthermore, /ʏ/-umlaut, as a round vowel harmony, forces the sacrifice of *Round/Front (=*Ro/Fr) (Archangeli & Pulleyblank 1994), a feature cooccurrence constraint, militating against any fronted round vowel on the surface. *Ro/Fr, bottom-ranked here, does not play a vital role in Icelandic /ʏ/-umlaut.

b. Ident(palatal) (=Id(pal)): Preserve the featural identity of [palatal] between corresponding segments.

Given the ranking of Agree(pal) in (15a) sitting over Id(pal) in (15b), which gives rise to /ʏ/-umlaut, the most harmonic chain in (16b), with /ʏ/-umlaut, is selected as optimal as the tableau in (17) illustrates.

(16) Valid chains of /daɣ-ʏm/ 'day, dat. pl.'

a. <daɣʏm>	Faithful parse
b. <daɣʏm, döɣʏm>	*Id(pal)

(17) With /ʏ/-umlaut

/daɣ-ʏm/	Agree(pal)	Id(pal)
a. daɣʏm < >	*!	
☞b. döɣʏm <*Id(pal)>		*

The tableau in (17) tells us that /ʏ/-umlaut occurs only when /ʏ/ is underlyingly present in Icelandic. Otherwise, the stem vowel /a/ remains constant. The optimal chain in (17b) fares better in /ʏ/-umlaut than (17a) with the fatal violation of Agree(pal).

Compared to the tableau in (17) with the presence of /ʏ/-umlaut, when /ʏ/ is epenthesized, /ʏ/-umlaut is entirely blocked as illustrated in the first row of each data set in (18).

(18) Underapplication of /ʏ/-umlaut (Karvonen & Sherman 1997a:42)

a. /daɣ-r/	[daɣʏr]	day, nom. sg.	but
/daɣ-ʏm/	[döɣʏm]	day, dat. pl.	
b. /hatt-r/	[hattʏr]	hat, nom. sg.	but
/hatt-ʏm/	[höttʏm]	hat, dat. pl.	
c. /dal-r/	[dalʏr]	valley, nom. sg.	but
/dal-ʏm/	[dölʏm]	valley, dat. pl.	

Given the rule-based perspective, /ʏ/-umlaut counterfeeds /ʏ/-epenthesis as schematized in (19a). However, as clarified in (19b), with the opposite rule ordering, if /ʏ/-epenthesis is applied prior to /ʏ/-umlaut, the ill-formed output *[döɣʏm] occurs.

(19) Conterfeeding rule relation

	a. /daɣ-r/		b. /daɣ-r/
Rule A: /ʏ/-umlaut	______	Rule B:	daɣʏr
Rule B: /ʏ/-epenthesis	daɣʏr	Rule A:	döɣʏr
	[daɣʏr]		*[döɣʏr]

Still, Parallel OT misbehaves in predicting the counterfeeding opacity of /ʏ/-umlaut as clarified in (20).

(20) The failure of Parallel OT

/daɣ-r/	SonCon	Max-Seg	Dep-Seg	Agree (pal)	Id (pal)
a. daɣr	*!				
☞b. daɣʏr (opaque)			*	*!	
☛c. döɣʏr (transparent)			*		*

The surface-unattested output in (20c) mistakenly emerges as optimal. Parallel OT cannot distinguish the underlying /ʏ/ from the epenthetic /ʏ/, thus blindly prefers /ʏ/-umlaut. Therefore, the result is alike in both tableaux (17) and (20). No matter where /ʏ/ comes from, i.e., underlyingly (as in (17b)) or epenthesized (as in (20c)), the output with /ʏ/-umlaut always wins in Parallel OT.

Thus far, it has been shown that Icelandic involves two types of opacity, overapplication of glide deletion and underapplication of /ʏ/-umlaut with respect to /ʏ/-epenthesis, and that Parallel OT malfunctions in predicting an opaque output as optimal. However, in OT-CC with Prec, the analytic mismatch witnessed in the tableaux (13) and (20) will be fixed successfully and straightforwardly.

4. An OT–CC Account on Icelandic Opacity

In this section, OT-CC with Prec shows success in treating the Icelandic opacity phenomena since it refers to the faithfulness constraints violated and their violation order in a chain. Given the data in (12) and (18) where different kind of opacity is involved, OT-CC with Prec resolves the analytic mismatch and clearly predicts the different characteristic of /ʏ/ regarding /ʏ/-umlaut.

Let us first consider the overapplication of glide deletion. All possible valid chains of /krefj-r/ are laid out in (21).

(21) Valid chains of /krefj-r/ 'demand, 2, 3. sg. pres.'[12)]

a. <krefjr>	Faithful parse
b. <krefjr, krefr>	*Max-seg
c. <krefjr, krefjʏr>	*Dep-seg
d. <krefjr, krefr, krefʏr>	*Max-seg → *Dep-seg
e. <krefjr, krefjʏr, krefʏr>	*Dep-seg → *Max-seg

All valid chains built in (21) fulfill the well-formedness conditions given in (1). Especially, the chains in (21d) and (21e) are merged at the point of convergence with no further harmony ascent (McCarthy 2007:96). However, the Prec constraint posited in (22) successfully picks out the real and the fake.

(22) Prec constraint for counterbleeding opacity

Prec (Max-seg, Dep-seg)

a. Only Dep-seg violation with no prior Max-seg violation (*Prec)

b. Dep-seg violation and then Max-seg violation (**Prec)

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12) As discussed earlier, the potential but ill-formed chain like *<krefjr, krefʏr> is ruled out since it fatally commits the simultaneous violation of two different basic faithfulness constraints, Dep and Max, in a single step, and even worse, dissatisfies the gradualness and harmonic improvement restrictions imposed on candidate chains as well. Also this paper clarifies that the potential but surface-unattested chain in (21e) needs to be considered since it satisfies the gradualness and harmonic improvement requirements. Strictly speaking, the glide in (21e) sits between two consonants though there is a single vowel intervening. No analytic failure is found since the chain in (21d) always wins as the tableau in (23) clearly shows.

Disobeying the violation order of Prec constraint posited in (22), the transparent chain in (21c) and the convergent chain in (21e) are both filtered out, as clearly shown in the tableau (23).

(23) No chaos of counterbleeding opacity via the role of Prec

/krefj-r/	Son Con	Dep-seg	Prec (Max-seg, Dep-seg)	Max-seg
a. <krefjr> < >	*!			
b. <krefr> <Max-seg>	*!			*
c. <krefjʏr> <Dep-seg>		*	*!	
☞d. <krefʏr> <Max-seg, Dep-seg>		*		*
e. <krefʏr> <Dep-seg, Max-seg>		*	**!	*

The tableau is self-explanatory. The competitors in (23c) and (23e) are both losers due to the Prec violation. The transparent chain in (23c) has no prior violation of Max-seg, which incurs the Prec violation as stated in (22a). The convergent chain in (23e) is the worst with the Prec violation twice as defined in (22b). Thus, the real opaque chain in (23d) emerges as optimal.

Now let us move onto the underapplication opacity of /ʏ/-umlaut and consider the valid chains of /daɣ-r/ as laid out in (24).

(24) Valid chains of /daɣ-r/ 'day, nom. sg.'

a. <daɣr>	Faithful parse
b. <daɣr, daɣʏr>	*Dep-seg
c. <daɣr, daɣʏr, döɣʏr>	*Dep-seg → *Id(pal)

Among the legal chains in (24), the potential but unwelcome chain in (24c) with the gradual violation of Dep and then Ident achieves maximum harmony in /ʏ/-umlaut, but it is ruled out with the Prec violation posited in (25).

(25) Prec constraint for counterfeeding opacity

Prec (Id(pal), Dep-seg)

a. Only Dep-seg violation with no prior Id(pal) violation (*Prec)

b. Dep-seg violation and then Id(pal) violation (**Prec)

The Prec constraint in (25) successfully removes the worst chain in (24c) with the opposite violation order of faithfulness constraints. From the tableau in (26), we see that opacity closely pertains to the violation order of faithfulness constraints in a chain.[13]

(26) No challenge of counterfeeding opacity via the role of Prec

/daɣ-r/	SonCon	Dep-seg	Prec (Id(pal), Dep-seg)	Id (pal)
a. daɣr < >	*!			
☞b. daɣʏr <Dep-seg>		*	*	
c. döɣʏr <Dep-seg, Id(pal)>		*	**!	*

The chain in (26c), with the Prec violation twice, fares worse than the opaque chain in (26b). Since Prec constraint considers the target candidate and the violation order in a chain as well, it apparently predicts the opaque chain in (26b) as optimal and further completely bars /ʏ/-umlaut when /ʏ/ is not present underlyingly.[14]

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13) Given McCarthy's (2007:99) Metaconstraint (B >> Prec(A. B)) regulating the relative ranking of Prec constraint and its constituent B, B constraint, Dep-seg here, is ranked over each Prec constraint posited in (22) and (25). In fact, Dep-seg does not affect the evaluation, even though it sits below each Prec constraint in the tableaux given above. Regarding the critical arguments on Metaconstraint and its alternative proposal, refer to M. Lee (2008, 2009).

14) Also note that the invalid chain like *<daɣr, döɣʏr> which is convergent to the chain in (26c) is also a loser since it dissatisfies the well-formedness conditions along with the Prec constraint given in (25). Both Ident and Dep are violated at the same time. As strongly argued in McCarthy (2007:109), without imposing the gradualness and harmonic improvement restrictions on candidate chains, the chain above fares better in Agree(pal), ranked below the Prec constraint but over Id(pal), than the real opaque chain in (26b).

Thus far, it has been emphasized that OT pursuing an intermediate derivation via candidate chains and Prec constraint provides a superior analysis of the opacity issue. As clearly shown in the tableaux (23) and (26), opacity is a natural result of the violation order of faithfulness constraints in a chain.

5. Conclusion

Opacity issue is a big challenge to Parallel OT with the direct mapping of input to output with no intermediate level of derivation, which requires some special mechanism like Sympathy theory irrespective of its theoretical defects. However, with the addition of candidate chains and Prec constraint into OT, opacity is not a residual issue any more.

Each candidate in a chain should be divergent from its immediate predecessor with a single change at a time, thus chains are harmonically improving. OT can achieve a rule-based intermediate derivational effect by candidate chains obeying the requirements of gradualness and harmonic improvement and Prec constraint assessing the violation order of faithfulness constraints in a chain. OT-CC captures two major aspects, that is, which faithfulness constraints are violated and further in what order they are violated in a chain. Therefore, as evidenced in the Icelandic data, opacity is attributed to the violation order of faithfulness constraints in a chain.

In Icelandic, with respect to the rule relation of /ʏ/-epenthesis, two different types of opacity occur. In counterbleeding opacity, the opaque chain satisfying the violation order of Prec(Max-seg, Dep-seg) fares better than its competitors, i.e., its transparent chain and convergent chain. In counterfeeding opacity, Prec(Id(pal), Dep-seg) plays a vital role in selecting the opaque chain while rejecting the transparent chain with /ʏ/-umlaut. Unlike in Parallel OT, OT-CC with Prec correctly captures the different behavior of the epenthetic /ʏ/ from the underlying /ʏ/ regarding the presence or absence of /ʏ/-umlaut.

As such, OT with candidate chains as outputs and Prec constraint violable and ranked as well, successfully tackles opacity phenomena found in Icelandic. In essence, opacity is not chaotic but natural via the violation order of faithfulness constraints in a chain. No analytic gap that Parallel OT substantially entails is relevant and further there is no need of any additional mechanism separately embedded into OT grammar.

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Received on 12 July, 2011
Revised version received on 8 August, 2011
Accepted on 8 August, 2011