Sympathy, Opacity and Palatalization in English[1]

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Kim, Moonhee. 2002. Sympathy, Opacity and Palatalization in English. *SNU Working Papers in English Language and Linguistics* 1, 30-44. This paper examines Palatalization in English to discuss the issue of opacity. The paper shows that English Palatalization involves opacity and thus poses challenge to mainstream Optimality Theory (Prince and Smolensky 1993). In derivational terms, Palatalization in English requires intermediate representations, neither input nor output. The intermediate representations cannot be directly managed by output-oriented Optimality Theory (OT). This paper argues that McCarthy's (1997) Sympathy Theory, which assumes a constraint termed selector and a constraint regulating the relation between a failed, sympathetic candidate and an optimal candiate, is the most successful theory available to settle the opacity problem observed in English Palatalization. **(Seoul National University)**

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1. Introduction

According to the central concepts of OT on the basis of McCarthy and Prince (1993a&b, 1995) and Prince and Smolensky (1993), OT emphasizes the role of constraints and constraint interactions, whereas the standard generative theory is a model of rules and derivations. Phonological generalizations in OT are expressed as the interactions between markedness constraints and faithfulness constraints. The former evaluates the structural well-formedness of only the output representations, not of input representations, and the latter evaluates the similarities between the input and only the output.

Such output-based OT is problematic to explain the opacity

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which is easily regulated in derivational theory by the existence of intermediate representations. In OT, however, markedness constraints can often be violated, when they conflict with higher-ranking constraints. Thus a constraint can be violated at output, in other words, OT may account for some kinds of non-surface-true opacity.

In serialism, all the phonological opacities are easily explained by the rule-ordering through an intermediate stage of the derivation. The applications of subsequent rules alter an underlying representation, creating many intermediate representations. Later derivational representations can, also, obliterate the condition which triggered the earlier rule.

McCarthy (1997) suggested Sympathy theory to solve the opaque phenomena within OT framework. Sympathy is a kind of the faithfulness from Input-output Faithfulness in standard OT (Prince and Smolensky 1993). In Sympathy theory, a non-optimal candidate has an important status for selecting an optimal output by faithfulness constraints and it resembles the input more than the actual output does.

This paper is to explore Palatalization in English, within Sympathy theory, which is non-surface-apparent opaque phenomenon since the subsequent rule obliterates the environment of earlier rule application. I will support, through sympathetic analyses of Palatalization, McCarthy's claim that opacity can be solved by Sympathy within OT framework.

The organization of this paper is as follows: Section 2 sketches the definition of opacity and introduces sympathy. Section 3 investigates examples of palatalization in English and offers the derivational approach of them. Section 4 examines Palatalization to show the sympathetic effects such as inter-candidate faithfulness and cumulativity. Section 5 concludes this paper.

2. Opacity and Sympathy

Kiparsky(1971, 1973a) defines opacity as the phonological processes which may appear to have applied when they should not (counterbleeding or non-surface-apparent) or to have failed to apply when they should (counterfeeding or non-surface-true). For example, Tiberian Hebrew (1) is an example of the non-surface-apparent opacity, which can be analyzed as follows:

(1) Interaction of Epenthesis and ʔ Deletion in Tiberian Hebrew (Malone 1993)
  a. Epenthesis into final clusters /deš š ʔ
  b. ʔ š ʔ -> deš
  c. serial derivation: Epenthesis -> ʔ Deletion
     UR /deš
     Epenthesis deš ʔ
     ʔ Deletion deš

In serial derivation, epenthesis must precede ʔ ʔ which triggers epenthesis is not apparent at the surface, that is second rule, ʔ Deletion, eliminates the condition of first rule, epenthesis.

In the view of output-oriented OT, the output [deš | seems to be affected by epenthesis, even though the epenthetic condition is not apparent at output. It is, but, unexplained why the epenthesis which induces the faithfulness violation is applied. The following tableau (2) shows that a classic OT approach cannot resolve the non-surface-apparent cases like /deš -> deš

(2) Analyzing /deš -> deš within the classic OT framework

/deš	*COMPLEX	CODA-COND	MAX-C$_{IO}$	DEP-V$_{IO}$
a. ☞ eš			*	¡
b. ☜ eš			*	
c. deš ʔ		*!		*
d. deš	*!	*		

(2c) has two violations owing to the epenthetic /e/; CODA-COND and DEP-V$_{IO}$. In (2d), the consonant sequence in coda, /š , violates both *COMPLEX and CODA-COND. The actual output (2a) violates two Faithfulness constraints, MAX-C$_{IO}$ owing to deleted /ʔ and DEP-V$_{IO}$ owing to epenthetic /e/, while the transparent candidate (2b) violates only MAX-C$_{IO}$. This fact shows that the actual output (2a) never can be more harmonic than the transparent candidate (2b) within this classic OT frame.

In the above tableau, the failed candidate [deš ? in (2c) resembles the input /deš more than the actual output [deš | in (2a) does. Also, the similarity between the failed candidate (2c) and the actual output (2a) is more than that between the failed candidate (2c) and the input. These two facts are important to illustrate the opaque phenomenon in /deš -> deš The failed candidate is the best harmonic member of the set of candidates that obey a designated IO Faithfulness constraint. The actual output is adopted by the faithfulness with the failed candidate, where such relation is called as Sympathy. Sympathy can be classified as a kind of the extended correspondence from the classic Input-Output Correspondence, such as Output-Output Correspondence or Reduplicant-Base Correspondence.

There are many correspondence relations between the various candidates generated from a single input, that is, each candidate corresponds to all other candidates. Here, Gen supplies such correspondence relations of inter-candidates. Sympathy effects are induced by undominated faithfulness constraint evaluating the similarities between the designated failed candidate and other candidates including the actual output. Thus, in sympathy theory, Faithfulness plays two important roles; first, the failed candidate is selected by IO Faithfulness constraint and then another Faithfulness constraint evaluates the similarity between the designated candidate and other candidates, which is the decisive role to adopt the actual output. Here a designated IO Faithfulness constraint which selects a sympathetic candidate tends to be low-ranked, otherwise, a failed candidate is likely to be identical with a sympathetic candidate.

The following tableau in (3) shows the sympathetic analysis of the opaque phenomenon in Tiberian Hebrew:

(3) Analyzing /deš -> [deš | with sympathy

/deš	♧ IAX -V_{MAX-C}	*COMPLEX	CODA -COND	★ IAX-C_{IO}	DEP-V_{IO}
a. ☞ eš				*	*
b. ☜ eš	*!			*	
c. ♧ eš ?			*!	∨	*
d. deš	*!	*	*	∨	

In the above tableau, MAX-C_{IO} plays a selector role in looking for the failed candidate (3c), where the symbol ♧ s added before this sympathetic candidate in (3c) and the symbol ★ s added to indicate the selector constraint. The sympathetic candidate in (3c) is the most harmonic member of the candidates which obey MAX-C_{IO}, up to this point, the sympathetic constraint ♧ IAX-V_{MAX-C} is invisible. The sympathetic constraint ♧ IAX-V_{MAX-C} evaluates the resemblance between the sympathetic candidate and other candidates. In sympathy theory, in this way, the opaque candidate in (3a) is adopted as the optimal output.

As mentioned in McCarthy(1999), opacity can be also explained by the relationship of Cumulativity between the sympathetic candidate and other candidates. In the above tableau (3), considering only Faithfulness constraints, the sympathetic candidate in (3c) violates one faithfulness constraint, like DEP-V. The opaque output in (3a), thus, accumulates all faithfulness violations of the sympathetic candidate, since it violates two faithfulness constraints, DEP-V and MAX-C. But the transparent candidate in (3b) is not in a cumulative relationship with the sympathetic candidate in (3c), since it violates MAX-C. From these facts, two following sympathetic constraints are supposed to compare other candidates' faithfulness violations with the sympathetic candidate's: first, the constraint ♧ UMUL evaluates each candidate categorically for whether the set of sympathetic candidate's IO Faithfulness violations is a subset of other candidate's IO Faithfulness violations, and, second, the constraint ♧ IFF evaluates each candidate gradiently for whether every IO Faithfulness violation of other candidates is also incurred by sympathetic candidates. The ranking order of two constraints is fixed universally as ♧ ♧ IFF.

The following tableau (4) shows that the opaque output can be selected by the interactions of the constraints connected with cumulativity.

(4)Hebrew with cumulativity

/deš	*COMPLEX	CODA -COND	♧ UMUL	♧ IFF	★ IAX -C	DEP-V
a.☞ eš				*	*	¡
b.☜ eš			*!	*	*	
c.♧ eš ?		*!			∨	*
d.deš	*!	*!	*!		∨	

In (4a), [deš | satisfies ♧ UMUL for the violations of two IO Faithfulness constraints accumulate the IO-Faithfulness violation of (4c), that is it can be illustrated as a function relation like {MAX-C, DEP-V} ⊃ DEP-V}, but it violates ♧ IFF once for it violates MAX-C which (4c) doesn't violate. The transparent (4b) violates ♧ UMUL because Faithfulness violation of (4b) doesn't accumulate that of (4c), that is {MAX-C} ⊅ DEP-V}, and it also violates ♧ IFF once because it incurs the different IO-Faithfulness violation from DEP-V in (4c). The faithful candidate in (4d) violates ♧ UMUL for not accumulating the IO-Faithfulness violation DEP-V of (4c), but it obeys ♧ IFF for not incurring any different IO-Faithfulness violation from that in (4c). As mentioned above, McCarthy (1997, 1999) has suggested two different approaches to sympathy, which are concerned with IO-Faithfulness constraints, whether directly or indirectly.

3. Palatalization in English

The following words represent the consonantal alternation phenomena.

(5) a. space / spacious
b. quest / question
c. confuse / confusion
d. grade / gradual
e. maturate

f. office / officiate

The above words show Palatalization, which changes the alveolar obstruents /s, z, t, d/, followed by -yV, into the palato-alveolars /š ž č ǰ respectively. From the contrast between each pair above, it appears that Palatalization is affected by the glide, not the vowel, and then the glide is not in the surface form. The example in (5f), but, indicates that Palatalization seems to occur before /i/ rather than /y/ and the vowel following the palato-alveolar is stressed, unlike other palatalization examples. The data (5e) show that Palatalization occurs within a morpheme, not between the stem and the suffix. Even though Palatalization is somewhat different among the dialects, however, it apply obligatorily in the possible environment of Palatalization, .

In rule-based theory , Borowsky (1986) explains Palatalization in English as follows in (6): obstruents should be palatalized if they are followed by /y/ before the unstressed vowel (6a). The conditioning /y/, then, is obscured by a later rule which deletes /y/ after palatal obstruent (6b). Sometimes, but, /y/ is vocalized when /y/ appears before a stressed syllable (6c).

(6) Palatalization and y-deletion/ y-vocalization in English
  a. Palatalization rule
    'spacious' /speis + yɔ / -> speiš ə
    'officiate' /ɔ s + yæ ' -> ə íš è
  b. y-deletion after palatalization
    speiš ə -> speišə
  c. y-vocalization after palatalization
    ə íš è -> ə íš è

In derivational terms, after the application of palatalization rule, y-vocalization must precede y-deletion to delete only non-vocalized /y/, since the conditioning /y/ that trigger palatalization is not apparent at the surface. Palatalization rule becomes to be non-surface-apparent by the application of subsequent rules, like y-deletion or y-vocalization, thus it can be considered to be opaque. It is shown that the existence of intermediate representation, after the application of Palatalization rule, can easily illustrate the appearance of the opaque output.

4. Sympathetic Account

Let us now consider Palatalization as OT terms. (Kim 1998)

The constraint PAL requires that alveolar obstruents (t, d, s, and z) change into palatal consonants (č ǰ š and ž only if they precede glide /y/, as shown in (7).

(Though many phonologists (including Rosentall (1994)), as well as SPE (1968), have tried to define the distribution of /i/ and /y/, since this problem is very complicated, there is not still any clear generalization about it. Thus, here I will not remark any more about that, even if /y/ in the input, /speis+yɔ /, seems to conflict with 'richness of base' which means no restriction of input.)

(7) ex) spacious
input /speis + yɔ /

		PAL
a.	spé šə	∨
b.	spé yə	*

The OCP, which means that adjacent identical elements are prohibited, leads to the deletion of glide after a palatalized consonant. The English palatals are complex segments composed of two features, since they are created by spreading the feature [-anterior] from a glide to a preceding coronal, and hence they consist of features [+coronal, -anterior]. Since this feature composition of a palatal is identical with that of a glide, following a palatal, a glide is deleted evidently by OCP. This constraint can be referred to as OCP(+cor, -ant).

(8) ex) spacious
input: / speis + yɔ /
l l
[+cor] [+cor]
[+ant] [-ant]

	PAL	OCP(+cor, -ant)
a. spé šə l [+cor] [-ant]	∨	∨
b. spé š yə l l [+cor] [+cor] [-ant] [-ant]	∨	*

The opaque output has a MAX-IO violation, since /y/ of the input has no correspondent in the output, as exemplified in (9).

(9) ex) spacious

input : /speis + yɔ /	MAX-IO
a. speišə	*
b. speiš ə	∨
c. speisə	*
d. speisyə	∨

Palatalized consonant violats the constraint IDENT-IO[+ant], since an input alveolar obstruent is [+anterior], while a palatalized consonant as an output correspondent is [-anterior], as illustrated in (10).

(10) ex) spacious

input : /speis + yɔ /	IDENT-IO[+ant]
a. speišə	*
b. speiš ə	*
c. speisə	∨
d. speisyə	∨

With the above proposed constraints (11a), the effective analyses of English Palatalization can be formed by the constraint ranking in (11b).

(11) a. PAL: When alveolar obstuents precede glide /y/, they must be palatalized.
OCP(+cor, -ant): No cooccurence of [+cor, -ant] with itself within syllables.
MAX-IO: Every segment of input has a correspondent in output.
IDENT-IO[+ant]: Any correspondent of an input segment specified as [+ant] must be [+ant].

b. General ranking: PAL > OCP(+cor, -ant) > MAX-IO > IDENT-IO[+ant]

The following tableau shows that the Palatalization in (5a) is problematic for an OT approach without sympathy:

(12) Analyzing /speis + yɔ ′ -> [speišə without sympathy

/ speis + yɔ ′	PAL	OCP(+cor,-ant)	MAX-IO	IDENT-IO{+ant]
a. ☞ ɔei.šə			*	¡
b. spei.š ə		*!		*
c. ☜ ɔei.sə			*	
d. spei.syə	*!			

The actual output in (12a) can never be the most harmonic member, since the transparent candidate in (12c) violates just one low-ranking IO-Faithfulness constraint. Sympathy, however, solves this problem through the correspondences between sympathetic candidate and each other candidate, as shown in (13).

(13) Analyzing /speis + yɔ ′ -> [speišə with sympathy

/speis+yɔ/	♧ DENT-♧ [-ant]	PAL	OCP (+cor,-ant)	★ IAX -IO	IDENT-IO[+ant]	♧ UMUL	♧ IFF
a.☞ ɔei.šə				*	¡		*
b.♧ ɔei.š ə			*!	⋎	*		
c.☜ ɔei.sə	*!			*		*	*
d.spei.syə	*!	*		⋎		*	

In the above tableau, MAX-IO plays a selector role to select the sympathetic-candidate which is the most harmonic member of the candidate set to obey MAX-IO. Accordingly, [speiš ə in (13b) is the sympathetic candidate. The sympathetic constraint IDENT-♧ O[-ant] evaluates the similarities between other candidates and sympathetic candidate in (13b). The opaque candidate in (13a) can be the most optimal since the sympathetic constraint is ranked above IDENT-IO[+ant] which is violated by the actual output in (13a).

In my opinion, here, a selector seems to be one of IO-Faithfulness constraints violated by both the opaque and the transparent candidate. This fact can be confirmed in most data relevant to sympathy theory, even if McCarthy(1997, 1999) does not make clear about this fact.

Alternatively, cumulativity can produce the same result with inter-candidate correspondences. The opaque output in (13a) obeys ♧ UMUL because it accumulates a sympathetic candidate's faithfulness violation in (13b): that is {MAX-IO, IDENT-IO[+ant]} ⊃ {IDENT-IO[+ant]}, while it (13a) violates ♧ IFF once because it has one different faithfulness violation (MAX-IO) from faithfulness constraint (IDENT-IO[+ant]) violated by a sympathetic candidate. The transparent candidate in (13c), however, violates ♧ UMUL: that is, {MAX-IO} ⊅ DENT-IO[+ant]}. Also, it violates ♧ IFF once due to one different faithfulness violation from the sympathetic candidate's. The faithful candidate in (13d) violates ♧ UMUL because it doesn't include a sympathetic candidate's faithfulness violation in (13b): that is, ∅ ⊅ IDENT-IO[+ant]}, while it (13d) satisfies ♧ IFF because it doesn't violate any different faithfulness constraint from the sympathetic candidate's. Accordingly, the opaque candidate in (13a) can be optimal due to the satisfaction of ♧ UMUL, unlike the rest two candidates.

Next, the examples in (5b-5e) can be explained like (13), on same way with that in (5a).

Finally, the example in (5f) shows that palatalization rule is also non-surface-apparent, since its trigger /y/ is vocalized into [i]. The following two constraints are concerned with y-vocalization.

(14) a. OCP(stress): No cooccurrence of successive syllables with stress
b. DEP-IO(µ every µ of output has a correspondent in input

/y/ has to be vocalized to avoid stress clash between adjacent syllables in (14a), but vocalized /i/ violates DEP-IO(µ in (14b) since [i] in output has one mora, unlike /y/ in input. The following tableau (15) shows that an OT approach without sympathy is problematic.

(15) Analyzing 'officiate' without sympathy

/ɔ s+yæ '	OCP (stress)	PAL	MAX-IO	DEP-IO(µ	IDENT-IO[+ant]
a.☞ə íš è				*	¡
b.ə íš è	*!				*
c. ə íšè	*!		*		*
d. ə í è	*!		*		
e.☜ə í i.è				*	
f. ə í yè		*!			

The opaque candidate in (15a) cannot be optimal since it violates IDENT-IO[+ant] which is not violated by the transparent candidate in (15e). Sympathetic relation added to OT can make the opaque candidate to be selected as an optimal output as shown in (16).

(16) Analyzing 'officiate' with sympathy

/ɔ s+yæ '	♧ ƆENT -♧ [-ant]	OCP (stress)	PAL	MAX -IO	★ EP-IO(µ	IDENT-IO[+ant]	♧ UMUL	♧ IFF
a.☞ə íš è					*	¡		*
b.♧ə íš è		*!			∨	*		
c. ə íšè		*!		*	∨	*		*
d. ə í è	*!	*		*	∨		*	*
e.☜ə í i.è	*!				*		*	*
f. ə í yè	*!	*	*		∨		*	

DEP-IO(µ as a selector, adopts (16b) as the most harmonic member of the set of the candidates (16b-d, 16f) which obey DEP-IO (µ since (16b) violates only OCP(stress) while (16c) and (16d) violate both the OCP(stress) and MAX-IO and (16f) violates OCP(stress) and PAL, when sympathetic constraint IDENT-♧ '[-ant] is invisible. Each correspondence between sympathetic candidate in (16b) and other candidates is evaluated by sympathetic constraint IDENT-♧ '[-ant]. The candidates (16d-f) violate sympathetic constraint IDENT-♧ '[-ant], since feature [-ant] of /š in (16b) is not identical with [+ant] of output correspondent /s/ in (16d-f). Therefore, the opaque candidate in (16a) can be the most optimal due to the sympathetic constraint IDENT-♧ '[-ant] ranked above IDENT-IO{+ant].

Alternatively, cumulativity can have the same effects with inter-candidate correspondence. In (16a), the opaque candidate satisfies ♧ UMUL since it accumulates the faithfulness violation of the sympathetic candidate (16b): that is {DEP-IO(µ IDENT-IO[+ant]} ⊃ IDENT-IO[+ant]}. In (16c), the candidate obeys ♧ UMUL since it accumulates the faithfulness violation of the sympathetic candidate: that is {MAX-IO, IDENT-IO[+ant]} ⊃ {IDENT-IO[+ant]}. And, the both candidates, (16a) and (16c), violate once ♧ 'IFF due to one different faithfulness violation from the sympathetic candidate. Here is, even though the violations in (16a) is similar with that in (16c) under only cumulativity, since two cumulativity constraints are interacted with other constraints before two lines in tableau (16), (16a) is still the most optimal. (16d) violates two cumulative constraints due to one the faithfulness violation MAX-IO, since it doesn't accumulates the faithfulness violation of sympathetic candidate in (16b): that is {MAX-IO} $\not\supset$ {IDENT-IO[+ant]}, and it also has the different faithfulness violation from sympathetic candidate's in (16b). (16e) can be explained similarly with (16d). (16f) violates ♧ UMUL due to its no faithfulness violation: that is $\varnothing$ $\not\supset$ IDENT-IO[+ant]}.

5. Conclusion

This paper has shown that Palatalization in English, as a kind of opaque phenomena, can be explained by sympathy within OT framework. Palatalization in English is non-surface-apparent opacity, since the later rule, y-deletion or y-vocalization, eliminates the condition of the earlier Palatalization rule. It claims that sympathetic approach treat opacity with the basic notions of OT, irregardless of intermediate status required in Serialism. Faithfulness constraints play very important roles to select sympathetic candidate/ actual output, and are also crucial in another sympathetic approach, Cumulativity.

In one case of palatalization followed by y-deletion, like *spacious*, a sympathetic candidate is the most harmonic member selected by the selector MAX-IO, and a sympathetic constraint IDENT-♧ [-ant] evaluates the resemblance between the sympathetic candidate and each of the other candidates. In the other case of Palatalization followed by y-vocalization, like *officiate*, DEP-IO(μ plays a role as a selector and IDENT-♧ [-ant] as a sympathetic constraint.

I would support McCarthy's Sympathy theory in connection with opacity through showing the sympathetic account of opaque Palatalization in English.

References

Borowskey, Toni. 1986. *Topics in the lexical Phonology of English.* Ph. D.

dissertation. University of Massachusetts, Amherst.
Chomsky, N. and M. Halle. 1968. *The Sound of pattern of English*. Harper and Row. New York.
Kiparsky, Paul. 1971. Historical linguistics. In W. Dingwll, ed., *A Survey of Linguistic Science*. College Park, MD: University of Maryland Press.
Kiparsky, Paul. 1973a. phonological representations. In Osamu Fujimura (ed.), *Three Dimensions of Linguistic Theory*. Tokyo: Taikusha . Pp. 1-136.
Kim, M-H. 1998. *Palatalization in English: An Optimality-Theoretic Account* Master's Thesis. SNU
Malone. John. 1993. *Tiberian Hebrew Phonology*. Winona Lke, Indiana: Eisenbrauns.
McCarthy, J. and A. Prince. 1993a. Prosodic morphology I: constraint interaction and satisfaction. ms., University of Massachusetts, Amherst, & Rutgers University.
McCarthy, J. and A Prince. 1993b. Generalized alignment. ms. University of Massuchusetts, Amherst, & Rutgers University.
McCarthy, John J. and Alan Prince. 1995. "Faithfulness and Reduplicative Identity." In Beckman, J., Walsh Dickey, L., and Urbanczyk, S. (eds.), *University of Massachusetts occasional papers 18: papers in Optimality Theory*. Amherst: GLSA, University of Massachusetts, 249-384.University of Massachusetts, Amherst
McCarthy, John J. 1997. Sympathy & Phonological Opacity. Talk presented at the Johns Hopkins Optimality Theory Workshop/Maryland Mayfest, may, 1997
McCarthy, John J. 1999. Sympathy and phonological opacity. Phonology 16 [pages 331-399)
Prince, Alan. and Paul Smolensky. 1993. Optimality Theory: Constraint Interaction in Generative Grammar. ms., Rutgers University and University of Colorado at Boulder.
Rosentall, Sam. 1994. The phonology of vowels and glides. Ph. D. dissertation. University of Massachusetts, Amherst.

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