

A SYMPATHY ACCOUNT OF MULTIPLE OPACITY IN WINTU*

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Abstract: Wintu, a Penutian language, exhibits three phonological rules that interact in ways that produce two different kinds of opacity. One rule that raises mid vowels before a low vowel with one consonant intervening interacts with a rule of cluster simplification that deletes the first of two consonants in a cluster. The raising rule also interacts with a rule of absolute neutralization so that it appears that some mid vowels do not raise even when the structural description of the rule is met. These cases of opacity are shown to be analyzable within the framework of optimality theory through an appeal to McCarthy's (1998) proposal of 'sympathy'. While McCarthy describes cases where a language with multiple opaque interactions can have distinct \otimes -candidates which are subject to distinct sympathy relations, this paper will show that distinct \otimes -candidates may also be subject to the same sympathetic correspondence, thus lending support to the validity and universality of sympathy constraints.

1. Introduction

In derivational theories, rules can be ordered in such a way so as to produce opaque phonetic forms. When such orderings take place, it may appear that a rule applied even though its phonological requirements were not met at the surface (counterbleeding), or that a rule failed to apply even though its environmental conditions were met at the surface (counterfeeding). These types of opaque phenomena have traditionally posed a challenge for constraint-based approaches, such as optimality theory (Prince & Smolensky 1993, McCarthy & Prince 1995). Unlike derivational theory, optimality theory does not incorporate phonological rules or serial derivations to determine the correct surface form of a phonological input. Instead, the output of phonology is determined by the interaction of faithfulness constraints, which demand identity between two strings (usually between input and output forms), and well-formedness constraints, which may favor modification of the input. These constraints are ranked in a hierarchy of importance whereby low-ranked constraints may be violated in order to satisfy higher-ranked ones. Optimal forms, then, violate fewer high-ranked constraints than the competing candidates.

In order to account for opacity within the framework of OT without reference to rule ordering or serial derivation, McCarthy (1998) has proposed a theory of 'sympathy'. This theory describes the candidate-to-candidate faithfulness correspondence between an optimal candidate and a particular failed or 'sympathetic' candidate. This failed candidate (or ' \Leftarrow -candidate') emerges from a candidate set obeying a designated low-ranked faithfulness constraint (or 'selector') as the one that is most harmonic with respect to the rest of the constraint hierarchy. The effect of this sympathetic candidate on the actual output is mediated by a kind of faithfulness correspondence, which is enforced by a sympathy constraint. This sympathy constraint demands greater resemblance between the \Leftarrow -candidate and the output form. Sympathy theory has been used to account for various opacity effects in fully-developed languages (e.g. Davis 1997, Itô & Mester 1997, Karvonen & Sherman 1997) as well as in developing systems (e.g. Dinnsen, McGarrity, O'Connor & Swanson 1998).

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In his (1998) paper, McCarthy also describes examples of fully-developed languages that exhibit multiple opaque interactions. In such languages, McCarthy claims that multiple low-ranked faithfulness constraints can each select distinct \Leftarrow -candidates which are then subject to distinct sympathy relations. However, I intend to show in this analysis that distinct \Leftarrow -candidates may also be subject to the same sympathetic relation. By invoking sympathy, it is possible to devise an optimality theoretic account of two separate opaque phenomena in Wintu. These phenomena involve an interaction between a vowel raising rule and a cluster simplification rule, as well as between vowel raising and a rule of absolute neutralization. In this account, two separate selector constraints – MAX and IDENT[ATR] – are needed to choose the flower candidates for the two instances of opacity, but only one sympathy constraint – \Leftarrow IDENTHEIGHT – is needed to compel faithfulness between the objects of sympathy and the optimal output forms.

The paper is organized as follows: Section 2 gives a derivational account of the first case of opacity in Wintu, describing the phonological rules involved and the ordering required to obtain the correct surface forms. Section 3 examines this problem from a constraint-based perspective and details how optimality theory without sympathy is unable to correctly predict the proper opaque output forms. Section 4 discusses McCarthy’s (1998) proposal of sympathy, showing how it is able to correctly account for this same phenomenon, and introduces a second type of opacity in Wintu. The analysis will show that while different selector constraints are needed to choose the different \Leftarrow -candidates for the two instances of opacity, the same sympathy constraint can be used to compel faithfulness with the optimal output forms. The conclusion in section 5 summarizes the main points of this discussion.

2. A Derivational Account

2.1. Background

This section examines one type of opacity evidenced by Wintu, a Penutian (Amerind) language spoken in Northern California, and illustrates how it can be analyzed within a derivational theory by means of rule ordering or serial derivations. In this first type of opacity, there are two phonological rules which interact with each other in a counterfeeding relationship. The first, a vowel raising rule, raises short mid vowels to high when they precede a low vowel in the following syllable with only one consonant intervening.¹ The second rule simplifies consonant clusters that result from the concatenation of two morphemes. This rule must be applied after the vowel raising rule to produce the correct surface forms. The details of these rules and relevant data illustrating their application are presented in the following sections.

2.2. Vowel Raising

There are five vowels in Wintu – /a, e, i, o, u/. Since vowel length is distinctive in this language, each of these vowels has a long counterpart. Together they make up the vowel inventory of Wintu (Pitkin 1984). When verb stems containing a mid vowel are combined with suffixes that contain a low vowel, some height alternations take place. Consider the data in (1).²

(1) a.	/lel/		‘transform’	b.	/koy/		‘want, try’
	/lel+a/	[lila]	‘to transform’		/koy+a/	[kuya]	‘to want, try’
	/lel+u/	[lelu]	‘transform!’		/koy+u/	[koyu]	‘try!’
	/lel+it/	[lelit]	‘transformed’		/koy+it/	[koyit]	‘one who wants’

¹ Only certain mid vowels undergo this rule. This fact is relevant for the second type of opacity in Wintu and will be discussed in more detail in section 4.2.

² All of the Wintu examples are taken from Pitkin (1984, 1985).

c. /hen/		‘arrive, come’	d. /q’oy/		‘surround’
/hen+a/	[hina]	‘to arrive’	/q’oy+a/	[q’uya]	‘to surround’
/hen+es/	[henes]	‘gets here’	/q’oy+os/	[q’oyos]	‘a fence’
/hen+paq/	[henpaq]	‘to make them come’	/q’oy+ca/	[q’oyca]	‘to fence in’
e. /pe:l/		‘peel’	f. /λ’o:m/ ³		‘kill’
/pe:l+us/	[pe:lus]	‘tool to strip bark’	/λ’o:m+it/	[λ’o:mit]	‘the killer’
/pe:l+a/	[pe:la]	‘to peel a big tree’	/λ’o:m+a/	[λ’o:ma]	‘to kill’

Within these verb stems, there is an alternation between mid vowels and high vowels. In (a) and (b), it can be seen that the mid vowels /e, o/ raise to [i, u] before a low vowel /a/ with a single consonant intervening, but they do not raise before high vowels. In (c) and (d), the data show that the mid vowels also do not raise before other mid vowels or when there are two consonants intervening between the mid vowel and the low vowel. The forms in (e) and (f) show that mid vowels that are long do not raise before low vowels, even when there is only one consonant intervening. The rule which accounts for all of these facts can be formulated as in (2).

(2) Vowel raising rule:

$$\begin{array}{c} V \rightarrow [+high] / \text{ ___ } C V \\ [-low, -long] \qquad \qquad \qquad [+low] \end{array}$$

This rule states that short mid vowels will raise to high vowels when followed by a low vowel in the next syllable with only one intervening consonant. In all other contexts, they remain mid vowels. This rule is obligatory in its operation. As will be shown in the next section, this rule interacts with a rule of cluster simplification in a counterfeeding relationship to create opaque surface forms. This vowel raising rule also interacts with a rule of absolute neutralization to create another type of opacity in Wintu, which will be discussed in section 4.2.

2.3. Cluster Simplification

A second phonological rule that operates in Wintu simplifies consonant clusters that result from the concatenation of two morphemes. When the combination of morphemes places two identical consonants adjacent to each other, they are realized as a single consonant. The forms in (3) illustrate this fact.

(3) />>elew+war/	→	[>>elewar]	‘not’
/heket+to:t/	→	[heketo:t]	‘anyone’
/>>el->>ih+heres/	→	[>>el->>iheres]	‘something put inside’

Other clusters consisting of two different consonants are realized phonetically as the second of the two consonants. This is shown in (4).⁴

(4) /wb/	→	[b]	/>>ew+bas/	→	[>>ebas]	‘they, these’
/rn/	→	[n]	/pur+nen/	→	[punen]	‘his mother’
/rl/	→	[l]	/pur+la:h/	→	[pula:h]	‘his older sister’
/nl/	→	[l]	/win+lél/	→	[wilel]	‘let’s see’
/tc/	→	[c]	/yet+cu/	→	[yecu]	‘name it!’
/rs/	→	[s]	/nor+sono/	→	[nosono]	‘South Nose (place name)’
/rλ/	→	[λ]	/pur+λabe:/	→	[puλabe:]	‘his older brother’
/lλ/	→	[λ]	/>>el+λeλe:/	→	[>>eλeλe:]	‘to throw back and forth’

³ The symbol [λ] represents a voiceless apical fricative with a lateral release. An apostrophe after a segment indicates that it is glottalized.

⁴ Independent motivation exists for the underlying representations of each of the morphemes in this list. See Pitkin (1984:46-48) for a detailed discussion.

/lλ'/	→	[λ']	/>>ol+λ'ura/	→	[>>oλ'ura]	'to pile up rocks'
/wh/	→	[h]	/>>uw+hetan/	→	[>>uhetan]	'anyway'

However, according to Pitkin (1984), not all consonant clusters simplify in the way that the clusters do in (4). Some clusters, like the ones in (5) below, do not simplify and are allowed to surface.

(5) /tip+na+mina/	→	[tipnamina]	'hadn't understood'
/kiyem+ti:n/	→	[kiyemti:n]	'wise-speaking'
/suk+mina/	→	[sukmina]	'don't stand'

In the cases where the clusters are simplified, as in (3) and (4) above, the repair consists of deleting the first of the offending segments. This is most apparent in the forms given in (4), in which the clusters consist of different consonants. I assume that in parallel fashion, the repair is the same in the case of the geminate clusters in (3). I argue that the driving force behind the cluster reduction in (3) and (4), and the lack thereof in (5), can be explained in terms of the Obligatory Contour Principle, as defined by McCarthy (1986a), and its prohibition of adjacent segments sharing the same place and subsidiary features. I will return to this point in the optimality theoretic section of this paper (section 3.1). First, I will show in the next section how the vowel raising rule and the cluster simplification rule must be crucially ordered so as to create opaque surface forms.

2.4. Serial Rule Ordering

The initial forms given above in (3) [>>elewar] 'not' and (4) [>>ebas] 'they, these' are opaque. In both cases, a mid vowel occurs before a low vowel in the next syllable even though there is only one consonant intervening. It appears that the vowel raising rule should have applied but did not. Only one ordering of the two rules introduced above will produce the correct opaque phonetic forms: vowel raising must precede cluster simplification or else an incorrect surface form will result. Derivations illustrating how these rules must be ordered are given in (6).

(6) a. /lel+a/	b. />>elew+war/	c. />>ew+bas/	UR
lila	—	—	Vowel raising
—	>>elewar	>>ebas	Cluster simplification
[lila]	[>>elewar]	[>>ebas]	PR

In (a), there is no rule interaction. The raising rule applies first, raising the mid vowel to a high vowel; the cluster simplification rule does not apply, so the phonetic representation is [lila]. This is a fully transparent form. However, in (b) and (c), the vowel raising rule does not apply since there are two consonants intervening between the mid vowel and the low vowel in the underlying representation; the structural description of the rule is not met. The cluster simplification rule then applies, deleting the first consonant. The result is an opaque surface form that shows a mid vowel occurring phonetically before a low vowel with only one consonant intervening. This illustrates that the two rules are in a counterfeeding relationship. If the rules were reversed, the cluster simplification rule would delete the first consonant in the cluster, thereby creating the conditioning environment in which the vowel raising rule could then apply, producing incorrect transparent output forms.

These same data pose a challenge for an analysis conducted within a constraint-based framework such as optimality theory. In the following section, the relevant constraints necessary for entertaining such an account will be introduced. It will ultimately be shown that an OT analysis cannot account for this kind of opacity effect without employing sympathy.

3. Optimality Theoretic Account without Sympathy

One of the main properties of a constraint-based theory such as optimality theory (Prince & Smolensky 1993, McCarthy & Prince 1995) is that there are no phonological rules or serial derivations to determine the correct surface form of a phonological input. Instead, the output forms are determined

by the interaction of faithfulness constraints, which demand identity between two strings (such as an input and an output), and well-formedness constraints, which favor structurally unmarked forms at the expense of modifying the input. These constraints are ranked in a language-specific hierarchy whereby an optimal form can violate lower-ranked constraints if such violation secures satisfaction of higher-ranked constraints. The winning candidate emerges as the form that violates fewer high-ranked constraints than its competitors.

In the following sections, the motivating factor behind Wintu cluster simplification and the constraints required to account for these facts within an OT framework will be examined. The well-formedness constraint responsible for the vowel raising phenomenon as well as some antagonistic low-ranked faithfulness constraints will also be introduced. Lastly, I will show how these constraints alone are unable to fully account for all the Wintu data, motivating an appeal to sympathy.

3.1. Cluster Simplification and the OCP

As mentioned in section 2.3, Wintu has a rule that deletes the first segment of derived geminates and some consonant clusters, but allows other clusters to stay intact. The determining factor behind whether or not a cluster must be simplified is the Obligatory Contour Principle (henceforth OCP). When first proposed by Leben (1973), the OCP was intended to account for distributional regularities in lexical tone systems. Since then, however, the OCP has been modified to apply to nonlinear segmental phonology (McCarthy 1986a). McCarthy's reformulated definition is given in (7).

(7) Obligatory Contour Principle:

At the melodic level, adjacent identical elements are prohibited.

McCarthy redefined the OCP to account for the fact that in Semitic, consonants within a particular group or identity class (a term introduced by Yip 1989) were found to cooccur significantly infrequently within the same root (1986b). He identified five Semitic identity classes: [labial], [coronal, +sonorant], [coronal, -sonorant], [dorsal], and [pharyngeal]. The 'identical elements' that McCarthy's definition of the OCP prohibits refer to the articulator features. However, consonants that differ in stricture features can occur within the same root, even if they share the same articulator feature – namely [coronal]. Thus, a coronal sonorant is allowed to cooccur with a coronal obstruent in the same root.

Padgett (1992) accounts for these facts by drawing a distinction between regular OCP features and what he terms 'OCP-subsidary features'. In the Semitic case, place is a regular OCP feature, while [sonorant] is a subsidiary feature for coronal. His proposal maintains that a representation is first checked for adjacent identical articulator features. If these features are found, the representation is further checked for identical OCP-subsidary features. Only then, if the subsidiary features are identical – or if none are relevant to the articulator feature – will the representation be ruled out.

I argue that this same notion of different identity classes of OCP features and OCP-subsidary features can be used to apply to the Wintu cluster simplification phenomenon. I repeat in (8) the list of clusters that are simplified in Wintu.

- | | | | | | | | |
|--------|-------|---|------|--------------|---|------------|---------------------------|
| (8) a. | /wb/ | → | [b] | //ew+bas/ | → | [/ebas] | 'they, these' |
| b. | /rn/ | → | [n] | /pur+nən/ | → | [punən] | 'his mother' |
| | /rl/ | → | [l] | /pur+la:h/ | → | [pulah] | 'his older sister' |
| | /nl/ | → | [l] | /win+ləl/ | → | [wilel] | 'let's see' |
| c. | /tc/ | → | [c] | /yet+cu/ | → | [yecu] | 'name it!' |
| d. | /rs/ | → | [s] | /nor+sono/ | → | [nosono] | 'South Nose (place name)' |
| | /rλ/ | → | [λ] | /pur+λabe:/ | → | [puλabe:] | 'his older brother' |
| | /lλ/ | → | [λ] | />>el+λελε:/ | → | [>>eλελε:] | 'to throw back and forth' |
| | /lλ'/ | → | [λ'] | />>ol+λ'ura/ | → | [>>oλ'ura] | 'to pile up rocks' |
| | /wh/ | → | [h] | />>uw+hetan/ | → | [>>uhetan] | 'anyway' |

The data in (8) are grouped into identity classes defining the cooccurrence restrictions on Wintu consonants. Set (a) represents the [labial] identity class, set (b) the [coronal, +sonorant] class, set (c) the [coronal, -sonorant] class, and set (d) the [+continuant] class.⁵ Wintu clusters that do not simplify contain two segments that have different places of articulation or are not from the same identity class (that is, they have opposite values for their subsidiary features). A few examples of such allowable clusters in Wintu that are not simplified are given in (9).

(9) [tip <u>n</u> amina]	‘hadn’t understood’	e.g., [labial] , [coronal, +sonorant]
[kiyem <u>t</u> i:n]	‘wise-speaking’	e.g., [labial] , [coronal, -sonorant]
[suk <u>m</u> ina]	‘don’t stand’	e.g., [dorsal] , [labial]
[pant <u>i</u>]	‘over, above’	e.g., [coronal, +sonorant] , [coronal, -sonorant]

These restrictions on adjacent segments in Wintu that have the same OCP features and subsidiary features can be combined into a family of constraints to fit within the framework of OT. Following Yip (1998), I will use the general family constraint name OCP as a kind of ‘meta-constraint’ to represent the cooccurrence restrictions in Wintu on adjacent segments within the same identity class.⁶ Although this constraint could be exploded into four separate featural constraints (OCP[lab], OCP[cor, +son], OCP[cor, -son], and OCP[cont]), I argue that they act as a unit and are not crucially ranked in the tableau. Therefore, I define the OCP constraint in general terms below.

(10) OCP:

An output must not contain two adjacent elements from the same identity class.

A candidate that contains a cluster whose segments are members of the same identity class, then, will violate this constraint. The repair strategy taken in the language to avoid violation of this constraint is to delete one of the segments. Since it is evident from the data that non-geminate clusters accomplish this by deleting the first of the offending segments, there must be a relatively high-ranked faithfulness constraint that requires maintaining the second segment in the cluster at the expense of the first. This constraint, FAITHONSET, is a positional faithfulness constraint that requires that a segment in onset position in the input must be preserved in the output. This constraint is ranked above a more general faithfulness constraint, MAX, which requires that all input segments, regardless of their position, must be preserved in the output. This ranking follows the widely held assumption that more specific constraints are universally ranked above more general ones. The definition of FAITHONSET is given in (11).

(11) FAITHONSET:

Input segments in onset position must be preserved in the output.

As the tableau in (12) illustrates, the ranking of both FAITHONSET and OCP above MAX will ensure that the first segment in a disallowed consonant cluster will be deleted.⁷ In the tableau, the faithful output in (a) fatally violates the OCP constraint because the cluster with adjacent [labial] segments is still intact. Candidate (b) is ruled out because the onset segment is deleted instead of the coda, fatally violating FAITHONSET. The winning candidate, then, is [/ebas] in (c), which does not violate either constraint, though it does violate lower-ranked MAX.

⁵ I assume here that the liquids [r] and [l] are [+continuant].

⁶ See also Alderete (1997) who proposes an alternative approach to applying the OCP to these phenomena. He claims that OCP effects are the result of markedness constraints which are strengthened by the operation of Local Conjunction (Smolensky 1995, Kirchner 1996, Itô & Mester 1998). Alderete uses local conjunction of a constraint with itself (C^2_L) to disallow multiple violations of a constraint in a local context. In this way, the Wintu cooccurrence restrictions on adjacent consonants with identical features could alternatively be seen as the self-conjunction of a constraint on a feature within the domain of a cluster (e.g. $*[+labial]^2_{CC}$, $*[cor, +son]^2_{CC}$).

⁷ To prevent epenthesis from breaking up impermissible clusters, I am assuming that there is an undominated DEP constraint operating in this language.

(12) Ranking: OCP, FAITHONSET >> MAX

/>>ew+bas/	OCP	FAITHONSET	MAX
(a) >>ew-bas	*!		
(b) >>ewas		*!	*
... (c) >>ebas			*

3.2. RAISING and Low-Ranked Faithfulness

In addition to the constraints introduced in 3.1, there are several other constraints that are relevant for an account of the Wintu facts, including a well-formedness constraint and several low-ranked faithfulness constraints. The well-formedness constraint responsible for mid vowel raising is defined in (13).

(13) RAISING:

Avoid mid vowels before a low vowel with one consonant intervening.

This constraint requires that well-formed candidates must not have mid vowels before low vowels with only one intervening consonant. Like the OCP and FAITHONSET constraints, the RAISING constraint is also undominated in this language.

In addition to this well-formedness constraint which demands that mid vowels raise in certain contexts, an OT account of the Wintu facts also requires some antagonistic faithfulness constraints which compel input values for vowel height to remain unchanged. A list of all the constraints and their definitions is given in (14).

(14) Constraints defined:

- OCP: An output must not contain two adjacent identical elements from the same identity class.
- FAITHONSET: Input segments in onset position must be preserved in the output.
- RAISING: Avoid mid vowels before a low vowel with only one consonant intervening.
- IDENT[low]: A segment with some value for [low] in the input must correspond to a segment with that same value for [low] in the output.
- IDENT[high]: A segment with some value for [high] in the input must correspond to a segment with that same value for [high] in the output.
- MAX: Every segment in the input must have a correspondent in the output.

Since it is more important to raise a mid vowel to high before a low vowel than it is to preserve the input value for the feature [high], the well-formedness constraint RAISING must be ranked above the faithfulness constraint IDENT[high]. Furthermore, to prevent a mid vowel from lowering to satisfy the well-formedness constraint instead of raising, IDENT[low] must be ranked above IDENT[high]. The ranking of the constraints listed above is given in (15).

(15) Preliminary Wintu constraint ranking:

OCP, FAITHONSET, IDENT[low], RAISING, >> IDENT[high], MAX

The tableau in (16) illustrates how this ranking is able to correctly predict the optimal transparent candidate for the input form /lel+a/.

(16) Correct prediction of transparent output: /lel+a/ → [lila] ‘to transform’

/lel+a/	OCP	FAITHONS	IDENT[low]	RAISING	IDENT[high]	MAX
(a) lela				*!		
... (b) lila					*	
(c) lala			*!			

In this tableau, the OCP and FAITHONSET constraints do not come into play because there is no cluster in the input form. The faithful candidate in (a) fatally violates the RAISING constraint because it contains a mid vowel before a low vowel with a single consonant intervening. Candidate (c) with a low vowel is ruled out because it fatally violates the IDENT[low] constraint by changing the input value for the feature [low]. The winning candidate in (b) does violate IDENT[high], but because it is ranked below the other constraints, [lila] with the high vowel is selected as the optimal candidate.

However, as can be seen in (17), this same constraint ranking fails to predict the optimal opaque candidate for the input form />>ew+bas/.

(17) Incorrect prediction of opaque output: />>ew+bas/ → [>>ebas], * [>>ibas] ‘they, these’

/>>ew+bas/	OCP	FAITHONS	IDENT[low]	RAISING	IDENT[high]	MAX
(a) >>ew-bas	*!					
(b) >>ewas		*!				*
... (c) >>ebas				*!		*
˘ (d) >>ibas					*	*
(e) >>abas			*!			*

Candidate (a) with the intact cluster is eliminated due to its violation of undominated OCP. Candidate (b) likewise violates the undominated constraint FAITHONSET by deleting an onset consonant. Candidate (e) with the low vowel fatally violates IDENT[low] and so is ruled out as a potential winning candidate. The desired output, marked with the ‘...’, is the opaque candidate with the mid vowel and no cluster in (c), but it fatally violates the undominated RAISING constraint. The transparent candidate in (d) (indicated by the ‘˘’), which has a raised vowel and no cluster, is incorrectly predicted to be the winner. Since all of candidate (d)’s marks are ranked lower than the desired output candidate’s worst mark, there is no ranking of these constraints that will choose candidate (c) as the optimal output as well as correctly predict the optimal candidate in a perfectly transparent case such as the one in (16) above. This failure to correctly predict opaque forms is an indicator of the challenge that opacity poses for optimality theory. However, as will be shown in the next section, it is possible to successfully account for opacity effects within optimality theory by invoking sympathy.

4. A Sympathy Account

4.1. Opacity with Vowel Raising and Cluster Simplification

The problem to overcome in the OT account of Wintu is avoiding the selection of the transparent candidate in (17d), which meets the demands of both the RAISING and the OCP constraints by violating only the lower ranked faithfulness constraints. What should be noted is that the desired optimal candidate in (17c) more closely resembles a particular failed candidate in (17a) in terms of vowel height than the unintended winner does. This correspondence can be captured by a particular kind of faithfulness constraint that demands similarity between two output candidates. Correspondence theory has shown that an output form may be influenced by a variety of different faithfulness relations: between an input and an output (McCarthy & Prince 1995), between two morphologically related forms (e.g. Benua 1997, Dinnsen & McGarrity 1999), and between a base and a reduplicated or truncated form (e.g. Benua 1995, McCarthy & Prince 1995, Itô & Mester 1997). Therefore, McCarthy’s proposal of candidate-to-candidate faithfulness relations through sympathy is just an extension of the theory.

Sympathy theory, then, allows for the optimal output form to be sympathetically influenced by the properties of a particular failed output candidate. This failed ‘sympathetic’ or ↔-candidate is the most harmonic member of a candidate set that obeys a designated low-ranked IO-faithfulness constraint (called the ‘selector’) that the actual output form violates. According to McCarthy, the choice

of which selector constraint is used to choose the \Leftarrow -candidate is determined on a language-particular basis. The selector divides the candidate set into two subsets – those that violate the constraint, and those that obey it. The most harmonic member of the set that satisfies the constraint is selected as the \Leftarrow -candidate. The optimal candidate then emerges as the one that is most faithful to the \Leftarrow -candidate with respect to the sympathetic faithfulness constraint.

To apply sympathy to the Wintu case, it is necessary to determine the \Leftarrow -candidate. The \Leftarrow -candidate is selected by a low-ranked faithfulness constraint that the actual output violates, in this case MAX. The sympathetic candidate that is chosen by MAX is [\gg ewbas], which happens to be the fully faithful candidate, because it is the one among the candidate set obeying MAX that fares best with respect to the rest of the constraint hierarchy. The desired winner [\gg ebas] should resemble this failed sympathetic candidate in a way that the incorrect winner does not. In this case, it is more sympathetic or faithful to the \Leftarrow -candidate in terms of vowel height than the unintended winner [\gg ibas]. This implies a sympathetic constraint that demands preservation of vowel height between the optimal form and the object of sympathy. The sympathy constraint for the Wintu opacity problem is defined below in (18).

(18) Sympathy constraint:

\Leftarrow IDENTHEIGHT: Preserve the vowel height of the sympathetic candidate in the output.

This constraint must be relatively high-ranking for its effects to be evident in the language. It must crucially dominate RAISING to ensure that the correct optimal candidate which violates RAISING is chosen over the other candidates. The ranking of this constraint with respect to the rest of the constraint hierarchy is given in (19).

(19) Ranking:

OCP, FAITHONSET, IDENT[low], \Leftarrow IDENTHEIGHT \gg RAISING \gg IDENT[high], MAX \Leftarrow

(20) Sympathy correctly predicts opaque output: / \gg ew+bas/ \rightarrow [\gg ebas] ‘they, these’

	/ \gg ew+bas/	OCP, FAITHONS	IDENT [low]	\Leftarrow IDENT HEIGHT	RAISING	IDENT [high]	MAX \Leftarrow
\Leftarrow (a)	\gg ewbas	*!					✓
(b)	\gg iwbas	*!		*		*	✓
... (c)	\gg ebas				*		*
(d)	\gg ibas			*!		*	*
(e)	\gg abas		*!	*			*

With the introduction of the sympathetic constraint into the tableau, the opaque optimal candidate can now be correctly chosen over the incorrect winner with a high vowel that was chosen in the tableau in (17). The tableau in (20) demonstrates how this ranking correctly yields the desired output form for input / \gg ew+bas/. In this tableau, candidates (a) and (b) both satisfy the low-ranked selector constraint MAX (indicated with the ‘ \Leftarrow ’ subscript) so both are potential \Leftarrow -candidates.⁸ Candidate (a), however, is the most harmonic and is chosen as the object of sympathy since it only violates OCP while candidate (b) violates OCP as well as IDENT[high].⁹ Both are failed candidates with respect to the rest of the constraint hierarchy, though, since they each violate an undominated constraint. Candidate (d), which had earlier emerged as the incorrect winner in the tableau in (17) now fatally violates the sympathy constraint \Leftarrow IDENTHEIGHT since it does not preserve the vowel height of the sympa-

⁸ While the faithfulness constraint IDENT[high] is also low-ranked and might seem to be a possible selector constraint, it would incorrectly choose the non-raised mid vowel for the transparent case of /lel+a/ \rightarrow [lila].

⁹ Crucially, the sympathetic faithfulness constraint is invisible for the purpose of selecting the \Leftarrow -candidate.

thetic candidate. Candidate (e) also fatally violates this constraint. Because \Leftarrow IDENTHEIGHT is crucially ranked above the RAISING constraint, the opaque candidate in (c) is now able to emerge as the optimal candidate.

Ranking the sympathy constraint with the rest of the constraint set does not interfere with the selection of the optimal candidate in the transparent case, as the tableau in (21) shows for output [lila].

(21) Sympathy correctly predicts transparent output: /lel+a/ \rightarrow [lila] ‘to transform’

/lel+a/	OCP, FAITHONS	IDENT [low]	\Leftarrow IDENT HEIGHT	RAISING	IDENT [high]	MAX \Leftarrow
(a) lela			*!	*		✓
... (b) lila					*	✓
(c) lala		*	*!			✓

In this case, low-ranked MAX selects the candidate in (b) as the sympathetic candidate because even though all three candidates satisfy the constraint, the candidate in (b) is selected as the \Leftarrow -candidate because it is the most harmonic. The sympathy constraint then eliminates candidates (a) and (c) since they do not preserve the vowel height of the \Leftarrow -candidate. This leaves the transparent form in (b), which is selected as both the \Leftarrow -candidate and the optimal output form.

4.2. Opacity with Non-Raising Mid Vowels

In addition to the type of opacity involving vowel raising and cluster simplification discussed in the previous section, Wintu also exhibits a different kind of opacity. This second instance of opacity obtains as a result of the fact that some mid vowels do not raise before low vowels, even when there is no cluster underlyingly.

In his (1998) paper, McCarthy discusses languages that have multiple opaque interactions. In these languages, he explains, different IO faithfulness constraints can each select distinct \Leftarrow -candidates. As a result, these \Leftarrow -candidates can be subject to distinct sympathetic relations with the rest of the candidate set. In other words, he maintains that there is no prohibition against having distinct, separately ranked sympathetic faithfulness constraints in force on the two correspondence relations at any one time. However, as the facts of Wintu will show, distinct \Leftarrow -candidates may also be subject to the same sympathy relation. Specifically, two faithfulness constraints MAX and IDENT[ATR] act as selectors for choosing distinct \Leftarrow -candidates for the two different cases of opacity. I argue based on the Wintu data that the same sympathetic faithfulness constraint \Leftarrow IDENTHEIGHT is responsible for the correspondence relation between each of the \Leftarrow -candidates and the rest of the candidate set.

According to Pitkin (1984), there are some phonetic mid vowels in Wintu that are derived from the underlying vowels /e/ and /o/ that do not undergo vowel raising before low vowels or in any context. However, other surface mid vowels that are phonetically identical do undergo raising. He posits that these mid vowels are derived from underlying archiphonemes /E/ and /O/.¹⁰ When these vowels occur in contexts other than before a low vowel, they undergo absolute neutralization and are realized on the surface as [e] and [o].¹¹

¹⁰ According to Alice Shepherd (personal communication), these mid vowels that undergo raising are historically descendent from high vowels.

¹¹ A similar case of opacity due to absolute neutralization can be seen in Barrow Inupiaq (Archangeli & Pulleyblank 1994) whereby an *i* derived from underlying /i/ triggers palatalization, but an *i* derived from underlying / $\frac{1}{2}$ / (or an archiphoneme /I/) does not. See also Schindwein Schmidt (1996) for an underspecification analysis of a similar case of vowel raising and absolute neutralization in Basaa.

I argue that the differential behavior of these two types of mid vowels motivates an underlying featural distinction. For ease of exposition, the feature [\pm ATR] will be used to distinguish between the two types of mid vowels at the underlying level of representation, though it is not crucial what specific feature is used as long as some kind of underlying distinction is made. As a result, the analysis must account for the fact that only the [-ATR] mid vowels /E/ and /O/ undergo raising while the [+ATR] mid vowels /e/ and /o/ do not. In derivational terms, the raising rule would have to be ordered in a counterbleeding relationship with the rule of absolute neutralization to produce the correct surface forms. For an input with a [-ATR] mid vowel before a low vowel, the raising rule would apply first, raising the mid vowel to a high vowel. The neutralization rule would then get to apply, changing it to [+ATR]. This would produce an opaque surface form in which it appeared that the raising rule should not have applied but did. If the rules were to apply in the opposite order, the rule of absolute neutralization would change the underlying [-ATR] mid vowel to [+ATR], thereby bleeding the application of the raising rule and creating an incorrect surface form.

In order to account for these facts, the well-formedness constraint RAISING must be redefined to prohibit only [-ATR] mid vowels from occurring before low vowels in a following syllable. Furthermore, additional constraints are necessary for a sympathy account of this type of opacity. These constraints and a new ranking are given below in (22).

- (22) RAISING redefined and additional constraints:
 RAISING: Avoid [-ATR] mid vowels before a low vowel with only one consonant intervening.
 *[-ATR]: Avoid [-ATR] vowels.
 IDENT[ATR]: Preserve the input value for the feature [ATR] in the output.
 Ranking: OCP, FAITHONSET, IDENT[low], \Leftarrow IDENTHEIGHT \gg RAISING \gg *[-ATR] \gg IDENT[high], IDENT[ATR], MAX

The well-formedness constraint *[-ATR] achieves the effect of absolute neutralization by barring all [-ATR] vowels from occurring in the output. RAISING must be ranked above *[-ATR] because it is a more specific instance of the constraint – it prohibits [-ATR] mid vowels from occurring in a particular context, namely before low vowels. Because [-ATR] vowels never surface in Wintu, *[-ATR] must be ranked above the antagonistic faithfulness constraint IDENT[ATR] which demands that output forms preserve the input value for the feature [ATR].

Consider the tableau in (23), which evaluates an input form /lEl+a/ with a [-ATR] mid vowel that raises before a low vowel to produce the output form [lila].¹²

(23) Sympathy constraint \Leftarrow IDENTHEIGHT predicts optimal opaque output: /lEl+a/ \rightarrow [lila]

/lEl+a/	OCP, FAITHONS	\Leftarrow IDENT HEIGHT	RAISING	*[-ATR]	IDENT [high]	IDENT [ATR] _{\Leftarrow}	MAX
(a) lEla		*!	*	*		✓	
(b) lela		*!				*	
\Leftarrow (c) llla				*!	*	✓	
... (d) lila					*	*	

In this tableau, the low ranked faithfulness constraint IDENT[ATR] acts as the selector constraint. Of the two competing candidates that satisfy the constraint, candidate (c) with the [-ATR] high vowel is selected as the \Leftarrow -candidate because it is most harmonic. The same sympathy constraint as in the previous case of opacity discussed in section 4.1, \Leftarrow IDENTHEIGHT, selects candidate (d) as the opti-

¹² I use capital letters to indicate [-ATR] vowels. In the interest of space, I do not include the constraint IDENT[low] or any candidates violating it in the subsequent tableaux.

mal candidate due to its faithfulness to the vowel height of the sympathetic candidate. Without sympathy, the transparent candidate in (b) with the [+ATR] mid vowel would have been incorrectly chosen as the winning output.

Consider now a word that has an underlying [+ATR] mid vowel that surfaces as such and does not raise before a low vowel. An example is given in the tableau in (24).

(24) Sympathy correctly predicts transparent output: /kel+a/ → [kela] ‘to be tall’

/kel+a/	OCP, FAITHONS	↔IDENT HEIGHT	RAISING	*[-ATR]	IDENT [high]	IDENT [ATR] _↔	MAX
... ↔ (a) kela						✓	
(b) kEla			*!	*		*	
(c) kila		*!			*	✓	
(d) kIla		*!		*	*	*	

This example shows that sympathy does not interfere with choosing the correct output in the transparent case. In this tableau, the two candidates (a) and (c) satisfy the low-ranked selector constraint IDENT[ATR] and thus are potential ↔-candidates. Candidate (a) is chosen as the object of sympathy because it does not violate any constraints whereas candidate (c) violates IDENT[high]. Because it is completely faithful to the input form, the transparent candidate in (a) is chosen as the optimal output form. Candidates (c) and (d) fatally violate the sympathy constraint since they do not preserve the vowel height of the ↔-candidate, while candidate (b) fatally violates the RAISING constraint since it has a [-ATR] mid vowel before a low vowel.¹³

¹³ An alternative analysis to the one presented here that should be considered is that it is not the [-ATR] mid vowels /E, O/ that raise before low vowels, but the [+ATR] mid vowels /e, o/. If such were the case, an input with a [-ATR] mid vowel such as /kEl+a/ would be realized on the surface with a [+ATR] mid vowel (i.e. [kela]) because it would fail to undergo raising for not meeting the structural description of the rule but would then undergo absolute neutralization. A derivational account would achieve this result by ordering the vowel raising rule before the absolute neutralization rule in a *counterfeeding* relationship. Consider the following derivations.

(i) UR	/kEl+a/	/lel+a/
raising	----	lila
neutralization	kela	----
PR	[kela]	[lila]

The raising rule would have to apply before the neutralization rule to produce the correct surface forms. If the rules were to apply in the opposite order, the input [-ATR] mid vowel for input /kEl+a/ would be neutralized to a [+ATR] mid vowel which would then feed the raising rule, causing it to produce an incorrect phonetic form with a high vowel (i.e. *[kila]). While an analysis making these assumptions would be a conceivable alternative to the one proposed in this section for the second case of opacity, an OT account of these facts would predict the wrong output form for the word [kela] ‘to be tall’, which should surface with a [+ATR] mid vowel. That an unintended winner would result from such an account is shown in the tableau in (ii) below.

(ii) Incorrect prediction of [-ATR] vowel in the output: /kEl+a/ → [kela], *[kEla] ‘to be tall’

/kEl+a/	OCP, FAITHONS	↔IDENT HEIGHT	RAISING	*[+ATR]	IDENT [high]	IDENT [ATR] _↔	MAX
... (a) kela			*!	*		*	
↔ (b) kEla						✓	
(c) kila		*!		*	*	*	
(d) kIla		*!			*	✓	

5. Discussion and Conclusion

The analysis presented here of two separate cases of opacity in Wintu has certain implications for sympathy theory. First of all, it was noted that McCarthy has discussed other examples of languages that exhibit multiple cases of opacity. In such languages, he claims that different IO faithfulness constraints can each select distinct \Leftarrow -candidates and that these \Leftarrow -candidates can each be subject to distinct sympathetic relations with the rest of the candidate set. In other words, he shows that a language can have distinct, separately ranked sympathy constraints enforcing two different correspondence relations at any one time. However, as I have attempted to argue in this paper, this does not necessarily have to hold for all cases of multiple opacity. In presenting the Wintu facts, I have shown that distinct \Leftarrow -candidates chosen by two different selector constraints may also be subject to one and the same sympathy relation.

In the first type of opacity discussed, the low-ranked faithfulness constraint MAX acted as the selector for choosing the \Leftarrow -candidate in the case of />ewbas/, which is realized phonetically in Wintu as [>>ebas]. According to McCarthy, the selector constraint is a language-specific, low-ranked IO faithfulness constraint that is satisfied by the \Leftarrow -candidate but which the actual output form violates. In this example, the actual output form [>>ebas] does violate MAX, whereas the fully faithful \Leftarrow -candidate [>ewbas] does not. Since the desired output form resembles the \Leftarrow -candidate in terms of vowel height, the sympathetic faithfulness constraint \Leftarrow IDENTHEIGHT is then responsible for the correspondence relation between the \Leftarrow -candidate and the rest of the candidate set.

In the second case of opacity, however, a different selector constraint was needed to choose the \Leftarrow -candidate. In the forms discussed in section 4.2, where some mid vowels were shown to raise before a low vowel in the following syllable but others did not, cluster simplification was not involved. Therefore, the constraint MAX was not relevant in evaluating the most likely competing candidates. Since the selector is supposed to be a faithfulness constraint that the \Leftarrow -candidate obeys but the actual output form violates, MAX cannot act as the selector for this type of opacity because none of the competing candidates, including the optimal candidate, violates it. Another low-ranked faithfulness constraint IDENT[ATR] must act as the selector for this instance of opacity and choose the \Leftarrow -candidate which the optimal candidate must resemble. However, even though a different selector constraint is necessary to choose the \Leftarrow -candidate for this type of opacity, the same sympathy constraint as in the previous case, \Leftarrow IDENTHEIGHT, is able to compel correspondence between the \Leftarrow -candidate and the optimal opaque output form.

These facts not only offer support for sympathy theory in general as a way of resolving opaque phenomena within OT, but also offer support for the universality of sympathy constraints. The fact that one sympathetic correspondence is responsible for compelling candidate-to-candidate faithful-

In considering an analysis where only [+ATR] mid vowels undergo raising, the hypothetical input form for this word must have a [-ATR] mid vowel, since this word is known empirically to fail to undergo raising. The RAISING constraint would likewise have to be formulated so as to prevent the occurrence of [+ATR] mid vowels before a low vowel. This would mean that the desired optimal output in (a) would violate this constraint. Similar to how the constraint operates in the tableaux in (23) and (24), the RAISING constraint would be a more specific instance of a lower ranked well-formedness constraint *[+ATR], which prohibits [+ATR] vowels in general. Since the Wintu vowels are all [+ATR] on the surface, it is possible, for the purposes of this illustrative example, that this constraint could be very low ranked. Regardless, the incorrect result still obtains no matter what the position of the *[+ATR] constraint in the ranking. Since the desired winner with a [+ATR] mid vowel is eliminated by the RAISING constraint, sympathy would be required to select the optimal output form. However, candidate (b) with the [-ATR] mid vowel would be chosen as the \Leftarrow -candidate by the selector constraint IDENT[ATR] since it does not violate any constraints; it is completely faithful to the input representation and is thus the most harmonic. As a result, it would surface as the unintended winner due to its compliance with the sympathy constraint.

ness in two separate cases of opacity distinguishes Wintu from the languages with multiple opacity that McCarthy describes in his paper. It lends new insight into how sympathetic correspondences can be viewed and may eventually provide support for McCarthy's revised proposal of sympathy theory (this volume), which places greater restrictions on sympathy by eliminating the notion of candidate-to-candidate faithfulness and proposes a general \Leftarrow SYM constraint to assess the cumulativity of IO-faithfulness violations.

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