Looking through opacity[1]

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1. Introduction

Comparative Markedness deals with alternations which are problematic for classical Optimality Theory such as counterfeeding opacity. In Sea Dayak, for example, the distribution of nasal and oral vowels is generally predictable: after a nasal consonant, a vowel is typically nasal and after an oral consonant, the vowel is oral. However, an oral vowel also occurs after a nasal consonant just in case the consonant is optionally followed by an oral stop, as in [rambo?] ~ [ramo?] 'a kind of flowering plant'. The orality of the postnasal vowel in such cases is thus opaque (Scott 1957, 1964). Representative forms are shown in (1).

(1) *Sea Dayak* (originally from Scott 1957)

nãŋã?	'straighten'
nãŋga? ~ nãŋa?	'set up a ladder'
rambo? ~ ramo?	'a kind of flowering plant'

Opacity of this type has been brought to the forefront of phonological theory by Optimality Theory, precisely because it is difficult to formalize in a surface-oriented theory. Some accounts have gone so far as to claim that constraint interaction *explains* the occurrence of opacity (see, e.g., Ito and Mester 1999). We argue in section 2 that it is not necessary for OT formalism to explain the existence of opacity because historical linguistics provides us with adequate explanation; instead, the concern of phonological theory is how a speaker synchronically manages opacity. In section 3, we show that some cases of opacity that were previously considered problematic for a surface-oriented formal model of synchronic phonology can be reanalyzed in a manner that renders the phonological patterns transparent. These findings converge to an extent with Sanders'

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(2003) independent research on the topic. The cases we examine involve opacity in Sea Dayak, Canadian English and Barrow Inupiaq. Our conclusion is that the additional machinery of Comparative Markedness theory is unnecessary to account for such cases of opacity. We conclude with some speculative remarks on the role of the lexicon in predicting sound patterns.

2. A Diachronic Explanation for Opacity

A fundamental issue in the study of opacity in phonology concerns its origin. Kiparsky (1968, 1971) argues that rule ordering in synchronic grammars reflects the order in which sound changes occurred. Rules that apply later in a derivation are more recent additions to the grammar, so ordered rules are essentially a recapitulation of the historical changes that gave rise to a particular form. Recapitulating historical changes can, however, lead one to incorrectly overburden the synchronic phonology. In this respect, Pinker (1999:100) criticizes Chomsky and Halle's (1968) account of the English irregular past tense, e.g. *sing/sang*, *bring/brought*, where they propose three rules to account for all irregular forms (see also Halle and Mohanan 1985), for the following reason:

> Any theory that can tame the quintessentially unruly English irregular past-tense system with only three rules, each delicately adjusting a single feature, is undeniably brilliant. But is it true? Not necessarily. One problem comes from the assumption that every scintilla of patterning in the verb system needs an explanation in terms of the psychology of speakers, in particular that the patterns are distilled out into rules in the mind. Chomsky, Halle, and Mohanan's rule-by-rule derivations often recapitulate the history of a past-tense form in English over the centuries—deliberately—and that brings to mind an alternative explanation… that the patterns are fossils of rules that died long ago. The surviving past-tense forms, semilawful though they are, could simply be memorized by today's generation without any help from the rules.

Among the phenomena that the term *opacity* is used to describe are cases in which the environment relevant for a generalization is obscured by a later change. This is exemplified by Latin rhotacism. Latin underwent a series of sound changes *[s] > *[z] > [r] which were complete by around 600 BC (Anttila 1989:89, Kiparsky 1971), resulting in synchronic morphophonemic alternations such as *honōs/honor-is* 'honor', and *nefās/nefārius* 'impious' where word-final [s] alternates with intervocalic [r]. This

change had no effect on geminate *[ss] (derived from /d+t/ and spelled *ss* in Old Latin), and the subsequent degemination of *[ss] created words such as *dīvīsus* 'divided' and *causa* 'cause'. Consequently, the generalization that [s] did not occur intervocalically in Latin was no longer surface-true. Further, not every word-final [s] alternated with intervocalic [r], due to late borrowings such as *ros-a* 'rose'. Thus, an opaque alternation was born.

Historical phonology can explain why particular cases of opacity have arisen, but it does not explain how speakers deal with opacity synchronically. For a synchronic rule-based grammar, opacity is unremarkable because rules modeled after the hypothesized sound changes could be sequenced to reenact the diachronic changes, and therefore arrive at the correct output. However, with only an input and an output, classical Optimality Theory (Prince and Smolensky 1993) is unable to account for opaque alternations in the fashion of rule-based analyses because representing opacity crucially requires a third form in the relationship, such as the intermediate level of representation. The proposals to patch this particular hole in Optimality Theory's coverage have introduced strategies for a counterpart to a derivational intermediate level of representation.

3. A Synchronic Formalization of Opacity in OT

Comparative Markedness (McCarthy 2003) simulates an intermediate level of representation by introducing markedness constraints which mimic sequential application, and thereby reflect counterfeeding rule orders. Kenstowicz and Kisseberth (1979:314-15) show that the occurrence of a post-nasal oral vowel in Sea Dayak can be analyzed by ordering vowel nasalization before deletion of a post-nasal stop. McCarthy (2003) analyzes Sea Dayak in Comparative Markedness theory by ranking faithfulness below a constraint prohibiting *old* sequences of nasal consonant + oral vowel, and above a constraint prohibiting *new* sequences of nasal consonant + oral vowel.[2] We return to McCarthy's analysis of Sea Dayak in section 3.1.

[2] McCarthy (2003:53) does note that this case is somewhat problematic for his proposal, a point we return to in section 3.1.

It is no surprise that modifications of Optimality Theory which effectively reintroduce the intermediate level of representation would be more adept at recapitulating non-simultaneous historical changes. This paves the way for Optimality Theory to echo the historical sound changes of a language. There is a harmful side-effect to this, however. A phonology that mirrors diachrony can shy away from some difficult and unanswered questions: Which phonological processes are active, and which are sound changes that have run their course? What are the limits of phonological generalization? Which items in the lexicon are chance diachronic relics, and which are the basis for generalizations made by speakers?

Opacity plays a central role in the competition between enhancements of Optimality Theory. But exactly how opaque is opacity? In Optimality Theory, opacity exists when a phonological alternation or phonotactic pattern implies the existence of a particular constraint, yet this constraint is violated inexplicably. For example, the account of opacity in Sea Dayak involves a constraint against nasal consonants followed by oral vowels, but surface forms violate this constraint, even though there is no other evidence of a higher-ranked constraint that would cause this behavior. Yet, are such cases of opacity truly problematic for classical OT? We suggest that they are not for a number of reasons.

First, in some instances an alternative non-opaque analysis exists, which obviates the need for special treatment. Second, many cases of opacity are non-productive or infrequent enough to be considered lexical. Third, some opaque data represent a morphological pattern that, while phonologically conditioned, exists outside the scope of Optimality Theory phonology (see Sanders 2003). In this commentary, we focus on the first two types of opacity noted above: allophonic opacity and lexicalized opacity. As we hope to show, in neither case is recourse to Comparative Markedness theory required to account for the observed patterns. In the first case we argue that reanalysis of the patterns causes opacity to disappear, while in the second case we argue that the alternations can be dealt with as lexicalized suppletion.

3.1. Apparent Allophonic Opacity

In this section we look at a particular subset of opacity cases that have proved troublesome for Comparative Markedness theory: opacity in allophonic processes. One such case involves Sea Dayak. It will be recalled from (1) that opacity in the language involves the occurrence of a post-nasal oral vowel in forms in which the presence of an intervening oral voiced stop is optional, e.g. [rambo?] ~ [ramo?] 'a kind of flowering plant'. In other contexts, the distribution of oral and nasal vowels is predictable: oral vowels follow oral segments and nasal vowels follow nasal segments. McCarthy (2003) suggests an account within Comparative Markedness theory using "old" and "new" versions of the markedness constraint *NV_{Oral}: post-nasal oral vowels are prohibited. The crucial ranking positions the "old" constraint, $_{O}$*NV_{Oral} above the relevant faithfulness constraint, itself ranked above the "new" $_{N}$*NV_{Oral} constraint. This ranking allows oral vowels to surface following a nasal provided that this violation is not inherited from the input. As McCarthy points out, however, this analysis alone is unable to successfully generate the correct patterns when Richness of the Base is assumed; the model would predict the input /nãŋgã/ to map variably to either [nãŋa?] or *[nãŋã?] creating an alternation in nasality not attested in the data.

McCarthy explains the difficulty caused by near-allophony in cases such as Sea Dayak and Canadian English as follows:

> More generally, the problem is this. In cases of allophony, richness of the base entails that the input is relatively indeterminate. But comparative markedness theory relies on the input and its surrogate, the FFC, to evaluate markedness. Opacity of basically allophonic processes presents the same challenge to comparative markedness or sympathy as it did to the structuralists... it looks as if another level if representation is required. (McCarthy 2003:54)

We would suggest, however, that these cases are amenable to reanalysis that is transparent. By analyzing the patterns as basically contrastive, as opposed to allophonic, the cases no longer pose a challenge to Comparative Markedness theory or to classical OT.

As noted above, in Sea Dayak the distribution of nasal vowels is generally predictable: after a nasal consonant, a vowel is typically nasal while after an oral consonant, the vowel is oral. Following McCarthy (2003), these patterns can be attributed to a constraint prohibiting an oral vowel after a nasal consonant: *NV_{oral}. Recall that an oral vowel does occur after a nasal consonant when the consonant is optionally followed by an oral stop, as in [rambo?] ~ [ramo?] 'a kind of flowering plant'.

Of particular interest to the present analysis is the observation that when the oral stop does not surface, a surface contrast exists between oral and nasal vowels: [ramo?] 'a kind of flowering plant' vs. [ramõ?] 'timber'. The presence of this surface contrast suggests to us that the distribution of oral and nasal vowels in Sea Dayak need not be treated as "basically allophonic." Rather, since the nasality of vowels is the only difference between minimal pairs on the surface, we propose that this contrast form the basis of a surface-based analysis; ignoring it is an invitation to failure. In what follows, we outline our proposed analysis of nasalization in Sea Dayak, assuming contrastive nasality in vowels.

While nasal vowels only occur following another nasal segment, oral vowels are not constrained by this requirement; as we have seen, on the surface they occur after oral as well as nasal consonants. We formulate the nasal vowel pattern as the positive constraint in (2).

(2) NASALCONDITION (NASALCOND): Nasal vowels are prohibited except when preceded by a nasal segment.

We view NASALCOND as similar in spirit to the coda condition proposed in Itô (1986, 1989) for Japanese: place specification is prohibited in coda position except when the consonant is followed by a homorganic or identical consonant. In other words, place is licensed by a following consonant in Japanese, just as the nasality of a vowel is licensed by a preceding nasal in Sea Dayak.

NASALCOND is crucially ranked above the vowel-nasality faithfulness constraint, IDENT-V[nasal], which penalizes a change in the value of the feature [nasal] on a vowel between input and output. The following tableaux predict the correct nasal vowel qualities. (Note that while we assume the inputs /rambo/ and /ramõ/ in (3), this is not crucial to the analysis, as will be seen further below.)

(3) Sea Dayak: contrastive nasality in vowels

/rambo/	NASALCOND	IDENT-V(Nasal)
a. ☞ ramoʔ		
b. ramõʔ		*!
c. rãmoʔ	*!	*
d. rãmõʔ	*!	**
/ramõ/		
e. ramoʔ		*!
f. ☞ ramõʔ		
g. rãmoʔ	*!	**
h. rãmõʔ	*!	*

Not yet accounted for is the observation that an oral stop occurs variably after a nasal consonant. Note that the optional stop is always homorganic with the preceding nasal. Based on these observations, we draw on a constraint against homorganic N + stop clusters, formulated in (4).

(4) *N D (*ND): A homorganic nasal stop cluster is prohibited.

[place]

As we show in (5), the variable ranking of *ND and *NV[oral] correctly predicts the observed patterns: both [rambo?]/[ramo?] are viable realizations of the same word. It can be seen that while the contrastive oral vowel quality is lexically present, the presence or absence of the oral stop is entirely predictable, regardless of which input is assumed.

(5) Sea Dayak: contrastive vowel orality and variable stop realization

/ramo/	NASALCOND	IDENT-V[nasal]	*ND	*NV_{Oral}
a. rambo?			*!	
b. ☞ ramo?				*
c. rambõ?	*!	*	*	
d. ramõ?		*!		
/rambo/				
e. ☞ rambo?				*
f. ramo?			*!	
g. rambõ?	*!	*		*
h. ramõ?		*!		

The proposed constraints and rankings also correctly predict that only a nasal vowel may occur in [ramõ?], as shown in (6). Note also that regardless of which input is assumed in (5) and (6), only the three observed surface realizations are selected.

(6) Sea Dayak: contrastive vowel nasality

/ramõ?/	NASALCOND	IDENT-V[nasal]	*ND	*NV_{Oral}
a. rambo		*!	*	
b. ramo		*!		*
c. rambõ	*!		*	
d. ☞ ramõ				
/rambõ?/				
e. rambo		*!		*
f. ramo		*!	*	
g. rambõ	*!			*
h. ☞ ramõ				

An important consequence of the proposed reanalysis of Sea Dayak is that by focusing on an existing surface contrast rather than on a partial allophonic pattern, we obviate the need to assume additional machinery to account for the apparent opaque orality of vowels in the language.

The interaction between raising and flapping in Canadian English is another classic case of opacity, and we suggest that it too can be described transparently through attention to surface contrasts of the language. In Canadian English, the diphthongs [ʌw, ʌy] occur only before voiceless consonants (*right*, *bike*, *rice*, *house*, *shout*, etc.). The lower

diphthongs [aw, ay] occur elsewhere, i.e. before voiced segments (*to house*, *shroud*, *ride*, *rise*), and at the ends of words (*cow*, *buy*). This straightforward generalization is complicated by the observation that both higher and lower diphthongs occur before the voiced flap, i.e., *writer* and *rider* keep their higher and lower diphthongs, respectively. There is no vowel neutralization, just neutralization of the voicing of the following stop consonant. A rule-based account maintains the simple generalization that the higher variant occurs before voiceless consonants by ordering raising before flapping.

In standard OT, where no sequential ordering of processes is available, the Canadian raising pattern is potentially troublesome. However, it is only problematic if flapping after diphthongs is regarded as a neutralizing process, and flapping after diphthongs is only neutralizing if the remaining voicing cue (preceding diphthong height) is disregarded. Limiting the analysis to segment-internal cues means that the two flaps are indistinguishable. However, by considering other voicing cues, such as the duration of the preceding vowel (in many varieties of English), or the height of a preceding diphthong (in Canadian English), the voicing value of the flap is completely recoverable, even without recourse to orthography or to less ambiguous members of each paradigm such as *write and ride*.

An alternative solution rests on the surface of the language: outputs such as *riding/writing* show that the "opaque" vowel quality forms a minimal contrast in the language: [rayɾɪŋ] 'riding' vs. [rʌyɾɪŋ] 'writing'. Following the same strategy used to analyze Sea Dayak, we assume that the series of higher and lower diphthongs is basically contrastive, though predictable in one context. Given this, our analysis is as follows.

(7) FAITH[HIGHERV, LOWERV] (FAITHV): correspondent diphthongs in the input and output have identical feature values.
*FTMED{td}: foot-medial [t] and [d] are prohibited.
HIGHERVCONDITION (HVCOND): a higher diphthong [ʌy,ʌw] is prohibited except before a [-voice] segment.
LOWERVCONDITION (LVCOND): a lower diphthong [ay, aw] is prohibited before a [-voice] segment.
IDENT[voice]: correspondent segments in the input and output have identical

values for the feature [voice].

In (7) we outline the constraints assumed in this analysis. Since vowel quality is surface-contrastive, the vowel faithfulness constraint, formulated in general terms as FAITHV, is undominated. The constraint forcing intervocalic flapping (*FTMED{td}) is likewise surface-true and so is also effectively undominated.[3] The markedness constraints regulating the distribution of the diphthongs (HIGHERVCOND, LOWERVCOND) are violable. However, in the context of flapping, their relative ordering is unimportant since vowel quality is not neutralized. Both are ranked above IDENT[voice], as will be shown below.

(8) FAITH -V, *FTMED{td} >> HIGHERVCOND, LOWERVCOND >> IDENT[voice]

These constraints trivially derive the inflected forms.

(9) Canadian English: contrastive vowel quality and inflected forms

/raydɪŋ/	FAITH -V	*FTMED{td}	HVCOND	LVCOND	IDENT[vc]
a. raydɪŋ		*!			
b. ☞ rayɾɪŋ					
c. rʌydɪŋ	*!	*	*		
/rʌytɪŋ/					
d. rʌytɪŋ		*!			
e. ☞ rʌyɾɪŋ			*		*
f. rayɾɪŋ	*!				*

Yet, this account does not explain the distribution of the diphthongs: why do raised diphthongs generally only occur before voiceless obstruents and some flaps?

An answer worth considering is that the distribution is a historical relic: while the vowels are no longer in allophones, the artifacts of their previously allophonic distribution still linger in the lexicon. Not all sound patterns in language are necessarily endemic of a speaker's synchronic grammar, and the regularity with which sound change can occur can always confound the distribution of sounds within a lexicon in relation to the active

[3] We assume an additional undominated constraint which prohibits voiceless flaps.

grammar that manipulates it. This approach is supported by the limited extent of Canadian English raising: Bermúdez-Otero (2003) reports that raising does not occur before certain suffixes such as *–ful* and *–ship*, exemplified by the contrast *Eiffel* [ayfəl] and *eyeful* [ʌyfəl]. Moreover, lexical exceptions exist for many speakers, such as *Cyclops* [sayklaps] in opposition to *micron* [mʌykran] (consistent with our fieldwork; see also Hayes (1999) and Vance (1982)).

However, attributing the patterns solely to the lexicon is not the most satisfactory solution since the distribution is still largely predictable from the constraints above. The crucial aspect is that the markedness constraints which favor the higher diphthongs before voiceless stops and the lower diphthong before voiced stops can force the generation of the proper phonotactics. As the following tableaux reveal, this result is assured by the ranking of HIGHERVCOND and LOWERVCOND above IDENT[voice]. Thus, the same constraints as above (save for the irrelevant flapping constraint) correctly predict the distribution of raised and non-raised diphthongs in non-flapping environments.

(10) Canadian English: the predictable distribution of diphthongs and obstruent voice

/rayt/	FAITH-V	*FTMED{td}	HVCOND	LVCOND	IDENT[vc]
a. rayt				*!	
b. ☞ rayd					*
c. rʌyt	*!				
d. rʌyd	*!		*		*
/rʌyt/					
a. rayt	*!			*	
b. rayd	*!				*
c. ☞ rʌyt					
d. rʌyd			*!		*
/rayd/					
a. rayt				*!	*
b. ☞ rayd					
c. rʌyt	*!				*
d. rʌyd	*!		*		
/rʌyd/					
a. rayt	*!			*	*
b. rayd	*!				
c. ☞ rʌyt					*

d.	rʌyd			*!		

Our accounts of Sea Dayak and Canadian English reveal that some apparently opaque outputs, namely, opaque allophony, can actually be analyzed in a surface-transparent manner. The crucial step in these two analyses is to account first for what is surface-true, and then from that build upon the constraints that might explain the violable phonological patterns of the language. By doing so, analyses emerge that place no demands on classical Optimality Theory that it cannot already satisfy. We suspect that upon closer scrutiny, other cases of allophonic opacity will lend themselves to similar reanalyses.

While our analysis of Canadian Raising succeeds in transparently accounting for the observed data, we cannot help but speculate that a more satisfying explanation would directly incorporate the relationship between phonological voicing and preceding vowel length. In many Germanic languages, the ratio of vowel duration to consonant duration is a cue to postvocalic consonant voicing (see Port 1996 and references therein). This ratio is a cue in the near-merger of *writer* and *rider* in American English, and Canadian Raising occurs in precisely the same environments as vowel lengthening in other Germanic languages. As Port (1996) observes, the tendency to view segments as discrete elements leads to the analysis of vowel raising and consonant voicing as separate contrasts, and this misses an important generalization about the interrelatedness of the phonetic realization of vowels and consonants in phonological contrast.

3.2. Lexicalized Opacity

We turn now to a different class of opacity which, similar to the ones above, we argue is also non-problematic. The cases involve patterns which are either non-productive or, as we show, continue to be productive only in a very limited and non-opaque sense. Such cases, we would suggest, are best considered lexicalized since the conditioning factors are no longer phonological in nature.

Consider the case of Barrow Inupiaq. In this language, suffix-initial alveolars are palatalized after some roots with [i] (11a), but not after others (11b) (Kaplan 1981:82).

(11) Barrow Inupiaq progressive palatalization:

	stems	*enclitic 'and'*	*pl. modalis*	*sg. aequalis*	*gloss*
a.	iki	ikiʎu	ikiñik	ikisun	'wound'
	savik	savigʎu	savigñik	saviksun	'knife'
	qimmiq	qimmiʀʎu	qimmiñik	qimmisun	'dog'
b.	ini	inilu	ininik	initun	'place'
	kamik	kamiglu	kamignik	kamiktun	'boot'
	aiviq	aiviʀlu	aiviʀnik	aiviqtun	'walrus'
	iglu	iglulu	iglunik	iglutun	'house'

Following Kaplan (1981), McCarthy assumes an underlying /ɨ/, distinct from /i/. Both /ɨ/ and /i/ are realized as [i], but only /i/ triggers palatalization. This is handled in Comparative Markedness with an "old" and a "new" PAL-R constraint, which are violated when an anterior coronal follows /i/. The "old" constraint, $_{O}$PAL-R, is violated when the markedness violation is shared with the fully faithful candidate (FFC) (i.e., the [i] is underlyingly /i/), while "new" $_{N}$PAL-R is violated when the markedness violation is *not* shared with the FFC (the [i] is underlyingly /ɨ/). The ranking $_{O}$PAL-R >> IDENT(place) >> $_{N}$PAL-R ensures that consonants are only palatalized after an *underlying* /i/.

Viewed diachronically, this pattern appears to have arisen from a sound change by which alveolars following [i] became palatalized at a stage in which the language had four vowels *[i, ə, a, u] rather than three. A later sound change merged *[i] with *[ə]. Roots which trigger palatalization in suffixes generally have cognates in Yupik languages which contain [i], and roots which do not trigger palatalization generally have Yupik cognates with [ə] (Kaplan 1981:83). As we note below, palatalization is sometimes predictable on the surface in Barrow Inupiaq, and we suggest that the members of the remaining paradigms with non-predictable palatalization have separate lexical entries for what would otherwise be treated as uninflected and inflected forms.

This pattern in Barrow Inupiaq is not as opaque as it would seem, due to an artifact of another palatalization process, in this case *regressive* palatalization, also triggered by *[i]. Regressive palatalization changed *[t] into [s], and resulted in the surface

generalization that when [i] is immediately preceded by stem-initial [s], it *always* triggers (progressive) palatalization because the [i] was historically *[i]. Conversely, when [i] is preceded by stem-initial [t] or [n], it *never* triggers palatalization because the [i] was historically *[ə] (Kaplan 1981:91). Thus, although progressive palatalization is not completely predictable from vowel quality, in many cases the consonants provide transparent cues to which stems trigger palatalization and which do not. Kaplan (1981:272-74) reports that loanwords from English seem to provide "minor support" for the productivity of palatalization. For instance, Kaplan observes that the palatalization in [siʎaavyak] 'pancake' (from 'slapjack') indicates that palatalization is associated with word-initial [si]. And as expected, [tii] 'tea' does not trigger palatalization in the derived form [tiiliuʀun] 'teapot'.[4] It appears that the only forms which show evidence that progressive palatalization is productive are those in which the process is transparently cued by a stem-initial consonant-vowel sequence. This leads to the interesting conclusion that while related language data indicate that palatalization was originally conditioned only by vowels, it has been reanalyzed in Barrow Inupiaq based on the fact that the occurrence of certain stem-initial consonants is correlated with the presence or absence of palatalization. This illustrates the importance of speaker under- and over-generalization in the explanation of phonological patterns (Mielke, forthcoming).

There is further evidence that there is a lexical, rather than phonological, distinction between the stems for which palatalization is not predictable from consonants: palatalization is spreading to additional lexical items in Barrow Inupiaq, at least in stems which do *not* contain consonants which cue palatalization. Inupiaq [niʀi-] 'eat' conditions palatalization,[5] but corresponds to Yupik [neʀe-]. The presence of [e]s in Yupik would normally indicate that the Inupiaq word would be underlyingly /niʁi-/, and thus not trigger palatalization, but this lexical item has been reanalyzed as a stem that

[4] Kaplan speculates that this may also be because [i:] is not normally followed by alveolars in Inupiaq, and there is no evidence that [tii] has lost its status as a foreign word.

[5] The fact that this stem now triggers progressive palatalization is not inconsistent with the above claim that an [i] preceded by stem-initial [n] never triggers palatalization, because the two vowels are phonologically independent. The first vowel is historically responsible for the presence of [n], and the second vowel is relevant for palatalization. This stem has been reanalyzed as if it were historically *[nəʀi-].

does trigger palatalization. Finally, Kaplan (1981:108) reports that younger speakers confuse the stems which do or do not trigger palatalization and are unable to reliably palatalize in the historically correct environments.

Based on these observations, we conclude that the historical processes which lead to opacity in Barrow Inupiaq are no longer productive in the language. Thus, distinguishing between the forms in (11) that display palatalization from those that do not is best attributed to lexical, rather than phonological, considerations.

4. Conclusion

We have shown that two classes of opacity in phonology can be handled without the additional machinery provided by Comparative Markedness theory. The first class, opaque allophony, was accounted for by novel analyses focusing on surface-true contrasts in each language. In the second class, the alternations involved in the opaque sound pattern were argued to be lexicalized. We suspect that upon closer scrutiny reanalyses of other cases of opacity will lead to similar transparent solutions, thus obviating the need for theoretical enhancements to classical OT (see Sanders 2003 for related discussion).

In this commentary we have essentially argued against a theoretical approach in which all surface forms are generated by the grammar in the form of rules or constraints. We have suggested in the case of Barrow Inupiaq that at least some observable patterns are not generated by the grammar. Rather, the alternations are memorized as less abstract forms and stored in the lexicon as such. In this approach, the distinction between grammar and lexicon basically amounts to a distinction between productive phonological processes and memorized lexical alternations, a not uncommon assumption in traditional generative phonology. In Sea Dayak and Canadian English as well, we have argued that allophonic phonological distinctions that had previously been generated by rules or constraints receive a simpler and more transparent analysis when the distinctions are treated as phonemically contrastive, and consequently also part of the lexicon. The approach we

have assumed thus far then splits the work of generating sound patterns between the grammar and the lexicon. A theoretically more appealing solution would be to exploit either the grammar or the lexicon, but not both. Since, as shown in this commentary, grammar-based approaches are unable to do it all, it seems reasonable to explore the extent to which an empowered lexicon is able to manage all aspects of a language's sound system. Research in this area shows the promise of such a venture (see, e.g., Bybee 1998; Pierrehumbert 2001). For example, in a lexicon-driven phonology the productiveness of a given generalization is entirely a function of the relative strength of the sound pattern in the particular language.[6] The extent to which the full range of language sound patterns can be explained by the lexicon is an approach that, in our opinion, merits careful consideration.

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