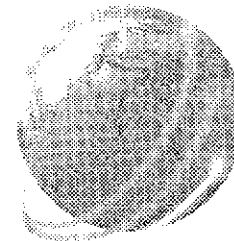PROCEEDINGS

The 2000

International Workshop on Generative Grammar

Edited by   Youngjun   Jang
            Jeong-Seok Kim

The Korean Generative Grammar Circle

Chomsky in press, φ-features on an element need to be valued (by the other element of the agreement relationship) Suppose (quite plausibly) that valuation is 'ordering' It follows that φ-features are unordered intrinsically It makes sense to say that elements without φ-features need not enter into any agreement/valuation/ordering relationship. That is, they are intrinsically ordered. Viewing the combination of the wh-doublet with the maximality operator (Q) in terms of Agree, as we did above, explains the absence/restrictions on adjunct-doubling in Korean

References

Boeckx Cedric, and Bosook Kang In progress Wh-doublets Ms, University of Connecticut.

Chomsky, Noam (2000). Minimalist inquiries: the framework In *Step by step minimalist essays in honor of Howard Lasnik*, ed. R Martin D Michaels, and J Uriagereka, 89-155. Cambridge, Mass : MIT Press.

Chomsky, Noam (in press) Derivation by phase. In *Ken Hale A life in language*, ed M Kenstowicz Cambridge, Mass : MIT Press

Chung, Daeho (1999) On wh-doublets Ms Hanyang University.

Groenendijk Jeroen, and Martin Stokhof (1984) Studies on the semantics of questions and the pragmatics of answers Doctoral dissertation, University of Amsterdam.

Hagstrom, Paul (1998). Decomposing questions Doctoral dissertation, MIT

Haspelmath, Martin (1997) *Indefinite Pronouns* Oxford: Oxford University Press

Kim, Jeong-Seok (2000) On the interpretation of wh-doublets Ms, Sogang University

Link, Godehart (1983). The logical analysis of plurals and mass terms: a lattice-theoretical approach. In *Meaning use and interpretation*, ed R Bäuerle, et al, 302-323. Berlin: de Gruyter

Pietroski, Paul (1999) Plural descriptions as existential quantifiers In *University of Maryland Working Papers in Linguistics* #8, 323-342

Reinhart, Tanya (1995). Interface strategies. Ms, OTS, Utrecht University.

Rullmann, Hotze (1995). Maximality in the semantics of wh-constructions Doctoral dissertation, University of Massachusetts, Amherst

Szabolcsi, Anna, and Frans Zwarts 1993 Weak islands and algebraic semantics for scope taking. *Natural Language Semantics* 1, 235-284

Tsai, W.-T. Dylan (1994). Eliminating A-bar dependencies Doctoral dissertation MIT

Tsai, W.-T. Dylan (1999) The whys of *how*'s and the hows of *whys* Presented at UC Irvine

Uriagereka, Juan (1999) What's in a word Ms, University of Maryland

Dept of Linguistics
University of Connecticut, U-1145
Storrs, CT 06269-1145 (USA)
ceb99001@sp uconn edu (Boeckx)
bok99002@sp uconn edu (Kang)

On Syllable-based Multiple Opacities

WILLIAM J IDSARDI AND SUN-HOI KIM
University of Delaware and MIT

1. Introduction

We will make several points in this brief article First, that *opacity* is a fundamental property of human language. Second, that languages typically display *multiple opacities* in their grammatical systems, and that a class of these are based on the interaction between syllabification processes and morphology processes — we, therefore, call these *syllable-based multiple opacities* Third, that *ordered rules* within Lexical Phonology (Kiparsky 1982) provide an explanatory account of these opacities And, finally, that Optimality Theory (OT, Prince & Smolensky 1993, McCarthy & Prince 1993) even when augmented with various auxiliary devices cannot handle these opacities

Chomsky's original motivation for the invention of generative phonology was specifically the opaque phonological patterns in Modern Hebrew, as Chomsky (1975: 25-26) explains:

> I thought it might be possible to devise a system of recursive rules and thus perhaps to achieve the kind of explanatory force that I recalled from historical grammar I had in mind such specific examples as the following. The Hebrew root *mlk* ("king") enters into such forms as *malki* ("my king"), *malka* ("queen"), *mlaxim* ("kings") The change of *k* to *x* in *mlaxim* results from a general process of spirantization in post-vocalic position But consider the construct state form *malxey* ("kings of") Here we have *x* in a phonological context in which we would expect *k* (cf. *malki*, *malka*) The anomaly can be explained if we assume that spiratization preceded a process of vowel reduction that converted *malaxim* to *mlaxim* and *malaxey*-X ("kings of X," where X contains the main stress) to *malxey*-X The processes of spi-

rantization and reduction (generally, antepretonic) are motivated independently, and by assuming the historical order to be spirantization-reduction, one can explain the arrangement of forms *malki, malka, malxey, mlaxim* It seemed only natural to construct a synchronic grammar with ordering of rules such as spirantization and reduction to explain the distribution of existing forms.

Opaque phenomena are not found only in the phonological component, but also in syntax, as Chomsky (1995: 223-224) points out:

> Viewed derivationally, computation typically involves simple steps expressible in terms of natural relations and properties, with the context that makes them natural "wiped out" by later operations, hence not visible in the representations to which the derivation converges. Thus, in syntax, crucial relations are typically local, but a sequence of operations may yield a representation in which the locality is obscured Head movement, for example, is narrowly "local," but several such operations may leave a head separated from its trace by an intervening head This happens, for example, when N incorporates to V, leaving the trace t_N and the [$_V$ V-N] complex then raises to I, leaving the trace t_V: the chain (N, t_N) at the output level violates the locality property, and further operations (say XP-fronting) may obscure it even more radically, but locality is observed by each individual step

All languages display opaque effects, both in syntax and in phonology What Chomsky discovered was not an oddity of Hebrew or English, but a core property of human language, and one which any reasonable theory of the human language faculty must explain

In the rest of this article we will consider a few examples of phonological opacities and show why they cannot be adequately handled in OT In section 2, we review basic opacity phenomena and the core issues that this article focuses on Section 3 demonstrates our analysis of syllable-based multiple opacities, and section 4 discusses revised versions of OT and the problems arising with their analyses

2. Syllable-based Multiple Opacities

2.1 Phonological Opacity

The opacity problem is that the motivating context for a process can be modified by later processes so as to make it difficult or even impossible to find the motivation in the surface forms In OT, this results in a situation which we could call the *non-minimal repair syndrome* Consider some standard ordered rule interactions, as in (1)

(1) a. Boston English

UR	/fajr/	'fire'
Epenthesis	fajər	
r-deletion	fajə	
SR	fajə	*[faj]

b. Tiberian Hebrew

UR	/dɛʃʔ/	'grass'
Epenthesis	dɛʃɛʔ	
ʔ-deletion	dɛʃɛ	
SR	[dɛʃɛ]	*[dɛʃ]

c. Icelandic

UR	/bɪlj-r/	'storm'
j-deletion	bɪlr	
Epenthesis	bɪlʏr	
SR	[bɪlʏr]	*[bɪljʏr]

In each case in (1) two processes apply even though a pronounceable form can be obtained by applying the second process by itself. That is, if the *optimal pronunciation* is the phonotactically valid output which is most *faithful* to the input form (that is, the one which makes the fewest changes to the input form), then why do we observe the forms in (1) as the actual pronunciations? For example, if we are going to lose the /r/ in /fajr/ anyway, why bother to also epenthesize a schwa? Why not simply drop the /r/ (as happens in other forms: /kar/ → [ka] 'car') and produce *[faj], which *is* a pronounceable form (indeed, an existing form, albeit for a different word, 'fie') Because we have changed the form more than is necessary to simply make it pronounceable, these are *non-minimal repairs*

Moreover, in the forms in (1a,b), the operation of the second process eliminates one of the elements which motivated the first process In each case, the input form contains an unacceptable consonant clusters In (1a,b) the cluster is eliminated by epenthesis But then one of the consonants deletes anyway, and we can no longer see in the surface form what motivated the epenthesis in the first place In (1c) the offending cluster is removed by deleting one of the consonants, but then the resulting cluster is still no good, and this is fixed up by epenthesis But if we do epenthesis alone, we end up with a perfectly valid output form for Icelandic To summarize, all theories of phonology

must explain why the alternative forms, *[faj], *[dɛS], and *[bɪljYɪ] which are more faithful to the input are not chosen instead of the actual output forms, [fajə], [dɛSɛ] and [bɪljYɪ].

As pointed out by McCarthy (2000: 332), such non-minimal repairs observed in opacity cases cannot be handled in standard OT.

> As OT is currently understood, though, constraint ranking and violation cannot explain all instances of opacity. Unless further refinements are introduced, OT cannot contend successfully with any non-surface-apparent generalisations.

Thus, revised versions of OT, such as Sympathy (McCarthy 2000), Output-Output (O-O) faithfulness (Benua 1997), and the local conjunction of constraints (Kirchner 1996, Lubowicz 1998) have been proposed in the OT framework. These new OT approaches, however, have difficulty in explaining the opacity problems theoretically and practically. The difficulty is more clearly observed in explaining the following case where an output form is the result of the simultaneously occurring multiple opacities.

2.2 Syllable-based Multiple Opacities

To illustrate a simple case of multiple opacities resulting from the interaction between syllabification and morphology, we turn to some simple facts of Korean. Korean stops are neutralized to plain variants when they cannot be syllabified as onsets, as shown in (2).

(2)		UR	SR	
	a	/pat^h-il/	[pa t^{h}il]	'field-obj.'
	b	/pat^h/	[pat]	'field'
	c	/pat^h-to/	[pat t'o]	'field also'

In (2a), where the underlying t^h can be incorporated as an onset to the following vowel it surfaces unchanged. In (2b,c) the t^h cannot be an onset, and consequently it neutralizes to the plain [t].

In addition to this neutralization phenomenon, Korean coronal stops also undergo affrication (and palatalization, see H. Kim 1997) when they appear as the onset to the vowel *i* provided that a morpheme-boundary intervenes, as shown in (3).

(3)		UR	SR	
	a	/pat^h-i/	[pa c^{h}i]	'field-subj.'
	b	/pat^h-il/	[pa t^{h}il]	'field-obj.'
	c	/t^{h}ik'il/	[t^{h}i k'il]	'dust'

In (3a), the stem *pat^h* is combined with the suffix *–i*, and the stem-final consonant *t^h* is changed to *c^h*, but retains its aspiration. Other vowels do not induce this change, (3b), and the same sequence, *t^{h}i* within a morpheme also does not change, (3c).

Compounds illustrate the interactions of interest. Consider compounds in which the first element ends with *t^h*, and the second element starts with *i*, as in (4).

(4)			UR	SR	
	a	Stem	/pat^h/	[pat]	'field'
	b	Stem	/ilaŋ/	[iraŋ]	'ridge'
	c	Compound	/pat^h-ilaŋ/	[pa.di raŋ][1]	'the ridge of a field'

In the isolation form of the stem, (4a), the final coronal stop, *t^h*, cannot be an onset, and therefore changes to the plain variant, *t*. When this stem is combined with another stem, *ilaŋ* 'ridge,' which begins with the vowel *i*, the stem-final coronal stop, *t^h*, surfaces as the plain voiced variant, *d*. This change raises several important questions.

The first question is why the aspirated coronal stop, *t^h*, becomes voiced in (4c). In Korean, surface aspirated stops are never voiced; it is only the plain stops which become voiced, generally between sonorants. Thus, the overall change can be explained succinctly by two independently motivated processes in Korean—neutralization and contextual voicing. That is, we can say that the neutralization of the aspirated stop, *t^h*, to its plain voiceless variant, *t*, occurs in this form, and that the voicing is a phonetic implementation process whereby plain voiceless stops become voiced between sonorants. That is, there is a natural explanation in terms of a modular phonology, with the phonological neutralization processes feeding into the phonetic implementation.

Hyunsoon Kim (p.c.) points out that another form, [panniraŋ], is also acceptable for some speakers (see for example Ahn 1998: 123). This form shows instead the combined effects of *n*-insertion and nasal assimilation. Although we will not discuss the significance of this form in this article, its existence raises several issues. One issue is how to rank the constraints so as to produce two optimal outputs. Another is what motivates *n*-insertion given that *t^h* could serve as an onset by itself. That is why is [panniraŋ] preferable to *[pat^{h}iraŋ]?

The second question is why the neutralization occurs to a surface onset element. Recall that the neutralization does not occur to the onset element in (2a), although it does occur in (2b,c) when t^h is not an onset. In other words, (4c) undergoes a process of neutralization even though it fails to match the structural description of neutralization at the surface. In this case, syllabification obscures the conditioning factor that motivates neutralization. We will use the term *overapplication opacity* for such phenomena.

But this is not the only opacity. The form (4c) exhibits another kind of opacity. Recall that in (3a) the combination of t^h and i across a morpheme boundary results in $[c^h]$. Affrication is also observed with plain t, as shown in (5).

(5) /tot – i/ [toɹi] 'rise'

However, the coronal stop in (4c) does not change to [ɹ] even though its surface form matches the structural description for affrication, an example of *underapplication opacity*. Overapplication opacity arises from *counter-bleeding* orderings of phonological rules whereas underapplication opacity arises from counter-feeding orderings of phonological rules. Therefore, the surface form of compound *pa di raŋ* in (4c) simultaneously exhibits multiple opacities. In the next section, we present our analysis of this case.

3. An Account Based on Rules and Principles

Following Chomsky's formulation of a generative grammar as a system of recursive rules, we propose a modular grammar of Korean with the morphological component creating representations that serve as inputs to the phonology, which in turn calculates a representation which will be interpreted by the phonetic component. Also following Lexical Phonology (Kiparsky 1982, Halle and Vergnaud 1987), the phonological component is divided into two sub-components, or strata—an inner one (cyclic) and an outer one (noncyclic). There are also principles governing the application of rules in this framework, the operative one for the present analysis is the Derived Environment Condition. Cyclic rules typically apply only in derived environments (those not present in the lexical entry), whereas noncyclic rules typically also apply in nonderived environments. As we have seen above, affrication occurs only across morpheme boundaries, that is, in de-

rived environments.[2] Consequently, we should assign affrication to the cyclic stratum. In contrast, neutralization applies to bare stems, a nonderived environment, and should be assigned to the noncyclic stratum. Since the cyclic stratum is "inside" the noncyclic stratum, affrication necessarily applies before neutralization. That is, the order of the application is tied to the assignment of rules to strata, which in turn is tied to their application in nonderived environments. Furthermore, since the phonetic module strictly follows the phonology in this model, contextual voicing between sonorants will follow both affrication and neutralization. Somewhat incidentally for the data here, we further propose a radical simplification of the syllabification component, eliminating the concept of codas entirely. Neutralization can then be directed at unsyllabified elements, as a kind of weakened form of stray erasure. These derivational processes correctly derive the surface forms of isolated stems and [stem + suffix] combinations, as in (6) and (7).

(6)	**Input**		a /pat^h/	b /pat^h-il/
			'field'	'field-obj.'
	Cyclic	Syllabification	(pa)t^h	(pa)(t^{h}i)l
		Affrication		
	Noncyclic	Neutralization	(pa)t	
	Phonetic			
	Output		[pat]	[pat^{h}il]

In (6a), the stem-final t^h is not syllabified. Neutralization is a noncyclic process applying to unsyllabified stop consonants. This definition is supported by the fact that the stop consonants syllabified in the cyclic block do not undergo neutralization.

In (6b), following Halle and Vergnaud (1987), the suffix does not form its own cyclic domain, and so is available for syllabification only in the [stem + suffix] complex. Therefore, the stem-final t^h is syllabified as an onset, and is not neutralized.

While the stem-initial t^h in (7a) does not change to c^h before a vowel i, the stem-final t^h in (7b) does. As stated above, affrication is subject to the Derived Environment Condition, and therefore it is blocked in (7a). This is notated by "*NDEB*" in the derivation.

---

[2] We will forgo discussion of the relation between affrication and palatalization (see H. Kim 1997). A more sophisticated analysis might assign palatalization to both strata and limit its application through Structure Preservation.

(7) **Input**

		a. /tʰikʼil/	b /patʰ-i/
		'dust'	'field-subj.
Cyclic	Syllabification	(tʰi)(kʼi)l	(pa)(tʰi)
	Affrication	*NDEB*	(pa)(cʰi)
Noncyclic	Neutralization		
Phonetic			
Output		[tʰikʼil]	[pacʰi]

Now, let us consider the derivation of compound form /patʰ-ilaŋ/ in (4c). Its derivation is illustrated in (8).

(8) **Input**

		/patʰ-ilaŋ/ 'the ridge of a field'	
Cyclic	Syllabification	(pa)tʰ	(i)(la)ŋ
	Affrication		
Noncyclic	Neutralization	(pa)t (i)(la)ŋ	
	Syllabification	(pa)(ti)(la)ŋ	
Phonetic		(pa)(di)(ra)ŋ	
Output		[padiraŋ]	

Since each stem in (8) forms an independent cyclic domain, cyclic rules separately apply to each stem. For this reason, syllabification occurs in each stem separately In the cyclic block, therefore, the final consonant of the first stem is unsyllabified, and it does not undergo affrication. On the other hand, noncyclic rules and phonetic implementation rules apply to the entire word Therefore, the unsyllabified *tʰ* is neutralized to its plain variant *t* and only subsequently incorporated into the following syllable in the noncyclic block. The only extrinsic ordering necessary in this account is between neutralization and syllabification in the noncyclic block

Thus, we have shown that the syllable-based multiple opacities in Korean can be explained by the interaction between cyclic and noncyclic rules in a Lexical Phonology model Crucial in this model is the fact that, while stems form independent cyclic domains, suffixes do not In the next section, we examine the revised versions of OT in accounting for the syllable-based multiple opacities

4. Revised Versions of OT and Their Shortcomings

Especially problematic for OT are the multiple opacities in (4c), where neutralization cannot be blocked even though its structural de-

scription is destroyed in the surface form (an overapplication opacity) coexisting with the non-application of affrication even though its structural description is satisfied in the surface form (an underapplication opacity) Taken together these phenomena cannot be adequately explained by any proposed OT approaches

4 1 OT with Sympathy

According to McCarthy (2000) in OT augmented with Sympathy, two distinct processes that violate the same faithfulness constraint must act together in rendering a third process opaque This prediction, however, does not hold in the following Korean examples.

(9)

	UR	SR	
a	/patʰ-il/	[pa tʰil]	'field-subj '
b	/patʰ-ilaŋ/	[pa di raŋ]	'the ridge of a field'

In (9), two very similar processes□ syllabification of a stem-final consonant as an onset to a vowel in a following suffix (9a) or stem (9b)— violate the same faithfulness constraint, ALIGN(STEM, σ, R). However, only the syllabification with a *stem* results in overapplication opacity of neutralization, syllabification with a suffix does not

Furthermore, if we devise an OT grammar with Sympathy constraints so as to correctly select the opaque form *padiraŋ* in (9b) as optimal, as in (10), then we cannot correctly select the transparent form *patʰil* in (9a) as optimal, as shown in (11) (We ignore in these tableaux the contextual voicing and the *l-r* alternation)

(10) **Tableau with Sympathy:** Opaque form selected as optimal

	/patʰ-ilaŋ/	Ons	* tʰ	⊛IDENT (LAR)	ALIGN (STEM,σ,R)*	IDENT (LAR)
FAITH	patʰ.i.laŋ	*!				
TRANS.	pa.tʰi.laŋ			*!		
SYM.	pat.i.laŋ	*!				*
OPAQUE	☞pa.ti.laŋ					*

In (10), the selector constraint, ALIGN(STEM, σ, R) chooses the sympathetic candidate ⊛*pat i laŋ* The constraint ⊛IDENT(LAR) then selects the opaque form *pa ti laŋ* for its faithfulness to the laryngeal features of ⊛*pat i.laŋ*. (That is, the winner has the laryngeal features it would have had if syllabification had respected the stem boundary)

(11) Tableau with Sympathy: Transparent form that is not selected

	/patʰ-il/	Ons	*tʰ.	⊛Ident (Lar)	Align (Stem,σ,R)*	Ident (Lar)
Faith	patʰ.il	*!	*	*		
Trans.	✖ pa.tʰil			*!	*	
Sym.	pat.il	*!				*
Opaque	☞ pa.til				*	*

However, although the sympathy OT approach explains the selection of an opaque form as optimal in this way, this constraint-computation with Sympathy cannot select the transparent form as optimal, as shown in (11), where the opaque form *pa til* is incorrectly selected as optimal by ⊛IDENT(LAR). Kaisse (2000) makes a parallel argument against OT with Sympathy from Argentinian Spanish

One could counter this argument by choosing a different selector constraint, perhaps ALIGN(STEM, σ, L) This would treat compounds differently from suffixed forms in the desired way. This leads to three related arguments, each of which is too complex to properly elucidate here The first is a learnability problem internal to OT: how do we decide that the selector is ALIGN(STEM, σ, L) instead of ALIGN(STEM, σ, R)? The two selectors make the same predictions for compounds, but not for suffixed forms. Therefore, the child must attend to exactly the forms at issue to learn the language. This aspect of the grammar does not follow from general principles and instead must be learned by brute-force The second problem is typological The ranking in (11) is a possible OT grammar. Why doesn't Korean work this way? Do any languages work this way? The third argument comes from asking the same questions of the rule-based account: Why do compounds behave differently? The rule-based account says they behave differently because it is a principle of UG that each compound element forms an independent cyclic domain, whereas suffixes do not. Furthermore, it is the *left* edge of the stems that are at issue because syllabification leaves stray material on the right in these languages. That is, these facts are derivable from two UG principles in the rule-based account, but are contingent on the constraint ranking in the OT account, and must be learned by each child. Thus, the OT account predicts that children should make errors in their acquisition of Korean, namely that some children might initially choose the wrong selector, leading to a grammar like (11) We know of no such finding.

4.2 Output-Output Faithfulness

From an Output-Output (O-O) faithfulness perspective, /patʰ-ilaŋ/ preserves the neutralization of the isolation form in the compound output. In other words, as shown in (12) below, since the base output form is *[pat]*, the neutralization form *pa ti laŋ* ([pa di raŋ]) is selected as a phonological optimal output by the O-O faithfulness constraint OO-IDENT(LAR)

(12)   INPUT: /patʰ/
Recursion (A)

	Ons	*tʰ.	O-O Ident (Lar)	Align (Stem,σ,R)	I-O Ident (Lar)
patʰ		*!			
☞ pat					*

Recursion (B)

	Ons	*tʰ.	O-O Ident (Lar)	Align (Stem,σ,R)	I-O Ident (Lar)
patʰ.i.laŋ	*!	*	*		
pa.tʰi.laŋ			*!	*	
pat.i.laŋ	*!			*	*
☞ pa.ti.laŋ				*	*

However, there are cases where a stem is bound, and does not occur as an independent word, as in (13)

(13)   UR   SR
a.   /k'ak'-i/ cut-Nom   [k'a k'i]   'cutter'
b.   /nic-k'ak'-i/ late-cut-person [nit k'a gi] 'late bloomer'

Notice that, while the bound verbal stem *k ak'-* 'cut' in /nic-k ak'-i/ → *[nit k'a gi]* 'late bloomer' in (13b) undergoes the neutralization of the stem-final *k'* to *k* (and then is voiced to *g*), in (13a) it does not undergo neutralization Since the stem *k ak -* is not an independent word, there is no isolation base form, and the O-O-IDENT(LAR) vacuously applies to all the output candidates of /nic-k'ak'-i/ Therefore, the optimal form should not be *[nit k'a gi]*, but *[nit k'a k'i]* Therefore, while the O-O faithfulness approach explains the neutralization process in the words containing free stems, it fails to explain the neutralization process of the words containing bound stems This problem

could be overcome by combining O-O Faithfulness with Sympathy Theory, forcing identity with the hypothetical output of the bare stem. In practice, however, this is insufficient, as the final consonant of Korean verbal stems have several output variants depending on the syllable contact, details too complicated to consider here. In brief, simply forcing the stem-final consonant to be word-final does not ensure that it will be neutralized in the right way in all cases.

4.3 Local Conjunction of Constraints

In this section, we will demonstrate the inadequacy of OT augmented with the local conjunction of constraints (see especially Lubowicz 1998) in handling the data so far considered. In order to restrict affrication to derived environments, in Lubowicz's model it would be necessary to conjoin a markedness constraint with a faithfulness constraint: *[ti] & ALIGN(STEM, σ, R). In order to ensure that neutralization applies in compounds, we need another conjoined constraint: *[Laryngeal stop] & ALIGN(STEM, σ, L). Furthermore, in the compound in (4c), neutralization occurs, but affrication does not. In order to get this result, the two conjoined constraints must be ranked so that *[Laryngeal stop] & ALIGN(STEM, σ, L) is ranked above *[ti] & ALIGN(STEM, σ, R), as shown in (14).

(14) Local Conjunction

	ONSET	*[Laryngeal stop] & ALIGN (STEM,σ,L)	*[ti] & ALIGN (STEM,σ,R)
patʰ.i.laŋ	*!		
pa.tʰi.laŋ		*!	
pat.i.laŋ	*!		
pa.ci.laŋ		*!	
☞ pa.ti.laŋ			*

But the compound case constitutes the only evidence for the ranking between the two conjoined constraints. Therefore, in this account, the child must attend to such forms explicitly in order to arrive at the correct grammar. This problem of local conjunction of constraints in acquisition is also pointed out by Eckman & Iverson (1999: 6):

> In Korean, a markedness constraint PAL militating against sequence of /si/ would have to be ranked superior to IDENT(anterior) because /s/ palatalizes before /i/ both within and between morphemes.

According to Eckman & Iverson's (1999) experiment, the ordering of acquisition of English as a second language for Korean native speakers is as in (15)

(15) Stage I: PAL » IDENT(anterior)
        (sea = she, messing = meshing)
    Stage II: PAL & R-ANCHOR(stem; σ) » IDENT(anterior) » PAL
        (sea ≠ she, messing = meshing)
    Stage III: IDENT(anterior) » PAL
        (sea ≠ she, messing ≠ meshing)

The question here is how they get the constraint ranking of Stage II, without knowing the constraint ranking of Stage III. That is, what would motivate the learner to change their grammar by adding a locally conjoined constraint instead of performing a simple reranking of two constraints? Especially since the simple reranking is the target grammar, and the one they eventually do select. Eckman and Iverson offer a principled account of this behavior based on Lexical Phonology. In Stage I, the rule of s-palatalization is noncyclic, and therefore applies in all environments. At Stage II the rule is restricted to derived environments. At Stage III the rule is abandoned completely. We can generalize this to say that rule loss starts with rule restriction, a pattern familiar from diachronic studies.

Thus, local conjunction of constraints runs into standard poverty-of-the-stimulus learnability problems, and cannot adequately explain how learners could know when to invoke conjoined constraints and how to rank them. The local conjunction theory predicts that the ranking opposite to that in (13) should be an equally possible grammar, a situation which is, however, unattested.

5. Conclusion

In summary, Korean shows multiple opacities due to the interaction between syllabification and morphology. The results fall out simply and naturally in an account with the rule-based level-ordering, but are *ad hoc* or even unattainable in all versions of OT. Korean thus provides further evidence for the importance of opacity in phonological theory, and for the inadequacy of current OT approaches to opacity.

References

Ahn, Sang-Cheol. 1998 *An Introduction to Korean Phonology*. Seoul: Hanshin Publishing Co.
Benua, Laura. 1997 *Transderivational Identity. Phonological Rela-*

tions Between Words. PhD Dissertation University of Massachusetts at Amherst.

Chomsky, Noam. 1975. *The Logical Structure of Linguistic Theory.* New York: Plenum.

Chomsky, Noam 1995 *The Minimalist Program.* Cambridge MA: MIT Press

Eckman, Fred, and Gregory Iverson 1999. Some principles of second language phonology. Ms University of Wisconsin-Milwaukee.

Halle, Morris, and J.-R, Vergnaud. 1987 *An Essay on Stress* Cambridge, MA: MIT Press

Kaisse, Ellen. 2000. Sympathy meets Argentinian Spanish Ms University of Washington.

Kang, O.-M 1992. *Korean Prosodic Phonology.* PhD Dissertation University of Washington

Kim, Hyunsoon. 1997.*The Phonological Representation of Affricates. Evidence from Korean and Other Languages* PhD dissertation Cornell University.

Kiparsky, Paul 1982 Lexical morphology and phonology In I.-S Yang (ed.), *Linguistic in the Morning Calm,* Seoul: Hanshin Publishing Co., 3-91.

Kirchner, Robert. 1996. Synchronic Chain Shifts in OT. *Linguistic Inquiry* 27, 341-349

Lubowicz, Anna 1998. Derived Environment Effects in OT Ms University of Massachusetts at Amherst

McCarthy, John 2000 Sympathy and Phonological Opacity *Phonology* 16, 331-399

McCarthy, John, and Allan Prince 1993. Prosodic Morphology I: Constraint Interaction and Satisfaction Ms., University of Massachusetts at Amherst, and Rutgers University

Prince, Allan, and Paul Smolensky 1993 Optimality Theory: Constraint interaction in generative grammar Ms., Rutgers University, New Brunswick, NJ

William J Idsardi
Dept of Linguistics
University of Delaware
Newark DE 19716
idsardi@udel edu

Sun-Hoi Kim
Dept of Linguistics and Philosophy
MIT
Cambridge MA 02139
sunhoi@mit edu

An ATB Movement Approach to Gapping

HIRONOBU KASAI & SHOICHI TAKAHASHI
University of Tokyo & Kanda University of International Studies

1. Introduction

This paper is concerned with Gapping in English, Korean and Japanese as shown in (1a), (2a) and (3a), respectively.[1]

(1) a. Ae-ryung ate kimchi and Sandra [▲] the seasoned seaweed
   b. *Ae-ryung [▲] kimchi and Sandra ate the seasoned seaweed

(2) a. Ae-ryung-i   Sandra-wa   [▲], kuliko Yukiko-ka   Sumiko-wa
      Ae-ryung-Nom Sandra-with   and   Yukiko-Nom Sumiko-with
      mannassta.
      met
      'Ae-ryung (met) Sandra and Yukiko met Sumiko '
   b. *Ae-ryung-i Sandra-wa mannassta. kuliko Yukiko-ka Sumiko-wa [▲]

(3) a. Ae-ryung-ga   kimuchi-o   [▲] sosite Sandra-ga
      Ae-ryung-Nom kimchi-Acc   and   Sandra-Nom
      nattoo-o   tabeta
      fermented soybeans-Acc ate
      Ae-ryung (ate) kimchi and Sandra ate the fermented soybeans
   b. *Ae-ryung-ga kimuchi-o tabeta, sosite Sandra-ga nattoo-o [▲]

[1] The parenthesized words in the gloss do not appear superficially