

Korean Phonology in the Late Twentieth Century*

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Research in Korean phonology has been unusually productive, both within the structuralist tradition and in the generative framework. On the structural side, Martin's phonemics and morphophonemics laid structural groundwork for later generative studies while instrumental works provided a valuable phonetic grounding for phonological analyses to come. Earlier generative studies were mainly concerned with such issues as features, segments and rules, following the program developed in the *Sound Pattern of English*. The late 1970's saw the emergence of Autosegmental Theory. Many traditional analyses were revisited and given new interpretations. Recent works on consonantal phonology also attempt to move beyond description and toward explanation by maximizing representational apparatus and minimizing language-specific rules. The development of Lexical Phonology and Prosodic Hierarchy Theory in the 1980's was triggered by an interest in rule domains and in the interface between phonology and morphology/syntax. Many studies contributed to the prosodic characterization of morphological categories and the formal representation of domains. Most recently, Optimality Theory promises to solve some of the thorny issues of Korean phonology such as the $n-\emptyset$ alternation, Consonant Cluster Simplification and Glide Formation, Palatalization, Umlaut, Tensification and Korean phrasing.

Thanks to a few pioneers, research in Korean phonology has been unusually productive, both within the structuralist tradition and in the generative framework. On the structural side, Martin's phonemics (1951) and morphophonemics (1954) laid structural groundwork for generative studies.

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Similarly, instrumental works (M. Han 1966, Han and Weitzman 1970, C-W. Kim 1965, 1970a) provided a valuable phonetic grounding for phonological analyses to come. There is a long tradition of phonological research in Korea which dates back perhaps as early as the 15th century and had been particularly active in the first half of this century during the Japanese occupation. The scope of our paper, however, is limited to the research in the latter half of the 20th century, and the focus will be on the role Korean phonology has played in developing and evaluating various phonological theories¹.

1. The Vowel System

Earlier studies were mainly concerned with such issues as features, segments and rules, following the program developed in *The Sound Pattern of English* (Chomsky & Halle 1968). For instance, C-W. Kim's (1968) paper on Korean vowels suggests a systematic (albeit too abstract) analysis of underlying vowels and diphthongs. The paper sparked an abstractness debate (B-G. Lee 1976), and was also seminal in the development of underspecified analyses of vowels some twenty years later (Sohn 1987). On the abstract extreme is a theory that posits the four vowels shown in (1a), and derives all the other vowels and diphthongs by various rules of fronting and rounding.

(1) The Korean Vowel System

a. C-W. Kim's four vowel system (1968)

Underlying vowels : /i, a, o, ə/

onglides : /w/, /y/

offglide : /y/

Surface vowels : /i, e, æ, i, ə, a, u, o, ø/

b. Ten vowel system (B-G. Lee 1976, Y-S. Kim 1984, Ahn 1985)

	front	back
	rd	rd
high	i ü	i u
	e ö	ə o
low	æ	a

¹ We were not able to do justice to research done in Korea mainly due to lack of access, but the reader is referred to S-O. Lee (1988) which reviews work on Korean phonology published between 1977 and 1987.

c. Eight vowel system (H. Sohn 1987, Y-S. Lee 1993)

	front	back
		rd
high	i	ɨ u
	e	ə o
low	æ	a

The eight or nine vowel systems differ from the ten vowel system in that one or both of the front rounded vowels are not assumed to occur underlyingly. Often these vowels are derived postlexically from /wi/ and /we/. While these two vowels were pure monophthongs in the earlier stages of Korean, the diphthongization has been well underway and as a result, [ü] and [ä] are in most environments in free variation with [wi] and [we]. The monophthongal quality of these two vowels is preserved only after a coronal continuant (/s/ and /c/). The fact that they enjoy such a restricted existence and that they are in free variation with a glide and a vowel sequence while no other vowel exhibits such a behavior strongly suggests that these vowels are not distinctive.

However, as pointed out by Cho & Inkelas (1993) and M-H. Cho (1994), it seems to make more sense to assume /ü/ and /ö/ to be underlying when one considers such facts as the alternation between these vowels in mimetics. Likewise, the Umlaut process (a lexical phenomenon) creates /ü/ and /ö/ out of back vowels when followed by [i], thus arguing as well for the underlying status of these vowels.

Also frequently discussed is the ongoing merger of the two nonhigh front vowels, /e/ and /æ/ (H-B. Lee 1971, Y-S. Hong 1987), which could further reduce the number of vowels in the inventory. J-H. Lee (1995), for instance, demonstrates that the reported merger is not a complete merger but a case of a 'near-merger' in the sense of Labov, Karan & Miller (1991), i.e., these phonemes have a smaller phonetic distance than the normal phonemic difference, but they are not completely identical yet. Many speakers do not perceive the difference, while they consistently differentiate them in production.

Related to Korean syllable structure and vowel inventory, the distributional restrictions on the cooccurrence of a glide and a vowel have attracted considerable interest in the literature (B-G. Lee 1976, Levin 1987, H. Sohn 1987, Y-S. Lee 1993). The pattern in (2) identifies the distributional gaps.

(2) Cooccurrences Between Glide and Vowel

ii	i	wi *yi	ü *wü *yü	i *wi *yi	u *wu
yu					
	e	we ye	ö *wö *yö	ə wə yə	o *wo yo
	æ	wæ yæ	a wa ya		

These restrictions have been used for diverse purposes, including to argue for the position that the glide in Korean constitutes the nucleus, rather than the onset, of the syllable. The noncooccurrence of the rounded glide /w/ and any of the rounded vowels has been dealt with in terms of the Obligatory Contour Principle, barring two occurrences of the same feature [+round]. And the fact that the front rounded vowels never form a diphthong has been used to argue that they should not be posited as underlying. For some phonologists, the behavior of /i/ with regard to the glides is taken to mean that /i/ is the least marked vowel in Korean. The issues are far from being satisfactorily resolved, and we can expect to see many more papers on this topic in the future. (See Y. Cho (forthcoming) for further discussion).

Korean is traditionally described as having phonemic vowel length in all its inventory (Han 1964, Maddieson 1984, Lee & Zhi 1987, Magen & Blumstein 1993). However, researchers have disagreed on the inclusion of the length contrast. Although the vowel length distinction may be still phonemic for some speakers, its functional load is extremely low, and perception of the contrast does not always match the results of production (H-B. Lee 1971, J-W. Park 1993). In short, the vowel length distinction is being lost in Korean, and the contrast seems to be maintained mainly only by a 'learned vocabulary' strategy.

2. Korean Consonants

As for the consonantal processes, Kim-Renaud (1974) provided the first complete analysis of consonantal alternations involving intervocalic weakening, obstruent-neutralization, and assimilation. Her generalization that a coronal consonant is the most susceptible to assimilation was extensively utilized within the theory of Underspecification as it developed in the 1980's. She derives many processes from the phonetic fact that a Korean coda consonant is never released, which provides one of the empirical bases for Steriade's (1993) theory of aperture.

2.1. The Representation of Korean Tense Consonants

The last forty years have seen an ongoing debate on the proper representation of the underlying phonation contrasts in Korean. While most works assume that Korean has a three-way underlying phonation contrast—voiceless plain, aspirated, and tense (C-W. Kim 1965, Kim-Renaud 1974, etc.), there have been numerous attempts to reduce the contrast to a binary one. In particular, Martin (1954, 1982) and J. Han (1992, 1996) have claimed that the so-called ‘tense’ consonants are underlyingly geminate plain consonants. There are problems associated with the geminate-account of tense consonants, many of which have been addressed in the account of Tak & Davis (1994), who argue that intermorphemic or derived tense consonants indeed are geminates, but morpheme-internal, underived ones are simplex. Others have maintained that even aspirated consonants are also geminate (S-H. Kim 1989, J. Jun 1994). If tense consonants are underlyingly geminate, then tenseness (as interpreted by such features as [+tense], or [+constricted glottis]) can be dispensed with in the phonology and treated as the phonetic interpretation of the phonological representation of gemination. Though there are problems associated with this general approach, we will look at the specific proposal of J. Han (1992), one of the most concrete of the several claims along these lines.

Han observes in support of a geminate account of tenseness that there is a significant difference in length between intervocalic tense consonants, on the one hand, and word-initial tense and intervocalic plain consonants, on the other. However, we note that not only tense consonants but also aspirated consonants have been observed as considerably longer than plain consonants. Still, Han (1996) addresses many of the problems posed in Cho and Inkelas (1994), but not all. One of these is a question as to what kind of speech was used in measuring the duration of intervocalic tense consonants. In particular, it has often been observed that certain intervocalic tense and aspirated consonants are phonologically geminated in emphatic speech, as illustrated in (3).

(3) a. Emphatic Speech Gemination

ap'a	app'a	‘Dad’
ap ^h a	app ^h a	‘be sick’

b. Emphatic Speech Gemination is not allowed in non-initial syllables

acəs'i	*acəss'i	‘uncle’
cəlkut ^h ong	*cəlkutt ^h ong	‘pestle’

It so happens that all the examples used by Han of intervocalic tense consonants belong to the first class, and can be readily geminated in slow emphatic speech. Thus it is not clear that the extra duration must be attributed to the putative underlying geminate status of tense consonants, or whether it might not in fact be due to emphatic rendering of these forms by the subjects in the experiment.

Han's other argument comes from the phenomenon of Degemination, in which, as shown in (4), a sequence of homorganic plain obstruents is often simplified in *allegro* speech (Kim-Renaud 1987).

(4) *Allegro* Speech Degemination

ak + ki	akk'i	ak'i	'musical instrument'
tat + ta	tatt'a	ta't'a	'to close'

Both Emphatic Speech Gemination and *Allegro* Speech Degemination are optional and produce a clear, recognizable distinction between geminated and degeminated forms, thus indicating that tense consonants cannot be considered geminates across-the-board, although the two-way neutralization in which tense consonants are geminated and geminated consonants are realized as tense does seem to imply a close relationship between tenseness and gemination.

In sum, none of the arguments for the geminate account of tense consonants are compelling enough to reject the view of tense consonants as single phonemes, at least morpheme-internally. It has been claimed, however, that a certain explanatory economy is gained by the geminate account. In particular, for Korean partial reduplication, Jun (1994) proposes a principle of Metrical Weight Consistency which requires that the number of metrical feet in the input be conserved in the output. This principle is based on the following two assumptions: 1) Tense and aspirated consonants are geminates (i.e., moraic), 2) the Korean foot is quantity-sensitive, unbounded and right-headed.

What is relevant for our purposes is the fact that partial reduplication of bases with tense and aspirated onsets results in the loss of tenseness and aspiration on the second syllable, as illustrated in (5). Laryngeal feature loss in the reduplicant is presumably accounted for by Metrical Weight Consistency. All the inputs to partial reduplication contain a single foot (a single heavy syllable, or a disyllabic stem consisting of a light syllable and a heavy syllable). As a consequence, the output words should contain only

one foot. If the output were to preserve the laryngeal features on the second syllable, as in *[p'a-p'aŋ], then the tense consonant would be moraic, making the output consist, *incorrectly*, of two feet.

(5) Partial Reduplication (Jun 1994)

sak	sa-sak		'crisp'
tung	tu-tung		'booming drum'
culuk	cu-lu-luk		'rain dropping'
p'aŋ	p'a-paŋ	p'a-pa-paŋ (*p'a-p'aŋ)	'bang'
t ^h ak	t ^h a-tak, t ^h a-ta-tak	(*t ^h a-t ^h ak)	'with a slap'

It is, however, extremely plausible to have an optimality account of partial reduplication whereby the loss of laryngeal features is a case of emerging unmarked constraints by relevant constraint ranking; there is consequently no need to represent tense and aspirated consonants as geminates, nor any need to invoke Jun's foot-type (quantity-sensitive, unbounded and right-headed), which seems to play no role in other parts of Korean phonology (S. Kim 1996).

2.2. The Liquid

There are several changes involving the lateral and the nasals in Korean. One recent account is that of McDonough (1994), who argues that these changes occur to repair instances of violation of the Lateral Onset Constraint, according to which the feature [lateral] is not licensed in the onset except in geminates. As illustrated by the data in (6), it is true that Korean does not allow the underlying nonnasal sonorant to be realized as a lateral in the syllable onset position if it does not simultaneously constitute the latter half of a geminate.

(6) <u>Singleton Codas</u>	<u>Onsets</u>	<u>Geminates</u>
talkyal 'egg'	raion 'lion'	molla 'don't know'

The distributional pattern appears to be an obvious example of geminate inalterability with regard to an onset constraint, arguing against the position advocated by Inkelas & Cho (1993). It is specifically maintained that the syllable initial /l/ occurs only when it is (indirectly) licensed by a coda; licensing of the first part of a geminate /l/ enables the onset /l/ to be well-formed.

However, there is only one liquid in Korean and there is no evidence whatsoever that it is specified for laterality at the relevant point in derivation (Y. Cho 1997). In fact, there is a clear indication that the liquid is unmarked for this property in onset positions not only underlyingly but also at least until the phrasal level. One way of understanding the phonetic realization of liquids has been to assign the feature [+lateral] to the coda and the feature [-lateral] to the onset. According to this conception, singleton codas and geminates surface as [l], while singleton onsets surface as [r]. But the data involving lateralization of /t/ in (7b) strongly suggest that implementation of laterality in the onset position is not warranted. In loan phonology, all liquids (whether they came from /l/ or /r/ in the source languages) exhibit uniform realization for some processes. In (7b), word-initial [r] triggers lateralization even though it surfaces as nonlateral in the nonassimilatory environment. In (7c), both /l/ and /r/ undergo nasalization postconsonantly, while in (7d) both of them trigger lateralization of /n/.

(7) a. 'Los Angeles' 'Reno'
 [rosi enjeles] [rino]

b. Lateralization of /t/

kot rosi enjeles → kollosi enjeles 'soon Los Angeles ...'
 kot rino → kollino 'soon Reno ...'

c. Nasalization of liquid

'Hamlet' [hamnit]
 'Camry' [camni]

d. Lateralization of /n/

'Henry' [helli]
 'only' [olli]

The uniform behavior of /l/ and /r/ in loans makes it natural to assume that the feature [lateral] is privative in Korean. In other words, a syllable-initial [r] does not acquire any value for laterality in the phonology per se. In both 'Los Angeles' and 'Reno', the initial liquid should be represented as a sonorant approximant which is not marked one way or the other for the feature [lateral], as per the model introduced by Iverson & H. Sohn (1994). Laterality comes into play only when the default rule assigns [+lateral] to the coda position. As syllable-initial liquids are then not marked [-lateral], they will trigger lateralization as in (7b), which is in fact merely assimilation,

or spreading, of the feature [+sonorant] (along with its [+approximant] dependent). The lateralization of the assimilated cluster (/t + r/ → [l]) is therefore due to the independently needed rule assigning laterality to the coda consonant; and since onset [r] is not specified for laterality, the resulting lateralization in geminate clusters is also due to coda lateralization, not assimilation.

Contrary to the analysis couched in terms of geminate inalterability, the above data actually illustrate a case of geminate 'alterability': Both singleton and geminate codas undergo lateralization even though the second half of a geminate does not satisfy the structural description of coda lateralization. The phonetic interpretation of the onset liquid as a flap then follows from a phonetic implementation rule to that effect, but Iverson & H. Sohn (1994), in fact, go a step farther by relating the [l]/[r] distribution to the general requirement of coda non-release in Korean rather than to a phonological rule assigning laterality to coda liquids. Specifically, they observe that coda sonorant consonants in Korean, like the obstruents, maintain their central oral contact phase throughout their articulation, i.e., are 'unreleased'; for the liquid in coda position, the continued tongue-contact requirement results automatically in lateral articulation, whereas in onset position the liquid is centrally released, resulting in a tap.

3. Autosegmental Phonology

The late 1970's saw the emergence of Autosegmental (non-linear) Theory (Goldsmith 1976). Many traditional analyses were revisited and given new interpretations. Suprasegmental aspects such as harmony and tonology are two areas which naturally lend themselves to autosegmental analyses. Diachronic and synchronic accounts of Korean vowels were explored to a great extent, based on earlier studies by S-N. Lee (1947), W-J. Kim (1963), K-M. Lee (1972). Of particular theoretical interest is the mimetic system which involves typologically unusual height harmony (McCarthy 1984, Y-S. Kim 1988, Y-S. Lee 1993).

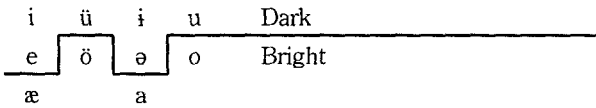
3.1. Vowel Harmony

The diachronic and synchronic aspects of vowel harmony in Korean have been a topic of much controversy in the literature. Much of the evidence for the organization of the Middle Korean vowel inventory comes from a

productive rule of vowel harmony, which has synchronic reflexes in the mimetic system of Modern Korean. The mimetic system involving height harmony is also interesting in its own right for puzzles which it raises about the representation of transparent vowels and distributional asymmetries in the vowel inventory.

The mimetic vocabulary of Korean consists of several thousands of sound-imitating and manner-symbolic words which manifest consonantal and vocalic alternations. The consonantal and vocalic qualities of the morphemes correlate with systematic semantic distinctions of light and dark, which roughly corresponds to diminutive and augmentative. This distinction is made along the height dimension of vowels; dark vowels are high or mid unrounded, and bright vowels are low or mid rounded.

(8) Vocalic Alternations



There are six 'non-low' vowels in the inventory, each of which has a low mimetic counterpart. This results in six possible mimetic alternation types; all are attested, and examples are given in (9).

(9) a. /i/-/æ/

kilc'uk	kæc'uk	'slim'
pisil	pæsil	'weak'
pit ^h il	pætīl	'twisted'
piŋiŋ	pæŋpæŋ	'rotating'

b. /e/-/æ/

kelkel	kælkæł	'exhausting'
k'ecilək	k'æcilak	'halfheartedly'
t'ekul	t'ækul	'rolling down'

c. /ü/-/ö/

k'üctü	k'öcöcö	'dingy'
hühü	höhö	'round about'
nüləh-ta	nöləh-ta	'sickly yellow'

d. /i/-/a/

k'it'ək	k'at'ak	'nodding'
silc'ək	salc'ak	'secretly'
hintil	hantil	'breezy'
k'ink'in	k'ank'an	'sticky'

e. /ə/-/a/

əlluk	allok	'motley'
pəpək	papak	'scratching'
k'əŋchuŋ	k'əŋchoŋ	'jumping'

f. /u/-/o/

culcul	colcol	'running'
pusil	posil	'drizzling'
k'umt ^h il	k'omt ^h il	'wriggling'
k'ultək	k'olt'ak	'gulping'

For vowels in columns with more than one dark, or nonlow, vowel, i.e., the unrounded vowels (/i/ and /e/, and /i/ and /ə/), the relationship between the two dark vowels is not predictable.

All previous attempts to analyze the mimetic system have confronted two basic problems. The first is that the two harmonic sets of vowels do not constitute natural classes in any standard feature system. The second is that the class of transparent vowels is defined in terms of the harmonizing feature—and as a further challenge for most existing theories of vowel harmony, the high vowels are transparent to height harmony (noninitially).

Kim-Renaud (1974) adopts a diacritic solution to the first problem, proposing the features [dark] and [light]; though semantically motivated, these are phonetically opaque. McCarthy (1983), on the other hand, tackles the first problem with an abstract solution. Assuming that mimetic harmony involves the feature [low], McCarthy proposes that the nonhigh round vowels are phonologically [+low]. Their phonetic mid values are generated by a late absolute neutralization rule ordered after mimetic harmony has taken place. To handle the transparency problem, he proposes that high vowels are underlyingly specified as [+high, -low]. Their inherent [-low] value blocks the assignment of [+low] in the 'bright' harmony environment. Initial high vowels lack inherent specification for [low], and therefore receive whatever value is assigned by the mimetic harmony. Though descriptively adequate, this analysis does not explain why transparency should be limited to

noninitial position, nor does it explain why specifically high vowels, rather than, say, mid vowels, are transparent.

Cho & Inkelas (1993) offer an alternative account which relies on the following assumptions. First, high vowels are underspecified for tongue height features, which accounts for their transparent behavior. Tongue Height harmony takes place below the level of the Tongue Height (or Aperture) node, from which both [high] and [low] are dependent. Finally, the mimetic process is decomposed into two parts, initial Linking and Spreading, which accounts for the different behavior of initial and noninitial high vowels. Other attempts to rationalize this system rely on different features (cf. Y-S. Kim 1988 for ATR [advanced tongue root] and Y. Lee 1993 for DVR [deep voice resonance]). There are several reasons to reject these proposals, however: 1) No phonetic motivation exists for Korean speakers to analyze the mimetic alternations in terms of ATR, since the height distinctions are articulatorily and acoustically salient, and ATR is usually defined as a distinction in vowels whose height is constant; 2) The transparency of high vowels is arbitrary and must stipulate * [+high, ATR].

3.2. Vowel Harmony in Verbal Morphology: Diagonal Harmony

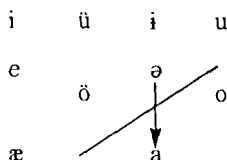
Aside from the mimetic vocabulary, the only area in which the once productive vowel harmony of Middle Korean has survived is the /ə-a/ alternation in verbal suffixes stated in (10).

- (10) In careful speech, suffix-initial /ə/ becomes /a/ after a verb stem whose last vowel is either /o/ or /a/.

(11) "Diagonal Harmony" (Ahn & Kim 1985)

a. coh-a	'be good-Continuative'
tolpo-asə	'look after-Causal'
cap-ass-ta	'catch-Past-Declarative'
b. cip-əla	'pick-Imperative'
pe-əsə	'cut-Causal'
mæ-əss-ko	'tie-Past-Conjunction'
cü-əto	'grab-Concessive'
k'ö-əla	'tempt-Imperative'
k ^h _i -ə > k ^h ə	'be big-Continuative'
mul-əss-ta	'bite-Past-Declarative'
sə-əto > səto	'stand-Concessive'

(12) Bright Vowels vs. Dark Vowels in verbal morphology



Is "Diagonal Harmony" a spreading (assimilation) process? The answer is no. First, in colloquial speech, initial /o/ obligatorily triggers the alternation while noninitial /o/ does not, as exemplified in (13).

- (13) a. coh-a *coh-ə 'be good'
 kow-a *kow-ə 'pretty'
 nok-a *nok-ə 'melt'
- b. kölow-ə ~ kölow-a 'agonize'
 alim^htaw-ə ~ alim^htaw-a 'be beautiful'

Second, an assimilation account cannot explain why the alternation is restricted to the first suffix even though the same suffix is involved, as in the case illustrated in (14).

- (14) coh-ass-əss-ta 'be good-Past-Past-Declarative'

Third, in colloquial speech, /a/ does not obligatorily trigger the alternation at all, as the doublets in (15) attest.

- (15) cap-ə ~ cap-a 'grab'
 yətat-ə ~ yətat-a 'open and close'

The /ə-a/ alternation, then, is basically morphological. The relevant suffixes are characterized by two allomorphs, with /a/ selected when the stem contains /o/ in its first syllable, the /ə/ allomorph elsewhere. This analysis also helps to explain an otherwise puzzling fact about the diagonal harmony, namely, its restriction to back vowels. In mimetics, both front and back vowels undergo height harmony. The explanation for the restriction on the diagonal process lies in the fact that historically, when the so-called Diagonal Harmony was productive, Korean only had a back vowel series (K-M. Lee 1972).

4. Lexical Phonology

The development of Lexical Phonology (Kiparsky 1982) and Prosodic Hierarchy Theory (Selkirk 1984, Nespor and Vogel 1986) in the 1980's was triggered by an interest in rule domains and in the interface between phonology and morphology/syntax. Several dissertations contributed to the prosodic characterization of morphological categories and the formal representation of domains, but it has often been noted that morphosyntactic structures do not always match up with prosodic structures (Selkirk 1984, Nespor and Vogel 1986, Inkelas 1989). One of the most well-known observations regarding this non-isomorphism is that there is an internal word boundary (often called a compound boundary), where each member of a compound forms a separate phonological domain, or 'prosodic word', while suffixes often cohere to the second member of a compound. Although mismatches between morphological and prosodic structures have been well documented, recently efforts have been made to clarify the nature of the prosodic constituents in question. In Korean, prefixes and each member of a compound (but not suffixes) form an independent domain for such processes as Syllabification (as evidenced by Coda-Neutralization and Cluster Simplification), Palatalization and /n/-insertion, some familiar examples of which are listed in (16).

- (16) Sublexical Prosodic Domain in Korean (S. Ahn 1985, Y-S. Kim 1985, J-M. Kim 1986, D. Park 1990, O. Kang 1993, E. Han 1994).

a. Coda-Neutralization

ap ^h	ap	'front'
pic ^h	pit	'light'
cas	cat	'pine nut'
pak'-e	pak'e	'outside-Locative'
k'oc ^h -i	k'oc ^h i	'flower-Nominative'
mos+an	motan	'inside the pond'
pat ^h +ilaŋ	patiraŋ	'field ridge'

b. Cluster Simplification

anc-a	anca	'sit+suffix'
kaps-i	kapsi	'price-Nominative'
nəks+əpsi	nəkəpsi	'absent-mindedly'
kaps+əc ^h i	kapəc ^h i	'value'

c. Palatalization

canti	canti (*canji)	'grass'
kat ^h -i	kac ^h i	'together+Adv'
pat ^h -i	pac ^h i	'field-Nominative'
pat ^h +ilaŋ	patiraŋ	'field ridge'

d. /n/- \emptyset alternation

k ^h oŋ+yəs	k ^h oŋnyət	'bean taffy'
pom+yəlim	pomnyərim	'spring and summer'
cit-iki-	cinniki-	'to mash'
c ^h æk-ilk-ko	c ^h ækilk'o (*c ^h æŋnik'o)	'read a book and'

5. Optimality Theory

Most recently, Optimality Theory (Prince and Smolensky 1993, McCarthy and Prince 1993) promises to solve some of the thorny issues of Korean phonology. For instance, the n - \emptyset alternation clearly demonstrates that neither the historically true deletion account nor the diachronically inverted insertion account is adequate. It is a well-known fact of Korean historical phonology that in the late 18th century the coronal nasal n started to delete in word-initial position before the high front vowel /i/ and the glide /y/. As a result, /ni/ has been completely neutralized in initial position in Modern Standard Korean, except in recent loan words.

However, the synchronic n - \emptyset alternation is much more complex in medial position. As exemplified in (17), not only the etymologic (i.e., historically true) /n/ but also nonetymologic (historically unattested) /n/ surfaces in non-initial positions.

(17) a. Etymologic /n/

əkum+ni	→	əkumni	'molar'
nuc+nyəlim	→	nunnyərim	'late summer'

b. Nonetymologic /n/

pam+il	→	pamnil	'night work'
sæk+yuli	→	sæŋnyuri, sæknyuri	'colored glass'

Whereas the historical change of /n/-deletion neutralized only the initial distinction between /ni/ and /i/, the synchronic rule seems to work in two ways: First delete the initial /n/, second, insert /n/ (optionally) in the

relevant medial position. Descriptively speaking, the relevant boundary here involves the position after a prefix or a stem in a compound, when the preceding element ends in a consonant (obligatorily after a sonorant and optionally after an obstruent), as illustrated by the pair /pam+il/ [pammil] 'night work' and /noŋ sa+il/ [noŋ sail] 'farm work'.

One can immediately rule out the possibility of diachronic rule inversion (Vennemann 1972), i.e., it is not possible to assume that /n/-deletion in initial position has been completely reanalyzed as /n/-insertion in a complementary environment, because etymologic /n/ behaves differently in compounding from nonetymologic /n/ when the preceding morpheme ends in a vowel. Thus, initial etymologic /n/ in the second element of a sub-compound undergoes gemination, but nonetymologic /n/ is not even introduced if the first word in the compound ends in a vowel, as shown in (18) (Cook 1987).

(18) a. Etymologic /n/ undergoes gemination:

alæ+ni	→	arænni	'lower teeth'
k'æ+nip ^h	→	k'ænnip	'sesame leaf'

b. Nonetymologic /n/ is not introduced:

noŋsa+il	→	noŋsail	'farm work'
k'æ+yəs	→	k'æyət	'sesame toffee'

Under the traditional rule-based approach, there are no reasons to prefer an insertion account over a deletion account. The deletion analysis alone (W. Huh 1965, C-W. Kim 1970b) is not descriptively adequate, since it cannot account for the reason why all words invariably acquire /n/ before a high front vowel unless preceded by a vowel-final word in a sub-compound. Since all underlying representations would begin with /n/, there is no way to account for the observed difference of gemination versus absence of /n/ in compounds, short of arbitrarily deleting just certain intervocalic /n/'s. The insertion account, on the other hand, cannot explain why all words beginning with /ni/ must lose /n/ in initial position.

As demonstrated in Y. Cho (1994, 1997), these data call for a nondirectional account in which the nasal segment alternates with zero, where the outcome depends on the interaction between several independent constraints. An optimality-theoretic account of Consonant Cluster Simplification (Iverson & S. Lee 1995, described below) and Glide Formation (Y-S. Lee 1995) are other good examples of the way Optimality Theory sheds light on hitherto

intractable problems.

6. Korean Intonation and Phrasal Phonology

There have also been several insightful instrumental studies of Korean intonation (H. Koo 1986, Silva 1992, S. Jun 1993). Recent interpretation of the data seems to suggest that Standard Korean is a deprived pitch-accent system where an underlying tonal melody is not associated with a lexical item (except for the set of interrogative pronouns), but is mapped onto the phonological phrase as defined by the theory of Prosodic Hierarchy. The major difference between the standard dialect on the one hand, and the Kyengsang dialect, other Modern Korean dialects (Ramsey 1978), and Middle Korean (S-O. Lee 1978)—of which the standard dialect is a direct descendant—on the other hand, lies in the fact that the latter have lexically contrastive tones. There are scattered studies on the Kyengsang (Y. Chung 1991, Kenstowicz & Sohn 1996) and Cholla dialects (S. Jun 1993), but it is time to aim for a complete tonological picture of all Korean dialects.

In addition, it has been demonstrated that Focus has a top-down effect in restructuring phonological phrases in Korean by obligatorily imposing a new phrase boundary (Y. Cho 1990). In particular, the role Focus plays in accentuation and phrasing has only recently begun to be explored. An Optimality-Theoretic investigation of Korean phrasing promises to be especially fruitful since diverse constraints reflecting syntactic constituency, weight, speech rate, and focus interact intricately to produce the surface patterns of intonation and rhythm.

7. Place Geometry

Turning now to new developments in feature geometry, we note that, in parallel to Y. Cho's (1990) parametric approach to the characterization of assimilation phenomena, a proposal has emerged in recent years which calls for a specific structural asymmetry in the representation of place features. The idea is founded primarily on a now familiar bias first noted in the phonology of Korean, where, under conditions of regressive place assimilation, coronals assimilate to labials and velars, and labials assimilate to velars; but velars do not assimilate to labials, and neither labials nor velars assimilate to coronals. Iverson & K-H. Kim (1987) lay out the relevant data, recently recapitulated as in (19) by Iverson & S. Lee (1995):

(19) Place of Articulation Assimilation

/pan+myən/	→	[pammyən]	'on the other hand'
/sin+pal/	→	[šimbal]	'shoes'
/han+kaŋ/	→	[haŋgaŋ]	'Han River'
/pat+ko/	→	[pakk'o]	'receive-and'
/os+pota/	→	[opp'oda]	'clothes-than'
/əp+ko/	→	[əkk'o]	'carry-and'
/kam+ki/	→	[kaŋgi]	'cold'
But :/nop+ta/	→	[nopt'a]	'high-Declarative'
/nok+ta/	→	[nokt'a]	'melt-Declarative'
/kuk+mul/	→	[kuŋmul]	'soup-broth'

This asymmetry derives conventionally from the spreading of marked into unmarked structure if, following Avery & Rice (1989) and Rice (1994), a node 'Peripheral' is posited in the feature geometry subordinate to Place; coronals are then unspecified for all Place nodes, labials are marked just for Peripheral, and velars contain Peripheral along with the subordinate articulator Dorsal, as shown in (20).

(20)	velars	labials	coronals
	Place	Place	Place
	Peripheral	Peripheral	
	Dorsal		

Thus, coronals take on the qualities of both labials and velars because coronals are less fully represented than either labials or velars. By the same consideration, labials take on the qualities of velars but not coronals, while velars resist assimilation to either of the other two place of articulation categories. This pattern is found also in English casual speech (*i*[ŋ] *Kingston*, *i*[m] *Plymouth*, *fro*[ŋ] *Kingston*, but *fro*[m] *Toronto*, etc.), and Rice (1994) adduces other support for the Peripherality idea from historical developments in Romanian and a number of Algonquian (Arapaho, Atsina, Yurok) and Athabaskan languages (Ingalik).

More recently still, Davis, Iverson & Salmons (1996) show how the markedness relations emerging from this originally Korean-based place of articulation hierarchy also bear, rather surprisingly, on the strictly manner of articulation adjustments in the history of German known collectively as the

High German Consonant Shift. According to this well-known sound change (cf., e.g., Davis & Iverson 1995), Proto-West Germanic /p t k/ became the voiceless affricates /pf ts kx/ in early Old High German, as in **plegan*, **tiohan*, **korn* > OHG *pflēgan* 'to tend', *ziohan* 'to pull', *chorn* 'grain' (z presumably stood for /ts/, ch for /kx/). Only the extreme southern dialects of Old High German were affected by the shift of *k* > *kx*, however, and the more northerly dialects also were generally exempt from the shift of *p* > *pf*, particularly in word-initial position. After vowels, the shift ultimately resulted in geminate fricatives rather than affricates, e.g., **opan* > OHG *offan* 'open', **etan* > *e33an* 'to eat', **makōn* > *mahhōn* 'to make' (-33- apparently indicated a retracted variant of geminate /ss/, -hh- stood for /xx/). But as the summary in (21) indicates, the shift affected /t/ over the widest range and to the greatest extent, /p/ somewhat less, and /k/ least of all. This follows precisely the Peripherality model laid out in (20), because the greatest resistance to participation in the shift is exhibited by the representationally most complex stop (the velar), and least resistance by the least complex stop (the coronal). Quite apart from its role in determining susceptibility to place of articulation assimilation, therefore, Peripherality offers the empirically correct distinction in place markedness not only of underspecified coronals vis-à-vis the other places of articulation, but also of labials in comparison to velars, which otherwise would not be differentiated along the markedness dimension.

(21) Overview of the High German Shift of /p t k/, from North to South

Old Saxon (unshifted)	coronals		labials		velars	
	t		p		k	
Middle	z-	-33-	p-	-ff-	k-	
Franconian						-hh-
Rhenish	z-	-33-	p/pf-		k-	
Franconian			-ff-			-hh-
East Franconian	z-	-33-	pf-	-ff-	k-	-hh-
Upper German	z-	-33-	pf-	-ff-	ch-	-hh-

8. Peripherality and Optimality in Korean Nonassimilatory Phonology

The Peripherality idea also figures prominently in nonassimilatory aspects

of Korean phonology, as pointed out early on by C-W. Kim (1988). One of these concerns the much discussed treatment of consonant clusters, which the language does not permit within syllables, i.e., only singletons are allowed syllable-internally, hence surface consonantal sequences are necessarily composed of at most two members, always heterosyllabic. Underlying clusters which cannot be parsed as split prosodically between two syllables because of their positioning in the word are then subject to simplification, resulting in removal of either the first or the second member. Following the discussion in Iverson & S. Lee (1995), the forms in (22) illustrate that only the first consonant in a stem-final cluster of obstruents or coronals surfaces when the morpheme is word-final or followed by another consonant.

(22) Standard (Seoul) and Southeastern (Kyengsang)

p(s)	kaps	→	[kap]	'price' (citation)
	kaps+to	→	[kapt'o]	'price-also'
Cf.	kaps+i	→	[kapši]	'price-Nominative'
k(s)	nəks	→	[nək]	'soul'
	moks	→	[møk]	'share'
n(c)	anc+ta	→	[ant'a]	'to sit down'
l(s)	tols	→	[tol]	'1st anniversary'
l(th)	halt ^h +ta	→	[halt'a]	'to lick'

While the cluster reduction exemplified in (22) is regularly achieved at the expense of the right member of the cluster, clusters of heterorganic liquid plus stop exhibit dialect variation as shown in (23): The second (obstruent) member survives in Standard Korean as spoken in Seoul (a), but the first (sonorant) member surfaces in the Southeastern dialects of Kyengsang (b). Sonorant-only clusters (\sqrt{lm}), however, are affected the same way throughout, viz., the second member survives.

(23) a. Seoul

(l)k	ilk+ta	→	[ikt'a]
(l)p	palp+ta	→	[papt'a]
(l)p ^h	ilp ^h +ta	→	[ipt'a]

b. Kyengsang

l(k)	ilk+ta	→	[ilt'a]	'to read'
l(p)	palp+ta	→	[palt'a]	'to tread on'
l(p ^h)	ilp ^h +ta	→	[ilt'a]	'to recite'

(l)m	salm	→	[sam]	(l)m salm → [sam] 'life'
(l)m	kulm	→	[kum]	(l)m kulm → [kum] 'to starve'

Couched in the increasingly familiar terms of Optimality Theory (Prince &

McCarthy 1993, Prince & Smolensky 1993), forms in the pattern of (22) and (23) can be accounted for under assumption of two weighted constraints which govern the construction of Korean syllables. These are Peripherality and Coda Sonority:

(24) Peripherality

Parse Peripheral specifications.

(25) Coda Sonority

In syllable codas, parse sonorant segments.

As Kenstowicz (1993) also observes, Peripherality (his 'Parse-Place') parallels the representations of the feature geometry shown in (20), and in the form of (24) gives prosodic priority to labials and velars. The result in a lexical cluster of heterorganic obstruents, as in /kaps/, will be that the Peripheral is parsed, or realized, at the expense of the nonperipheral: [kap]. It is not possible in Korean for both members of the cluster in /kaps/ to survive, and the winner is /p/ rather than /s/ (which would neutralize to [t]) because /p/ meets the Peripherality constraint in (24), /s/ does not.

There happen not to be any underlying final clusters in which both members are peripheral—if there were, one would expect parsing of the more marked velars at the expense of labials—but there are some composed of liquid or nasal plus coronal obstruent in which neither member is peripheral, e.g., in /tols/, and in these cases it is the sonorant member of the cluster which survives. Iverson & S. Lee (1995) ascribe this resolution of the cluster violation to the Coda Sonority constraint, a cross-linguistic preference for segments of higher rather than lower sonority in syllable codas. The implications of this principle for language change have been laid out by Vennemann (1988: 21ff; cf. the 'Coda Law' and 'Syllable Contact Law', and for language typology by Goldsmith (1990:128ff). In particular, Goldsmith observed that some languages permit only sonorant consonants in the coda, like Hausa and Mandarin Chinese, while others, like English, permit (essentially) any consonant in the inventory in this position; but apparently no languages exist which allow only obstruents in the syllable coda. In other frameworks, Clements (1990) has incorporated the effects of Coda Sonority into a set of general principles defining the 'sonority cycle' and core syllabification, and Iverson & Salmons (1992) have introduced the Coda Sonority idea into a comparative analysis of limitations on Proto-Indo-European root structure

(where a surprising 83% of CVC root reconstructions are sonorant or laryngeal-final).

With respect to a Korean word like [kap.ʃi], then, the interaction and applicability of relevant constraints would be as represented in the table in (26), adapted along with others from S. Lee (1994). Onset Maximalization ('Onset Max') is the familiar requirement that a syllable should incorporate a consonantal onset where possible; '*Complex' represents the exclusion of syllable-internal consonant clusters; and 'Parse' is simply the call for surface realization of underlying structure.

(26) kaps 'price' + i (nom) → [kapʃi]

candidate	Onset Max	*Complex	Parse	Peripherality
a. + kap.ʃi				
b. kapʃ.i	* !	*		
c. kap<ʃ>.i	* !		*	
d. ka<p>ʃ.i	* !		*	*

As is the convention, constraints are ordered left to right in order of priority. A '+' indicates the optimal output, '*' marks violation of the constraint in a given column, and '! indicates a decisive violation; unparsed material is bracketed by '>'. The shading of a box indicates that the information in that box is rendered irrelevant by the violation of a higher constraint. In (26), then, the optimal form is (26a) because (26b-d) all violate Onset Maximalization, the highest ranked of these constraints and violation of which is 'fatal' hence any violation of lower ranked constraints is moot (the shaded boxes). In the uninflected word [kap], on the other hand, the interaction of relevant constraints would be as presented in the table in (27).

(27) kaps 'price' → [kap]

candidate	*Complex	Parse	Peripherality
a. kaps	* !		
b. + kap<s>		*	
c. ka<p>s		*	* !

Here the optimal form is (27b) because (27a) fatally violates *Complex, the higher ranked constraint against syllable-internal clusters; (27c), in not

parsing the /p/, violates Peripherality as well as Parse, whereas (27b), which excludes the /s/ of /kaps/, violates *only* Parse. (Coda Sonority does not come into play in (27), because both /p/ and /s/ are obstruents, and Onset Maximalization is not illustrated here because the three candidates under consideration are all in observance of that constraint.)

The dialect differences shown in (23) can also be described in a principled way under the assumptions of Optimality Theory, because in the forms which vary, Peripherality and Coda Sonority are in competition. Thus in cases where both of the constraints are relevant, or make a potential difference, Peripherality takes precedence over Coda Sonority in the Seoul dialect, e.g., the peripheral /k/ survives in /ilk+ta/ → [ikt'a]; but Coda Sonority is weighted more heavily than Peripherality in Kyengsang, as there it is the sonorant consonant /l/ which survives in /ilk+ta/ → [ilt'a]. With the rank-ordering of constraints built-in as a fundamental rather than ancillary property of the model, Optimality Theory is especially well suited to the description of this kind of patterned linguistic variation.

But the theory also easily accomodates lexically idiosyncratic variation, which a classic rule-ordering model, insensitive to the properties of individual words, would handle only with added complexity. In Kyengsang, for example, there is variation reported in some words between a Seoul-type pronunciation retaining the peripheral member of an /lk/ cluster, and the typical Kyengsang pattern, in which the sonorant member is retained instead. Under apparent sociolinguistic conditioning, unsuffixed /talk/ 'chicken' (cf. [talgi]-Nominative) is variously realized in Kyengsang as [tak] or [tal], and /hilk/ 'soil' (cf. [hilgi]-Nominative) is manifested as either [hik] or [hil]. This variation provides confirmatory evidence apart from assimilation that Peripherality plays a persistent role in the Kyengsang dialect despite being generally subordinated to Coda Sonority there, but it also underscores the descriptive capacity in Optimality Theory for lexically sensitive constraint ranking. The interaction of constraints appropriate for Seoul speech (as well as a Kyengsang variant) with respect to /hilk/ → [hik] is illustrated in the table in (28), where Peripherality outranks Coda Sonority. The optimal form, (28b), violates only Parse and the lower ranked Coda Sonority constraint, whereas the other candidates, (28a) and (28c), violate more highly ranked constraints.

(28) hilk 'soil' → [hik] (Seoul; also a Kyengsang variant)

candidate	*Complex	Parse	Peripherality	Coda Sonority
a. hilk	* !			
b. + hi< >k		*		*
c. hil<k>		*	* !	

Similarly, the table in (29) shows the typical Kyengsang charting of /hilk/→ [hil], where the relative ranking of Coda Sonority and Peripherality is reversed. In this case, (29c) is optimal because its violation of Peripherality, the lowest ranked constraint, is made irrelevant by the superiority of Coda Sonority.

(29) hilk 'soil' → [hil] (Kyengsang)

candidate	*Complex	Parse	Coda Sonority	Peripherality
a. hilk	* !			
b. hi< >k		*	* !	
c. + hil<k>		*		*

The dialect differences at hand thus emerge naturally under the constraint interaction model of Optimality Theory, without multiple or contradictory procedures for the building of prosodic structure (Whitman 1988, Cho 1990), and without need to posit syllabification in the lexicon as well as in the phonology (Oh 1994). Kenstowicz's (1993) Optimality-Theoretic sketch of Korean cluster reduction, on the other hand, parallels much of the present exposition, including lexically variable constraint ranking, but it posits a constraint called Contiguity in the place of Coda Sonority. Contiguity calls for the maintaining of adjacency between segments which are already adjacent in lexical representation, thus the preferred site for epenthesis is at the margin of rather than within morphemes—an epenthetic segment at morpheme juncture does not interrupt the contiguity of segments which are adjacent in lexical representation, but morpheme-internal epenthesis does. Generalizing this idea to cover also deletion, or underparsed material, gives results for Korean cluster simplification similar to the present analysis developed to this point, but with Contiguity substituting for Coda Sonority. In (28), for example,

Peripherality would dominate Contiguity (rather than Coda Sonority), hence the survival of /k/ in /hilk/ would win out over /l/ despite the fact that /l/ and /k/ are not lexically contiguous in this form; then with the reverse ranking in (29), Contiguity would be a superior constraint to Peripherality, and so call for keeping intact the lexical adjacency of /l/ and /k/ at the expense of underparsing /k/.

Contiguity and Coda Sonority yield different predictions in other cases, however, and there the indication is that, if it is instantiated at all in Korean, the Contiguity constraint must be subordinate to Coda Sonority. In the case of heterorganic sonorant clusters, illustrated by /salm/ 'life' in (23), the surviving member of the cluster in each dialect area is the segment marked for both peripherality and sonority, /m/. If Contiguity were substituted for Coda Sonority, then *[sal] would be the form predicted in Kyengsang, where Peripherality is the subordinate constraint. But under assumption of Coda Sonority instead of Contiguity, [sam] is the form predicted in Kyengsang as well as in Seoul, as charted in the tables in (30) and (31).

(30) salm 'life' → [sam] (Kyengsang)

candidate	*Complex	Parse	Coda Sonority	Peripherality
a. salm	* !			
b. +sa<l>m		*		
c. sal<m>		*		*

(31) salm 'life' → [sam] (Seoul)

candidate	*Complex	Parse	Peripherality	Coda Sonority
a. salm	* !			
b. +sa<l>m		*		
c. sal<m>		*	* !	

In (30), the optimal form is (30b) because the fully parsed (30a) violates the higher ranked constraint against syllable-internal clusters, and (30c), though it conforms to Coda Sonority the same as (30b), violates Peripherality as well as Parse. In (31), where Peripherality dominates Coda Sonority, the least violated candidate again is the one in which the liquid is disregarded. The survival of /m/ in /salm/ is thus doubly motivated, as the /m/ satisfies

both Peripherality and Coda Sonority; hence [sam] is the pronunciation observed in both dialect groups, irrespective of rank ordering between the two constraints.

Optimality Theory thus offers a particularly suitable framework for description of this kind of linguistic variation, including lexically sensitive choices between alternate constraint rankings made within the same language or dialect. In addition to their role in the determination of consonant cluster simplification, however, these constraints appear to be involved in other aspects of Korean syllable structure as well. Interpreted as constraints on optimality rather than as factors of authorization in the syllabic licensing procedure (per Goldsmith 1990, Oh 1994), these principles cast the frequently described phenomenon of syllable-final obstruent neutralization in Korean in a new light.

It has been pointed out many times that this language's three-way laryngeal manner contrast neutralizes to the unmarked lax type of articulation in syllable-coda position, where the fricatives and affricates also lose their continuant qualities; additionally, the glottal approximant /h/ merges with the class of coronals to surface as unreleased [t̚] (Iverson 1989). However, these changes have the odd consequence within a derivational model of phonology of forcing the postulation of a rule which is not defined on any single geometric constituent (Clements & Hume 1994). As Iverson & Kim (1987) expressed it, the coda neutralization rule requires the 'delinking of all terminal features'—specifically, the laryngeal features [spread glottis] or [constricted glottis] as well as the manner feature [continuant], and the Coronal-subordinate place feature [-anterior] (which identifies the palatal series). Nodes in the geometry like Labial or Dorsal are then not affected, and the actual noncontinuant, lax character of the resulting stops is filled in by unmarked 'default' specification.

(32) Coda Neutralization	Word-Final Effects	
/p p' p ^h / → [p̚]	/i p ^h / → [ip̚]	'leaf'
/t t' t ^h / → [t̚]	/n a t ^h / → [nat̚]	'each'
/c c' c ^h / → [t̚]	/n a c ^h / → [nat̚]	'face'
/s s'/ → [t̚]	/n a s/ → [nat̚]	'sickle'
/h/ → [t̚]	/n a h/ → [nat̚]	'give birth'
/k k' k ^h / → [k̚]	/k o k/ → [kok̚]	'song'

Taking these adjustments now all to be reflections of a phonetic constraint imposing a gesture of 'oral contact nonrelease' on syllable-final consonants

generally (Kim-Renaud 1974, Iverson & H. Sohn 1994), the result will be an underparsing of distinctive phonological structure below the level of the Root node, which is itself composed of specifications for the three major class features ([sonorant], [approximant], and [vocoid], in the system of Clements & Hume 1995). In short, phonological segments need be marked only for non-default specifications (apart from major class feature configurations); hence /s/ requires only the specification [continuant] to distinguish it from /h/, which would be marked as both [continuant] and [spread glottis], and /t/ needs no specifications at all since its features are all provided by default (Iverson 1989). Accordingly, neutralization of the nonanterior coronal affricates and the placeless glottal approximant /h/ to an anterior coronal stop is attributable to the default character of the segment /t/ in Korean, because any nonsonorant not marked for Peripherality—the class of unreleased coronal obstruents as well as unreleased /h/—is spelled out in surface phonology as the lax anterior coronal stop [t].

The survival of labial and velar place properties, however, appears to be another instantiation of the Peripherality constraint, hierarchized in this case to dominate Coda Nonrelease. That is, Peripherality calls for the parsing specifically of labials and velars, while the constraint which derives from the Coda Nonrelease principle in (33) inhibits the parsing of phonological structure apart from major class specifications. The familiar Consonantal Defaults listed in (34) provide actual phonetic representation for unspecified structures, but the subordination of the Coda Nonrelease constraint to Peripherality will account for the surface retention of distinctive labial and velar qualities even under conditions of coda neutralization.

(33) Coda Nonrelease

Oral contact in syllable-final consonants may not be immediately released.

(Consequent Constraint: Parse major class features.)

(34) Consonantal Defaults

- The default Place specification is Coronal dominating [+anterior].
- The default Peripheral specification is Labial.
- The default obstruent manner specification is [-continuant]
(in the case of nonanterior coronals, [-continuant]/[+continuant]).
- Default Laryngeal specifications are [-spread glottis],
[-constricted glottis], [-voice].

In combination with Peripherality, then, Coda Nonrelease and Consonantal Defaults achieve the limitations on syllable-final obstruent articulations illustrated in (32). These constraints, in one form or another, are necessary elements in the description of Korean phonology in any framework, but under Optimality Theory they interact in ways that causally relate a number of superficially independent phenomena, including restrictions on place of articulation assimilation, consonant cluster simplification, and coda neutralization. A convergence of ideas advanced by Ahn (1994), Kenstowicz (1993), Oh (1994), and others thus leads to an account of constraint interaction offering insights into Korean sound structure which appear not to be as forthcoming under conventional, derivational models of phonology. At the same time, the possibility of variable constraint ranking under the model of Optimality Theory constitutes an obviously very powerful descriptive device, particularly when extended into the domain of individual lexical items. It is an important question bearing further investigation, then, as to what the limitations are on this kind of variability, or what constraints there may be on the constraints.

9. Korean Phonetics and the Representation of Aspiration

C-W. Kim's (1970) pioneering work on the laryngeal phonetics of Korean pointed out that there are actually two degrees of aspiration in the three-way distinctive stop system in this language. Besides the series of glottally tense voiceless unaspirated stops ($/p' t' \check{c}' k'/$), Korean has both heavily aspirated ($/p^h t^h \check{c}^h k^h/$) and lightly aspirated voiceless stops ($/p t \check{c} k/$) contrasting in syllable-initial position. Rather than attribute aspiration just to a delay in the onset of voicing for a following vowel, as suggested by the cross-linguistic survey of Voice Onset Time (VOT) variations conducted by Lisker & Abramson (1964), Kim proposed that aspiration is the automatic, aerodynamic result of a spread glottis configuration in the larynx. Thus, as abducted vocal folds begin to come together after release of oral closure in order to produce voicing in a following vowel, a certain amount of time passes before the vocal folds achieve the adducted state necessary for phonation. Up to that point, the vocal folds are not in contact, and air exiting the trachea during the period of post-release voicelessness is perceived as "aspiration". In Kim's (1970) words:

(35) ... it seems safe to assume that aspiration is nothing but a function

of the glottal opening at the time of release. This is to say that if a stop is n degree aspirated, it must have an n degree glottal opening at the time of release of the glottal closure. (C-W. Kim 1970:77)

More than two decades later, Ladefoged (1993) similarly holds that:

- (36) In general, the degree of aspiration (the amount of lag in the voice onset time) will depend on the degree of glottal aperture during the closure. The greater the opening of the vocal cords during a stop, the longer the amount of the following aspiration. (Ladefoged 1993:142)

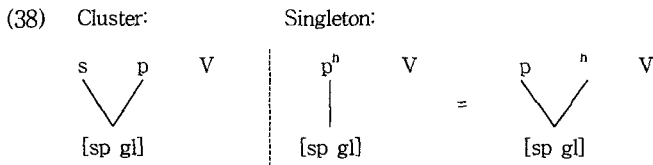
In Korean, then, the heavily aspirated series can be characterized as having the linguistically maximum degree of glottal width (around 10 mm, based on Kim's cineradiographic tracings, representable as [spread glottis]), whereas the lightly aspirated or lax series has an only slightly open glottis in which the vocal folds are neither particularly abducted nor adducted (an opening of around 3 mm, glottis neither spread nor constricted), while the laryngeal configuration of the tense series has the vocal folds in rather tight approximation (less than 1 mm of opening, [constricted glottis]).

This three-way division of glottal width and the identification of aspiration as ensuing from a specification of [spread glottis] have been integrated into the laryngeal feature framework worked out by Halle & Stevens (1971), and continue to form part of the distinctive feature stock of current phonological theory (Clements 1985, Goldsmith 1990, Kenstowicz 1994). But the "puff of air" of aspiration does not always result from a specification of [spread glottis]. In particular, as Kim pointed out well prior to the development of modern autosegmental representation, there is no aspiration produced within a syllable-internal cluster of voiceless obstruents in English words like *spit*, even though the glottis is spread. In essence, Kim suggested that the reason English stops are not aspirated after /s/ is that these clusters contain but a single specification of [spread glottis], shared between the fricative and the stop:

- (37) ... The glottal movement for /p/ of /sp/ will start during /s/, i.e., the glottis will begin to widen. This means that, if the glottis is instructed to open to the same degree and for the same period for /p/ of /sp/ as it would for initial /p/, the glottis will begin to close by the time the closure for /p/ is made, and consequently, by the time /p/ is released, the glottis will have become so narrow that the

voicing for the following vowel will immediately start, and thus we have an unaspirated /p/ after /s/. Note that the notion of simultaneous compatibility is crucial here, i.e., since /s/ is voiceless and does not require the closing of the glottis, the opening of the glottis for /p/ does not have to wait for the completion of /s/ but can proceed simultaneously with the oral articulation of /s/. (C-W. Kim 1970:80)

Indeed, the peak of glottal opening associated with this gesture in the cluster /sp/ lies in (the latter portion of) the /s/, as will be described. Though the glottis progressively narrows until achieving voicing in the following vowel, as it does in the release portion of singleton stops, in /sp/ the period of "aspiration" is consumed in the oral closure phase of the stop member of the cluster. Assuming a largely constant duration for the specification of [spread glottis] (which equates with the constancy of the "voiceless interval", or VLI, as laid out for English by Weismer 1980), the absence of aspiration in /s/-clusters thus reduces to the observation that the narrowing glottis which characterizes the latter portion of the [spread glottis] specification is associated with the stop in the cluster, whereas the presence of aspiration in singleton stops reflects association of a narrowing glottis with the release phase of the stop (equivalently, with the initial portion of the following vowel):



There is considerable phonetic as well as phonological evidence that the [spread glottis] specification in clusters is shared. Noting that especially sibilant fricatives, like /s/, require a large glottal aperture in order to produce air flow high enough to sustain their characteristic turbulence, Kingston (1990) cites experimental work using photoelectric glottography on voiceless obstruents, both singly and in clusters, from several languages – Swedish, Japanese, Icelandic, as well as English (Löqvist & Yoshioka 1981, Yoshioka, Löqvist, & Hirose 1981). For all of these, in single fricatives the peak of glottal opening is coordinated with the beginning of oral constriction. In single stops the peak occurs later, at the point of oral release, but in clusters there is only one such gesture:

- (39) Peak glottal opening in clusters of a fricative followed by a stop does not occur at the same time relative to the oral articulations as it would for either a fricative or a stop occurring alone. The most typical point is close to the boundary between the two oral articulations, a temporal compromise between the early peak of the fricative and the late peak of the stop. (Kingston 1990:427)

This observation parallels those by Browman & Goldstein (1986a), Anderson & Ewen (1987:195-196), or more recently Goldstein (1990:447) "... that words may begin with at most one glottal gesture", and is consistent with a feature representation for obstruent clusters of the sort in (38), in which the same laryngeal gesture has domain over both members of the cluster; however, it runs afoul of traditional phonological accounts wherein the [spread glottis] feature (or [aspiration]) is not present in either segment to begin with, and instead is added by rule to voiceless stops only at the beginning of the word or stressed syllable. The fact is too that [spread glottis] cannot be a property just of word and syllable-initial stops, because it also occurs phonetically in single fricatives—a wide glottis configuration marks the fricative /s/ in Korean even as a singleton (Kagaya 1974; Iverson 1983b)—and in clusters composed of fricative plus stop, in which case the gesture does not occur twice, once for each of the two voiceless segments, but rather is shared between them. This finding (as, indeed, the feature [spread glottis] itself) was foreshadowed almost exactly in the seminal work on Korean phonetics carried out by C-W. Kim (1970).

The scheme of laryngeal representation for two-way contrasts along the voice-onset continuum differs from language to language, however, depending on the phonology and the phonetics. In the simplest systems, like Hawaiian, there are no VOT contrasts at all, and hence no marked laryngeal features, either; but in two-way VOT contrastive systems, either the feature [voice] is contrasted with an absence of laryngeal specification (Romance, Slavic, Japanese, Dutch), or the feature [spread glottis] is so contrasted (English, German, Swedish, Icelandic). Both features are employed in three-way VOT-contrastive systems, (e.g., Thai), as well as in more complex four-way systems such as in Hindi. In other three-way systems, however, [constricted glottis] is invoked rather than [voice] (Korean, Quechua), or these two features together define a system without [spread glottis], as in Hausa, whose glottally constricted articulations are actually either laryngealized (labials, coronals) or ejective (velars) (Ladefoged 1973). There are numerous

two-way systems as well in which [constricted glottis], rather than [voice] or [spread glottis], is the marked laryngeal feature (e.g., K'ekchi [Mayan]), and there are also four-way systems which exploit [constricted glottis] in various ways (Yuchi [Macro-Siouan], Sedang [Austro-Asiatic], Zulu [Bantu], Kullo [Afro-Asiatic]). Moreover, as Ladefoged's (1973) survey of laryngeal typology first laid out (cf. also Iverson 1983a, Maddieson 1984), there are a number of five-way laryngeally contrastive systems (e.g., Sindhi [Indic], Siswati [Bantu]), and even six-way systems have been reported (Beja [Cushitic], Igbo [Kwa]). These fill out the remaining combinatorial possibilities of the simplex laryngeal features, taking into account that [spread glottis] may not cooccur with [constricted glottis] for obvious anatomical reasons and that all complex systems (three or more contrasts) seem to employ at least one VOT distinction. The table in (40), taken from Iverson & Salmons (1995), exemplifies the known combinations of these three laryngeal features which were anticipated in C-W. Kim's (1970) work, arranged in increasing order of presumed complexity as reflected in the number and kind of contrasts.

(40) Typology of Laryngeal Contrasts

	/p/	/b/	/p ^h /	/b ^h /	/p'/	/b~b'/
Hawaiian	[]					
English	[]	[]	[spr gl]			
Spanish	[]	[voice]				
K'ekchi	[]				[cnstr gl]	
Thai	[]	[voice]	[spr gl]			
Korean	[]		[spr gl]		[cnstr gl]	
Hausa	[]	[voice]			[cnstr gl]	
Hindi	[]	[voice]	[spr gl]	[spr gl] [voice]		
Yuchi	[]	[voice]	[spr gl]		[cnstr gl]	
Sedang	[]	[voice]	[spr gl]			[cnstr gl] [voice]
Zulu	[]		[spr gl]		[cnstr gl]	[cnstr gl] [voice]
Kullo	[]	[voice]			[cnstr gl]	[cnstr gl] [voice]

(continued on the next page)

	/p/	/b/	/p ^h /	/b ^h /	/p'/	/b~b'/
Sindhi	[]	[voice]	[spr gl]	[spr gl] [voice]		[cnstr gl] [voice]
Siswati	[]	[voice]	[spr gl]	[spr gl] [voice]	[cnstr gl]	
Beja	[]	[voice]	[spr gl]	[spr gl] [voice]	[cnstr gl]	[cnstr gl] [voice]

In all cases, save ordinary Germanic as represented by English, the unmarked type of stop falls in the voiceless (unaspirated) series. These segments can be expected then to exhibit the familiar phonological qualities of the unmarked, serving as the site to which rather than from which other features spread, and standing in as the product that results from nonassimilatory neutralizations. Such properties are in fact characteristic of the so-called voiced stop series in English and most other Germanic languages (cf. Iverson & Salmons 1995), where in word-initial position the phonemically voiced stops are phonetically only moderately voiced, if at all, while initial voiceless stops are aspirated according to familiar patterns of distribution. Like Korean, then, English juxtaposes marked aspirated stops with an unmarked series of lax stops (lightly aspirated/redundantly voiced in Korean, unaspirated/redundantly voiced in English), but Korean also contrasts these with a third, glottally constricted series.

10. Palatalization, Umlaut, and Blocking Effects

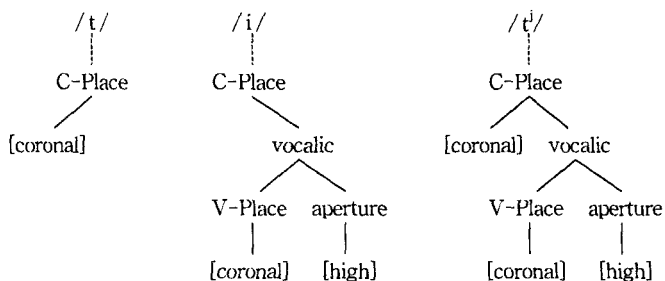
Another aspect of Korean phonology which has gained prominence in current theoretical discussion is the "blocking effect" associated with the processes of umlaut (Hume 1990, Y-S. Kang 1991, Kenstowicz 1994, S. Lee 1993, 1994) and palatalization (Ahn 1988, Iverson 1993, Kiparsky 1993). The two phenomena are related, and interact in ways which Iverson & S. Lee (1994) have argued come about automatically from the operation of cross-linguistically validated phonological principles.

Umlaut in Korean, especially in the Kyengsang and Cheolla dialects, has the familiar effect that back vowels are fronted before /i/ in the next syllable. But the process is inhibited by certain intervening consonants – specifically, by palatals. If a model of segment representation is assumed in which the same place of articulation features are used to describe both consonants and vowels (Clements 1993, Clements & Hume 1995), the

generalization emerges that umlaut takes place just across consonants which are phonologically independent of the vowels involved in the assimilation. That is, umlaut is blocked whenever the high front vowel which would otherwise trigger the process shares place of articulation features with a preceding palatal consonant. Suspension of the application of umlaut has been understood in terms of Geminate Inalterability (Hayes 1986, Schein and Steriade 1986). This principle has the consequence that geometrically shared configurations will satisfy a rule's structural requirements only if they are specifically referred to by the rule. Under this condition, in short, umlaut does not apply over palatal consonants preceding /i/ in Korean because the rule does not explicitly make reference to their shared or multiply associated properties.

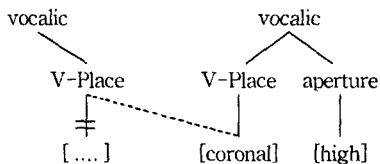
To see this, leaving aside for present purposes any lexical markedness considerations involving Peripherality (which does not play a determinative role in this connection), we look to the Clements model of segment representation in which individual features are not fixed invariantly according to their geometric organization. While vowel place features are subsumed under the category of V-Place, and consonant features fall under C-Place—the general place constituent to which V-Place is itself subordinated (cf. also Archangeli & Pulleyblank 1987)—either type of feature may also appear under the other (or both) of these categories. Thus, labial consonants and rounded vowels are both [labial], but in consonants this feature falls under the C-Place node, in vowels and glides under the V-Place node. Similarly, central consonants and front vowels are both [coronal] (organized under C-Place for consonants, V-Place for vowels), back consonants and back vowels are both [dorsal], and consonants and vowels with retracted tongue root (e.g., pharyngeals) are both [radical]. V-Place also identifies vocalic articulations in consonants: Plain consonants have only a C-Place specification, but secondarily articulated (palatalized, velarized, etc.) consonants, as well as vowels and glides, carry V-Place as a daughter of C-Place. These relationships are illustrated in the geometric comparison in (41), adapted from Clements (1993).

(41) Plain Consonant vs. Vowel vs. Secondary Consonant Articulation



Understanding umlaut as a spreading of the feature [coronal] from a high front vowel /i/ rearward onto a phonologically adjacent preceding vowel (simultaneously displacing any inherent place features) will result in a rule taking the form shown in (42).

(42) Umlaut



In (43a), then, some examples are given in which umlaut takes place over intervening labial and dorsal consonants, and over coronals in (43b), whereas (43c) exemplifies the blocking of umlaut over an underlying palatal consonant; (43d) lists a few forms which, for some speakers, exceptionally fail to undergo umlaut (cf. Kenstowicz 1994:470).

(43) a. Umlaut across noncoronal consonants:

- /api/ → [æbi] 'father'
- /koki/ → [kegi] 'meat'
- /əki/ → [emi] 'mother'
- /cuk+i+ta/ → [cigida] 'kill-Declarative'

b. Umlaut across anterior coronal consonants:

- /mati/ → [mædi] 'knot'
- /məlmi/ → [melmi] 'vertigo'
- /canti/ → [cændi] 'lawn'

c. Umlaut is blocked across an underlying palatal consonant:

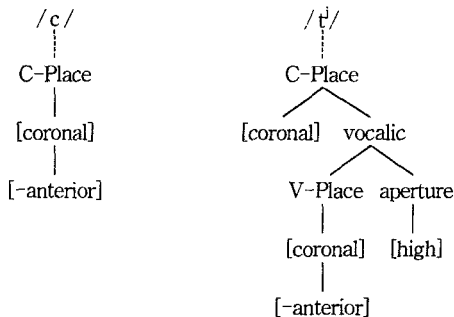
/kac ^h i/	→	[kac ^h i]	(*[kæc ^h i])	'value'
/taci+ta/	→	[tajida]	(*[tæjida])	'mince-Decl'
/kœci/	→	[kœji]	(*[keji])	'beggar'

d. Lexical exceptions to umlaut (some speakers):

/salp ^h i+ta/→	[salp ^h ida]	(*[salp ^h ida])	'search-Declarative'
/napi/	[nabi]	(*[næbi])	'butterfly'
/moki/	[mogi]	(*[megi])	'mosquito'

Thus, back vowels are fronted (and unrounded, for many umlauting speakers) before an /i/ in the next syllable, except that underlying palatals regularly interrupt this spread of vocalic coronality. The reason why particularly palatals block umlaut in Korean does not appear to be a function of the well-known prohibition on autosegmental line crossing, however, as suggested by Hume (1990) and Kenstowicz (1994). Though this kind of explanation is commonly brought forward as a general characterization of the interruption of feature spread, in this case ascribing the blocking of umlaut to the stricture against the crossing of autosegmental association lines would require that otherwise unmotivated V-Place structure be attributed to the intervening palatal consonants. But these are primary palatal (nonanterior coronal) articulations, not secondary palatalized sounds. That is, the structure of Korean palatal consonants must be along the simpler lines presented in (44a), not those of the richer, vocalized representation in (44b), because the affricates /c^hc'/ are nonanterior coronals rather than basic alveolars secondarily articulated with *i*-like qualities.

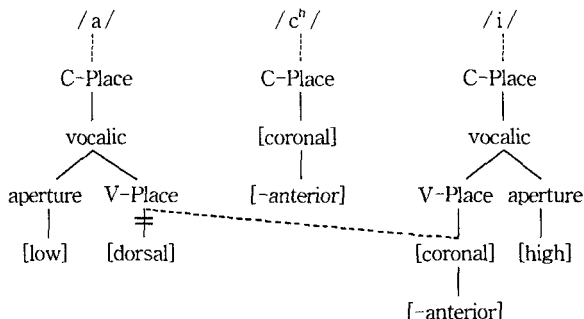
(44) a. Palatal consonant b. Palatalized consonant



There are perhaps other ways to distinguish plain palatals from palatalized

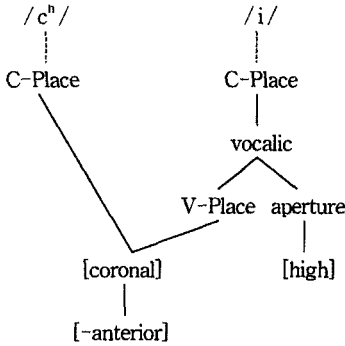
alveolars, but the important point is that no phonetic reason exists for ascribing secondary vocalic structure to the Korean palatal series /c^hc'/. (Though redundant in vowels, the presence of [-anterior] under the [coronal] feature is relevant to consonant assimilation; cf. below, and S. Lee 1994.) If vocalic structure is not present in Korean palatals, however, the fact that these segments block umlaut cannot be attributed to the familiar autosegmental line crossing prohibition, because without V-Place structure standing in the way of the spread of other V-Place features, the [coronal] element identified in rule (42) would propagate through any intervening consonants, palatal or otherwise. Thus, umlaut takes place in words like /mati/ 'knot' ([mædi]) because /t/ is not imbued with any vocalic structure; but it would also appear that umlaut should occur in words like /kac^hi/ 'value' (which is [kac^hi], not *[kæc^hi]), because, as exhibited in (44a), the 'true' palatals of Korean do not have secondary vocalic structure, either. The (incorrect) permeability of independently represented true palatals vis-à-vis the [coronal] spreading effect of umlaut is illustrated in (45).

(45) Umlaut would not be blocked over a lexically independent true palatal



In fact, however, the incorrect consequence in (45) will be avoided if the Obligatory Contour Principle (OCP) is taken into account. This is the frequently cited constraint in phonology which prohibits the representation of adjacent identical specifications within morphemes, forcing them instead to share but a single instance (cf. McCarthy 1986, others). The V-Place specifications for front vowels accordingly must be shared with the C-Place constituent in a preceding palatal consonant since these feature properties of the two adjacent segments, though of differing geometric affiliation, are identical. The unifying effect of the OCP operating on morpheme-internal sequences of palatal consonant plus front vowel is illustrated in (46).

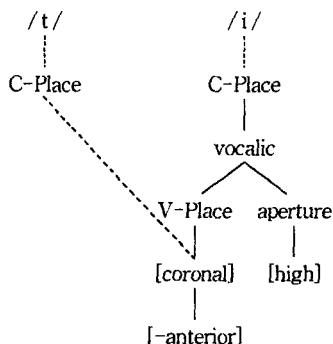
(46) OCP effect on tautomorphemic /... c^hi.../



The reason palatal consonants block umlaut in Korean is now clear, viz., the Uniformity Condition inhibits application to structures whose lines of autosegmental association are not explicitly mentioned in the rule. Thus, by virtue of the OCP, the feature configuration targeted for spread in the rule of umlaut ([coronal]) is shared in Korean representations containing a preceding underlying palatal consonant. But because the rule of umlaut given in (42) requires reference to only one line of association relating [coronal] to higher constituents, its application is automatically suspended in lexical representations, like /kac^hi/, in which this feature is associated with two skeletal elements.

In contrast to possible alternative interpretations invoking the autosegmental line crossing prohibition (which in any case would misrepresent Korean palatals as secondary rather than primary articulations), the Uniformity Condition also entails that derived palatals block the application of umlaut. As has often been described, alveolars become true palatals in position before /i/ in the next morpheme, and even within the same morpheme if no neutralization results (Iverson 1993). A basic characterization of the rule of alveolar palatalization is given in (47), with both neutralizing and allophonic examples of the phenomenon listed in (48). In parallel to the underlying palatals, these derived instances of nonanterior coronals also inhibit umlaut.

(47) Palatalization of alveolars



(48) a. Neutralizing palatalization:

/pat ^h +i/	→	[pac ^h i]	(*[pæc ^h i])	'field-Nominative'
/mat+i/	→	[maji]	(*[mæji])	'eldest-Nominal'
/tot+i/	→	[toji]	(*[teji])	'rise-Nominal'
/kat ^h +i/	→	[kac ^h i]	(*[kæc ^h i])	'same-Adverbial'
				('together')
/put ^h +i+ta/	→	[puc ^h ida]	(*[pic ^h ida])	'adhere-Causative-Declarative'

b. Allophonic palatalization:

/si/	→	[ši]	(*[si])	'poem'
/os+i/	→	[oši]	(*[eši])	'clothes-Nominative'
/əpsi/	→	[əpši]	(*[epši])	'without'
/mun+i/	→	[muɲi]	(*[miɲi])	'door-Nominative'
/holli+ta/	→	[hoλλida]	(*[heλλi])	'seduce-Declarative'

In merging (presumably underspecified) alveolars with palatals through spread of the [coronal] element (along with its redundant [-anterior] subordinate) from a following high vowel, the independent palatalization process given in (47) produces a shared feature configuration of the same kind as results from operation of the OCP in sequences of palatal plus front vowel shown in (46). Thus, both derived and basic palatals share coronal properties with a following high front vowel, and both, under the Uniformity Condition, are opaque to umlaut in virtue of their [coronal] constituent's multiple autosegmental association. Because alveolars assimilate to a following /i/, in other words, the [coronal] property of derived palatals is shared with that vowel, just as is a [coronal] specification among morpheme-internal

sequences of underlying palatal and front vowel per the OCP. In both cases, the reason that the general rule of umlaut does not apply over palatals is that these consonants are not autosegmentally independent of the vowel whose features they share, and on which the application of umlaut is defined.²

This way of looking at umlaut, as a further consequence, effectively removes the reservations registered by Iverson (1993) over 'context-sensitive radical underspecification' of the Korean palatals. The backdrop for these reservations is the well-known circumstance that, though obviously cut from the same phonetic cloth, the neutralizing (or lexical) and allophonic (or postlexical) aspects of Korean palatalization have defied descriptive unification within the conventional theory of Lexical Phonology, as Ahn (1985, 1988) points out with special clarity. In a proposal advanced by Kiparsky (1993), however, both types of palatalization would fall under a single generalization if contrastive place properties of underlying palatals were lexically specified everywhere except in the environment of a following tautomorphemic /i/, where their palatal qualities could be provided by a structure-building (feature-filling) application of the palatalization rule. Alveolars, on the other hand, would always be lexically underspecified—except again in the environment of a following /i/, where they would need to be marked for their anterior coronality in order to escape the structure-building effects of palatalization. That is, because the Derived Environment Constraint embodied in Lexical Phonology's Strict Cycle Condition inhibits lexical rules like palatalization from applying in a structure-changing fashion in nonderived, morpheme-internal environments, the special marking of certain alveolars (the ones occurring before /i/) assures that their place of articulation properties will not be subject to change via feature fill-in application of assimilatory rules. The necessary blocking of palatalization in a monomorphemic word such as /mati/ 'knot' accordingly, is achieved by representing its otherwise underspecified /t/ with distinctive alveolar place of articulation features, so taking advantage of the established principle that lexically listed structure cannot be changed in nonderived environments.

As sketched out in the preceding discussion of umlaut, however, the unmarked alveolars remain phonologically underspecified in all environments,

² Recently, H-S Kim (1997) raises objections to the traditional claim that Umlaut is sensitive to the place of articulation of intervening consonants, citing examples such as /tutæci/ → [tudæji] 'mole', /æcikanhi/ → [ejiganhi] 'considerably'.

irrespective of the following vowel. The OCP effect on underlying palatal plus front vowel sequences (cf. (46)) does result in a seeming underspecification of palatals before /i/, but, in actuality, lexical palatals are specified for place of articulation features even here: It is just that place features under this circumstance, by dint of the OCP, may not be independent of the following vowel. The unity of the derived-environment, neutralizing, lexical applications of palatalization exemplified in (48a) with the across-the-board, allophonic, postlexical aspects of palatalization seen in (48b) then ensues directly via implementation of Kiparsky's (1973) Revised Alternation Condition, the general principle which restricts specifically neutralizing rule applications to phonologically derived environments. Debate may continue over whether this is the appropriate form of the derived environment limitation (Iverson 1993) or, instead, the constraint should be subsumed under the Strict Cycle Condition along with context-determined feature underspecification (Kiparsky 1993). In either case, it is clear that the phonologically compound palatalization process in Korean has played, and continues to play, a catalytic role in framing fundamental questions of phonological theory, Lexical Phonology in particular. (The most recent contribution to this discussion is the prosodic analysis of Oh (1995), who shows that the derived environment to which palatalization actually is restricted is the 'phonological word' not higher-order prosodic structures such as compounds.) As laid out in a series of influential U.S. doctoral dissertations beginning with Kim-Renaud (1974) on consonantal phonology in general, through Ahn (1985) on Lexical Phonology, K-H. Kim (1987) on feature geometry, H. Sohn (1987) on underspecification, and Y. Cho (1990) on parametric phonology, palatalization thus joins with umlaut, coda neutralization, cluster simplification, place assimilation, tensification, and other segmental phenomena of Korean in the establishment and testing of major phonological hypotheses.

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