HARMONY PROCESSES IN KOREAN*

Sang-Cheol Ahn

According to Halle & Vergnaud (1981), harmony processes are classified into two distinct types, directional harmony and dominant harmony, depending on whether the harmonic features propagate in one direction only, or whether the propagation occurs in both directions. Vowel harmony in Korean is an example of the directional type because a harmonic feature propagates in one direction only, i.e. left to right. However, Modern Korean does not have a strict and regular vowel harmony process (VH henceforth) life that of Finnish or Mongolian, but rather has a very rare type of VH which is often called "diagonal" because the line dividing the harmonic classes runs diagonally (Aoki 1968; C.W. Kim 1978). Historically speaking, Middle Korean, like many languages in the Altaic family to which Korean belongs, had a very regular vertical (or palatal) vs. back (velar) alternation (K-M. Lee 1972). However, this strict VH has gradually decayed due in part to a vowel shift, monophthongization, and massive borrowing from Chinese which does not have VH (K-M. Lee 1972, Kim-Renaud 1976, C-W. Kim 1978). The result is that VH is regularly kept in only two areas of Korean morphology; between the final vowel of the verb stem and the following ə-initial suffix and in the words of phonetic symbolism.

Vowels in Modern Korean may be divided into two classes according to the harmony processes. The following chart from C-W. Kim (1978) shows the "diagonal" pattern in which the upper vowels are "dark" and the lower ones are "light": it has been interpreted that "light" vowels express "small", "bright", "light" or "shallow", while "dark" vowels express "big", "dark", "heavy", or "deep" (cf. Choi 1937; Huh 1968; Kim-Renaud 1976; McCarthy 1983).

(1)

"dark"	i	u
	ə	o
	a	"light"

*An Earlier version appeared in Ahn (1985). I would like to thank Prof. Chin-W. Kim for his Comments and criticisms.

This system shows the (so-called) ə-initial suffix harmony where ə has an alternative *a* if the final vowel of the verb stem is a light vowel *a* or *o* because dark and light vowels cannot occur together. Other vowels not shown here are "dark" vowels in verb stems to which ə-initial suffixes are attached.

(2)	a. Light	:	*po* - *ala*		'Look !'
				Imperative	
			kal - *ala*		'Grind it !'
	b. Dark	:	*cip* - ə*la*		'Pick it up !'
			se - ə*la*		'Count it !'
			mɛ - ə*la*		'Tie it !'
			cü - ə*la*		'Hold it!'
			cö - ə*la*		'Tighten it !'
			kɨ - ə*la*		'Draw it !'
			cu - ə*la*		'Give it !'

The earliest generative account of VH in Korean is given in C-W. Kim (1973) by borrowing the concept of "adjustment rules" from Chomsky & Halle (1968). Reasoning that VH, to the extent that it remains in modern Korean, still operates on the pre-vowel shift Middle Korean vowel system, he restores it by way of an adjustment rule of the form;

(3) u ⟶ ɨ

This is of course the reverse direction of the actual vowel shift,[1] but it enables the VH rule to refer to natural classes [-back] (ɨ, ə) vs. [+back] (o,a). But the actual pronunciation of ɨ is *u*, thus one needs a readjustment rule to change ɨ back to *u*, in order to undo the effect of the adjustment rule. The following shows the sequence of derivation of two verbal forms, "light" and "dark". Here an unspecified vowel V is used, instead of the traditional ə, to represent the suffix initial vowel which has the ə∼*a* alternation by VH.

[1]The historical vowel shift in Korean is described in C-W. Kim (1978: 228) as follows.

Modern Korean	i	ɨ	u	o	a	ə	ɸ
*Early Korean	i	a	ɨ	u	o	a	o

From this data, he reconstructs the Early Korean vowel system as below. (The modern reflexes of the reconstructed vowels are given in parentheses.)

i	ɨ (u)	u (o)
	ə (ɨ)	o (o)
	a (ə)	ɔ (a)

(4)	sok - V	'to deceive'	suk - V		'to lower'
	———		sik - V		Adjustment: u → i
	sok - a		sik - ə		VH
	———		suk - ə		Readjustment: i → u

While this sort of treatment of VH in Korean looks "reasonable and even logical" (C-W. Kim 1973: 138), it is nonetheless unsatisfactory for several reasons as C-W. Kim himself mentions: (i) it is quite arbitrary to invoke an adjustment rule, (ii) it requires a *re*adjustment rule which is an instance of absolute neutralization (cf. Kiparsky 1973), (iii) because only the i's which adjusted from *u*'s undergo a readjustment, but not the underlying i's, there is a dependency relation between the adjustment and readjustment rules which must be diacritically marked, (iv) phonology becomes too unconstrained and powerful if adjustment of this sort is allowed in phonology, for there is nothing one cannot do if one is permitted to alter the underlying representation by way of adjustment rules.

Moreover, C-W. Kim's (1973) account cannot explain VH in phonetic symbolism (or ideophone) because, unlike in ə-initial suffixes, ɛ and *o* as well as *a* and o function as "light" vowels in sound symbolic words.[2]

(5)	Dark	Light	
	p'əlkəh-	*p'alkah-*	'to be red'
	sukun	*sokon*	'whispering'
	k'ücücü	*k'öcöcö*	'shabby'
	kelkel	*kɛlkɛl*	'exhausted'
	pipi	*pɛpɛ*	'twisting'
	tɨls'ək	*tals'ak*	'lifting'

For this reason, McCarthy (1983), based on Kim-Renaud's (1976) categorization, divided the Korean surface vowels in the following way:

(6)

i	ü	ɨ	u	Dark
e	ö	ə	o	Light
ɛ		a		

[2] This phenomenon shows that VH survived in monophthongization which is described as: a + i > ɛ, ə+i>e, u+i > ü, o +i > ö

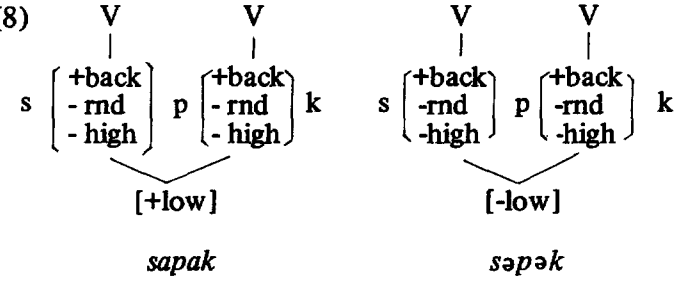
It should be noted here that there is no universal phonetic feature which will distinguish between the two groups: the dark and the light vowel sets are not natural classes in any distinctive feature framework. Thus Kim-Renaud (1976) adopts the semantic features [±dark] and [±light] by arguing that, although these diacritic features are phonologically ad hoc, they are semantically well motivated in Korean phonology. McCarthy (1983), however, does not agree with this phonetically ad hoc analysis. Instead, he proposes an abstract version of the Korean vowel system with the dark/light distinction corresponding to the values of [±low] in the following way.

(7)

i	ü	ɨ	u	
e		ə		dark = [-low]
æ	œ	a	ɔ	light = [+low]

It can be seen that this system permits a neat formulation of the VH process in Korean. An example from McCarthy is given below.

(8)

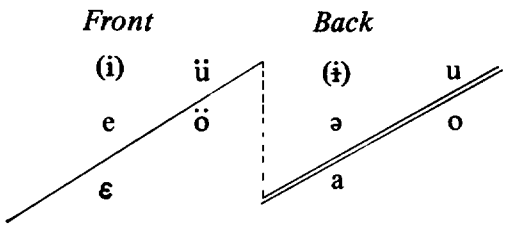


It is, however, still not satisfactory for several reasons. First, it does not reveal the unequivocal fact that the VH in Korean is "diagonal"; namely, the fact that Korean does nto have regular VH, but rather a disrupted harmonic process. Second, McCarthy's claim indicates that VH of Korean is a horizontal type which has a [+low] vs. [-low] distinction. However, as all the other languages in the Altaic family to which Korean belongs still retain vertical VH processes, we should assume the present system was historically derived from a regular vertical VH of an earlier period.[3] Third, this system cannot show the neutrality of *i* and ɨ; these two vowels are neutral when they are not syllable initial, e.g., *posɨlak,*

[3] Turkish has both vertical (or palatal) and rounding (or labial) harmonies as Aoki (1968: 143) notes that a rounding harmony frequently occurs secondarily with other type of harmony.

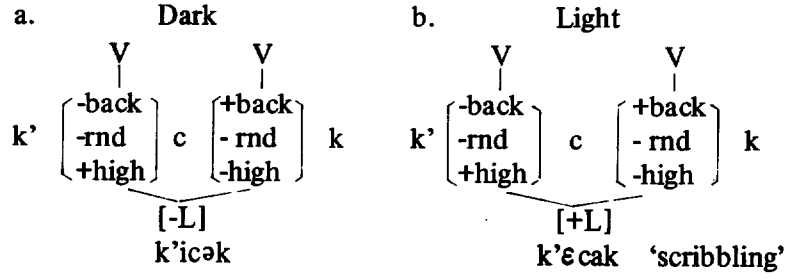
pusiləк 'rustling', *posisi, pusisi* 'rising gently'. Finally, œ and ɔ are abstract vowels arbitrarily motivated with no phonetic import. Consequently, I propose the following categorization of Korean vowels with two diagonal lines, one each in front and back. (The meaning of each diagonal line is explained below):

(9)



This system has several advantages over McCarthy's. First of all, it gives a true picture of the diagonal shape of Korean VH,where a glance reveals the disrupted and shifted pattern of vowel harmony. Second, the neutrality of i and ɨ can be explained by saying that they are located in the extreme peripheral region farthest from the dividing lines so that they are less sensitive to the VH process. Third, an arbitrary or abstract representation of the vowels is not needed. Finally, it can clearly be shown that the A-initial VH takes the division drawn by the double line, while the sound symbolic VH takes the division drawn by the double line, while the sound symbolic VH takes the division drawn by both lines. I realize, of course, that there is still the problem of dividing the two harmonic groups into two natural classes with a distinctive feature in a universal phonetic feature system. But I believe that the above system, which is a combination of Kim-Renaud (1976) and McCarthy (1983), represents the best solution. I have discarded McCarthy's abstract vowel system, but adopted his idea of using [+low] feature does not indicate the absolute height of vowels, so we must regard it as a diacritic mark. Nevertheless, I cannot accept Kim-Renaud's terms because they are motivated only semantically and not phonologically. Thus I replace [±low] of McCarthy and [light]/[dark] of Kim-Renaud with [±L] which indicates the relative, not absolute, heights of the two vowel groups, and this [±L] constitutes another (harmonic) tier in addition to the already existing syllable, CV, and segmental tiers. An example is given below.

(10)



In (10a), the first vowel is realized as i, not e, because of the feature [+high]. In (10b), however, there occurs a conflict between the segmental feature [+high] and the harmonic feature [+L]. In this case, the autosegmental harmony feature [+L] takes precedence over the segmental [+high] and hence the light form has the vowel ɛ.

At this point, I will consider two different ways to describe VH processes. First, following Kiparsky (1983). I assume that [+L] and [-L] are harmonic features and that [+L] spreads to the right if the first vowel has [+L] in its harmonic tier. If not, the floating [-L] associates with all vowels by a default rule.

(11) a. [+L] [-L] [+L]

k'Aŋ-c^{h}Uŋ → k'Aŋc^{h}Uŋ → k'anc^{h}oŋ '(small) jumping'

[-L] [-L]

k'Aŋ-c^{h}Uŋ → k'Aŋc^{h}Uŋ → k'əŋc^{h}uŋ '(big) jumping'

b. [+L] [-L] [+L]

mAk-A → mAk-A → *mak-a* 'Block (it) !'

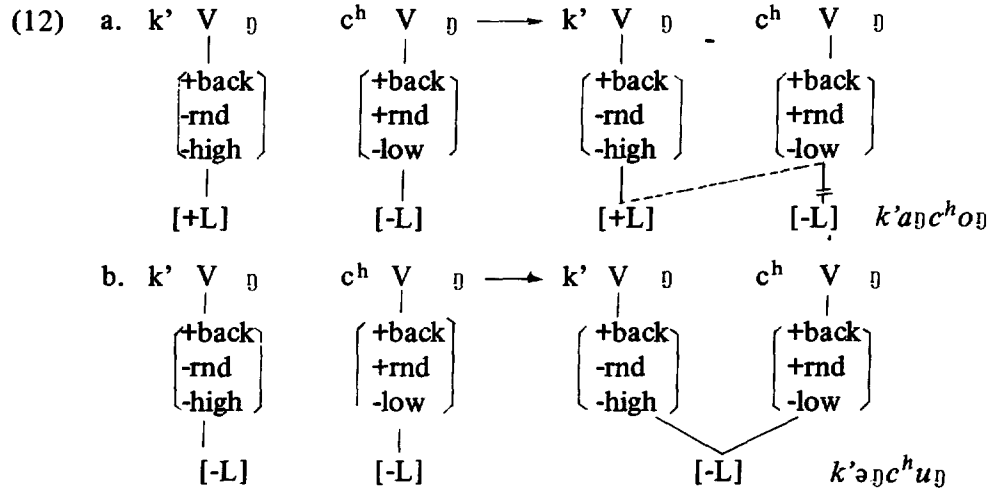
[-L] [-L]

mAk-A → mAk-A → *mək-ə* 'Eat (it) !'

As we can see here, an underspecified vowel is used for both [+L] and [-L] vowels, i.e., U for o and u, A for *a* and ə, so that we may specify the vowel after the spreading of a harmonic feature.

The second way is to stipulate the harmonic feature of the second vowel as [-L]. In this case, the other phonological features are ssisgned in a separate tier except the one which is determined by the VH rule. For example, I need to assign $\begin{bmatrix} +back \\ +rnd \\ -low \end{bmatrix}$, but not [±high] determined by the VH rule, for the second vowel which changes to either o or *u*. Then, in associating a harmonic feature to a segment, I assume that only [+L] of the first vowel is associated with the fol-

lowing feature matrix. Thus we must dissociate [-L] of the second vowel from the segmental tier as shown in (12a). As a result, only the harmonic feature [-L] is changed to [+L], while all other features remain unchanged. However, if the first vowel also has [-L] in its harmonic tier, the two identical features merge into one as in (12b) by the Shared Feature Convention proposed by Steriade (1982).



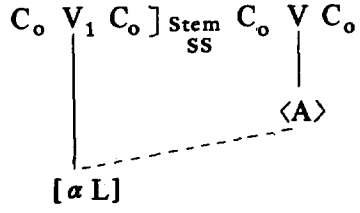
As we may expect, the same result may be achieved either eay. However, as not all vowels are paired in undergoing the harmonic process in ideophones, I prefer the second approach for sound symbolic VH. For example, both *i* and *e* can be [-L] counterparts of [+L] ɛ in sound symbolic VH. Thus, if a single underspecified representation is used for those two vowels, there will be a serious indeterminacy problem in deriving the correct phonetic representations. Consequently, I prefer the second approach for sound symbolic VH.

On the other hand, for the traditional ə-initial VH, it is not desirable to adopt the same approach which is not as simple as the first approach since *a* ~ ə is the only alternation. Thus I will take the less complex first approach illustrated in (11) because we still cannot use exactly the same approach illustrated in (11) because we have to specify that the stem vowel of each word in (11b) has its own harmonic feature associated in the underlying representation. In other words, as [+L] *mək-* 'to eat' and [-L] *mak-*'to block' are totally different morphologically as well as semantically, I regard [+L] of the stem vowel as a part of the lexical entry in the lexicon. Therefore, I will use the underspecified *A* only

for the affix-initial segment which has the a∼ə alternation according to VH.

Based on the observation so far, the VH rule can be displayed as follows. The vowel system is divided along the harmonic values of [+L] and the harmonic feature of the first vowel is associated to the right.

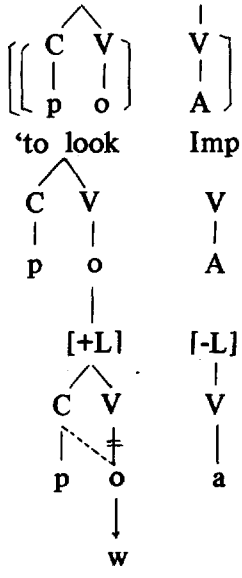
(13) Vowel Harmony Process



(stem = stem of a verb/ adjective
ss = sound symbolic morpheme)

Now, I appeal to lexical phonology in which the lexicon is stratified, and propose that *A*-initial suffixation harmony and sound symbolic harmony be treated differently because their domains of application are different. I have already shown that *A*-initial VH is triggered by the righthand dividing line in (9), while the sound symbolic VH is triggered by both dividing lines. The following example shows that *A*-initial VH is a lexical rule.[4]

(14) a.

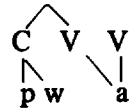


Inflection and Syllabification
'Look !'

VH

Glide formation

[4] The four ordered lexical strata were proposed in Ahn (1985).
Stratum 1: sub-compounding
Stratum 2: co-compounding
Stratum 3: derivation
Stratum 4: inflextion

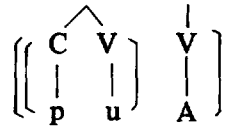


Reassociation of V

[pwa:]

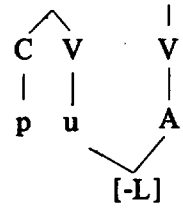
Phonetic representation

b.

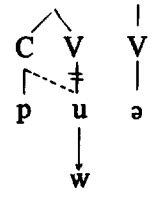


'to pour'

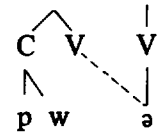
Inflection and syllabification



VH



Glide-formation



[pwə :]

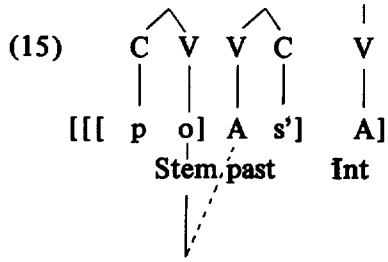
Reassociation of V

Phonetic representation

Because Glide-formation is a lexical rule (See Ahn (1985) for details), the A-initial suffix VH rule, preceding Glide-formation, should also be a lexical rule. Moreover, by applying before Glide-formation, this VH rule distinguishes between two different outputs in (14). Furthermore, it does not apply in a non-derived underlying morpheme. Finally, as we specify the the underspecified *A* as *a* or ə by adding a harmonic feature [+L] or [-L] as we saw in (10) and (12), *A*-initial VH is categorized as a structure-building, not a structure-changing, process which is defined as lexical according to the criteria on lexicality by Kiparsky (1983).

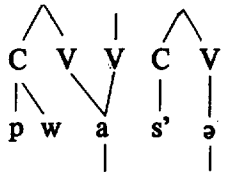
In the following example, however, we see that the VH rule does not apply cyclically as I derive [poas'ə] (or [powas'ə]), rather than *[poas'a] (or [pwas'a]), from the underlying [[[po] As'] A] 'saw'.

(15)



VH

VH



Glide-formation & Resyll

Association of [-L] by a default rule

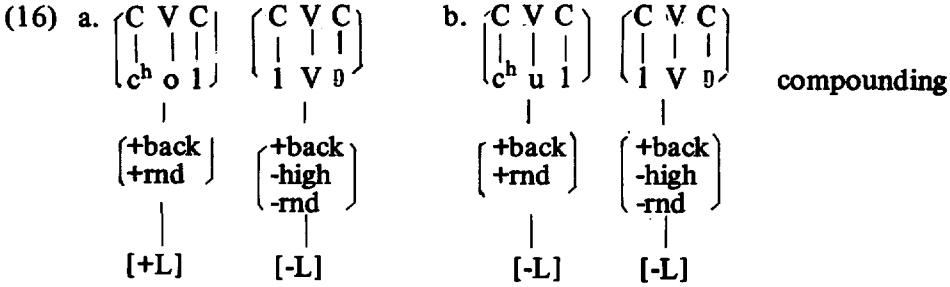
[poas'ə] (or [pwa:s'ə]) Phonetic representation

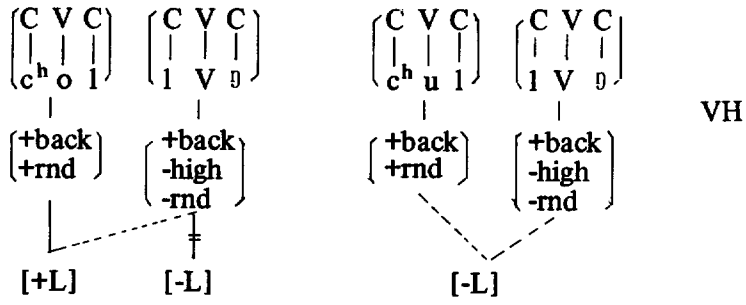
Nevertheless, lexical phonology can explain this blocking of cyclic application by providing a phonological rule with the appropriate morphological information. As we see in my rule (13), the VH rule contains the necessary morphological information "stem", thus it blocks the second application of VH.

On the contrary, sound symbolic VH is not lexical according to the criteria assumed in Kiparsky (1982) and Mohanan (1982). In other words, as we can see in (12), sound symbolic VH is post-lexical because it applies to non-derived root forms, violating the strict cyclicity principle. Moreover, as [-L] changes to [+L] when preceded by [+L], it is a structure-changing process which is post-lexical.

However, it may be argued that sound symbolic VH is also a lexical rule. For example, in the following example (16), *c^hol, c^hul, la*ŋ, and ləŋ can be regarded as independent morphemes because each of them has a different semantic implication such as "expression of shape" and "sound of waves".

(16)

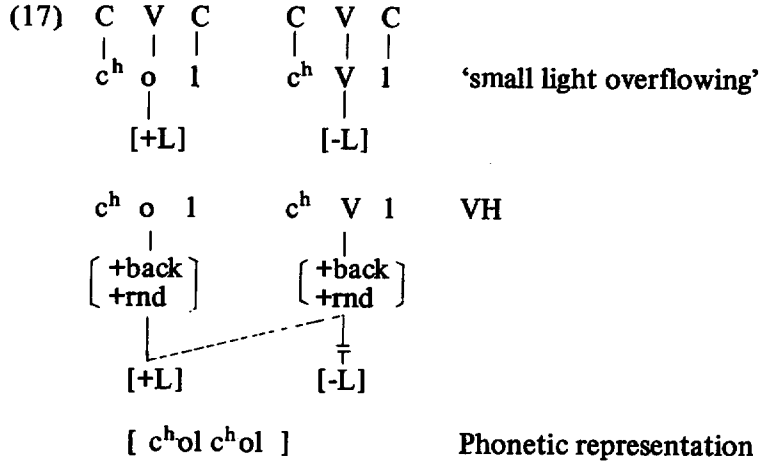




[c^{h}olla$ŋ$] [c^{h}ull ə $ŋ$]

'(small) splash' '(big) splash'

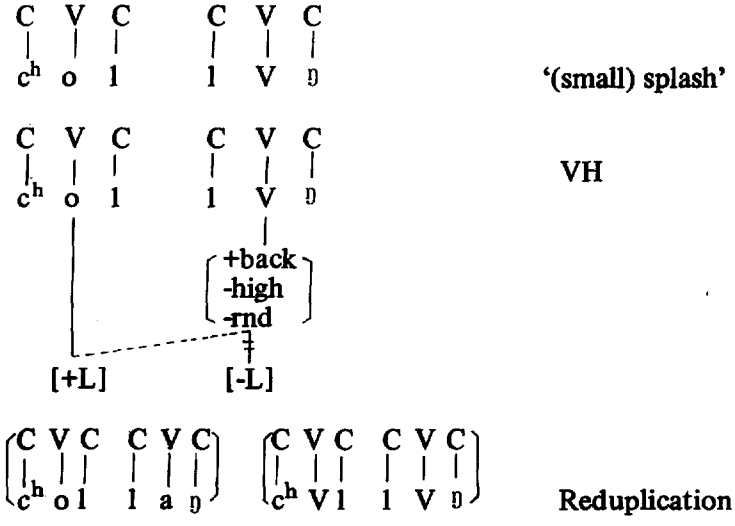
In this example, *c^{h}ol* and c^{h}ul express the "rising shape or sound of a wave" and *la$ŋ$* and *lə$ŋ$* are "falling of a wave", but not the opposite way. Moreover, *c^{h}ol* and *c^{h}ul* are often used as "shape and sound of overflowing" and hthe *c^{h}ol* and *c^{h}ul* are often used as "shape and sound of overflowing" and the former indicates "small light" stream, while the latter indicates "big heavy" stream. Nevertheless, I do not regard *c^{h}olla$ŋ$* or *c^{h}ullə$ŋ$* as a compound since *c^{h}ol* and *c^{h}ul* as well as *la$ŋ$* and *lə$ŋ$* cannot be used independently, i.e., they cannot be regarded as words eligible for compounding. Thus a sound symbolic VH should be displayed as follows.



Thus, as was mentioned in Ahn (1985), I conjecture that sound symbolic VH is also related to post-lexical morphology (cf. Kiparsky 1984). In other words, as Rubach (personal communication) points out, I believe there is a strong possibility of "external morphology" in the post-lexical stratum, besides the "internal morphology" in the lexicon. Thus in the "internal morphology" we refer to detailed information in the lexicon such as stem, root, and affix, in addition to the major grammatical categories such as noun, verb, adjective, etc, while in the "external morphology" we may refer to only major grammatical categories and lexically less crucial information.

Now, I will briefly discuss the reduplication phenomena in Korean ideophones. For example, the morphemes in (16) or in (17) can be repeated once or twice as in *c^{h}olla* *c^{h}olla* 'repeated (small) splash'. As Levin (1983) discussed in detail, this sort of reduplication process is found in many languages. In Korean, reduplication of prosodic structure is very common in sound symbolic words (or ideophones) in which a monosyllabic ideophone is reduplicated into a disyllabic ideophone as in (17) and a disyllabic ideophone is reduplicated into a four-syllable ideophone as in (18).

(18)



As (17) and (18) illustrate, consonants as well as vowels are copied during the reduplication process. Reduplication of consonants is made after the word-initial consonant is specified according to the speaker's decision on the degree of semantic intensity. Thus, this consonantal harmony is another parameter of internal alternation in which Korean ideophones vary (cf. Choi 1937; Kim-Renaud 1976; McCarthy 1983). Korean has three types of obstruents with

distinct laryngeal activity, i.e., plain (lax), unaspirated (tense), and aspirated obstruents, transcribed as *p, p', p*^{h}, respectively, for bilabial stops. In terms of articulation, the unaspirated tense obstruents have the most constriction of the vocal folds, and the aspirated ones have the least constriction at the time of release, as revealed in C-W. Kim (1970:110)[5]. Acoustically, as is revealed in spectrographic analyses, the aspirated ones have the longest voice onset time caused by heavy aspiration and the unaspirated tense ones have the shortest voice onset time. This phonetic contrast shows a clear semantic correlation in the ideophone system in Korean.[6] Thus, any obstruent capable of bearing the semantic contrast can mark a morphological property of sound symbolic words. As we can see below, the plain series has the unmarked semantic character, but the unaspirated series is intensive (or stiffening) and the (heavily) aspirated series is most intensive, i.e. "paraintensive" in McCarthy (1983).

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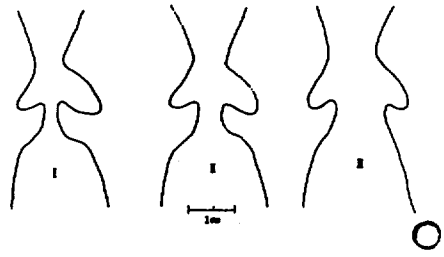
[5] C-W. Kim (1970:110) shows the tracings of a typical vocal fold shape of each type of stop at the time of release.



Distance of glottal opening at the narrowest point in each stop consonant is also displayed as follows in C-W. Kim (1970:110).

[6] According to my spectrographic analyses, the relative difference in voice onset time among the three types of consonants is revealed as follows.

Tense	:	0.007 sec.	*t'am*	'sweat'
Plain	:	0.02 sec. in	*tam*	'fence'
Aspirated	:	0.05 sec.	*t*^{h}*am*	'greed'

Related to this reduplication, I can raise the question of why some indeophones do not follow the VH rule. For instance, in *əp'ak cap'ak (*ap'ək cəp'ək)* 'disorderly' and *ə llən t'ont'an (*əllən) t'ont'an* or **allan t'ont'ən)* 'trickily', the first morpheme of the first example and the seccond morpheme of the second example have two vowels respectively which are not derived from VH rule. In other words, they are exceptional cases to VH in ideophones, by allowing [+L] and [-L] vowels in the same morpheme. However, I consider them as cases of intentional violation of VH to represent the "disorderly", "inconsistent", or "irregular" implication of the given ideophones.

(19)

	Plain (unmarked)	Unaspirated (intensive)	Aspirated (paraintensive)
'in circles'	*piŋ piŋ*	*p'iŋ p'iŋ*	$p^hiŋ$ $p^hiŋ$
'sturdy'	*tantan*	*t'ant'an*	t^hant^han
'shaking'	*sallɛ sallɛ*	*s'allɛ s'allɛ*	
'in a stream'	*cul cul*	*c'ul c'ul*	c^hul c^hul
'a long way off'	*kam kam*	*k'am k'am*	k^ham k^ham

As we notice here, the *s* series does not have the aspirated examples because the hypothetical s^h does not exist in Korean consonant inventory.[7] The CV theory, by allowing a morpheme to be represented as a feature matrix, can display the three series of morphemes as follows.

(20)

Plain	Intensive	Paraintensive
C | [-son -tense -asp]	C | [-son +tense -asp]	C | [-son +tense +asp]

[7] Unlike other obstruents with three degrees of aspiration, the *s*-column shows an empty slot where s^h is expected. Because Korean *s* has more aspiration than a standard IPA [s], this *s* is an exception to the intervocalic voicing rule which other lax obstruents undergo: therefore, C-W. Kim (1971:4-5) proposed an underlying segment s^h instead of *s*. He also claimed that we can set an abstract *s* which is a stem-final segment of the so-called *s*-irregular predicates and undergones the intervocalic voicing rule.

In an interesting fiberscoptic study, Kagaya (1974) argues that the traditional lax *s* is much more like the aspirates in its laryngeal activity and proposes that Korean has s^h and *s'* segments, not *s*.

More recently, however, Iverson (1983) argues that some psychophonological evidence shows that *s* belongs to the lax series as follows:

(1) The highly phonetic orthography represents that the character for the distinctly unaspirated fortis fricative is a gemination of its (lax) counterpart, just as all other fortis consonants are geminations of their lax, not aspirated, counterparts.

Fortis (CC)	*Lax (C)*	*Aspirated (C^h)*
p' - ㅃ	p - ㅂ	p^h - ㅍ
s' - ㅆ	s - ㅅ	

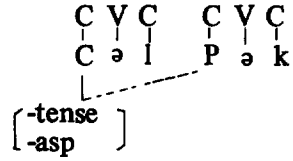
(2) Post-obstruent tensing affects the lax series and *s*, not the aspirated series.
/pak + ca/ [pakc'a] 'rhythm'
/pak + sa/ [paks'a] 'doctor'

(3) In reduplication of sound symbolism, *s*, unlike either aspirated or fortis ones, retains the non-intrinsic interpretation.

(4) *s* undergoes the same intervoiced slackening process as do the lax stops and affricates and it is subject to palatalization before high front segments irrespective of what precedes.

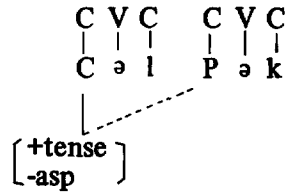
The lexical representation of ideophones contains underspecified obstruents for the consonantal harmonic features. These features are associated with the appropriate morpheme according to the degree of intensity. As we can see in (21), the underspecified consonantal segments are specified by the association of a harmonic feature matrix.

(21) a. Plain



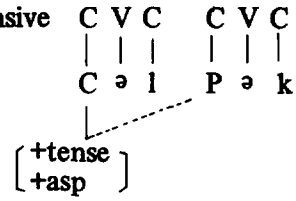
cəlpək 'dabbling'

b. Intensive



c'əlp'ək

c. Paraintensive

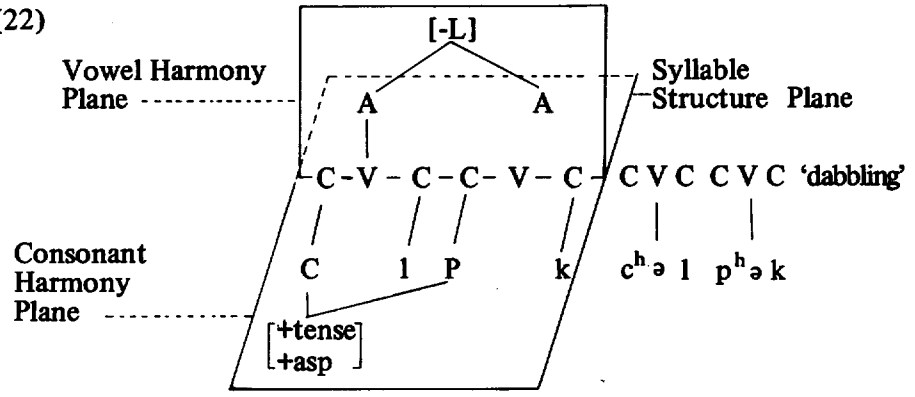


c^həlp^hək

Here we can consider the possibility of associating VH as well as consonantal harmony feature matrices to the underspecified segments within the basic framework of autosegmental theory. However, one serious problem arises; one basic condition in autosegmental theory states that association lines may not cross (cf. Goldsmith 1976), and there seems to be no way of obeying this condition in associating harmonic features to both vowels and consonants across the syllable. Thus, in order to derive the correct results by associating harmonic features without violating a basic condition of autosegmental phonology, I need to assume the independence of the consonantal harmonic tier association and vowel harmonic tier association to the segmental tier. In other words, I will assume that feature matrices of VH and consonant harmony belong to different harmonic planes. This idea of independent planes was invoked by Halle & Vergnaud (1980) and recently by Archangeli (1984) in which several "planes" were motivated. In the case of Korean ideophones, I claim that two harmonic processes of the given example (21c) are represented as follows (I use capital letters for convenience to indicate the underspecified segments, instead of the

feature matrices which were suggested above):

(22)



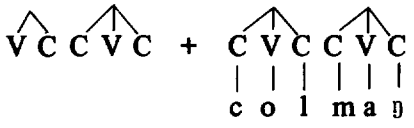
As we can see here, the two harmony tiers belong to different planes multi-dimensionally and thus the association lines do not cross.

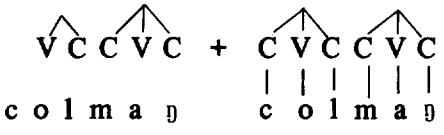
Now, returning to those examples in (18) and (19), let's take a closer look at the reduplication process in ideophones. The examples of reduplication in (18) and (19) are very regular, in the sense that each copied element is exactly the same as the original structure, e.g., *sallɛ* is reduplicated as *sallɛ sallɛ* '(repeated) shaking'. There are, however, some irregular cases in the sense that an initial consonant is often deleted in reduplication. For example, an ideophone *olmaŋ colmaŋ* 'variously' is a reduplication of *colmaŋ*, in which the initial consonant *c* is deleted. Examples of this sort indicate that the reduplication process is also applied by a 'Right to Left' principle, just as those cases described in Levin (1983) where the first CV or CVC of the stem is copied. In Korean ideophones, however, we copy the whole root form to the left as in *piŋ piŋ* 'in circles' or all the root except the initial consonant as in *olmaŋ colmaŋ* 'variously'. Here, we may of course assume that the reduplication process proceedes from Left to Right, i.e. *olmaŋ colmaŋ* from *olmaŋ*. In this case, however, we meet indeterminacy in deciding which consonant should occur between two *olmaŋ's*. Moreover, there is no case of $C(VC)_1 + (VC)_1$ reduplication from $C(VC)_1$ root, while the cases of $(VC)_1 + C(VC)_1$ reduplication from $C(VC)_1$ are frequent.

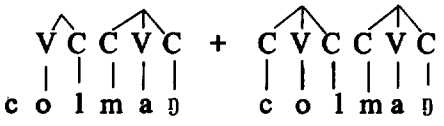
Based on this consideration, I will propose the following reduplication processes in ideophones which apply after the harmonic processes discussed above.

(23) a. Add appropriate CV-skeleton (Right to Left).
b. Copy segmental melody.
c. Associate the segmental melodies to their corresponding slots in the CV tier.

The following is an illustration of these steps.

(24) a. 

b. 

c. 

In (24c), the initial consonant *c* is not associated to the CV tier since its corresponding C slot was not assigned. Here, we need a device to delete the floating initial consonant in phonetic representation. Thus, I will employ the Stray Erasure Convention by Steriade (1982: 89) which is described as follows.

(25) Stray Erasure Convention
Erase segments and skeleton slots unless attached to higher levels of structure.

By this Stray Erasure Convention, the strayed segment *c*, not attached to a position in the CV tier in (24c), is erased and we get *olmaŋ colmaŋ* as the final result for the phonetic representation.

So far, I have discussed the various problems related to VH. First I claimed that we must distinguish between two kinds of VH processes in Korean, the *A*-initial suffix VH and the sound symbolic VH, each dividing the vowel chart in its own way and belonging to different strata in the lexicon. I also proposed to revise the harmonic feature specifications by Kim-Renaud (1976) and McCarthy (1983) for a non-abstract and phonologically motivated explanation. Second, I showed that the consonantal harmony process, which governs the morpheme-

initial consonants, can also be treated autosegmentally, by employing the CV framework. Finally, I claimed that we have to assume two different harmonic plans to explain the vowel and consonantal harmony processes. I proposed three steps in reduplication and I also showed how this proposal explains the reduplication process in ideophones.

REFERENCES

Ahn, Sang-Cheol. 1985. *The Interplay of Phonology and Morphology in Korean.* Ph. D dissertation, University of Illinois.

_____, and Chin-W. Kim. 1985. Vowel harmony in Korean, A multi–tiered and lexical approach. *Papers from the 1984 Mid-America Linguistics Conference*,ed. by G. Youmans and D. Lance, 17-26. Columbia, MO : Linguistics Area Program, University of Missouri.

Aoki, H. 1968. Toward a typology of vowel harmony. *IJAL* 34. 142-145.

Archangeli, Diana. 1984. *Underspecification in Yawelmani Phonology and Morphology.* Ph.D dissertation, MIT.

Choi, Hyon-Pai. 1937. *Wu-li Mal-pon* (The Grammar of Our Language). Seoul: Ceng-um-sa.

Chomsky, Noam, and Morris Halle. 1968. *The Sound Pattern of English.* New York: Harper & Row.

Clements, George N. and Samuel J. Keyser. 1983. *CV Phonology.* Cambridge, MA: MIT Press.

Goldsmith, John. 1976. *Autosegmental Phonology.* Ph.D dissertation, MIT. Distributed by the Indiana University Linguistics Club.

Halle, Morris, and Jean-Roger Vergnaud. 1980. Three dimensional phonology. *Journal of Linguistic Research* 1.1. 83-105.

_____.1981. Harmony processes. *Crossing the Boundaries in Linguistics*,ed. by W. Klein & W. Levelt, 1-22. Dordrecht, Holland: D. Reidel publishing co.

Huh, Woong. 1968. *Kwuk-e Um-wun-hak* (Korean Phonology). Seoul: Ceng-um-sa.

Iverson, Gregory. 1983. Korean *s*. *Journal of Phonetics* 11. 191-200.

Kagaya, Ryohei. 1984. A fiberscopic and acoustic study of the Korean stops, affricates and fricatives. *Journal of Phonetics* 2. 161-180.

Kim, Chin-W. 1970. Theory of aspiration. *Phonetica* 21. 107-116.

_____. 1973. Adjustment rules in phonology. *Issues in Phonological Theory,* ed. by M.J. Kenstowicz & C. W. Kisserberth, 130-144. The Hague: Mouton publishers.

_____. 1978. 'Diagonal' vowel harmony?: some implications for historical phonology. *Recent developments in Historical Phonology*, ed. by, 221-235. The Hague: Mouton publishers.

Kim-Renaud, Young-Key. 1976. Semantic features in Korean: evidence from vowel harmony in Korean. *CLS* 12. 397-412.

Kiparsky, Paul. 1973. How abstract is phonology? *Three Dimensions in Linguistic Theory*, ed. by O. Fujimura 5-56. Tokyo: TEC co.

_____. 1982. Lexical morphology and phonology. *Linguistics in the Morning Calm*, ed. by I-S. Yang, 3-91. Seoul: Hanshin publishing co.

_____. 1983. Some consequences of lexical phonology. ms. MIT.

_____. 1984. On the lexical phonology of Icelandic. *Nordic Prosody* III, ed. by Claes-Christian Elert, Irene Johansson, and Eva Strangert. Stockholm: University of Umea (Minab/Gotab, Kungälv).

Lee, Ki-Moon. 1972. *Kwuk-e Um-wun-sa Yen-kwu* (A Study of Korean Historical Phonology). Seoul: Tower press.

Levin, Juliette. 1983. Reduplication and prosodic structure. ms. MIT.

McCarthy, John J. 1983. Phonological features and morphological structure. *Papers from the Parasession on the Interplay of Phonology, Morphology, and Syntax*. 135-161. Chicago: Chicago Lingusitic Society.

Mohanan. K. P. 1982. *Lexical Phonology*. Ph.D dissertation, MIT. Distributed by the Indiana University Linguistics Club.

Steriade, Donca. 1982. *Greek Prosodies and the Nature of syllabification*. Ph.D dissertaion, MIT.

Department of Enghlish, Kyung Hee University