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VOWEL HARMONY, NATURAL PHONOLOGY AND THE PROBLEMS OF
BORROWING

Mehmet Yavaş

Abstract: The analysis of borrowing has created problems for any phonological theory proposed so far. In recent years a new phonological school, Natural Phonology, has claimed to offer a solution to these problems. This paper is an attempt to evaluate certain claims of Natural Phonology in relation to borrowing assimilation. Some shortcomings of the theory are mentioned. An alternative theory which is based on the hierarchical strengths of native constraints is also evaluated.

The analysis of borrowing has created problems for any phonological theory proposed so far. Recently, a new phonological school led by D. Stampe has claimed to offer a solution to these problems.

Natural Phonology is probably the only school which has committed itself to formulating an explicit account of the assimilation of borrowings. Reacting to standard generative phonology, which handles borrowed vocabulary with various kinds of exception features, Natural Phonology claims that borrowing could and should be handled with reference to a distinction between rules and natural processes. The idea behind this is that rule exception is an overly powerful device, and as long as we do not make a distinction between natural processes and learned rules, there is no way of accounting for assimilated and unassimilated borrowings.

The distinction between natural processes and learned rules is the trademark of natural phonology. Natural processes are constraints which the speaker brings to the language; rules, on the other hand, are constraints which the language brings to the speaker. The basic assumption of natural phonology as expressed by Stampe (1973:27) is as follows:

Processes are expressions of the language innocent speech capacity, and they are not overcome by the language learner unless they confront counterinstances in the language he is learning.

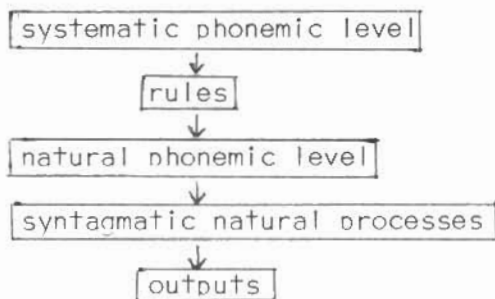
A corollary of this is that phonological constraints which govern our phonetic behavior are natural processes and not learned rules. However, as is obvious from the above quote, natural processes can be modified in several ways; some are suppressed, some are limited by the addition or tightening of contextual restrictions, some become subject to ordering constraints which limit their applicability as genuine ordering constraints always do, and finally, some are modified by the addition of learned rules.

Having mentioned these let us now look at the two basic elements,

rules and natural processes, more closely. As an example of a natural process we can cite the aspiration of voiceless stops at the onset of stressed syllables in English, for it persists in spoonerisms like [kʰaɪ step] for [skaɪ thep] scotch tape. On the other hand velar softening in English is classified as a learned rule. The alternation of [k] with [s] and [g] with [j] in words of Romance origin such as electric [k] electricity [s], pedagogue [ɑ] - pedagogy [j] is learned behavior, because we do not get [sɪti] for kitty, or [jɛt] for get (thus the suspendibility of learned rules).

The distinctions between natural processes and learned rules require further elaboration: a few of them will be cited here. Learned rules need not express phonetically transparent alternations or minimal substitutions. They are always context-sensitive, are not synchronically productive, and do not apply to nativize loanwords. Natural processes, on the other hand, always have phonetic motivation: they may be context-free, they can make only minimal substitutions, and do apply to loanwords.²

Another needed explanation concerns the nature of underlying representations in natural phonology. The underlying representation is phonemic in the sense that it is no deeper than is needed to account for allophonic variation. Higher level 'morphophonemic' processes are determinants of underlying representations only when they are needed to account for specific morpheme alternations. However the phonemes of natural phonology are different from both systematic and taxonomic phonemes in that the processes defining them do not apply in a block. In other words the phonemic level is particular to each morpheme. Context-free processes dictate the underlying representation, and all natural processes apply after all learned rules, thus giving us a picture like the following.³



With this information in mind we can move into the heart of the matter, namely the state of borrowings. As noted earlier, the claim made for borrowings is that they are subject to natural processes rather than to rules. To suggest such a distinction with regard to the constraints of the borrowing language, at the very least, is a good point. Anyone who has dealt with borrowing would know that some constraints apply to incoming loans consistently while others do not show the same consistency. The exceptionless character of word final devoicing as opposed to the passive behavior of backness harmony in Turkish towards incoming loans provides a good example. As the following shows, word final stops are devoiced but the vowels are not harmonized.

Arabic	kitab	'book'	Turkish	kitap
	istibdad	'despotism'		istibdat
	imdad	'help'		imdat
	intihab	'choice'		intihap

However, as we will see, even a theory which makes the distinction between rules and processes is not problem-free. We should remind ourselves that the rule/process distinction is not an absolute one; that is, a given substitution can be a natural process in one language but a learned rule in another. To give an example, let us look at vowel harmony. Vowel harmony per se is considered a natural process, because it occurs in child speech across languages, and it is physiologically motivated. Turkish vowel harmony however, is considered a learned rule for the simple reason that it has many exceptions. This view creates certain problems, as pointed out by Sommerstein (1977:235).

The child brings a ready-made natural process of vowel harmony to the task of learning Turkish, as he would bring it, along with all other universal natural processes, to the task of learning any language. If the Turkish rule is nevertheless a learnt one, does this mean that the child, in spite of finding massive evidence in the data presented to him that a vowel harmony rule of some kind is operating, nevertheless suppresses it completely and acquires a learnt rule which is much the same as the natural process but has restrictions and exceptions of a non-phonetic nature?

Application to loanwords creates further problems, and it is this aspect that I would like to focus on. Firstly, Turkish does not permit initial consonant clusters; thus incoming foreign words with original consonant clusters have been modified in accordance with this condition.⁴

A.	French	sməkin	'dinner jacket'	Turk.	s+mokin
		dram	'drama'		d+ram
		pri:z	'socket'		piriz
		trɛ̃	'train'		tiren
		frɛ̃	'brake'		firen
		flüt	'flute'		fülüt

These and dozens of other words indicate that the epenthetic vowels harmonize in nativization. Since the theory claims that processes rather than rules apply to loans, the above will force us to treat harmony as a process.

On the other hand, certain other examples in the same domain will tell us that the operation of harmony is not exceptionless.⁵

B.	French	grip	'influenza'	Turk.	g+rip
		grɛv	'strike'		g+rev

kɾɛm	'creme'	Turk.	kɾrem
kɾɛdi	'credit'		kɾredi
p'lɑn	'plan'		pil'ɑn
p'lɑʒ	'beach'		pil'aʒ

This time, because of these non-harmonic examples (and there are many more in the language) we are forced to view harmony as a rule rather than a process.

A related problem concerns the ordering relationship of rules and processes. One way of formulating the constraint for the modification of the unaccepted clusters in A. is to have the following:

- 1) $\emptyset \longrightarrow \text{I} \quad / \quad \# \text{C} _ \text{C}$
- 2) $\text{I} \longrightarrow [\alpha \text{ back}] \quad / \quad \# \text{C} _ \text{C} \quad \left[\begin{array}{l} +\text{syl} \\ \alpha \text{ back} \end{array} \right]$

Now let us examine this in light of the claims made by natural phonology. Natural phonology claims that processes are not ordered before rules. Since vowel epenthesis to incoming #CC loans is clearly a case of a natural process (because it provides the simplest syllable structure CV, and it is exceptionless), and has to be ordered before harmony, we apparently must modify our view that harmony is a learned rule, or modify the principle that all rules apply before all natural processes. That is, either harmony is a process, not a rule or it is a rule, but some rules may be ordered after processes.

The above formulation can be objected to on the grounds that it may result in incorrect claims about the language. Turkish possesses many forms such as siyah 'black', sima 'face' etc. where the first vowel does not harmonize to the second vowel, and this contradicts 2) above. Of course we might say that forms such as these would have their underlying forms with the first vowel present rather than #CC sequences, and rule 2) is claimed to be restricted to epenthetic vowels only. To say this commits one to the view that it is possible to differentiate the epenthetic vowels from others in order to trigger the application of the harmony rule in 2). The unavoidable consequence of this, of course, is to have a global rule in which the information from the systematic phonemic level is available at all stages of derivation. The status of global rules has been discussed extensively in the literature, and the popular view is that they add great power to grammars. Since our aim is to reduce the power of our theories, our formulation using 1) and 2) would result in an undesirable situation.

In order to avoid this undesirable consequence we can formulate the following to account for the cases in A:

- 3) $\emptyset \longrightarrow \left[\begin{array}{l} +\text{syl} \\ +\text{high} \\ \alpha \text{ back} \end{array} \right] \quad / \quad \# \text{C} _ \text{C} \quad \left[\begin{array}{l} +\text{syl} \\ \alpha \text{ back} \end{array} \right]$

That is, we can combine the insertion of the epenthetic vowel with the

harmony. Consequently, we can claim that the constraint as a whole is a process and thus we do not have a contradiction for natural phonology, since there is no rule ordered before a process.

Now let us turn to the words in B. where the above formulation is insufficient, because the epenthetic vowels are not harmonic. These and other similar violations all have to do with the adjacent velar and lateral consonants; the backness of the epenthetic vowel being determined by the front/back quality of preceding velars or following laterals. In Yavas (1978) I have given an analysis to account for these violations. There is no point in reiterating the entire analysis here; however, certain points will be necessary. I suggested two rules which I termed a) lateral conditioning:

$$4) \quad \begin{bmatrix} +\text{syl} \\ +\text{high} \end{bmatrix} \longrightarrow [\alpha \text{back}] \quad / \# \text{C} \frac{\text{l}}{[\alpha \text{back}]}$$

and b) velar conditioning:⁶

$$5) \quad \begin{bmatrix} +\text{syl} \\ +\text{high} \end{bmatrix} \longrightarrow [\alpha \text{back}] \quad / \# \text{K} \frac{\text{C}}{[\alpha \text{back}]}$$

Thus the following derivations:

	/kl'inik/ 'clinical hospital'		/pl'aʒ/
3	kil'inik		p+l'aʒ
4	kil'inik		pil'aʒ
5	k+l'inik		
	[k+l'inik]		[p̄il'aʒ]

Now let us consider the validity of the claims by natural phonology with regard to the rule/process distinction once again. Constraint 3) says that vowel epenthesis and its harmony is a one-shot affair. We were forced to do this, because their separation had to result in a global rule. But 3), while avoiding the undesirable global rule, creates another undesirable situation. Note that we had to call 3) a process in order to save the rule/process ordering relationship in natural phonology. However, it is obvious from the examples, while vowel epenthesis is exceptionless (applies to words in B, as well as in A), harmony is not (words in B), and we cannot call a constraint a 'process' with this many exceptions. So, what is 3) - partly a rule, and partly a process?

Another problem concerns the relationship of 3) with 4) and 5). First of all we have to decide on 4) and 5). Are they rules or processes? There is enough phonetic motivation to call these two constraints 'processes'. Moreover, their exceptionless character also points to the same direction. However, as the data in B. indicate 3), 4) and 5) would have to be critically ordered, and being critically ordered among themselves is very much against the nature of processes.

Similar considerations forced Rhodes (1973) to coin another term 'natural rule' for constraints like Turkish vowel harmony where the rule-

process distinction loses its transparency. Bjarkman (1975), on the other hand, believes that it is not so difficult to know what is a rule and what is a process once we consider the criterion of function. He suggests that in the case of Turkish vowel harmony we have an example of a natural process converted to a learned rule, for vowel harmony is no longer taken as a restriction on pronounceability by speakers of Modern Turkish. I am not at all sure what Bjarkman means by pronounceability; if he is pointing out the occurrences of the non-harmonic words in the language, and trying to say that Turkish speakers have no difficulty in pronouncing these words, then his conclusion can be challenged. Pronounceability is a dubious concept, for it is extremely difficult to define it. According to Chomsky and Halle (1968:380 ff.) knowledge of sequential constraints is responsible for the fact that speakers of a language have a sense of what "sounds" like a native word and what does not. Anybody who has experienced the reaction of an introductory linguistics class to the two nonsense words blick and bnick knows that students, without exception, choose blick as a possible word. When they are asked to explain why they did not choose bnick, the most likely answer you get is 'it is hard to pronounce bnick'. Of course, the fact is that the sequence bn is not allowed in English, since /n/ cannot follow /b/ at the beginning of an English word. Thus, the sequential constraint against bn suggests the unpronounceability of the word bnick. Nobody, I assume, will claim that bn is an 'unnatural' sequence, while bl is not. Then we are forced to conclude that it is not only the 'natural processes' but the constraints of a language in general that place restrictions on pronounceability. Therefore, to categorize Turkish vowel harmony as a learned rule rather than a natural process on the basis of pronounceability does not seem to be well motivated.

If, on the other hand, Bjarkman is suggesting that vowel harmony plays no role in borrowing assimilations, one can refute this claim simply by pointing out the surface manifestations of many epenthetic vowels, where the vowel harmony is clearly at work. Thus, it is my contention that constraints such as Turkish vowel harmony cannot be easily classified in one way or another, and create problems with regard to the basic assumption of natural phonology in its attempt to explain the assimilation of borrowing.

An alternative view for borrowing assimilations 'the magnetic attraction hypothesis' has been advanced by Holden (1976). Equally uncomfortable with the rule exception features of standard generative phonology, Holden offers a hypothesis of hierarchy of strength for native phonological constraints. Holden contests the assumption (Lightner 1972) that loanwords from a particular source uniformly and predictably exhibit the same set of phonological peculiarities, and suggests that the process of assimilation of borrowings indicates that distinctive segments assimilate to various native phonological constraints at different rates. This must be a reflection of the nature and strength of the target constraints themselves.

... each phonological constraint of the target system exerts a 'magnetic' pull on the appropriate segments of the borrowing, in order to assimilate those segments to the native system. Different constraints have

differing strengths of attraction, and the 'magnetic force' of each constraint acts differently on different segments which satisfy the structural conditions of that constraint.(p.133)

He also suggests that different strengths of these constraints are a direct measure of relative 'productivity' in the native system.

According to this view we can suggest that vowel harmony, at least for high vowels, is a living constraint in Turkish, since it operates in the determination of many epenthetic vowels. However, as we have seen earlier (words in B) there are many counter-instances. In these counter-instances we have a situation in which certain native constraints are in conflict; that is, the backness harmony is challenged and overpowered by consonantal influences. Moreover, certain examples also suggest that the two proposed rules (4) and 5) are also competing for power between themselves.

Words such as kilima 'heating', kilinik 'clinical hospital' etc. demonstrate the conflict clearly: kilinik enters the language, backness harmony favors the form kilinik, lateral conditioning also favors the same form. The output, however, is kilinik, and this shows the strength of velar conditioning over the other related rules. Since examples such as pilaz 'beach' from plaz, and pilastik 'plastic' from plastik indicate the strength of lateral conditioning over backness harmony we have to end up with a hierarchy of the following sort:

1. velar conditioning
2. lateral conditioning
3. harmony

The word buluz 'blouse' from bluz complicates the situation, and may suggest that lateral conditioning can be passive, because the epenthetic vowel is [u] (a back vowel) rather than the expected front vowel [ü], despite the fact that it is followed by a /l/. As the following examples indicate, when the original vowel of the incoming word is high, then the epenthetic vowel (which is also high) agrees with this original vowel in rounding as well as in backness.

French	f ^l üt	'flute'	Turk.	f ^ü lüt
	grup	'group'		gurup

However, the word buluz 'blouse', although it obeys the rounding agreement fails to obey the backness constraint. If we follow the above strength hierarchy where we stated the greater strength of lateral conditioning over harmony we should get *bülüz, because the lateral conditioning calls for [ü]. If, on the other hand, we reverse the order for the hierarchical strength, and say that harmony is more powerful than lateral conditioning, then we should expect buluz. It seems that neither order could cope with this particular example. If, however, we adjust the strength hierarchy according to directionality, we seem to be able to explain the attested form buluz. When the assimilation is regressive (right-to-left) as in the

case of the epenthetic vowel for #CC sequences, harmony, which applies to high vowels and calls for an agreement in rounding and in backness, is more powerful than lateral conditioning, thus the epenthetic [u]. Yet, we still need an explanation for the second vowel [ü]. If we attribute the frontness of this vowel to the preceding /i/ then we imply that lateral conditioning can also influence the vowel which follows /i/. That this is an observed phenomenon can be seen in vowel harmony operating on suffixes. We observe certain exceptional cases to otherwise very regular suffix harmony. The so-called exceptional cases can be explained in terms of stem final /i/.

gol'	'goal'	gol'ü	'his goal'	not	gol'u
hal'	'state'	hal'i	'his state'		hal'ı
ampul'	'light bulb'	ampul'ü	'his light bulb'		ampul'u

Assigning the pivotal role to /i/ is the only possible explanation for this irregularity, because regardless of the preceding vowel, /i/ is followed by a front vowel in suffixation. Therefore, we can suggest that, in the case of progressive assimilation the strength hierarchy is reversed, and /i/ conditioning which imposes a front quality to a following high vowel is more powerful than the backness component of roundness-backness harmony which dictates an agreement in backness for high vowels.

Now let us look at the relationship of roundness-backness harmony with velar conditioning. We have ku'lüp 'club' from kl'üb, rather than kü'lüp, and this again supports the strength of velar conditioning, since all other related rules call for the form *kü'lüp.

	/kl'üb/	'club'
Har.	kü'lüb	
L.Con.	kü'l'üb	
V.Con.	ku'l'üb	
Devoic.	ku'l'üp	
	[ku'l'üp]	

This, however, may also suggest another variable in that directionality rather than the strength alone could be the decisive factor of the shape of the epenthetic vowel. In other words ku'lüp 'club' and also previously mentioned k+l'inik 'clinical hospital' etc. do not really show the power of velar conditioning over lateral conditioning and harmony, but simply show that progressive assimilation is more powerful than regressive assimilation. In all these examples velar conditioning applies progressively, and lateral conditioning and harmony apply regressively. If directionality is the underlying factor for the strength hierarchy then it is not fair to compare the rules with their opposite directions.

Fortunately, Turkish provides some examples with final consonant clusters, and these can be a testing-ground for the alternative hypotheses we have mentioned. Turkish permits syllable final consonant clusters only if C₁ is a sonorant and C₂ is an obstruent, or C₁ is a fricative and C₂ is a stop.

renk	'color'	sarp	'steep'	kürk	'fur'
ders	'lesson'	alt	'bottom'	çift	'pair'

If these conditions are not met by an incoming sequence the unpermitted cluster will be broken by an epenthetic high vowel.

Arabic	jɛbr	'force'	Turk.	jebir
	fasl	'chapter'		fasɪl
	nutq	'speech'		nutuk
	zul'm	'oppression'		zul'üm
	ɣusl'	'ritual ablution'		gusul'

If we examine zul'üm 'oppression', we see that the two constraints, lateral conditioning and roundness-backness harmony, are in conflict. If, however, we apply our hierarchy of strength, the form seems to be explainable. zul'm enters the language, and since the final cluster is unacceptable our epenthesis rule will apply and insert the high epenthetic vowel. Roundness-backness harmony requires the vowel to be [u], but since this is a case of progressive assimilation, lateral conditioning dominates and we get zul'üm, rather than *zul'um. In other words /l'/ cancels out the effects of the backness agreement of the roundness-backness harmony on the vowel which follows it. We observe the same thing in the suffixed form zul'mü 'his oppression'. That the additional consonant between /l'/ and the following vowel in zul'mü is irrelevant for the operation of lateral conditioning can be seen in other examples which reveal the same pattern.

kal'p	'heart'	kal'bi	'his heart'
kalp	'counterfeit'	kalbɪ	'his counterfeit'

When we examine some other cases about which we have said nothing, namely the forms showing the applicability of roundness-backness progressively, and lateral conditioning regressively, we observe the strength of harmony over lateral conditioning.

Arab.	ɣusl'	'ritual ablution'	Turk.	gusul'
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However, the suffixed form is gusl'ü rather than gusl'u. This demonstrates that lateral conditioning is more powerful than the backness requirement of roundness-backness harmony when both can be applied in the same direction.

All the above have certain implications; first, they make the separation of rounding harmony from backness harmony imperative, because the interference of lateral conditioning is beyond any doubt. While the rounding component of the harmony is exceptionless, the backness component is not. Lateral conditioning seems to be in conflict with the backness agreement, and in each and every progressive case we have examined, the former seems to have overpowered the latter.

By stating the obligatory separation of backness harmony from rounding I do not intend to conclude that they are unrelated. As we have seen, in many cases, rounding agreement is followed by backness agreement, and in the cases where velar conditioning and lateral conditioning did not interfere, backness harmony was indeed obligatory.

Finally, we examine the strength relationship between velar conditioning and lateral conditioning once again. We have the forms halk 'people', and

hal'k 'his people'; however, for some speakers (my father for one) the form hal'k is possible. But even for these speakers the suffixed form is hal'k, and never *hal'ki, thus showing another velar dominance over lateral. This example may be thought to have eliminated the doubt we have had about the strength hierarchy between these two rules because of directionality earlier. It, however, may also suggest a new argument in another dimension. We can suggest that it is not the strength of velars over laterals but the immediate closeness that is responsible for the example. This again leaves the question open.

The reader may have thought that I am moving toward a constraint for the entire language allowing velars and laterals to determine the backness of a high vowel adjacent to them; this is not the case. Note that examples such as usul 'manner', gusul 'ritual ablution' etc. clearly show that backness harmony is more powerful than lateral conditioning when both apply; the former progressively and the latter regressively. Since lateral conditioning always dominates backness harmony when both rules are applicable in the same direction, this opposite strength hierarchy in usul, gusul must be the reflection of the fact that assimilation is basically progressive, and the regressive assimilations exhibited in the nativization of #CC forms are obligatorily regressive, since there was no other choice. It is for this reason that, whatever cooccurrence restrictions we place on vowels, they have to be in accordance with this basic progressive character of the assimilation. I suggest that when a high vowel is preceded by a velar or a lateral the backness of the vowel is determined by the backness of the velar or lateral.

However, the problems of borrowing are far from being resolved. Although we seem to have sufficient justification to claim the basic directional character of harmony, we do not seem to be able to get away from certain problems caused by initial CC sequences. Discussions of Turkish vowel harmony typically state that the harmony is progressive; this is quite natural for a suffixing language. The examples of borrowed #CC sequences do not refute this directionality, since the constraint would have to work regressively to harmonize the epenthetic vowel. It might be suggested that although the directionality is different, functionally we are dealing with the same constraint. When we examine rounding harmony we observe a strange situation: when it works progressively, the height of the conditioning vowel is irrelevant. Simply stated, a high vowel takes the rounding of the preceding vowel regardless of the height of the conditioning vowel.

C.	pantolon-u	'his trousers'	not	*pantolon
	org-u	'his organ(music.)'		*org
	gol-u	'his lake'		*goli
	okul-u	'his school'		*okul

When we consider the examples in which rounding harmony works regressively, we realize that it is not only the height of the conditioned vowel but also the height of the conditioning vowel which becomes important; rounding harmony operates regressively only when both the conditioned and the conditioning vowels are high.

D.	f'lüt	'flute'	Turk.	f'ülüt
	grup	'group'		gurup

When the conditioning vowel is non-high, rounding harmony is inoperative, even though the conditioned vowel is high.

E.	Fr.	smɔkin	'dinner jacket'	Turk.	s+mokin	not	*sumokin
		spor	'sport'		s+por	"	*supor
		kroki	'sketch'		k+roki	"	*kuroki

But why should a language have two different conditions for what is functionally the same constraint, and why are these conditions determined by directionality? Unfortunately, these questions remain unanswered.

Finally, a related issue concerns the claims made for vowels in natural phonology. Donegan (1978:32) discussing the relationship of sonority and color (palatality and labiality), mentions the conflict between sonority and color, and states

The properties which are central to the nature of vowels seem to be present more strongly in the lower, more sonorant vowels.

Note that our examples have revealed the fact that rounding harmony which applies to high vowels is "stronger" than backness harmony in Turkish. If we follow Donegan's suggestion, which states that articulations which increase color decrease sonority, and those which increase sonority decrease color, then we will have a contradictory situation for Turkish harmony. Vowel harmony is essentially a phenomenon in which one vowel conditions certain features of another vowel. However, as we have seen above, backness harmony is weaker despite the fact that the conditioning vowel was a non-high and thus more sonorous one. On the other hand, in the case of a high, round and thus less sonorous vowel, harmony became more powerful, and was harder to suspend.

One might suggest that this is irrelevant and does not provide a counter-argument to the general principle, because the operation of harmony attaches more importance to the quality of the conditioned vowel rather than the conditioning vowel. However, even this cannot save the day for Donegan's principle. The examples in D.(harmonic for rounding) and E.(non-harmonic for rounding) both employ epenthetic (high) vowels, but reveal opposite cases. Since these words all have conditioned vowels with identical height, we should dismiss the argument which attaches importance to the quality of the conditioned vowel. Once we do this, the only thing we are left with is the difference between the conditioning vowels, and this contradicts the original claim, by urging us to ask another unanswered question: Why is a non-high vowel (more sonorous than a high vowel) incapable of conditioning (words in E.), while a high vowel (less sonorous than a non-high vowel) is able to do so (words in D.)?

In this paper I have attempted to evaluate certain claims of natural phonology in relation to borrowing assimilations. Some shortcomings of the theory are mentioned, and although it is shown that an alternative analysis based on the hierarchical strengths of native constraints is more capable of explaining many assimilations, certain problems of borrowing remain as puzzling as ever.

Footnotes

1 Natural phonology is not to be confused with Natural Generative phonology, a theory advanced by J. Hooper and T. Vennemann. For a detailed account of Natural Phonology the reader is referred to Stampe's (1973) unpublished dissertation. For the latest developments see Rhodes (1974), Bjarkman (1975) and Donegan (1978). Sommerstein (1977) gives a very good summary of the basic principles of the theory.

2 This is reminiscent of Chafe's (1968) distinctions between 'persistent' and 'transient' rules. Chafe suggests that persistent rules are the ones which are most alive in the language. Transient rules are the ones that induced phonological change at some past time but have no synchronic validity. Thus loanwords would be subject to persistent rules and immune to transient rules when they first enter the language.

3 This reflects Rhodes' (1974) interpretation. For a different interpretation see Bjarkman (1975).

4 The vowel system of contemporary standard Turkish consists of eight vowels, usually defined by the distinctive features back, high and round.

	a	e	o	ö	u	ü	+	i
back	+	-	+	-	-	+	+	-
high	-	-	-	-	-	+	+	+
round	-	-	+	+	-	+	-	-

5 This is also counter to the universal claim made by Hooper (1976:236) for vowel epenthesis in which she states

Many tone languages and all vowel harmony languages (my emphasis) insert and delete V's that are identical to some nearby V.

6 K is velar. This analysis is based on the view that Turkish has two sets of velars /k/ /k'/ /g/ /g'/ and two laterals /l/ and /l'/.

7 Forms such as bül'öf 'bluff', purova 'rehearsal', purože 'project' which occur alongside with bil'öf, p+rova, and p+rože, do not contradict this, for all these examples have labial consonants before the epenthetic vowels, and I contend that the vowel rounding is due to these consonants.

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