VOWEL HARMONY IN PROTO-FINNO-UGRIC AND HUNGARIAN

Les Zsoldos

Department of Linguistics
Simon Fraser University, B.C., Canada

0. INTRODUCTION

I will first explore the development of vowel harmony in Proto-Finno-Ugric and then vowel harmony in Hungarian. In order to explore the development of vowel harmony in Proto-Finno-Ugric, it is necessary to determine the vowel system. I will elaborate on the vowel system which scholars believe existed in Proto-Finno-Ugric and then explore the development of vowel harmony in Proto-Finno-Ugric. I will then continue with an investigation of Hungarian vowel harmony which will present and evaluate different analyses of this phenomenon.

1. VOWEL HARMONY

According to Hajdú (1975), the rule of vowel harmony, common to most Finno-Ugric languages, can be traced back to the early Proto-Finno-Ugric period. In one word only back (e.g., a, o, u) or front (ä, e, i) vowels could be found, and this principle applied to suffixes also; the latter had two forms, one back-vowel and one front-vowel.

1.1 The Vowels of Proto Finno-Ugric

Lakó (1968) infers the Proto Finno-Ugric existence of the sounds a, o, u, ä, e, i and ü. This is similar to Décsy's reconstruction of the Proto-Uralic language which posits the six vowel phonemes /u/, /o/, /a/, /i/, /e/ and /ä/. The difference between these two reconstructions is the secondary development of the high front rounded vowel ü in Proto Finno-Ugric. The qualities of the Proto Finno-Ugric vowels have been comparatively best preserved in Finnish, a language which is considered very conservative among the Finno-Ugric languages, and also in the Volga-Finnic languages (Mordvin, Cheremis), Vogul, Ostyak and Hungarian. He notes that these languages conform to one another at least to the extent that in most cases they have palatal vowels as continuers of the original palatal vowels and velar vowels as continuers of the original velar vowels.

Lakó believes the vocalic stock of the Proto Finno-Ugric language probably consisted of the following vowels: the palatal vowels ä, e, ü, i and the velar vowels a, o, u. Besides these vowels, Proto Finno-Ugric also possibly had a velar e. Mid and high vowels may also have occurred long: e:, i:, o:, u:. In non-initial syllables, only short vowels could occur, the three illabial vowels a, ä and e. The vowel inventory of Proto-Finno-Ugric was greater than that of Proto-Uralic, which Décsy (1990) claims consisted of only the six vowel phonemes /u/, /o/, /a/, /i/, /e/ and /ä/. However, Proto-Uralic also had a limitation with respect to the vowels which could occur in non-initial syllables. According to Décsy, only the vowel phonemes /a/ and /ä/ could occur in non-initial syllables. In a negligible number of cases (PU mene 'to go' nele 'to swallow) /e/ could also occur.

1.2 Reconstruction of the Vowel System

Lakó notes that in comparing the vocalic stock reconstructed on the basis of Itkonen's research with the conclusions reached by Steinitz, the findings of the two scholars are only partly inconsistent. Steinitz assumes 10 (possibly 11) vowels and Itkonen reconstructs 11 vowels for Proto Finno-Ugric. Concerning the number of Proto Finno-Ugric vowels, the two researchers are almost in full agreement. Steinitz reconstructs two or three reduced vowels for Proto-Finno-Ugric which are a reduced i, a reduced central vowel u and a reduced back vowel u. With respect to the reduced central vowel and the reduced back vowel, Steinitz accepts that it is possible that there could have been only one in Proto-Finno-Ugric.

Itkonen reconstructs a series of short vowels and long vowels. His long vowels are i:, e:, u: and o:. Lakó admits that we can never be certain what the Proto-Finno-Ugric vowels were. However, he says that one thing is

certain: the palatal-illabial vowels (ä, e, i) as well as the velar a can be found in all the Finno-Ugric languages, and the o and u vowels are known in every Finno-Ugric language.

1.3 Vowel Harmony in Proto-Uralic

Hajdú (1975) and Rédei (1986) both claim that vowel harmony developed in Proto-Finno-Ugric. Décsy (1990), however, believes that vowel harmony existed in Proto-Uralic. He states that Uralic Vowel Harmony was palato-velar and that the labial-illabial vowel harmony known in Hungarian and Cheremis can not be assumed for the Uralic Protolanguage for the simple reason that labial vowels could not occur in non-initial syllables. This made the following vowel combinations possible between the initial and non-initial syllables.

velar	palatal
u—a	i—ä
o—a	e—ä
a—a	ä—ä

Collinder (1969) claims that the core and essence of ancient Uralic vowel harmony was the alternation a~ä in other syllables than the first, depending on whether the first syllable had a back or front vowel. Décsy states the basic formula of Proto-Uralic vowel harmony was: palatal vowel + ä and velar vowel + a.

1.4 Vowel Harmony in Proto-Uralic vs. Proto-Finno-Ugric

In contrast to Décsy, Rédei does not argue that vowel harmony existed in Proto-Uralic. He states that researchers nowadays are generally in agreement that the proto language had vowel harmony and that it was a palato-velar or palatal vowel harmony, but he does not affirm that vowel harmony existed in Proto-Uralic. He adds that the existence of vowel harmony may be connected to the agglutinative nature of the proto language, although there is no lack of agglutinative languages without vowel harmony. In order to be able to clarify the conditions for the functioning of this system it is above all important to note that palato-velar harmony has two subtypes: 1) radical or stem harmony, and 2) suffixal harmony.

For the development of vowel harmony, Rédei explains that the vowel combination rules of the word stems played a major role. The velar or palatal vowel of the first syllable determined which vowel could occur in the second syllable and this is still characteristic of several Finno-ugric languages. Regarding the combination possibilities, i in the first syllable as well as e in non-initial syllables were neutral vowels. He believes that the existence of radical vowel harmony or vowel combinations, and the stressing of the first syllable together with the presumably restricted agglutinative character of the proto language led to the development of suffixal vowel harmony.

While it is possible that vowel harmony existed in Proto-Uralic, I believe the literature favours the view that vowel harmony can be traced back to the early Finno-Ugric period. Lorand & Imre (1972) state that the rule of vowel harmony has been one of the distinguishing features of Hungarian ever since the Finno-Ugric period. If vowel harmony existed in Proto-Uralic, it was a form of vowel harmony which only allowed a or ä in non-initial syllables, a palato-velar vowel harmony. The literature states that the relatively small vowel inventory of Proto-Uralic was expanded in Proto-Finno-Ugric, that Proto-Finno-Ugric developed a contrast between short and long vowels or full and reduced vowels, and that the existence of root harmony led to the development of suffixal vowel harmony.

2. VOWEL HARMONY IN HUNGARIAN

Vowel harmony is the term used when all the vowels of a single word must be of the same quality. Marcantonio (2000) and Vago (1973) define vowel harmony as a term which suggests that a particular vowel assimilates to another vowel in some feature specification. Marcantonio states that in the Uralic languages, vowel harmony is mainly palatal; the vowels of a word must all be front or back in quality. However, Hajdú notes that certain developments have taken place since Proto-Finno-Ugric. He explains that in Finnish the simple distinction between palatal (front or high) and velar (back or deep) vowels has been maintained, but in Hungarian and the

eastern dialect of Cheremis a further distinction has been added which differentiates between labial and illabial vowels. The rule is that front rounded vowels (ö, ü) occur in combination with one another. Marcantonio notes that in Hungarian some suffixes have a third labial variant: e, o, ö to be used when there is a labial vowel within the word. We can compare ház-hoz 'house-toward', víz-hez 'water-toward' but gyümölcs-höz 'fruit-toward'. Collinder states that rounding harmony occurs in Hungarian, Eastern Cheremis and Selkup, all languages which have been subjected to Turkic influence. Hajdú explains that result of this can be seen in the Hungarian noun suffixes; some, like –ban/-ben 'in' have back and front vowel forms only, while others, such as –hoz/-hez/-höz 'to' have two front-vowel forms, one illabial and the other labial. Roots containing an illabial front vowel take the form –hez, e.g. kéz 'hand' ~ kézhez, but those containing a labial vowel require the form –höz, e.g., bőr 'skin' ~ bőrhöz, tu 'pin' ~ tűhöz. In the case of back vowels, there is only one form –hoz, for both labial and illabial roots (úr 'gentleman' ~ úrhoz, vár 'castle' ~ várhoz). According to Hajdú, this development is probably the result of Turkic influence.

2.1 The Hungarian Vowels

Hungarian has fourteen vowels, seven long and seven short (Ringen, 1988). They can be organized as follows:

	SHORT			LONG			
	FRONT		BACK	FRONT BACK			
	[-round]	[+round]	[+round]	[-round][+round]		[-round]	[+round]
high	i	ü	u	i:	ü:		u:
mid		ö	o	e:	o:		o:
low	e		a			a:	

Ringen points out that the long and short vowel systems are not totally symmetrical. The long low back vowel is unrounded whereas the short low back vowel is round; there is no short mid front vowel (in standard Hungarian) nor any long low front vowel. According to Fee (1990), historically the language contained both mid and low front vowels, but these have been merged in most dialects. With respect to the vowels i, í, and é, they are neutral and occur freely with both front and back harmonic vowels.

Ringen provides these examples:

tányér	'plate'
radír	'eraser'
bika	'bull'
művész	'artist'
körív	'arch'

According to Ringen, there is some disagreement about the status of e. She notes that Vágó (1974) and Stong-Jensen (1973) classify this vowel as neutral. She argues that this vowel is best viewed as a harmonic front vowel.

2.2 The Neutral Vowels

Olsson (1992, 80) states: "Harmony would really be a very simple process, were it not for the neutral vowels." According to Ohala (1994), languages exhibiting vowel harmony often have one or more vowels which are indifferent to the harmonizing principle. Lass (1984) explains that the vowels i, í, e, é are called neutral because of the odd way they interact with the normal vowel harmony rule. If they co-occur in a stem with non-neutral vowels, they do not seem to trigger vowel harmony. This is the case with kordé 'cart' kordé-nak 'car-to' (dat.) and kordé-tól 'car-from' (abl.). Olsson notes that one way of dividing the Hungarian vowels is according to backness. Harmonic front and back vowels are normally kept apart word-internally. Vowels that belong to the neutral group- though phonetically front- may appear freely with vowels from any of the two harmonic sets.

Siptár and Törkenczy (2000) believe it is reasonable to consider front unrounded vowels neutral because this is better than allowing for huge numbers of exceptions (front unrounded vowels which combine with back vowels). They let harmony pass through them (i.e. they are transparent). If a word has another vowel that is harmonic (non-neutral), suffixes will be harmonized to that vowel. They illustrate this with the following examples:

rövid-en 'briefly' but hamis-an 'falsely', örmény-től 'from an Armenian' but kastély-tól 'from a manor', kever-ék-et 'mixture' (acc.) but marad-ék-ot 'remnants' (acc.). They conclude that if the words 'hamis', 'kastély' and 'maradék' had a front harmonic vowel in the last syllable, we could never explain why they take back vowel suffixes.

We have seen that vowel harmony appears to ignore neutral vowels. Therefore, the last non-neutral vowel in the stem controls vowel harmony. However, when stems contain only neutral vowels, harmonization looks random (Lass, 1984).

To illustrate this, consider the following examples:

	Root	from inside	in	at	to
'water'	víz	-ből	-ben	-nél	-nek
'knife'	kés	-ből	-ben	-nél	-nek
'torture'	kín	-ból	-ban	-nál	-nak
'target'	cél	-ból	-ban	-nál	-nak

The words 'water' and 'knife' show phonetically predictable front harmony but the words 'torture' and 'target' show back harmony. This is a further complication of the neutral vowels. However, we notice that the vowel e does not appear in the examples. Ringen argues that there are fifty neutral vowel roots such as these which require back vowel suffixes. According to her, one indication that e is not a neutral vowel is that of these fifty roots, none contain e.

2.3 The Status of the e

Ringen (1988) argues that e is not a neutral vowel, but rather a front harmonic vowel. Siptár and Törkenczy (2000) mention that the neutrality of this vowel is ambiguous and controversial. They give the example haver-ok 'pals' and kódex-ek 'codices'. In the word haver-ok we notice that the e behaves as a neutral or transparent vowel; in kódex-ek it behaves as a harmonic front vowel.

Ringen and Kontra (1989) cite empirical evidence for the claim that e is a harmonic front vowel. The evidence is based on questionnaire studies in which a group of native speakers were asked to provide suffixed forms of various lexical items containing front unrounded vowels in their final syllable(s) along with back harmonic ones in a preceding syllable. Their data suggests that there is some variation with all front unrounded vowels. However, the number of front vowel responses is statistically higher in the case of words with e in their last syllable than in the case of the other front unrounded vowels. As a result, Ringen and Kontra conclude that e is best viewed as front harmonic and not neutral.

They state that the Hungarian neutral vowels are not equally neutral but rather that the high front unrounded vowels seem most neutral, the mid front unrounded vowel less neutral and the low front unrounded vowel not neutral at all. Törkenczy and Siptár agree that there is variation in the data, but believe it would be a more faithful summary of the facts if Ringen and Kontra concluded that the low front unrounded vowel is the least neutral of all.

Ringen presents additional arguments in favour of the view that e is not a neutral vowel. She argues that there are no invariable suffixes with e, but rather that suffixes with e always alternate. In contrast, there are invariable suffixes with i and é: (e.g., -ig hatig 'up to six', -ik mászik 'it crawls', -ként kulcsként 'as a key', -ért hazáért 'for one's country'). Her final argument is that the behaviour of suffixes following back vowel roots followed by e indicates that e is a harmonic vowel. Ringen concludes that if e were a neutral vowel, there would be back vowel roots followed by e which require only back vowel suffixes. She illustrates this with the neutral vowels i and é: (taxi 'taxi' taxiban *taxiben 'taxi-in' kávé 'coffee' kávéban *kávében 'coffee-in'). Ringen notes that there are few if any such forms with e.

However, there are examples of words with back vowel roots followed by e where we have back vowel suffixes. These are known as doublets. Examples include: dzsungel-ban/ben 'jungle-in', Ágnes-tól/tol 'Agnes-from', József-nak/nek 'Joseph-to' derék-tól/től 'waist-from' and hotel-ban/ben 'hotel-in'. For these cases, Ringen

proposes an optional rule which backs a suffix vowel when it follows a back vowel root followed by e. This is how she accounts for the doublets. Since Ringen treats e as a harmonic suffix vowel, her argument is that the back vowel suffixes are optional forms.

However, she does not offer any evidence to support her claim that the back vowel suffixes in these cases are optional. As for her claims that there are no invariable suffixes with e and that none of the fifty neutral vowel roots contain e, we can argue that this alone is not sufficient evidence that e is not a neutral vowel. The vowel é is only present in two of the fifty neutral vowel roots, but is nonetheless classified as a neutral vowel.

2.4 The Problem of Loanwords

According to Slobin (1997), although palatal harmony historically regulated the quality of vowels within the word, in the present day language this assimilatory phenomenon has eroded, as contamination from loanwords has produced many exceptions to the general word-internal pattern. Törkenczy and Siptár (2000) offer the following examples: sofor 'driver', kosztüm 'outfit', nüansz 'nuance' and pözsó 'Peugeot'. These word stems can be described as disharmonic. The word 'nüansz', for example, consists of a front rounded vowel and a back rounded vowel, a combination which violates backness harmony. However, suffix harmony is predictable as we can see from these examples:

dative	sofőrnek	kosztümnek	nüansznak	pözsónak
ablative	sofőrtől	kosztümtől	nüansztól	pözsótól

The examples show that Hungarian vowel harmony is stem-controlled which means that it is always the harmonic value of stems that controls that of affixes, never the other way round. Harmony is directional (left-to-right), i.e. only suffixes are affected (Törkenczy & Siptár, 2000). The stems are invariable. If we look at the examples, we notice that it is the last vowel of these stems which determines the vowel quality of the suffix vowel. In 'sofor' the final vowel of the stem is a front vowel; therefore, the suffix is –nek. In the case of nüansz the final vowel is a back vowel. As a result, the suffix must be –nak.

3. EARLY ANALYSES OF VOWEL HARMONY

Early analyses of vowel harmony relied on the use of underlying vowels and abstract or imaginary segments. Lass (1984) explains that there were two basic approaches: one was to mark the aberrant items in the lexicon with a rule feature such as [+ back VH] in order to override the normal assimilatory vowel harmony rule. The other was to argue that the non-harmonic e, é, i and í were underlyingly different from the harmonic ones because they were not truly front vowels. Therefore, they were represented as back vowels which did not appear on the surface, i.e. /ɯ ɣ/. The result was an underlying contrast that never surfaced. This approach which uses an underlying contrast to trigger differential behaviour and then gets rid of it before deriving the surface form is called absolute neutralization.

The problem with this theory is that it was not adequately constrained. It was impossible to test the claim that Hungarian e had underlying ɣ and i had underlying ɯ. Furthermore, many abstract solutions disregarded phonetic plausibility. Lass notes that the more powerful a theory is, the less responsive it is to empirical checks. This was a major problem with abstract solutions such as absolute neutralization.

According to Schmidt (1995), few investigations of Hungarian vowel harmony any longer even entertain the alternative abstract analysis proposed by Vágó (1973), in which the i and e occurring in back harmonic domains are, until the final stages of the phonological derivation, really /ɯ/ and /ɣ/. This sort of abstract analysis subjected /ɯ/ and /ɣ/ to a feature-reversing rule of absolute neutralization that resulted in their surfacing as i, í, e and é. She claims that this analysis of Hungarian vowel harmony is now largely ignored.

4. PALATAL HARMONY AND ROUNDING HARMONY

Utasi-McRobbie (1984) evaluates an influential approach (Vago 1975) to Hungarian vowel harmony on the basis of her observations of a phonological change in the speech of English-Hungarian bilinguals. It is her contention that Hungarian rounding harmony functions as a sub-part of a complex vowel harmony rule. If we

consider the rounding harmony rule as a sub-part of a complex vowel harmony rule, we may look upon the process of the disappearance of the rounding harmony rule in cases of imperfect language performance as rule simplification.

To view rounding harmony as an independent rule, as Vago does, would have to be regarded as rule loss. Utasi-McRobbie explains that to account for this rule loss would mean considering two possibilities, both of which are implausible: i) accepting Vago's solution would leave the change from one grammar to another unmotivated; ii) assuming the correctness of two separate rules would not truly reflect the essence of the relationship between palatal harmony and rounding harmony rules.

After his vowel harmony rule has applied, Vago posits two additional rules: a rounding harmony rule and an e-adjustment rule. The e-adjustment rule is needed to lower the output of rounding harmony, a front mid rounded vowel, to a front low unrounded vowel. In verbs where the underlying suffix is /tok/ (Ind. Prs. Pl, 2), he proposes the following derivations for the verbs mostok 'you wash', vertek 'you beat' and törtök 'you break'.

/mos + tok/		/ver + tok/	/tor + tok/
VH	mostok	vertök	törtök
RH	---	vertek	---
e-adj	---	vertek	---
	[mostok]	[vertek]	[törtök]

Utasi-McRobbie notes that if this type of derivation is correct it follows that in the course of imperfect language performance there is a greater chance that the 'mostok' and 'törtök' types of strings will be achieved naturally. However, once an assimilation rule does not seem to be functioning in exact accordance with the exact requirements of the rule, one may suspect that the rule is marked. She states that in the above derivation the unrounding process has to be marked. Thus one would expect the vertök, törtök forms to surface in the case of imperfect language learning. However, she did not observe this to be the case among her sample of bilinguals. They never produced forms like *vertök. On the contrary, the overwhelming majority used strings such as *törtek. The following are typical examples taken from her material:

főzek 'cook' (1Sg.), töltek 'fill' (1Sg.), jövek 'come' (1Sg.)
főztek (2Pl.), fésültek 'comb' (2Pl.), jöttek (2Pl.)

Utasi-McRobbie's research shows that vowel harmony appears to be the more stable assimilation rule, the one applied by her bilingual participants with almost no exceptions. She concludes that the fact that vowel harmony occurs where rounding harmony does not occur at all, suggests that the relationship between the two rules is more than just structural. It seems very likely that rounding harmony is a sub-rule of the vowel harmony rule and that the result is a case of rule simplification.   She also argues that diachronic evidence supports the probable relationship between palatal harmony and rounding harmony. Szépe (1958) and Rédei (1977) both state that labial harmony appeared at a much later period than palatal harmony.

5. RECENT ANALYSIS OF VOWEL HARMONY

A more recent analysis of vowel harmony in Hungarian is found in feature geometry. According to Levi (2000), it exploits the hierarchical structure of the internal features of phonemes. This model relies on an organization where vowel features are located on a lower tier than consonants. Since consonants lack this tier, they are transparent to spreading rules. Vowel harmony can therefore be explained as a local process involving adjacent vowel place features. Clements (1980) states that in its simplest, most regular form, vowel harmony consists of a co-occurrence restriction upon the vowels that may occur in a word. All vowels in a word must be drawn from one or another of two mutually exclusive sets. Siptár and Törkenczy (2000) analyze Hungarian vowel harmony in terms of the Clements/Hume feature system. This system uses the place features coronal, labial and dorsal to describe the vowels. It further classifies them as open1 or open2.

Here is the underlying representation of Hungarian stem vowels:

i   ü   u   ö   o   e   a

	c1	c2	c3	c4	c5	c6	c7
COR	.					.	
LAB		.		.			
DOR			.		.		.
open1	-	-	-	-	-	+	+
open2	-	-	-	+	+	+	+

Suffix vowels are represented as follows:

	non-alternating			alternating				
	i	e:	o	ü/u	ö/o	e/a	ö/o/e	ö/o/e/a
COR	.	.						
LAB				.	.			
DOR			.					
open1	-	-	-	-	-	+	-	
open2	-	+	+	-	+	+	+	+

Now we will consider a few simple cases. Pure dorsal stems like kalap 'hat' and koszorú 'wreath' have a single floating DOR feature that is linked to all their vowels by Link DOR. Similarly, pure LAB stems like öröm 'joy' have a single floating LAB linked to all their vowels; pure COR stems like szegény 'poor' have a single floating COR linked to all their vowels. In a word such as telefon 'telephone' the analysis is that the first two vowels are prelinked to the same COR followed by a floating DOR which will spread to suffix vowels. In an analysis of a word such as piros-hoz 'to (the) red one', the dorsal vowel o in 'piros' spreads to the suffix vowel, resulting in the correct suffix –hoz.

6. CONCLUSION

I explored the development of vowel harmony in Proto-Finno-Ugric and then presented an analysis of vowel harmony in Hungarian. The literature is not unanimous on when vowel harmony first began. Some scholars trace it back to Proto-Uralic and others to the early period of Proto-Finno-Ugric. Nervertheless, it is clear that Proto-Uralic had a simpler vowel system than Proto-Finno-Ugric. A contrast between short and long vowels or between full and reduced vowels was developed in Proto-Finno-Ugric. There is no full agreement on which were the vowels of Proto-Finno-Ugric, but there appears to be agreement on the type of harmony which developed. Proto-Finno-Ugric had palatal harmony; the labial harmony of Hungarian was a later development. There was root harmony which further developed into suffix harmony.

I then discussed the vowel system of Hungarian, the neutral vowels and also the controversy of the vowel e, a vowel which is not classified as neutral by all linguists. Despite the arguments that e is a harmonic front vowel, I concluded that it is better classified as neutral. I also discussed loanwords which unlike native words often disobey the principles of vowel harmony.

Early approaches to the analysis of vowel harmony in Hungarian often employed abstract solutions. The problem with abstract solutions was that their claims were not adequately constrained; they could not be tested nor falsified. An evaluation of an influential approach to vowel harmony used concrete analysis of the speech of English-Hungarian bilinguals to counter the claim that palatal harmony and rounding harmony are separate rules in Hungarian. The data suggested that rounding harmony is a sub-rule of a vowel harmony (palatal harmony) rule. Due to the problems with abstract solutions in the analysis of Hungarian vowel harmony, they have been largely abandoned. A recent analysis is feature geometry. One of the great advantages of such an approach is that it places

vowel features on a lower tier than consonants, thereby making it possible to view vowel harmony as a local process and allowing vowel features to spread from one vowel to another.

REFERENCES

Clements, George N. (1980) *Vowel Harmony in Nonlinear Generative Phonology.* Indiana University, Bloomington, Indiana.

Collinder, Björn. (1957) *Survey of the Uralic Languages.* Almqvist & Wiksell Förlag, Stockholm.

Collinder, Björn. (1965) *An Introduction To The Uralic Languages.* University of California Press, Berkeley and Los Angeles.

Décsy, Gyula. (1990) *The Uralic Protolanguage: A Comprehensive Reconstruction.* Eurolingua Bloomington, Indiana.

Fee, Jane E. (1990) *Underspecification and Hungarian Back Harmony.* Cahiers Linguistiques D'Ottawa, Ottawa.

Hajdú, Peter. (1975) *Finno-Ugrian Languages and Peoples.* Deutsch, London.

Kontra, Miklos, Ringen, Catherine O. and Stemberger, Joseph P. (1989) *Context Effects in Hungarian Vowel Harmony* Nyelvtudományi Közlemények, Budapest.

Lakó, György. (1968) *Proto Finno-Ugric Sources of the Hungarian Phonetic Stock,* Indiana University, Bloomington.

Lass, Robert. (1984) *Phonology.* Cambridge University Press Cambridge.

Levi, Susannah V. (2000) MA Thesis *Glides, laterals and Turkish Vowel Harmony* University of Washington, Seattle.

Loránd, Benkő and Imre, Samu. (1972) *The Hungarian Language.* Mouton, The Hague

Marcantonio, Angela. (2000) *The Uralic Language Family: Facts, Myths and Statistics.* Blackwell Publishers, Oxford.

Ohala, John J. (1994) *Hierarchies of Environments for Sound Variation plus implications for neutral vowels in vowel harmony.* Acta Linguistica Hafniensa.

Olsson, Magnus. (1992) *Hungarian Phonology and Morphology.* Lund University Press Lund, Sweden.

Rédei, Károly. (1986) *A magánhangzó-harmónia kialakulása a PU-PFU Alapnyelvben.* Nyelvtudományi Közlemények Budapest.

Ringen, Catherine O. (1988) *Vowel Harmony: theoretical implications.* Garland, New York.

Schlindwein Schmidt, Deborah. (1996) *Absolute Neutralization and Underspecification in Hungarian Vowel Harmony.* Cornell University, New York.

Siptár, Péter and Törkency, Miklós. (2000) *The Phonology of Hungarian.* Oxford University Press.

Slobin, Dan Isaac. (1997) *The Crosslinguistic Study of Language Acquisition.* Volume 4. Lawrence Erlbaum Associates, New Jersey

Utasi-McRobbie, Zita. (1984) *A Case For Rule Simplification*. Nyelvtudományi Közlemények, Budapest

Vágó, Robert. (1973) *Abstract vowel harmony systems in Uralic and Altaic Languages*. Language Journal of the Linguistic Society of America, Washington, D.C.