

Glides, laterals, and Turkish Vowel Harmony¹

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1 Introduction to the problem of Turkish Vowel Harmony

Processes of vowel harmony involve a type of non-local behavior that is absent from much of phonology. In order to maintain the notion that phonological processes are local, two non-linear models have evolved that redefine locality. The first, known as the syllable-head approach (discussed in van der Hulst & van der Weijer 1995), is a theory that makes use of the suprasegmental structure of the syllable. Syllables inherit vocalic features from the head of the syllable (i.e. the vowel) and assimilation or spreading can occur between two adjacent syllables. Thus, the local aspect of phonology is retained because the syllables involved in the harmony are adjacent.

The second approach, known as feature geometry (Clements 1990, Clements & Hume 1996), exploits the hierarchical structure of the internal features of phonemes. In particular, this model relies on an organization where vowel features are located on a lower tier. Consonants lack this tier and are therefore transparent to any spreading rules. Hence, vowel harmony can be explained as a local process that involves adjacent V(owel)-place features.

Turkish Vowel Harmony provides the perfect data with which to juxtapose these two competing theories. In addition to backness harmony, Turkish has a glide /j/ that is transparent to vowel harmony, as well as a palatal lateral /ʎ/ that is not. The glide is relevant to feature geometry because some theories treat it as having the same feature organization as the high front unrounded vowel /i/. Thus, it is a potential problem for feature geometry. The palatal lateral is also problematic. In the syllable-head approach, there is no way to explain how the non-nuclear lateral can initiate a new harmony domain. On the other hand, this lateral does not pose a threat to feature geometry. Ultimately, we will see that feature geometry, suitably amended, can adequately and accurately account for the data in Turkish, while the syllable-head approach cannot.

2 Background

2.1 Vowel harmony in Turkish

Turkish exhibits rightward backness and labial vowel harmony (VH) (Lees 1961, Underhill 1976: 25, Underhill 1986: 13, Comrie 1997: 886). Backness harmony occurs in all suffixes, regardless of the height of the suffixal vowel.² Labial harmony only affects [+high] suffixes. The domain of vowel harmony is the entire word. The data in (1) show some examples of backness and labial harmony (Clements & Sezer 1982: 216). Labial harmony will not be discussed in this article.

¹ This paper is based on work from my MA thesis. I would like to thank Ellen Kaisse and Sharon Hargus for their comments. I would also like to thank my consultants Cigdem Armutlu, Umut Aydogdu, Oya Findik, Hurriyet Gokdayi, and Latife Lacin. Any mistakes are my own.

² In suffixes, I will use the capital *I* to refer to vowels specified as [+high], and the capital *E* to refer to vowels specified as [-high].

(1)	Gloss	nom. sing.	gen. sing.	nom. pl.	gen. pl.
	“rope”	ip	ipin	ipler	iplerin
	“girl”	kiz	kizin	kizlar	kizlerin
	“face”	jyz	jyzyn	jyzler	jyzlerin
	“end”	son	sonun	sonlar	sonların

2.2 Vowels and consonants

Turkish has a perfectly symmetric eight vowel system: four round, four back, four high. In this article, I will use the feature [labial] for rounded vowels [coronal] for front vowels, and [dorsal] for back vowels.

(2) Turkish Vowel Inventory

Front Vowels		Back Vowels	
Unround	Round	Unround	Round
i	y	ɨ	u
e	ø	a	o

The consonants of Turkish require a bit more explanation.³ Formerly, the palatal lateral [ɭ] was only an allophone of the plain lateral /L/. The palatal lateral was found only in front vowel words, while the plain counterpart was found in back vowel words. However, due to abundant loans in the Turkish lexicon, the palatal lateral has become phonemic. It can now be found in back vowel environments as well. §5 will discuss the laterals in detail.

(3)	petroɭ	“gasoline”	kol	“arm”
	petroɭden	“gas abl.”	koldan	“arm abl.”

When these palatal laterals are stem final as in (3), they constitute a new harmonic domain triggering front vowel suffixes. Thus, [petroɭ] takes front vowel suffixes as in [petroɭden]. The fact that these palatal laterals occur phonemically in word final position will be crucial to the discussion of the two models of VH.

The other phoneme that is relevant to Turkish VH is the palatal glide /j/. Unlike the lateral, the glide is transparent to vowel harmony as in [tʃaj-dan] (*[tʃaj-den]) “stream ablative”. If the glide in Turkish were featurally the same as the vowel /i/, we might expect it to pattern with the vowel and initiate a new harmonic domain.

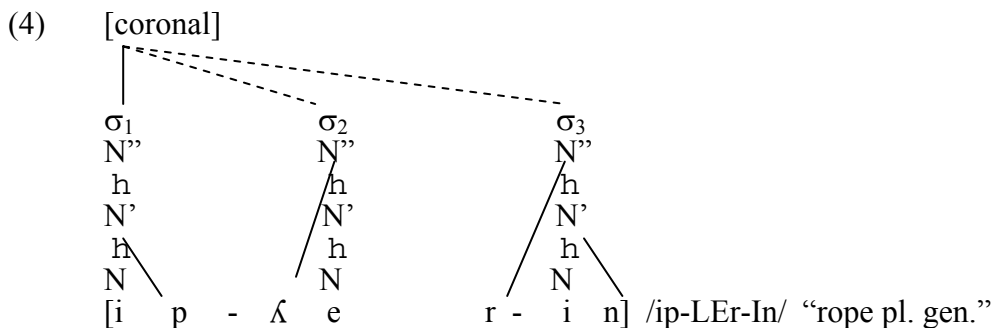
3 Two competing theories of VH: the syllable head approach and the feature geometry approach

What makes processes of vowel harmony difficult to explain is that they generally skip intervening consonants and freely affect vowels in adjacent syllables. This section will discuss two competing theories that attempt to explain this apparent non-local behavior of vowel harmony by establishing different criteria for locality. We will see that both theories are able to predict the correct outputs for simple cases of VH.

³ I will not discuss the plain velars and palatalized velars because they do not contrast word finally. See Clements & Sezer 1982 (page 242) and Levi 2000 (§2.3) for further discussion of these phonemes.

3.1 The syllable-head approach

The syllable-head approach is able to maintain the idea that VH is local by utilizing the syllable as its domain. This approach gives special status to the head of the syllable, namely the nucleus. Only the features from the head are visible to VH. Under this approach, VH occurs on the syllable tier where the spreading feature can freely dock on adjacent syllable nodes without being blocked by intervening segments (discussed in van der Hulst & van de Weijer 1995: 508). For example, in (4), the nucleus of σ_1 is specified for [coronal]. The feature from the nucleus rises to the syllable tier and spreads to σ_2 and σ_3 . Once the feature has docked on the syllable tier, it filters down to the nucleus and the word surfaces with three nuclear vowels, all specified as [coronal]. The syllable-head approach is both able to maintain locality and account for the simple cases of VH.



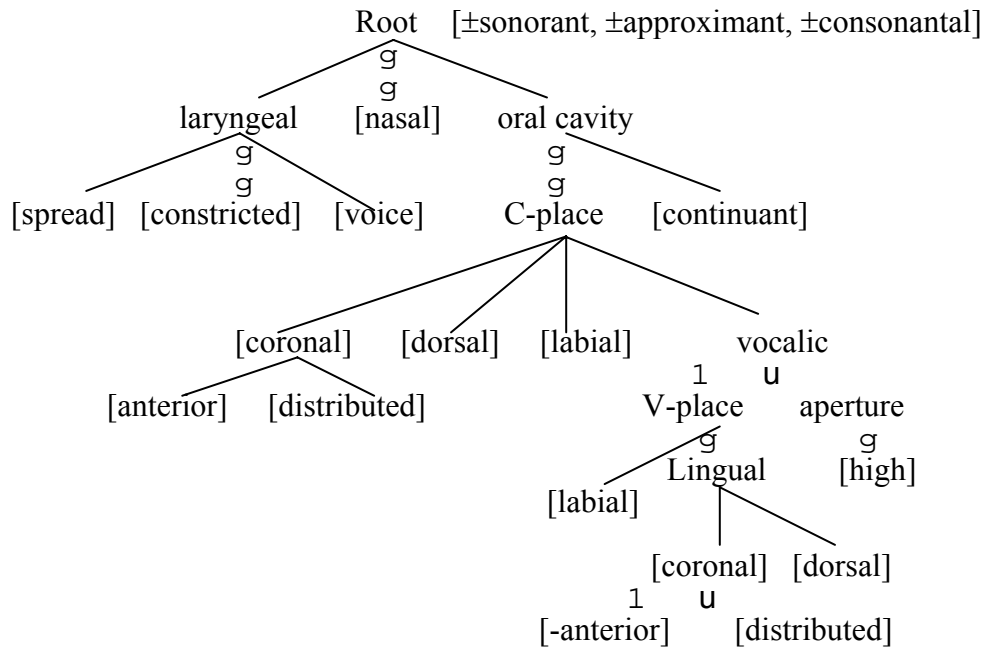
3.2 The feature geometry approach

Like the syllable-head approach, feature geometry is also able to explain VH as a local process. The specific hierarchy in the feature tree was designed to explain why certain processes such as place assimilation or voicing assimilation occur, while others do not (Sagey 1986, Clements 1990, Clements & Hume 1995).

In this article, I will use the feature organization given in (5). Consonants with no secondary articulations do not have a vocalic node. Conversely, vowels are only specified for vocalic features and lack any other features under C-place. Consonants with secondary articulation have both C-place features and V-place features.⁴

⁴ I have eliminated the feature lateral from the representation in (5) because its placement is controversial (Clements & Hume 1995: 293). Its specific placement is irrelevant for Turkish VH since it proceeds from dependents of the V-place node. See Clements & Hume 1995 and Levi 2000 for discussion of the Lingual node.

(5) Feature hierarchy

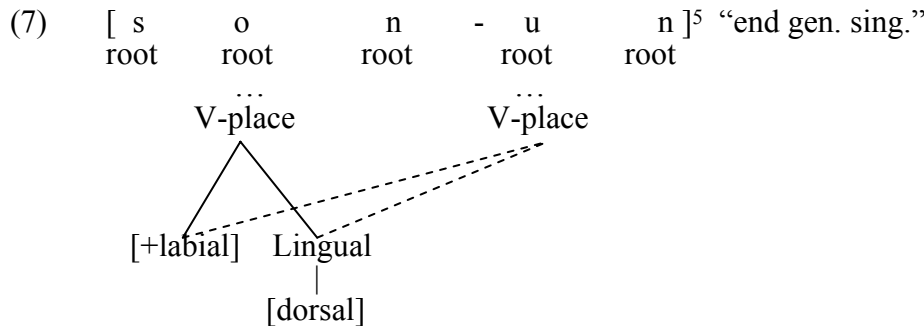


In feature geometry, assimilation processes are characterized by feature spreading. In particular, a feature is not allowed to spread from one segment to another if there is an intervening segment that is specified for that same feature. This restriction on spreading, known as the No-Crossing Constraint, was first articulated in Goldsmith 1979 and is reiterated in Clements & Hume 1995.

- (6) No-Crossing Constraint (Clements & Hume 1995: 266)
 Association lines linking two elements on tier *j* to two elements on tier *k* may not cross.

A theory of feature geometry that hierarchically represents a V-place node as a lower node in the feature tree explains the invisibility of consonants to VH. Thus, for our purposes, vowel harmony is considered local since spreading occurs from one V-place to the next. The suffix vowels are unspecified under the lingual node and pick up this feature as the result of spreading.

We now have the tools to consider a simple example of vowel harmony in Turkish. Below in (7), we see that the rule of spreading occurs naturally from one V-place to an adjacent V-place, while ignoring any intervening consonants. As a result, the suffix surfaces with a back rounded vowel. As with the syllable-head approach, feature geometry maintains locality and accounts for the simple cases of VH.



4 The glide

4.1 The relevance of the glide

The first question to ask when dealing with the palatal glide /j/ is whether or not it interferes with backness harmony in Turkish.⁶ Though it is easy to see on the surface that the glide is transparent to backness harmony (viz. (8)), determining why this is the case will require further analysis. In addition to the data in (8), my informants used back vowel suffixes in nonsense words such as [pɨj] and [puj], indicating that the transparency of the glide is not a lexically specified phenomenon, but is productive within the phonology of Turkish.

(8)	Gloss	nom. sing.	acc. sing.	nom. pl.
	“small bay”	koj	koju	kojlar
	“share”	paj	pajɨ	pajlar
	“village”	køj	køjy	køjler

The status of the glide is relevant to both approaches to VH discussed in §3. In the syllable head approach, we are concerned with the location of the glide in the syllable. If the glide is in the nucleus, then the [coronal] feature of this segment could potentially influence the harmony. For this reason, we will need to consider the distribution of the glide in Turkish and examine evidence for its position within the syllable.

The reason we are concerned with the glide in the feature geometry approach is that according to some phonologists, it looks the same as the high front vowel /i/ (Clements & Keyser 1983, Kaye & Lowenstamm 1984). Under this assumption, the only difference between the glide and the vowel is the position within the syllable. The presumption that the palatal glide looks like [i] and has a V-place dependent implies that the glide will block spreading and will initiate its own harmonic domain. Though this is expected, it is not what occurs in Turkish. Thus, we will need to consider the glide in further detail.

4.2 The status of the glide in Turkish

In this section, we will examine a variety of phenomena that involve the palatal glide. All the evidence from this section leads to two conclusions about the distribution of the glide. First, the glide is not in the syllable nucleus, and second,

⁵ See Levi 2000 for discussion of the interaction between labial and backness harmony.

⁶ Throughout this article, I will treat the palatal glide as [coronal]. Others may wish to treat the palatal glide as [dorsal]. Which feature is used does not change the problems with the glide, nor does it change the solution.

the glide patterns with the other [+consonantal] segments. Evidence comes from three phenomena.

The first phenomenon involves the possible consonant clusters in Turkish. With very few exceptions, Turkish does not allow onset clusters (Lewis 1967, Kornfilt 1997). Turkish does, however, allow certain types of coda clusters, though no more than two segments are allowed (Kornfilt 1997: 492). In general, coda clusters can contain a sonorant followed by a stop or an affricate (Underhill 1976: 105). In addition to these standard clusters, Turkish allows a few other, less common combinations. The cases in (9a-b) follow the general pattern, while those in (9c-e) do not.

(9)	(Underhill 1976, Kornfilt 1997)		
a. sonorant + stop	alp		“brave”
	pejk		“satellite”
	dørt		“four”
b. sonorant + affricate	kazantʃ		“gain”
	bortʃ		“debt”
c. sonorant + fricative	ders		“lesson”
	harf		“letter”
d. fricative + stop	aʃk		“love”
	sev̥k		“driving”
e. k + s	boks		“boxing”
	raks		“dance”

Despite these restrictions, there is a series of words whose underlying forms have an impermissible cluster of sonorant + sonorant (Clements & Sezer 1982: 243, Kornfilt 1997: 497). When these words occur in uninflected forms or with a consonant initial suffix, an epenthetic vowel is inserted to break up the cluster. If, on the other hand, a vowel initial suffix follows, no epenthetic vowel is inserted.⁷

(10)	Gloss	UR	Uninflected	C-initial suffix	V-initial suffix
	“forehead”	/aln/	alın	alınlar	alını
	“nose”	/burn/	burun	burunlar	burnu
	“neck”	/bojn/	bojun	bojunlar	bojnu

What is particularly relevant to us is the third form /bojn/. If Turkish speakers could syllabify the glide in the syllable nucleus, then the nasal would be the only segment in the coda and we would expect to find no epenthesis [bojn]. However,

⁷ An alternate account of the data in (10) is vowel deletion (Clements & Sezer 1982: 244). In this analysis, the vowel is underlying and is only deleted when vowel initial suffixes are attached immediately after the base. For, example, we would find /bojn-I/ and /burn-I/ becoming [bojnu] and [burnu]. When consonant initial suffixes are attached, the second vowel remains, because deletion would create an impermissible cluster. We would expect /bojn-LEr/ and /burn-LEr/ to surface as [bojunlar] and [burnunlar]. Crucially, we do not find *[bojnlar], because the coda cluster j + n is disallowed. In the deletion account, the result with respect to the glide is the same; the cluster is impermissible because the glide is in coda. The deletion account has some problems with forms such as [kojun] *sheep* and [bakır] *copper* which do not alternate. The genitive singular forms of these words are [kojunun] and [bakırın], not *[kojnun] and *[bakrın].

this form is disallowed. Because epenthesis does occur, we can conclude that the glide cannot be syllabified in the nucleus.⁸

Next, consider the Arabic loans in (11). Again, we are concerned with the final two sounds: glide + sonorant. In addition to the data in (11), when asked how a certain English brand name would be loaned into Turkish, my consultants responded as in (12). As we saw in (10), the glide cannot be syllabified in the nucleus, for if it were, we would not find epenthesis. The fact that the glide + sonorant cannot surface implies that the glide cannot be placed in the nucleus.

(11)	Gloss	Arabic form	Turkish loan (Lewis 1975: 18)
	“good”	khajr	hajir
	“man’s name”	husajn	hysejin
	“tendency”	mejł	mejil
(12)	Gloss	English	Turkish loan (Levi 2000: 22)
	“(C.) Klein”	klajn	kiʎejin

The last relevant piece of data from clusters deals with stress. There is a class of words that constitute primarily toponyms and borrowed words where stress is quantity sensitive. In this class of words, stress falls on the penultimate syllable, unless the antepenultimate syllable is heavy and the penult is light⁹ (Sezer 1983: 65, Kaisse 1985: 200, Kornfilt 1997: 504). Crucially, words with a heavy penult and a heavy antepenult are stressed on the penult.

(13)	is.tán.bul	“city in Turkey”	HH	(Sezer 1983)
	an.tál.ja	“city in Turkey”	HH	*án.ta.lja
	va.ʃɪŋk.ton	“Washington”	LH	
	ke.né.di	“Kennedy”	LL	
	pén.dʒe.re	“window”	HL	

What is interesting for the present discussion is the second word in (13), [antálja]. If the glide were in the nucleus, the lateral could be syllabified in onset as [an.ta.lja]. Recall that Turkish does not allow complex onsets. Under such a syllabification, the penult would be light and stress would fall on the antepenult, as it does in the word “window”. Since stress is not on the antepenult, but on the penult, we conclude that this syllable is heavy as a result of a filled coda position. Again, the glide is not in nucleus.

The second type of evidence I consider is the distribution of the glide in Turkish. If sequences of a vowel plus the glide were limited to a small number of vowels (as is the case with the English vowels [oj] and [aj]), then it would be possible to argue that these sequences constitute diphthongs. That is, they could be treated as though they were in the nucleus. If, on the other hand, they occur throughout the language and in a variety of vowel environments, then we can assume that they are not diphthongs. In this case, the glide is not in nucleus. In Turkish, the palatal glide [j] can freely follow any vowel except [i] and [i]. Though the dictionary I consulted did not have any sequences of [ij], one of my informants treated the nonsense word [pij] as totally regular, adding back vowel suffixes as expected.

⁸ Notice we cannot explain the lack of [bojn] as a ban on a complex nucleus followed by a coda because of [pejk] “satellite”, [fejz] “abundance, fertility”, and [dʒynejt] “man’s name”.

⁹ Here heavy refers to a syllable with a coda and light refers to one without.

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|------|-----|-------------|------|-----------------------|
| (14) | tyj | “feather” | pij | “nonsense word” |
| | bej | “gentleman” | huj | “disposition, temper” |
| | køj | “village” | tʃaj | “stream” |
| | | | boj | “length” |

In addition to word final glides, Turkish also allows word initial glides with all vowels.

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|------|-------|----------------|-------|-----------|
| (15) | jiv | “groove” | jil | “year” |
| | jyn | “wool” | julaf | “oats” |
| | jemek | “food” | jad | “strange” |
| | jøre | “neighborhood” | jok | “absent” |

From the data in (14) and (15), I conclude that these sequences are not ongliding or offgliding diphthongs. Instead, they are vowels with glides in non-nuclear positions. Furthermore, there are no Turkish words beginning CjV. If the glide were in the nucleus, then a sequence like this should be allowed. The absence of such sequences implies that the glide is not in a nuclear position, but in a marginal position. Because Turkish bans onset clusters, such a sequence is barred from surfacing.

Third, we consider morpheme alternations. Consider the case of the reflexive verbal suffix /-(I)n/. Roots ending in a vowel trigger vowel deletion. Consonant final roots retain the vowel, for deletion would create an impermissible cluster. Roots ending with a palatal glide do not trigger deletion, showing that the glide cannot be syllabified in the nucleus and patterns with the rest of the consonants.

- | | | | | |
|------|---|-----------------|---------|--------------------|
| (16) | (Underhill 1976: 357, Kornfilt 1997: 139) | | | |
| | jika- | “to wash s.th.” | jika-n- | “to wash oneself” |
| | gør- | “to see” | gør-yn- | “to seem” |
| | gij- | “to wear” | gij-in- | “to dress oneself” |

Next, we examine the third person singular possessive suffix. It has the shape /-(s)I/. Suffix initial /s/ is deleted when the stem ends in a consonant. Here too, we see that /s/ deletion occurs when the root ends in the palatal glide, implying that the glide is not in the nucleus.

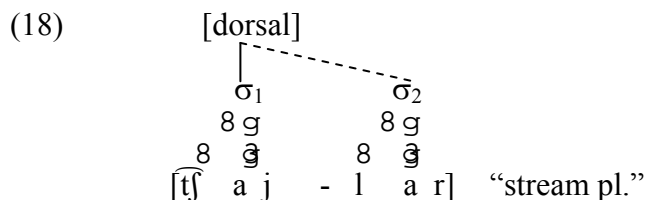
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|------|-------|--------|-------------------------------|
| (17) | boru | borusu | “his/her pipe” (Lees 1961: 7) |
| | jilan | jilani | “his/her snake” |
| | saraj | saraji | “his/her palace” |

Based on cluster formation, distribution, and morpheme alternations, we conclude that the glide is not in a nuclear position. Furthermore, it freely occupies onset and coda positions, hence patterning with the other consonants.

4.3 The syllable-head approach and the glide

The syllable-head approach is consistent with the data given in the previous section. In the syllable-head approach, only segments in nuclear positions can affect harmony. The evidence shows that the glide is not in syllable nucleus and therefore plays no role in providing or receiving the spreading feature. By using

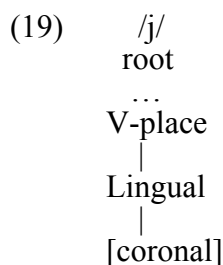
the syllable-head approach, we need not posit any further features for or restrictions on the glide.



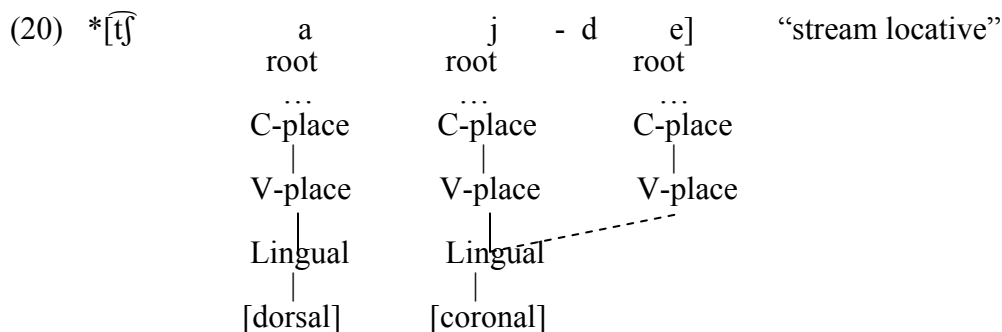
The example in (18) illustrates how vowel harmony proceeds provided that the glide is in coda. The feature [dorsal] from the root vowel spreads from σ_1 to σ_2 . The glide does not participate in VH because it is in coda. In §5.2, however, we will see that the syllable-head approach cannot account for the behavior of the palatal lateral. Therefore, we will now investigate further the alternative option, that there is something about the feature geometry of glides that can explain their transparency to VH in Turkish.

4.4 Feature geometry and the glide

It is often assumed that the glide [j] has the same underlying representation as the vowel [i] and that the only difference between them is their position within the syllable. Under this assumption, the glide would have the representation in (19).



Let us now consider the representation of the glide if the syllable-head approach is not taken. With this feature tree, the glide would have to interact with VH when it occurs between two V-place nodes as in (20). However, forms such as these are ungrammatical.



Because the glide does not block harmony, we must consider if there is an alternate representation of the glide that is consistent with feature geometry, as well as with the phonology of the language. Several works have argued that

vowels and glides must have the same representation and must be [-consonantal] (Clements & Keyser 1983, Kaye & Lowenstamm 1984: 32). Such approaches are based on alternations between vowels and glides that occur in some languages. For example, [w] and [u] alternate in French depending on their position in the syllable (Tranel 1981).

Other authors have argued that vowels and glides are different entities. Ladefoged & Maddieson 1996 point out that glides are produced with more constriction than their corresponding vowels (Ladefoged & Maddieson 1996:323). Hayes 1989 and Hyman 1985 cite the tri-consonantal Semitic roots /jjj/ “to write the letter y” and /jsr/ “to play with a dreydl” (Hayes 1989: 83, Hyman 1985). Hayes writes, “representing the Semitic glides as [+consonantal] can solve the long-standing problem of how to indicate that they are to be mapped onto syllable-peripheral rather than nuclear positions.” (Hayes 1989: 302). Cohn 1993 proposes that glides in Sundanese are specified as [+consonantal] because they do not pattern with vowels and laryngeals as targets of nasal spreading (Cohn 1993: 346). All of these works recognize that glides can act differently from vowels by relying on the feature [±consonantal].

Calling glides [+consonantal] goes against the definition of this feature, as stated in (21).

- (21) Consonantal sounds are produced with a radical obstruction in the midsagittal region of the vocal tract; nonconsonantal sounds are produced without such an obstruction. (Chomsky and Halle 1968: 302)

Furthermore, calling glides [+consonantal] does not necessarily change the feature organization. There is, however, another way to distinguish vowels and glides that is not based on the existence of a particular feature, but on the structure within the feature geometry. This alternative approach to the glide comes from Herman 1994 and Hume 1995. Both Herman and Hume argue that languages can choose between *consonantal* glides, which pattern with consonants, and *vocalic* glides, which pattern with vowels. Consonantal glides have a C-place feature, while vocalic glides have a V-place dependent. They further argue that this difference is language specific. Hume 1995 goes on to propose that the feature [consonantal] be eliminated from the feature hierarchy because this distinction can now be explained in the structure.

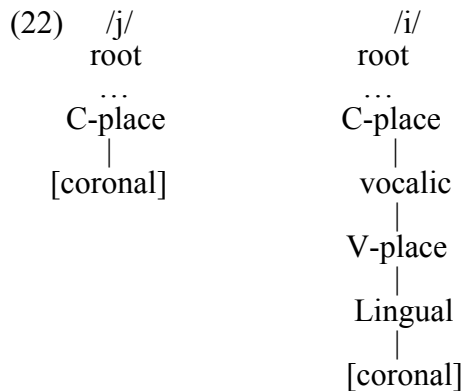
I will follow the proposal above and assume that Turkish has consonantal glides based on three sources of evidence. First, the glide is transparent to vowel harmony. Following Hume 1995, this is evidence that the glide lacks a V-place dependent. Second, the glide always surfaces in non-nuclear marginal positions (onset or coda), as discussed in §4.2.

The last, and perhaps the most compelling piece of evidence comes from Turkish roots. Though loans into Turkish may be disharmonic (c.f. [petroʎ] “petrol”, [kitap] “book”, [oteʎ] “hotel” (Clements & Sezer 1982)), native roots are nearly all harmonic (Lees 1961, Yavas 1980, Comrie 1997).¹⁰ If the glide were simply the non-nuclear version of the high front unrounded vowel /i/, then we would posit many underlyingly disharmonic native roots, such as [tʃai] “stream” and [koi] “bay”. The output [tʃaj] would simply be a reflex of

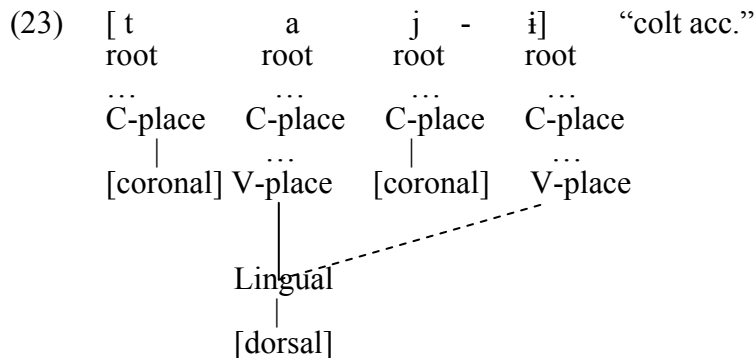
¹⁰ There is a small set of native roots that are disharmonic. For example the words [elma] *apple* and [tʃamur] *mud* contain sequences of vowels which differ in backness or rounding (Lees 1961: 12), as does [kardeş] *sibling* (Comrie 1997: 888).

syllabification. However, the problem with such an approach is that many native roots would be disharmonic, but only with respect to the underlying segment /i/. Furthermore, the only disharmonic roots would be those whose vowel /i/ always surfaces as the glide [j]. It is highly unlikely that the only disharmonic native roots would be those with a high front unrounded vowel.

In light of this evidence, we can conclude that the underlying glide is not the same as the underlying high vowel. Indeed, the difference between these two segments is in the structure. /i/ has a V-place dependent and therefore interacts with vowel harmony. /j/, on the other hand, has only a C-place dependent and therefore is transparent to vowel harmony.



With this representation of the glide, feature geometry approach correctly predicts the transparency of the glide. It now patterns with the rest of the consonants in being transparent to VH.



5 The laterals

5.1 The distribution of the laterals

Turkish contains two laterals underlyingly. The first is the palatal lateral /ʎ/. This palatal lateral can occur in stem final position and initiate its own harmonic domain. That is, if the vowel in the final syllable is back, but the word ends in a palatal lateral, the suffix will surface with a front vowel. The palatal lateral has a V-place dependent [coronal].¹¹

¹¹ The idea that palatals are redundantly palatalized comes from Hall 1997 in which he argues that palatals never contrast with palatalized palatals. Thus within feature geometry, palatals must be redundantly specified with a V-place feature [coronal] in order to account for this lack of contrast.

(24)	Gloss	root	acc.	plural
	“method”	usu λ	usu λ y	usu λ λ er
	“crescent”	hi λ a λ	hi λ a λ i	hi λ a λ λ er

The other underlying lateral /L/ is one that alternates between the surface forms [λ] and [l]. Contrary to / λ /, /L/ does not have a specified V-place dependent. Their representations are given in (25). Evidence that the plain lateral has two allophones comes from the plural suffix /-LEr/. In this suffix, the lateral surfaces as the palatal variant in front vowel words and surfaces as the plain variant in back vowel words.

(25)	$\begin{array}{c} / \lambda / \\ \text{root} \\ \dots \\ \text{C-place} \\ \begin{array}{cc} [\text{coronal}] & \text{vocalic} \\ & \\ & \text{V-place} \\ & \\ & \text{Lingual} \\ & \\ & [\text{coronal}] \\ & \text{ip} \end{array} \end{array}$		$\begin{array}{c} / L / \\ \text{root} \\ \dots \\ \text{C-place} \\ \begin{array}{cc} [\text{coronal}] & \text{vocalic} \\ & \\ & \text{V-place} \end{array} \end{array}$	
(26)	“rope”	ip	“ropes”	ip λ er
	“car”	araba	“cars”	arabalar

5.2 The palatal lateral and the syllable-head approach

The syllable-head approach is based on the assumption that vowel harmony is a relationship between syllables and between syllable nuclei. The status of the palatal lateral in Turkish thus poses a serious problem to the syllable-head approach. The lateral is not in the syllable nucleus, yet it conditions its own harmony domain. Therefore, the syllable-head approach predicts the incorrect form in (27).

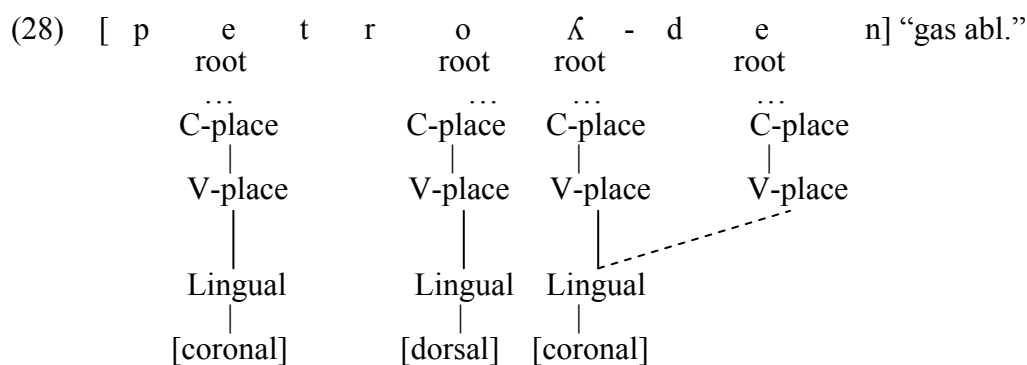
(27)	[coronal]	[dorsal]	
	g	g	
	g	g	!
	σ	σ	σ
	8g	8g	8g
	8g	8g	8g
	*[p e t	r o λ - d a n]	

Not only does the syllable-head method predict incorrect outputs, but there is no way to salvage the approach. We would not want to allow it to see features of the coda segments because this undermines the simplicity of targeting the nucleus. Furthermore, if we could see the features in the codas, then we would have to use the model of feature geometry in which the glide lacks any vowel

features. Thus, this fix merely puts us back into the lap of feature geometry. Therefore, the syllable-head approach remains incapable of handling the non-nuclear [ʎ]-triggered harmony.

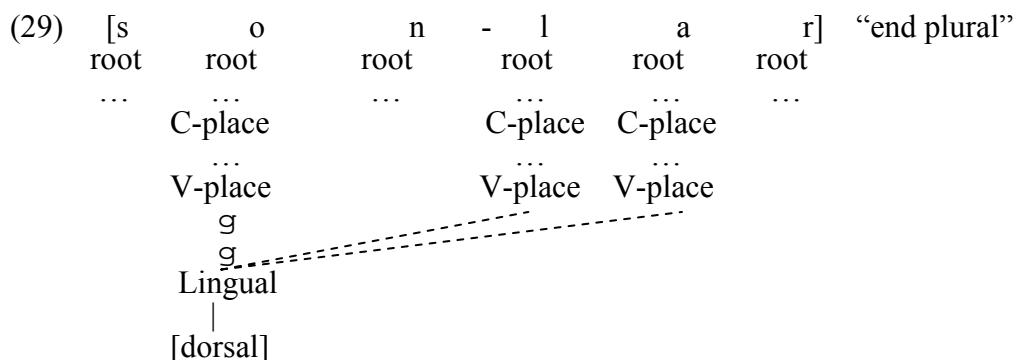
5.3 Feature geometry and the palatal lateral

Let us now consider how the feature geometry framework deals with stem-final palatal laterals. Recall that underlying /ʎ/ has a V-place dependent. In (28), the V-place dependents from both of the root vowels /e/ and /o/ are blocked from spreading onto the suffixal vowel by the presence of the palatal lateral. The lateral's V-place dependent is not blocked and spreads to all the remaining V-place nodes. From this example, we see that feature geometry is able to correctly predict the interaction of the palatal lateral with VH.



5.4 Feature geometry and /L/

Not only does feature geometry explain the facts of the underlying palatal lateral, but it also explains the allophonic variation of /L/. In (29), the root vowel /o/ spreads its lingual node to all of the remaining V-place nodes. The suffix initial lateral is not specified for a V-place underlyingly and picks up the [dorsal] feature from the preceding vowel. In words with front vowels, such as /ip-Ler/ → [ipʎer] “ropes”, the feature [coronal] spreads from the root vowel and onto the lateral and the suffixal vowel.



One question remains. Is it legitimate to say that the feature [dorsal] really docks on the lateral /l/ as depicted in (29)? That is, are these laterals really produced with a dorsal component? In order to answer this question, we must consider the acoustic characteristics attributed to different laterals. Ladefoged & Maddieson 1996 provide a chart of formant values for several different laterals

from a variety of languages. What are particularly interesting are the F2 values they cite for velarized laterals. Because of their dorsal component, these segments have a low F2, below 1000Hz for Russian, Bulgarian, and Albanian (Ladefoged & Maddieson 1996: 197). They caution us to beware of comparing formant values across languages and across speakers, but suggest that F2 appears to be lowest in velarized alveolar laterals (Ladefoged and Maddieson 1996: 197). Preliminary examination of laterals in Turkish back vowel words is promising. I found the F2 values for the non-palatal laterals to be primarily in the range of the velarized laterals discussed by Ladefoged & Maddieson. Three of the speakers' laterals averaged below 1000 Hz for F2 in the following contexts: [kal], [kul], [kol]. The fourth speaker had higher values, in the range of 1200 Hz. In order to determine the validity of the claim that the feature [dorsal] spreads to an adjacent lateral, further testing will have to be done. Unfortunately, such a study has not yet been conducted.

In addition to the acoustic qualities, several other sources describe the non-palatal lateral as velarized, from an articulatory point of view (Comrie 1997, Kornfilt 1997). Because of this evidence, I conclude that it is possible for the lingual node, regardless of whether [coronal] or [dorsal], to spread onto any available V-place node, including that for laterals.

In §5.1, I posited two allophones for the underspecified lateral. The existence of two allophones is a direct result of spreading the lingual node in backness harmony. One allophone results from spreading a lingual node with a [coronal] dependent, while the other results from spreading a lingual node with a [dorsal] dependent.

6 Conclusion

In this article, I have compared the how two competing theories of vowel harmony deal with the facts of Turkish Vowel Harmony. Because its phonemic inventory includes a transparent palatal glide /j/ as well as an opaque palatal lateral /ɰ/, Turkish provides fertile ground with which to compare these two theories. The syllable-head approach utilizes the syllable as the unit in which spreading occurs. In this way, the syllable-head approach ensures that vowel harmony remains a local phenomenon. The transparency of the palatal glide is thus explained, for it does not sit in a nuclear position. The opacity of the palatal lateral, however, remains a problem because this segment initiates its own harmonic domain and is not in a nuclear position.

Feature geometry makes use of the subsegmental feature organization. Using a feature organization that realizes vowel features on a lower tier allows for the transparency of most consonants. What is fascinating about such a theory is its ability to allow consonants with secondary articulations to be opaque to processes involving vowels. Because the palatal lateral has a V-place dependent, it is able to block spreading from the preceding vowel and initiate its own domain. The transparency of the glide required us to recognize that Turkish has consonantal, as opposed to vocalic glides. This approach represents the glide with a C-place dependent and its transparency is thus explained. We conclude that feature geometry accurately explains the transparency of the glide and the opacity of the palatal lateral, while the syllable-head approach does not.

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