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THE STRICT CYCLE AND EPENTHESIS IN HUNGARIAN

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1. Introduction

Recent approaches to epenthesis hold that epenthesis follows from principles of syllabification rather than from language-specific rules. In a skeletal approach (Levin 1985), epenthesis is expressed as the insertion of an X slot before (or after) an unsyllabified consonant. More recently, Itô (1986; to appear) has argued that formulating epenthesis rules in terms of the skeleton misses the generalization that epenthesis produces structures containing optimal syllables in terms of a language's syllable template. In Ponapean, for example, a skeletal rule inserting a V slot after an unsyllabified consonant duplicates the universal preference for CV syllables. Itô's approach is to produce degenerate syllables containing only a consonant as part of the syllabification process. Since a nucleus is required in all syllables, a vowel is inserted into the degenerate syllable after the consonant, producing the maximally unmarked CV syllable. For more complex cases, Itô resorts to language-specific rules. For example, for Icelandic she proposes that unsyllabified *r* is associated to the postnuclear position in the syllable template. We suggest that Itô's approach can be generalized, in the context of a moraic approach (Hayes ms., McCarthy & Prince ms.). We propose that languages differ as to whether a stray consonant is assigned a mora. A stray consonant specified as a mora requires epenthesis before it, as in Icelandic, while an unmorified stray consonant requires epenthesis after it, as in Ponopean. We show that Hungarian treats stray consonants as moras, requiring epenthesis before them, as in Icelandic. We also show that syllabification and epenthesis are both cyclic and postcyclic. In the cyclic component they are governed by the Strict Cycle Condition (SCC, Kiparsky 1985). Following Kiparsky but contrary to Itô, we assume that prosodic operations,

including syllabification, are subject to the SCC in the cyclic component in that they can build structure in underived environments but can change structure only in derived environments.

2. Data

First, in (1), we give the phonetic values of some orthographic symbols. The remaining orthographic symbols are self explanatory. All examples are given orthographically.

(1) Some orthographic correspondences

c	= [t^s]	s	= [š]	ë	= mid front unround
gy	= [d^y]	sz	= [s]	e	= low front unround
ly	= [y]	ty	= [t^y]	ő	= [ö:]
ny	= [n^y]	zs	= [ž]	ű	= [ü:]
		j	= [y]	´	= long

Hungarian exhibits epenthesis after consonant-final stems before certain consonant-initial suffixes such as the accusative *-t* and the plural *-k*. The epenthetic vowel is regularly mid. We argue that the low vowel that appears after certain stems and between the plural and accusative suffixes is an underlying floating feature [+low] associated with the stem or the plural suffix, to which Epenthesis supplies the required prosodic structure (see below and section 5). Further qualities of the vowels are determined by vowel harmony and default rules. Vowel harmony requires that suffix vowels agree with stem vowels in the feature [back]; short front mid vowels must agree in the feature [round] also. Harmony also applies within stems in native words, except that the vowels *i* and *e* are neutral in that backness harmony can propagate across them. Default rules supply [-high, -low] to vowels unspecified for these features. This results in mid vowels for the unmarked case. Low vowels appear in the epenthetic environment if a floating feature [+low] appears in stem-final position. We will consider certain cases of epenthetic high vowels in section 5. Mid-vowel epenthesis is illustrated in (2), where the epenthetic mid vowels are italicized. The epenthetic low vowel in the accusative plural will be discussed shortly.

(2)

gloss	a. 'bench'	b. 'clod'	c. 'chair'
nom.	pad	rög	szék
acc.	pad*o*t	rög*ö*t	szék*ë*t
pl.	pad*o*k	rög*ö*k	szék*ë*k
acc. pl	pad*o*kat	rög*ö*ket	szék*ë*ket
iness.	padban	rögben	székben
all.	padhoz	röghöz	székhëz

(nom. = nominative, acc. = accusative, pl. = plural, iness. = inessive, all. = allative; the same order applies to subsequent examples.)

If the stem ends in a vowel plus coronal sonorant or coronal fricative (call this class C_t), there is no epenthesis before accusative *-t*, but otherwise the pattern is the same

as in (2), as shown in (3).

(3)

gloss	a. 'wine'	b. 'crime'	c. 'Mensch'
nom.	bor	bűn	embër
acc.	bort	bűnt	embërt
pl.	bor*o*k	bűn*ö*k	embër*ë*k
acc.pl.	bor*o*kat	bűn*ö*ket	embër*ë*ket
iness.	borban	bűnben	embërben
all.	borhoz	bűnhöz	embërhëz

A number of stems irregularly require a low rather than a mid vowel in epenthetic environments, such as those in (4). We analyze these stems as having an underlying final floating feature [+low]. The epenthetic vowels in (4) are italicized.

(4)

gloss	a. 'tooth'	b. 'book'	c. 'machine'
nom.	fog	könyv	gép
acc.	fog*a*t	könyv*e*t	gép*e*t
pl.	fog*a*k	könyv*e*k	gép*e*k
acc.pl.	fog*aka*t	könyv*eke*t	gép*eke*t
iness.	fogban	könyvben	gépben
all.	foghoz	könyvhöz	géphëz

The front low vowel *e* is not distinguished from mid *ë* in the standard language or in the orthography. We mark the mid *ë* with a diaeresis, following standard etymological practice. A diagnostic for the low vowel in (4b) (acc. *könyvet)* is that it is unrounded (compare (2b) acc. *rögöt).* Another diagnostic is that low vowels appear even after C_t, as shown in (5).

(5)

gloss	a. 'house'	b. 'ear'	c. 'honey'
nom.	ház	fül	méz
acc.	ház*a*t	fül*e*t	méz*e*t
pl.	ház*a*k	fül*e*k	méz*e*k
acc.pl.	ház*aka*t	fül*eke*t	méz*eke*t
iness.	házban	fülben	mézben
all.	házhoz	fülhöz	mézhëz

We assume that the low vowel following the stem in (4) and (5) and following the plural suffix *-k* is represented in the underlying forms of these morphemes as a floating feature [+low]. Floating features participate in syllabification only to the extent that they are needed. This implies that the floating [+low] at the end of the stems in (5) is realized on the second cycle in *házat*, for example, because the *t* is not otherwise syllabifiable. But in *házban,* on the second cycle, *ban* is syllabifiable by itself, and the stem-final floating feature, never being prosodically licensed, is not realized. We assume that a floating feature is not associated with a root node in underlying representation, and that epenthesis licenses the floating feature by supplying it with prosodic structure.

Finally, a number of stems show epenthesis in the stem in the nominative, as seen in (6). The mid epenthetic vowel is italicized.

(6) gloss	a. 'bush'	b. 'river bed'	c. 'mirror'
nom.	bok*o*r	med*ë*r	tük*ö*r
acc.	bokr*o*t	medr*ë*t	tükr*ö*t
pl.	bokr*o*k	medr*ë*k	tükr*ö*k
acc.pl.	bokr*o*kat	medr*ë*ket	tükr*ö*ket
iness.	bok*o*rban	med*ë*rben	tük*ö*rben
all.	bok*o*rhoz	med*ë*rhëz	tük*ö*rhöz

The stems in (7) retain the vowel of their final syllable in all forms, showing that epenthesis is involved in forming the stems in (6) rather than deletion.

(7) gloss	a. 'bulge'	b. 'element'	c. 'Turk'
nom.	dudor	elem	török
acc.	dudort	elem*ë*t	török*ö*t
pl.	dudor*o*k	elem*ë*k	török*ö*k
acc.pl.	dudor*o*kat	elem*ë*ket	török*ö*ket
iness.	dudorban	elemben	törökben
all.	dudorhoz	elemhëz	törökhöz

3. Syllabification

Syllabification conforms to Itô's principles of Maximality, Prosodic Licensing, and the Onset Principle, which we give in (8).

(8) a. *Maximality*
"Units are of maximal size, within the other constraints on their form." (Prince 1985, cited in Itô (to appear, p. 3))

b. *Prosodic Licensing*
"All phonological units belong to higher prosodic structure: segments to syllables, syllables to metrical feet, and metrical feet to phonological words or phrases." (Itô, to appear, p. 4)

c. *Onset Principle*
Avoid $_{\sigma}$[V. (Itô, to appear, p. 7)

However, Directionality plays no role in our analysis of Hungarian syllabification. We show that either left-to-right or right-to-left postcyclic syllabification produces incorrect forms. Instead, syllabification and epenthesis apply cyclically in conformity with the SCC. A consequence of this is that some segments are prosodically licensed only by remaining syllabified as degenerate syllables throughout the cyclic component.

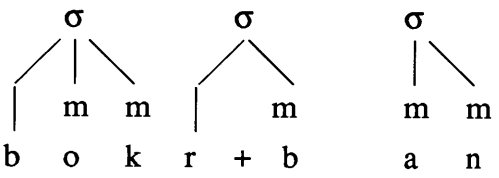
We assume that Hungarian allows syllables that are maximally of the form (9).[1]

[1]The condition on codas stated in (9) needs some refinement, but it is adequate for our present purposes.

(9) *Maximal syllable:*
CVCC, where two consonants in the coda must both be coronal and follow the sonority hierarchy.

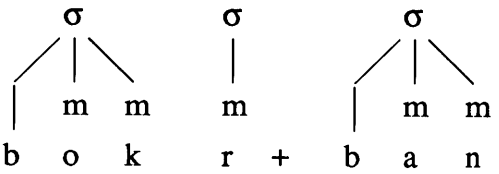
First we demonstrate that syllabification cannot be postcyclic and directional. Let us assume that syllabification is postcyclic and left to right. A form like *bokorban* is derived as in (10).

(10) a.



(left to right) →

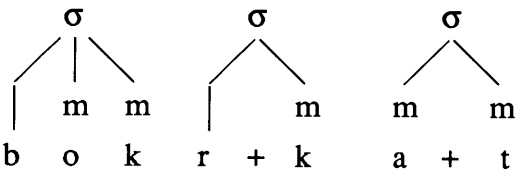
b.



→ c. bokorban

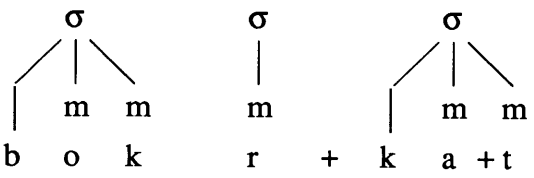
In (10a), *r+b* is initially assigned to a single syllable by the Maximality principle, but this is overridden by the Onset Principle, which moves the *b* to the following syllable. The stranded *r* is thus moraic, producing the desired result. However, if we consider *bokrokat*, we get an incorrect derivation with left-to-right application, as shown in (11).

(11) a.



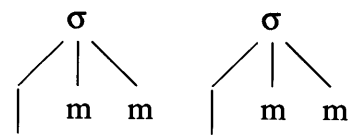
(left to right) →

b.



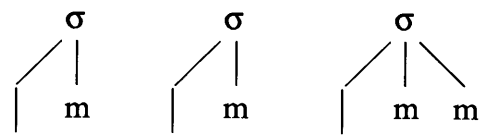
→ c. *bokorkat

The same Onset Principle forces resyllabification, giving **bokorkat*. Now consider *padokat*. With either direction of syllabification, the incorrect **padkat* is derived, since the Maximality principle requires the syllabification indicated.

(12) a. 

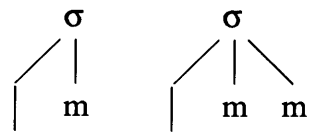
(left to right or right to left) → b. *padkat

On the other hand, right-to-left syllabification produces the right result for *bokorban* (starting directly with (10b)), but incorrectly produces **bokorkat*, as in (13).

(13) a. 

(right to left) → b. *bokorkat

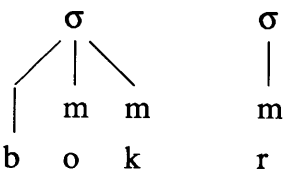
Right-to-left syllabification also produces incorrect **padkat* (cf. (12)) and **bokort*, as as shown in (14).

(14) a. 

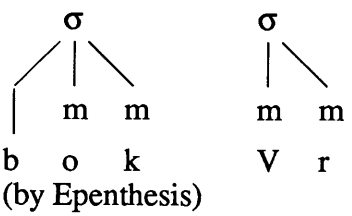
(right to left) → b. *bokort

The rightmost syllable will take in all of *krt* because of Maximality, and epenthesis can produce only *kort* from this because Hungarian does not allow complex onsets. This shows that either setting of the directionality parameter produces incorrect results if syllabification and epenthesis apply only postcyclically.

If we adopt cyclic application of syllabification and epenthesis, everything falls into place. The nominative form *bokor* is derived from underlying /bokr/ by assuming that cyclic syllabification produces (15a).

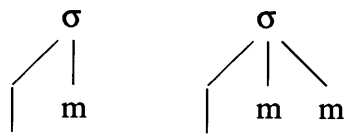
(15) a. 

(cyclic) →

b. 

(postcyclic) →

(15) c.



(by Onset Principle, Harmony, defaults)

The moraic status of the final *r* requires insertion of a V before the consonant, as in (15b). Harmony and defaults give the final result (15c). Note that (15a) is produced cyclically, but (15b) is produced postcyclically. The cyclic application of Epenthesis is blocked by the SCC. We state the SCC in (16), from Kiparsky (1985).

(16) *Strict Cycle Condition* (SCC, Kiparsky 1985, 89)
If W is derived from a lexical entry W', where W' is nondistinct from XPAQY and distinct from XPBQY, then a rule A → B / XP__QY cannot apply to W until the word level.

Crucial to understanding this condition are the terms "distinct" and "nondistinct." We follow SPE in the definition of "distinct."

(17) Two units U_1 and U_2 are distinct if and only if there is at least one feature F such that U_1 is specified [αF] and U_2 is specified [βF] where α is plus and β is minus...Two strings X and Y are distinct if they are of different lengths, that is, if they differ in the number of units that they contain, or if the *i*th unit of X is distinct from the *i*th unit of Y for some *i*. (SPE p. 336)

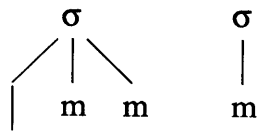
These definitions allow cyclic rules to build structure but not to change structure in nonderived environments on a cyclic level. This means that (15b) is not formed cyclically, but only postcyclically, where the SCC is no longer operative. It is clear that applying epenthesis within the stem on the first cycle would produce the incorrect **bokort* for the accusative, as shown in (18).

(18)

First cycle:	underlying	/bokr/	
	Epenthesis	/bokor/	
Second cycle:	Morphology	[[bokor]t] →	*bokort

Epenthesis on the first cycle would produce **bokort*, which is a theoretically possible form, as shown by the accusative *dudort* (7a); compare accusative *bort* (3a). But if Epenthesis is blocked on the stem cycle, we get the correct derivation in (19).

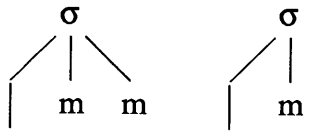
(19) a.



→

(first cycle)

b.



→ c. bokrot *bokort

(second cycle by Maximality)

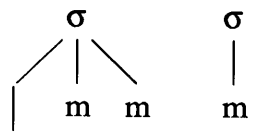
Epenthesis can apply on the second cycle in this case, since the SCC does not block changing structure in derived environments.

In (19) the consonant *r* is assigned to a degenerate syllable on the first cycle. We give such a consonant moraic status in order to encode the fact that Epenthesis, if it applies to such a form, places a vowel before the consonant of the degenerate syllable (cf. the nominative *bokor*). Phonotactic constraints would be sufficient to determine the position of the epenthesized V in *bokor*, since words in Hungarian cannot end in a short mid vowel. But this does not suffice for affixed forms such as *bokorban,* since the constraint does not apply word-internally, as shown by *bokrot* and *bokrokat*. On the second cycle in (19), Maximality requires syllabifying *rt* together as a degenerate syllable, with *t* assigned moraic status. The *r* automatically loses its moraic status on being assigned to an onset.

In the derivation of *bokorban* (10c), the SCC blocks epenthesis before *r* until the postcycle. As a result, the moraic *r* remains as a degenerate syllable throughout the cycle.

We now turn to the derivation of *bokrokat*, which requires three cycles, as shown in (20). The underlying form of *-k* 'plural' is /kA/, where A represents a floating [+low].

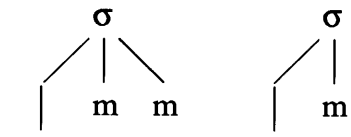
(20) a.



→

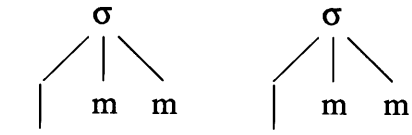
(first cycle)
Syllabification

(20) b.



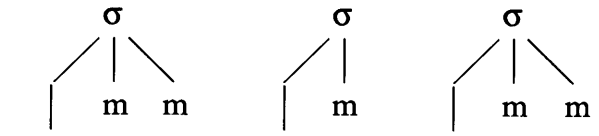
→
(second cycle)
Morphology, syllabification (by Maximality)

c.



→
(second cycle, cyclic epenthesis)

d.

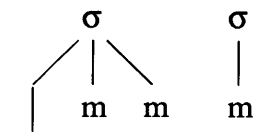


→
(third cycle)
Morphology, Epenthesis, Syllabification

e. bokrokat
(postcyclic)
Harmony, defaults

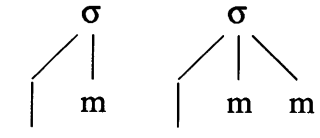
We now contrast the accusative and plural of *bor* 'wine' (3a). The plural *borok* is straightforwardly derived in a manner parallel to *bokrot* (19). We give this derivation in (21).

(21) a.



→
(second cycle)
Syllabification

b.

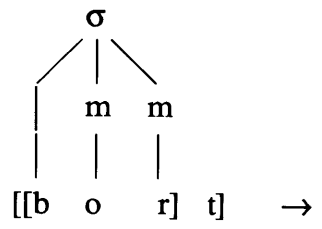


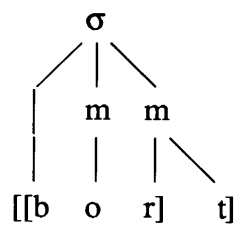
→
Second cycle: cyclic epenthesis, Onset Principle

(21) c. borok
(postcyclic)
Harmony, defaults, deletion of floating [+Low]

In (21), assignment of a mora to stranded *k* is needed to ensure that epenthesis applies before *k*, since epenthesis after *k* would also result in a phonotactically well-formed but non-existent word **borka* 'wine (pl.)', compare *uborka* 'cucumber.'

The accusative is different. On the second cycle the accusative suffix *-t* is unsyllabified. If this consonant were assigned to a degenerate syllable and Epenthesis applied, it would incorrectly derive **borot*. But the principle of Maximality prevents this, since *-rt* is an acceptable coda by (9). Accordingly, *-t* is adjoined to the existing syllable, as in (22).

(22) a. 

→ b. 

(second cycle)

bort *borot

Notice the contrast between *bort* (22) and *bokrot* (19). In (22) Maximality forces adjoining unsyllabified *-t* into the existing syllable. In (19), on the other hand, the stem-final *-r* constitutes a degenerate syllable which is filled out by the suffix *-t*. This result follows from the assumption that there is a principle that requires minimal adjustment to syllable structure when incorporating stray elements into existing syllables. Furthermore, the SCC is crucial in (19). If Epenthesis had been able to apply on the first cycle, the incorrect form **bokort* would have been produced.

4. Some problematic cases

A very small number of epenthetic stems have a somewhat different behaviour from those in (6), which represent the vast majority of stems of this type. The examples in (23) are representative of the exceptional epenthetic stems. The epenthetic vowels are italicized.

(23)	gloss	a. 'lip'	b. 'rubbish'	c. 'moustache'
	nom.	aj*a*k	vac*a*k	baj*u*sz
	acc.	ajk*a*t	vack*o*t	bajsz*o*t
	pl.	ajk*a*k	vack*o*k	bajsz*o*k
	acc.pl.	ajk*aka*t	vack*oka*t	bajsz*oka*t
	iness.	aj*a*kban	vac*a*kban	baj*u*szban
	all.	aj*a*khoz	vac*a*khoz	baj*u*szhoz

Vacak (23b) is exceptional in that it takes a low rather than a mid epenthetic vowel in the stem. *Bajusz* (23c) takes a high round vowel in the stem, and *ajak* (23a) has both a low epenthetic vowel in the stem and a low vowel before the suffixes for 'plural' and 'accusative.' We already have an account of the low vowel before

suffixes. Like the nouns in (4), they have a stem-final floating feature [+low] in the underlying form. We can account for the appearance of high or low epenthetic vowels in the stem in a similar way by appealing to the notion floating feature. Thus *ajak* and *vacak* have a floating feature [+low] between the two stem-final consonants; *bajusz* has a floating [+high] in that position. In addition, *ajak* has a stem-final floating feature [+low]. Harmony and defaults produce the correct phonetic forms. We assume the underlying forms in (24).

(24) a. /a j [+L] k [+L]/
b. /v a c [+L] k/
c. /b a j [+H] sz/

In the case of the accusative and plural of the forms in (24), Syllabification analyzes the suffix consonant as a moraic degenerate syllable, forcing epenthesis before the consonant. Syllabification is thus complete on the second cycle without the participation of the stem-internal floating feature, which is therefore unrealized. We assume that floating features are always available for syllabification, but that if syllabification is complete without them, they are unrealized. In the nominative (unsuffixed) forms of these stems, the stem-final consonant cannot be syllabified without the participation of the floating feature, which therefore forms the rhyme of the syllable. This rhyme is realized as *a* or *u* as required, with Harmony and defaults supplying the remaining features. For *bajusz* we invoke an additional principle that syllabification cannot apply across floating features. This is needed, since *-jsz* is a possible coda. This principle is also needed to derive *házat* (5a), since *-zt* is a possible coda, as in *gázt* 'gas (acc.),' *gáz* (nom.).

5. Word-final low vowels

We have assumed that the plural suffix *-k* and the stems that take a low linking vowel have a floating feature [+low] in their underlying representations. It is interesting to note that, for all stems that end in a low vowel on the surface, the final low vowel is underlyingly long. Word-final short low vowels are always derived in this analysis by a rule of shortening, which we give as (25).

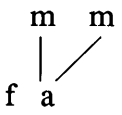
(25) $\underset{\text{[+low]}}{\text{m}} \rightarrow \emptyset / \_\_\_\_\_]$ (Postcyclic)

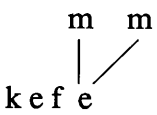
This rule shortens word-final low vowels in a group of stems that end in a short low vowel in the nominative but have a long low vowel before most suffixes. Two such examples are given in (26).

(26)

gloss	a. 'tree'	b. 'brush'
nom.	fa	kefe
acc.	fát	kefét
pl.	fák	kefék
acc.pl.	fákat	kefét
iness.	fában	kefében
all.	fához	kefével

Vago (1980) accounted for these by a lengthening rule that applied to stem-final low vowels when followed by any segment. We claim that the stems in (26) should be represented with an underlying bimoraic vowel, as in (27).

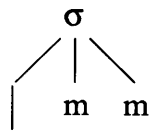
(27) a. 

b. 

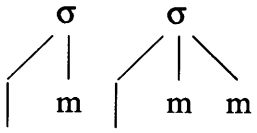
Rule (25) removes the final mora of these low vowels unless a suffix has been added.

6. Conclusion

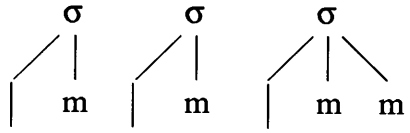
We have shown that syllabification and epenthesis in Hungarian must be cyclic, and cannot be postcyclic and directional, as in the examples cited in Itô (to appear). If syllabification and epenthesis are postcyclic, the principles of syllabification wrongly predict that there will be no epenthesis in some cases where it is required, such as *padokat* ((2a), cf. (12)), and that epenthesis will appear in the wrong places in some derivations, as in **bokorkat* (cf. (11)) and **bokort* (cf. (l4)). This is true regardless of which direction of syllabification is chosen. However, cyclic application eliminates all these problems. The derivation of *padokat* (2a) is quite straightforward in a cyclic analysis, as in (28).

(28) a. 

[p a d] →
(first cycle: syllabification)

b. 

[[p a d] V k A] →
(second cycle: morphology, epenthesis, syllabification)

c. 

[[[p a d] V k a] t] →
(third cycle: morphology, epenthesis, syllabification)

d. padokat
(postcyclic: Harmony, defaults)

The second cycle is crucial here. There is no need to syllabify the floating feature

[+low] at the end of the plural suffix. The unsyllabified consonant *k* projects a mora, inducing epenthesis. It is only on the third cycle that the floating feature at the end of the plural suffix is syllabified, owing to the mora projected by the accusative suffix *t*. Cyclic syllabification and epenthesis prevents the unwanted output **padkat* predicted by Maximality if syllabification and epenthesis are only postcyclic, with either direction of scanning.

Invoking cyclic application also requires that we invoke the Strict Cycle Condition (16). This condition prevents epenthesis from applying on the stem cycle of *bokor* in such derivations as (18). Therefore, we conclude that epenthesis is cyclic and governed by the Strict Cycle Condition in Hungarian.

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