Chapter Four

Output-Output Correspondence in Casablanca Moroccan Arabic

1. INTRODUCTION

In Optimality Theory (Prince and Smolensky 1993), grammar is conceived of as a set of ranked and violable structural and faithfulness universal constraints regulating the relationship between an input and an output. The development of this theoretical model with McCarthy and Prince (1995, 1999) has led to a new version of faithfulness constraints formulated within CT. In this theory, correspondence is assumed to regulate not only the relation between an input and an output but also the relation between a base form and its reduplicative copy. In the extended version of CT, Benua (1995, 1997), McCarthy (1995, 1997), Kenstowicz (1996, 1997), Kager (1996), Burzio (1996), Basri et al (1998) and Selkirk (1999), among others, have shown that correspondence should relate, in addition to an input and an output and a base and its reduplicant, a derived output form and its morphologically simple base output form. This new version of correspondence is dubbed in the CT literature as output-output (O-O) correspondence.

The present chapter is an attempt to reanalyze the three linguistic issues of cyclicity effects of syllabification, truncation and prosodic circumscription in CMA by making use of the extended version of correspondence whereby correspondence can be established between words standing in a transderivational relationship.

The first issue that will be tackled relates to the notion of cyclic syllabification. For illustration, consider the trisegmental and quadrisegmental verb paradigms given in 1 below:

-1-

a. The perfective form of the verb [ktəb] “write”

1sg	ktəb-t	1pl	ktəb-na
2sg	ktəb-ti	2pl	ktəb-tu
3sg	ktəb	3pl	kətb-u
3sg.fem.	kətb-at		

b. The perfective form of the verb [kərkəb] “roll”

1sg	kərkəb-t	1pl	kərkəb-na
2sg	kərkəb-ti	2pl	kərkəb-tu
3sg	kərkəb	3pl	kərkb-u
3sg.fem	kərkb-at		

The schwa in the above cases is not part of the base; it is epenthesized for syllabic purposes in accordance with Benhallam’s (1990a) SSAA (see chapter two for details). According to the SSAA, schwa epenthesis in items like the ones in 1 operates from right to left. What it basically does is to take every CC sequence and assign to it the canonical shape CəəC. Accordingly, the schwa is epenthesized between the second and third consonants in trisegmental roots as in the stem [ktəb] and between each cluster of two consonants in quadrisegmental roots as in the stem [kərkəb]. Of particular interest to us here are the verbs marked for the first person singular and the verbs whose affixes begin with a vowel. Given an input like /krkb-t/, the SSAA proceeds from right-to-left and epenthesizes a schwa between each pair of consonants. The result is the ungrammatical form *[krəkbət]. On the basis of items like these, Benhallam (1990a) concludes that schwa epenthesis should be allowed to apply cyclically if we are to derive the correct output. With the notion of cyclicity included, schwa epenthesis will apply first to the inner-most bracketed item in [[krkb]t] to yield [kərkəb]. Only then is the suffix added to give [kərkəbt], an output form wherein the schwa is not epenthesized between the affixal and the stem-final consonants. However, this account fails to account for items like [kərkbək] “he rolled you”, where the schwa is epenthesized between the object affix [-k] and the stem-final consonant.

In section 3 below, we reconsider the phenomenon of cyclicity of syllabification in the light of the extended version of correspondence based on a morphologically-grounded theory of O-O correspondence proposed in Basri et al (1998) and Selkirk (1999). In order to provide a systematic treatment of cyclicity and get a full picture of how O-O faithfulness operates in CMA, we will contrast the patterns of syllabification with inflectional endings such as the

paradigms in 1 above with the patterns of syllabification with pronominal enclitics of the form C, CV and V.

The second issue analyzed in this chapter relates to truncation. In the formation of a morphological class called the nisba derived from certain nouns, part of the base is deleted as shown in the examples given below:

-2-

a.	bni-məllal	məllali	from Beni-Mellal
	nas-əl-ɣiwan	ɣiwani	of Ghiwane (a musical band)
	DDaR-əl-biDa	biDawi	from Casablanca
b.	ʔa-məzzru	məzzriwi	from Amezzrou
	ta-rudan-t	rudani	from Taroudant

The items in 2a are derived from compound nouns; those in 2b are derived from nouns whose affixes are of Berber origin ([ta-...-t] and [ʔa-] where the glottal stop is prothesized for onset purposes). Both cases involve deletion of some material from the base. In 2a it is the left-hand member of the compound which is deleted; in 2b it is [ʔa-] and [ta-...-t] which are deleted. In section 3 below, we will consider what motivates this deletion: is it some prosodic constraint on the output that forces truncation, or is truncation morphologically conditioned?

The final issue addressed in this chapter is the causative. Consider the following cases for illustration.

-3-

	Vb stem	*Causative*	*Gloss*
a.	ktəb	kəttəb	write
	wSəl	wəSSəl	arrive
	bka	bəkka	cry
b.	fiq	fəyyəq	wake up
	ʃuf	ʃəwwəf	see

Bennis (1992) has argued that the base for the causative derivation is the stem, that is an output form, or more specifically a prosodic category which forms part of the stem. According to the author, the causative is formed by the affixation of a bimoraic syllable to a circumscribed prosodic domain which is a minimal syllable of the type CəC or CV. In 3a, the bimoraic syllable is prefixed to CəC; in 3b it is suffixed to CV. The gemination obtained is

the result of the spreading of the second segment of the base. In O-O correspondence, circumscription has been analyzed as a case involving positional faithfulness to some designated edge of a base output (McCarthy 1997). In section 5 we will show that a circumscriptive analysis cannot account for the causative forms in 4b and propose that all causative forms be better analyzed as cases involving reduplication.

The present chapter is organized into five major sections. In section 2, we lay down the basic tenets of the extended version of CT as well as the definition and nature of the base and the output forms and how they relate to each other. In section 3, we discuss cyclicity of syllabification in CMA. In particular, we will show that cyclicity can be accounted for by an O-O constraint where the derived form is related to its morphologically related output form. In section 4, we will consider morphological truncation and argue that the fact that part of the base deletes cannot be attributed to a prosodic constraint. In particular, we will show that the nisba morpheme attaches to bases that do not have a complex morphological nature. Finally, in section 5, we reanalyze the causative as a case involving reduplication as proposed in Imouzaz (forthcoming). We will especially show that the causative could best be understood if we assume output constraints regulating the relationship between the base form and its reduplicant.

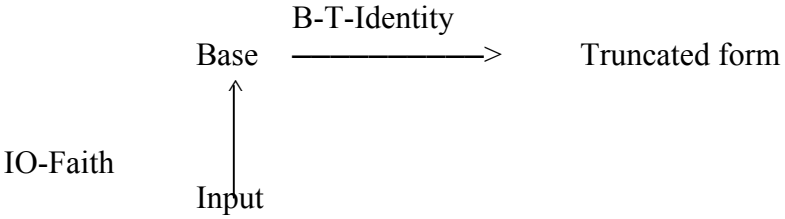
2. TRANSDERIVATIONAL RELATIONS IN OPTIMALITY THEORY

In recent developments within the OT framework, McCarthy and Prince (1995, 1999) reformulate Prince and Smolensky's (1993) faithfulness constraints under CT. According to McCarthy and Prince (1999), correspondence is at minimum a relationship between segments and can also be extended to features and prosodic units such as moras. Correspondence was originally conceived of as a relation between the base and the reduplicant (B-R correspondence) but it was soon extended to cover input-output faithfulness (I-O correspondence). However, in works such as McCarthy (1995, 1997), Benua (1995, 1997), Kenstowicz (1996, 1997), Burzio (1996) and Kager (1996), Basri et al (1998) and Selkirk (1999), the notion of correspondence has been extended to cover O-O relations (O-O correspondence) to account for morphologically related output forms which stand in a transderivational relation.

In dealing with truncatory phenomena, Benua (1995) proposes that truncation involves two correspondence relations: one that holds between an input and the base (I-B correspondence) and another that holds between the base and the truncated form (B-T correspondence). The truncation model proposed by Benua (1995:6) is as follows:

-4-

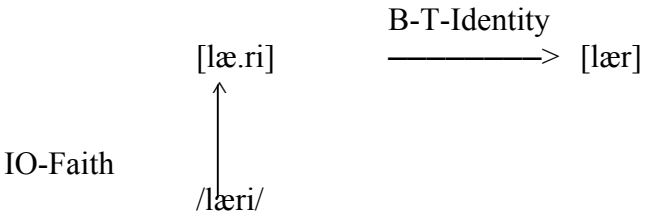
Truncation



As shown in 4 the input is related to the base by I-O correspondence while the base is related to the truncated form by B-T correspondence.

Benua (1995:1, 2) argues that truncated hypocoristics in certain dialects of American English (e.g. New York and Philadelphia American English) behave differently from their non-truncated counterparts vis-à-vis [æ] ≈ [ɑ] alternation found in syllables closed by [r]. Orthographic "a" is realized as [ɑ] before a tautosyllabic [r] as in [mɑr], [kɑr]; and as [æ] when it occurs in syllable final position as in [læ.ri] and [hæ.ri]. However, in truncated forms, the constraint against tautosyllabic [ær] is not respected as we find items such as [hær] and [lær], which are the truncated forms of [læ.ri] and [hæ.ri]. Benua argues that the underapplication of [ɑ] in [lær] and [hær] is attributed to the fact that the truncated items are related to the initial string of their source words as shown below:

-5-



Notice that the base in 5 is a fully prosodized word and that the base and the truncated forms are separate words.

Transderivational relations of the type that exists between the base [læ.ri] and the output [lær] could also be extended to account for cyclic phenomena. In this respect, Kager (1996) has shown that an O-O correspondence relation is needed to account for phenomena that Brame (1974) attributed to cyclic rule application in Palestinian Arabic. Brame maintains that the stress rule interacts with a rule of syncope that deletes an /i/ in an open unstressed nonfinal syllable. To understand this interaction, one has to understand the distinction between Class I affixes, which are markers indicating agreement with the subject for person, number and gender; and Class II affixes which are object markers. Consider the following examples taken from Kager (1996: 5,6):

-6-

a. stem /fihim/ + class I affixes

/fihim/	fíhim	he understood
/fihim-na/	fhímna	we understood
/fihim-u/	fíhmu	they understood

b. stem /fihim/ + class II affixes

/fihim/	fíhim		he understood
/fihim-ni/	**fi**hímni	*fhímni	he understood me
/fihim-ha/	**fi**hímha	*fhímha	he understood her
/fihim-na/	**fi**hímna	*fhímna	he understood us

The behavior of the verbal forms in 6 above vis-à-vis **i**-syncope can be explained by reference to the base which is defined by Kager (1996: 7) as follows:

-7-

> ... a form that is compositionally related to the affixed word in a morphological and a semantic sense. (The meaning of the affixed form must contain all the grammatical features of its base.) Moreover, the base is a free form, i.e. a word. This second criterion implies that a base is always an output itself.

Kager shows that the failure of /i/ to delete in the object forms in 6b can be attributed to the fact that these have a morphological base form (i.e. [fíhim]) in which [i] is stressed. The base [fíhim] is related both morphologically and semantically to the affixed form in 6b. In contrast, the same /i/ deletes in the subject forms because these are assumed not to have a base; or more accurately the verb stem /fihim/, which is morphologically related to the affixed forms in 6a, does not fulfill the second requirement, namely semantic compositionality.

An account of the cases of affixation witnessed in the Palestinian Arabic cases based on the cyclic lexical phonology and morphology in OT is offered in Kiparsky (1998). According to Selkirk (1999), Kiparsky's theory is based on four properties. First, faithfulness is defined only on input-output relations. Second, input-output relations are defined within a Stem-grammar and a Word-grammar. Third, the output of stem grammar is the input of the word grammar. Finally, the constraints of Stem-grammar and Word-grammar are identical but the ranking of the constraints may be different. Kiparsky (1998) holds that the asymmetry exhibited in Palestinian Arabic between subject morphology and object morphology reflects the distinction between stem-level constraints and word-level constraints. Although, Kiparsky's analysis proves to work well for the Palestinian Arabic paradigm asymmetry and other cases of opacity cross-linguistically, it cannot be adopted in this work given its serialist nature which is incompatible with the principles of the OT model.

A better solution to the Palestinian Arabic problem is offered in Basri et al (1998) and Selkirk (1999). Basri et al point out that Kager's definition of the base and consequently his theory of O-O correspondence is too restrictive in the sense that it requires the base to have all the grammatical features of a related independent word, and in so doing confines O-O correspondence relations to cases of syntactic affixation to words. The aforementioned authors instead develop a morphologically-grounded theory of O-O correspondence which distinguishes between two sets of O-O constraints: O-O_{stem} Faith and O-O_{word} Faith.

Basri et al (1998) propose that O-O correspondence be defined as follows:

-8-

Two output strings S1 and S2 are in a correspondence relation if:

i- the input S1' and S2' to which S1 and S2 respectively correspond are dominated by the morphological constituents φ and Ψ, respectively,

ii- φ is an independent word

iii- Ψ is an immediate daughter of an independent word, and

iv- Ψ is morphologically nondistinct from φ (in the sense that the morphological properties of Ψ are a proper subset of those of φ)

The definition of O-O correspondence established in Basri et al differs from that of Kager in the sense that the affixed form is not necessarily required to share all the grammatical features

of the related simple base form but rather only a proper subset of those properties. Under this definition of O-O correspondence, the Palestinian Arabic data in 6b could be viewed as a case involving O-O_{word} faithfulness constraints. Consider the embedded structure of [fihim] and [fihímna] taken from Basri and others (1998):

-9-

Output-output correspondence under affixation-to-word (O-O_{word})

Input: $_{word}[_{stem}[fihim]_{stem}\text{-}ø]_{word}$ $_{word}[_{word}[_{stem}[fihim]_{stem}\text{-}ø]_{word}\text{-}na]_{word}$

S1’ S2’

Output: fíhim fihím-na

S1 S2

“he understood” “he understood us”

On the other hand, the data in 6a involve O-O_{stem} faithfulness constraints. The structures of words such as [fihim] and [fhímna], taken from Basri et al (1998), are reproduced in 10 below:

-10-

Output-output correspondence under affixation-to-stem (O-O_{stem})

Input: $_{word}[_{stem}[fihim]_{stem}\text{-}ø]_{word}$ $_{word}[_{stem}[fihim]_{stem}\text{-}na]_{word}$

S1’ S2’

Output: fíhim fhím-na

S1 S2

‘he understood’ ‘we understood’

According to Basri et al (1998) correspondence in the way defined in 9 holds for both 9 and 10. In the case of 9, the embedded morphological constituent shares all the properties of the independent word. In 10, the embedded morphological constituent is the stem. It is not identical to the independent word. However both of them are morphologically nondistinct and are related to the stem /fihim/.

This new theory of O-O correspondence, as Selkirk (1999) puts it, is superior to both the Stem-grammar and Word-grammar theory of Kiparsky (1998) and to the earlier versions of O-O Faith theory (Burzio 1996, Kenstowicz 1996, 1997, Kager 1996, Benua 1995, 1997). Kiparsky's model is serialist in nature whereas the earlier versions of O-O Faith make no appeal to the internal morphological properties of words in an O-O correspondence relation. Within the morphologically-grounded theory of O-O correspondence, correspondence is defined by Selkirk (1999) as follows:

-11-

a. Definition of O-O_{stem} correspondence

> An O-O_{stem} correspondence relation holds between two output strings S1' and S2' when S1' and S2' are in an Output-Output correspondence relation and the input strings corresponding to S1' and S2' are terminal strings of morphological constituents of the type Stem.

b. O-O_{word} correspondence

> An O-O_{word} correspondence relation holds between two output strings S1' and S2' when S1' and S2' are in an Output-Output correspondence relation and the input strings corresponding to S1' and S2' are terminal strings of morphological constituents of the type Word.

Consistent with the general theory of correspondence of McCarthy and Prince (1995), Selkirk further assumes that there are two different families of O-O faithfulness constraints: O-O $Faith_{stem}$ and O-O $Faith_{word}$. The first holds in cases of O-O_{stem} correspondence while the second holds in cases of O-O_{word} correspondence.

It is the morphologically-grounded theory of output-output correspondence proposed in Basri et al (1998) and Selkirk (1999) that will be adopted in the present work for the analysis of the CMA cyclic and truncatory phenomena as well as circumscription. We will start first with the cyclic effect of syllabification in verbs.

3. CYCLIC SYLLABIFICATION

3.1 Introduction

In chapter two, we have shown how an OT account of CMA syllable structure is far better than a rule-based analysis which relies on syllable structure building rules,

directionality and cyclicity. In particular, we have shown that an analysis in terms of the ranking of a subset of constraints pertaining to UG provides a straightforward account of all cases of syllabification except those that require recourse to the cycle.

As noted earlier in this chapter, the more problematic cases are those quadrisegmental verb bases attached to vowel-initial affixes and the first person suffix [t] as well as trisegmental verb bases to which the first person singular [-t] is attached. For example, words such as [kərkb-u] "they rolled", [kərkəb-t] "I rolled" and [DRəb-t] "I hit" need a cyclic account. Assuming that syllabification applies after all the morphological rules have applied will yield the incorrect output *[krəkbu], *[krəkbət] and *[DəRbət]. On the basis of items like these, Benhallam (1990a) assumes that syllabification should be allowed to apply cyclically to yield the attested output. In the items [DRəbt] and [kərkbu], syllabification applies as in 12 below. The brackets stand for cycles.

-12-

Input	[[DRb]t]	[[krkb]u]
	First cycle	
Syllabification	D.Rəb	kər.kəb
	Second Cycle	
Affixation	D.Rəb-t	kər.kəb-u
Syllabification	D.Rəb.t	kər.kə.bu.
Output	[DRəbt]	[kərkbu]
	"I hit"	"they rolled"

Syllabification first applies to the innermost bracketed items in the first cycle. It reapplies in the second cycle after affixation to adjoin the stranded [t] as a postmargin to the preceding syllable, thus giving the correct output [DRəbt]. In the remaining item, and after the suffixation of [u], the segment [b] , syllabified as a coda in the first cycle, is assigned as an onset to this suffix and this follows from the fact that CMA does not allow onsetless syllables. Consequently, the schwa is left in an open syllable, thus subject to deletion.

The question we will try to answer here is the following: how is it possible to capture the sense of cyclicity of right-to-left syllabification in CMA within a non-derivational

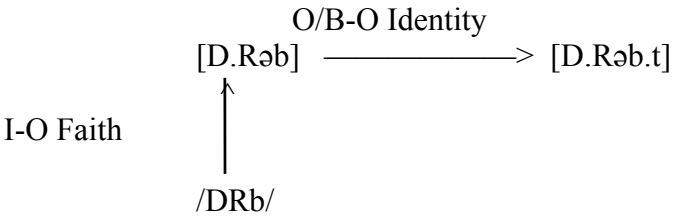
constraint-based framework? To answer this question, we will explore an analysis in terms of O-O correspondence along the lines suggested in Basri et al (1998) and Selkirk (1999).

3.2 Cyclicity as Output-Output Correspondence

In this subsection we show how cyclic phenomena could be accounted for by reference to constraints requiring phonological identity between separate output forms that stand in a transderivational relation as defined in 8 above.

To solve problems of cyclic syllabification in CMA cases like the ones brought up in section 1 above, Boudlal (to appear a) proposes, following McCarthy (1995, 1997) and other work on transderivational correspondence (Benua 1995, 1997, Kenstowicz 1996, 1997, McCarthy 1995, 1997, Burzio 1996, Kager 1996), that cyclic syllabification in CMA be accounted for by invoking a constraint establishing correspondence between an affixed form and a simple base form. Thus a word such as [DRəbt] could be derived by comparing it to the simple base form [DRəb], which is itself an independent form, and not by comparing it to the input form /DRb/. The whole picture is schematized in 13 below:

-13-



However, and as it has been pointed out above this model does not make any reference to the internal morphological properties of the words standing in an O-O correspondence. For this reason, Basri et al (1998) and Selkirk (1999) propose that the theory of O-O correspondence be developed in such a way that it is grounded in the morphosyntactic representation and in particular the stem-word distinction. The authors distinguish between two sets of O-O faithfulness constraints: O-O_{stem} faithfulness constraints and O-O_{word} faithfulness constraints. The first govern alternations at the stem level while the second account for alternation at the word level.

In order to account for cyclicity of syllabification and get the full picture of how O-O faithfulness works in CMA, we will consider two different types of affixation reflecting the stem-word distinction: affixation to the stem which involves the subject affixes [-t] “I”, [-na]

"we" and [-u] "they"; and affixation to the word which involves the object clitics [-k] "you", [-u] "him" and [-na] "us".

First consider the stems [DRəb] and [kərkəb] to which the inflectional affixes marking person are added:

-14-

Verb stem + subject marker

a.	DRb	DRəb	he hit
	DRb-t	DRəbt	I hit
	DRb-na	DRəbna	we hit
	DRb-u	DəRbu	they hit
b.	krkb	kərkəb	he rolled
	krkb-t	kərkəbt	I rolled
	krkb-na	kərkəbna	we rolled
	krkb-u	kərkbu	they rolled

Two generalizations could be made about the data above. First, when consonant-initial affixes (i.e. C and CV) are introduced, the stem remains intact, i.e. the schwa retains its position between the second and third consonants of the stem in trisegmental verbs and between the third and fourth consonants in quadrisegmental verbs. Second, when vowel-initial affixes are introduced (i.e. V), the schwa, originally placed before the final segment of the stem deletes in quadrisegmental verbs or is placed before the second segment of the stem in trisegmental verbs. The deletion of the schwa leads to a change in the syllabic configuration of the stem.

When a pronominal enclitic of the form C, V and CV attaches to the same verb forms, the result obtained is the following:

-15-

Verb form (3 sg. mas) + object marker

a.	DRb	DRəb	he hit
	DRb-k	DəRbək	he hit you
	DRb-u	DəRbu	he hit him
	DRb-na	DRəbna	he hit us

b.	krkb	kərkəb	he rolled
	krkb-k	kərkbək	he rolled you
	krkb-u	kərkbu	he rolled him
	krkb-na	kərkəbna	he rolled us

The forms in 15 look much like those in 14 except for affixes that consist of a single consonant. In 15 the schwa is epenthesized before the consonantal affix [-k] whereas in 14 such epenthesis does not take place. The behavior of verbal forms in 15 is identical to nouns to which the pronominal enclitics of the form C, V and CV (marking the possessive) are added. Consider the following data for illustration:

-16-
Noun + possessive marker

a	ktf	ktəf	shoulder
	ktf-k	kətfək	your shoulder
	ktf-u	kətfu	his shoulder
	ktf-na	ktəfna	our shoulder
b.	ʃrʒm	ʃərʒəm	window
	ʃrʒm-k	ʃərʒmək	your window
	ʃrʒm-u	ʃərʒmu	his window
	ʃrʒm-na	ʃərʒəmna	our window

In these nominal forms, the words [ktəf] and [ʃərʒəm] retain their syllabic configuration only when they attach to the clitic [-na]. When they attach to the clitics
[-u] and [-k], their syllabic configuration changes. Given that the clitic [-u] is a vowel and that the onset is obligatory in CMA, it follows that the change in syllabic configuration is dictated by the constraint ONSET requiring that every syllable have an onset. With respect to the clitic [-k], one should expect it to behave like the subject prefix [-t] which does not cause the stem to change its syllabic configuration. This points out to the fact that the two affixes are attached to two distinct morphological categories. The fact that the schwa is epenthesized before the subject affix [-t] in [DRəbt] but not before the object affix [-k] in [DəRbək] reflects a distinction between affixation to the stem and affixation to the word. In affixation to the stem, the correspondence between the verb stem [DRəb] and the affixed verb form [DəRbt] is shown in 17 below:

-17-

Affixation to stem in CMA

Input: $_{word}[_{stem}\ [DRəb]_{stem}\ ø]_{word}$ $_{word}[_{stem}\ [DRəb]_{stem}\ -t]_{word}$

S1' S2'

Output: [D.Rəb] [D.Rəb.t]

S1 S2

"he hit" "I hit"

The base in 17 conforms to the definition set by Basri et al (1998). Correspondence here is established between S1 and S2 which are both stems. On the other hand, the correspondence between [DRəb] and [DəRbək] is one that relates a word to another word as in 18:

-18-

Affixation to word in CMA

Input: $_{word}[_{stem}\ [DRəb]_{stem}\ ø]_{word}$ $_{word}\ [_{word}[_{stem}\ [DRəb]_{stem}\ -ø]_{word}\ -k]_{word}$

S1' S2'

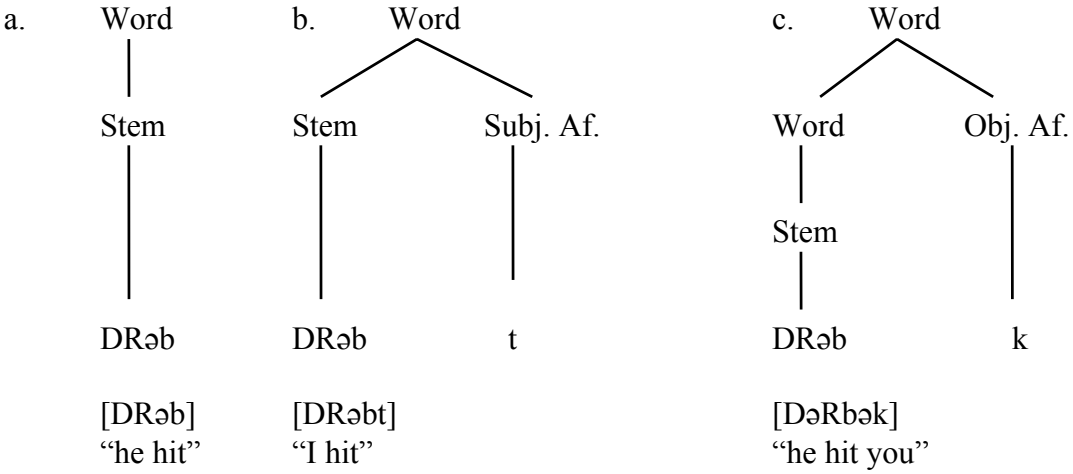
Output: [D.Rəb] [DəR.bək]

S1 S2

"he hit" "he hit you"

The hierarchical morphological structures of the affixation-to-stem and affixation-to-word instances in 17 and 18 are given in 19 below:

-19-



According to the definition set in 8 above, a correspondence relation holds between 19a and 19b and between 19a and 19c. In the case of affixation to stem (i.e. 19b), the stem φ, which stands for the output string S1 [DRəb], is an independent word. Moreover, ψ , which stands for the stem part in the affixed form [DRəbt], is an immediate daughter of an independent word, whose morphological properties are a subset of φ , which is the stem [DRəb]. The same thing could be said about the embedded morphological constituent standing for the word part in the affixed form [DəRbək], which is a morphosyntactic word, and shares all the morphological properties of the independent word. Thus and according to Basri et all (1998) and Selkirk (1999), an O-O correspondence holds in both 17 and 18 . So, the difference between [DRəbt], where schwa epenthesis applies and [DəRbək], where it does not, finds its explanation in the distinction between O-O_{stem} correspondence versus O-O_{word} correspondence. It is evident enough that the output [D.Rəb.t] is closer to the base [D.Rəb] than [DəRbək] is. In particular [D.Rəb.t] is identical to [D.Rəb] but not to [DəRbək] in as far as the initial segments of the stem syllables are concerned. Faithfulness to some designated periphery of a prosodic category has been captured in the literature by invoking an O-O constraint, dubbed ANCHOR (McCarthy 1997). McCarthy assumes the existence of distinct Anchoring constraints from S1 to S2 and from S2 to S1, referred to as I-ANCHOR and O-ANCHOR. He also assumes that there are two senses of Anchoring: ANCHOR-POS which is satisfied when a segment's position as head, initial or final is preserved under correspondence; and ANCHOR-SEG, which demands that the segment itself be conserved in

the designated position (i.e. the Beckman (1995, 1998) positional faithfulness). Within each of the two families of constraints, a token must also specify the constituents involved, the type of correspondence relation between them (I-O, B-R, O-O) and the position anchored to (head, initial, final).

For the purpose of the syllabification cases considered in this section, the constraint needed is the one that anchors position and is formulated by McCarthy (1997: 12) as follows:

-20-

O-ANCHOR-POS $_{S1\text{-}S2}$ (Cat_1, Cat_2, P)

If ς_1 $Cat_1 \in S_1$
ς_2 $Cat_2 \in S_2$
ς_1 $\mathcal{R}\varsigma_2$, and
ς_2 stands in position P of Cat_2

then ς_1 stands in position P of Cat_1.

According to McCarthy, when Cat_1=Cat_2, the result is prosodic faithfulness per se. An example of this type is I-ANCHOR-POS_{IO} (Ft, Ft, Head) which states that the locus of stress must not change in the input/output mapping. When Cat_1=Base and Cat_2=Reduplicant, the result is a typical BR- Anchoring. Finally when Cat_1= stem and Cat_2= σ, the result is the alignment of a morphological category and a prosodic one. It should be noted that the constraint in 20 is irrelevant when a segment is deleted or epenthesized at the designated edge.

In order to account for the difference between [DRəbt] and [DəRbək], correspondence has to refer to the initial position of the syllable in the derived output form and its related base output form. Given the distinctions made between stem and word, we will have to distinguish between O-O_{stem} $ANCHOR_{POS}$ and O-O_{word} $ANCHOR_{POS}$. These constraints are formulated, after Selkirk (1999) as in 21 below:

-21-

a. O-O_{stem} ANCHOR (σ, σ, Initial)

> Where two strings S1 and S2 are in an O-O_{stem} correspondence relation and S1 is the base and S2 the affiliate of that correspondence relation, a syllable-initial segment belonging to S2 must correspond to a syllable-initial segment belonging to S1.

b. O-O_{word} ANCHOR (σ, σ, Initial)

> Where two strings S1 and S2 are in an O-O_{word} correspondence relation and S1 is the base and S2 the affiliate of that correspondence relation, a syllable-initial segment belonging to S2 must correspond to a syllable-initial segment belonging to S1.

[DRəb] is related to [DRəbt] in an O-O_{stem} correspondence whereas [DRəb] is related to [DəRbək] in an O-O_{word} correspondence relation. The word [DRəbt] shows that it is more important to keep the left edges of the stem when the suffix is added than to avoid a minor syllable. Thus in order to rule out a potential output candidate such as *[DəRbət], O-O_{stem} ANCHOR (σ, σ, Initial) must dominate the markedness constraint *Min-σ which penalizes minor syllables as shown for the derivation of [ktəbt], which stands in correspondence with the base output form [k.təb] in the constraint tableau
in 22:

-22-

/DRb-t/ Base: $[D.Rəb]_{stem}$	O-O_{stem} ANCHOR (σ, σ, Initial)	*Min-σ
☞a. D.Rəb.t		*
b. DəR.bət	*!	*
c. D.Rə.bət	*!	
d. Də.Rə.bət	*!	*

In the optimal candidate, the initial segment of the first syllable in the affiliate (derived) form corresponds to the initial segment of the first syllable in the simple output base form (i.e. the segment [D]). The same thing could be said about the initial segment of the second syllable which is the segment [R]. Candidates 22b-d incur a single violation mark of the constraint requiring left anchoring of the initial segments in the derived output and the simple base form. In 22b, the initial segment of the second syllable in the affixed forms (i.e. the segment [b]) does not correspond to the initial segment of the second syllable in the simple base form (i.e. the segment [R]). In 22c and 22d, the initial segment of the third syllable in the derived form does not have a correspondent in the simple base form.

In the instance of affixation to word [DəRbək], satisfying the constraint *Min-σ is more important than conserving the initial position of the base syllables. This points out to the fact that *Min-σ must rank higher than O-O_{word} ANCHOR (σ, σ, Initial) as the tableau below shows:

-23-

/DRb-k/ Base: $[[D.Rəb]_{stem}]_{word}$	*Min-σ	O-O_{word} ANCHOR (σ, σ, Initial)
☞a. DəR.bək		*
b. D.Rəb.k	**!	
c. D.Rə.bək	*!	*

The tableau shows that any candidate violating *Min-σ is ruled out. This is the case with 23b and 23c. The optimal candidate spares that markedness constraint but instead violates the lower-ranking O-O_{word} ANCHOR (σ, σ, Initial) because the initial segment of the second syllable in the affixed form (i.e. the segment [b]) does not correspond to the initial segment of the second syllable in the base form (i.e. the segment [R]). Since O-O_{stem} ANCHOR (σ, σ, Initial) dominates *Min-σ and *Min-σ dominates O-O_{word} ANCHOR (σ, σ, Initial), we therefore conclude that O-O_{stem} ANCHOR (σ, σ, Initial) dominates O-O_{word} ANCHOR (σ, σ, Initial), by transitivity. This ranking predicts that faithfulness should appear in cases of affixation to stem but not in cases of affixation to words. While this prediction is partially true and allows for a clear distinction between cases like [DRəbt], where stem faithfulness is satisfied, and [DəRbək], where word faithfulness is sacrificed, it cannot be generalized to account for all the paradigms, especially the cases involving vowel-initial affixes. When a vowel-initial affix is attached to a verbal form, be it a stem or a word, its syllabic configuration changes and as such both O-O_{stem} faithfulness and O-O_{word} faithfulness constraints are violated. This points to the fact that ONSET must dominate both
O-O_{stem} ANCHOR (σ, σ, Initial) and O-O_{word} ANCHOR (σ, σ, Initial). In the tableau below, we show how the candidate [DəR.bu] which violates O-O_{stem} ANCHOR (σ, σ, Initial) wins over *[DRəbu]:

/DRb-u/ Base: [D.Rəb]$_{stem}$	ONSET	O-O$_{stem}$ ANCHOR (σ, σ, Initial)
☞a. DəR.bu		*
b. D.Rəb.u	*!	

In the optimal candidate, only the initial segment of the first syllable of [DəRbu] corresponds to the syllable initial segment of the base [DRəb]. The initial segment of the second syllable in the derived output form which is [b] does not correspond to the initial segment of the second syllable in the base which is [R] and this mismatch leads to the violation of O-O$_{stem}$ ANCHOR (σ, σ, Initial). However, this violation is not fatal since the constraint O-O$_{stem}$ ANCHOR (σ, σ, Initial) is violated only for the purpose of securing a higher-ranking constraint, namely ONSET. The candidate in 24b preserves the initial segments of the first and second syllables of the base form but fails because it incurs a fatal violation of ONSET. What the tableau above shows is that it is more optimal to violate O-O$_{stem}$ ANCHOR (σ, σ, Initial) than ONSET.

Quadrisegmental verbs to which the subject affix [-t] is added could be obtained much in the same way as trisegmental ones. Thus an input such as /krkb-t/ surfaces as [kərkəbt] (cf. the stem [kərkəb]) and not as *[krəkbət] by virtue of ranking O-O$_{stem}$ ANCHOR (σ, σ, L) higher than *Min-σ. On the other hand, an input such as /krkb-k/, where the object clitic is suffixed to the verb, surfaces as [kərkbək] and not as *[kərkəbk] because of ranking O-O$_{word}$ ANCHOR (σ, σ, Initial) lower than *Min-σ. As to verbs to which vowel-initial suffixes are attached, they are expected to violate the anchoring constraints given that ONSET is undominated. For illustration, consider the input /krkb-u/ to which the subject affix
[-u] is attached:

-25-

/krkb-u/ Base: [kər.kəb]$_{stem}$	ONSET	O-O$_{stem}$ ANCHOR (σ, σ, Initial)
☞a. kər.kbu		
b. kər.k.bu		*!
c. kər.kəb.u	*!	

The two constraints in 25 wrongly predict that the optimal candidate is 25a. This candidate satisfies ONSET and O-O$_{stem}$ ANCHOR (σ, σ, Initial) by virtue of the fact that the initial segment of the first and second syllables of the derived output (i.e. the segment [k]) correspond to the initial segment of the first and second syllables of the base. Although candidate 25a satisfies both constraints, it should be excluded on the ground that it incurs a fatal violation of the undominated constraint *COMPLEX. Therefore, in order to derive the correct output, *COMPLEX has to dominate O-O$_{stem}$ ANCHOR (σ, σ, Initial) as the following tableau shows:

-26-

/krkb-u/ Base: [kər.kəb]$_{stem}$	ONSET	*COMPLEX	O-O$_{stem}$ ANCHOR (σ, σ, Initial)
☞a. kər.k.bu			*
b. k.rək.bu			**!
c. kər.kbu		*!	
d. kərk.bu		*!	*
e. kər.kəb.u	*!		

The optimal candidate comprises three syllables, one of which is minor and is associated with the consonant [k]. This minor syllable arises in order to satisfy *COMPLEX. However this satisfaction causes violation of O-O$_{stem}$ ANCHOR
(σ, σ, Initial) by virtue of the fact that the initial segment of the third syllable of the derived output which is [b] does not correspond to any syllable in the base form. In candidate 26b the minor syllable arises at the left periphery, a fact which causes a fatal violation of O-O$_{stem}$ ANCHOR (σ, σ, Initial) because the initial segment of the second syllable of the derived

output does not correspond to the initial segment of the second syllable of the base and the initial segment of the third syllable of the output candidate does not have any correspondent. Candidates 26c and 26d are both excluded because of *COMPLEX. Finally candidate 26e retains the initial segments of the base syllables in their position and thus incurs a fatal violation of ONSET.

The cases so far seen have the shape /CCC/ or /CCCC/. A reasonable question one should ask here is whether or not verbs with underlying full vowels behave like the patterns already considered. More specifically, could the analysis undertaken for verbs on the pattern /CCC/ and /CCCC/ be extended to verbs on the pattern /CVC/ and /CVCC/?

To answer this question, consider the following examples which include trisegmental and quadrisegmental verbs and nouns to which affixes on the pattern C, V and CV are attached:

-27-

a. Verb stem + subject marker

i.	bas	bas	he kissed
	bas-t	bəst [1]	I kissed
	bas-na	bəsna	we kissed
	bas-u	basu	they kissed
ii.	samħ	saməħ	he forgave
	samħ-t	saməħt	I forgave
	samħ-na	saməħna	we forgave
	samħ-u	samħu	they forgave

b. Verb form (3 sg. mas) + object marker

i.	bas	bas	he kissed
	bas-k	basək	he kissed you
	bas-u	basu	he kissed him
	bas-na	basna	he kissed us

[1] Notice here that in verbs on the pattern CVC (where V is a full vowel), the medial vowel appears consistently as a schwa in the first and the second person singular and plural. This phenomenon of vowel reduction will not be considered in this section, but for an account of such a phenomenon, the reader is referred to works such as El Himer (1991), Boudlal (1993), Hammari (1996, 2000), Benhallam (1998) and Rguibi (forthcoming).

ii.	samħ	saməħ	he forgave
	samħ-k	samħək	I forgave
	samħ-u	samħu	he forgave him
	samħ-na	saməħna	he forgave us

c. Noun + possessive marker

i.	bab	bab	door
	bab-k	babək	your door
	bab-u	babu	his door
	bab-na	babna	our door
ii.	faxr	faxər	coal
	farx-k	faxrək	your coal
	faxr-u	faxru	his coal
	faxr-na	faxərna	our coal

The data in 27 comprise both trisegmental and quadrisegmental verb and noun forms. Trisegmental forms have the shape CVC while quadrisegmental forms have the shape CVCC. In the affixation-to-stem cases (i.e. 27a), no schwa is epenthesized between the verb stem and the first person marker [-t]. Thus we get output affixed forms such as [bəst] and [saməħt] which satisfy O-O_{stem} ANCHOR (σ, σ, Initial) but not *[bəsət] and *[samħət] which violate it. An output candidate such as [basət] meaning "she kissed" is allowed in CMA. The subject suffix here is the morpheme [-at] whose low vowel is reduced to a schwa because the stem contains another low vowel[2].In the affixation-to-word cases, the schwa is epenthesized before the affix [-k] in the verbal as well as the nominal forms. Thus inputs such as /bas-k/, /DaR-k/, /samħ-k/, and /faxr-k/ violate the constraint O-O_{word} ANCHOR (σ, σ, Initial) and surface respectively as [basək], [DaRək], [samħək], and [faxrək] but not as *[bask], *[DaRk], *[saməħk], and *[faxərk]. It should be noted that when the affix added is vowel-initial, O-O faithfulness in the stem and word levels is sacrificed to secure the undominated constraint ONSET.

In the following tableau, we consider some possible candidate output forms obtained from the input /samħ-u/ where the suffix [-u] marks the third person plural:

[2] Items such as [salat] do not constitute any counterexamples to vowel reduction. Given the fact that the input is /sala-at/ and not /sala-t/, one should expect the vowel of the suffix to truncate in order to avoid a cluster of two vowels.

-28-

/samħ-u/ Base: [sa.məħ]$_{stem}$	ONSET	*COMPLEX	O-O$_{stem}$ ANCHOR (σ, σ, Initial)
☞a. sam.ħu			*
b. sa.mħu		*!	
c. sa.məħ.u	*!		

The optimal candidate wins although it incurs a violation mark of O-O$_{stem}$ ANCHOR (σ, σ, Initial). In this candidate, only the initial segment of the first syllable corresponds to the initial segment of the first syllable in the base form. The initial segment of the second syllable in [sam.ħu] does not correspond to the initial segment of the second syllable in the base form (i.e. the segment [m]). Candidates 28b and 28c are ruled out although they satisfy O-O$_{stem}$ ANCHOR (σ, σ, Initial): 28b is excluded because of *COMPLEX, and 28c, because of ONSET.

To sum up, the examples considered in this subsection show that cyclicity in CMA can be explained in the extended version of correspondence where a distinction should be made between O-O$_{stem}$ and O-O$_{word}$. This distinction allows for a straightforward explanation of schwa epenthesis and non-epenthesis when a suffix that consists of a single consonant is added to the verb form. It has been shown that in the case of affixation to stem, no schwa is epenthesized between the stem and the subject suffix [-t], a fact which follows from high ranking O-O$_{stem}$ ANCHOR (σ, σ, Initial) above the markedness constraint *Min-σ. In the case of affixation to the word, schwa epenthesis applies before the object suffix [-k] and leads to a mismatch in position between the syllable initial segments of the affixed and the base forms. We have also shown that O-O$_{stem}$ ANCHOR (σ, σ, Initial) is satisfied only when ONSET and *COMPLEX are not at stake. Evidence for high ranking ONSET comes from vowel-initial suffixes that satisfy the constraint by changing the syllabic configuration of the base thus leading to the violation of O-O$_{stem}$ ANCHOR (σ, σ, Initial) and O-O$_{word}$ ANCHOR (σ, σ, Initial). As to the constraint *COMPLEX, we have shown that the initial segment of the third syllable of the affixed form in quadrisegmental verbs and nouns does not correspond to any segment in the base form.

In what follows, we will try to show if this line of analysis, which distinguishes between O-O_{stem} Faith and O-O_{word} Faith, can account for truncation observed in certain items to which the nisba morpheme is attached.

4. TRUNCATION

In this section, we will consider how O-O correspondence could be made use of to account for a class of nisba adjectives derived from compound nouns. Consider the following examples for illustration:

-29-

a.	nas-əl-ɣiwan	ɣiwani	(of) Ghiwane (a musical band)
	wlad-ħriz	ħrizi	from Oulad Hriz
	bni-məllal	məllali	from Beni-Mellal
	bni-zərwal	zərwali	from Beni Zerwal
	bni-məskin	məskini	from Beni-Meskine
b.	DDaR-(əl)-biDa[3]	biDawi	from Casablanca
	qəlʕət-əs-sraɣna	sərgini	from Qalaat Seraghna
	wlad-ʕəbbu	ʕəbbawi/ʕəbbubi	from Ouled Abbou
	wlad-ħəddu[4]	ħəddawi	from Ouled Haddou

Most of these toponyms are formed by compounding the word [wlad] or [bni] (both meaning "sons of") and another noun. However the meaning of the compound is not compositional. For example, the meaning of a word such as [bniməskin] is not predictable from the constituent elements [bni] meaning "sons" and [məskin] meaning "beggar" but it refers to a geographical area called "Beni-Meskine". In 29, the base to the derivation of the nisba adjective is the compound noun. When the nisba suffix is added, part of the base is deleted, a fact which shows that the output might be governed by some prosodic constraint that limits its output size. A consideration of the forms in 29 shows that the output does not exceed three

[3] the first [D] in [DDaRəlbiDa] and the first [s] in [qəlʕətəssraɣna] result from the assimilation of the definite article [l-] to the following coronal segment of the right-hand member of the compound.

[4] Notice here that the base final vowel [u] is realized as [a] in the nisba. The contiguity of the nisba suffix and the base final vowel gives rise to a hiatus that the language resolves by epenthesizing the glide [w] which agrees with the preceding vowel. Given the fact that CMA does not allow a sequence of two rounded segments (as will be seen in chapters five and six), the [u] of the base dissimilates to [a] to avoid output forms such as *[ʕəbbuwi] and *[ħədduwi].

major syllables. However, other nisba adjectives show that the output may also consist of two major syllables as the examples below:

-30-

sla	slawi	from Salé
sma	smawi	sky blue
wəʒda	wəʒdi	from Oujda
ʕəbda	ʕəbdi	from the Plain Abda
TaTa	TaTawi	from Tata
fas	fasi	from Fes
tazi	tazi	from Taza

Thus, it might be the case that part of the base in the compound items in 29 is truncated in order not to end up in forms that consist of more than three syllables. If this is the case, one might be tempted to assume that the deletion in the items in 29 is the result of a prosodic constraint requiring that the output consist of a minimum of two syllables and a maximum of three. The minimality requirement could be obtained by FT-BIN, which requires that the foot be binary at some level of analysis. As to the maximality requirement, it could be obtained by invoking the constraint ALIGN-Ft-R, demanding the alignment of the right edge of every foot with the right edge of the prosodic word. In this way, the constraint ALIGN-Ft-R may act as a prosodic delimiter of the output to the nisba. Thus the more feet a form has the less optimal it is. This constraint will have to dominate PARSE-σ demanding that every syllable be parsed into foot structure unless FT-BIN is at stake. It will also have to dominate the faithfulness constraint O-O_{word} MAX (corresponding to MAX-Base/Truncated in Benua 1995, 1997) to account for output-output correspondence between two words: the base output and its affiliate truncated form. In the tableau below, we show if the aforementioned constraints could account for the relation between the base [nasəlɣiwan] and the truncated form [ɣiwani].

-31-

Input: /nas-l-γiwan-i/ Base: [nasəlγiwan]$_{word}$	FT-BIN	PARSE-σ	ALIGN-FT-R	O-O$_{word}$ MAX
☹a. na(səl.γi)(wa.ni)			**	
b. (γi)(wa.ni)	*!		**	*****
c. γi.(wa.ni)		*!		*****

The optimal candidate according to the ranking in 31 is the wrong output *[nasəlγiwani] which contains only one foot that right-aligns with the PWd. The candidate in 31b is excluded because it violates FT-BIN and in so doing incurs two violation marks of the constraint ALIGN-Ft-R. The final candidate, which should be the actual optimal candidate, is ruled out because it incurs a fatal violation of PARSE-σ. One possible way of obtaining the optimal candidate [γiwani] is by ranking ALIGN-Ft-R above PARSE-σ thus allowing monomoraic syllables to be left unparsed as the following tableau shows:

-32-

Input: /nas-l-γiwan-i/ Base: [nasəlγiwan]$_{word}$	FT-BIN	ALIGN-FT-R	PARSE-σ	O-O$_{word}$ MAX
☞a. γi.(wa.ni)			*	*****
b. na(səl.γi)(wa.ni)		**!	*	

This ranking seems to yield the correct output. However, it cannot be accepted for three different reasons. First, and as it has already been established in chapter three, CMA is a language with exhaustive parsing, a fact which explains why PARSE-σ has to dominate ALIGN-Ft-R and not the other way round. Second, the ranking above would give the wrong output as to trisyllabic outputs not derived from compound nouns and which consist of a heavy syllable followed by two light syllables as in 33:

-33-

Base	*Nisba*	*Gloss*
tadla	tadlawi	from Tadla
TiTwan	TiTwani	from Tetuan
warzazat	warzazi	from Ouarzazate
bulman	bulmani	from Boulmane
wazzan	wazzani	from Ouazzane
tiznit	tizniti	from Tiznit

The foot structure of the output form should in fact be (H)(LL). But given the wrong ranking in 32, we should expect a word such as [tadlawi], for example, to be footed as tad.(la.wi) or even see its heavy syllable delete to surface as (la.wi). These two candidates fare better than the optimal (tad)(la.wi) in-as-far as the constraints in 32 are concerned. Third, the ranking of the constraints 32 predicts that words which consist of more than three syllables would never arise because this would incur additional violations of ALIGN-Ft-R. Such is not always the case as there are other nisba adjectives whose output consist of four syllables as shown in the examples below:

-34-

Base	*Nisba*	*Nisba Gloss*
filiSTin	filiSTini	from Palestine
muriTanya	muriTani	from Mauritania
mirikan	mirikani	from America
sinigal	sinigali	from Senegal
pakistan	pakistani	from Pakistan
l-kamirun	kamiruni	from Cameroon
l-filippin	filippini	from the Philippines

Truncation does not apply in these simple words even if the output consists of four syllables constituting two feet. Does that mean that the first two syllables to the left should be left unfooted? Or should the first be truncated and the second unfooted? Or should the first and second be truncated? Neither of these would work. If this is so, how is it then possible to account for deletion of part of the base in compound nouns when the nisba suffix is added?

The answer to this question comes from morphology and more particularly from the distinction between the categories 'stem' and 'word'[5]. A look at the compound words in 29 shows that the nature of the base of affixation, i.e. the constituent to which the nisba affix

[5] See Selkirk (1982) on the theory about the syntax of words and the distinction she makes between the categories Affix, Root, Stem and Word.

attaches, is defined in morphological terms. The morphological structures of the compound forms in 29 are given in 35 below:

-35-

a. $_{word}[[[nas]_{stem}]_{word}$-[əl-$[\gamma iwan]_{stem}]_{word}]_{word}$

$_{word}[[[wlad]_{stem}]_{word}$-$[[\hbar riz]_{stem}]_{word}]_{word}$

$_{word}[[[bni]_{stem}]_{word}$-$[[məllal]_{stem}]_{word}]_{word}$

$_{word}[[[bni]_{stem}]_{word}$-$[[zərwal]_{stem}]_{word}]_{word}$

b. $_{word}[[D[DaR]_{stem}]_{word}$-[əl-$[biDa]_{stem}]_{word}]_{word}$

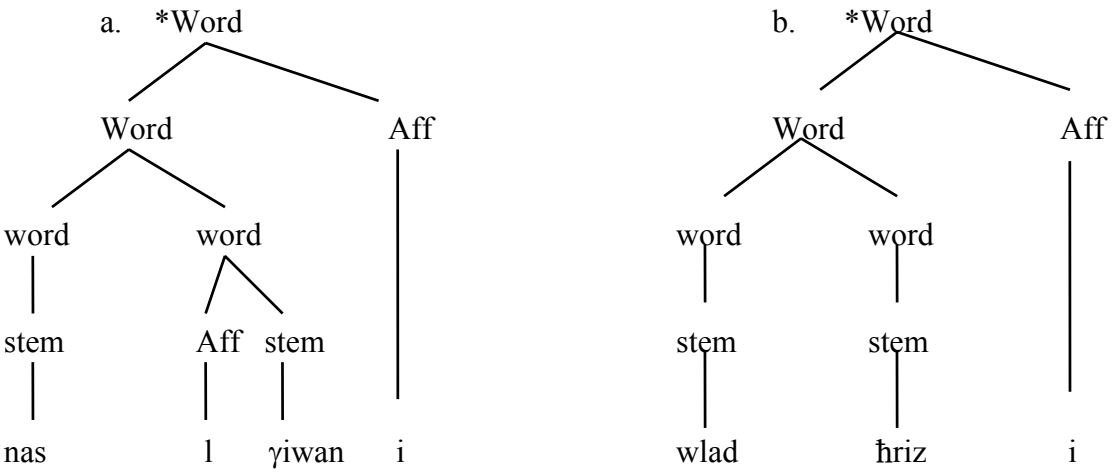
$_{word}[[[qəlʕət]_{stem}]_{word}$-[əs-$[sra\gamma na]_{stem}]_{word}]_{word}$

$_{word}[[[wlad]_{stem}]_{word}$-$[[ʕəbbu]_{stem}]_{word}]_{word}$

$_{word}[[[wlad]_{stem}]_{word}$-$[[\hbar əddu]_{stem}]_{word}]_{word}$

In the case of the compounds, the nisba morpheme has to attach to a base which should not have a morphologically complex shape. More specifically, it has to attach to the rightmost stem of the base. The input to the nisba cannot be the rightmost stem alone but it is the rightmost stem part of the whole compound word. In other words, nisba forms such as [γiwani] and [ħrizi] are derived not from the stems [γiwan] and [ħriz] but from the compound words [nasəlγiwan] and [wladəħriz], respectively. Thus nisba adjectives such as *[nasəlγiwani] and *[wladəħrizi] are failed candidates not because they consist of more than three syllables but because the nisba morpheme has been attached to the category ‘word’ and not to the category ‘stem’. Within the theory of word syntax (Selkirk 1982), the structures of *[nasəlγiwani] and *[wladəħrizi] are shown in 36:

-36-



The question we will try to answer below relates to the nature of the constraint(s) ruling out structures where the nisba affix is sister to the category 'word' instead of the category 'stem'.

In order to exclude structures like the ones in 36, we could possibly posit, following McCarthy (1993b), an alignment constraint of the type ALIGN (Nisba, L, Rightmost Stem, R) requiring that the left edge of the nisba morpheme coincide with the right edge of the rightmost stem. However, the problem with alignment constraints is that they do not say anything about hierarchical morphological structural relations since these constraints govern the relation of terminal strings. Therefore, and in order to account for the case of affixation to stem observed in the nisba adjectives derived from compounds, we need to invoke a specific class of constraints, which we call affixation constraints. These constraints account for the place of affixes in the hierarchical morphological structure, i.e. they specify the morphological category to which a particular affix attaches. In the case of the CMA nisba adjectives, the affixational constraint needed is stated in 37 below:

-37-

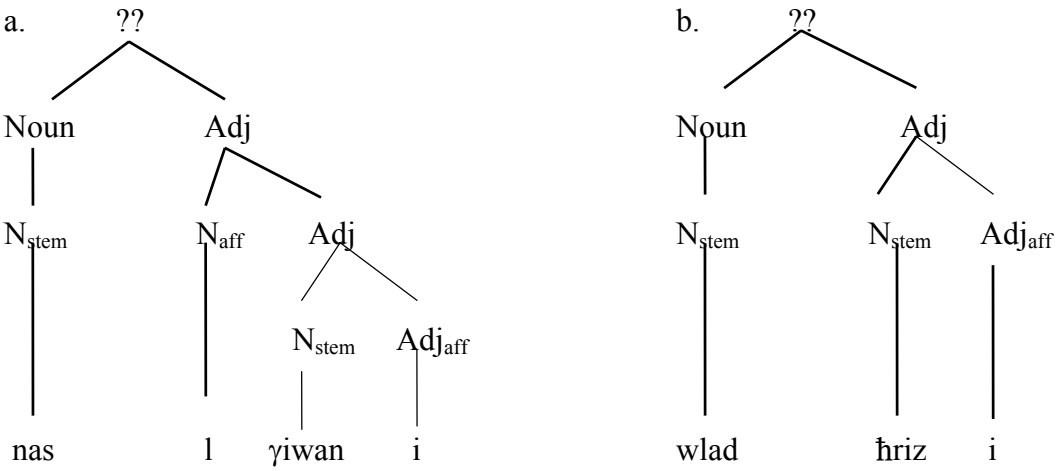
AFFIX (Nisba, R, $NOUN_{stem}$, R) (henceforth AFFIX-TO-N_{stem})

The nisba morpheme is suffixed to a noun stem.

Following Selkirk (1982), satisfying this constraint will give a derived structure where a stem dominates the nisba suffix and the noun stem. An additional principle from Selkirk calls for the projection of the features associated with the head of a morphological constituent. Since the nisba is an adjective-creating suffix in that it changes the syntactic category of the base to

which it attaches, we assume that this suffix is specified as [+adjective] and that, being the head, it projects its adjectival feature, thus producing an adjectival stem as the dominating node. In addition to the feature [+adjective], the nisba suffix projects other features such as [-feminine] and [-plural] since the resulting word is always masculine singular. Given the affixation constraint in 37 and the projection of the adjectival feature of the nisba, the structures in 36 will look like the ones in 38 below. (Noun and Adj stand for the major lexical category corresponding to 'word', N_{aff} stands for 'noun affix' and Adj_{aff} stands for 'adjectival affix')

-38-



As to the syntactic category of the whole compound, it is yet to be determined. It will be shown below that whenever a situation such as the one in 38 arises, the leftmost member of the compound is truncated. Truncation of this type could be understood if we know that the only compound structure allowed in CMA is one where both members are nouns.

Given that the compound nouns in 35 consist of two noun stems, attaching the nisba morpheme to the leftmost or to the rightmost stem would satisfy the constraint AFFIX-TO-N_{stem}. If this is the case, how is it possible to exclude forms such as *[nas**il**γiwan] and *[wlad**i**ħriz], where the nisba morpheme (written in bold) attaches to the leftmost stem and

retain forms such as those in 38, where the nisba attaches to the rightmost stem?[6]

The answer to this question comes from the Generalized Alignment Theory of McCarthy and Prince (1993b), and more particularly from a constraint requiring right alignment of the nisba affix and the PWd. This constraint is stated in 39 below:

-39-

ALIGN (Nisba, R, PWd, R) (henceforth ALIGN-Nisba-R)

The right edge of the nisba affix must be aligned with the right edge of the PWd.

This constraint, if satisfied, rules out any output form where the nisba is attached to the leftmost noun stem, a fact which shows that ALIGN-Nisba-R has to dominate AFFIX-TO-N_{stem}.

In compound nouns, suffixation of the nisba morpheme to the stem causes truncation of part of the base, i.e. any segment occurring to the left of the rightmost stem of the compound. In other words, the definite article (if any) and the leftmost member of the compound, which happens to be the head (Al Ghadi 1990, Boudlal 1993), are deleted, thus causing violation of the constraint Morpheme Realization (Samek-Lodovici 1993, Rose 1997, Gnanadesikan 1997) which is stated as follows:

-40-

Morpheme Realization (henceforth MORPH-REAL)

An input morpheme must be realized in the output.

In order to get the truncation of any morpheme occurring to the left of the rightmost stem, we need a constraint of the type in 41 below, ruling out compound constructions that consist of a noun and a nisba adjective.

---

[6] Further support for choosing the rightmost stem of a compound as a base for the nisba comes from abbreviated names whose leftmost stem, which is consistently the stem [ʕəbd] "servant of", is truncated as shown in the following items:

ʕəbd-lə-ʕziz	ʕaziz
ʕəbd-lə-krim	karim
ʕəbd-əl-ħakim	ħakim

The rightmost adjectival noun which is retained is subject to a constraint requiring that it be disyllabic, a fact which shows why stems such as [ʕaziz] and [ħakim] proceed to augmentation by a-affixation.

-41-

*[Noun + Adjective]$_{PWd}$ (henceforth *[N + A]$_{PWd}$)

A sequence of a noun and an adjective is prohibited.

If this constraint together with the constraints ALIGN-Nisba-R and AFFIX-TO-Nstem dominates MORPH-REAL, the morpheme(s) occurring to the left of the rightmost stem will not be realized. In 42 below, we shown how the nisba adjective [γiwani], derived from the base noun [nasəlγiwan] wins over other competing candidates. We assume that violation of MORPH-REAL is categorical, i.e. a form incurs a single violation even if more than one morpheme is deleted:

-42-

$_{word}$[[[nas]$_{stem}$]$_{word}$-[əl-[γiwan]$_{stem}$]$_{word}$]$_{word}$ **-i**	*[N + A]$_{PWd}$	ALIGN-Nisba-R	AFFIX-TO-N$_{stem}$	MORPH-REAL
☞a. γiwan**i**				*
b. nasəlγiwan**i**	*!		*	
c. nas**i**lγiwan		*!		
d. nas**i**		*!		*

In the optimal candidate, the right edge of the nisba suffix is aligned with the right edge of the PWd, which happens to be the base. The failure of the definite article and the leftmost stem of the compound to be realized in 42a is dictated by the constraint banning structures where the PWd contains compound structures that consist of a noun and an adjective. Such is not the case with candidate 42b which is ruled out because of violating higher-ranked *[N + A]$_{PWd}$. One way of avoiding a sequence of a noun and an adjective and therefore violation of the constraint *[N + A]$_{PWd}$ is for the nisba morpheme, held responsible for projecting its adjectival feature to the mother node dominating this morpheme and the noun stem, to attach to the leftmost stem of the compound. This is exactly the case with candidate 42c which satisfies *[N + A]$_{PWd}$ but fails because the right edge of the nisba suffix does not correspond to the right edge of the PWd. The same thing could be said about candidate 42d, except that it incurs, in addition to *[N + A]$_{PWd}$, a gratuitous violation of MORPH-REAL.

Next, consider an input such as [DDaRəlbiDa] (from the list in 35b) where the base ends up in a vowel. Since the nisba suffix is a vowel, we should expect glide epenthesis to apply to provide an onset to the syllable whose nucleus is the suffix vowel. This is exactly what happens. The optimal candidate [biDaw**i**] incurs a violation of the lower-ranked DEP-IO by epenthesizing the glide [w] and this in order to satisfy the undominated constraint ONSET. It also incurs a violation of another lower-ranked constraint, namely MORPH-REAL, by deleting the definite article and the leftmost stem of the compound in order to satisfy the constraint *[N + Adj]$_{PWd}$. A candidate such as *[biDa**i**] is excluded on the ground that it incurs a fatal violation of ONSET. Finally, other forms such as *[DDaR**i**lbiDa] and *[DDaRəlbiDaw**i**] are failed candidates because of different reasons. *[DDaR**i**lbiDa] fails because the nisba morpheme is adjoined to the leftmost stem of the base compound, thus causing a fatal violation of ALIGN-Nisba-R, whereas *[DDaRəlbiDaw**i**] fails because it consists of a sequence of a noun and an adjective which is ruled out by the constraint *[N + Adj]$_{PWd}$.

Morphologically conditioned truncation is not restricted to compound constructions; it also applies in certain toponyms containing the discontinuous feminine affix [ta-…-t] and the prefix [(ʔ)a-] as the examples in 43 for illustration:

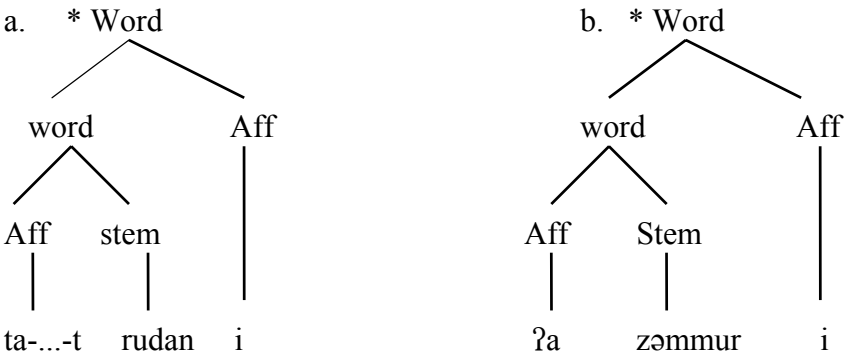
-43-

	Base	*Nisba*	*Gloss*
a.	tafilalt	filali	from Tafilalt
	tarudant	rudani	from Taroudant
	taħənnawt	ħənnawi	from Tahannaout
	təməSluħt	məSluħi	from Tameslouht
b.	ʔazəmmur	zəmmuri	from Azemmour
	ʔasfi	sfiwi/məsfiwi	from Safi
	ʔaməzzru	məzzriwi	from Amezrou

The suffixation of the nisba morpheme results in the deletion of the discontinuous morpheme [ta-...-t] and the prefix [(ʔ)a-]. The two affixes are of Berber origin: [(ʔ)a-] marks the singular

number, and [ta-...-t] shows that the word is feminine singular[7].What is more important for us here is that the nisba morpheme adjoins to a noun stem rather than to the major lexical category noun, corresponding to the 'word'. Adjoining the nisba morpheme to the 'word' would result in ungrammatical forms exemplified by the words *[tafilalti] and *[ʔazəmmuri] whose internal hierarchical morphological structures we give in 44 below:

-44-



In the structure in 44a, the discontinuous affix [ta-...-t] could well appear to the right of the stem and the result would always be the same. It is the sister node that determines the morphological category to which the nisba affix is attached. In both structures, the nisba morpheme is sister to the category 'word', a state of affairs which is ruled out by the constraint AFFIX-TO-N_{stem}. It has already been established above that ALIGN-Nisba-R must dominate AFFIX-TO-N_{stem} to ensure that the nisba morpheme appears at the right edge of the base in the case of compounds. With simple words such as those in 43, attaching the nisba morpheme to a noun stem would lead to the violation of ALIGN-Nisba-R, especially in bases with the discontinuous morpheme [ta-...-t] (cf. words such as *[tarudan**i**t] and *[tafilal**i**t], where the nisba is placed before the second part of the discontinuous morpheme). This points out to the fact that another constraint must dominate ALIGN-Nisba-R. In the case of the nisba

[7] The same morpheme is used in MA to derive abstract nouns of profession such as the following:

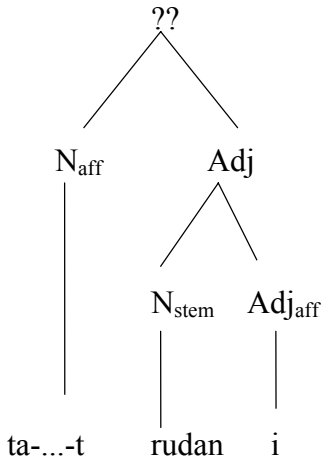
Base Noun	*N. of Profession*	*Base Gloss*
bənnay	tabənnayt	mason
fəllaħ	tafəllaħt	farmer
ħəddad	taħəddatt	blacksmith
ʃəffar	taʃəffart	thief

Here the discontinuous morpheme [ta-...-t] has both a derivational and an inflectional status. It performs more than the function it has in Berber which is marking the word for the feminine gender.

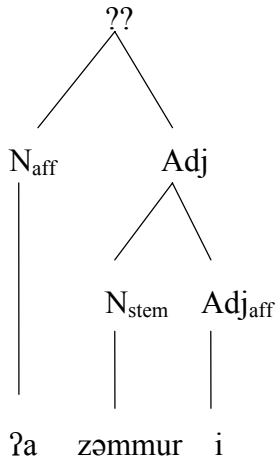
with compounds, it has been shown that it is the constraint *[N + Adj]$_{PWd}$ which forces the deletion of the leftmost member of the compound. In the case of the nisba with bases containing the affixes [ta-...-t] and [ʔa-], adjoining the nisba morpheme to the noun stem produces an adjectival stem as the dominating node, thus creating a sequence of a noun and an adjective as shown in 45:

-45-

a.



b.



The structures in 45 are reminiscent of a situation which is déjà vu with the compounds in 38 above. Both the structures in 45 and the structures in 38 contain a sequence of a noun and an adjective. The only difference is that the noun in 38 does not correspond to a major lexical category; it is an affix which is specified as [+noun]. The juxtaposition of a noun (or a nominal affix) and an adjective makes it impossible to determine which of the two categories the mother node, dominating both the nominal affix and the nisba adjective, should be specified for. Because the nominal affixes in 45 and the nisba adjectival affix bear conflicting features, the language resolves this conflict by truncating the nominal affix in order to satisfy the constraint *[N + Adj]. In the following tableau, we show how the nisba adjective [rudani], derived from the base [tarudant], wins over two other competing candidates:

-46-

$_{word}$[[ta-[rudan]$_{stem}$ -t] $_{word}$]$_{word}$ -i	*[N + A]$_{PWd}$	ALIGN-Nisba-R	AFFIX-TO-N$_{stem}$	MORPH-REAL
a. tarudant**i**	*!		*	
b. tarudan**it**	*!	*		
☞c. rudan**i**				*

Both candidates 46a and 46b are ruled out for violating the higher-ranked constraint *[N + Adj]$_{PWd}$ by allowing the nominal affix to occur with the nisba adjectival stem. Candidate 46a retains the discontinuous affix [ta-...-t] of the base and suffixes the nisba morpheme to the word, thus incurring a violation of the constraint AFFIX-TO-N$_{stem}$. As to candidate 46b, it satisfies AFFIX-TO-N$_{stem}$ but incurs a violation of ALIGN-Nisba-R by retaining the suffixal part of the same discontinuous morpheme which happens to mark the right edge of the base word.

To sum up, this section has shown that if we are to account for the truncatory phenomenon exhibited by the nisba adjective derived from compound nouns, we need to make recourse to constraints governing morphological structure. We have shown the nisba morpheme is introduced by an affixation constraint of the type AFFIX-TO-N$_{stem}$, requiring that it attach to the noun stem and not to the major lexical category noun. we have also shown that this constraint needs to be complemented by an alignment constraint requiring coincidence of the right edge of the nisba suffix with the right edge of the PWd. We have argued that these two constraints along with the undominated constraint *[N + Adj]$_{PWd}$ force truncation of the nominal affixes in the toponyms in 43 and the leftmost stem of compound bases

Having shown how the nisba adjectives with compound nouns and nouns with the affixes [ta-...-t] and [ʔa-] are derived, we turn, in the following section, to show how correspondence constraints, formulated within the OT framework, could account for the causative forms in CMA.

5. PROSODIC CIRCUMSCRIPTION AS REDUPLICATION

As stated in the introduction to this chapter, Bennis (1992) has shown that the causative could be analyzed as a case of prosodic circumscription. The domain circumscribed

prosodically is a minimal syllable which corresponds to CəC or CV (where V is one of the full vowels [i, u, a]). Consider some causative forms derived from the base which corresponds to the verb stem:

-47-

	Base	*Causative*	*Base Gloss*
a.	ktəb	kəttəb	write
	dxəl	dəxxəl	enter
	lʕəb	ləʕʕəb	play
	tləf	təlləf	lose
	wləd	wəlləd	give birth to
	bki	bəkki	cry
	dwi	dəwwi	speak
	kma	kəmma	smoke
b.	fiq	fəyyəq	wake up
	Tiħ	Təyyəħ	fall down
	TiR	TəyyəR	fly
	ʃuf	ʃəwwəf	see
	dub	dəwwəb	dissolve
	nuD	nəwwəD	get up
	bul	bəwwəl	urinate
	gul	gəwwəl	say

According to Bennis (1992), the causative is obtained by the prefixation of $\sigma_{\mu\mu}$ to a prosodically circumscribed syllable which is CV or CəC as in 47a, or the suffixation of $\sigma_{\mu\mu}$ to a minimal CV syllable as in 47b. This affixation is obligatorily accompanied by left-to-right or right-to-left spreading of the second segment of the base and this to satisfy a template requiring that the causative consist of two syllables. Unlike Bennis, we assume that the causative involves affixation of a monomoraic rather than a bimoraic syllable and this in conformity with the claim made in Al Ghadi (1994) and Boudlal (to appear a), namely that the schwa and a following consonant are dominated by a single mora. With this revision in hand, let us see how words such as [bəkka] and [fəyyəq] could be derived

a. Input (= stem)

b. Consonant extrametricality and circumscription of a minimal syllable

c. Causative (Affixation of σ_{μ})

d. Right-to-Left/ Left-to-right spreading

e. Restoring extrametrical consonants

f. Schwa epenthesis

The derivation of the causative in 48 is operational and is therefore incompatible with the theoretical model adopted here. A circumscriptional analysis operates in successive steps: it first scans for a prosodic constituent in the input, which is either CV or CəC. Then, it performs an operation on that constituent by proceeding to the prefixation or suffixation of the causative morpheme and the spreading of the base medial segment and schwa epenthesis. Finally, the result is put together and mapped onto a disyllabic template.

As seen in section 3.2 above, McCarthy (1997) has shown that much of the burden of operational prosodic circumscription could be taken on by ANCHOR-POS constraint family which requires forms to match in specific aspects of prosodic constituency. It has been shown that cyclic syllabification in CMA could be accounted for by invoking either the constraint O-O_{stem} ANCHOR (σ, σ, Initial) requiring preservation of syllable-initial segments of the base and derived output forms in the morphological constituent stem, or the constraint O-O_{word} ANCHOR (σ, σ, Initial) requiring preservation of syllable-initial segments of the base and derived output forms in the morphological constituent word.

For example, in the case of the causative form [kəttəb], we assume that the base is the stem [ktəb] and that both [kəttəb] and [ktəb] are related in an O-O_{stem} correspondence relation requiring that the syllable-initial segments of the base preserve their positions in the derived output. Compare the candidates in 49 below to see to what extent they are related to the base. For the sake of clarity, the geminate part indicating the causative is underlined.

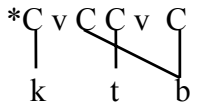
-49-

/ktb, Caus/ Base: [k.təb]$_{word}$	O-O_{stem} ANCHOR (σ, σ, Initial)	ALIGN-L (Causative, PWd)
☞a. kət.təb		**
☜b. kəb.təb		**
c. kət.bəb	*!	***

This tableau does not consider candidates such as *[kəktəb], where the first segment of the root is geminated. The reason is that such a form is ruled out by an independently motivated OCP constraint that prohibits geminates from occurring in initial position (see below for details). Candidate 49c is excluded because it incurs a fatal violation of O-O_{stem} ANCHOR (σ, σ, Initial): the initial segment of the second syllable, which is [b], does not correspond to the initial segment of the same syllable in the base (i.e. the segment [t]). In 49a and 49b, both candidates satisfy O- O-O_{stem} ANCHOR (σ, σ, Initial). The syllable-initial segment of the first syllable (i.e. [k]) in the derived forms corresponds to the syllable-initial segment in the simple form (i.e. the segment [k] that constitutes a minor syllable on its own). Similarly, the syllable-initial segment of the second syllable (i.e. [t]) corresponds to the syllable-initial segment of the second syllable in the simple base form. Note also that both 49a and 49b incur two violation marks for the constraint requiring left alignment of the causative and the PWd.

One could possibly argue that given the fact that the causative formation yields a geminate, an output form such as *[kəbtəb] could possibly be ruled out by invoking the NO-CROSSING principle (Goldsmith 1976, 1979 and McCarthy 1979) as the representation in 50 shows. The lower case v stands for the schwa position:

-50-



The long distance consonant spreading is blocked in 50 exactly because it creates line-crossing since the first part of the geminate denoting the causative is not contiguous to the second part. Thus in order to derive the correct output, NO-CROSSING and O-O_{word} ANCHOR (σ, σ, Initial) must dominate ALIGN-L (Causative, PWd) as the tableau below shows:

-51-

/ktb, Caus/ Base: [k.təb]$_{stem}$	NO-CROSSING	O-O_{stem} ANCHOR (σ, σ, Initial)	ALIGN-L (Causative, PWd)
☞a. kət.təb			*
b. kəb.təb	*!		*

Candidate 51 is ruled out because the underlined segment denoting the causative is the result of a consonantal spreading that causes violation of NO-CROSSING.

Verb bases on the pattern CCV can be accounted for in the same way as bases on the pattern CCVC considered in 51. For example, the causative form of a verb such as [b.ka] "he cried" is [bək.ka] where the syllable-initial segments in the derived word correspond to the syllable-initial segments in the base stem. The problematic cases are bases on the pattern CVC whose causative form is realized as CəG.GəC, where G stands for glide. Thus, in an example such as [fiq] "wake up!", the causative form [fəy.yəq] violates the constraint O-O_{stem} ANCHOR (σ, σ, Initial) because the initial segment of the second syllable in [fəy.yəq] (i.e. the glide [y]) does not have a correspondent in the base [fiq]. This shows that the circumscriptive analysis, reformulated within the correspondence model of McCarthy and Prince (1995, 1999), is incapable of deriving the correct output causative form.

In what follows, we propose to analyze the causative within nonoperational CT without reference to the O-O_{stem} ANCHOR (σ, σ, Initial) constraint. In particular, we will make use of a proposal made by Imouzaz (forthcoming), namely that the causative formation involves partial reduplication of the base. Stating that the causative morpheme is reduplicative obviates the need for a template since the role played by this latter follows from the interaction of universal constraints in the grammar of CMA. Moreover, we would not have to resort to the NO-CROSSING principle to block long distance spreading in cases such as *[kəbtəb] since this would derive from segmental copying as in reduplication (Gafos 1996, 1998).

It should be noted that the output of the causative is a disyllabic word which satisfies FT-BIN (McCarthy and Prince 1993a and Prince and Smolensky 1993) and conforms to an iambic foot of the type LL [8]. Note also that the reduplicant in CMA is always the second segment of the base. The causative reduplicative affix itself is not specified for any segmental content; its realization depends on constraint interaction.

One of the constraints needed for the derivation of the causative is E-ALIGN (Root, PWd) formulated by Nelson (1998) within McCarthy and Prince's (1993b) Alignment Theory. This constraint is stated as follows:

[8] This is a piece of evidence for the line of analysis suggested in chapter three for the stress system of the language, i.e. that the foot is iambic. It might even be said that the default foot of the language is of the type LL. (See Boudlal to appear b, and chapter six below for examples supporting this assumption)

-52-

ALIGN-E (Root, PWd)

The left edge of the root must correspond to the left edge of the PWd and the right edge of the root must correspond to the right edge of the PWd.

As predicted by Nelson (1998), the constraint in 52 forces infixation of a reduplicative morpheme, exactly as is the case in CMA causative forms. This constraint also prevents total reduplication of the base, thus forcing violation of MAX-Rt-BR:

-53-

MAX-Rt-BR

Every root segment of the base has a correspondent in the reduplicant.

The constraint ALIGN-E (Root, PWd) must dominate MAX-Rt-BR since only a single segment of the base is reduplicated in the data in 47 above. It has also to dominate another constraint, proposed in McCarthy and Prince (1995), demanding that the left edge of the reduplicant correspond to the left edge of the base:

-54-

ANCHOR (Base, L, RED, L) (henceforth L-ANCHOR-BR)

The left edge of the base must correspond to the left edge of the reduplicant.

Violations of ALIGN-E (Root, PWd), MAX-Rt-BR and L-ANCHOR (RED, Base) are assessed gradiently; each failed candidate receives one violation for every segment violating ALIGN-E (Root, PWd) or L-ANCHOR (RED, Base).

With the constraints in 52, 53 and 54 in hand, let us proceed by showing how the causative form is obtained. The constraint tableau in 55 shows how the constraints developed above interact to give the output form [kəttəb] from the input /RED, ktb/. For clear exposition, the reduplicant is underlined:

-55-

/RED, ktb/	ALIGN-E (Root, PWd)	L-ANCHOR-BR	MAX-Rt-BR
☞ a. kə<u>t</u>.təb		*	**
b. <u>k</u>ək.təb	**!		**
c. kət.<u>b</u>əb		**!	**
d. kə<u>b</u>.təb		**!	**
e . <u>k.təb</u>.k.təb	****!		

Two observations need to be made here: first, is that only consonants (including glides) and high vocoids are copied. The low vowel [a] and the epenthetic schwa are never copied. Second, all the causative forms resort to schwa epenthesis to yield a disyllabic output. This epenthesis leads to the violation of DEP-IO which will not be shown in the tableaux here since the constraint ranks low in the constraint hierarchy.

The optimal candidate in 55 satisfies higher-ranked ALIGN-E (Root, PWd) but incurs one violation mark of L-ANCHOR-BR because the reduplicant copies the second segment of the base and not the first. It also violates MAX-Rt-BR because the reduplicant is only one segment of the base. Although the reduplicant in candidate 55b is left-anchored to the base, it is excluded because it violates an undominated constraint, namely ALIGN-E (Root, PWd). Both 55c and 55d are failed candidates because the reduplicant copies the third segment of the base and not the second thus causing a fatal violation of L-ANCHOR-BR. Finally, candidate 55e is ruled out because the reduplicant copies all of the base segments, thus fatally violating ALIGN-E (Root, PWd).

Now let us return to the candidate where the reduplicant copies the first segment of the base. A form such as *[kəktəb], where both the left and right edges of the root and the PWd are aligned, would be hard to defend given the constraints in 55. It should win over the optimal candidate since the left edge of the base anchors with the left edge of the reduplicant. But as we have already pointed out, forms such as *[kəktəb] never arise since they violate the OCP which prohibits words in CMA to start with initial geminates. In fact, initial geminates do occur in CMA as the following examples show:

-56-

a.	bb^{w}a	my father
	mm^{w}i	my mother
	xx^{w}a	brother/friend (colloquial)
b.	l-DaR < DDaR	the house
	l-tub < ttub	the fabric
	l-ʃəmʃ < ʃʃəmʃ	the sun
	l-DəRb < DDəRb	the hitting

The geminates in 56a are referred to as underlying geminates. Those in 56b are derived geminates; they are the result of the assimilation of the definite article [l-] to a word-initial coronal consonant. As we have already pointed out in chapter two, the first and second members of the geminate belong to two different syllables, something that follows from the constraint *COMPLEX. If this is so, then the prohibition against the occurrence of initial geminates in cases such as *[kəktəb] could be seen as one referring to the first syllable of a word[9]. The constraint is formulated within the Beckman (1998) Positional Faithfulness Theory as follows [10]:

-57-

*GEMINATES-σ1 (henceforth *GEM-σ1)

Geminates are prohibited in the first syllable.

This constraint will have to dominate the more general version of the markedness constraint banning the occurrence of geminates (i.e. *GEM) as the tableau below expounds:

[9] McCarthy (1997) has pointed out that imperfective initial gemination cannot apply in Berber words such as[bb.xl] (where underlined segments are syllabic) because of an undominated constraint against syllabifying a geminate as an onset and nucleus of a single syllable.

[10] Beckman (1998) assumes that there are a variety of phonological asymmetries exhibited by segments in certain perceptually or psycholinguistically prominent positions. Such positions include stressed syllables, syllable onsets, roots, and root-initial syllables. The prohibition against initial geminates in CMA could be seen as an example of positional faithfulness.

-58-

	*GEM-σ1	*GEM
☞a. kət.təb		*
b. kək.təb	*!	*

This tableau shows that if geminates are to occur in CMA, they have to be heterosyllabic in order to avoid violating *GEM-σ1.

Let us next see how candidates such as *[kək.təb] and *[kək.təb] are suboptimal. We assume that *GEM-σ1 should outrank L-ANCHOR-BR and that *GEM-σ1 is not ranked with respect to ALIGN-E (Root, PWd) as shown in 59:

-59-

/RED, ktb/	*GEM-σ1	ALIGN-E (Root, PWd)	L-ANCHOR-BR
☞ a. kət.təb			*
b. kək.təb	*(!)	**(!)	
c. kək.təb	*!		

Note that in this tableau, candidate 59b could be excluded either because the initial syllable contains a geminate or because the left edge of the root is not aligned with the left edge of the PWd.

Roots whose medial segment is a high vocoid need reference to the constraints in 55 along with ONSET, an undominated constraint in CMA. Verb bases of this type always geminate their second segment and surface as CəyyəC or CəwwəC. Consider how [fəyyəq] in 60 wins over any of the other candidates. Here, we represent a high vocoid with the underspecified segment /I/, but see the tableau below for a different assumption that will be adopted in this work.

/RED, fIq/	ONSET	ALIGN-E (Root, PWd)	L-ANCHOR-BR	MAX-Rt-BR
☞a.fə<u>y</u>.yəq			*	**
b. f<u>i</u>.iq	*!		*	**
c. <u>fiq</u>.fiq		***!		
d. fi.<u>q</u>əq			**!	**

It has now become clear that any output form violating the undominated ONSET will be rejected and so will any form resorting to total reduplication. Such is the case with candidates 60b and 60c. The candidate in 60d is suboptimal because instead of copying the second segment of the base, it copies the third and in so doing incurs two violations of L-ANCHOR-BR which prove fatal. The optimal candidate incurs only a single violation mark of L-ANCHOR-BR compared to candidate 60d. It also incurs two violation marks of DEP-IO since it has resorted twice to schwa epenthesis.

Note that there are other candidates that have not been included in the tableau above and these are candidates that tightly compete with the optimal one and seem to incur less violations as to the constraints given in tableau 60. Take for example a possible candidate such as *[f<u>i</u>.yəq] where the reduplicant is the high vowel [i] which corresponds to the glide [y] in the base. Both *[f<u>i</u>.yəq] and [fə<u>y</u>.yəq] incur a single violation mark of L-ANCHOR-BR by virtue of the fact that they copy the second segment of the base, and two violation marks of MAX-Rt-BR by virtue of the fact that two base segments are not copied. However, [fə<u>y</u>.yəq] incurs two violations of DEP-IO by epenthesizing two schwas whereas *[f<u>i</u>.yəq] incurs only one. This points to the fact that other constraints are needed to distinguish the two candidates.

To account for roots whose medial segment is a high vocoid, we assume, following Rosenthall (1994), that vowel/glide alternation follows from constraint interaction and that the difference between a vowel and a glide corresponds to association to a mora. In other words, a glide is a high vocoid linked directly to a syllable node and a vowel is a high vocoid associated to a mora. This way of viewing high vocoids eliminates underspecification for the feature [consonantal] and as such the underspecified high vocoids /I/ and /U/, representing both high vowels and their corresponding glides, will be simply represented as the vowels /i/

and /u/. The alternation between high vowels and their corresponding glides has been accounted for in feature geometry by assuming that glides have a [+consonantal] root note dominating a V-Place node while high vowels have a [-consonantal] root node dominating a V-Place node (Clements and Hume 1995). The assumption underlying the present work about high vocoids is that underlying high vowels are specified as [-consonantal] whereas underlying glides are specified as [+consonantal] (Hyman 1985, Waksler 1990, Hume 1992 and Clements and Hume 1995). The realization of an underlying high vowel as a glide or an underlying glide as a high vowel results in a change of featural specification of the input. Thus an output such as *[fi̲.yəq] is a failed candidate because there is a lack of identity between the base and the reduplicant in terms of featural correspondence. The constraint needed to account for this mismatch is formulated along the lines suggested in McCarthy and Prince (1995) and which demands featural identity of the base and the reduplicant:

-61-

IDENT-BR [cons]

The base featural specification for [cons] must be preserved in the reduplicant.

We assume that this constraint outranks another IDENT constraint, IDENT-IO [cons] constraint demanding preservation of featural identity in the input/output mapping:

-62-

IDENT-IO [cons]

Featural specification for [cons] must be preserved in the input/ output mapping.

Let us see how the interaction of the two IDENT-IO [cons] constraints would favor [fəyyəq] over other competing candidates:

-63-

/RED, fiq/	IDENT-BR [cons]	IDENT-IO [cons]
☞a.fə̲y.yəq		*
b. fi̲.yəq	*!	*
c. fi.y̲əq	*!	

Both candidates 63b and 63c incur a fatal violation of higher-ranked IDENT-BR [cons] either because the reduplicant is a high vowel and the base is a glide or vice versa. 63b fails exactly because the reduplicant which is [i] in this case corresponds to [y] in the base; candidate 63c is also excluded because the reduplicant [y] corresponds to the base [i]. The optimal candidate 63a satisfies IDENT-BR [cons] at the expense of low-ranked IDENT-IO [cons]. Here, the input vowel associated to a mora is realized as a glide in the output, thus losing its moraic status. Of a particular interest in tableau 63 is that the base copies the reduplicant, a state of affairs which leads to the violation of input-output faithfulness. Given that the second segment of the input is /i/, its realization as the glide [y] will automatically lead to the violation of IDENT-IO [cons]. Such account is available only under CT where an identity relation holds between the base and the reduplicant, on the one hand, and between the input and the output, on the other.

One may wonder why a form such as *[fi̲yiq] is ruled out although it satisfies both IDENT-BR [cons] and IDENT-IO [cons] by virtue of the fact that the reduplicant has a correspondent in the base (the glide being epenthesized to satisfy ONSET). It should be noted that the causative form is governed by a prosodic constraint which requires that the output form consist exactly of an iambic foot of the type LL. The constraint LL will have to dominate MAX-Rt-BR so as to exclude cases that resort to total reduplication or any other type of feet as the tableau below shows:

-64-

	LL	MAX-Rt-BR	DEP-IO
a. fə̲y.yəq		**	**
b. fi̲.yiq	*!	**	*
c. fiq̲.fiq	*!		
d. fi.fi̲q	*!	*	

All of the candidates, except 64a, are ruled out because they fail to conform to an iambic foot of the type LL. The optimal candidate has proceeded to a double epenthesis of a schwa to achieve the desired foot type. Note also that this candidate violates IDENT-IO [cons] but this violation is achieved for the purpose of establishing featural correspondence between the base and the reduplicant.

Next, consider another causative case obtained from verbs whose second segment is the high vocoid /u/. The tableau below lists some possible candidates from the input /RED, dub/:

-65-

/RED, dub/	ONSET	ALIGN-E (Root, PWd)	L-ANCHOR-BR	MAX-Rt-BR
☞a.dəw.wəb			*	**
b. du.ub	*!		*	**
c. dub.dub		***!		
d. du.bəb			**!	**

Once again, the constraints developed above predict that it is always the form that copies the second segment of the base which is optimal. Of course, this form has to satisfy higher-ranked constraints such as ONSET and ALIGN-E (Root, PWd). Note that the constraint LL considered in 64 blocks total reduplication and in so doing does part of the functions performed by ALIGN-E (Root, PWd). In the optimal candidate in 65, the input vowel, which is /u/ loses the mora associated with it and surfaces as the glide [w] due to undominated IDENT-BR [cons] requiring identity between the base and the reduplicant.

Finally, let us consider a causative form obtained from verbs whose final segment is a vocoid. From the input /RED, bki/, Gen would allow the generation of output candidates such as the following:

-66-

/RED, bki/	ALIGN-E (Root, PWd)	L-ANCHOR-BR	MAX-Rt-BR
☞a. bək.ki		*	**
b. bəy.ki		**!	**
c. bək.yi		**!	**

Both candidate 66b and 66c are excluded because they incur two violations of L-ANCHOR-BR. The optimal candidate itself incurs only a single violation of the same constraint. As to the IDENT constraint family, candidates 66b and 66c violate IDENT-BR [cons] because the reduplicant, which is a glide, stands in correspondence with the base vowel.

To conclude, we have argued that the causative in CMA could be accounted for adequately by assuming a set of universal constraints ranked on a language-particular basis. In essence we have shown that operational circumscription is not warranted for the different steps it involves. We have also shown that the reanalysis of circumscription as prosodic faithfulness to some designated syllable edge can neither account for verb bases having the shape /CVC/ nor block long distance consonantal spreading. We have instead proposed an output-output analysis based on the idea that the causative involves partial reduplication of the second segment of the base. The output-output relation dealt with in this section involves two strings produced simultaneously (i.e. the base and the reduplicant) which do not exist as separate words. This relation differs from the output-output relation encountered in section 3 above involving separate words that are not produced simultaneously. (For a comparison between the two output-output relations, the reader is referred to Benua 1995, 1997).

6. CONCLUSION

This chapter has tried to analyze phonological similarities between words that stand in a transderivational relationship. It has been shown that cases originally attributed to cyclicity, truncation and circumscription could be accounted for by output-output constraints demanding correspondence between a derived form and its morphologically related form. The cases considered were cyclic syllabification, truncation and finally causative formation.

In dealing with cyclic syllabification in CMA, we have proposed an analysis in terms of a small subset of constraints, one of which demands faithfulness of the derived form to the simple base form. Our notion of the base rests essentially on the definition set up in Basri et al (1998) and Selkirk (1999). These authors have proposed a morphologically grounded theory of O-O correspondence that distinguishes two different O-O faithfulness constraints: O-O_{word} Faith and O-O_{stem} Faith. In order to account for cyclic syllabification in CMA, we have proposed two different O-O constraints formulated after Selkirk (1999) and consistent with the correspondence model of McCarthy and Prince (1995, 1999): O-O_{stem} ANCHOR (σ, σ, Initial) and O-O_{word} ANCHOR (σ, σ, Initial). This distinction is based on the distribution of subject and object suffixes. In particular, we have shown that O-O_{stem} ANCHOR (σ, σ, Initial) must dominate O-O_{word} ANCHOR (σ, σ, Initial) based on items such as [DRəb-t] which does not epenthesize a schwa before the subject suffix and [DəRbək] which

epenthesizes a schwa before the object suffix and hence violates O-O_{word} ANCHOR (σ, σ, Initial). We have also shown that O-O_{stem} ANCHOR (σ, σ, Initial) is never violated except when the markedness constraints ONSET and *COMPLEX are at stake. Resorting to a morphologically-grounded theory of O-O correspondence to account for cyclic syllabification obviates the need for any mechanisms, such as those used in rule-based systems, which try to explain cyclicity by reference to intermediate stages in the input-output mapping process.

The chapter has also dealt with cases where part of the base is truncated in the formation of some nisba adjectives derived from compound nouns and from nouns with the affixes [ta-...-t] and [ʔa-]. We have argued that in order to adequately account for these nisba adjectives, recourse needs to be made to morphology, and especially to the distinction between the stem and the word. We have shown that truncation follows from ranking *[N + Adj]$_{PWd}$ along with the affixation constraint AFFIX-TO-N_{stem} and the alignment constraint ALIGN-Nisba-R above the constraint MORPH-REAL, thus forcing deletion of the leftmost stem of a compound and the nominal affixes [ta-...-t] and [ʔa-] in toponyms.

Finally, following Imouzaz (forthcoming) we have argued that the causative could adequately be accounted for in terms of O-O correspondence relating the base and its reduplicant. We have shown that the constraint ALIGN-E (Root, PWd) proposed in Nelson (1998) is very active in CMA since it prevents total reduplication and forces the reduplicant to be an infix. We have also shown that the causative form of words such as [fəyyəq] "wake up" and [dəwwəb] "dissolve", derived from the roots /fiq/ and /dub/, exhibits a special behavior in that the base in both forms copies the reduplicant which is [y] in the first item and [w] in the second. Such an explanation could only be achieved if we posit constraints on the output such as the one between the base and the reduplicant.